Media Object Server (MOS™) Protocol v4.0

MOS Protocol version 4.0
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7. You are not allowed to make representations of MOS Compatibility unless you have followed these guidelines.

Abstract

MOS is a more-than twenty year-old evolving protocol for communications between Newsroom Computer Systems (NCS) and Media Object Servers (MOS) such as Video Servers, Audio Servers, Still Stores, Character Generators, Automation Servers, and Prompters. The MOS Protocol development is supported through cooperative collaboration among equipment vendors, software vendors and end users.

Status of this document

This document reflects changes to the MOS protocol discussed during various NAB and IBC MOS meetings. It is referred to as MOS v4.0. New version details are here.

How to use this document

The document contains bookmarks and hyperlinks. The Table of Contents and other areas contain underlined phrases. Depending on the viewer application used, clicking or double clicking on underlined links will take the viewer to the relevant portion of the document.

Please make special note of the Profiles section which provides context for the use of command messages which are later defined in detail.

Examples of each MOS message and data structure are included. These messages may be used for testing. Developers are encouraged to cut these messages from the document, change the value of ID tags as appropriate, and paste the modified messages into validation tools. Other than these example messages, validation tools are not provided by the MOS Group.

Media Object Server Protocol v4.0

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"ro" (Running Order) family of messages

NOTE: The following messages are officially removed from the MOS v4.0 specification and noted that they should not be used.

roStoryAppend
roStoryInsert
roStoryReplace
roStoryMove
roStoryMoveMultiple
roStorySwap
roStoryDelete
roItemInsert
roItemReplace
roItemMoveMultiple
roItemDelete
roStat
roItemStat

While vendors may choose to support the receipt and handling of older messages based on legacy implementations in prior versions of MOS, any MOS or NCS claiming to support MOS v4.0 and running in MOS v4.0 configuration should NEVER initiate any of the deprecated messages (above). For full descriptions of deprecated messages, please refer to the MOS v2.8.5 documentation.

5. ActiveX and HTML5 Web Control Specification

6. Field Descriptions

7. Recent Changes

(Changes prior to MOS v2.5 removed from this document)

1. MOS v4.0 Introduction

MOS v4.0 builds on earlier versions of the protocol by enhancing the communication layer to allow interaction between systems across firewall-protected security zones.

This may typically include work between a local facility and cloud-based resources, or among an enterprise's locations.

MOS v4.0 transport is designed around the Web Security Services (WSS) standard. WSS is an established, off-the-shelf technology with a wide set of libraries for several programming languages.

The message flow and message structure of MOS 4.0 is fundamentally the same as earlier versions of MOS.

It is expected that an NCS will support MOS v4.0 in addition to earlier families of the Protocol, i.e.: MOS v2.x (socket) and MOS 3.x (WebService).

MOS v4.0 supports "Passive Mode" transmission. MOS Passive Mode is similar to FTP PASV, in that it allows for bi-directional MOS-based communication to be initiated from one end of a “conversation.” MOS 4.0 utilizes a web socket-based solution, as a means of supporting and securing this passive approach. Often an organization may have one system ("inside" of a firewall) which will need to establish both outbound and inbound connections to the external device/newsroom. This approach allows for inbound MOS communication without having to open or expose firewall ports to do so.

Technical Details

In order for web socket-based communication to work, it requires both the NCS and the MOS to each expose a web server interface. Typically, this communication happens on port 80 for standard unsecure HTTP, or port 443 for standard secure HTTPS. However, devices may be configured to different ports, as necessary. Behind each of those interfaces, both the MOS and NCS must each expose an "endpoint" supporting the web socket protocol. This endpoint may be configured per device as well.

> For example, the secure "endpoint" for a MOS might be:
> wss://<SERVERNAME>/mos/Communication

WSS, similar to HTTPS, requires a certificate to be installed on each NCS and MOS. In the case of MOS passive mode, where only one side is listening for the initiating communication, only a single SSL certificate for the "external" or "listening" MOS or NCS is required. If passive mode is used, only the "listening" side needs to be directly available from system originating the communication across the data network.

In order to start communicating via MOS v.4.0 to our example MOS endpoint, the NCS opens a Web Socket connection pointing to the MOS's endpoint. Once a connection has been established, the NCS issues web socket messages (MOS messages) to the device.

In our example, the protocol specified is wss, this is web socket secure. In non-secure environments, the specified protocol would be "ws" - not requiring an SSL certificate on the listener end. Secure connections should be considered to be the standard for any communication link that will leave a customer's protected data environment. Non-secure connections should be considered only for communication that never leaves a customer's local network.

To ensure security at a "connection" level, parameters should be provided in the URL in order to authenticate the connection. The URL also includes an indication of what type of messages the connection carries.

To identify source and destination, the URL consists of a mosID (unique identifier for the media server), ncsID (unique identifier for the NCS).

As for the type of messages that will be carried, the transport layer of MOS 4 is built on the conventions of MOS 2. One group is for messages related to individual media objects (Legacy MOS Lower Port 10540). A second group is used for messages related to the organization of those media objects within stories and Running Orders and other content collections (Legacy: MOS Lower

Port 10540). A third group is for querying external systems for available content (Legacy Port 10542).

The URL for a message in MOS 4 includes a channel designation to represent the legacy MOS port that would be specified in MOS 2.x:

mom = MOS Lower (10540)
ro = MOS Upper (10541)
aux = MOS Obj Req (10542)

The specification of the “channel” preserves the logic of MOS 2.x, in that the two-port logic doesn’t fundamentally change.

Additional query parameters that are required as part of the device/newsroom URL configuration (for example, a NCS could request additional configuration if desired as a configuration parameter) may be passed along in the URL.

For “Standard” MOS communication (not Passive MOS), both the MOS and the NCS will open up one or two web socket connections – as appropriate (one which would have traditionally been port 10540, and one traditionally on port 10541) to the other side’s "web socket URL" - using the channel mom and channel ro respectively. You can then freely send messages using the web socket client/server model where each MOS message is automatically bounded by the web socket protocol.

If a device is currently configured to carry parameter information in the URL (API Key, username/password, etc.) the URL might look like this example:

<DEVICEHOSTNAME>/somepath/MyDeviceMos?param1=12345

Under MOS 4.0, the URLS might look like these:

wss://<DEVICEHOSTNAME>/somepath/MyDeviceMos?
param1=12345&mosID=MYMOSID&ncsID=MYNCSID&channel=mom

wss://<DEVICEHOSTNAME>/somepath/MyDeviceMos?
param1=12345&mosID=MYM OSID&ncsID=MYNCSID&channel-ro

For Passive MOS, the MOS or NCS which is protected inside the firewall will open a web socket client and connect to the externally-available MOS or NCS using a wss URL with the additional parameter added to the URL scheme:

"passive=true"

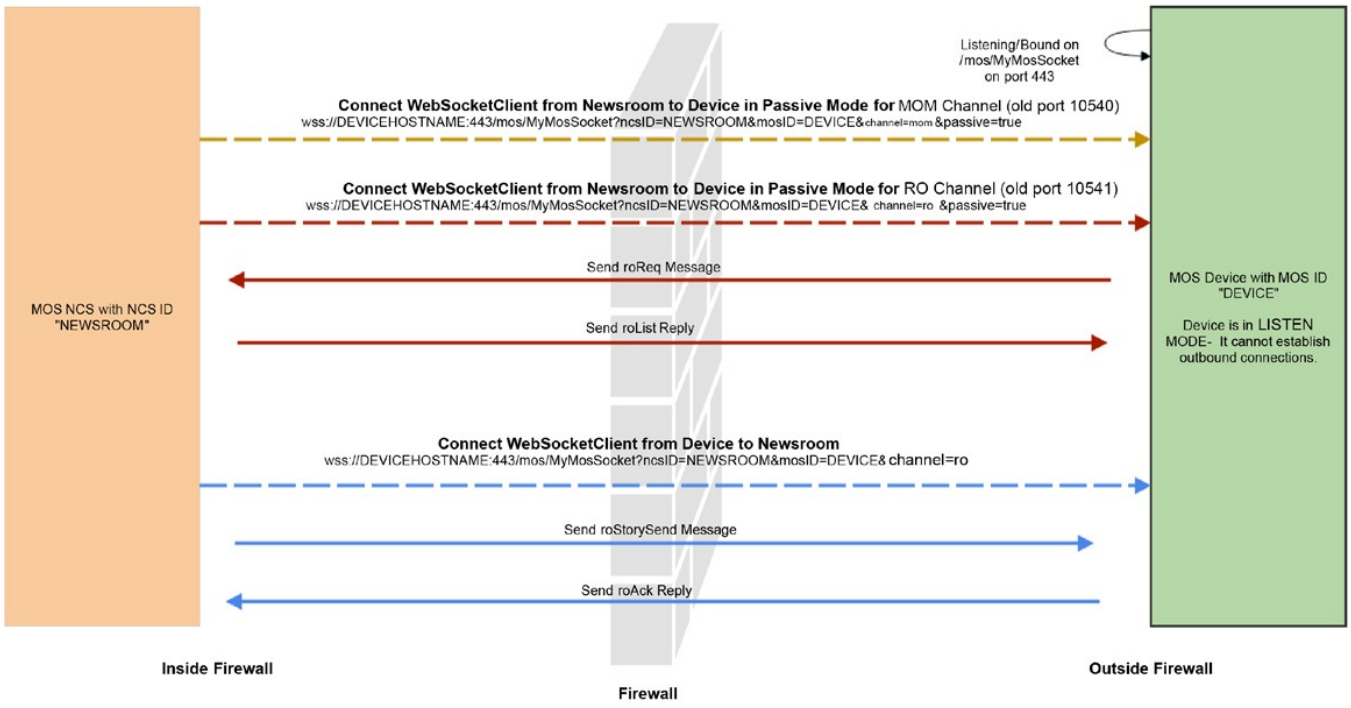
This parameter instructs the receiving device to respond to the connection through the temporary opening made in the sender’s firewall.

If the connection closes for any reason, the device inside the firewall must re-establish it as quickly as possible. One connection per group/“port” (ex: mom, ro or aux) should be established.

When the "external" device needs to originate a message sequence, for example an roReq message to the "internal" NCS, it will use this "passive" connection for the specific port that it was provided.

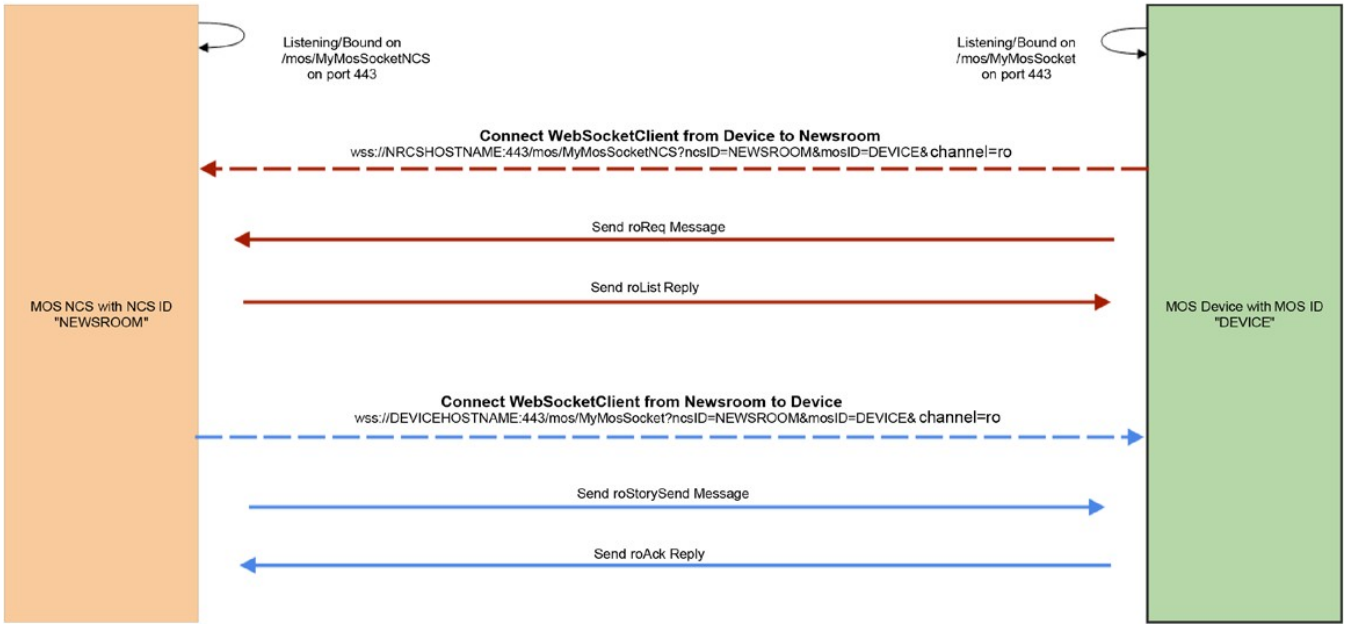
A comparison of these workflows is described in the diagrams below.

RoReq / RoList Sequence for Passive Web Socket Implementation



Note: Passive Connections **Yellow** and **Red** must remain connected at all times. If the connection disconnects, the" active" device(in this case, the newsroom) is expected to immediately reconnect them. Otherwise, inbound messages originating from the external device will not be received.

RoReq / RoList Sequence for Standard Web Socket Implementation



Authentication

MOS v4.0 is designed so all web socket channel communication may be secured.

It is strongly recommended that devices use HTTPS with a username/password schema on the basis of the HTTP Authorization headers with the "Basic" schema. This is well defined and secure, and by not putting sensitive credentials into the URL avoids any accidental interception or capture of this data in logs.

This requires an authorization fields to be added to the HTTP header on connection of the web socket.

See the supplemental security links for additional information about header authentication, section 10.5.

Self Signed and Untrusted Certificates

Authority issued certificates are always accepted, SSL certificates issued by Certificate Authorities are always accepted.

MOS devices and NCSes are also expected to accept self-signed certificates, or provide an option to do so.

When configuring the device, if self-signed certificates aren’t enabled by default, a configuration option should be provided allowing for this option.

For security purposes, it is recommended that devices allowing self-signing by default provide an option to disable it.

The following changes have been made to this document:

- A new introduction has been added to this document that explains the MOS 4.0 protocol changes focused on security in modern newsrooms.
- Passive MOS is a new style of MOS communication (similar to FTP passive mode) which allows a device inside a firewall to establish and communicate bi-directionally with devices outside of the firewall.
- keepAlive is a new MOS message that has been added to profile zero. It is designed to keep secure connection established between devices inside and outside of a site's secure network.
- A new appendix has been added that describes web security standards that are used in MOS 4.0.
- Many of the old MOS 2.6 messages, which were deprecated in MOS 2.8 have been removed from the MOS 4.0 document. These messages have been superseded by roElementAction. Additionally, roStat and roItemStat have also been removed as their functionality can be replicated with roElementAction.
- The XSD and DTD have been updated to remove the 2.6x branch of messages as well as adding the new keepAlive message.
- This document has been globally updated to replace all special quotes with standard quotes for better clarity and copy/paste support.
- Minor typographical errors were corrected throughout the document.

A reminder: MOS Protocol v4.0 compatible equipment will ignore, without error, any unknown tags in a message, so long as the message or structure contains properly formatted XML content and the minimum subset of required MOS tags for that message or structure.

2. MOS Profiles

The purpose of these profiles is to define basic levels of functionality enabled by the MOS Protocol v4.0.

There are seven Profiles defined:

The purpose of MOS Profiles is to describe minimum levels of functionality and support. Vendors are encouraged to derive more complex levels of functionality from any Profile, so long as support is maintained for the basic profile and MOS syntax and transport rules are not compromised.

Vendors wishing to claim MOS compatibility must fully support, at a minimum, Profile 0 and at least one other Profile.

When claiming MOS compatibility or using the MOS Logo, vendors must clearly state which of the seven profiles they support. For instance: "MOS Compatible – Profiles 0,1,2,3,4,5,6,7"

In order to claim support for a specific profile the vendor must fully implement all messages in the manner specified by the profile. In addition, the vendor must fully implement and support the workflow described by the profile.

Optional functionality is clearly identified with the word "Optional" or with the phrase "Recommended Work Practice" in bold, followed with optional information in italics.

All other functionality is required.

2.1 Profile 0 – Basic Communication

This Profile enables basic MOS XML message exchange and discovery between applications and machines using TCP/IP sockets.

Messages required for support of Profile 0:

keepAlive
heartbeat
reqMachInfo
listMachInfo

General Work Flow for Profile 0

- Establish communication to another MOS Protocol-compliant device
- Send a <heartbeat> message to another application and receive a <heartbeat> message in response
- Send a <reqMachInfo> message to another application and receive a <listMachInfo> message in response.

Implementation Notes

This Profile encompasses the most basic requirements and functions to support MOS Protocol message transfer. The four basic messages included in this profile, <keepAlive>, <heartbeat>, <reqMachInfo> and <listMachInfo> can be exchanged between any MOS v4.0 compliant devices

Profile 0 required MOS message support

keepAlive –Firewalls often close connections after short periods without traffic. The keepAlive message is utilized as a mechanism to keep the connection active, especially when MOS passive mode is in use.

Each connection can (optionally) send keepAlive messages. This message is valid on both MOS ports, bidirectionally. When received by the other end, the keepAlive messages are simply discarded. No reply (ACK, NACK, etc.) is necessary. Since a reply is not required and therefore not sequenced, the messageID field is not required for this message.

```
<mos>
<mosID>mediaserver.mos</mosID>
<ncsID>newsroomsystem.mos</ncsID>
<keepAlive/>
</mos>
```

keepAlive messages should be sent no faster than every 30 seconds. However, it is also acceptable to only send this message when an idle period of 30 seconds on the socket has been detected to reduce traffic.

heartbeat

The heartbeat message is designed to allow one application to confirm to another that it is still alive and communications between the two machines is viable.

An application will respond to a heartbeat message with another heartbeat message. However, care should be taken in implementation of this message to avoid an endless looping condition on response.

Recommended Work Practice: *It is useful for a MOS Protocol enabled application to be aware of the three levels of connectivity, which are required for MOS message exchange:*

1) *Network Connectivity: You must be able to confirm bidirectional connectivity with the remote machine hosting the application with which you wish to communicate.*

   An ICMP "ping" should not be depended upon as a prerequisite for achieving socket connectivity. In the case of systems behind a firewall of any type (ex: cloud-based systems), responses to an ICMP "ping" are generally disabled for overall security reasons.

2) *Socket Connectivity: You must be able to establish a socket connection with the remote application*

3) *Application Response: You must be able to receive a <heartbeat> message in response to the <heartbeat> message you have transmitted.*

If you can send a <heartbeat> message and receive a <heartbeat> message in response you have verified the continuity at all three levels.

Each heartbeat message contains a time stamp. This gives each application the opportunity to synchronize time of day, with a relatively low degree of precision, and to be aware of the other machine's local offset from GMT.

reqMachInfo

This message is a request for the target machine to respond with a listMachInfo message.

listMachInfo

This message allows the machine to identify itself with manufacturer, model, hardware and software revisions, and MOS profiles supported, etc.

This message identifies which MOS Profiles the application supports, as well as the device type.

Optionally, the machine may also identify information necessary for remote devices to install and configure an associated ActiveX control.

Recommended Work Practice: *Applications may optionally use the information contained in this message to provide automatic or semi-automatic configuration.*

General Explanation of MOS message format and construction

Identification

In practice the MOS and NCS character names are predefined in each system and IP addresses associated with each name.

Encoding

The supported character encoding is ISO 10646 (Unicode) in UCS-2, as defined in The Unicode Standard, version 2.0. All MOS message contents are transmitted in Unicode, high-order byte first, also known as "big endian."

MOS Message Format

The MOS Protocol is fundamentally a tagged text data stream. In versions 4.x 3.x and 2.x, data fields are character delimited using Extensible Markup Language (XML™) tags defined in the MOS Data Type Definition (DTD). In MOS v1.x (now deprecated) data fields were delimited using a proprietary format.

Extensible Markup Language (XML)

The syntax of MOS v4.0 is an application of XML, an international standard for describing document content structure. XML is a simple, flexible text format based on SGML (ISO 8879). XML is an abbreviated version of SGML, to make it easier for you to define your own document types, and to make it easier for developers to write programs to handle them. It omits the more complex and less-used parts of SGML, in return for the benefits of being easier to write applications, easier to understand, and more suited to delivery and interoperability over the Web.

All tags are case sensitive. All MOS messages must be well formed XML, but are not required to be valid.

Each MOS message begins with the root tag ("mos"), followed by the MOS and NCS ID ("mosID" and "ncsID"), and followed by the message type. Data follows in tagged form.

Vendors are encouraged to add CR/LF and Tabs within a message to improve readability for debugging purposes.

Unknown Tags

Should a MOS or NCS encounter an unknown message or data tag set, the device will ignore the tag set and any data within it - and continue to process the message. Unknown

data tags will not generate an application error. The application has the option of indicating a warning.

Data Format for Object <description> field

The value of Object <description> is restricted to plain Unicode UCS-2 text that includes Tab, CR,/LF and the optional markup for paragraphs, tabs and emphasis. Formatted text such as HTML, RTF, etc. will not be allowed in the unstructured description area.

Languages

The following rules apply:

- Data tags and meaningful constants (like UPDATE) are formatted as English
- Data Fields containing string values (like title, etc…) may contain other languages.
- Data Fields containing datatime, time or number values are formatted as English and have the formats defined in the Section 6 "Field Descriptions"

Numbers

Numbers are formatted as their text equivalent, e.g.:
The decimal number 100 is represented as text "100".
Hex FF55 is represented as text "0xFF55" or "xFF55".

Running Orders

1) Running Order (Unique ID - may appear only once in the NCS and MOS)
2) Story (Unique ID - may appear only once in the RO)
3) Item (Unique ID - may appear only once in a story)
4) Object (Unique ID - may appear only once in an item)

It is assumed that all Unique ID's (UID's) created by one machine are respected by others.

Order of data fields within an item is significant.

Items are sent in the intended order they will be played.

Order of items is significant.

Multiple Running Orders may contain the same Story.

Running Orders may contain zero or more Stories.

Multiple stories can contain the same Object referenced by different Items.

Stories can contain multiple Items.

Item IDs may appear only once in a Story, but can appear in other Stories.

Objects can appear multiple times in a Story, but only one object may appear in an Item.

A Running Order Item is defined by the combination Running Order.Story.Item and contains the UID's of the Running Order, Story and Item which together can identify a unique Item within a Running Order. Additions, deletions, and moves within the running order are referenced in this way to the Item.

Definition of Object Sample Rate

Still Store and Character Generator media objects are defined as having 1 sample per second. They are special cases that require the NCS and MOS applications to understand they do not change every second.

Message Acknowledgement

When a message is sent by a device to a target device, that device will not send another message to the target device on the same port until it receives an acknowledgement ("ACK") or error ("NACK") from the target device.

MOS enabled equipment and applications will retry when a timeout occurs. This applies to all messages on the same port.

Message acknowledgment on one port is independent of the flow of messages on the other port.

If a message is not acknowledged, it and all subsequent waiting messages will be buffered.

Recommended Work Practice: *It is recommended that these messages be buffered in such a way that machine or application restart or reset will not destroy these buffered messages.*

2.2 Profile 1 – Basic Object Workflow

This profile allows a Media Object Server to push messages, which represent objects contained on the Media Object Server, to other machines.

In addition to support for Profile 0, these additional messages are required for support of Profile 1:

mosAck
mosObj
mosReqObj
mosReqAll
mosListAll

General Work Flow for Profile 1

- Media Object Servers push <mosObj> messages describing media to the NCS. This description includes a pointer to the media object as well as descriptive metadata.

- The NCS exposes <mosObj> information to users through lists, searches or other mechanisms in such a way that pointers representing the media objects can be moved or copied into stories as Item References. Item References are derived from <mosObj> information.

- Optionally, an ActiveX control, provided by the Media Object Server Vendor, can be instantiated within the NCS UI. This ActiveX control has the ability to form an Item Reference and pass it to the NCS for integration as an Item Reference into a Story. (See the MOS v4.0 ActiveX Specification)

- Optionally, activating a pointer within the NCS (for example: in a list, embedded in a Story, etc.) instantiates an ActiveX control, provided by the Media Object Server Vendor, within the NCS UI. This ActiveX control provides, at a minimum, the ability to browse or display a proxy version of an object and also facilitates the integration of that object into an NCS Story as an Item Reference. (See the MOS v4.0 ActiveX Specification)

- The only MOS External Metadata (MEM) blocks that can be carried from the mosObj to the Item Reference are those with a <mosScope> of either "STORY" or "PLAYLIST".

Implementation Notes:

<mosObj> messages are sent from the Media Object Server to other applications to make them aware of objects stored on the Media Object Server.

Recommended Work Practice: *Other machines can populate their own database structures from the data contained within the <mosObj> messages they receive. It is possible then for these other applications to maintain a synchronized metadatabase describing objects contained within the Media Object Server.*

Other NCS applications have the opportunity to store and update a local metadatabase with this information. These applications can then perform searches on the local metadatabase and retrieve pointers to objects stored on the Media Object Server with matching records. These objects can then be referred to by unique <objID> without the immediate need to copy or move the essence of the object from the Media Object Server to the other applications.

Object Creation and Notification

When an object is created on a Media Object Server a <mosObj> message is pushed from the Media Object Server to a target application configured to receive this information. The initial <mosObj> message will have a <status> value of "NEW".

As metadata associated with an object stored on the Media Object Server changes, the Media Object Server needs to update the metadata already sent to other applications where it has been stored locally. Subsequent <mosObj> messages with updated metadata are sent from the Media Object Server with a <status> value of "UPDATED".

In regards to the <mosObj> "UPDATED" message; if metadata tags exist in the target MOS Object and are not present in the <mosObj> "UPDATED" message, the metadata tags in the target Item Reference should be left intact.

Also, if the intention is to remove a tag from the target MOS Object, it should be included in the <mosObj> "UPDATED" message with a null value.

When the object is deleted from the Media Object Server or when the Media Object Server determines the object no longer has relevance to other devices, the Media Object Server sends a final <mosObj> message with a <status> of "DELETED".

Recommended Work Practice: *In many implementations both the target NCS and MOS sender need to have prior knowledge of each other stored in local configurations before messages can be meaningfully exchanged.*

It is possible, and sometimes desirable, to limit the number and type of objects which are pushed from the Media Object Server to other applications so that other applications are aware of only a subset of the entire population of objects stored on the Media Object Server.

Care should be taken to avoid unnecessary <mosObj> updates.

For instance, if an object is being ingested or recorded by a media server the duration of that object could be expected to be constantly changing as the recording continues. It is not reasonable to assume that other systems will want to receive updates every 1/10th of a second, every second, or even every few seconds when the recording is in progress. Such frequent updates, in most systems, would not be useful and would only serve to consume network, disk I/O and CPU bandwidth.

<mosObj> updates will be sent only at a frequency which is useful. There may be exceptions to this general rule and thus the protocol does not specifically define a maximum or minimum update frequency.

Object IDs Must Be Unique

<objID>s are absolutely unique within the scope of the Media Object Server and are used to unambiguously reference media stored on a specific server. The combination of <mosID> and <objID> will serve as a unique reference to an object on a specific server within an enterprise or multi-Media Object Server environment. The <objID> associated with an object will never change. Even if an object is moved from online, to nearline, to

offline storage it will still use the same <objID> for unambiguous reference.

Applications should never, ever allow a user to enter or type an <objID>. Users should be presented with indirect methods, such as lists, drop downs, drag and drop operations, etc. to choose and manipulate objects and object pointers.

Object Slugs are intended for display and use by Users

<objSlug>s are the non-unique, human readable analog to the unique, machine assigned <objID>.

In short, <objSlug>'s are for humans. <objID>'s are for machines.

<objSlug>s can optionally be assigned or changed as necessary by users. <objID>s can never be assigned or modified by users directly.

Recommended Work Practice: *Display the <objSlug> to users and hide the <objID>.*

The <objSlug> field will contain the primary one line reference or name for an object exposed to users. This field is limited to 128 characters.

Abstracts and Descriptions may contain more information

The <mosAbstract> can contain a somewhat longer, but still brief, description of summary of the object which many applications may choose to alternately display.

The <description> will contain a verbose description of the object with information necessary to find the object via search functions.

MEM blocks carry Metadata Payloads

The <mosExternalMetadata> block (aka MOS MEM) is intended to be the mechanisms through which full and verbose descriptions of objects can be carried, which include the use of non-MOS schemas and tags for fielded data.

The MEM is the mechanism by which MOS supports Metadata Schema Standards such as NewsML, SMEF, SMPTE, MPEG7 and user specific schemas. MEM data blocks are not directly manipulated by the MOS Protocol and can be considered an information Payload which is carried between systems by the MOS Protocol.

Because MEM blocks can potentially carry large volumes of information, and because this information may not be relevant to all aspects of MOS applications, it makes sense to specifically state the scope of processes to which this information may be relevant. Thus, MEM blocks need only be carried as far into the

process as is needed, and not unnecessarily consume network bandwidth, CPU or storage.

The <mosScope> tag describes to what extent within an NCS type workflow the MEM block will be carried.

> A value of "OBJECT" implies that the MEM payload will be used for list and search purposes, but will not necessarily be carried into Stories or Play Lists/Content Lists.
>
> A value of "STORY" implies the MEM payload will be used like the "OBJECT" case, but will be further carried into MOS Item References embedded in Stories. However, MEM Payloads with a <mosScope> of "STORY" are not carried into Play Lists/Content Lists.
>
> A value of "PLAYLIST" implies the MEM payload will be used and included in all aspects of the production workflow, including embedding this information in the Item Reference in the Story and in Item References contained in the PlayList.

Exchanging Messages between MOS devices

To send a <mosObj> message from MOS to NCS:

1) The MOS device will open a socket on the lower port to the NCS if it is not already open

2) The MOS device will send the mosObj message

3) The MOS device will hold the socket open

4) The MOS device will wait for a mosAck message to be returned on the same socket before either dropping the socket or transmitting the next message.

5) The MOS device can optionally send <heartbeat> messages at regular intervals to the remote machine and look for a response.

Recommended Work Practice: *It is not necessary to disconnect the socket once the ACK has been received. It may be more efficient and require less overhead to simply leave the socket open*

until the next message is transmitted, even if this is not immediate. If the socket is dropped the application should re-establish the socket before the next message is transmitted.

Important Application Note: When a socket is closed, either locally or remotely, care should be taken to ensure the socket is completely disconnected. This is a 4 step process involving communication between both machines. It is normally taken care of at a level below application development. However, if problems are experienced establishing a socket between machines after at least one socket connection has been established and then dropped, this may be a sign the first socket was not properly closed. Check the status of all network connections on both machines. A socket status of "FIN_WAIT_2" or "CLOSE_WAIT" on ports used for MOS communications indicates that there may be a problem.

MOS message flow is strictly sequential

The Media Object Server will not send the next lower port message until the last message is acknowledged.

Flow of message traffic on the upper port is unrelated to acknowledgements on the lower port and vice versa.

If the value of <status> in the mosAck message is "NACK" then a more verbose error message is contained in <statusDescription>.

Data ownership and Synchronization

Metadata sent from the Media Object Server, including descriptions, pointers and MEM blocks, cannot be changed by the NCS device. No mechanisms exist to reflect such changes back into the Media Object Server. Such an operation would be conceptually incompatible with the MOS Protocol.There is one exception: MOS metadata that was created by the NCS can be modified by the NCS. The <mosReqObjAction> message provides this capability.

Users at an NCS workstation can change MOS related data via an ActiveX control should one be provided by the Media Object Server vendor. The ActiveX can be instantiated within the NCS UI and provide the ability to edit, create, and delete MOS data. This method is permitted since the vendor's ActiveX control, not the NCS, modifies the object information.

There may be times when an application may wish for the Media Object Server to send a full list of objects and descriptions. This may happen on initial installation and integration of systems, or at any other time when an NCS device wishes to synchronize its <mosObj> metadatabase from the Media Object Server. The <mosReqAll> and <mosListAll> messages are designed to facilitate this. There are methods enabled by these messages.

Method 1:

1. NCS sends a <mosReqAll> with a <pause> value of "0"

2. MOS replies with a <mosAck>, and then sends a series of <mosObj> messages encapsulated within a single <mosListAll> tag.

The first method enables the receiving NCS device to detect the start and end of the synchronization sequence. It can also potentially consume large amounts of network, CPU and disk I/O bandwidth.

Method 2:

1. NCS sends a <mosReqAll> with a <pause> value greater than zero.

2. MOS replies with a <mosAck>, and then sends a series of individual <mosObj> messages.

The value of <pause> indicates the number of seconds the MOS will pause in between <mosObj> messages intended for synchronization.

Other <mosObj> messages can be transmitted by the MOS between and concurrent with <mosObj> messages created as a result of the <mosReqAll> request. For instance, new objects, updates and deletions caused by workflow interaction.

The second method is advantageous as it has less impact on MOS and NCS resource bandwidth, but there is no differentiation of <mosObj> messages intended for synchronization as opposed to those generated as a result of normal work flow.

The <mosReqObj> message is rarely used in actual operation but must be supported so that it can be used as a diagnostic tool..

2.3 Profile 2 – Basic Running Order/Content List Workflow

Profile two gives a NCS the ability to build dynamic Running Order/Content List sequences of Item References within a Media Object Server.

In addition to support for Profiles 0 and 1, these additional messages are required for support of Profile 2:

"roConstruction" family of messages

roAck
roCreate
roReplace
roDelete
roReq
roList
roMetadataReplace
roDelete
roElementStat
roElementAction
roReadyToAir

General Work Flow for Profile 2

- NCS Stories containing Item References can be placed into Running Orders (RO's are also referred to as Content Lists).

- The NCS examines all Stories in a RO/Content List, extracts the Item References and uses these to build Playlists or Content Sequences within the parent Media Server machine.

- Playlists built in the Media Object Server by the NCS are filtered so they contain only Items which are stored on the target device.

  For instance, if a Running Order/Content List contains one story with embedded Item References from three different Media Object Servers, this single story would result in the creation of three Playlist/ContentLists – one in each of the Media Object Servers represented in the Story's Item References. Each Playlist/Content List would contain only one Item – the Item which references an Object stored on the local machine.

  In practice, this means that a Story which contains Item References for a Video Object, a CG Object and a Still Store Object will create three different playlists – one in the Video Server, one in the CG Server and one in the Still Store Server. Each playlist would contain a single Item.

  Exceptions to this rule are machines which conform to Profiles 4 and 5.

- Only MOS External Metadata (MEM) blocks included in Item References with a <mosScope> of "PLAYLIST" are included in construction messages. MEM blocks with a <mosScope> of "STORY" are stripped and not sent.

- The NCS provides the Parent Media Object Server a list pointing to Objects that are in the same order as they are used in the Play List/Content List.

- The Media Object Server must always keep track of the list sequence sent from the NCS without making changes to it. However, the MOS Device may choose to execute this list out of sequence without changing the list itself.

- As the content list is changed in the NCS, messages are dynamically sent from the NCS to the Media Object Server to insert, replace,

delete, or otherwise resequence the contextual list of objects. This is a dynamic process and is not static.

- As objects identified by Item References are rendered or played to air, the status of these objects is sent from the MOS to the NCS via the <roElementStat> message.

- Finally, when the production of content within the NCS is complete, the NCS issues a final command to delete the RO/Content List.

Important Implementation Notes:

1) Connectivity between NCS and MOS device is expected to operate continuously and without routine interruption.

2) Brief unplanned discontinuities in operation of either NCS or MOS, or connectivity between them, will be viewed as an error condition.

3) Discontinuities which result in un-ACK'd messages will be handled by buffering messages in the transmitter until they are ACK'd by the receiver.

4) Devices will not attempt to transmit further messages until the current message is acknowledged.

5) Message transmissions which do not receive a response will be retried at intervals until a response is received.

6) An ACK message signifies that:
   - The message was received and parsed correctly
   - The data contained in the message was saved or does not need be saved by the receiver
   - Metadata objects (rundowns, stories, items, and objects as metadata) within sent messages are assumed and actually do exist in the receiver.

However any existence checks or status checks regarding material / essences are typically not performed at this time, but when further operation requires it.

Very Important Note:

Changes to the list sequence are made relative to existing elements in the list. This allows a system to transmit only the changes to a list without sending the entire list, top to bottom. Thus, it is absolutely critical that all messages be applied in the order they are received. If a message in a sequence is not applied or "missed" then it is guaranteed that all subsequent messages will cause the sequence in the MOS to be even further out of sequence.

Recommended Work Practice: *It is recommended that after an object is inserted into a playlist by the NCS, either as a result of RO creation or RO modification, that the MOS system, in addition to providing the ACK, send a following <roElementStat> message to the NCS.*

Exchanging Messages between MOS devices

To send one of the "roConstruction" messages from an NCS to a MOS:

1) The NCS device will open a socket on the upper port to the MOS if it is not already open

2) The NCS will send the roConstruction message

3) The NCS will hold the socket open

4) The NCS will wait for a roAck message to be returned on the same socket before either dropping the socket or transmitting the next message.

5) The NCS can optionally send <heartbeat> messages at regular intervals to the remote machine and look for a response.

Recommended Work Practice: *It is not necessary to disconnect the socket once the ACK has been received. It is more efficient and requires less overhead to simply leave the socket open until the next message is transmitted, even if this is not immediate. If the socket is dropped the application should re-establish the socket before the next message is transmitted. It is a good idea to establish and maintain the socket connection continuously as this gives the other application the opportunity to monitor continuity.*

Important Application Note: *When a socket is closed, either locally or remotely, care should be taken to ensure the socket is completely disconnected. This is a 4 step process involving communication between*

both machines. It is normally taken care of at a level below application development. However, if problems are experienced establishing a socket between machines after at least one socket connection has been established and then dropped, this may be a sign the first socket was not properly closed. Check the status of all network connections on both machines. Indications of "FIN_WAIT_2" or "CLOSE_WAIT" on ports used for MOS communications are a sign of a problem.

MOS message flow is strictly sequential

The Media Object Server will not send the next upper port message until the last message is acknowledged.

Flow of message traffic on the lower port is unrelated to acknowledgements on the upper port and vice versa.

If the value of <status> in the roAck message is "NACK" then a more verbose error message is contained in <statusDescription>.

Recommended Work Practice: *Some devices wait only a finite time for a response. If this response is not received they will transmit an unacknowledged message again. It is recommended that all devices provide acknowledgement of messages within a maximum of 60 seconds of receipt. The faster ACK messages are received the more efficiently integrated systems will function. Please keep in mind unnecessary cumulative delayed responses will have an adverse effect in high message environments.*

If a MOS device receives a message from the NCS which references an <roID> or <storyID> which is not known to the MOS within the context of the application of the message, then the MOS device will assume there has been a prior error in communication with the NCS. The MOS will then request a full list of the Running Order/Content List from the NCS via the <roReq> message to the NCS and the <roList> response to the MOS.

> For instance, if a MOS device receives an <roElementAction> message which references an unknown <roID>, <storyID> or <itemID>, the MOS device will send an <roReq> message to the NCS which includes the <roID>. The NCS will then respond with an <roList> message which includes the entire current context of the RO/Content List.

Recommended Work Practice: *"ro" messages allow the NCS to dynamically transmit a sequence of objects to a MOS device. The MOS device then determines what to do with this list. In the case of video and audio equipment, this list from the NCS often represents the sequence to*

be played on air. Just because content is presented in an ordered list does not imply an absolute need to actually execute the list in order. Specific applications may allow users to "hop around" and execute the list out of order without actually changing the order of the list.

Important Note: If for any reason the sequence of the Running Order/Content List on the MOS device is intentionally changed such that it no longer represents the sequence as transmitted from the NCS, the MOS device will immediately send a series of <roElementStat> messages to the NCS with a <status> of "DISCONNECTED" and ACK all subsequent "ro" messages with a <status> of "DISCONNECTED".

The MOS device can recover synchronization with the NCS by sending an <roReq> message to the NCS and receiving a full <roList> message in return. Information in the <roList> message will be used to replace the list previously modified through user input in the MOS device.

The MOS device can optionally send an <*roElementStat*> message to the NCS indicating the RO/Content List is under manual or NCS control.

The <roElementAction> message in MOS v2.8 functionally replaces the following messages used in older versions of the protocol:

roStoryAppend
roStoryInsert
roStoryReplace
roStoryMove
roStoryMoveMultiple
roStorySwap
roStoryDelete
roItemInsert
roItemReplace
roItemMoveMultiple
roItemDelete

The <roReadyToAir> message, sent from the NCS to the MOS device, is used to indicate that a specified RO/Content List is editorially approved or not approved for output. This message has no direct impact on MOS message flow or sequencing. It is up to individual vendors and customers to determine what work practices and functionality may be linked to this message.

2.4 Profile 3 – Advanced Object Based Workflow

This Profile allows an NCS to request a Media Object Server to create a new object with specific properties, attributes and metadata description. It also allows a Media Object Server to replace an Item Reference embedded within a specific Story/Running Order, and request that a MOS device return a list of mosObj descriptions which meet certain search criteria.

In addition to support for Profiles 0, 1 and 2, these additional MOS Protocol Messages must be supported for Profile 3:

mosObjCreate

mosItemReplace

mosReqObjList family of messages

mosReqSearchableSchema
mosListSearchableSchema
mosReqObjList
mosObjList

mosReqObjAction

General Work Flow for Profile 3

The <mosObjCreate> and <mosReqObjAction> messages

- An NCS or NCS user wishes to create a new object on a Media Object Server.
- The NCS sends a request to the Media Object Server, via the <mosObjCreate> message, to create a new Object or Place Holder to the Media Object Server.
- Within the <mosObjCreate> message the NCS sends a description and metadata for the new object.
- The Media Object Server responds with a <mosAck> message, which includes:
    - If the object was created, a <status> value of "ACK" and a <statusDescription> which contains the new <objID> value.

- If the object was not created, a <status> value of "NACK" and a <statusDescription> which contains a textual error message.

- If the Object was created as a result of the request, the Media Object Server also sends a new <mosObj> message on the lower port. This message will contain the full object description, pointer and metadata.

- The NCS may also modify or delete the Object or Placeholder that it created, using the mosReqObjAction message.

- **Recommended Work Practice:** *Media Objects created with this message may be either real or virtual. When an <objID> is returned it will eventually reference an actual Media Object.*

The <mosItemReplace> message

- A Media Object Server wishes to replace all or part of an Item Reference embedded in a Story.

- Story data is "owned" by the NCS and cannot be changed by the Media Object Server.

- Item Data that is copied from Object Data is "owned" by the Media Object Server and can be changed, even though it is embedded in a Story.

- Although the Item Reference can be changed by the Media Object Server, its position within the Story cannot.

- The Media Object Server sends a <mosItemReplace> message, referencing the <roID>, <storyID> and <itemID> which points to the Item Reference to be changed.

- The NCS will replace or merge the data in the <item> structure. (See the protocol definition for <mosItemReplace> for specifics).

- The NCS will respond with an <roAck> message, and if successful:

  - <roAck> will have a <status> value of "ACK".

  - The NCS will send a further and independent <roStoryReplace>, <roItemReplace>, or <roElementAction> message, which the Media Object Server must accept and ACK.

- If Profile 4 is supported, the NCS will also send an independent <roStorySend> message which must also be accepted and ACK'd.

The <mosReqObjList> family of messages

- An NCS Server or NCS Client, communicating with the MOS on the new port 10542, may receive a list of mosObj messages which meet certain search criteria.
- For a general search, the NCS or NCS Client sends a mosReqObjList message with a simple search string as the value of the <generalSearch> tag.
  - Logical operators are allowed in this string.
  - The MOS devices will search its database for this general search term. The internal data fields to which the MOS applies this search term is determined by the MOS.
- For a field specific search, the NCS or NCS client must first ask the MOS device for a list of field definitions, in the form of a schema.
  - The NCS or NCS client sends a mosReqSearchableSchema message to the MOS.
  - The MOS returns a list of schema pointers, in the form of URI's, to the NCS or NCS client in the mosListSearchableSchema message.
  - If the mosListSearchableSchema message contains no URI's, then the NCS should recognize that the MOS device does not support field specific searching.
  - The NCS or NCS client then retrieves the schema and specifies field(s) to search with the value of the <searchField> tag(s) in the mosReqObjList message.
  - Multiple <searchField> tags can be included in within a single <searchGroup> structure. All <searchField> tags will be logically "AND"ed.
  - Multiple <searchGroup> structures can be included. These will be logically "OR"ed.
- The MOS device then returns a sequence of mosObj messages which meet the search criteria.
  - These messages are encapsulated in the mosObjList message.
  - The information in the mosObj messages, including objIDs can be used as normal by the NCS or NCS Client.

It is recommended that this family of messages be used to re-synchronize the NCS and MOS devices instead of the older mosReqAll message.

2.5 Profile 4 – Advanced RO/Content List Workflow

This profile enables a device to request a full list of all Running Orders/Content Collections under MOS control in an NCS. It also allows any device to receive the full context of data associated with a Running Order/Content List and send contextual "cues" to the parent Media Object Server.

In addition to support for Profiles 0, 1 and 2, these additional MOS Protocol Messages must be supported for Profile 4:

roReqAll
roListAll
roStorySend

General Work Flow for Profile 4

<roReqAll> and <roListAll> are functionally similar to <roReq> and <roList>.

<roReqAll> is a request from the MOS device to the NCS for a list of all MOS Active Running Orders. <roListAll> is the response from the NCS. This list contains the <roID>, <roSlug> and other metadata. For a full listing of the contents of the RO the MOS device must issue a subsequent <roReq> using a <roID> from the <roListAll> message.

<roStorySend> is a method by which the NCS can send the complete body of a story to another device.

This is useful for prompters and publishing devices which must be aware not only of the sequence of stories but also the full body of text and metadata for each story, which is not otherwise sent.

Recommended Work Practice: *To send a complete list of stories associated with a Running Order along with the bodies of all Stories, the NCS must first construct a playlist in the Media Object Server using the "roConstruction" messages, taking care to send *all* <story> structures, not just Stories which contain <item> structures belonging to a specific device. (Normal practice is to use "roConstruction" messages to send only <story> structures that contain <items> belonging to the parent Media Object*

Server.) This is followed by an <roStorySend> message for each of the Stories in the NCS Running Order/Content Collection. In this way changes to the order of the Stories can be communicated without retransmitting Story objects. Likewise, a Story can be updated without making a change to the Story Sequence.

When changing the sequence of an Running Order/Content List which is linked to a MOS device via "roConstruction" and <roStorySend> messages, it is important to use the <roElementAction<> message to effect moves in the story sequence, rather than using options for delete and insert. Once a story is deleted from the list the receiving device may assume the body of the story is no longer needed and delete it, thus requiring an unnecessary and repetitive <roStorySend> message after the <roElementAction> "insert" command.

As the status of the Story changes in the MOS device the MOS device should send roElementStat messages for that story to the NCS.

2.6 Profile 5 – Item Control

This profile enables applications to send "cue" and control commands to Media Object Servers

In addition to support for Profiles 0, 1 and 2, these additional MOS Protocol Messages must be supported for Profile 5:

roItemCue
roCtrl

<roItemCue> is a method used to signal or "cue" a parent MOS device at a specific time.

This message is for notification only, but can be used by the parent Media Object Server to allow other applications to trigger rendering, publishing or output of a specific Item Reference to an Object at a specific time, which can be in the future. This is not a specific command to play or take action on an object.

<roCtrl> is a method used to signal or "cue" a parent MOS device at a specific time.

This message allows other devices to send specific and unambiguous "PLAY"," "EXECUTE"," "PAUSE"," "STOP"," AND "SIGNAL" commands to a Media Object Server. Though these messages were originally intended for control of audio and video servers, their application should not be thought of as limited to these types of output devices.

Application Note: The use and timing of these messages is subject to network propagation and application processing latency. Synchronicity and frame accuracy can be achieved in the application of the <roItemCue> message if an event to which it is linked can be anticipated by an amount of time equal to or greater than total link latency. The <roEventTime> can then be set to an appropriate future value which in effect leads system latency.

2.7 Profile 6 – MOS Redirection

This Profile provides a mechanism for <item> structures containing media objects from one server to be meaningfully included in messages sent to a server other than the one on which they are immediately stored. This information enables servers to automate the transfer of these objects between machines, using methods independent of the MOS Protocol.

Profile 6 requires full support for Profiles 0, 1 and 2 and can be applied to Profiles 3, 4 and 5

Fully Qualified MOS ID

Profile 6 does not include any additional MOS messages. However, it does require that all MOS device compatible with Profile 6 use a specific naming convention for <mosID>'s and <ncsID>'s of this form:

<family>.<machine>.<location>.<enterprise>.mos

Where <location> and <enterprise> are optional.

This is called a "Fully Qualified MOS ID"

For example, these are valid Fully Qualified MOS ID's:

aveed.server2.camden.cbs.mos

tornado.mach2.wjla.allbritton.mos

Quantuml.VidServ2.mos

Sonny.point77.city.company.mos

Using this naming convention, it is possible for a machine to determine whether an object is stored locally or on another machine of the same family or compatible family. Furthermore, this naming convention allows a server tomake separate arrangements for the transfer of the referenced object to the local machine.

This functionality can be extended to transfer material between machines located in the same building, different buildings or different cities.

The transfer mechanism is separate from the MOS Protocol, which only provides the Fully Qualified MOS ID.

Vendors claiming compatibility with Profile 6 must support, at a minimum, automated transfer of objects between machines of the same family within the vendor's product line.

2.8 Profile 7 – MOS RO/Content List Modification

This profile enables a Media Object Server to make changes to the running order in a Newsroom Computer System.

In addition to support for Profiles 0, 1 and 2, these additional MOS Protocol Messages must be supported for Profile 7:

roReqStoryAction

3. Media Object Server Protocol Message Definition

In the Structural Outline sections below use of

- "?" specifies optional element
- "+" specifies one or more of the element
- "*" specifies zero or more of the element

Note: Elements without any of these three special characters are required.

Tags enclosed in parenthesis and separated by "|" represent a selection.
The Syntax section shows the definition of non-terminals for this message from the DTD.

Examples shown are representative of syntax only and do not represent samples from any system.

3.1 Basic Object Communication

3.1.1 mosAck - Acknowledge MOS Object Description

Purpose

mosAck is the acknowledgement response to various types of messages.

Response

None – this is a response to various messages.

Port

MOS Lower Port (10540) - Media Object Metadata

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosAck
- objID
- objRev
- status
- statusDescription

Syntax

```
<!ELEMENT mosAck (objID, objRev, status, statusDescription)>
```

Example

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  <messageID>99</messageID>
  <mosAck>
    <objID>M000123</objID>
    <objRev>1</objRev>
    <status>ACK</status>
    <statusDescription></statusDescription>
  </mosAck>
</mos>
```

3.1.2 mosObj - MOS Object Description

Purpose

Contains information that describes a unique MOS Object to the NCS. The NCS uses this information to search for and reference the MOS Object.

<objGroup> tag

No specific values for this element are officially defined. Definition of values is left to the configuration and agreement of MOS connected equipment. The intended use is for site configuration of a limited number of locally named storage folders in the NCS or MOS, such as "ControlA", "ControlB" , "Raw", "Finished", etc. For editorially descriptive "category" information, it is suggested that the <mosExternalMetadata> block be used.

External Metadata Block

This data block can appear in several messages as a mechanism for transporting additional metadata, independent of schema or DTD. When found within the mosObj message, this block carries data defined external to the MOS Protocol.

External Metadata <mosScope> tag

The value of the <mosScope> tag implies through what production processes this information will travel.

A scope of "OBJECT" implies this information is generally descriptive of the object and appropriate for queries. The metadata will not be forwarded into Stories or Playlists.

A scope of "STORY" suggests this information may determine how the Object is to be applied in a Story. For instance, Intellectual Property Management. This information will be forwarded with the contents of a Story.

A scope of "PLAYLIST" suggests this information is specific to describing how the Object is to be published, rendered, or played to air and thus, will be included in the <roCreate> Play List Construction and <roStorySend> messages.

Scope allows systems to, optionally, roughly filter external metadata and selectively apply it to different production processes and outputs. Specifically, it is neither advisable nor efficient to send large amounts of inappropriate metadata to the Playlist in <roCreate> messages. In addition to these blocks of data being potentially very large, the Media Object Server is, presumably, already aware of this data.

Response

mosAck

Port

MOS Lower Port (10540) - Media Object Metadata

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosObj
  - objID
  - objSlug
  - mosAbstract?
  - objGroup?
  - objType
  - objTB
  - objRev
  - objDur
  - status
  - objAir
  - objpaths?
    - objPath*
    - objProxyPath*
    - objMetadataPath
  - createdBy
  - created
  - changedBy
  - changed
  - description
    - (p | em | tab)*
  - mosExternalMetadata*
    - mosScope?
    - mosSchema
    - mosPayload

Syntax

```
<!ELEMENT mosObj (objID, objSlug, mosAbstract?, objGroup?, objType,
objTB, objRev, objDur, status, objAir, objPaths?, createdBy, created,
changedBy, changed, description, mosExternalMetadata*)>
<!ELEMENT description (#PCDATA | p | em | tab)*>
<!ELEMENT p (#PCDATA | em | tab)*>
```

```
<!ELEMENT mosExternalMetadata (mosScope?, mosSchema, mosPayload)>
<!ELEMENT mosScope (#PCDATA)>
<!ELEMENT objPaths (objPath*, objProxyPath*, objMetadataPath*)>
<!ELEMENT mosSchema (#PCDATA)>
<!ELEMENT mosPayload ANY>
<!ELEMENT messageID (#PCDATA)>
<!ELEMENT objPath (#PCDATA)>
<!ELEMENT objProxyPath (#PCDATA)>
<!ELEMENT objMetadataPath (#PCDATA)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>34</messageID>
   <mosObj>
      <objID>M000123</objID>
      <objSlug>Hotel Fire</objSlug>
      <mosAbstract>
         <b>Hotel Fire</b>
         <em>vo</em>
          :30
      </mosAbstract>
      <objGroup>Show 7</objGroup>
      <objType>VIDEO</objType>
      <objTB>59.94</objTB>
      <objRev>1</objRev>
      <objDur>1800</objDur>
      <status>NEW</status>
      <objAir>READY</objAir>
       <objPaths>
              <objPath techDescription="MPEG2
       Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
              <objProxyPath techDescription="WM9
       750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
              <objMetadataPath techDescription="MOS
       Object">http://server/proxy/clipe.xml</objMetadataPath>
       </objPaths>
      <createdBy>Chris</createdBy>
      <created>2009-10-31T23:39:12</created>
      <changedBy>Chris</changedBy>
      <changed>2009-10-31T23:39:12</changed>
      <description>
         <p>
            Exterior footage of
            <em>Baley Park Hotel</em>
             on fire with natural sound. Trucks are visible for the first
portion of the clip.
            <em>CG locator at 0:04 and duration 0:05, Baley Park Hotel.</em>
         </p>
         <p>
            <tab/>
            Cuts to view of fire personnel exiting hotel lobby and cleaning up
after the fire is out.
         </p>
         <p>
            <em>Clip has been doubled for pad on voice over.</em>
         </p>
      </description>
      <mosExternalMetadata>
```

```
         <mosScope>STORY</mosScope>
         <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXML2.08</mosSche
ma>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <ModTime>20010308142001</ModTime>
            <mediaTime>0</mediaTime>
            <TextTime>278</TextTime>
            <ModBy>LJOHNSTON</ModBy>
            <Approved>0</Approved>
            <Creator>SHOLMES</Creator>
         </mosPayload>
      </mosExternalMetadata>
   </mosObj>
</mos>
```

3.1.3 mosReqObj - Request Object Description

Purpose

Message used by the NCS to request the description of an object.

Response

mosObj - if objID is found
mosAck - otherwise

Port

MOS Lower Port (10540) - Media Object Metadata

Structural Outline

mos
  mosID
  ncsID
  messageID
  mosReqObj
    objID

Syntax

```
<!ELEMENT mosReqObj (objID)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>654</messageID>
   <mosReqObj>
      <objID>M000123</objID>
   </mosReqObj>
</mos>
```

3.2 Object Resynchronization/Rediscovery

3.2.1 mosReqAll - Request All Object Data from MOS

Purpose

Method for the NCS to request the MOS to send it a mosObj message for every Object in the MOS. Pause, when greater than zero, indicates the number of seconds to pause between individual mosObj messages. Pause of zero indicates that all objects will be sent using the mosListAll message..

Response

mosAck - which then initiates one of the following:

mosListAll - if pause = 0
mosObj - if pause > 0

Port

MOS Lower Port (10540) - Media Object Metadata

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosReqAll
  - pause

Syntax

```
<!ELEMENT mosReqAll (pause)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>234</messageID>
   <mosReqAll>
      <pause>0</pause>
   </mosReqAll>
</mos>
```

3.2.2 mosListAll - Listing of All Object Data from MOS

Purpose

Send MOS object descriptions in a format similar to mosObj messages from the MOS to the NCS. mosListAll is initiated by a properly Ack'd mosReqAll message from the NCS.

Response

mosAck

Port

MOS Lower Port (10540) - Media Object Metadata

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosListAll
  - mosObj*
    - objID
    - objSlug
    - mosAbstract?
    - objGroup?
    - objType
    - objTB
    - objRev
    - objDur
    - status
    - objAir
    - objPaths?
      - objPath*
      - objProxyPath*
      - objMetadataPath*
    - createdBy
    - created
    - changedBy
    - changed
    - description
      - (p | em | tab)*
    - mosExternalMetadata*
      - mosScope?

mosSchema
mosPayload

Syntax

```
<!ELEMENT mosListAll (mosObj*)>
<!ELEMENT mosObj (objID, objSlug, mosAbstract?, objGroup?, objType,
objTB, objRev, objDur, status, objAir, objPaths?, createdBy, created,
changedBy, changed, description, mosExternalMetadata*)>
<!ELEMENT description (#PCDATA | p | em | tab)*>
<!ELEMENT p (#PCDATA | em | tab)*>
<!ELEMENT mosExternalMetadata (mosScope?, mosSchema, mosPayload)>
<!ELEMENT mosScope (object | story | playlist)>
<!ELEMENT mosSchema (#PCDATA)>
<!ELEMENT mosPayload ANY>
<!ELEMENT messageID (#PCDATA)>
<!ELEMENT objPaths (objPath*, objProxyPath*, objMetadataPath*)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>2010</messageID>
   <mosListAll>
    <mosObj>
      <objID>M000123</objID>
      <objSlug>HOTEL FIRE</objSlug>
      <objPaths>
            <objPath techDescription="MPEG2
      Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
            <objProxyPath techDescription="WM9
      750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
            <objMetadataPath techDescription="MOS
      Object">http://server/proxy/clipe.xml</objMetadataPath>
      </objPaths>
      <createdBy>Chris</createdBy>
      <created>2009-10-31T23:39:12</created>
      <changedBy>Chris</changedBy>
      <changed>2009-11-01T14:35:55</changed>
      <description>
         <p>
            Exterior footage of

            <em>Baley Park Hotel</em>

             on fire with natural sound. Trucks are visible for the
first portion of the clip.

            <em>CG locator at 0:04 and duration 0:05, Baley Park
Hotel.</em>
         </p>
         <p>
            <tab/>
```

```
            Cuts to view of fire personnel exiting hotel lobby and
cleaning up after the fire is out.

         </p>
         <p>
            <em>Clip has been doubled for pad on voice over.</em>
         </p>
      </description>
    </mosObj>
    <mosObj>
      <objID>M000224</objID>
      <objSlug>COLSTAT MURDER:VO</objSlug>
      <objType>VIDEO</objType>
      <objTB>59.94<objTB>
      <objRev>4</objRev>
      <objDur>800</objDur>
      <status>UPDATED</status>
      <objAir>READY</objAir>
      <objPaths>
            <objPath techDescription="MPEG2
      Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
            <objProxyPath techDescription="WM9
      750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
            <objMetadataPath techDescription="MOS
      Object">http://server/proxy/clipe.xml</objMetadataPath>
      </objPaths>
      <createdBy>Phil</createdBy>
      <created>2009-11-01T15:19:01</created>
      <changedBy>Chris</changedBy>
      <changed>2009-11-01T15:21:15</changed>
      <description>VOICE OVER MATERIAL OF COLSTAT MURDER SITES SHOT ON
1-NOV.</description>
      <mosExternalMetadata>
         <mosScope>STORY</mosScope>
                     <mosSchema>http://MOSA4.com/mos/supported_schema
         s/MOSAXML2.08</mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <ModTime>20010308142001</ModTime>
            <mediaTime>0</mediaTime>
            <TextTime>278</TextTime>
            <ModBy>LJOHNSTON</ModBy>
            <Approved>0</Approved>
            <Creator>SHOLMES</Creator>
         </mosPayload>
      </mosExternalMetadata>
    </mosObj>
   </mosListAll>
</mos>
```

mosReqObjList family of messages

Purpose

To retrieve only selected object descriptions from a MOS.

Port

10542

Communication Type

NCS SERVER to MOS and NCS CLIENT to MOS

Messages in this family

mosReqSearchableSchema
mosListSearchableSchema
mosReqObjList
mosObjList

Workflow

1) NCS sends a <mosReqSearchableSchema> message to the MOS.

2) MOS responds with a <mosListSearchableSchema> message.

3) NCS can then perform a query by sending a <mosReqObjList> message, using one or both of the Search Options below

    a) Search Method #1 (Simple): Perform a general search based on the textual content of the <generalSearch> field. The following six examples illustrate valid values for this field.

```
<generalSearch>man</generalSearch>
<generalSearch>man dog</generalSearch>
<generalSearch>man and dog</generalSearch>
<generalSearch>man not dog</generalSearch>
<generalSearch>man or dog</generalSearch>
<generalSearch>man and dog not poodle</generalSearch>
```

Note: only one <generalSearch> tag is allowed per message

The simple method will search all default fields in the MOS database, as defined by the MOS vendor. Only one <generalSearch> field may be present.

b) Search Method #2 (Complex): Perform a specific query based on the value of selected external metadata (MEM) fields. These queries are wrapped in the <searchGroup> tag. The <searchGroup> structure can be used with or without,<generalSearch>, as in Method #1. The following is a valid example:

```
<searchGroup>
     <searchField XPath="/Presenter [. ='Bob']" sortByOrder="1"/>
     <searchField XPath="/Slug [.='Dog Abuse']"/>
     <searchField XPath="/Video/Length [.&gt;60 AND &lt;120]"
                  sortByOrder="2" sortType="DESCENDING"/>
     <searchField XPath="Producer [.!='Susan']" sortByOrder="3"/>
</searchGroup>

<searchGroup>
     <searchField XPath="/Presenter [. ='Jennifer']"
                  sortByOrder="1"/>
     <searchField XPath="/Slug [.='Big Mice in City']"/>
     <searchField XPath="/Video/Length [.&gt;60 AND &lt;120]"
                  sortByOrder="2" sortType="DESCENDING"/>
     <searchField XPath="Producer [.!='Susan']" sortByOrder="3"/>
</searchGroup>
```

Multiple <searchGroup> structures are logically "OR"ed with each other.

The attributes included in each <searchField> tag were derived from the schema returned in the initial <mosListSearchableSchema> message.

mosSchema must be an HTTP pointer to a valid schema. This schema is passed to the NCS by the MOS via the <mosListSearchableSchema> message.

Note: The schema must be valid XML.

searchField must contain an XPath statement which conforms to a subset of the W3C XPath 1.0 specification. The specification can be found here: http://www.w3.org/TR/xpath

Minimum implementations must support Basic XPath Expressions needed to process Abbreviated Syntax for Location Paths with Location Steps that may contain Predicates with Operators "and", "or", "<", ">", ">=", "<=", "=", "!=", and the following functions:

1. **String Functions**

Function	Parameters	Return Type	Description
`String`	object?	String	Converts to string

2. **Number Functions**

Function	Parameters	Return Type	Description
`Number`	object?	Number	Converts to a number

3. **Boolean Functions**

Function	Parameters	Return Type	Description
`Boolean`	object	Boolean	Converts to a boolean value
`False`		Boolean	Returns false
`Not`	boolean	Boolean	Inverts a boolean value
`True`		Boolean	Returns true

XPath search requests are assumed to be case sensitive.

Rules on Sorting are as follows:

- All fields of the same name have to have the same sortByOrder and sortType attributes for the same fieldname. This is why /Presenter is the same in the first searchGroup as it is in the second.
- No two unlike fields can share the same sort order. Presenter can not be sortByOrder = 1 in the same request as Producer having a sortByOrder = 1.
- The MOS determines sorting rules according to the natural language of the MOS System Environment

<searchField>'s within the same <searchGroup> are logically joined (AND'ed).

Multiple <searchGroup>'s are allowed. Each <searchGroup> is logically "OR"ed with the others.

A maximum of six <searchGroup> structures is recommended.

4) The MOS returns a list of <mosObj> messages, encapsulated in the <mosObjList> message, to the NCS. The number and sequence of these messages is specified by the NCS.

5) The NCS can handle the returned <mosObj> messages as normal, meaning the <objID>s they hold can be validly used with ActiveX controls, within item references, and with playlist construction, etc.

Note: Use of the <mosReqObjList> group of messages between **NCS SERVER → MOS** and **NCS CLIENT → MOS** should take place on port 10542. Because of the potential for this family of messages to generate large amounts of network traffic and consume application bandwidth, this message has been assigned a separate and specific port in order to minimize potential impact on mission critical operations taking place on ports 10540 and 10541. Other future messages may also share port 10542.

General notes

Both Search Methods can be used together, in which case the <generalSearch> is logically joined (AND'ed) with the <searchGroup> results. The Simple and Complex methods may also be used separately and independent of each other.

The <generalSearch> tag must always be present, even if Null.

For both methods the NCS can specify the number of search results to return, which is the difference between the integer values of.<listReturnStart> and <listReturnEnd>.

The <listReturnStart> tag must always be present and must always have a value of 1 or greater.

The <ListReturnEnd> tag must always be present, but a value is optional. If a value is present, it must be greater than or equal to <listReturnStart>.

Omission of a value for <listReturnEnd> implies that *all* possible search results should be returned. Care should be taken when implementing this option to avoid returning more pointers than is necessary which may overwhelm network or application bandwidth.

Paging is supported by supplying chained values for <listReturnStart> and <listReturnEnd>, e.g. 1-20, 21-40, 41-80. These values represent requests in the mosReqObjList message. In the <mosObjList> message these values indicate the actual number of objects returned.

<listReturnTotal>applies only to the <mosObjList> message and this tag is required. If the value is null, this indicates generally more than one object has been found. A non zero value indicates the total number of objects which meet the search criteria and can be returned.

A zero value of <listReturnTotal> indicates no objects were located which meet the search criteria. In this case the values of <listReturnStart> and <listReturnEnd> would also be zero.

<listReturnStatus> should contain a human readable status message, of 128 max characters, which indicates the reason for a zero value in <listReturnTotal>. <listReturnStatus> can optionally be used to return additional human readable status information when <listReturnTotal> is a non-zero value.

Cached searching is enabled by the mandatory use of the <queryID> field, which is defined as a 128 character ID unique within the scope of the NCS system. Though the full values of <generalSearch> and/or <searchGroup>'s must still be supplied in each and every <mosReqObjList> message, the <queryID> value provides a short cut for the MOS device, which may choose to buffer the results of first query and then return additional paged requests for the same query from a buffer.

3.2.3 mosReqSearchableSchema

Purpose

mosReqSearchable Schema is a mechanism used by the NCS to request the MOS to send a pointer to a schema in which searchable fields are defined by the MOS device.

Port

10542

Communication Type

NCS SERVER to MOS and NCS CLIENT to MOS

Response

mosListSearchableSchema

Structural Outline

mos
mosID
  ncsID
  messageID
  mosReqSearchableSchema (username)

Syntax

```
<!ELEMENT mosReqSearchableSchema EMPTY>
<!ATTLIST mosReqSearchableSchema username CDATA #IMPLIED>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>9012</messageID>
   <mosReqSearchableSchema username="jbob"/>
</mos>
```

3.2.4 mosListSearchableSchema

Purpose

mosListSearchableSchema is a mechanism used by the MOS to send a pointer to a schema in which searchable fields are defined for the NCS device.

Port

10542

Communication Type

MOS to NCS SERVER and MOS to NCS CLIENT

Response

None – this is a response to mosReqSearchableSchema.

Structural Outline

mos
mosID
  ncsID
  messageID
  mosListSearchableSchema (username)
    mosSchema

Syntax

```
<!ELEMENT mosListSearchableSchema (mosSchema)>
<!ATTLIST mosListSearchableSchema username CDATA #IMPLIED>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>2782</messageID>
   <mosListSearchableSchema username="jbob">
      <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXML2.08</mo
sSchema>
   </mosListSearchableSchema>
</mos>
```

3.2.5 mosReqObjList

Purpose

mosReqObjList is a mechanism used by a NCS to retrieve only selected object descriptions from a MOS.

Port

10542

Communication Type

NCS SERVER to MOS and NCS CLIENT to MOS

Response

mosObjList

Structural Outline

mos
  mosID
  ncsID
  messageID
  mosReqObjList (username)
    queryID
    listReturnStart
    listReturnEnd
    generalSearch
    mosSchema
    searchGroup*
      searchField+
        (XPath, sortByOrder, sortType)

Syntax

```
<!ELEMENT mosReqObjList (queryID, listReturnStart, listReturnEnd,
generalSearch, mosSchema, searchGroup*)>
<!ATTLIST mosReqObjList username CDATA #IMPLIED>
<!ELEMENT queryID (#PCDATA)>
<!ELEMENT generalSearch (#PCDATA)>
<!ELEMENT listReturnStart (#PCDATA)>
<!ELEMENT listReturnEnd (#PCDATA)>
<!ELEMENT searchGroup (searchField+)>
<!ELEMENT searchField EMPTY>
<!ATTLIST searchField
      XPath CDATA #REQUIRED
      sortByOrder CDATA #IMPLIED
      sortType CDATA #IMPLIED
>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>6666</messageID>
   <mosReqObjList username="jbob">
      <queryID>123439392039393ade0393zdkdls</queryID>
      <listReturnStart>1</listReturnStart>
      <listReturnEnd/>
      <generalSearch>man bites dog</generalSearch>
            <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXML2
.08</mosSchema>
      <searchGroup>
         <searchField XPath="/Presenter [. ='Bob']" sortByOrder="1"/>
         <searchField XPath="/Slug [.='Dog Abuse']"/>
   <searchField XPath="/Video/Length [.&gt;60 AND &lt;120]"
sortByOrder="2" sortType="DESCENDING"/>
         <searchField XPath="Producer [.!='Susan']" sortByOrder="3"/>
      </searchGroup>
      <searchGroup>
         <searchField XPath="/Presenter [. ='Jennifer']"
sortByOrder="1"/>
         <searchField XPath="/Slug [.='Big Mice in City']"/>
         <searchField XPath="/Video/Length [.&gt;60 AND &lt;120]"
sortByOrder="2" sortType="DESCENDING"/>
         <searchField XPath="Producer [.!='Susan']" sortByOrder="3"/>
      </searchGroup>
   </mosReqObjList>
</mos>
```

3.2.6 mosObjList

Purpose

Returns selected object descriptions from a MOS.

Port

10542

Communication Type

MOS to NCS SERVER and MOS to NCS CLIENT

Response

None – this is a response to mosReqObjList.

Structural Outline

mos
mosID
ncsID
messageID
mosObjList (username)
queryID
listReturnStart
listReturnEnd
listReturnTotal
listReturnStatus?
list?
mosObj+

Syntax

```
<!ELEMENT mosObjList (queryID, listReturnStart, listReturnEnd,
listReturnTotal, listReturnStatus?, list?)>
<!ATTLIST mosObjList username CDATA #IMPLIED>
<!ELEMENT listReturnTotal (#PCDATA)>
<!ELEMENT listReturnStatus (#PCDATA)>
<!ELEMENT list (mosObj+)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>321</messageID>
   <mosObjList username="jbob">
      <queryID>A392938329kdakd2039300d0s9l3l9d0bzAQ</queryID>
      <listReturnStart>1</listReturnStart>
      <listReturnEnd>20</listReturnEnd>
      <listReturnTotal>128</listReturnTotal>
      <list>
         <mosObj>
            <objID>M000121</objID>
            <objSlug>Hotel Fire</objSlug>
            <mosAbstract>
               <b>Hotel Fire</b>
               <em>vo</em>
      </mosAbstract>
            <objGroup>Show 7</objGroup>
            <objType>VIDEO</objType>
            <objTB>59.94<objTB>
            <objRev>1</objRev>
            <objDur>1800</objDur>
            <status>NEW</status>
            <objAir>READY</objAir>
             <objPaths>
            <objPath techDescription="MPEG2
      Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
               <objProxyPath techDescription="WM9
      750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
            <objMetadataPath techDescription="MOS
      Object">http://server/proxy/clipe.xml</objMetadataPath>
             </objPaths>
            <createdBy>Chris</createdBy>
            <created>1998-10-31T23:39:12</created>
            <changedBy>Chris</changedBy>
            <changed>1998-10-31T23:39:12</changed>
            <description>
               <p>

            Exterior footage of

            <em>Baley Park Hotel</em>

             on fire with natural sound. Trucks are visible for the
first portion of the clip.

            <em>CG locator at 0:04 and duration 0:05, Baley Park
Hotel.</em>
               </p>
               <p>
                  <tab/>

            Cuts to view of fire personnel exiting hotel lobby and
cleaning up after the fire is out.
```

```
         </p>
               <p>
                  <em>Clip has been doubled for pad on voice over.</em>
               </p>
            </description>
            <mosExternalMetadata>
               <mosScope>STORY</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <ModTime>20010308142001</ModTime>
                  <mediaTime>0</mediaTime>
                  <TextTime>278</TextTime>
                  <ModBy>LJOHNSTON</ModBy>
                  <Approved>0</Approved>
                  <Creator>SHOLMES</Creator>
               </mosPayload>
            </mosExternalMetadata>
         </mosObj>
         <mosObj>
            <objID>M000122</objID>
            <objSlug>Another Hotel Fire</objSlug>
            <mosAbstract>
               <b>Hotel Fire</b>
               <em>vo</em>
      </mosAbstract>
            <objGroup>Show 7</objGroup>
            <objType>VIDEO</objType>
            <objTB>59.94<objTB>
            <objRev>1</objRev>
            <objDur>1800</objDur>
            <status>NEW</status>
            <objAir>READY</objAir>
            <objPaths>
                  <objPath techDescription="MPEG2
            Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
                  <objProxyPath techDescription="WM9
            750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
            <objMetadataPath techDescription="MOS
      Object">http://server/proxy/clipe.xml</objMetadataPath>
            </objPaths>
            <createdBy>Chris</createdBy>
            <created>1998-10-31T23:39:12</created>
            <changedBy>Chris</changedBy>
            <changed>1998-10-31T23:39:12</changed>
            <description>
               <p>

            Exterior footage of

            <em>Baley Park Hotel</em>

             on fire with natural sound. Trucks are visible for the
first portion of the clip.

            <em>CG locator at 0:04 and duration 0:05, Baley Park
Hotel.</em>
```

```
                </p>
                <p>
                   <tab/>

            Cuts to view of fire personnel exiting hotel lobby and
cleaning up after the fire is out.

         </p>
                <p>
                   <em>Clip has been doubled for pad on voice over.</em>
                </p>
             </description>
             <mosExternalMetadata>
                <mosScope>STORY</mosScope>
                <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
                <mosPayload>
                   <Owner>SHOLMES</Owner>
                   <ModTime>20010308142001</ModTime>
                   <mediaTime>0</mediaTime>
                   <TextTime>278</TextTime>
                   <ModBy>LJOHNSTON</ModBy>
                   <Approved>0</Approved>
                   <Creator>SHOLMES</Creator>
                </mosPayload>
             </mosExternalMetadata>
          </mosObj>
          <mosObj>
             <objID>M000123</objID>
             <objSlug>Yet Another Hotel Fire</objSlug>
             <mosAbstract>
                <b>Hotel Fire</b>
                <em>vo</em>
       </mosAbstract>
             <objGroup>Show 7</objGroup>
             <objType>VIDEO</objType>
             <objTB>59.94<objTB>
             <objRev>1</objRev>
             <objDur>1800</objDur>
             <status>NEW</status>
             <objAir>READY</objAir>
             <objPaths>
                   <objPath techDescription="MPEG2
             Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
                   <objProxyPath techDescription="WM9
             750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
             <objMetadataPath techDescription="MOS
       Object">http://server/proxy/clipe.xml</objMetadataPath>
             </objPaths>
             <createdBy>Chris</createdBy>
             <created>1998-10-31T23:39:12</created>
             <changedBy>Chris</changedBy>
             <changed>1998-10-31T23:39:12</changed>
             <description>
                <p>

             Exterior footage of
```

```
            <em>Baley Park Hotel</em>

             on fire with natural sound. Trucks are visible for the
first portion of the clip.

            <em>CG locator at 0:04 and duration 0:05, Baley Park
Hotel.</em>
               </p>
               <p>
                  <tab/>

            Cuts to view of fire personnel exiting hotel lobby and
cleaning up after the fire is out.

         </p>
               <p>
                  <em>Clip has been doubled for pad on voice over.</em>
               </p>
            </description>
            <mosExternalMetadata>
               <mosScope>STORY</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <ModTime>20010308142001</ModTime>
                  <mediaTime>0</mediaTime>
                  <TextTime>278</TextTime>
                  <ModBy>LJOHNSTON</ModBy>
                  <Approved>0</Approved>
                  <Creator>SHOLMES</Creator>
               </mosPayload>
            </mosExternalMetadata>
         </mosObj>
      </list>
   </mosObjList>
</mos>
```

3.3 Object and Item management

3.3.1 mosObjCreate – MOS Object Create

Purpose

mosObjCreate allows an NCS to request the Media Object Server to create a Media Object with specific metadata associated with it.

Response

mosAck (if object can be created then status description = objID)
mosAck (if object CANNOT be created, status = NACK and status description = reason for error)
mosObj

Port

MOS Lower Port (10540) – MOS Object

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosObjCreate
  - objSlug
  - objGroup?
  - objType
  - objTB
  - objDur?
  - time?
  - createdBy?
  - description?
  - mosExternalMetadata*

Syntax

```
<!ELEMENT mosObjCreate (objSlug, objGroup?, objType, objTB, objDur?,
time?, createdBy?, description?, mosExternalMetadata*)>
<!ELEMENT description (#PCDATA | p | em | tab)*>
<!ELEMENT p (#PCDATA | em | tab)*>
```

Example

```
<mos>
   <mosID>videoserver.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>724</messageID>
   <mosObjCreate>
      <objSlug>Hotel Fire</objSlug>
      <objGroup>Show 7</objGroup>
      <objType>VIDEO</objType>
      <objTB>59.94<objTB>
      <objDur>1800</objDur>
      <createdBy>Chris</createdBy>
      <description>
         <p>
            Exterior footage of
            <em>Baley Park Hotel</em>
             on fire with natural sound. Trucks are
        visible for the first portion of the clip.
            <em>CG locator at 0:04 and duration 0:05, Baley Park
        Hotel.</em>
         </p>
         <p>
            <tab/>
            Cuts to view of fire personnel exiting hotel lobby and
cleaning up after the fire is out.
         </p>
         <p>
            <em>Clip has been doubled for pad on voice over.</em>
         </p>
      </description>
      <mosExternalMetadata>
         <mosScope>STORY</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <ModTime>20010308142001</ModTime>
            <mediaTime>0</mediaTime>
            <TextTime>278</TextTime>
            <ModBy>LJOHNSTON</ModBy>
            <Approved>0</Approved>
            <Creator>SHOLMES</Creator>
         </mosPayload>
      </mosExternalMetadata>
   </mosObjCreate>
</mos>
```

3.3.2 mosItemReplace – Replace one Item Reference with another

Purpose

This message allows a Media Object Server to replace an Item Reference in a Story with new metadata values and/or additional tags. The Story must be in a MOS Active PlayList. Thus, this message is in the "ro" family of messages rather than the "mos," or lower port, family. However, this message is initiated by the Media Object Server, rather than the NCS.

Behavior

This message must reference an existing unique Item Reference in a MOS Active PlayList through the values of ncsID, roID, storyID, and itemID.

If metadata tags in the mosItemReplace message already exist in the target Item Reference, values within the Item Reference will be replaced by the values in the mosItemReplace message.

If the metadata tags do not already exist in the target Item Reference they will be added.

If metadata tags exist in the target Item Reference and are not present in the mosItemReplace message, the metadata tags in the target Item Reference should be left intact.

If the intention of the Media Object Server is to remove metadata tag(s) from the target Item Reference, those metadata tag(s) should be included in the mosItemReplace message with a null value.

If a mosExternalMetadata block is included in the mosItemReplace message, it will replace an existing mosExternalMetadata block **only** if the values of <mosSchema> in the two blocks match, and only for the first occurrence of a block with a matching <mosSchema> tag. Otherwise the mosExternalMetadata block will be added to the target Item Reference.

If the itemID in the mosItemReplace message does not match an existing itemID in the specified Story then no action will be taken and the mosItemReplace message will be replied to with an roAck message specifying the Item values in the mosItemReplace message and carrying a status value of "NACK."

Response

roAck

Subsequent messages

roStoryReplace, roItemReplace, roElementAction – A successful mosItemReplace operation will result in a change to an Item reference embedded in a Story. This new information must now be placed in associated MOS Playlists. Any one of the three messages listed will replace the old item reference in the playlist with the newly updated item reference from this Story.

roStorySend – A successful mosItemReplace operation will result in a change in the body of a Story. This change must be sent back out if an roStorySend target has been defined for the RO.

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosItemReplace
  - roID
  - storyID
  - item
    - itemID
    - itemSlug?
    - objID
    - mosID
    - mosPlugInID?
    - mosAbstract?
    - objPaths?
      - objPath*
      - objProxyPath*
      - objMetadataPath*
    - itemChannel?
    - itemEdStart?
    - itemEdDur?
    - itemUserTimingDur?
    - itemTrigger?
    - macroIn?
    - macroOut?
    - mosExternalMetadata*

Syntax

```
<!ELEMENT mosItemReplace (roID, storyID, item)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosPluginID?,
```

```
mosAbstract?, objPaths?, itemChannel?, itemEdStart?, itemEdDur?,
itemUserTimingDur?, itemTrigger?, macroIn?, macroOut?,
mosExternalMetadata*>
<!ELEMENT mosExternalMetadata (mosScope?, mosSchema, mosPayload)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>9088</messageID>
   <mosItemReplace>
      <roID>5PM</roID>
      <storyID>HOTEL FIRE</storyID>
      <item>
         <itemID>30848</itemID>
         <objID>M000627</objID>
         <mosID>testmos.enps.com</mosID>
          <objPaths>
            <objPath techDescription="MPEG2
            Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
            <objProxyPath techDescription="WM9
            750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
            <objMetadataPath techDescription="MOS
      Object">http://server/proxy/clipe.xml</objMetadataPath>
          </objPaths>
         <itemEdStart>0</itemEdStart>
         <itemEdDur>815</itemEdDur>
         <itemUserTimingDur>310</itemUserTimingDur>
         <macroIn>c01/l04/dve07</macroIn>
         <macroOut>r00</macroOut>
         <mosExternalMetadata>
            <mosScope>PLAYLIST</mosScope>
            <mosSchema>HTTP://VENDOR/MOS/supportedSchemas/vvend280</mos
Schema>
            <mosPayload>
               <trigger>837</trigger>
               <key>110</key>
               <fade>17</fade>
               <efxTime>15</efxTime>
            </mosPayload>
         </mosExternalMetadata>
      </item>
   </mosItemReplace>
</mos>
```

3.3.3 mosReqObjAction - NCS requests action on MOS object

Purpose

mosReqObjAction allows an NCS to request the Media Object Server to create, modify or delete a media object. This is a request only. A NACK response is perfectly valid and must be anticipated. It is possible that an ACK may never be returned to the MOS.

Action	"operation" attribute	"objID" attribute
Create an Object	"NEW"	Attribute not used (should be omitted)
Modify an Object	"UPDATE"	objID of the referenced Object
Delete an Object	"DELETE"	objID of the referenced Object

A "NEW" operation creates a "placeholder" Object that has no media.

An "UPDATE" operation provides new metadata values for an existing Object. The intent is that the specified values will replace the corresponding Object values. The Media Object Server will merge in any mosExternalMetadata blocks as described in the mosItemReplace message.

A "DELETE" operation will delete an existing Object from the Media Object Server inventory.

The NCS must not expect an "UPDATE" operation to succeed if it contains new values for objType, objTB, or objDur and the Object already has actual media.

A Media Object Server may choose to report an action as successful even when it does not fulfil the entire request. For instance, the NCS might send an "UPDATE" operation containing new objSlug and objType values. If the Object already has media, the Media Object Server may change its objSlug value but leave its objType value unchanged. In that case, the Media Object Server may respond with an ACK whose status description indicates that some but not all values changed.

Response

mosAck

If the specified action cannot be completed, the status is NACK and the status description will define the error.

If the specified action is successfully completed, the message will take one of three forms:

1. If the action is "NEW," the status description will be the objID.

2. If the action is "UPDATE," the status decription may be any additional information the Media Object Server wants to send. See the example above.
3. If the action is "DELETE," the status description may include any additional information the Media Object Server wants to send.

Subsequent messages

If the specified action is successfully completed, the MOS will subsequently send a mosObj message. It will take one of three forms:

1. If the action is "NEW," the status will be "NEW."
2. If the action is "UPDATE," the status will be "UPDATED."
3. If the action is "DELETE," the status will be "DELETED."

Port

MOS Lower Port (10540) – MOS Object

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosReqObjAction (operation = {NEW, UPDATE, DELETE} objID={x})
  - objSlug?
  - mosAbstract?
  - objGroup?
  - objType?
  - objTB?
  - objDur?
  - time?
  - createdBy?
  - changedBy?
  - changed?
  - descriptiondescription?
  - mosExternalMetadata*

Syntax

```
<!ELEMENT mosReqObjAction (objSlug?, mosAbstract?, objGroup?, objType?,
objTB?, objDur?, time?, createdBy?, changedBy?, changed?, description?,
mosExternalMetadata*)>
<!ELEMENT description (#PCDATA | p | em | tab)*>
<!ELEMENT p (#PCDATA | em | tab)*>
<!ATTLIST mosReqObjAction
            operation CDATA #REQUIRED
            objID CDATA #IMPLIED
>
```

Example - Create

```
<mos>
   <mosID>videoserver.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>724</messageID>
   <mosReqObjAction operation="NEW" >
      <objSlug>Hotel Fire</objSlug>
      <objGroup>Show 7</objGroup>
      <objType>VIDEO</objType>
      <objTB>59.94<objTB>
      <objDur>1800</objDur>
      <createdBy>Chris</createdBy>
      <description>
         <p>
            Exterior footage of
            <em>Baley Park Hotel</em>
             on fire with natural sound. Trucks are
        visible for the first portion of the clip.
            <em>CG locator at 0:04 and duration 0:05, Baley Park
        Hotel.</em>
         </p>
         <p>
            <tab/>
            Cuts to view of fire personnel exiting hotel lobby and
cleaning up after the fire is out.
         </p>
         <p>
            <em>Clip has been doubled for pad on voice over.</em>
         </p>
      </description>
      <mosExternalMetadata>
         <mosScope>STORY</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <ModTime>20010308142001</ModTime>
            <mediaTime>0</mediaTime>
            <TextTime>278</TextTime>
            <ModBy>LJOHNSTON</ModBy>
            <Approved>0</Approved>
            <Creator>SHOLMES</Creator>
```

```
        </mosPayload>
      </mosExternalMetadata>
   </mosReqObjAction>
</mos>
```

Example - Modify

```
<mos>
   <mosID>videoserver.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>724</messageID>
   <mosReqObjAction operation="UPDATE" objID="1EFA3009233F8329C1">
      <objSlug>Hotel Fire</objSlug>
      <objGroup>Show 7</objGroup>
      <objType>VIDEO</objType>
      <objTB>59.94<objTB>
      <objDur>1800</objDur>
      <createdBy>Chris</createdBy>
      <description>
         <p>
            Exterior footage of
            <em>Baley Park Hotel</em>
             on fire with natural sound. Trucks are
        visible for the first portion of the clip.
            <em>CG locator at 0:04 and duration 0:05, Baley Park
        Hotel.</em>
         </p>
         <p>
            <tab/>
            Cuts to view of fire personnel exiting hotel lobby and
cleaning up after the fire is out.
         </p>
         <p>
            <em>Clip has been doubled for pad on voice over.</em>
         </p>
      </description>
      <mosExternalMetadata>
         <mosScope>STORY</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <ModTime>20010308142001</ModTime>
            <mediaTime>0</mediaTime>
            <TextTime>278</TextTime>
            <ModBy>LJOHNSTON</ModBy>
            <Approved>0</Approved>
            <Creator>SHOLMES</Creator>
         </mosPayload>
      </mosExternalMetadata>
   </mosReqObjAction>
</mos>
```

Example - Delete

```
<mos>
   <mosID>videoserver.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>724</messageID>
   <mosReqObjAction operation="DELETE" objID="1EFA3009233F8329C1">
   </mosReqObjAction>
</mos>
```

ro (Running Order) family of messages

3.4 ro Playlist Construction

3.4.1 roAck - Acknowledge Running Order

Purpose

roAck is the MOS response to receipt of any Running Order command. The response may contain the status for one or more Items in a Running Order. This is useful when the roAck is in response to a roCreate or roReplace command.

Response

None

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roAck
  - roID
  - roStatus
    (storyID, itemID, objID, itemChannel?, status)*

Syntax

```
<!ELEMENT roAck (roID, roStatus, (storyID, itemID, objID, itemChannel?,
status)*)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>23569</messageID>
   <roAck>
      <roID>96857485</roID>
      <roStatus>Unknown object M000133</roStatus>
      <storyID>5983A501:0049B924:8390EF2B</storyID>
      <itemID>0</itemID>
      <objID>M000224</objID>
      <status>LOADED</status>
      <storyID>3854737F:0003A34D:983A0B28</storyID>
      <itemID>0</itemID>
      <objID>M000133</objID>
      <itemChannel>A</itemChannel>
      <status>UNKNOWN</status>
   </roAck>
</mos>
```

3.4.2 roCreate - Create Running Order

Purpose

Message from the NCS to the MOS that defines a new Running Order.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roCreate
  - roID
  - roSlug
  - roChannel?
  - roEdStart?
  - roEdDur?
  - roTrigger?
  - macroIn?
  - macroOut?
  - mosExternalMetadata*
  - story*
    - storyID
    - storySlug?
    - storyNum?
    - mosExternalMetadata*
    - item*
      - itemID
      - itemSlug?
      - objID
      - mosID
      - mosAbstract?
      - objPaths?
        - objPath*
        - objProxyPath*
        - objMetadataPath*

itemChannel?
itemEdStart?
itemEdDur?
itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*

Syntax

```
<!ELEMENT roCreate (roID, roSlug, roChannel?, roEdStart?, roEdDur?,
roTrigger?, macroIn?, macroOut?, mosExternalMetadata*, story*)>
<!ELEMENT story (storyID, storySlug?, storyNum?,
mosExternalMetadata*,  item*)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosAbstract?,
objPaths?, itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>30334</messageID>
   <roCreate>
      <roID>96857485</roID>
      <roSlug>5PM RUNDOWN</roSlug>
      <roEdStart>2009-04-17T17:02:00</roEdStart>
      <roEdDur>00:58:25</roEdDur>
      <story>
         <storyID>5983A501:0049B924:8390EF2B</storyID>
         <storySlug>COLSTAT MURDER</storySlug>
         <storyNum>A5</storyNum>
         <item>
            <itemID>0</itemID>
            <itemSlug>COLSTAT MURDER:VO</itemSlug>
            <objID>M000224</objID>
            <mosID>testmos.enps.com</mosID>
             <objPaths>
                  <objPath techDescription="MPEG2
      Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
                  <objProxyPath techDescription="WM9
      750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
            <objMetadataPath techDescription="MOS
      Object">http://server/proxy/clipe.xml</objMetadataPath>
             </objPaths>
            <itemEdDur>645</itemEdDur>
            <itemUserTimingDur>310</itemUserTimingDur>
            <itemTrigger>CHAINED</itemTrigger>
            <mosExternalMetadata>
               <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
```

```
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <transitionMode>2</transitionMode>
                  <transitionPoint>463</transitionPoint>
                  <source>a</source>
                  <destination>b</destination>
               </mosPayload>
            </mosExternalMetadata>
         </item>
      </story>
      <story>
         <storyID>3854737F:0003A34D:983A0B28</storyID>
         <storySlug>AIRLINE INSPECTIONS</storySlug>
         <storyNum>A6</storyNum>
         <item>
            <itemID>0</itemID>
            <objID>M000133</objID>
            <mosID>testmos.enps.com</mosID>
            <itemEdStart>55</itemEdStart>
            <itemEdDur>310</itemEdDur>
             <itemUserTimingDur>200</itemUserTimingDur>
            <mosExternalMetadata>
               <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <transitionMode>2</transitionMode>
                  <transitionPoint>463</transitionPoint>
                  <source>a</source>
                  <destination>b</destination>
               </mosPayload>
            </mosExternalMetadata>
         </item>
      </story>
   </roCreate>
</mos>
```

3.4.3 roReplace - Replace Running Order

Purpose

Replaces an existing Running Order definition in the MOS with another one sent from the NCS.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roReplace
  - roID
  - roSlug
  - roChannel?
  - roEdStart?
  - roEdDur?
  - roTrigger?
  - macroIn?
  - macroOut?
  - mosExternalMetadata*
  - story*
    - storyID
    - storySlug?
    - storyNum?
    - mosExternalMetadata*
    - item*
      - itemID
      - itemSlug?
      - objID
      - mosID
      - mosAbstract?
      - objPaths?
        - objPath*
        - objProxyPath*

objMetadataPath*
itemChannel?
itemEdStart?
itemEdDur?
itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*

Syntax

```
<!ELEMENT roReplace (roID, roSlug, roChannel?, roEdStart?, roEdDur?,
roTrigger?, macroIn?, macroOut?, mosExternalMetadata*, story*)>
<!ELEMENT story (storyID, storySlug?, storyNum?,
mosExternalMetadata*,  item*)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosAbstract?,
objPaths?, itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>2345</messageID>
   <roReplace>
      <roID>96857485</roID>
      <roSlug>5PM RUNDOWN</roSlug>
      <story>
         <storyID>5983A501:0049B924:8390EF2B</storyID>
         <storySlug>COLSTAT MURDER</storySlug>
         <storyNum>A1</storyNum>
         <item>
            <itemID>0</itemID>
            <itemSlug>COLSTAT MURDER:VO</itemSlug>
            <objID>M000224</objID>
            <mosID>testmos.enps.com</mosID>
            <objPaths>
                  <objPath techDescription="MPEG2
                  Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
                  <objProxyPath techDescription="WM9
                  750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
            <objMetadataPath techDescription="MOS
      Object">http://server/proxy/clipe.xml</objMetadataPath>
            </objPaths>
            <itemEdDur>645</itemEdDur>
            <itemUserTimingDur>310</itemUserTimingDur>
            <itemTrigger>CHAINED</itemTrigger>
            <mosExternalMetadata>
               <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
```

```
                  <Owner>SHOLMES</Owner>
                  <transitionMode>2</transitionMode>
                  <transitionPoint>463</transitionPoint>
                  <source>a</source>
                  <destination>b</destination>
               </mosPayload>
            </mosExternalMetadata>
         </item>
      </story>
      <story>
         <storyID>3852737F:0013A64D:923A0B28</storyID>
         <storySlug>AIRLINE SAFETY</storySlug>
         <storyNum>A2</storyNum>
         <item>
            <itemID>0</itemID>
            <objID>M000295</objID>
            <mosID>testmos.enps.com</mosID>
            <itemEdStart>500</itemEdStart>
            <itemEdDur>600</itemEdDur>
            <itemUserTimingDur>310</itemUserTimingDur>
            <mosExternalMetadata>
               <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <transitionMode>2</transitionMode>
                  <transitionPoint>463</transitionPoint>
                  <source>a</source>
                  <destination>b</destination>
               </mosPayload>
            </mosExternalMetadata>
         </item>
      </story>
   </roReplace>
</mos>
```

3.4.4 roMetadataReplace – Replace RO metadata without deleting the RO structure

Purpose

The roMetadataReplace message allows metadata associated with a running order to be replaced without deleting the running order and sending the entire running order again.

Behavior

This message must reference an existing running order

If metadata tags in the roMetadataReplace message already exist in the target RO, values within the RO will be replaced by the values in the roMetadataReplace message.

If the metadata tags do not already exist in the target RO they will be added.

If a mosExternalMetadata block is included in the roMetadataReplace message, it will replace an existing mosExternalMetadata block **only** if the values of mosSchema in the two blocks match. Otherwise the mosExternalMetadata block will be added to the target RO.

If the roID in the roMetadataReplace message does not match an existing roID then no action will be taken and the roMetadataReplace message will be replied to with an roAck message which carrying a status value of "NACK."

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roMetadataReplace
  - roID
  - roSlug
  - roChannel?

roEdStart?
roEdDur?
roTrigger?
macroIn?
macroOut?
mosExternalMetadata?

Syntax

```
<!ELEMENT roMetadataReplace (roID, roSlug, roChannel?, roEdStart?,
roEdDur?, roTrigger?, macroIn?, macroOut?, mosExternalMetadata?)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>654033</messageID>
   <roMetadataReplace>
      <roID>96857485</roID>
      <roSlug>5PM RUNDOWN</roSlug>
      <roEdStart>2009-04-17T17:02:00</roEdStart>
      <roEdDur>00:58:25</roEdDur>
      <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope><mosSchema>http://MOSA4.com/mos/s
upported_schemas/MOSAXML2.08</mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <transitionMode>2</transitionMode>
            <transitionPoint>463</transitionPoint>
            <source>a</source>
            <destination>b</destination>
         </mosPayload>
      </mosExternalMetadata>
   </roMetadataReplace>
</mos>
```

3.4.5 roDelete - Delete Running Order

Purpose

Deletes a Running order in the MOS.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roDelete
  - roID

Syntax

```
<!ELEMENT roDelete (roID)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>544</messageID>
   <roDelete>
      <roID>49478285</roID>
   </roDelete>
</mos>
```

3.5 ro Synchronization, Discovery and Status

3.5.1 roReq - Request Running Order

Purpose

Request for a complete build of a Running Order Playlist.
NOTE: This message can be used by either NCS or MOS.
A MOS can use this to "resync" its Playlist with the NCS Running Order or to obtain a full description of the Playlist at any time.
An NCS can use this as a diagnostic tool to check the order of the Playlist constructed in the MOS versus the sequence of Items in the Running Order.

Response

roList or roAck (roAck is sent with the status value of NACK if the roID is not valid, or if the Running Order is not available).

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roReq
  - roID

Syntax

```
<!ELEMENT roReq (roID)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>30761</messageID>
   <roReq>
      <roID>96857485</roID>
   </roReq>
</mos>
```

3.5.2 roList - List Running Order

Purpose

A complete build or rebuild of a Running Order Playlist in response to an roReq message.
NOTE: This message can be sent by either the NCS or MOS
A MOS can use this to "resync" its Playlist with the NCS Running Order or to obtain a full description of the Playlist at any time.
An NCS can use this as a diagnostic tool to check the order of the Playlist constructed in the MOS versus the sequence of Items in the Running Order.

Response

None

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roList
  - roID
  - roSlug
  - roChannel?
  - roEdStart?
  - roEdDur?
  - roTrigger?
  - macroIn?
  - macroOut?
  - mosExternalMetadata*
  - story*
    - storyID
    - storySlug?
    - storyNum?
    - mosExternalMetadata*
    - item*
      - itemID
      - itemSlug?

objID
mosID
mosAbstract?
objPaths?
objPath*
objProxyPath*
objMetadataPath*
itemChannel?
itemEdStart?
itemEdDur?
itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*

Syntax

```
<!ELEMENT roList (roID, roSlug, roChannel?, roEdStart?, roEdDur?,
roTrigger?, macroIn?, macroOut?, mosExternalMetadata*, story*)>
<!ELEMENT story (storyID, storySlug?, storyNum?,
mosExternalMetadata*,  item*)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosAbstract?,
objPaths?, itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>111</messageID>
   <roList>
      <roID>96857485</roID>
      <roSlug>5PM RUNDOWN</roSlug>
      <story>
         <storyID>5983A501:0049B924:8390EF2B</storyID>
         <storySlug>Colstat Murder</storySlug>
         <storyNum>B10</storyNum>
         <item>
            <itemID>0</itemID>
            <itemSlug>COLSTAT MURDER:VO</itemSlug>
            <objID>M000224</objID>
            <mosID>testmos.enps.com</mosID>
            <objPaths>
                  <objPath techDescription="MPEG2
                  Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
                  <objProxyPath techDescription="WM9
                  750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
                  <objMetadataPath techDescription="MOS
                  Object">http://server/proxy/clipe.xml</objMetadataPath>
            </objPaths>
```

```
            <itemEdDur>645</itemEdDur>
             <itemUserTimingDur>310</itemUserTimingDur>
            <itemTrigger>CHAINED</itemTrigger>
            <mosExternalMetadata>
               <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <transitionMode>2</transitionMode>
                  <transitionPoint>463</transitionPoint>
                  <source>a</source>
                  <destination>b</destination>
               </mosPayload>
            </mosExternalMetadata>
         </item>
      </story>
      <story>
         <storyID>3854737F:0003A34D:983A0B28</storyID>
         <storySlug>Test MOS</storySlug>
         <storyNum>B11</storyNum>
         <item>
            <itemID>0</itemID>
            <objID>M000133</objID>
            <mosID>testmos.enps.com</mosID>
            <itemEdStart>55</itemEdStart>
            <itemEdDur>310</itemEdDur>
             <itemUserTimingDur>310</itemUserTimingDur>
            <mosExternalMetadata>
               <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <transitionMode>2</transitionMode>
                  <transitionPoint>463</transitionPoint>
                  <source>a</source>
                  <destination>b</destination>
               </mosPayload>
            </mosExternalMetadata>
         </item>
      </story>
   </roList>
</mos>
```

3.5.3 roReqAll - Request All Running Order Descriptions

Purpose

roReqAll is a request for a description of all Running Orders known by a NCS from a MOS.

Response

roListAll

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roReqAll

Syntax

```
<!ELEMENT roReqAll EMPTY>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>60543</messageID>
   <roReqAll/>
</mos>
```

3.5.4 roListAll - List All Running Order Descriptions

Purpose

The roListAll message provides a description of all Running Orders known by a NCS to a MOS.

Response

None

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roListAll
  - ro*
    - roID
    - roSlug?
    - roChannel?
    - roEdStart?
    - roEdDur?
    - roTrigger?
    - mosExternalMetadata*

Syntax

```
<!ELEMENT roListAll (ro*)>
<!ELEMENT ro (roID, roSlug?, roChannel?, roEdStart?, roEdDur?,
roTrigger?, mosExternalMetadata*)>
```

Example

```
<mos>
 <mosID>aircache.newscenter.com</mosID>
 <ncsID>ncs.newscenter.com</ncsID>
   <messageID>300045</messageID>
   <roListAll>
     <ro>
       <roID>5PM</roID>
       <roSlug>5PM Rundown</roSlug>
       <roChannel></roChannel>
       <roEdStart>2009-07-11T17:00:00</roEdStart>
       <roEdDur>00:30:00</roEdDur>
       <roTrigger>MANUAL</roTrigger>
       <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <mediaTime>0</mediaTime>
            <TextTime>278</TextTime>
            <ModBy>LJOHNSTON</ModBy>
            <Approved>0</Approved>
            <Creator>SHOLMES</Creator>
         </mosPayload>
      </mosExternalMetadata>
     </ro>
     <ro>
       <roID>6PM</roID>
       <roSlug>6PM Rundown</roSlug>
       <roChannel></roChannel>
       <roEdStart>2009-07-09T18:00:00</roEdStart>
       <roEdDur>00:30:00</roEdDur>
       <roTrigger>MANUAL</roTrigger>
       <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <mediaTime>0</mediaTime>
            <TextTime>350</TextTime>
            <ModBy>BSMITH</ModBy>
            <Approved>1</Approved>
            <Creator>SHOLMES</Creator>
         </mosPayload>
      </mosExternalMetadata>
      </ro>
   </roListAll>
</mos>
```

3.5.5 roReadyToAir - Identify a Running Order as Ready to Air

Purpose

The roReadyToAir message allows the NCS to signal the MOS that a Running Order has been editorially approved ready for air.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roReadyToAir
  - roID
  - roAir

Syntax

```
<!ELEMENT roReadyToAir (roID, roAir)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>30467</messageID>
   <roReadyToAir>
      <roID>5PM</roID>
      <roAir>READY</roAir>
   </roReadyToAir>
</mos>
```

3.6 ro Story and Item Sequence Modification

3.6.1 roElementAction – Performs specific Action on a Running Order

Purpose

The roElementAction command executes INSERT, REPLACE, MOVE, DELETE, and SWAP operations on one or more elements in a playlist. The elements can be either Stories or Items. The command specifies one or more source elements and a single target element. The source elements are those Stories or Items to be acted upon. The target element specifies where in the running order the actions take place.

As with the story-level and item-level commands, the INSERT and REPLACE operations send new content to the MOS. Thus the element_source tag must contain either all Stories or all Items, depending on which is being inserted or replaced.

The MOVE, DELETE, and SWAP operations act on content already existing in the MOS. Thus the element_source tag must contain either all storyIDs or all itemIDs, depending on which is being moved, deleted, or swapped.

The following table describes what goes in the element_source and the element_target for each of the eight possible operations. As of MOS 2.8.5 roElementAction message's syntax has been clarified to reduce confusion.

Operation	**In** element_target	**In** element_source
Inserting stories	A storyID specifying the story before which the source stories are inserted	One or more stories to insert
Inserting items	A storyID and itemID specifying the item before which the source items are inserted	One or more items to insert
Replacing a story	A storyID specifying the story to be replaced	One or more stories to put in its place
Replacing an item	A storyID and itemID specifying the item to be replaced	One or more items to put in its place

Moving stories	A storyID specifying the story before which the source stories are moved	One or more storyIDs specifying the stories to be moved
Moving items	A storyID and itemID specifying the item before which the source items are moved	One or more itemIDs specifying the items in the story to be moved
Deleting stories	Not needed, since deletes don't happen relative to another story	One or more storyIDs specifying the stories to be deleted
Deleting items	A storyID specifying the story containing the items to be deleted	One or more itemIDs specifying the items in the story to be deleted
Swapping stories	An empty storyID tag, or the element_target tag itself is absent	Exactly two storyIDs specifying the stories to be swapped
Swapping items	A storyID specifying the story containing the items to be swapped	Exactly two itemIDs specifying the items to be swapped

Note: This message effectively replaces messages 3.6.1 – 3.6.11 and will be supported in future versions of MOS.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roElementAction (operation = (INSERT, REPLACE, MOVE, DELETE,SWAP))
  - roID
  - element_target
    - storyID
    - itemID?
  - element_source
    - story+
      - storyID
      - storySlug?
      - storyNum?
      - mosExternalMetadata*
    - item+
      - itemID
      - itemSlug?
      - objID
      - mosID
      - mosAbstract?
      - objPaths?
        - objPath*
        - objProxyPath*
          - itemChannel?
          - itemEdStart?
          - itemEdDur?
          - itemUserTimingDur?
          - itemTrigger?
          - macroIn?
          - macroOut?
          - mosExternalMetadata*

Syntax

```
<!ELEMENT roElementAction (roID, element_target?, element_source)>
<!ELEMENT element_target  (storyID, itemID?)>
<!ELEMENT element_source  (story+ | item+ | storyID+ | itemID+)>
<!ELEMENT story (storyID, storySlug?, storyNum?, mosExternalMetadata*,
item*)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosAbstract?,
objPaths?, itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>

<!ATTLIST roElementAction operation CDATA #REQUIRED>
```

Because this command is complex, we provide several examples.

Insert example 1 - inserting a story in a rundown:

Insert a new story with storyID=17 before the story with storyID = 2 in the 5PM running order.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>4433250443</messageID>
      <roElementAction operation="INSERT">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
            </element_target>
            <element_source>
              <story>
                  <storyID>17</storyID>
                  <storySlug>Barcelona Football</storySlug>
                  <storyNum>A2</storyNum>
                    <item>
                          <itemID>27</itemID>
                          <objID>M73627</objID>
                          <mosID>testmos</mosID>
                               <objPaths>
                                     <objPath techDescription="MPEG2
                               Video">\\server\media\clip392028cd2320s0d.mxf<
                               /objPath>
                                     <objProxyPath techDescription="WM9
                               750Kbps">http://server/proxy/clipe.wmv</objPro
                               xyPath>
                                                        <objMetadataPath
                  techDescription="MOS
                  Object">http://server/proxy/clipe.xml</objMetadataPath>

                                     </objPaths>
                          <itemEdStart>0</itemEdStart>
                          <itemEdDur>715</itemEdDur>
                          <itemUserTimingDur>415</itemUserTimingDur>
                    </item>
                    <item>
                          <itemID>28</itemID>
                          <objID>M73628</objID>
                          <mosID>testmos</mosID>
                          <itemEdStart>0</itemEdStart>
                          <itemEdDur>315</itemEdDur>
                    </item>
              </story>
            </element_source>
        </roElementAction>
</mos>
```

Insert example 2 - inserting a new item into a story:

Insert a new item with storyID =27 before the item with storyID = 23 within the story with storyID =2.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>44333</messageID>
      <roElementAction operation="INSERT">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
                  <itemID>23</itemID>
            </element_target>
            <element_source>
              <item>
                  <itemID>27</itemID>
                  <itemSlug>NHL PKG</itemSlug>
                  <objID>M19873</objID>
                  <mosID>testmos</mosID>
                  <objPaths>
                        <objPath techDescription="MPEG2
                        Video">\\server\media\clip392028cd2320s0d.mxf</objPat
                        h>
                        <objProxyPath techDescription="WM9
                        750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
                  <objMetadataPath techDescription="MOS
                  Object">http://server/proxy/clipe.xml</objMetadataPath>

                  </objPaths>

                  <itemEdStart>0</itemEdStart>
                  <itemEdDur>700</itemEdDur>
                  <itemUserTimingDur>690</itemUserTimingDur>
              </item>
            </element_source>
        </roElementAction>
</mos>
```

Replace example 1 - replacing a story in a rundown:

Replace the story with storyID = 2 (in the 5PM running order) with a new story with storyID = 17.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>44334</messageID>
      <roElementAction operation="REPLACE">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
            </element_target>
            <element_source>
              <story>
                  <storyID>17</storyID>
                  <storySlug>Porto Football</storySlug>
                  <storyNum>A2</storyNum>
```

```
                    <item>
                         <itemID>27</itemID>
                         <objID>M73627</objID>
                         <mosID>testmos</mosID>
                        <objPaths>
                              <objPath techDescription="MPEG2
                              Video">\\server\media\clip392028cd2320s0d.mxf<
                              /objPath>
                              <objProxyPath techDescription="WM9
                              750Kbps">http://server/proxy/clipe.wmv</objPro
                              xyPath>
                              <objMetadataPath techDescription="MOS
                              Object">http://server/proxy/clipe.xml</objMeta
                              dataPath>
                        </objPaths>

                         <itemEdStart>0</itemEdStart>
                         <itemEdDur>715</itemEdDur>
                         <itemUserTimingDur>415</itemUserTimingDur>
                    </item>
                    <item>
                         <itemID>28</itemID>
                         <objID>M73628</objID>
                         <mosID>testmos</mosID>
                         <itemEdStart>0</itemEdStart>
                         <itemEdDur>315</itemEdDur>
                    </item>
               </story>
          </element_source>
     </roElementAction>
</mos>
```

Replace example 2 - replacing an item in a story:

Replace the item with storyID = 23 with new item with storyID = 27 within the story with storyID = 2.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>44335</messageID>
      <roElementAction operation="REPLACE">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
                  <itemID>23</itemID>
            </element_target>
            <element_source>
              <item>
                  <itemID>27</itemID>
                  <itemSlug>NHL PKG</itemSlug>
                  <objID>M19873</objID>
                  <mosID>testmos</mosID>
                  <objPaths>
```

```
                        <objPath techDescription="MPEG2
                        Video">\\server\media\clip392028cd2320s0d.mxf</objPat
                        h>
                        <objProxyPath techDescription="WM9
                        750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
                        <objMetadataPath techDescription="MOS
                        Object">http://server/proxy/clipe.xml</objMetadataPat
                        h>
                    </objPaths>
                    <itemEdStart>0</itemEdStart>
                    <itemEdDur>700</itemEdDur>
                    <itemUserTimingDur>690</itemUserTimingDur>
                </item>
            </element_source>
        </roElementAction>
</mos>
```

Move example 1 - moving a story:

This moves the story with storyID =7 before the story with storyID =2 in the 5PM running order.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>44336</messageID>
      <roElementAction operation="MOVE">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
            </element_target>
            <element_source>
                  <storyID>7</storyID>
            </element_source>
        </roElementAction>
</mos>
```

Move example 2 - moving a block of stories:

This moves stories with storyID = 7 and storyID = 12 before story with storyID = 2 in the 5PM running order.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>44337</messageID>
      <roElementAction operation="MOVE">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
            </element_target>
```

```
            <element_source>
                  <storyID>7</storyID>
                <storyID>12</storyID>
            </element_source>
        </roElementAction>
</mos>
```

Move example 3 - moving items within a story:

This moves an item with storyID = 23 and storyID = 24 before the item with storyID = 12 within the story with storyID = 2 in the 5PM running order.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>44338</messageID>
      <roElementAction operation="MOVE">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
                  <itemID>12</itemID>
            </element_target>
            <element_source>
                  <itemID>23</itemID>
                  <itemID>24</itemID>
            </element_source>
        </roElementAction>
</mos>
```

Delete example 1 - deleting a story from the rundown:

This removes the story with storyID = 3 from the 5PM running order.

```
<mos>
      <mosID>aircache.newscenter.com</mosID>
      <ncsID>ncs.newscenter.com</ncsID>
      <messageID>44339</messageID>
      <roElementAction operation="DELETE">
            <roID>5PM</roID>
            <element_source>
                  <storyID>3</storyID>
            </element_source>
        </roElementAction>
</mos>
```

Delete example 2 - deleting items from a story:

This removes items with storyID = 23 and storyID = 24 from the story with storyID = 2.

```
<mos>
	<mosID>aircache.newscenter.com</mosID>
	<ncsID>ncs.newscenter.com</ncsID>
	<messageID>44340</messageID>
	<roElementAction operation="DELETE">
		<roID>5PM</roID>
		<element_target>
			<storyID>2</storyID>
		</element_target>
		<element_source>
			<itemID>23</itemID>
			<itemID>24</itemID>
		</element_source>
	  </roElementAction>
</mos>
```

Swap example 1 – swapping two stories in the rundown:

This swaps the story with storyID = 3 with the story with storyID = 5 in the 5PM running order.

```
<mos>
	<mosID>aircache.newscenter.com</mosID>
	<ncsID>ncs.newscenter.com</ncsID>
	<messageID>44339</messageID>
	<roElementAction operation="SWAP">
		<roID>5PM</roID>
		<element_source>
			<storyID>3</storyID>
			<storyID>5</storyID>
		</element_source>
	  </roElementAction>
</mos>
```

Swap example 2 – swapping two items in a story:

This swaps the items with storyID = 23 and the item with storyID = 24 in the story with storyID = 2.

```
<mos>
	<mosID>aircache.newscenter.com</mosID>
	<ncsID>ncs.newscenter.com</ncsID>
```

```
      <messageID>44340</messageID>
       <roElementAction operation="SWAP">
            <roID>5PM</roID>
            <element_target>
                  <storyID>2</storyID>
            </element_target>
            <element_source>
                  <itemID>23</itemID>
                  <itemID>24</itemID>
            </element_source>
        </roElementAction>
</mos>
```

3.7. ro Control and Status feedback

3.7.1 roElementStat - Status of a Single Element in a MOS Running Order

Purpose

In MOS 2.8.5 and later roElementStat becomes a bidirectional method for the MOS to update the NCS or the NCS to update the MOS on the status of any Item, Story or RO. This allows the receiving device to reflect the status of any element in the MOS Running Order.

This message is a member of both profile 2 and 4. For use with profile 2 set the element attribute to either ITEM, STORY or RO to update the NCS or MOS on the status of an Item or a RO.

Note: roElementStat makes roStat and roItemStat legacy commands.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roElementStat (element = {RO,STORY,ITEM})
  - roID
  - storyID?
  - itemID?
  - objID?
  - itemChannel?
  - status
  - time

Syntax

```
<!ELEMENT roElementStat (roID, storyID?, itemID?, objID?, itemChannel?, status, time)>
<!ATTLIST roElementStatus  element CDATA  #REQUIRED>
```

Example Item Status

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
 <ncsID>ncs.newscenter.com</ncsID>
 <messageID>506702</messageID>
 <roElementStat element = "ITEM">
    <roID>5PM</roID>
    <storyID>HOTEL FIRE </storyID>
    <itemID>0</itemID>
    <objID>A0295</objID>
    <itemChannel>B</itemChannel>
    <status>PLAY</status>
   <time>2009-04-11T14:13:53</time>
 </roElementStat>
</mos>
```

Example Story Status

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
 <ncsID>ncs.newscenter.com</ncsID>
 <messageID>234754</messageID>
 <roElementStat element = "STORY">
    <roID>5PM</roID>
    <storyID>HOTEL FIRE </storyID>
    <status>PLAY</status>
   <time>2009-04-11T14:13:53</time>
 </roElementStat>
</mos>
```

Example RO Status

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
 <ncsID>ncs.newscenter.com</ncsID>
 <messageID>506702</messageID>
 <roElementStat element = "RO">
    <roID>5PM</roID>
    <status>MANUAL CTRL</status>
   <time>2009-04-11T14:13:53</time>
 </roElementStat>
</mos>
```

3.7.2 roItemCue – Notification of Item Event

Purpose

The roItemCue message allows a device, such as a prompter, to send a time cue for an Item.

Description

This command allows a non MOS or NCS device to send a time cue to the parent Media Object Server (or Automation MOS) for a specific Item event. This is not a command to execute or play. Instead, this is intended to provide feedback to the parent device as to the current execution point of the program.

The values <mosID>, <roID>, <storyID>, and <itemID> are derived from the Item reference embedded in a story. The story information is assumed to be transmitted via the roStorySend message.
The Media Object Server or automation device that receives this command may use this information to update status or generate device triggers. Optionally, the message may be redirected to the NCS as a means of providing additional status information.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roItemCue
  - mosID
  - roID
  - storyID
  - itemID
  - roEventType
  - roEventTime
  - mosExternalMetadata*

Syntax

```
<!ELEMENT roItemCue (mosID, roID, storyID, itemID, roEventType,
roEventTime, mosExternalMetadata*)>
<!ELEMENT roEventType (#PCDATA)>
<!ELEMENT roEventTime (#PCDATA)>
```

Example

An example of a notification message forced to the NCS:

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>400932</messageID>
   <roItemCue>
      <mosID>videoserver.station.group.com</mosID>
      <roID>96857485</roID>
      <storyID>5983A501:0049B924:8390EF2B</storyID>
      <itemID>234343234</itemID>
      <roEventType>Prompter</roEventType>
      <roEventTime>2000-03-20T10:45:00.00</roEventTime>
      <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSBBBBXML2.
08</mosSchema>
         <mosPayload>
            <triggeredby>operator</triggeredby>
            <operatorType>prompter</operatorType>
            <netPropDelay>10</netPropDelay>
         </mosPayload>
      </mosExternalMetadata>
   </roItemCue>
</mos>
```

An example of a notification message sent to the parent MOS. Note the counterintuitive assignment of the parent MOS name to the <ncsID> field:

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>videoserver.station.group.com</ncsID>
   <messageID>400932</messageID>
   <roItemCue>
      <mosID>videoserver.station.group.com</mosID>
      <roID>96857485</roID>
      <storyID>5983A501:0049B924:8390EF2B</storyID>
      <itemID>234343234</itemID>
      <roEventType>Prompter</roEventType>
      <roEventTime>2000-03-20T10:45:00.00</roEventTime>
      <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSBBBBXML2.
08</mosSchema>
         <mosPayload>
            <triggeredby>operator</triggeredby>
            <operatorType>prompter</operatorType>
            <netPropDelay>10</netPropDelay>
         </mosPayload>
      </mosExternalMetadata>
   </roItemCue>
</mos>
```

3.7.3 roCtrl – Running Order Control

Purpose

The roCtrl message allows basic control of a media object server via simple commands such as READY, EXECUTE, PAUSE, STOP and SIGNAL

Description

The roCtrl message allows control of a running order at three levels: the Running Order itself, a Story, and an Item. The commands READY, EXECUTE, PAUSE and STOP, as well as the general indicator, SIGNAL, can be addressed at each level. In other words, a single command can begin EXECUTION of an entire Running Order, of a Story containing multiple Items, or of a single Item.

The NCS indicates the level at which to execute a command by leaving the lower level IDs empty:

- if only storyID and itemID are empty, the command is executed on the specified Running Order.
- If only itemID is empty, the command is executed on the specified Story.
- If none of the three IDs are empty, the command is executed on the specified Item.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
  mosID
  ncsID
  messageID
  roCtrl
    roID
    storyID
    itemID
    command

mosExternalMetadata*

Syntax

```
<!ELEMENT roCtrl (roID, storyID, itemID, command,
mosExternalMetadata*)>
<!ELEMENT command (READY|EXECUTE|PAUSE|STOP|SIGNAL)>
```

Example

```
<mos>
   <mosID>aircache.newscenter.com</mosID>
   <ncsID>ncs.newscenter.com</ncsID>
   <messageID>3007</messageID>
   <roCtrl>
      <roID>3dedde9jd</roID>
      <storyID>A3fds3d</storyID>
      <itemID>30848</itemID>
      <command>EXECUTE</command>
   </roCtrl>
</mos>
```

3.8 Metadata Export

3.8.1 roStorySend – Send Story information, including Body of the Story

Purpose

This message enables sending the body of story from the NCS to a Media Object Server. Item references <storyItem>are embedded within the story's text. These item references are not intended to be displayed on the prompter, but instead can optionally be used to send a message <roItemCue> to the media object server indicated in the embedded reference. Composed from information in the embedded item reference, the <roItemCue> message could be generated by the prompter as this hidden text <storyItem> scrolls past the imaginary execution/read line of the prompter display.

The <storyItem> information can also optionally allow the prompter vendor to display the length of the embedded object and perhaps even a countdown.

The <roStorySend> message is able to transmit agency/wire protocol data by adding the optional attribute Read1stMEMasBody to the <storyBody> tag and settting it to true. The Read1stMEMasBody tag will allow the first MEM block to substitute the story body. Users should look for the body of the story in the first MEM block. Examples of agency/wire data are newsML, IPC, NAA, and other custom formats. Read1stMEMasBody is boolean the proper syntax would be: Read1stMEMasBody="true" or Read1stMEMasBody="false."

Prompters, radio systems, external archive systems, accounting systems, and potentially other systems and devices can make use of this information.

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roStorySend

roID
storyID
storySlug?
storyNum?
storyBody (Read1stMEMasBody)
storyPresenter*
storyPresenterRR*
p*
em*
tab*
pi*
pkg*
b*
I*
u*
storyItem*
itemID
itemSlug?
objID
mosID
mosAbstract?
objPaths?
objPath*
objProxyPath*
objMetadataPath*
itemChannel?
itemEdStart?
itemEdDur?
itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*
mosExternalMetadata*

Syntax

```
<!ELEMENT roStorySend (roID, storyID, storySlug?, storyNum?, storyBody,
mosExternalMetadata*)>
<!ATTLIST storyBody
           Read1stMEMasBody CDATA #IMPLIED
>

<!ELEMENT storyBody ((storyPresenter*, storyPresenterRR*, p*,
storyItem*)*)>
<!ELEMENT storyPresenter (#PCDATA)>
<!ELEMENT storyPresenterRR (#PCDATA)>
```

```
<!ELEMENT storyItem (itemID, itemSlug?, objID, mosID, mosAbstract?,
itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
<!ELEMENT p (#PCDATA | em | tab | pi | pkg | b | i | u)*>
<!ELEMENT pi (#PCDATA |  b | i | u)*>
<!ELEMENT pkg (#PCDATA |  b | i | u)*>
<!ELEMENT b (#PCDATA |  i | u)*>
<!ELEMENT i (#PCDATA |  b | u)*>
<!ELEMENT u (#PCDATA |  b | i)*>
```

Example - roStorySend

The roStorySend and roCreate messages are used in conjuction for prompter implementations. The roCreate message sends all the stories in a Running Order to the prompter (Forced Playlist Construction), this includes all stories, not just stories which contain the prompter's MOS ID. This workflow establishes a list of all story ID's and pointers in the order they will air for the associated running order. The prompter uses this information to sequence the story information sent in the <roStorySend> message.

RO messages, such as <roCreate> , <roStoryInsert>, <roStoryDelete>, etc. should be sent before the <roStorySend>messages. <roStorySend> messages can be sent alone after the story is initially referenced in a RO message (e.g. after <roCreate> or <roStoryInsert>,) if only the body of the story has changed and not its position within the Running Order.

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <roStorySend>
      <roID>96857485</roID>
      <storyID>5983A501:0049B924:8390EF1F</storyID>
      <storySlug>Show Open</storySlug>
      <storyNum>C8</storyNum>
      <storyBody>
         <storyPresenter>Suzie</storyPresenter>
         <storyPresenterRR>10</storyPresenterRR>
         <p>
            <pi> Smile </pi>
         </p>
         <p> Good Evening, I'm Suzie Humpries </p>
         <storyPresenter>Chet </storyPresenter>
         <storyPresenterRR>12</storyPresenterRR>
         <p> - and I'm Chet Daniels, this is the 5PM news on Monday
November 5th.</p>
         <p>First up today - a hotel fire downtown</p>
         <storyItem>
            <itemID>1</itemID>
            <itemSlug>Hotel Fire vo</itemSlug>
            <objID>M000705</objID>
            <mosID>testmos</mosID>
            <itemEdStart>0</itemEdStart>
```

```
            <itemEdDur>800</itemEdDur>
            <itemUserTimingDur>310</itemUserTimingDur>
            <macroIn>c01/l04/dve07</macroIn>
            <macroOut>r00</macroOut>
            <mosExternalMetadata>
               <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
               <mosPayload>
                  <Owner>SHOLMES</Owner>
                  <transitionMode>2</transitionMode>
                  <transitionPoint>463</transitionPoint>
                  <source>a</source>
                  <destination>b</destination>
               </mosPayload>
            </mosExternalMetadata>
         </storyItem>
         <p>...as you can see, the flames were quite high. </p>
      </storyBody>
      <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <changedBy>MPalmer</changedBy>
            <length>463</length>
            <show>10 pm</show>
         </mosPayload>
      </mosExternalMetadata>
   </roStorySend>
</mos>
```

Example – roStorySend With ReadMEMAsDescription set to true

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <roStorySend>
      <roID>96857485</roID>
      <storyID>5983A501:0049B924:8390EF1F</storyID>
      <storySlug>Show Open</storySlug>
      <storyNum>C8</storyNum>
      <storyBody Read1stMEMasBody="true">
      </storyBody>
      <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope>

      <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08</mo
sSchema>
         <mosPayload>
            <?xml version="1.0" encoding="iso-8859-1"
standalone="yes"?>
            <NewsML>
      <!--Processed by DeltaToNewsML rev1c-->
```

```
<Catalog Href="http://www.afp.com/dtd/AFPCatalog.xml"/>
<NewsEnvelope>
      <DateAndTime>20030319T000031Z</DateAndTime>
      <NewsService FormalName="FRSGL"/>
      <Priority FormalName="3"/>
</NewsEnvelope>
<NewsItem>
      <Identification>
            <NewsIdentifier>
                  <ProviderId>ap.org</ProviderId>
                  <DateId>20030319</DateId>
                  <NewsItemId>000031-TX-LNH41</NewsItemId>
                  <RevisionId PreviousRevision="0"
                  Update="N">1</RevisionId>

<PublicIdentifier>urn:newsml:afp.com:20030319:000031-TX-
LNH41:1</PublicIdentifier>
            </NewsIdentifier>
            <NameLabel>Irak-Onu</NameLabel>
            <Label>
                  <LabelType FormalName="SequenceNumber"/>
                  <LabelText>21</LabelText>
            </Label>
      </Identification>
      <NewsManagement>
            <NewsItemType FormalName="News"/>
            <FirstCreated>20030319T000031Z</FirstCreated>

<ThisRevisionCreated>20030319T000031Z</ThisRevisionCreated>
            <Status FormalName="Usable"/>
      </NewsManagement>
      <NewsComponent>
            <NewsLines>
                  <HeadLine> Israel to Push Even Deeper Into
                  Lebanon</HeadLine>
                  <DateLine> JERUSALEM (AP) </DateLine>
                  <CopyrightLine>© 2006 AP</CopyrightLine>
                  <SlugLine>Israel at war with Lebanon
                  </SlugLine>
            </NewsLines>
            <AdministrativeMetadata>
                  <Provider>
                        <Party FormalName="AFP"/>
                  </Provider>
                  <Creator>
                        <Party FormalName="BUR"/>
                  </Creator>
            </AdministrativeMetadata>
            <DescriptiveMetadata>
                  <Language FormalName="fr-FR"/>
                  <SubjectCode>
                        <Subject
                        Vocabulary="urn:newsml:afp.com:20011001:A
                        FPCatCodes:1" FormalName="I"/>
                  </SubjectCode>
                  <SubjectCode>
```

```
                  <Subject
                  Vocabulary="urn:newsml:afp.com:20011001:A
                  FPCatCodes:1" FormalName="P"/>
            </SubjectCode>
            <SubjectCode>
                  <Subject FormalName="11000000"/>
            </SubjectCode>
            <Property FormalName="Location">
                  <Property FormalName="Country"
                  Value="IRQ"/>
                  <Property FormalName="City"
                  Value="BAGDA"/>
            </Property>
</DescriptiveMetadata>
<ContentItem>
      <MediaType FormalName="Text"/>
      <Format FormalName="bcNITF2.5"/>
      <Characteristics>
            <Property FormalName="WordCount"
            Value="823"/>
      </Characteristics>
      <DataContent>
            <p> JERUSALEM (AP) -- Israel's Security
            Cabinet overwhelmingly decided Wednesday
            to send troops deeper into Lebanon in a
            major expansion of the ground war - an
            attempt to further damage Hezbollah and
            score quick battlefield victories before
            a cease-fire is imposed.</p>
            <p>The move came as fierce fighting was
            reported overnight with Hezbollah
            militants, and Arab broadcaster Al-
            Jazeera reported 11 Israeli soldiers had
            been killed in what would be the
            deadliest day for Israeli troops in
            Lebanon in four weeks of fighting.</p>
            <p>A minister who spoke on condition of
            anonymity because he was not authorized
            to give details, said the offensive would
            not begin for two or three days so as not
            interfere with efforts to broker a cease-
            fire at the United Nations. However,
            senior military officials said it would
            start far quicker than that.</p>
            <p>Soon after the Cabinet voted 9-0 with
            three abstentions, a column of Israeli
            tanks and armored vehicles crossed into
            southern Lebanon and took up
            positions.</p>
            <p>The Cabinet decision was risky. Israel
            could set itself up for new criticism
            that it is sabotaging diplomatic efforts,
            particularly after Lebanon offered to
            deploy its own troops in the border
            area.</p>
            <p>A wider ground offensive also might do
            little to stop Hezbollah rocket fire on
```

Israel, while sharply increasing the already-high number of casualties among Israeli troops.
Since the fighting began, at least 700 people have died on the Lebanese side. The Israeli toll stood at 103 killed - including 36 civilians.
In the six-hour meeting, Cabinet officials were told a new offensive could mean 100 to 200 more military deaths, a participant said on condition of anonymity because he was not authorized to brief reporters. At least 67 Israeli soldiers have been confirmed killed.
Secretary of State Condoleezza Rice and Prime Minister Ehud Olmert spoke by telephone for a half-hour during the meeting, Israeli officials said. Olmert told the ministers the offensive will be accompanied by a diplomatic initiative, based on a U.S.-French truce proposal that would take Lebanon's concerns into account, a participant in the meeting said.
Under the army's plan, troops would push to Lebanon's Litani River, about 18 miles from the border. Olmert and Defense Minister Amir Peretz will decide on the timing of the new push, said Trade Minister Eli Yishai, a member of the Security Cabinet.
"The assessment is it will last 30 days," Yishai said afterward. "I think it is wrong to make this assessment. I think it will take a lot longer, " added Yishai, who had abstained in the vote..
The offensive won't require a new call-up of reserves, Cabinet officials said. The government approved a call-up of some 30,000 reservists earlier this month.
More than 10,000 troops are in Lebanon, many of them regular soldiers. They are fighting in a four-mile stretch, and have encountered fierce resistance from Hezbollah.
The decision on the wider offensive came a day after the commander of Israeli forces in Lebanon was sidelined in an unusual midwar shake-up - another sign of the growing dissatisfaction with the military, which has been unable to stop Hezbollah's rocket barrages.
The army denied it was dissatisfied with Maj. Gen. Udi Adam, but military commentators said the commander was seen

```
                                    as too slow and cautious. The deputy
                                    chief of staff, Maj. Gen. Moshe
                                    Kaplinski, was appointed to oversee the
                                    Lebanon fighting.</p>
                                    <p>At least six missiles fired from
                                    Israeli ships slammed into Beirut's
                                    southern suburbs as Israel continued its
                                    sporadic attacks on Shiite neighborhoods
                                    and Hezbollah strongholds, police said.
                                    Smoke and dust rising over several square
                                    blocks.</p>
                                    <p>At least six missiles fired from
                                    Israel ships slammed into the south
                                    Beirut suburbs Wednesday, as residents
                                    were conducting a funeral for some of the
                                    41 victims killed in Israeli airstrikes
                                    there three days earlier, police
                                    said.</p>
                                    <p>About a mile away, some 400 people
                                    marched in a funeral procession for 30 of
                                    the 41 killed in an Israeli airstrike
                                    Monday. They carried the bodies draped in
                                    Lebanon's green, red and white flag and
                                    chanted, &quot;Death to America! Death to
                                    Israel!&quot;.</p>
                                    <p>The Israeli military has declared a
                                    no-drive zone south of the Litani and
                                    threatened to blast any moving vehicles.
                                    Country roads and highways were deserted.
                                    In the Lebanese coastal city of Tyre,
                                    only pedestrians ventured into the
                                    streets.</p>
                                    <p>The Al-Jazeera report said 11 Israeli
                                    soldiers were killed in heavy fighting
                                    with Hezbollah guerrillas near the
                                    border. The Israeli army declined to
                                    comment on the report but had said
                                    earlier that 15 soldiers were wounded in
                                    overnight clashes.</p>
                                    <p>bur-jr/prh </p>
                                    <p/>
                                </DataContent>
                            </ContentItem>
                        </NewsComponent>
                    </NewsItem>
</NewsML>
                    </mosPayload>
                    </mosExternalMetadata>
                </roStorySend>
</mos>
```

3.8.2 roElementStat - Status of a Single Element in a MOS Running Order

Purpose

The roElementStat message with an attribute of "STORY" is a method for the MOS to update the NCS on the status of any Story.

This message is a member of both profile 2 and 4. For use with profile 4 only an Element attribute of "STORY" is used .

Response

roAck

Port

MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- roElementStat (element = {STORY})
  - roID
  - storyID?
  - itemID
  - objID?
  - itemChannel?
  - status
  - time

Syntax

```
<!ELEMENT roElementStat (roID, storyID?, itemID, objID?, itemChannel?, status, time)>
<!ATTLIST roElementStat element CDATA  #REQUIRED>
```

Example Story Status

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
 <ncsID>ncs.newscenter.com</ncsID>
 <messageID>506702</messageID>
 <roElementStat element = "STORY">
    <roID>5PM</roID>
    <storyID>HOTEL FIRE </storyID>
    <status>PLAY</status>
   <time>1999-04-11T14:13:53</time>
 </roElementStat>
</mos>
```

3.9 MOS RO/Content List Modification

3.9.1 roReqStoryAction – MOS requests action on NCS story

Purpose

roReqStoryAction allows a MOS to request that the NCS create, modify, delete, or move a story in the NCS. This is a request only. A NACK response is perfectly valid and must be anticipated. It is possible that an ACK condition may never be returned by the NCS.

Operation	**"operation" attribute**
Create a Story(s)	"NEW"
Modify a Story	"UPDATE"
Delete a Story	"DELETE"
Move a Story(s)	"MOVE"

Operation	**In** element_target	**In** element_source
Create a Story(s)	A storyID specifying the story before which the source stories are inserted	One or more stories to be inserted
Move a Story(s)	A storyID specifying the story before which the source stories are moved	One or more storyIDs specifying the stories to be moved

A "NEW" operation creates a new Story. The MOS will specify where the story(s) will be place within the specified running order. If the MOS does not specify, then it will be up to the NCS.

An "UPDATE" operation replaces an existing Story in the specified running order.

A "DELETE" operation deletes an existing Story in the specified running order.

A "MOVE" operation moves an existing Story(s) in the specified running order.

An NCS may choose to report an operation as successful even if it does not fulfil the entire request.

Response

roAck

If the specified action cannot be completed, the NCS sends a NACK message with <roStatus> containing a reason for the error.

If the specified action is successfully completed, the NCS sends an ACK message. If the operation is "NEW," the storyID will be in roStatus.

Subsequent Messages

There are three possible sequences of messages that are sent by the NCS if the operation is successfully completed:.

1. If the operation is "NEW," the NCS will send a <roStoryInsert> message or the equivalent <roElementAction> message to the MOS. It may then also send a <roStorySend> roStorySend message for the Story.

2. If the operation is "UPDATE," the NCS will send a <roStoryReplace> message or the equivalent <roElementAction> message to the MOS. It may then also send a <roStorySend> message for the Story.

3. If the operation is "DELETE," the NCS will send a <roStoryDelete> message or the equivalent <roElementAction> roElementAction message to the MOS.

4.If the operation is "MOVE" the NCS will send a <roStoryMove> message or the equivalent <roElementAction> message to the MOS. If may then also send a <roStorySend> message for the Story(s).

5.LeaseLock is defined as time in seconds that a MOS requests a lock on a particular story from the NCS. The MOS must send a subsequent action message after the first leaseLock message has been sent, but before the original leaseLock message has expired. If the the leaseLock message has expired then the NCS will take back control of the story from the MOS.

Port

MOS Upper Port (10541) – Running Order

Structural Outline

mos
mosID
ncsID
messageID
roReqStoryAction (operation = {NEW, UPDATE, DELETE, MOVE} leaseLock = {duration} username)
roStorySend
roID
element_target?
storyID
itemID?
element_source?
story + item + or storyID + itemID
storyID
storySlug?
storyNum?
storyBody (Read1stMEMasBody)
storyPresenter*
storyPresenterRR*
p*
em*
tab*
pi*
pkg*
b*
I*
u*
storyItem*
itemID
itemSlug?
objID
mosID
mosAbstract?
objPaths?
objPath*
objProxyPath*
objMetadataPath*
itemChannel?
itemEdStart?
itemEdDur?

itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*
mosExternalMetadata*

Syntax

```
<!ELEMENT roReqStoryAction (roStorySend)>
<!ATTLIST roReqStoryAction
            operation CDATA #REQUIRED
            leaseLock CDATA #IMPLIED
            username  CDATA #IMPLIED
>
<!ELEMENT roStorySend (roID, element_target?, element_source, storyID,
storySlug?, storyNum?, storyBody, mosExternalMetadata*)>
<!ELEMENT element_target  (storyID, itemID?)>
<!ELEMENT element_source  (story+ | item+ | storyID+ | itemID+)>
<!ELEMENT storyBody ((storyPresenter*, storyPresenterRR*, p*,
storyItem*)*)>
<!ATTLIST storyBody Read1stMEMasBody CDATA #IMPLIED>
<!ELEMENT storyPresenter (#PCDATA)>
<!ELEMENT storyPresenterRR (#PCDATA)>
<!ELEMENT storyItem (itemID, itemSlug?, objID, mosID, mosAbstract?,
objPaths?, itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
<!ELEMENT objPaths? (objPath?, objProxyPath?, objMetadataPath)>
<!ELEMENT objPath (#PCDATA)>
<!ELEMENT objProxyPath (#PCDATA)>
<!ELEMENT objMetadataPath (#PCDATA)>
<!ELEMENT p (#PCDATA | em | tab | pi | pkg | b | i | u)*>
<!ELEMENT pi (#PCDATA |  b | i | u)*>
<!ELEMENT pkg (#PCDATA |  b | i | u)*>
<!ELEMENT b (#PCDATA |  i | u)*>
<!ELEMENT i (#PCDATA |  b | u)*>
<!ELEMENT u (#PCDATA |  b | i)*>
```

Example – Move

This moves story with ID=12 before story with ID=2 in the running order.

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <roReqStoryAction operation="MOVE" leaseLock="2" username="jbob">
      <roStorySend>
         <roID>96857485</roID>
         <element_target>
             <storyID>2</storyID>
         </element_target>
        <element_source>
            <storyID>12</storyID>
       </element_source>
     </roStorySend>
   </roReqStoryAction>
</mos>
```

This moves stories with ID=7 and ID=12 before story with ID=2 in the running order.

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <roReqStoryAction operation="MOVE" leaseLock="2" username="jbob">
      <roStorySend>
         <roID>96857485</roID>
         <element_target>
             <storyID>2</storyID>
         </element_target>
        <element_source>
            <storyID>7</storyID>
            <storyID>12</storyID>
       </element_source>
     </roStorySend>
   </roReqStoryAction>
</mos>
```

Example – Create

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <roReqStoryAction operation="NEW" leaseLock="2" username="jbob">
      <roStorySend>
         <roID>96857485</roID>
         <element_target>
           <storyID>2</storyID>
         </element_target>
```

```
         <element_source>
         <story>
         <storyID></storyID>
         <storySlug>Show Open</storySlug>
        <storyNum>C8</storyNum>
         <storyBody>
            <storyPresenter>Suzie</storyPresenter>
            <storyPresenterRR>10</storyPresenterRR>
            <p>
               <pi> Smile </pi>
            </p>
           <p> Good Evening, I'm Suzie Humpries </p>
            <storyPresenter>Chet </storyPresenter>
            <storyPresenterRR>12</storyPresenterRR>
            <p> - and I'm Chet Daniels, this is the 5PM news on Monday
November 5th.</p>
           <p>First up today - a hotel fire downtown</p>
            <storyItem>
               <itemID>1</itemID>
               <itemSlug>Hotel Fire vo</itemSlug>
               <objID>M000705</objID>
              <mosID>testmos</mosID>
               <itemEdStart>0</itemEdStart>
               <itemEdDur>800</itemEdDur>
               <itemUserTimingDur>310</itemUserTimingDur>
               <macroIn>c01/l04/dve07</macroIn>
              <macroOut>r00</macroOut>
               <mosExternalMetadata>
                  <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
                  <mosPayload>
                     <Owner>SHOLMES</Owner>
                     <transitionMode>2</transitionMode>
                     <transitionPoint>463</transitionPoint>
                     <source>a</source>
                     <destination>b</destination>
                  </mosPayload>
               </mosExternalMetadata>
            </storyItem>
           <p>...as you can see, the flames were quite high. </p>
         </storyBody>
         <mosExternalMetadata>
            <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
           <mosPayload>
               <Owner>SHOLMES</Owner>
               <changedBy>MPalmer</changedBy>
               <length>463</length>
               <show>10 pm</show>
           </mosPayload>
         </mosExternalMetadata>
        </story>
      </element_source>
```

```
      </roStorySend>
    </roReqStoryAction>
</mos>
```

Example – Modify

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <roReqStoryAction operation="UPDATE" leaseLock="2" username="jbob">
      <roStorySend>
         <roID>96857485</roID>
         <storyID>5983A501:0049B924:8390EF1F</storyID>
         <storySlug>Show Open</storySlug>
        <storyNum>C8</storyNum>
         <storyBody>
            <storyPresenter>Suzie</storyPresenter>
            <storyPresenterRR>10</storyPresenterRR>
            <p>
               <pi> Smile </pi>
            </p>
           <p> Good Evening, I'm Suzie Humpries </p>
            <storyPresenter>Chet </storyPresenter>
            <storyPresenterRR>12</storyPresenterRR>
            <p> - and I'm Chet Daniels, this is the 5PM news on Monday
November 6th.</p>
           <p>First, an update on the hotel fire downtown.</p>
            <storyItem>
               <itemID>1</itemID>
               <itemSlug>Hotel Fire Update vo</itemSlug>
               <objID>M000710</objID>
              <mosID>testmos</mosID>
               <itemEdStart>0</itemEdStart>
               <itemEdDur>1600</itemEdDur>
               <itemUserTimingDur>310</itemUserTimingDur>
               <macroIn>c01/l04/dve07</macroIn>
              <macroOut>r00</macroOut>
               <mosExternalMetadata>
                  <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
                  <mosPayload>
                     <Owner>SHOLMES</Owner>
                     <transitionMode>2</transitionMode>
                     <transitionPoint>463</transitionPoint>
                     <source>a</source>
                     <destination>b</destination>
                  </mosPayload>
               </mosExternalMetadata>
            </storyItem>
           <p>...The police are still looking for clues. </p>
         </storyBody>
         <mosExternalMetadata>
            <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
           <mosPayload>
               <Owner>SHOLMES</Owner>
               <changedBy>MPalmer</changedBy>
```

```
            <length>463</length>
            <show>10 pm</show>
          </mosPayload>
        </mosExternalMetadata>
      </roStorySend>
    </roReqStoryAction>
</mos>
```

Example – Delete

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
  <roReqStoryAction operation="DELETE" leaseLock="2" username="jbob">
      <roStorySend>
         <roID>96857485</roID>
         <storyID>5983A501:0049B924:8390EF1F</storyID>
         <storyBody/>
      </roStorySend>
   </roReqStoryAction>
</mos>
```

4 Other messages and data structures

4.1.1 keepAlive – Maintain Web Socket Connections

Purpose

The keepAlive message is sent for the purpose of maintaining web socket connections through firewalls and proxies. keepAlive should be sent no more frequently than every thirty seconds.

Response

No Reponse

Port

MOS Lower Port (10540) - Media Object Metadata
MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- keepAlive

Syntax

```
<!ELEMENT keepalive>
```

Example

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  </keepAlive>
</mos>
```

4.1.2 heartbeat - Connection Confidence Indicator

Purpose

The heartbeat message is sent for the purpose of verifying network and application continuity.

Response

heartbeat

Port

MOS Lower Port (10540) - Media Object Metadata
MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
- messageID
- heartbeat
  - time

Syntax

```
<!ELEMENT heartbeat (time)>
```

Example

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  <messageID>9988</messageID>
  <heartbeat>
    <time>2009-04-11T17:20:42</time>
  </heartbeat>
</mos>
```

4.1.3 reqMachInfo - Request Machine Information

Purpose

The reqMachInfo message is a method for an NCS or MOS to determine more information about its counterpart.

Response

listMachInfo

Port

MOS Lower Port (10540) - Media Object Metadata
MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
  - messageID
- reqMachInfo

Syntax

```
<!ELEMENT reqMachInfo EMPTY>
```

Example

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  <messageID>3940</messageID>
  <reqMachInfo/>
</mos>
```

4.1.4 listMachInfo - Machine Description List

Purpose

The listMachInfo message is a method for an NCS or MOS to send information about itself.

Response

None

Port

MOS Lower Port (10540) - Media Object Metadata
MOS Upper Port (10541) - Running Order

Structural Outline

mos
- mosID
- ncsID
  - messageID
- listMachInfo
  - manufacturer
  - model
  - hwRev
  - swRev
  - DOM
  - SN
  - ID
  - time
  - opTime?
  - mosRev
  - supportedProfiles (deviceType = (MOS, NCS))
    - mosProfile (number = (0))
    - mosProfile (number = (1))
    - mosProfile (number = (2))
    - mosProfile (number = (3))
    - mosProfile (number = (4))
    - mosProfile (number = (5))
    - mosProfile (number = (6))
    - mosProfile (number = (7))
  - defaultActiveX*
    - mode
    - controlFileLocation
    - controlSlug

controlName
controlDefaultParams
mosExternalMetadata*

NOTE: No two <defaultActiveX> elements can have the same <mode> value.

Syntax

```
<!ELEMENT listMachInfo (manufacturer, model, hwRev, swRev, DOM, SN, ID,
time, opTime?, mosRev, supportedProfiles, defaultActiveX*,
mosExternalMetadata*)>
<!ELEMENT supportedProfiles (mosProfile)>
<!ELEMENT mosProfile (#PCDATA)
<!ATTLIST supportedProfiles deviceType CDATA #REQUIRED>
<!ATTLIST mosProfile number CDATA #REQUIRED>
<!ELEMENT defaultActiveX (mode, controlFileLocation, controlSlug,
controlName, controlDefaultParams)>
```

Example

This is an example of a NCS reply to the reqMachInfo message

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  <messageID>6331</messageID>
  <listMachInfo>
    <manufacturer>RadioVision, Ltd.</manufacturer>
    <model>TCS6000</model>
    <hwRev></hwRev>
    <swRev>2.1.0.37</swRev>
    <DOM></DOM>
    <SN>927748927</SN>
    <ID>airchache.newscenter.com</ID>
    <time>2009-04-11T17:20:42</time>
    <opTime>2009-03-01T23:55:10</opTime>
    <mosRev>2.8.2</mosRev>
    <supportedProfiles deviceType="NCS">
      <mosProfile number="0">YES</mosProfile>
      <mosProfile number="1">YES</mosProfile>
      <mosProfile number="2">YES</mosProfile>
      <mosProfile number="3">YES</mosProfile>
      <mosProfile number="4">YES</mosProfile>
      <mosProfile number="5">YES</mosProfile>
      <mosProfile number="6">YES</mosProfile>
      <mosProfile number="7">YES</mosProfile>
    </supportedProfiles>
    <defaultActiveX>
       <mode>CONTAINED</mode>
       <controlFileLocation>\\MOSDEVICE\Controls\</controlFileLocation>
       <controlSlug>Contained Control</controlSlug>
       <controlName>contained.containedCTRL.1</controlName>
       <controlDefaultParams>URL=http://containedcontrolpage.com</contr
olDefaultParams>
    </defaultActiveX>
    <defaultActiveX>
       <mode>MODAL</mode>
       <controlFileLocation>\\MOSDEVICE\Controls\</controlFileLocation>
       <controlSlug>MODAL Control</controlSlug>
       <controlName>modal.modalCTRL.1</controlName>
       <controlDefaultParams></controlDefaultParams>
    </defaultActiveX>
  </listMachInfo>
</mos>
```

This is an example of a MOS reply to the reqMachInfo message

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  <messageID>6331</messageID>
  <listMachInfo>
```

```
    <manufacturer>RadioVision, Ltd.</manufacturer>
    <model>TCS6000</model>
    <hwRev></hwRev>
    <swRev>2.1.0.37</swRev>
    <DOM></DOM>
    <SN>927748927</SN>
    <ID>airchache.newscenter.com</ID>
    <time>2009-04-11T17:20:42</time>
    <opTime>2009-03-01T23:55:10</opTime>
    <mosRev>2.8.2</mosRev>
    <supportedProfiles deviceType="MOS">
      <mosProfile number="0">YES</mosProfile>
      <mosProfile number="1">YES</mosProfile>
      <mosProfile number="2">YES</mosProfile>
      <mosProfile number="3">YES</mosProfile>
      <mosProfile number="4">YES</mosProfile>
      <mosProfile number="5">YES</mosProfile>
      <mosProfile number="6">YES</mosProfile>
      <mosProfile number="7">YES</mosProfile>
    </supportedProfiles>
    <defaultActiveX>
       <mode>CONTAINED</mode>
       <controlFileLocation>\\MOSDEVICE\Controls\</controlFileLocation>
       <controlSlug>Contained Control</controlSlug>
       <controlName>contained.containedCTRL.1</controlName>
       <controlDefaultParams>URL=http://containedcontrolpage.com</contr
olDefaultParams>
    </defaultActiveX>
    <defaultActiveX>
       <mode>MODAL</mode>
       <controlFileLocation>\\MOSDEVICE\Controls\</controlFileLocation>
       <controlSlug>MODAL Control</controlSlug>
       <controlName>modal.modalCTRL.1</controlName>
       <controlDefaultParams></controlDefaultParams>
    </defaultActiveX>
  </listMachInfo>
</mos>
```

This is an example of a device acting as a NCS and a MOS and its reply to the reqMachInfo message

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  <messageID>6331</messageID>
  <listMachInfo>
    <manufacturer>RadioVision, Ltd.</manufacturer>
    <model>TCS6000</model>
    <hwRev></hwRev>
    <swRev>2.1.0.37</swRev>
    <DOM></DOM>
    <SN>927748927</SN>
    <ID>airchache.newscenter.com</ID>
    <time>2009-04-11T17:20:42</time>
```

```
    <opTime>2009-03-01T23:55:10</opTime>
    <mosRev>2.8.2</mosRev>
    <supportedProfiles deviceType="MOS">
      <mosProfile number="0">YES</mosProfile>
      <mosProfile number="1">YES</mosProfile>
      <mosProfile number="2">YES</mosProfile>
      <mosProfile number="3">YES</mosProfile>
      <mosProfile number="4">YES</mosProfile>
      <mosProfile number="5">YES</mosProfile>
      <mosProfile number="6">YES</mosProfile>
      <mosProfile number="7">YES</mosProfile>
    </supportedProfiles>
    <supportedProfiles deviceType="NCS">
      <mosProfile number="0">YES</mosProfile>
      <mosProfile number="1">YES</mosProfile>
      <mosProfile number="2">YES</mosProfile>
      <mosProfile number="3">YES</mosProfile>
      <mosProfile number="4">YES</mosProfile>
      <mosProfile number="5">YES</mosProfile>
      <mosProfile number="6">YES</mosProfile>
      <mosProfile number="7">YES</mosProfile>
    </supportedProfiles>
    <defaultActiveX>
       <mode>CONTAINED</mode>
       <controlFileLocation>\\MOSDEVICE\Controls\</controlFileLocation>
       <controlSlug>Contained Control</controlSlug>
       <controlName>contained.containedCTRL.1</controlName>
       <controlDefaultParams>URL=http://containedcontrolpage.com</contr
olDefaultParams>
    </defaultActiveX>
    <defaultActiveX>
       <mode>MODAL</mode>
       <controlFileLocation>\\MOSDEVICE\Controls\</controlFileLocation>
       <controlSlug>MODAL Control</controlSlug>
       <controlName>modal.modalCTRL.1</controlName>
       <controlDefaultParams></controlDefaultParams>
    </defaultActiveX>
  </listMachInfo>
</mos>
```

4.1.5 mosExternalMetadata – External Metadata

Purpose

The mosExternalMetadata block can appear in several messages as a mechanism for transporting additional metadata, independent of schema or DTD.

Behavior

The value of the <mosScope> tag implies through what production processes the mosExternalMetadata information will travel.

A scope of "OBJECT" implies this information is generally descriptive of the object and appropriate for queries.

A scope of "STORY" suggests this information may determine how the Object is used in a Story. For instance, Intellectual Property Management. This information will be stored and used with the Story.

A scope of "PLAYLIST" suggests this information is specific to describing how the Object is to be published, rendered, or played to air and thus, will be included in the Playlist in addition to the Story.

This mechanism allows devices to roughly filter external metadata and selectively apply it to different production processes and outputs. Specifically, it is neither advisable nor appropriate to send large amounts of inappropriate metadata to the Playlist in roCreate messages. In addition to these blocks of data being potentially very large, the Media Object Server is, presumably, already aware of this data.

The value of the <mosSchema> tag will be descriptive of the schema used within the <mosPayload>. The value of <mosSchema> is implied to be a pointer or URL to the actual schema document.

The contents of <mosPayload> must be well formed XML, regardless of the schema used.

Structural Outline

mosExternalMetadata
  mosScope?
  mosSchema
  mosPayload

Syntax

```
<!ELEMENT mosExternalMetadata (mosScope?, mosSchema, mosPayload>
```

Note: The value of mosSchema is recommended to be a URL – the rightmost element of which is considered significant and uniquely identifying for the purposes of validation

Example

```
<mosExternalMetadata>
    <mosScope>STORY</mosScope>
     <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSAXML2.08</mos
Schema>
    <mosPayload>
      <Owner>SHOLMES</Owner>
      <ModTime>20010308142001</ModTime>
      <mediaTime>0</mediaTime>
      <TextTime>278</TextTime>
      <ModBy>LJOHNSTON</ModBy>
      <Approved>0</Approved>
      <Creator>SHOLMES</Creator>
    </mosPayload>
</mosExternalMetadata>
```

4.1.5 mosItemReference (or "item") – Metadata block transferred by ActiveX Controls included in roCreate messages

Purpose

The mosItemReference data block appears in the MOS Protocol as a subset of the roCreate command, but may also stand alone as a recommended mechanism for transferring Item information from an NCS ActiveX plug-in to the NCS. It is implied that this format will also be included in the body of the Story and thus will be output in the roStorySend messages.

Behavior

The metadata in the mosItemReference is a description of how to execute playback or instantiation of an object, pointed to by the <objID>. The <mosID> is required for forced playlist construction, maintenance of the mosItemReferences within stories and for association with MOS ActiveX components. The <mosAbstract> field provides a displayable abstract of the Object/Item, more verbose than the <itemSlug>. The <mosAbstract> may contain formatting.

It is recommended that vendor or site specific tags be included in the <mosExternalMetadata> structure, not in the body of the message.

Structural Outline

item
- itemID
- itemSlug?
- objID
- mosID
- mosAbstract?
- objPaths?
  - objPath*
  - objProxyPath*
  - objMetadataPath*
- itemChannel?
- itemEdStart?
- itemEdDur?
- itemUserTimingDur?
- itemTrigger?
- macroIn?
- macroOut?
- mosExternalMetadata*

Syntax

```
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosAbstract?,
objPaths?, itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
```

Example

```
<item>
 <itemID>1</itemID>
 <itemSlug>Man Bites Dog vo</itemSlug>
 <objID>34323</objID>
 <mosID>ncs.com</mosID>
 <mosAbstract>Man Bites Dog vo trt :48</mosAbstract>
  <objPaths>
       <objPath techDescription="MPEG2
       Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
       <objProxyPath techDescription="WM9
       750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
       <objMetadataPath techDescription="MOS
       Object">http://server/proxy/clipe.xml</objMetadataPath>
  </objPaths>
 <itemChannel>1</itemChannel>
 <itemEdStart>0</itemEdStart>
 <itemEdDur>1440</itemEdDur>
 <itemUserTimingDur>1310</itemUserTimingDur>
 <itemTrigger>manual</itemTrigger>
 <macroIn>2e9de</macroIn>
 <macroOut>2399a</macroOut>
 <mosExternalMetadata>
    <mosScope>PLAYLIST</mosScope>
     <mosSchema>http://mosA4.com/mos/supported_schemas/MOSAXML2.08</mos
Schema>
     <mosPayload>
      <source>production</source>
      <machine>A5</machine>
    </mosPayload>
 <mosExternalMetadata>
<item>
```

4.1.6 messageID – Unique Identifier for Requests

Purpose

MOS messages which expect an answer from a recipient have a unique identifier as the value of a messageID field.
Repeated messages due to retry attempts will have the same messageID as the original message sent in the first attempt.

Behavior

The messageID is useful in retry scenarios, when the NCS or the MOS Server is resending identical messages.

Possible usage in retry scenario:

- The NCS sends a request (e.g. roElementAction) to the MOS Server.
- The NCS receives no response within the timeout and therefore resets the connection.
- The NCS sends the same request a second time.
- The NCS cannot really know if the first sent message was processed by the MOS Server.
- Assume the MOS Server processed the first sent message. The MOS Server will receive the repeated request, but without a messageID it could not know that it is a repeated request, as the requests had no identity.
- Therefore the MOS Server would be forced to process the repeated message, which will lead to an unwanted result in many cases.
- When messageIDs are provided by the NCS the MOS Server can keep the messageIDs of the last received message(s). When it receives a message now, it can see from the messageID whether or not it processed this message already, as only messages having identicalmessageIDs are repeated messages.

The scenario described is just one special situation of course, it is not relevant for messages which say "give me that piece of information" like the mosReqObj message.

However, the messageID field was added to most messages because there might be other usages.

When debugging MOS integrations it will be helpful to see the messageID in the log files of both sides of a communication.

Messages including a messageID field:

Messages used for requests, which expect an answer from a recipient, have a unique identifier in the messageID field.

Examples: roCreate, mosObj

Messages used as response to a request have the same messageID as the request.

Examples: mosAck, roAck

Messages which are only repeated messages due to a retry attempt have the same messageID as the original message sent at the first try.

Mandatory field:

The messageID is a mandatory field in the messages that use the messageID tag.. However an empty messageID tag is allowed for messages when used in the ActiveX interface, as for the ActiveX interface there is no need for a unique identifier.

Incrementing:

The sender in a MOS communication increments the messageID by one for each new request it sends, the last used messageID must be persistent. The messageID wraps to 1 when the limit of the data type is reached.

Syntax

```
<!ELEMENT messageID (#PCDATA)>
```

The contents of the element must be a 32-bit signed integer, decimal or hexadecimal, with a value larger than or equal to 1.

Example

```
<messageID>437</messageID>
```

4.1.7 objPaths – Unambiguous pointers to media files

Purpose

The <objPaths> structure is intended to provide links to one or more renderings of a media object and related proxies for the object. These links can be used, without ambiguity, and allows machines to fetch the media object. This, enables "MOS Redirection" and new uses of media proxies.

The <objPaths> structure is an optional component to be included within these existing structures:

<mosObj>
<item>

Behavior

This structure, embedded in mosObj and item messages, enables systems to retrieve foreign media files, both essence and proxy media, and metadata. The objPaths structure may contain a single or multiple objPath, objProxyPath, or objMetadataPath fields.

Structural Outline

objPaths
- objPath*
- objProxyPath*
- objMetadataPath*

Syntax

```
<!ELEMENT objPaths (objPath*, objProxyPath*, objMetadataPath)>
<!ELEMENT objPath (#PCDATA)>
<!ELEMENT objProxyPath (#PCDATA)>
<!Element objMetadataPath (#PCDATA)>
```

Example of the <objPaths> structure:

```
<objPaths>
        <objPath techDescription="MPEG2 Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
        <objProxyPath techDescription="WM9 750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
        <objMetadataPath techDescription="MOS Object">http://server/proxy/clip.xml</objMetadataPath>
</objPaths>
```

Components of the <objPaths> structure are:

<objPath> tag
<objProxyPath> tag
<objMetadataPath> tag
techDescription attribute
mimeType attribute ?

- <objPath> provides a path to a file object in a form intended for production or distribution. This path can be formatted as a UNC, HTTP, HTTPS FTP, or SFTP link. As of MOS 2.8.5 ObjPaths paths must meet the following requirements:
  - Be a call to return the media , without requiring client-side redirection
  - The character string following the last slash in the path must be the full filename, including the asset's extension.

- <objProxyPath> provides a path to an alternate technical form of the object, most often provided at a lower resolution/bit rate/file size as compared to the <objPath>. This path can be formatted as a UNC or HTTP or HTTPS link. FTP and SFTP are not allowed. As of MOS 2.8.5 ObjProxyPaths paths must meet the following requirement:
  - Be a call to return the media proxy , without requiring client-side redirection
  - The character string following the last slash in the path must be the full filename, including the asset's extension.

<objMetadataPath> provides a path that points to metadata for the MOS Object. The metatdata may consist of the actual MOS Object structure and reflect any updates made to the MOS Object.

These are examples of path formats:

1) HTTP link
   a. http://server/proxy/clip392028cd2320s0e.wmv

2) FTP link
   a. ftp://server/proxy/clip392028cd2320s0e.wmv

3) UNC link
   a. \\server\media\clip392028cd2320s0d.mxf

The techDescription attribute provides a brief and very general technical description of the codec or file format. Note that the codec name should come first, followed by additional optional description.

Examples: "MPEG2 Video", "WM9 750Kbps", "MOS Object"

The optional mimeType attribute provides an unambiguous description of the media type. The IANA Mime Type Registry will be the authority for established MIME type designations.

Example: video/mp4

Scope of <objPaths>:

The <objPaths> structure is intended to be included in both <mosObj> messages and <item> structures.

In the context of <item> structures, the <objPaths> structure is intended to be included in Stories.

The <objPaths> structure should be considered to have an implied Scope of "Story" and by preference not passed to the parent MOS device in roConstruction messages from the NCS.

An exception to this is if redirection is used. In this case the <objPath> structure *is* intended to be passed to non-parent MOS devices. The<objPath> structure will enable non-parent devices to fetch the media object as a file from the parent MOS device.

The <objPath> structure should be passed in all roStorySend messages as part of the unmodified <item> structure within each Story.

Example

```
<objPaths>
        <objPath techDescription="MPEG2 Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
        <objPath techDescription="MPEG2 Audio Only">\\server\media2\clip39d.mp2</objPath>
        <objProxyPath techDescription="WM9 750Kbps">http://server/proxy/clip4.wmv</objProxyPath>
        <objProxyPath techDescription="WM9 64Kbps">http://server/proxy/e.wma</objProxyPath>
        <objMetadataPath techDescription="MOS Object">http://server/proxy/clip.xml</objMetadataPath>
</objPaths>
```

Example of the <objPaths> structure in a <mosObj> message:

```
<mos>
    <mosID>aircache.newscenter.com</mosID>
    <ncsID>ncs.newscenter.com</ncsID>
    <messageID>34</messageID>
    <mosObj>
        <objID>M000123</objID>
        <objSlug>Hotel Fire</objSlug>
        <mosAbstract>
            <b>Hotel Fire</b>
```

```
                <em>vo</em>
    </mosAbstract>
        <objGroup>Show 7</objGroup>
        <objType>VIDEO</objType>
        <objTB>59.94<objTB>
        <objRev>1</objRev>
        <objDur>1800</objDur>
        <status>NEW</status>
        <objAir>READY</objAir>
        <objPaths>
            <objPath techDescription="MPEG2 Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
            <objPath techDescription="MPEG2 Audio only">\\server\media2\clip392028cd2320s0d.mp2</objPath>
            <objProxyPath techDescription="WM9
750Kbps">http://server/proxy/clip392028cd2320s0e.wmv</objProxyPath>
            <objProxyPath techDescription="WM9 64Kbps audio
only">http://server/proxy/clip392028cd2320s0e.wma</objProxyPath>
            <objMetadataPath techDescription="MOS Object">http://server/proxy/clip.xml</objMetadataPath>
        </objPaths>
        <createdBy>Chris</createdBy>
        <created>2009-10-31T23:39:12</created>
        <changedBy>Chris</changedBy>
        <changed>2009-10-31T23:39:12</changed>
        <description>
            <p>

        Exterior footage of

        <em>Baley Park Hotel</em>

         on fire with natural sound. Trucks are visible for the first portion of the clip.

        <em>CG locator at 0:04 and duration 0:05, Baley Park Hotel.</em>
            </p>
            <p>
                <tab/>

        Cuts to view of fire personnel exiting hotel lobby and cleaning up after the fire is out.

      </p>
            <p>
                <em>Clip has been doubled for pad on voice over.</em>
            </p>
         </description>
        <mosExternalMetadata>
            <mosScope>STORY</mosScope>
            <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXML2.08</mosSchema>
            <mosPayload>
                <Owner>SHOLMES</Owner>
                <ModTime>20010308142001</ModTime>
                <mediaTime>0</mediaTime>
                <TextTime>278</TextTime>
                <ModBy>LJOHNSTON</ModBy>
                <Approved>0</Approved>
                <Creator>SHOLMES</Creator>
            </mosPayload>
        </mosExternalMetadata>
    </mosObj>
</mos>
```

Example of the use of the <objPaths> structure in a <item> structure:

```
<item>
    <itemID>30849</itemID>
    <objID>M000628</objID>
```

```
    <mosID>testmos</mosID>
    <objPaths>
        <objPath techDescription="MPEG2 Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
        <objPath techDescription="MPEG2 Audio Only">\\server\media2\clip392028cd2320s0d.mp2</objPath>
        <objProxyPath techDescription="WM9 750Kbps">http://server/proxy/clip392028cd2320s0e.wmv</objProxyPath>
        <objProxyPath techDescription="WM9 64Kbps audio
only">http://server/proxy/clip392028cd2320s0e.wma</objProxyPath>
        <objMetadataPath techDescription="MOS Object">http://server/proxy/clip.xml</objMetadataPath>
    </objPaths>
    <itemEdStart>0</itemEdStart>
    <itemEdDur>815</itemEdDur>
    <itemUserTimingDur>310</itemUserTimingDur>
    <macroIn>c01/l04/dve07</macroIn>
    <macroOut>r00</macroOut>
    <mosExternalMetadata>
        <mosScope>PLAYLIST</mosScope>
        <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXML2.08</mosSchema>
        <mosPayload>
            <Owner>SHOLMES</Owner>
            <transitionMode>2</transitionMode>
            <transitionPoint>463</transitionPoint>
            <source>a</source>
            <destination>b</destination>
        </mosPayload>
    </mosExternalMetadata>
</item>
```

5. MOS v4.0 ActiveX and HTML Control Specifications

This specification describes the requirements for an ActiveX or HTML5 web MOS Plug-in and how it is to interact with an NCS host.

The two main goals are:

- To allow flexibility in defining the size and function of the MOS Plug-in
- To allow modification of Item References inside NCS stories

It is assumed that any communication initiated by either application is the result of the user who is performing an action.

Section 5.1 deals with HTML5 controls.
Section 5.2 deals with ActiveX controls.
Section 5.3 deals with communication between the MOS Plug-in and the NCS host.

At the 2015 spring open meeting of the MOS group, a consensus of participants recommended that system vendors migrate to the HTML5/JavaScript model for NCS plug-in functionality.

While the participating Newsroom Computer System vendors plan to support the ActiveX technology for the foreseeable future, **effective with the 2.8.5 and 3.8.5 update of the MOS Protocol, ActiveX is being classified as deprecated.**

5.1.1 Behavior of Web/HTML5 Plug-ins

General

Messages are sent from the NCS host to the Web Plug-in via the window.postMessage method, or the drag and drop "text" interface.

Messages are sent from the Web Plug-in via the window.postMessage method, or the drag and drop "text" interface Responses are issues asynchronously via the event.source.postMessage method. Drag and drop operations receive no response.

5.1.2 Methods, Events and Data Types for Web Controls

Requirements and Startup

The HTML5 control makes calls to an accessible web server which hosts the appropriate web-based component. The web server is part of the MOS vendor's infrastructure. It may be hosted on-site or at a different location. The NCS plug-in host will open the plug-in via an embedded web browser in an iFrame or similar environment.

It is highly recommend that device vendors implement CORS (Ccross Oorigin Resource Sharing, defined via the W3 at http://www.w3.org/TR/cors/) on their web server, as it possible that the newsroom system may not proxy their plug-ins.

The plug-in will be registered in the news environment by providing the NCS a URL at which to access the hosted plug-in "page". The NCS will append an origin parameter to this URL, whose contents are defined in the section called "origin".

For example, a device plug-in may be requested at the URL defined below:

http[s]://mydevice[:8080]/myplugin.html?origin=http[s]://newsroom[:80]

The NCS will not send any messages to the plug-in until the plug-in first sends a message to the NCS host (generally an ncsReqAppInfo message). This is to ensure that the plug-in has time to register for events prior to the NCS attempting to send the initial message. The NCS must queue all messages destined for that plug-in upon first opening a web plug-in until the plug-in sends the NCS host a message first. This is because of the potential rendering and parsing time of the HTML and JavaScript code in a web plug-in, where there is the potential for the plug-in to miss messages from the news environment if it hasn't yet had a chance to subscribe to the proper messaging channels. Having the plug-in initiate communication eliminates this potential race condition.

If a web plug-in is subsequently closed and re-opened, this message queue must be re-established until the web plug-in sends the NCS host a message.

Event Registration

The plug-in must register with the "window" component within the web browser environment to subscribe for cross document messaging events.

For a plug-in, the registration implementation might look like this:

```
// Register the Event Handler – Cross Browser
if (window.addEventListener) {
     window.addEventListener('message',
     mosMsgFromHost, false);
} else if (window.attachEvent) {
     window.attachEvent('message', mosMsgFromHost,
     false);
}
```

This code handles various browser implementations with different functionalities.

In this case, we are relaying any messages received to a method, mosMsgFromHost, however the plug-in can name this method however they choose.

Methods

mosMsgFromHost

This method can be named anything the vendor decides, so long as the appropriate messaging events are pipelined to the method in the Message Registration above. The event parameter received will be a cross document messaging event, defined in the W3 web messaging specification (http://www.w3.org/TR/webmessaging/). The MOS message can be found in the event.data parameter.

```
mosMsgFromHost(event)
```

When an event is received via this method, a response can be issued to the message by invoking

```
event.source.postMessage(reply, event.origin)
```

Events

window.postMessage

To send a message to the NCS host, issue a cross-document message to the parent window with the payload as the MOS message.

JavaScript code for this send may look as follows:

```
window.parent.postMessage(message, getNewsroomOrigin());
```

where getNewsroomOrigin is defined under "Origin".

Origin

Origin is a concept in HTML web messaging to provide a layer of security and allow for filtering of unwanted or unexpected messages.

When a plug-in is invoked by the NCS, the URL will provide a parameter called origin, in addition to any other parameters defined by the plug-in. This origin is critical in order to successfully register and send messages to the NCS.

An origin is composed of a protocol definition, the hostname or IP address of the NCS, and optionally the port. This origin must match exactly the value in the browser address bar in order for messages to be successfully sent and received.

For example, a method in JavaScript to retrieve the origin may look like this:

```
function getNewsroomOrigin() {

      var qs = document.location.search.split("+").join(" ");
      var params = {};
      var regex = /[?&]?([^=]+)=([^&]*)/g;

      while (tokens = regex.exec(qs)) {
            params[decodeURIComponent(tokens[1])] =
            decodeURIComponent(tokens[2]);
      }
      return params['origin'];

}
```

This origin should be checked on the receipt of a message to ensure that the message originated from a trusted and expected source. This could be done via the following:

```
function mosMsgFromHost(event) {

      var message = event.data;
      // Check the Origin in event.origin to ensure it matches
      // our expected NCS origin parameter.

      if (event.origin != getNewsroomOrigin()) {
            alert('Origin does not match');
            return;
      }
```

```
        // Handle the Message
        // To Reply, issue a postMessage on the event source.
        var reply = "SOME MOS MESSAGE";
        event.source.postMessage(reply, event.origin);

}
```

Start Up:

1) Before the Web Plug-in is instantiated, the NCS host determines whether it will be instantiated in modal or non-modal mode

2) The NCS host determines what options for screen metrics are available for the control.

3) The NCS host enumerates these options, giving option "0" to the metrics within which the control will be initially instantiated. It is recommended that the NCS host provide enumerated options for both absolute maximum and minimum screen metrics.

4) If the NCS host chooses, it can optionally place either a <mosObj> message or Item info in the <ncsAppInfo> message. The <storyID> must be included if Item information is sent. The <roID > can optionally be included with Item information.

5) The NCS host chooses the mode the control will be instantiated in and includes this in the <ncsAppInfo> message.

6) The NCS host optionally provides additional context of BROWSE, EDIT or CREATE. The functions of these choices are:

    a. BROWSE - tells the control to provide the ability to look at the inventory list for the MOS, and optionally to preview specific MOS Objects;

    b. EDIT - tells the control to provide the ability to edit a MOS item that is passed in the ncsAppInfo message;

    c. CREATE - tells the control to provide the ability to create a new MOS Object on the Media Object server.

7) The NCS host identifies the local user's name and places this in the <ncsAppInfo> message.

8) The NCS host also identifies its own manufacturer name, product name, and software version in the <ncsAppInfo> message.

9) The NCS host registers for cross-document messaging events.

10) The NCS host instantiates the control.

11) The plug-in registers for events. The control initiates a message to the NCS host to indicate it is ready to accept messages, generally an <ncsAppInfo> message.

12) The NCS host sends the <ncsAppInfo> message via the window.postMessage event for Web plug-ins.

13) The Plug-in recognizes the mode it was instantiated in and checks for optional context (BROWSE, EDIT or CREATE) and the availability of window closing functionality.

14) The Plug-in optionally recognizes and uses the user's name, manufacturer name, product name and software version.

15) The Plug-in then checks for either a mosObj structure or Item structure embedded in the <ncsAppInfo> message and, if it is present, uses this information to fetch the appropriate object from its associated database/storage.

Additional functionality:

1) Story Information can be sent from the NCS host to the Web Plug-in in three different manners.

    a. Users can choose to drag and drop a Story from the NCS host to the Web Plug-in.

        The NCS host will form an <roStorySend> message.

        If a value for roID does not exist a value of "0" will be used.

        The <roStorySend> message will be sent via Web drag and drop and the text data type or the window.postMessage method.

    b. An alternate method exists which allows the Web Plug-in to request the NCS host send Story information.

        Rather than use drag and drop to send Story data from the NCS host to the Web Plug-in, the <ncsStoryRequest> message can alternately be used by the Web Plug-in to request Story information from the NCS host via the window.postMessage event and response message

    An <roStorySend>
        message is sent from the NCS host in the window.postMessage parameter as a normal response.

        If the NCS host cannot logically respond to the request, then an <ncsAck> message with a status value of "ERROR" is returned to the Web Plug-in instead of the <roStorySend> message.

    c. Unsolicited <roStorySend> messages can also be sent from the NCS host to the Web Plug-in.

        The NCS host can initiate the stand alone <roStorySend> message, via the window.postMessage method.

An <ncsAck>
    message is returned with a value of either "ACK" or "ERROR" through the return value of the window.postMessage method.

2) Item reference information can be exchanged between the NCS host and the Web Plug-in in three different manners.

   a. Users can choose to drag and drop an Item reference from the Web Plug-in to the NCS host.

      The Web Plug-in will form an <ncsItem> message, using an <itemID> value of "0" (the NCS host will actually ignore the <itemID> value).

      The Drag message should specify the Data Type as:

      mosMsg (Unicode UCS-2)

   b. A second method exists to send Item reference information between the Web Plug-in and the NCS host.

      The <ncsItemRequest> message can alternately be used to send Item information from either the NCS Host to the Web Plug-in via the window.postMessage Method and return value, or from the Web Plug-in to the NCS host via the window.postMessage event and subsequent response.

      This allows either the Web Plug-in or NCS host to request the other send an Item reference.

      An <ncsItem> message is sent as a normal response.

      If either side cannot logically respond to the request, then an <ncsAck> message with a status value of "ERROR" is returned instead of the ncsItem message.

   c. Unsolicited <ncsItem> messages can be sent between the Web Plug-in and the NCS host.

      Either the Web Plug-in or the NCS host can initiate the stand alone ncsItem message, via the window.postMessage event..

An <ncsAck>
message is returned with a status value of either "ACK" or "ERROR" through either the value of the window.postMessage event.

3) The Web Plug-in may request the window in which it runs be resized to one of an enumerated list of modes provided by the NCS host.

The Web Plug-iIn sends an <ncsReqAppInfo> message to the NCS host via the window.postMessage event.

The NCS host responds with an <ncsAppInfo> message sent via the event.source.postMessage event.

Alternately, the <ncsAppInfo> message received on start-up can be used if a significant delay does not exist between start up and the resize request.

The <ncsAppInfo> message includes an enumerated list of display metrics which it will support and from which the plug-in may choose. Enumerated option "0" will always be the current mode.

It is recommended that the NCS host always return options for maximum and minimum possible display metrics.

The Web Plug-in then chooses the new mode in which it wishes to run and sends the mode number to the NCS host in a ncsReqAppMode message via a second window.postMessage event.

The NCS host will then respond by resizing the window and sending a final ncsAppInfo message via the window.postMessage event, indicating the new current mode as enumerated option "0".

4) The Web Plug-in may request to close the window in which it is running.

The Web Plug-in sends an <ncsReqAppClose> message to the NCS host via the window.postMessage event.

If the request is not supported by the NCS host for the current mode, the NCS host will take no action, except to return an <ncsAck> message with a status of ERROR. This should be a rare event – the ActiveX should check for support of the message in the <ncsAppInfo> message.

If the request is supported by the NCS host for the current mode, the NCS host will close the window. The NCS may, at its option, transfer the Web control to another window.

If the NCS host changes the mode or context of the control rather than releasing it, it will return an <ncsAppInfo> message indicating the new mode in a window.postMessage event.

5.2.1 Behavior of ActiveX Plug-ins

General

Messages are sent from the NCS host to the ActiveX Plug-in via the mosMsgFromHost Method or the OLE drag and drop data type mosMsg. Responses to select messages are returned via the return value of the mosMsgFromHost method.

Messages are sent from the ActiveX Plug-in to the NCS host via the mosMsgFromPlugIn event or the OLE drag and drop data type mosMsg. Responses to mosMsgFromPlugIn events are returned via the mosResponse parameter. Messages sent via OLE drag and drop receive no response.

Data transfer between the NCS host and the ActiveX Plug-in have been enabled via drag and drop operations as well as non-drag and drop Methods and Events. Thus, it should be possible for application developers to enable keyboard equivalent operations for most drag and drop operations.

5.2.2 Methods, Events and Data Types for ActiveX Controls

Methods

mosMsgFromHost

VB code to call the method might look like this:

```
sActiveXResponse = mosMsgFromHost(mosMsg)
```

Events

mosMsgFromPlugIn

VB code for the NCS host event handler might look like this:

```
Private Sub MosActiveX_mosMsgFromPlugIn(mosMsg as
     String, mosResponse as String)
     ' Process mosMsg...

     ' Assign Response accordingly..
     mosResponse = GetROStorySend()
End Sub
```

Data Type

mosMsg (Unicode UCS-2)

Start Up:

1) Before the ActiveX Plug-in is instantiated, the NCS host determines whether it will be instantiated in modal or non-modal mode

2) The NCS host determines what options for screen metrics are available for the control.

3) The NCS host enumerates these options, giving option "0" to the metrics within which the control will be initially instantiated. It is recommended that the NCS host provide enumerated options for both absolute maximum and minimum screen metrics.

4) If the NCS host chooses, it can optionally place either a <mosObj> message or Item info in the <ncsAppInfo> message. The <storyID> must be included if Item information is sent. The <roID> can optionally be included with Item information.

5) The NCS host chooses the mode the control will be instantiated in and includes this in the <ncsAppInfo> message.

6) The NCS host optionally provides additional context of BROWSE, EDIT or CREATE. The semantics of these choices are:

    a. BROWSE - tells the control to provide the ability to look at the inventory list for the MOS, and optionally to preview specific MOS Objects;

    b. EDIT - tells the control to provide the ability to edit a MOS item that is passed in the ncsAppInfo message;

    c. CREATE - tells the control to provide the ability to create a new MOS Object on the Media Object server.

7) The NCS host identifies the local user's name and places this in the <ncsAppInfo> message.

8) The NCS host also identifies its own manufacturer name, product name, and software version in the <ncsAppInfo> message.

9) The NCS host instantiates the control.

10) The NCS host sends the ncsAppInfo message via the mosMsgFromHost method.

11) The ActiveX Plug-in recognizes the mode it was instantiated in and checks for optional context (BROWSE, EDIT or CREATE) and the availability of window closing functionality.

12) The ActiveX Plug-in optionally recognizes and uses the user's name, manufacturer name, product name and software version.

13) The ActiveX Plug-in then checks for either a mosObj structure or Item structure embedded in the <ncsAppInfo> message and, if it is present, uses this information to fetch the appropriate object from its associated database/storage.

Additional functionality:

1) Story Information can be sent from the NCS host to the ActiveX Plug-in in three different manners.

    a. Users can choose to drag and drop a Story from the NCS host to the ActiveX Plug-in.

        The NCS host will form an <roStorySend> message.

        If a value for roID does not exist a value of "0" will be used.

        The <roStorySend> message will be sent via OLE drag and drop and the mosMsg data type or the mosMsgFromHost method.

    b. An alternate method exists which allows the ActiveX Plug-in to request the NCS host send Story information.

        Rather than use drag and drop to send Story data from the NCS host to the ActiveX Plug-in, the <ncsStoryRequest> message can alternately be used by the ActiveX Plug-in to request Story information from the NCS host via the mosMsgFromPlugIn event and mosResponse returned parameter.

    An <roStorySend>
        message is sent from the NCS host in the mosResponse parameter as a normal response.

        If the NCS host cannot logically respond to the request, then an <ncsAck> message with a status value of "ERROR" is returned to the ActiveX Plug-in instead of the <roStorySend> message.

    c. Unsolicited <roStorySend> messages can also be sent from the NCS host to the ActiveX Plug-in.

        The NCS host can initiate the stand alone <roStorySend> message, via the mosMsgFromHost method.

An <ncsAck>

message is returned with a value of either "ACK" or "ERROR" through the return value of the mosMsgFromHost method.

2) Item reference information can be exchanged between the NCS host and the ActiveX Plug-in in three different manners.

a. Users can choose to drag and drop an Item reference from the ActiveX Plug-in to the NCS host.

The ActiveX Plug-in will form an <ncsItem> message, using an <itemID> value of "0" (the NCS host will actually ignore the <itemID> value), and send this message via OLE drag and drop and the mosMsg data type.

b. A second method exists to send Item reference information between the ActiveX Plug-in and the NCS host.

The <ncsItemRequest> message can alternately be used to send Item information from either the NCS host to the ActiveX Plug-in via the mosMsgFromHost Method and return value, or from the ActiveX Plug-in to the NCS host via the mosMsgFromPlugIn event and mosResponse parameter.

This allows either the ActiveX Plug-in or NCS host to request the other send an Item reference.

An <ncsItem> message is sent as a normal response.

If either side cannot logically respond to the request, then an <ncsAck> message with a status value of "ERROR" is returned instead of the ncsItem message.

c. Unsolicited <ncsItem> messages can be sent between the ActiveX Plug-in and the NCS host.

Either the ActiveX Plug-in or the NCS host can initiate the stand alone ncsItem message, via the mosMsgFromHost method or the mosMsgFromPlugIn event.

An <ncsAck>
message is returned with a status value of either "ACK" or "ERROR" through either the value of the

mosMsgFromHost method or the mosResponse parameter of the mosMsgFromPlugIn event.

3) The ActiveX Plug-in may request the window in which it runs be resized to one of an enumerated list of modes provided by the NCS host.

The ActiveX Plug-in sends an <ncsReqAppInfo> message to the NCS host via the mosMsgFromPlugIn event.

The NCS host responds with an <ncsAppInfo> message sent via the mosResponse return parameter of the mosMsgFromPlugIn event.

Alternately, the <ncsAppInfo> message received on start-up can be used if a significant delay does not exist between start up and the resize request.

The <ncsAppInfo> message includes an enumerated list of display metrics which it will support and from which the plug-in may choose. Enumerated option "0" will always be the current mode.

It is recommended that the NCS host always return options for maximum and minimum possible display metrics.

The ActiveX Plug-in then chooses the new mode in which it wishes to run and sends the mode number to the NCS host in a ncsReqAppMode message via a second mosMsgFromPlugIn event.

The NCS host will then respond by resizing the window and sending a final ncsAppInfo message, via the mosResponse return parameter of the mosMsgFromPlugIn event, indicating the new current mode as enumerated option "0".

4) The ActiveX Plug-in may request to close the window in which it is running .

The ActiveX Plug-in sends an <ncsReqAppClose> message to the NCS host via the mosMsgFromPlugIn event.

If the request is not supported by the NCS host for the current mode, the NCS host will take no action, except to return an <ncsAck> message with a status of ERROR. This should be a rare event – the ActiveX should check for support of the message in the <ncsAppInfo> message.

If the request is supported by the NCS host for the current mode, the NCS host will close the window. The NCS may, at its option, transfer the ActiveX control to another window or release its reference to the object.

If the NCS host changes the mode or context of the control rather than releasing it, it will return an <ncsAppInfo> message indicating the new mode in the mosResponse parameter.

If the NCS host releases its reference to the ActiveX control, it will return an <ncsAck> message with a status of ACK. It may release its reference to the ActiveX during the mosMsgFromPlugIn event or after returning. The ActiveX must not allow itself to be destroyed until after the call has returned. Depending on the compiler functionality, this may require the temporary increment of the object's reference count until the call has completed. Failure to do so may result in an access violation when the call returns.

5.3 MOS Plug-in Communication messages

MOS Messages

ncsAck
ncsReqAppInfo
ncsAppInfo
ncsReqAppMode
ncsStoryRequest
ncsItemRequest
roStorySend
ncsItem
mosItemReplace
ncsReqAppClose

5.3.1 ncsAck - Acknowledge message

Purpose

The ncsAck message allows MOS Plug-in to acknowledge receipt of certain messages. The status value is either "ACK" or "ERROR." If it is "ERROR," the statusDescription value optionally describes the problem.

Response

None – this is a response to several messages.

Structural Outline

mos
  ncsAck
    status
    statusDescription?

Syntax

<!ELEMENT ncsAck (status, statusDescription?)>

Example

```
<mos>
        <ncsAck>
                <status>ERROR</status>
        </ncsAck>
</mos>
```

5.3.2 ncsReqAppInfo – Request Application information and context

Purpose

The ncsReqAppInfo message allows the MOS Plug-in to request contextual information from the NCS host. If the NCS host can fulfill the request, it returns the ncsAppInfo message; otherwise, it returns ncsAck with a status of "ERROR."

Response

ncsAppInfo
or

ncsAck

Structural Outline

mos
ncsReqAppInfo

Syntax

<!ELEMENT ncsReqAppInfo ()>

Example

```
<mos>
        <ncsReqAppInfo/>
</mos>
```

5.3.3 ncsAppInfo – Application information and context

Purpose

The ncsAppInfo message allows the NCS host to send contextual information to the MOS Plug-in. The information includes product information about the NCS host, the context in which the MOS Plug-in can be instantiated, the available screen sizes and modes for the MOS Plug-in window and whether the window can be closed by the Plug-in.

Note: This message has two forms. The first uses the mosObj structure and the second uses the roID/StoryID/item structure. These tags are listed as optional; the message can be used without context of mosObj/roID/StoryID/Item information if the purpose is to instantiate an "empty" control.

The following are valid values of <mode>:

CONTAINED – The MOS Plug-in window is contained in an NCS host window.

MODALDIALOG – The MOS Plug-in window is contained in an NCS host modal dialog.

NONMODAL – The MOS Plug-in window is contained in an NCS host modeless dialog.

TOOLBAR – The MOS Plug-in window is contained in an NCS host toolbar.

Response

None if sent as a response to ncsReqAppInfo

or

ncsAck if sent as an unsolicited message

Structural Outline

mos
- mosID
- ncsID
- messageID
- ncsAppInfo

mosObj?
roID?
storyID?
item?
roID?
storyID?
item?
ncsInformation
    userID
    runContext
    software
        manufacturer
        product
         version
    mosActiveXversion
    UImetric num="x"
        startx
        starty
        endx
        endy
         mode
         canClose?

Note: The optional mosObj and item elements shown in the outline refer to the corresponding elements defined in the MOS 2.8.5 Protocol. See mosObj and item, respectively.

Syntax

```
<!ELEMENT ncsAppInfo (mosObj?, roID?, storyID?, item?, ncsInformation)>
<!ELEMENT ncsInformation (userID, runContext, software, Uimetric*)>
<!ELEMENT software (manufacturer, product, version)>
<!ELEMENT UIMetric (startx, starty, endx, endy, mode, canClose?)>
```

Example – mosObj form (note: no rolD, storyID, or item structure is included)

```
<mos>
        <mosID>aircache.newscenter.com</mosID>
        <ncsID>ncs.newscenter.com</ncsID>
        <messageID/>
          <ncsAppInfo>
            <mosObj>
                <objID>M000123</objID>
                <objSlug>Hotel Fire</objSlug>
                <mosAbstract>
                        <b>Hotel Fire</b>
                         <em>vo</em>:30</mosAbstract>
                <objGroup>Show 7</objGroup>
                <objType>VIDEO</objType>
                <objTB>59.94<objTB>
                <objRev>1</objRev>
                <objDur>1800</objDur>
                <status>NEW</status>
                <objAir>READY</objAir>
                <createdBy>Chris</createdBy>
                <created>1998-10-31T23:39:12</created>
                <changedBy>Chris</changedBy>
                <changed>1998-10-31T23:39:12</changed>
                <description>
                        <p>Exterior footage of <em>Baley Park Hotel</em>on fire with natural sound. Trucks are
visible for the first portion of the clip.
<em>CG locator at 0:04 and duration 0:05, Baley Park Hotel.</em>
                        </p>
                        <p>
                                <tab/>Cuts to view of fire personnel exiting hotel lobby and cleaning up after the
fire is out.</p>
                        <p>
                                <em>Clip has been doubled for pad on voice over.</em>
                        </p>
                </description>
                <mosExternalMetadata>
                        <mosScope>STORY</mosScope>
                        <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXML2.08</mosSchema>
                        <mosPayload>
                                <Owner>SHOLMES</Owner>
                                <ModTime>20010308142001</ModTime>
                                <mediaTime>0</mediaTime>
                                <TextTime>278</TextTime>
                                <ModBy>LJOHNSTON</ModBy>
                                <Approved>0</Approved>
                                <Creator>SHOLMES</Creator>
                        </mosPayload>
                </mosExternalMetadata>
            </mosObj>
        <ncsInformation>
                <userID>JOHNDOE</userID>
                <runContext>BROWSE</runContext>
                <software>
                        <manufacturer>Good Software R Us</manufacturer>
                        <product>story composer</product>
                        <version>8.9.3</version>
                </software>
                <UImetric num="0">
                        <startx>690</startx>
                        <starty>230</starty>
                        <endx>690</endx>
                        <endy>230</endy>
                        <mode>CONTAINED</mode>
                        <canClose>FALSE</canClose>
                </UImetric>
                <UImetric num="1">
```

```
                        <startx>810</startx>
                        <starty>100</starty>
                        <endx>810</endx>
                        <endy>490</endy>
                        <mode>CONTAINED</mode>
                        <canClose>FALSE</canClose>
                    </UImetric>
                    <UImetric num="2">
                        <startx>1000</startx>
                        <starty>575</starty>
                        <endx>1000</endx>
                        <endy>575</endy>
                        <mode>NONMODAL</mode>
                        <canClose>TRUE</canClose>
                    </UImetric>
                    <UImetric num="3">
                        <startx>200</startx>
                        <starty>50</starty>
                        <endx>400</endx>
                        <endy>50</endy>
                        <mode>TOOLBAR</mode>
                        <canClose>FALSE</canClose>
                    </UImetric>
                    <UImetric num="4">
                        <startx/>
                        <starty/>
                        <endx/>
                        <endy/>
                        <mode/>
                    </UImetric>
                </ncsInformation>
            </ncsAppInfo>
</mos>
```

Example – item form (note: no mosObj structure is included)

```
<mos>
	<mosID>aircache.newscenter.com</mosID>
	<ncsID>ncs.newscenter.com</ncsID>
	<messageID/>
	<ncsAppInfo>
	<roID/>
	<storyID/>
	<item>
		<itemID>2</itemID>
		<itemSlug>Cat bites dog VO</itemSlug>
		<objID>A0323H1233309873139AQz</objID>
		<mosID>aircache.newscenter.com</mosID>
		<mosAbstract>Cat Bites Dog VO :17</mosAbstract>
		<itemChannel>A</itemChannel>
		<itemEdStart>0</itemEdStart>
		<itemEdDur>510</itemEdDur>
		<itemUserTimingDur>310</itemUserTimingDur>
		<itemTrigger>MANUAL</itemTrigger>
		<macroIn>1;7;5</macroIn>
		<macroOut>2;8;4</macroOut>
		<mosExternalMetadata>
			<mosScope>STORY</mosScope>
			<mosSchema>http://ncsA4.com/mos/supported_schemas/NCSAXML2.08</mosSchema>
			<mosPayload>
				<Owner>SHOLMES</Owner>
				<ModTime>20010308142001</ModTime>
				<mediaTime>0</mediaTime>
				<TextTime>278</TextTime>
				<ModBy>LJOHNSTON</ModBy>
				<Approved>0</Approved>
				<Creator>SHOLMES</Creator>
			</mosPayload>
		</mosExternalMetadata>
	</item>
	<ncsInformation>
		<userID>JOHNDOE</userID>
		<runContext>BROWSE</runContext>
		<software>
			<manufacturer>Good Software R Us</manufacturer>
			<product>story composer</product>
			<version>8.9.3</version>
		</software>
		<UImetric num="0">
			<startx>690</startx>
			<starty>230</starty>
			<endx>690</endx>
			<endy>230</endy>
			<mode>CONTAINED</mode>
			<canClose>FALSE</canClose>
		</UImetric>
		<UImetric num="1">
			<startx>810</startx>
			<starty>100</starty>
			<endx>810</endx>
			<endy>490</endy>
			<mode>CONTAINED</mode>
			<canClose>FALSE</canClose>
		</UImetric>
		<UImetric num="2">
			<startx>1000</startx>
			<starty>575</starty>
			<endx>1000</endx>
			<endy>575</endy>
			<mode>NONMODAL</mode>
			<canClose>TRUE</canClose>
```

```
                </UImetric>
                <UImetric num="3">
                        <startx>200</startx>
                        <starty>50</starty>
                        <endx>400</endx>
                        <endy>50</endy>
                        <mode>TOOLBAR</mode>
                        <canClose>FALSE</canClose>
                </UImetric>
                <UImetric num="4">
                        <startx/>
                        <starty/>
                        <endx/>
                        <endy/>
                        <mode/>
                </UImetric>
        </ncsInformation>
        </ncsAppInfo>
</mos>
```

5.3.4 ncsReqAppMode – Request to run Plug-in in different size window

Purpose

The ncsReqAppMode message allows the MOS Plug-in to request the NCS host to allow it to run in a different mode. This mode must be chosen from an enumerated list provided by the NCS host in the <ncsAppInfo> message. If the NCS host can fulfill the request, it returns <ncsAppInfo> containing a list of display metrics as described in part 3 of the "Additional Functionality" section. If it cannot fulfill the request, it returns ncsAck with a status of "ERROR."

Response

ncsAppInfo

or

ncsAck

Structural Outline

mos
ncsReqAppMode
UImetric num="x"

Syntax

<!ELEMENT ncsReqAppMode (UImetric)>

Example

```
<mos>
        <ncsReqAppMode>
                <UImetric num="1"/>
        </ncsReqAppMode>
</mos>
```

5.3.5 ncsStoryRequest – Request the NCS host to send a Story

Purpose

This allows the MOS Plug-in to request the NCS host to send it the body of a Story. The NCS host must determine which Story to send and whether this message is allowed in a specific context. If there is an error or the message is not allowed, then an ncsAck message must be sent with a status of "ERROR".

Response

roStorySend
or
ncsAck

Structural Outline

mos
ncsStoryRequest

Syntax

```
<!ELEMENT ncsStoryRequest EMPTY>
```

Example

```
<mos>
        <ncsStoryRequest/>
</mos>
```

5.3.6 ncsItemRequest – Request the NCS host or MOS Plug-in to send an Item

Purpose

This allows either application to request the other application to send an Item. The requested application must determine which Item to send and whether this message is allowed in a specific context. If there is an error or the message is not allowed, then an ncsAck message must be sent with a status of "ERROR".

Response

ncsItem
or
ncsAck

Structural Outline

mos
ncsItemRequest

Syntax

<!ELEMENT ncsItemRequest ()>

Example

```
<mos>
        <ncsItemRequest/>
</mos>
```

5.3.7 roStorySend – Allows the NCS host to send a Story Body to the MOS Plug-in

Purpose

This allows the NCS host to send the body of a story and associated metadata to the MOS Plug-in. This can be done in an unsolicited manner or as a result of.ncsStoryRequest.

Response

None if as a response to ncsStoryRequest

or

ncsAck if sent as an unsolicited message

Structural Outline

mos
- mosID
- ncsID
- messageID
- roStorySend
  - roID
  - storyID
  - storySlug?
  - storyNum?
  - storyBody (Read1stMEMasBody)
    - storyPresenter*
    - storyPresenterRR*
    - p*
    - em*
    - tab*
    - pi*
    - pkg*
    - b*
    - I*
    - u*
    - storyItem*
      - itemID
      - itemSlug?
      - objID
      - mosID
      - mosPlugInID?

objSlug?
objDur
objTb
mosAbstract?
objSlug?
objDur
objTB
mosAbstract?
objPaths?
objPath*
objProxyPath*
objMetadataPath*
itemChannel?
itemEdStart?
itemEdDur?
itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*
mosExternalMetadata*

Syntax

```
<!ELEMENT roStorySend (roID, storyID, storySlug?, storyNum?, storyBody,
mosExternalMetadata*)>

<!ELEMENT storyBody ((storyPresenter*, storyPresenterRR*, p*,
storyItem*)*)>
<!ATTLIST storyBody CDATA #IMPLIED>
<!ELEMENT storyPresenter (#PCDATA)>
<!ELEMENT storyPresenterRR (#PCDATA)>
<!ELEMENT storyItem (itemID, itemSlug?, objID, mosID, mosPlugInID?,
objSlug?, objDur, objTB, mosAbstract?,objPaths?, itemChannel?,
itemEdStart?, itemEdDur?, itemUserTimingDur?,  itemTrigger?, macroIn?,
macroOut?, mosExternalMetadata*)>
<!ELEMENT p (#PCDATA | em | tab | pi | pkg | b | i | u)*>
<!ELEMENT pi (#PCDATA |  b | i | u)*>
<!ELEMENT pkg (#PCDATA |  b | i | u)*>
<!ELEMENT b (#PCDATA |  i | u)*>
<!ELEMENT i (#PCDATA |  b | u)*>
<!ELEMENT u (#PCDATA |  b | i)*>
```

Example

```
<mos>
   <mosID>prompt.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID/>
   <roStorySend>
```

```
      <roID>96857485</roID>
      <storyID>5983A501:0049B924:8390EF1F</storyID>
      <storySlug>Show Open</storySlug>
      <storyNum>C8</storyNum>
      <storyBody>
         <storyPresenter>Suzie</storyPresenter>
         <storyPresenterRR>10</storyPresenterRR>
         <p>
            <pi> Smile </pi>
         </p>
         <p> Good Evening, I'm Suzie Humpries </p>
         <storyPresenter>Chet </storyPresenter>
         <storyPresenterRR>12</storyPresenterRR>
         <p> - and I'm Chet Daniels, this is the 5PM news on Monday
November 5th.</p>
         <p>First up today - a hotel fire downtown</p>
         <storyItem>
           <itemID>2</itemID>
           <itemSlug>Cat bites dog VO</itemSlug>
           <objID>A0323H1233309873139AQz</objID>
           <mosID>aircache.newscenter.com</mosID>
           <mosAbstract>Cat Bites Dog VO :17</mosAbstract>
           <objPaths>
             <objPath techDescription="MPEG2
Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
             <objProxyPath techDescription="WM9
750Kbps">http://server/proxy/clipe.wmv</objProxyPath>">http://server/proxy/clipe.wmv</obj
ProxyPath>
<objMetadataPath techDescription="MOS
Object">http://server/proxy/clipe.xml</objMetadataPath>
           </objPaths>
           <itemChannel>A</itemChannel>
           <itemEdStart>0</itemEdStart>
           <itemEdDur>510</itemEdDur>
           <itemUserTimingDur>400</itemUserTimingDur>
           <itemTrigger>MANUAL</itemTrigger>
           <macroIn>1;7;5</macroIn>
           <macroOut>2;8;4</macroOut>
           <mosExternalMetadata>
             <mosScope>STORY</mosScope>
             <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSAXML2
      .08</mosSchema>
             <mosPayload>
               <Owner>SHOLMES</Owner>
               <ModTime>20010308142001</ModTime>
               <mediaTime>0</mediaTime>
               <TextTime>278</TextTime>
               <ModBy>LJOHNSTON</ModBy>
               <Approved>0</Approved>
               <Creator>SHOLMES</Creator>
             </mosPayload>
           </mosExternalMetadata>
         </storyItem>
         <p>...as you can see, the flames were quite high. </p>
       </storyBody>
       <mosExternalMetadata>
         <mosScope>PLAYLIST</mosScope>
```

```
     <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08</mos
Schema>
         <mosPayload>
            <Owner>SHOLMES</Owner>
            <changedBy>MPalmer</changedBy>
            <length>463</length>
            <show>10 pm</show>
         </mosPayload>
      </mosExternalMetadata>
   </roStorySend>
</mos>
```

5.3.8 ncsItem – Allows either the MOS Plug-in or NCS host to send an Item Reference to the other application

Purpose

This allows either application to send an Item reference to the other application. The receiving application must determine how to best handle the data.

Note: itemID is sent as the reserved value "0" which replaced with an actual value by the NCS host before insertion into the body of a Story.

Response

none if in response to an ncsItemRequest message

or

ncsAck if sent as an unsolicited message

Structural Outline

mos
- ncsItem
  - item
    - itemID
    - itemSlug?
    - objID
    - mosID
    - mosPlugInID?
    - mosAbstract?
    - objPaths?
      - objPath*
      - objProxyPath*
      - objMetadataPath*
    - itemChannel?
    - itemEdStart?
    - itemEdDur?
    - itemUserTimingDur?
    - itemTrigger?
    - macroIn?
    - macroOut?
    - mosExternalMetadata*

Syntax

```
<!ELEMENT ncsItem (item)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosPlugInID?,
mosAbstract?, objPaths?, itemChannel?, itemEdStart?, itemEdDur?,
itemUserTimingDur?,  itemTrigger?, macroIn?, macroOut?,
mosExternalMetadata*)>
```

Example

```
<mos>
  <ncsItem>
    <item>
      <itemID>2</itemID>
      <itemSlug>Cat bites dog VO</itemSlug>
      <objID>A0323H1233309873139AQz</objID>
      <mosID>aircache.newscenter.com</mosID>
      <mosPlugInID>Shell.Explorer.2</mosPlugInID>
      <mosAbstract>Cat Bites Dog VO :17</mosAbstract>
      <objPaths>
        <objPath techDescription="MPEG2
Video">\\server\media\clip392028cd2320s0d.mxf</objPath>">\\server\media\clip392028cd2320s
0d.mxf</objPath>
        <objProxyPath techDescription="WM9
750Kbps">http://server/proxy/clipe.wmv</objProxyPath">http://server/proxy/clipe.wmv</objP
roxyPath>
<objMetadataPath techDescription="MOS
Object">http://server/proxy/clipe.xml</objMetadataPath>
      </objPaths>
      <itemChannel>A</itemChannel>
      <itemEdStart>0</itemEdStart>
      <itemEdDur>510</itemEdDur>
      <itemUserTimingDur>310</itemUserTimingDur>
      <itemTrigger>MANUAL</itemTrigger>
      <macroIn>1;7;5</macroIn>
      <macroOut>2;8;4</macroOut>
      <mosExternalMetadata>
        <mosScope>STORY</mosScope>
        <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSAXML2.08</
      mosSchema>
        <mosPayload>
          <Owner>SHOLMES</Owner>
          <ModTime>20010308142001</ModTime>
          <mediaTime>0</mediaTime>
          <TextTime>278</TextTime>
          <ModBy>LJOHNSTON</ModBy>
          <Approved>0</Approved>
          <Creator>SHOLMES</Creator>
        </mosPayload>
      </mosExternalMetadata>
```

```
    </item>
  </ncsItem>
</mos>
```

5.3.9 mosItemReplace – Allows the MOS Plug-in to replace an existing Item in a Story

Purpose

This allows the MOS Plug-in to replace an Item Reference embedded in a Story. It is up to the NCS host to determine which Story will be the target of this action. It is implied that the ActiveX Plug-in previously became aware of the contents of the Story through a preceding roStorySend message.

Note: The Media Object Server to which the MOS Plug-in is connected should never cause a MOS Plug-in to initiate this message. The MOS should send the mosItemReplace message from the MOS 2.8.5 Protocol instead.

Note: itemIDs must match in order for the replace operation to take place.

Note: This is a strict replace; the existing Item Reference is removed and the new Item Reference is inserted. This is different from the action of the mosItemReplace message sent from a MOS to a NCS, where the new Item Reference is merged into the existing Item Reference.

Response

ncsAck

Structural Outline

mos
- mosID
- ncsID
- messageID
- mosItemReplace
  - roID?
  - storyID
  - item
    - itemID
    - itemSlug?
    - objID
    - mosID
    - mosPlugInID?
    - mosAbstract?
    - mosAbstract?
    - objPaths?
      - objPath*
      - objProxyPath*

objMetadataPath*
itemChannel?
itemEdStart?
itemEdDur?
itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*

Syntax

```
<!ELEMENT mosItemReplace (roID, storyID, item)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosPlugInID?,
objPaths?, objSlug?, objDur, objTB, mosAbstract?, objPaths?,
itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur? ,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
```

Example

```
<mos>
  <mosID>aircache.newscenter.com</mosID>
  <ncsID>ncs.newscenter.com</ncsID>
  <messageID/>
  <mosItemReplace>
    <roID>5PM</roID>
    <storyID>HOTEL FIRE</storyID>
          <item>
                <itemID>2</itemID>
                <itemSlug>Cat bites dog VO</itemSlug>
                <objID>A0323H1233309873139AQz</objID>
                <mosID>aircache.newscenter.com</mosID>
                <mosPlugInID>Shell.Explorer.2</mosPlugInID>
                <mosAbstract>Cat Bites Dog VO :17</mosAbstract>
                 <objPaths>
                        <objPath techDescription="MPEG2
                Video">\\server\media\clip392028cd2320s0d.mxf</objPath>
                        <objProxyPath techDescription="WM9
                750Kbps">http://server/proxy/clipe.wmv</objProxyPath>
                        <objMetadataPath techDescription="MOS
                Object">http://server/proxy/clipe.xml</objMetadataPath>
                 </objPaths>
                <itemChannel>A</itemChannel>
                <itemEdStart>0</itemEdStart>
                <itemEdDur>510</itemEdDur>
                <itemUserTimingDur>310</itemUserTimingDur>
                <itemTrigger>MANUAL</itemTrigger>
                <macroIn>1;7;5</macroIn>
                <macroOut>2;8;4</macroOut>
                <mosExternalMetadata>
                        <mosScope>STORY</mosScope>
                        <mosSchema>http://ncsA4.com/mos/supported_schemas/NCSAXML2.08</mosSchema>
                        <mosPayload>
                                <Owner>SHOLMES</Owner>
                                <ModTime>20010308142001</ModTime>
                                <mediaTime>0</mediaTime>
                                <TextTime>278</TextTime>
                                <ModBy>LJOHNSTON</ModBy>
                                <Approved>0</Approved>
```

```
                                    <Creator>SHOLMES</Creator>
                                </mosPayload>
                            </mosExternalMetadata>
                    </item>
  </mosItemReplace>
</mos>
```

5.3.10 ncsReqAppClose – Request to close window for Plug-in

Purpose

This allows the MOS Plug-in to request the NCS host to close the window in which it is hosted. If the NCS host can fulfill the request, it closes the window and returns ncsAppInfo (if it moves the control to another window) or ncsAck with a status of ACK (if it releases its reference to the control) as described in part 4 of the "Additional Functionality" section. If it cannot fulfill the request, it returns ncsAck with a status of "ERROR."

Response

ncsAppInfo

or

ncsAck

Structural Outline

mos
    ncsReqAppClose

Syntax

```
<!ELEMENT ncsReqAppClose EMPTY>
```

Example

```
<mos>
  <ncsReqAppClose/>
</mos>
```

5.3.11 – ncsReqStoryAction – MOS Plug-in can create, edit, or replace stories on a NCS

Purpose

The ncsReqStoryAction message allows the MOS Plug-in to update an existing story in the NCS. It is implied that the ActiveX Plug-in became previously aware of the story through a preceding roStorySend message. This is a request only. A NACK is a perfectly valid response and must be anticipated.

Operation	"operation" attribute
Create a Story	"NEW"
Modify a Story	"UPDATE"
Replace a Story	"REPLACE"

A "NEW" operation tells the NCS to create a new story in its text editor. The story is not linked to any running order.

An "UPDATE" operation updates specified tags within an existing story. This may include any tag which was part of the original roStorySend message, including <storyBody> or MEM-block tags. If a blank tag is included in an UPDATE message, the tag is removed from the story.

A "REPLACE" operation replaces the entire story, including all Item references, story body text and MEM-block data.

Response

ncsAck

If the specified action cannot be completed, the <ncsAck> will have a value of NACK with an explanation for the NACK in <statusDescription>.

Structural Outline

mos
- mosID
- ncsID
- messageID
- ncsReqStoryAction (operation = {NEW, UPDATE, REPLACE})
- roStorySend
  - roID (set to 0 for operation=NEW)
  - storyID (set to 0 for operation=NEW)
  - storySlug?
    - storyNum?

storyBody (Read1stMEMasBody)?
storyPresenter*
storyPresenterRR*
p*
em*
tab*
pi*
pkg*
b*
I*
u*
storyItem*
itemID
itemSlug?
objID
mosID
mosAbstract?
objPaths?
objPath*
objProxyPath*
objMetadataPath*
itemChannel?
itemEdStart?
itemEdDur?
itemUserTimingDur?
itemTrigger?
macroIn?
macroOut?
mosExternalMetadata*
mosExternalMetadata*

Syntax

```
<!ELEMENT ncsReqStoryAction (roStorySend)>
<!ATTLIST ncsReqStoryAction
            operation CDATA #REQUIRED
>
<!ELEMENT roStorySend (roID, storyID, storySlug?, storyNum?, storyBody,
mosExternalMetadata*)>
<!ELEMENT storyBody ((storyPresenter*, storyPresenterRR*, p*,
storyItem*)*)>
<!ATTLIST storyBody Read1stMEMasBody CDATA #IMPLIED>
<!ELEMENT storyPresenter (#PCDATA)>
<!ELEMENT storyPresenterRR (#PCDATA)>
<!ELEMENT storyItem (itemID, itemSlug?, objID, mosID, mosAbstract?,
objPaths?, itemChannel?, itemEdStart?, itemEdDur?, itemUserTimingDur?,
itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
<!ELEMENT objPaths? (objPath?, objProxyPath?, objMetadataPath?)
```

```
<!ELEMENT objPath (#PCDATA)>
<!ELEMENT objProxyPath (#PCDATA)>
<!ELEMENT objMetadataPath (#PCDATA)>
<!ELEMENT p (#PCDATA | em | tab | pi | pkg | b | i | u)*>
<!ELEMENT pi (#PCDATA |  b | i | u)*>
<!ELEMENT pkg (#PCDATA |  b | i | u)*>
<!ELEMENT b (#PCDATA |  i | u)*>
<!ELEMENT i (#PCDATA |  b | u)*>
<!ELEMENT u (#PCDATA |  b | i)*>
```

Example - Create

```
<mos>
   <mosID>activex.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <ncsReqStoryAction  operation="NEW" leaseLock="2" username="jbob">
      <roStorySend>
         <roID></roID>
         <storyID></storyID>
         <storySlug>Show Open</storySlug>
        <storyNum>C8</storyNum>
         <storyBody>
            <storyPresenter>Suzie</storyPresenter>
            <storyPresenterRR>10</storyPresenterRR>
            <p>
               <pi> Smile </pi>
            </p>
           <p> Good Evening, I'm Suzie Humpries </p>
            <storyPresenter>Chet </storyPresenter>
            <storyPresenterRR>12</storyPresenterRR>
            <p> - and I'm Chet Daniels, this is the 5PM news on Monday
November 5th.</p>
           <p>First up today - a hotel fire downtown</p>
            <storyItem>
               <itemID>1</itemID>
               <itemSlug>Hotel Fire vo</itemSlug>
               <objID>M000705</objID>
              <mosID>testmos</mosID>
               <itemEdStart>0</itemEdStart>
               <itemEdDur>800</itemEdDur>
               <itemUserTimingDur>310</itemUserTimingDur>
               <macroIn>c01/l04/dve07</macroIn>
              <macroOut>r00</macroOut>
               <mosExternalMetadata>
                  <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
                  <mosPayload>
                     <Owner>SHOLMES</Owner>
                     <transitionMode>2</transitionMode>
                     <transitionPoint>463</transitionPoint>
                     <source>a</source>
                     <destination>b</destination>
                  </mosPayload>
               </mosExternalMetadata>
```

```
            </storyItem>
           <p>...as you can see, the flames were quite high. </p>
         </storyBody>
         <mosExternalMetadata>
            <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
           <mosPayload>
               <Owner>SHOLMES</Owner>
               <changedBy>MPalmer</changedBy>
               <length>463</length>
               <show>10 pm</show>
           </mosPayload>
         </mosExternalMetadata>
     </roStorySend>
   </ncsReqStoryAction >
</mos>
```

Example – Modify

```
<mos>
   <mosID>activex.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <ncsReqStoryAction  operation="UPDATE" leaseLock="2"
username="jbob">
      <roStorySend>
         <roID>96857485</roID>
         <storyID>5983A501:0049B924:8390EF1F</storyID>
         <storySlug>Show Open</storySlug>
        <storyNum>C8</storyNum>
         <storyBody>
            <storyPresenter>Suzie</storyPresenter>
            <storyPresenterRR>10</storyPresenterRR>
            <p>
               <pi> Smile </pi>
            </p>
           <p> Good Evening, I'm Suzie Humpries </p>
            <storyPresenter>Chet </storyPresenter>
            <storyPresenterRR>12</storyPresenterRR>
            <p> - and I'm Chet Daniels, this is the 5PM news on Monday
November 6th.</p>
           <p>First, an update on the hotel fire downtown.</p>
            <storyItem>
               <itemID>1</itemID>
               <itemSlug>Hotel Fire Update vo</itemSlug>
               <objID>M000710</objID>
              <mosID>testmos</mosID>
               <itemEdStart>0</itemEdStart>
               <itemEdDur>1600</itemEdDur>
               <itemUserTimingDur>310</itemUserTimingDur>
               <macroIn>c01/l04/dve07</macroIn>
              <macroOut>r00</macroOut>
               <mosExternalMetadata>
                  <mosScope>PLAYLIST</mosScope>
```

```
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
                  <mosPayload>
                     <Owner>SHOLMES</Owner>
                     <transitionMode>2</transitionMode>
                     <transitionPoint>463</transitionPoint>
                     <source>a</source>
                     <destination>b</destination>
                  </mosPayload>
               </mosExternalMetadata>
            </storyItem>
           <p>...The police are still looking for clues. </p>
         </storyBody>
         <mosExternalMetadata>
            <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
           <mosPayload>
               <Owner>SHOLMES</Owner>
               <changedBy>MPalmer</changedBy>
               <length>463</length>
               <show>10 pm</show>
           </mosPayload>
         </mosExternalMetadata>
     </roStorySend>
   </ncsReqStoryAction >
</mos>
```

Example – Replace

```
<mos>
   <mosID>activex.station.com</mosID>
   <ncsID>ncs.station.com</ncsID>
   <messageID>507891</messageID>
   <ncsReqStoryAction  operation="REPLACE" leaseLock="2"
username="jbob">
      <roStorySend>
         <roID>96857485</roID>
         <storyID>5983A501:0049B924:8390EF1F</storyID>
         <storySlug>Show Open</storySlug>
        <storyNum>C8</storyNum>
         <storyBody>
            <storyPresenter>Suzie</storyPresenter>
            <storyPresenterRR>10</storyPresenterRR>
            <p>
               <pi> Smile </pi>
            </p>
           <p> Good Evening, I'm Suzie Humpries </p>
            <storyPresenter>Chet </storyPresenter>
            <storyPresenterRR>12</storyPresenterRR>
            <p> - and I'm Chet Daniels, this is the 5PM news on Monday
November 6th.</p>
           <p>First, an update on the hotel fire downtown.</p>
            <storyItem>
               <itemID>1</itemID>
               <itemSlug>Hotel Fire Update vo</itemSlug>
               <objID>M000710</objID>
              <mosID>testmos</mosID>
               <itemEdStart>0</itemEdStart>
               <itemEdDur>1600</itemEdDur>
               <itemUserTimingDur>310</itemUserTimingDur>
               <macroIn>c01/l04/dve07</macroIn>
              <macroOut>r00</macroOut>
               <mosExternalMetadata>
                  <mosScope>PLAYLIST</mosScope>
               <mosSchema>http://MOSA4.com/mos/supported_schemas/MOSAXM
L2.08</mosSchema>
                  <mosPayload>
                     <Owner>SHOLMES</Owner>
                     <transitionMode>2</transitionMode>
                     <transitionPoint>463</transitionPoint>
                     <source>a</source>
                     <destination>b</destination>
                  </mosPayload>
               </mosExternalMetadata>
            </storyItem>
           <p>...The police are still looking for clues. </p>
         </storyBody>
         <mosExternalMetadata>
            <mosScope>PLAYLIST</mosScope>
         <mosSchema>http://NCSA4.com/mos/supported_schemas/NCSAXML2.08<
/mosSchema>
           <mosPayload>
               <Owner>SHOLMES</Owner>
```

```
                <changedBy>MPalmer</changedBy>
                <length>463</length>
                <show>10 pm</show>
            </mosPayload>
        </mosExternalMetadata>
    </roStorySend>
  </ncsReqStoryAction >
</mos>
```

6. Field Descriptions

Many of the terminal elements are constrained in size and/or content as listed below. Character entities count as one character in size constraints. Numeric values may be provided in decimal or hexadecimal (when preceded by "0x", or "x"). Text constants are case sensitive.

b

Bold face type: Specifies that text between tags is in boldface type.

canClose

Indicates whether an NCS can close the window in which it is hosting an ActiveX control when the control sends an ncsReqAppClose message. Permitted values are TRUE and FALSE.

changed

Changed Time/Date: Time the object was last changed in the MOS. Format is YYYY-MM-DD'T'hh:mm:ss[,ddd]['Z'], e.g. 2009-04-11T14:22:07,125Z or 2009-04-11T14:22:07,125-05:00. Parameters displayed within brackets are optional. [,ddd] represents fractional time in which all three digits must be present. ['Z'] indicates time zone which can be expressed as an offset from UTC in hours and minutes. Optionally, the time zone may be replaced by the character 'Z' to indicate UTC.

changedBy

Last Changed by: Name of the person or process that last changed the object in the MOS. This can be stored in a language other than English.

command

roItemCtrl command: The commands READY, EXECUTE, PAUSE and STOP, as well as general indicator, SIGNAL, can be addressed at each MOS Structure level. In other words, a single command can begin EXECUTION of an entire Running Order, of a Story containing multiple Items, or of a single Item.

controlDefaultParams

This value represents the parameters that can be passed to an ActiveX.

controlFileLocation

controlFileLocation is the file location for the default ActiveX control.

controlName

This value represents the key/classid key used to load the ActiveX from the registry.

controlSlug

Defined by MOS 128 characters max

created

Creation Time/Date: Time the object was created in the MOS. Format is YYYY-MM-DD'T'hh:mm:ss[,ddd]['Z'], e.g. 2009-04-11T14:22:07,125Z or 2009-04-11T14:22:07,125-05:00. Parameters displayed within brackets

are optional. [,ddd] represents fractional time in which all three digits must be present. ['Z'] indicates time zone which can be expressed as an offset from UTC in hours and minutes. Optionally, the time zone may be replaced by the character 'Z' to indicate UTC.

createdBy

Created by: Name of the person or process that created the object in the MOS. This can be stored in a language other than English. 128 chars max.

defaultActiveX

defaultActiveX contains tags that describe the correct settings for the ActiveX control (NOTE: no two <defaultActivX> elements can have the same <mode> value).

description

Object Description: Text description of the MOS object. No maximum Length is defined. This can be stored in a language other than English.

deviceType

deviceType is a required attribute of supportedProfiles. The required values are either "NCS" or "MOS".

DOM

Date of Manufacture.

element_source

element_source is a tag that designates the story(s) and or item(s) to be acted upon.

element_target

element_target specifies where in the running order the actions are to take place.

em

Emphasized Text: markup within description and p to emphasize text.

endx

Used in MOS ActiveX messages. The maximum width in pixels that the NCS Host allows for an ActiveX Plug-In in a particular metric in ncsAppInfo. 0XFFFFFFFF max.

endy

Used in MOS ActiveX messages. The maximum height in pixels that the NCS Host allows for an ActiveX Plug-In in a particular metric in ncsAppInfo. 0XFFFFFFFF max.

generalSearch

String used for simple searching in the mosReqObjList message. Logical operators are allowed. 128 chars max.

hwRev

HW Revision: 128 chars max.

I

Italics: Specifies that text between tags is in Italics.

ID

Identification of a Machine: text. 128 chars max.

item

Item: Container for item information within a Running Order message.

itemChannel

Item Channel: Channel requested by the NCS for MOS to playback a running order item. 128 chars max.

itemEdDur

Item Editorial Duration: in number of samples 0XFFFFFFFF max.

itemEdStart

Editorial Start: in number of samples 0XFFFFFFFF max.

itemID

Item ID: Defined by NCS, UID not required. 128 chars max.

itemSlug

Item Slug: Defined by NCS. 128 chars max

itemTrigger

Item Air Trigger: "MANUAL", "TIMED" or "CHAINED".
CHAINED (sign +/-) (value in # of samples)
CHAINED -10 would start the specified clip 10 samples before the proceeding clip ended. CHAINED 10 would start the specified clip 10 samples after the preceding clip ended, thus making a pause of 10 samples between the clips. There is a space character between the word CHAINED and the value.

itemUserTimingDur

Item User Timing Duration: If the NCS extracts a duration value from a MOS item for show timing, and this field has a value, then the NCS must use this value. The value is in number of samples. 0XFFFFFFFF max.

leaseLock

Interger value used in roReqStoryAction less then 999 where a MOS requests a lock on a given story from the NCS. A MOS must then send subsequent message to modify the story before the leaseLock expires.

listReturnEnd

Integer value used in mosReqObjList commands to specify the index of the last mosObj message requested or returned in a message. 0xFFFFFFFF max.

listReturnStart

Integer value used in mosReqObjList commands to specify the index of the first mosObj message requested or returned in a message. 0xFFFFFFFF max.

listReturnStatus

Optional string value in the mosObjList message that specifies the reason for a zero value in the <listReturnTotal> tag. 128 chars max.

listReturnTotal

Integer value in the mosObjList message specifying how many mosObj messages are returned. 0xFFFFFFFF max.

mosPlugInID

mosPlugInID is used as the unique identifier for a ActiveX control. 128 characters max.

macroIn

Macro Transition In: Defined by MOS. 128 chars max.

macroOut

Macro Transition Out: Defined by MOS. 128 chars max.

manufacturer

Used in MOS ActiveX messages. Manufacturer: Text description. 128 chars max.

messageID

Unique identifier sent with requests. See chapter 4.1.6 for a detailed description. Format: signed integer 32-bit, value above or equal to 1, decimal or hexadecimal. An empty messageID tag is allowed for messages when used in the ActiveX interface.

mode

Used in MOS ActiveX messages. How the ActiveX Plug-In window appears in the NCS Host window: MODALDIALOG, MODELESS, CONTAINED, TOOLBAR.

model

Model: Text description. 128 chars max.

modifiedBy

Modified by: Name of the person or process that last modified the object in the MOS. This can be stored in a language other than English. 128 chars max.

mosAbstract

Abstract of the Object intended for display by the NCS. This field may contain HTML and DHTML markup. The specific contents are limited by the NCS vendor's implementation. Length is unlimited but reasonable use is suggested.

mosActiveXversion

Used in MOS ActiveX messages. String indicating the version of the ActiveX Plug-In. 128 chars max

mosID

MOS ID: Character name for the MOS unique within a particular installation.

mosGroup

This field is intended to imply the name of a destination, group or folder for the Object pointer to be stored in the NCS. 128 chars max.

mosMsg data type

Used in MOS ActiveX messages. Clipboard format used for OLE drag and drop from the ActiveX Plug-In.

mosPayload

mosPayload is apart of the mosExternalMetadat block, and it generally includes essential metadata that is referenced within the mosSchema.

mosPlugInID

Used in MOS ActiveX messages. ID that the NCS Host can use to instantiate the ActiveX Plug-In. 128 chars max.

mosProfile

This field is intended to define a device's supported MOS Profiles. A "YES" or "NO" value is required for each profile.

mosRev

MOS Revision: Text description. 128 chars max.

mosSchema

mosSchema is the descriptive schema used within the mosPayload. The value is to be an implied pointer or URL to the actual schema document.

mosScope

This field implies the extent to which the mosExternalMetadata block will move through the NCS workflow. Accepted values are "OBJECT" "STORY" and "PLAYLIST"

ncsID

NCS ID: Character name for the NCS unique within a particular installation. 128 chars max.

objAir

Air Status: "READY" or "NOT READY".

objDur

Object Duration: The number of samples contained in the object. For Still Stores this would be 1. 0XFFFFFFFF MAX

objGroup

Definition of the values for objGroup is left to the configuration and agreement of MOS connected equipment. The intended use is for site configuration of a limited number of locally named storage folders in the NCS or MOS.

objID

Object UID: Unique ID generated by the MOS and assigned to this object. 128 chars max.

objPath

- This is an unambiguous path to a media file - essence. The field length is 255 chars max, but it is suggested that the length be kept to a minimum number of characters. As of MOS 2.8.5 ObjPaths paths must meet the following requirements:
  - Be a call to return the media , without requiring client-side redirection
  - The character string following the last slash in the path must be the full filename, including the asset's extension.These path formats are acceptable:
    UNC (eg: \\machine\directory\file.extension)
    URL (eg: http://machine/directory/file.extension) http and https
    FTP (eg: ftp://machine/directory/file.extension) ftp and ftps

objProxyPath

- This is an unambiguous path to a media file – proxy. The field length is 255 chars max, but it is suggested that the length be kept to a minimum number of characters. As of MOS 2.8.5 ObjPaths paths must meet the following requirements:

- Be a call to return the media , without requiring client-side redirection
- The character string following the last slash in the path must be the full filename, including the asset's extension.These path formats are acceptable:
  UNC (eg: \\machine\directory\file.extension)
  URL (eg: http://machine/directory/file.extension) http and https
  (note: FTP is *NOT* allowed for objProxyPath)

objMetadataPath

This is an unambiguous path to the xml file – MOS Object. This field length is 255 chars max, but is is suggested that the length be kept to a minimum number of characters. These path formats are acceptable:

UNC (eg: \\machine\directory\file.extension)
URL (eg: http://machine/directory/file.extension)
FTP (eg: ftp://machine/directory/file.extension)

objRev

Object Revision Number: 999 max.

objSlug

Object Slug: Textual object description. 128 chars max.

objTB

Object Time Base: Describes the sampling rate of the object in samples per second. This tag should be populated with a value greater than 0. For PAL Video this would be 50. For NTSC it would be 59.94. For audio it would reflect the audio sampling rate. Object Time Base is used by the NCS to derive duration and other timing information. 0XFFFFFFFF MAX

objType

Object Type: Choices are "STILL", "AUDIO", "VIDEO".

opTime

Operational Time: date and time of last machine start. Format is YYYY-MM-DD'T'hh:mm:ss[,ddd]['Z'], e.g. 2009-04-11T14:22:07,125Z or 2009-04-11T14:22:07,125-05:00. Parameters displayed within brackets are optional. [,ddd] represents fractional time in which all three digits must be present. ['Z'] indicates time zone which can be expressed as an offset from UTC in hours and minutes. Optionally, the time zone may be replaced by the character 'Z' to indicate UTC.

p

Paragraph: Standard html delimitation for a new paragraph.

pause

Item Delay: Requested delay between items in ms 0XFFFFFFFF MAX.

pi

Presenter instructions: Instructions to the anchor or presenter that are not to be read such as "Turn to 2-shot."

pkg

Package: Specifies that text is verbatim package copy as opposed to copy to be read by presenter.

product

Used in MOS ActiveX messages. String indicating the product name of the NCS Host. 128 chars max.

queryID

Unique identifier used in mosReqObjList and mosObjList to allow the MOS to do cached searching. 128 chars max.

Read1stMEMasBody

Allows the first MEM block to substitute the story body.

ro

The ro tag is used within the roListAll message. ro designates each individual running order within the roListAll message.

roAir

Air Ready Flag: "READY" or "NOT READY".

roChannel

Running Order Channel: default channel requested by the NCS for MOS to playback a running order. 128 chars max.

roCtrlCmd

Running Order Control Command: READY, EXECUTE, PAUSE and STOP, as well as general indicator, SIGNAL, can be addressed at each level. In other words, a single command can begin EXECUTION of an entire Running Order, of a Story containing multiple Items, or of a single Item.

roCtrlTime

Running Order Control Time: roCtrlTime is an optional field which provides a mechanism to time stamp the time of message transmission, or optionally, to provide a time in the immediate future at which the MOS should execute the command. Format is YYYY-MM-DD'T'hh:mm:ss[,ddd]['Z'], e.g. 2009-04-11T14:22:07,125Z or 2009-04-11T14:22:07,125-05:00. Parameters displayed within brackets are optional. [,ddd] represents fractional time in which all three digits must be present. ['Z'] indicates time zone which can be expressed as an offset from UTC in hours and minutes. Optionally, the time zone may be replaced by the character 'Z' to indicate UTC.

roEdDur

Running Order Editorial Duration: duration of entire running order. Format in hh:mm:ss, e.g. 00:58:25.

roEdStart

Running Order Editorial Start: date and time requested by NCS for MOS to start playback of a running order. Format is YYYY-MM-DD'T'hh:mm:ss[,ddd]['Z'], e.g. 2009-04-11T14:22:07,125Z or 2009-04-11T14:22:07,125-05:00. Parameters displayed within brackets are optional. [,ddd] represents fractional time in which all three digits must be present. ['Z'] indicates time zone which can be expressed as an offset from UTC in hours and minutes. Optionally, the time zone may be replaced by the character 'Z' to indicate UTC.

roEventTime

Running Order Event Time: Time of the time cue sent to the parent MOS by the NCS for a specific item event.

roEventType

Running Order Event Type: The type of event that is being queued in the Running order.

roID

Running Order UID: Unique Identifier defined by NCS. 128 chars max.

roSlug

Running Order Slug: Textual Running Order description. 128 chars max.

roStatus

Running Order Status: Options are: "OK" or error description. 128 chars max.

roTrigger

Running Order Air Trigger: "MANUAL", "TIMED" or "CHAINED".
CHAINED (sign +/-) (value in # of samples)
CHAINED -10 would start the specified clip 10 samples before the proceeding clip ended. CHAINED 10 would start the specified clip 10 samples after the preceding clip ended, thus making a pause of 10 samples between the clips. There is a space character between the word CHAINED and the value.slug Textual Object ID: This is the text slug of the object and is stored in the native language. This can be stored in a language other than English. 128 chars max.

runContext

Used in MOS ActiveX messages. Specifies the context in which the NCS Host is instantiating the ActiveX Plug-In: BROWSE, EDIT, CREATE.

searchFieId

searchField contains attributes that are originally derived from the schema returned in the initial mosListSearchableSchema message.

searchGroup

searchGroup contains specific queries based on the values of selected mosExternalMetadata fields.

SN

Serial Number: text serial number. 128 chars max.

startx

Used in MOS ActiveX messages. The minimum width in pixels that the NCS Host allows for an ActiveX Plug-In in a particular metric in ncsAppInfo. 0XFFFFFFFF max.

starty

Used in MOS ActiveX messages. The minimum height in pixels that the NCS Host allows for an ActiveX Plug-In in a particular metric in ncsAppInfo. 0XFFFFFFFF max.

status

Status: Options are "NEW" "UPDATED" "MOVED" "BUSY " "DELETED", "NCS CTRL", "MANUAL CTRL", "READY", "NOT READY", "PLAY," "STOP".

statusDescription

Status Description: textual description of status. 128 chars max.

story

Story: Container for story information in a Running Order message.

storyBody

Story Body: The actual text of the story within a running order.

storyID

Story UID: Defined by the NCS. 128 chars max.

storyItem

Story Item: An item imbedded into a story that can be triggered when that point in the story is reached in the teleprompter.

storyNum

Story Number: The name or number of the Story as used in the NCS. This is an optional field originally intended for use by prompters. 128 chars max.

storyPresenter

Story Presenter: The anchor or presenter of a story within an running order.

storyPresenterRR

Story Presenter Read Rate: The read rate of the anchor or presenter of a story within a running order.

storySlug

Story Slug: Textual Story description. 128 chars max.

supportedProfiles

This field is intened to determine the device type of the device's supported MOS Profiles.

swRev

Software Revision: (MOS) Text description. 128 chars max.

tab

Tab: tabulation markup within description and p.

techDescription

techDescription is an attribute of objPath and objProxyPath. This attribute provides a brief and very general technical description fo the codec or file format (NOTE: the codec name should come first, followed by additional optional descriptions).

time

Time: Time object changed status. Format is YYYY-MM-DD'T'hh:mm:ss[,ddd]['Z'], e.g. 2009-04-11T14:22:07,125Z or 2009-04-11T14:22:07,125-05:00. Parameters displayed within brackets are optional. [,ddd] represents fractional time in which all three digits must be present. ['Z'] indicates time zone which can be expressed as an offset from UTC in hours and minutes. Optionally, the time zone may be replaced by the character 'Z' to indicate UTC.

u

Underline: Specifies that text between tags is to be underlined.

userName

An attribute in the mosReqObjList family of messages and the roReqStoryAction messages which identifies a username

version

Used in MOS ActiveX messages. String indicating the version of the NCS Host. 128 chars max.

7. Recent Changes

7.1 Changes from MOS version to 2.8.5 to 4.0

1. A new introduction has been added to this document that explains the MOS 4.0 protocol changes focused on security in modern newsrooms.
2. Passive MOS is a new style of MOS communication (similar to FTP passive mode) which allows a device inside a firewall to establish and communicate bi-directionally with devices outside of the firewall.
3. keepAlive is a new MOS message that has been added to profile zero. It is designed to keep secure connection established between devices inside and outside of a site's secure network.
4. A new appendix has been added that describes web security standards that are used in MOS 4.0.
5. Many of the old MOS 2.6 messages, which were deprecated in MOS 2.8 have been removed from the MOS 4.0 document. These messages have been superseded by roElementAction. Additionally, roStat and roItemStat have also been removed as their functionality can be replicated with roElementAction.
6. The XSD and DTD have been updated to remove the 2.6x branch of messages as well as adding the new keepAlive message.
7. This document has been globally updated to replace all special quotes with standard quotes for better clarity and copy/paste support.
8. Minor typographical errors were corrected throughout the document.

7.2 Changes from MOS version 2.8.4 to 2.8.5

1. A new web control interface (HTML5) and communication examples / message flow has been added under chapter 5
2. A new appendix has been added with code examples for both newsroom and plugin implementations for web controls.
3. The roElementStat message has updated and now is bidirectional (MOS to NCS and NCS to MOS).
4. The ObjPaths (objPath and objProxyPath) fields have been updated with two new requirements:
    a. Be a call to return the media , without requiring client-side redirection
    - The character string following the last slash in the path must be the full filename, including the asset's extension.
5. The roElementAction message syntax has been updated to be less confusing.
6. objMetadataPath is now set to an optional field in all examples, previously it was incorrectly set to be a required field.

7. This document has been globally updated to replace all special quotes with standard quotes for better clarity and copy/paste support.

7.3 Changes from MOS version 2.8.3 to 2.8.4

1. ncsReqStoryAction is a new method for ActiveX Plug-Ins to create, edit, or replace stories on a NCS
2. MOS 2.8.4 XSD section was added.
3. Fixed a number of typos and added hyperlinks where necessary to improve this document's readability.
4. objTB examples and explanation have been made clearer by using the specific time base codes for NTSC. Previous versions of MOS used the objTB of 30 for NTSC time base this would result in a objTB of 60 for NTSC. MOS 2.8.4 uses the exact time base value of 29.97 for NTSC this results in NTSC having a objTB of 59.94.
5. The listMachInfo message has been modified to allow a device to define itself as a NCS or a MOS. Additionally, the message requires the definition of supported MOS Profiles.
6. roReqStoryAction has been modified to give the MOS the ability to MOVE story(s) and CREATE more than one story.
7. The attribute techDescription was previously defined as not being required, this has been corrected. techDescription is a required attribute of objPath and objProxyPaths.
8. objMetadataPath has been added to the objPaths structure. objMetadataPath is a path that resolves to the MOS object xml file.

7.4 Changes from MOS version 2.8.2 to 2.8.3

1. roElementStat is a new method for the MOS to update the NCS on the status of any Item, Story, or a RO. This allows the NCS to reflect the status of any element in the MOS Running Order in the NCS Running Order display. roElementStat now makes roStat and roItemStat legacy commands. roElementStat will be used in profile two as a means of the NCS updateing the MOS on the status of items as well as ROs. Additionally, roElementStat will be used in profile four as a means for the NCS to update a MOS on the status of a story.
2. The roStorySend message has been modified to allow for transmission of agency/wire protocol data. This has been implemented by adding an optional attribute, Read1stMEMasBody,, to the storyBody tag that indicates an agency/wire transmission is in use. The Read1stMEMasBody tag will allow the first MEM block to substitute the story body. Users should look for the body of the story in the first MEM block. Examples of agency/wire data are newsML, IPC, NAA, and other custom formats.

3. An attribute has been added to the mosReqObjList family of messages and the roReqStoryAction messages which identifies a username.

7.5 Changes from MOS version 2.8.1 to 2.8.2

1. The roAck and roItemStat messages now contain an optional itemChannel element. Its purpose is to allow the NCS to reflect a new channel when the MOS changes the channel on an item.
2. The mosObj message now contains an optional objPaths element. Its purpose is to allow the MOS to indicate how to retrieve its media objects.
3. A new message called mosReqObjAction has been added to.Profile 3. It is a generalization of the mosObjectCreate message, in that it allows an NCS to modify or delete the placeholder MOS objects that it creates.
4. A new profile "Profile 7 – MOS RO/Content List Modification" has been added. Its purpose is to allow a MOS to make changes to the running order in an NCS. The profile contains one new message called roReqStoryAction. This message allows the MOS to add, modify, or delete stories in the NCS. Correspondingly, there is a new tag called mosProfile7 in the listMachInfo message.
5. The roElementAction message has a new operation "SWAP." This repairs an oversight made in version 2.8, where the roStorySwap message was supposed to be replaced by,roElementAction, but the method was never specified.
6. The objPath element has been added as an option to mosObj and item messages and structures. This provides an explicit and unambiguous path to the media file.

7.6 Changes from MOS version 2.8 to 2.8.1

1. A new family of messages has been added to allow the NCS to query the MOS for object metadata meeting certain criteria. The mosReqObjList message supports a subset of the XPath query language for mosObj message retrieval. They have been added to Profile 3 – Advanced Object-Based Workflow.
2. A new messageID element has been added to all the MOS device messages to support intelligent retry if a connection times out before a response to a message has been received. Three ActiveX messages also had the messageID tag added:
   ncsAppInfo
   mosItemReplace
   roStorySend
   The ActiveX messages do not require a value for the tag, as the communication happens within a single process.
3. Added a new ActiveX message.ncsReqAppClose. A hosted ActiveX Plugin can send this message to the NCS Host when it wants to shut itself down.

4. The roElementAction message description has been rewritten to make its use clearer. More examples have also been added. The message syntax and functionality have not changed.
5. All messages are now included in the DTD.
6. All the example messages have been validated by the DTD.

7.7 Changes from MOS version 2.6 to 2.8

The following command messages have been added:

1) A single preferred command message, roElementAction, is now available for manipulation of story and item sequences. This command message can effectively replace all existing use of roStory and roItem commands.

2) Five additional commands were added as alternates to roElementAction to ease transition and provide backward compatibility. These commands are allowed in MOS v2.8 but will be phased out at some point in the future

    a. roItemInsert
    b. roItemReplace
    c. roItemMoveMultiple
    d. roItemDelete
    e. roStoryMoveMultiple – allows multiple stories to be moved in a single command.

    Item level commands are analogous to the story-level commands with similar names.

    The item-level Append and Swap commands can be performed by using,roItemInsert and roItemMoveMultiple, respectively, and provide no extra performance gain. Hence roItemAppend and roItemSwap are not needed.

    Note: these commands are used to manage items within a single story; these cannot be used to copy or move items between stories.

The following command messages have been changed:

1) mosReqAll - command has reversed the meaning of the <pause> tag, so that a pause value greater than zero means that individual mosObj messages are sent by the MOS. A pause value of zero means that a single mosListAll message is sent by the MOS.

2) mosListAll - command now contains <mosObj> tags, instead of all the object fields appearing as direct tags inside <mosListAll>.

3) roListAll - command now contains <ro> tags, instead of all the ro fields appearing as direct tags inside roListAll.

4) listMachInfo - command contains additional tags to define the MOS profiles supported by the MOS, and optional ActiveX configuration information.

7.8 Changes to MOS version 2.6 WD-2001-08-09

1. Removed second reference to mosExternalMetadata in roStorySend description
2. DTD reworked with suggestions from Jiri Basek Aveco s.r.o (Jiri.Basek@aveco.com)
3. DTD also posted to web site at http://www.mosprotocol.com/mos2dot601.dtd

7.9 Changes from MOS version 2.5 to 2.6 WD-2001-06-06

1. Added message for mosItemReplace.
2. Added message for roMetadataReplace.
3. Added message for roStoryMove.
4. Added structure for mosExternalMetadata.
5. mosExternalMetadata structure added to many common elements.
6. DTD was restructured to include new and changed elements. The sequence of definitions was also changed.

8. MOS 4.0 DTD

```
<!-- MOS.DTD version 4.0 June 7, 2019-->
<!--Thanks to Jiri Basek Aveco s.r.o (Jiri.Basek@aveco.com) and the Octopus Team for the following list of modifications due to original DTD bugs :
      1:  element "roStorySend" : comma added between "mosExternalMetadata*" and "storyBody"
      2:  element "roStorySend" old version : deactivated
      3:  element "item" : ending bracket added after "mosExternalMetadata*"
      4:  element "command" : "READY", "EXECUTE", "PAUSE", "STOP", "SIGNAL" are not elements but predefined strings
      5:  element "mosObj" : "externalData" changed to "mosExternalData"
      6:  ATTLIST metadata : deactivated. ? should it be changed to ATTLIST mosExternalMetadata ?
      8:  element "mosScope" : "object, "story", "playlist" are not elements but predefined strings
      A9: element "mos" : "reqMachineInfo" changed to "reqMachInfo"
      A10:  element "storyNum" defined

Additional changes have been made to the formatting and sequence of the elements in order to better match the order of structures presented in the MOS Protocol document.

-->
<!-- MOS Message - One message type per message -->
<!ELEMENT mos ((ncsAck | ncsReqAppInfo | ncsReqAppMode | ncsStoryRequest | ncsItemRequest | ncsItem | ncsReqAppClose | (mosID, ncsID, messageID, (mosAck | mosObj | mosReqObj | mosReqAll | mosListAll | mosObjCreate | mosItemReplace | ncsAppInfo | roAck | roCreate | roReplace | roMetadataReplace | roDelete | roReq | roList | roReqAll | roListAll | roStat | roReadyToAir | roStoryAppend | roStoryInsert | roStoryReplace | roStoryMove | roStorySwap | roStoryDelete | roStoryMoveMultiple | roItemInsert | roItemReplace | roItemMoveMultiple | roItemDelete | roElementAction | roItemStat | roElementStat | roItemCue | roCtrl | roStorySend | keepAlive | heartbeat | reqMachInfo | listMachInfo | mosReqSearchableSchema | mosListSearchableSchema | mosReqObjList | mosObjList | mosReqObjAction | roReqStoryAction))))>
<!ELEMENT mosAck (objID, objRev, status, statusDescription)>
<!ELEMENT mosObj (objID, objSlug, mosAbstract?, objGroup?, objType, objTB, objRev, objDur, status, objAir, objPaths?, createdBy, created, changedBy, changed, description, mosExternalMetadata*)>
<!ELEMENT mosReqObj (objID)>
<!ELEMENT mosReqAll (pause)>
<!ELEMENT mosListAll (mosObj*)>
<!ELEMENT mosReqSearchableSchema EMPTY>
<!ATTLIST mosReqSearchableSchema username CDATA #IMPLIED>
<!ELEMENT mosListSearchableSchema (mosSchema)>
<!ATTLIST mosListSearchableSchema username CDATA #IMPLIED>
<!ELEMENT mosReqObjList (queryID, listReturnStart, listReturnEnd, generalSearch, mosSchema, searchGroup*)>
<!ATTLIST mosReqObjList username CDATA #IMPLIED>
<!ELEMENT searchGroup (searchField+)>
<!ELEMENT searchField EMPTY>
<!ATTLIST searchField
            XPath CDATA #REQUIRED
            sortByOrder CDATA #IMPLIED
            sortType CDATA #IMPLIED
>
<!ELEMENT mosObjList (queryID, listReturnStart, listReturnEnd, listReturnTotal, listReturnStatus?, list?)>
<!ATTLIST mosObjList username CDATA #IMPLIED>
<!ELEMENT list (mosObj+)>
<!ELEMENT generalSearch (#PCDATA)>
<!ELEMENT listReturnStart (#PCDATA)>
<!ELEMENT listReturnEnd (#PCDATA)>
<!ELEMENT listReturnTotal (#PCDATA)>
<!ELEMENT listReturnStatus (#PCDATA)>
<!ELEMENT queryID (#PCDATA)>
```

```
<!ELEMENT mosObjCreate (objSlug, objGroup?, objType, objTB, objDur?, time?, createdBy?, description?,
mosExternalMetadata*)>
<!ELEMENT mosItemReplace (roID, storyID, item)>
<!ELEMENT ncsAck (status, statusDescription?)>
<!ELEMENT ncsAppInfo (mosObj?, roID?, storyID?, item?, ncsInformation)>
<!ELEMENT roAck (roID, roStatus, (storyID, itemID, objID, itemChannel?, status)*)>
<!ELEMENT roCreate (roID, roSlug, roChannel?, roEdStart?, roEdDur?, roTrigger?, macroIn?, macroOut?,
mosExternalMetadata*, story*)>
<!ELEMENT roReplace (roID, roSlug, roChannel?, roEdStart?, roEdDur?, roTrigger?, macroIn?, macroOut?,
mosExternalMetadata*, story*)>
<!ELEMENT roMetadataReplace (roID, roSlug, roChannel?, roEdStart?, roEdDur?, roTrigger?, macroIn?,
macroOut?, mosExternalMetadata?)>
<!ELEMENT roDelete (roID)>
<!ELEMENT roReq (roID)>
<!ELEMENT roList (roID, roSlug, roChannel?, roEdStart?, roEdDur?, roTrigger?, macroIn?, macroOut?,
mosExternalMetadata*, story*)>
<!ELEMENT roListAll (ro*)>
<!ELEMENT ro (roID, roSlug?, roChannel?, roEdStart?, roEdDur?, roTrigger?, mosExternalMetadata*)>
<!ELEMENT roReadyToAir (roID, roAir)>
<!ELEMENT roStoryAppend (roID, story+)>
<!ELEMENT roStoryInsert (roID, storyID, story+)>
<!ELEMENT roElementAction (roID, element_target?, element_source)>
<!ELEMENT element_target  (storyID, itemID?)>
<!ELEMENT element_source  (story+ | item+ | storyID+ | itemID+)>
<!ATTLIST roElementAction operation CDATA #REQUIRED>
<!ELEMENT mosReqObjAction (objSlug?, mosAbstract?, objGroup?, objType?, objTB?, objDur?, time?,
createdBy?, changedBy?, changed?, description?, mosExternalMetadata*)>
<!ATTLIST mosReqObjAction
                        operation CDATA #REQUIRED
                        objID CDATA #IMPLIED
>
<!ELEMENT roReqStoryAction (roStorySend)>
<!ATTLIST roReqStoryAction
                        operation CDATA #REQUIRED
                        leaseLock CDATA #IMPLIED
                        username CDATA #IMPLIED
>
<!ELEMENT ncsReqStoryAction (roStorySend)>
<!ATTLIST ncsReqStoryAction
                        operation CDATA #REQUIRED
>
<!ELEMENT roStorySend (roID, storyID, storySlug?, storyNum?, storyBody, mosExternalMetadata*)>
<!ATTLIST storyBody Read1stMEMasBody CDATA #IMPLIED>
<!ELEMENT roElementStat (roID, storyID?, itemID, objID?, itemChannel?, status, time)>
<!ATTLIST roElementStat  element CDATA  #REQUIRED>
<!ELEMENT roItemCue (mosID, roID, storyID, itemID, roEventType, roEventTime, mosExternalMetadata*)>
<!ELEMENT roCtrl (roID, storyID, itemID, command, mosExternalMetadata*)>
<!ELEMENT keepalive>
<!ELEMENT heartbeat (time)>
<!ELEMENT listMachInfo (manufacturer, model, hwRev, swRev, DOM, SN, ID, time, opTime?, mosRev,
supportedProfiles, defaultActiveX*, mosExternalMetadata*)>
<!ELEMENT supportedProfiles (mosProfile)>
<!ELEMENT mosProfile (#PCDATA)
<!ATTLIST   mosProfile number CDATA #REQUIRED>
<!ATTLIST   supportedProfiles deviceType CDATA #REQUIRED>
<!ELEMENT defaultActiveX (mode, controlFileLocation, controlSlug, controlName, controlDefaultParams)>
<!ELEMENT story (storyID, storySlug?, storyNum?, mosExternalMetadata*, item*)>
<!ELEMENT description (#PCDATA | p | em | tab)*>
<!ELEMENT storyBody ((storyPresenter*, storyPresenterRR*, p*, storyItem*)*)>
<!ELEMENT storyItem (itemID, itemSlug?, objID, mosID, mosAbstract?, itemChannel?, itemEdStart?, itemEdDur?,
itemUserTimingDur?, itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
<!ELEMENT item (itemID, itemSlug?, objID, mosID, mosPlugInID?, mosAbstract?, objPaths?, itemChannel?,
itemEdStart?, itemEdDur?, itemUserTimingDur?, itemTrigger?, macroIn?, macroOut?, mosExternalMetadata*)>
<!ELEMENT mosExternalMetadata (mosScope?, mosSchema, mosPayload)>
<!ELEMENT ncsInformation (userID, runContext, software, UImetric*)>
<!ELEMENT UImetric ((startx, starty, endx, endy, mode, canClose?)?)>
```

```
<!ATTLIST UImetric num CDATA #REQUIRED>
<!ELEMENT ncsItem (item)>
<!ELEMENT ncsReqAppMode (UImetric)>
<!ELEMENT software (manufacturer, product, version)>
<!ELEMENT b (#PCDATA | i | u)*>
<!ELEMENT i (#PCDATA | b | u)*>
<!ELEMENT p (#PCDATA | em | tab | pi | pkg | b | i | u)*>
<!ELEMENT pi (#PCDATA | b | i | u)*>
<!ELEMENT pkg (#PCDATA | b | i | u)*>
<!ELEMENT u (#PCDATA | b | i)*>
<!ELEMENT mosID (#PCDATA)>
<!ELEMENT ncsID (#PCDATA)>
<!ELEMENT canClose (#PCDATA)>
<!ELEMENT changed (#PCDATA)>
<!ELEMENT changedBy (#PCDATA)>
<!ELEMENT command (#PCDATA)>
<!-- valid values for "command" are "READY", "EXECUTE", "PAUSE", "STOP", "SIGNAL" -->
<!ELEMENT controlDefaultParams (#PCDATA)>
<!ELEMENT controlFileLocation (#PCDATA)>
<!ELEMENT controlName (#PCDATA)>
<!ELEMENT controlSlug (#PCDATA)>
<!ELEMENT created (#PCDATA)>
<!ELEMENT createdBy (#PCDATA)>
<!ELEMENT DOM (#PCDATA)>
<!ELEMENT em (#PCDATA)>
<!ELEMENT endx (#PCDATA)>
<!ELEMENT endy (#PCDATA)>
<!ELEMENT hwRev (#PCDATA)>
<!ELEMENT ID (#PCDATA)>
<!ELEMENT itemChannel (#PCDATA)>
<!ELEMENT itemEdDur (#PCDATA)>
<!ELEMENT itemEdStart (#PCDATA)>
<!ELEMENT itemID (#PCDATA)>
<!ELEMENT itemSlug (#PCDATA)>
<!ELEMENT itemTrigger (#PCDATA)>
<!ELEMENT itemUserTimingDur (#PCDATA)>
<!ELEMENT macroIn (#PCDATA)>
<!ELEMENT macroOut (#PCDATA)>
<!ELEMENT manufacturer (#PCDATA)>
<!ELEMENT mode (#PCDATA)>
<!ELEMENT model (#PCDATA)>
<!ELEMENT mosAbstract ANY>
<!ELEMENT mosPayload ANY>
<!ELEMENT mosPlugInID (#PCDATA)>
<!ELEMENT mosProfile (#PCDATA)>
<!ELEMENT mosSchema (#PCDATA)>
<!ELEMENT mosScope (#PCDATA)>
<!-- valid values for "mosScope" are "OBJECT", "STORY", "PLAYLIST" -->
<!ELEMENT mosRev (#PCDATA)>
<!ELEMENT ncsItemRequest EMPTY>
<!ELEMENT ncsReqAppClose EMPTY>
<!ELEMENT ncsReqAppInfo EMPTY>
<!ELEMENT ncsStoryRequest EMPTY>
<!ELEMENT objAir (#PCDATA)>
<!ELEMENT objDur (#PCDATA)>
<!ELEMENT objGroup (#PCDATA)>
<!ELEMENT objID (#PCDATA)>
<!ELEMENT objPaths ( objPath*, objProxyPath*, objMetadataPath)>
<!ELEMENT objPath (#PCDATA)>
<!ELEMENT objProxyPath (#PCDATA)>
<!ELEMENT objMetadataPath (#PCDATA)>
<!ATTLIST   objPath  techDescription CDATA #REQUIRED>
<!ATTLIST   objProxyPath techDescription CDATA #REQUIRED>
<!ATTLIST   objMetadataPath techDescription CDATA #REQUIRED>
<!ELEMENT objRev (#PCDATA)>
<!ELEMENT objSlug (#PCDATA)>
```

```
<!ELEMENT objTB (#PCDATA)>
<!ELEMENT objType (#PCDATA)>
<!ELEMENT opTime (#PCDATA)>
<!ELEMENT pause (#PCDATA)>
<!ELEMENT product (#PCDATA)>
<!ELEMENT messageID (#PCDATA)>
<!ELEMENT reqMachInfo EMPTY>
<!ELEMENT roAir (#PCDATA)>
<!ELEMENT roID (#PCDATA)>
<!ELEMENT roChannel (#PCDATA)>
<!ELEMENT roCtrlCmd (#PCDATA)>
<!ELEMENT roCtrlTime (#PCDATA)>
<!ELEMENT roEdDur (#PCDATA)>
<!ELEMENT roEdStart (#PCDATA)>
<!ELEMENT roEventTime (#PCDATA)>
<!ELEMENT roEventType (#PCDATA)>
<!ELEMENT roReqAll EMPTY>
<!ELEMENT roSlug (#PCDATA)>
<!ELEMENT roStatus (#PCDATA)>
<!ELEMENT roTrigger (#PCDATA)>
<!ELEMENT runContext (#PCDATA)>
<!ELEMENT SN (#PCDATA)>
<!ELEMENT startx (#PCDATA)>
<!ELEMENT starty (#PCDATA)>
<!ELEMENT status (#PCDATA)>
<!ELEMENT statusDescription (#PCDATA)>
<!ELEMENT storyID (#PCDATA)>
<!ELEMENT storyNum (#PCDATA)>
<!ELEMENT storyPresenter (#PCDATA)>
<!ELEMENT storyPresenterRR (#PCDATA)>
<!ELEMENT storySlug (#PCDATA)>
<!ELEMENT swRev (#PCDATA)>
<!ELEMENT tab (#PCDATA)>
<!ELEMENT time (#PCDATA)>
<!ELEMENT userID (#PCDATA)>
<!ELEMENT version (#PCDATA)>
<!-- Attributes -->
<!ATTLIST mos
      version CDATA #FIXED "-//MOS Group//DTD MOS 2.8.2//EN"
      changeDate CDATA #FIXED "09 April 2005"
>
<!-- <!ATTLIST metadata xml:space (default | preserve) 'preserve'>  -->
```

1. MOS 4.0 XSD

```
      <MOS.XSD version 2.8.5 September 15, 2009>

<xsd:schema xmlns:xsd='http://www.w3.org/2001/XMLSchema'>
 <xsd:element name='mos'>
  <xsd:complexType>
   <xsd:choice>
    <xsd:element ref='ncsAck'/>
    <xsd:element ref='ncsReqAppInfo'/>
    <xsd:element ref='ncsReqAppMode'/>
    <xsd:element ref='ncsStoryRequest'/>
    <xsd:element ref='ncsItemRequest'/>
    <xsd:element ref='ncsItem'/>
    <xsd:element ref='ncsReqAppClose'/>
    <xsd:element ref="ncsReqStoryAction"/>
    <xsd:sequence>
```

```
    <xsd:element ref='mosID'/>
    <xsd:element ref='ncsID'/>
    <xsd:element ref='messageID'/>
    <xsd:choice>
     <xsd:element ref='mosAck'/>
     <xsd:element ref='mosObj'/>
     <xsd:element ref='mosReqObj'/>
     <xsd:element ref='mosReqAll'/>
     <xsd:element ref='mosListAll'/>
     <xsd:element ref='mosObjCreate'/>
     <xsd:element ref='mosItemReplace'/>
     <xsd:element ref='ncsAppInfo'/>
     <xsd:element ref='roAck'/>
     <xsd:element ref='roCreate'/>
     <xsd:element ref='roReplace'/>
     <xsd:element ref='roMetadataReplace'/>
     <xsd:element ref='roDelete'/>
     <xsd:element ref='roReq'/>
     <xsd:element ref='roList'/>
     <xsd:element ref='roReqAll'/>
     <xsd:element ref='roListAll'/>
     <xsd:element ref='roReadyToAir'/>
     <xsd:element ref='roElementAction'/>
     <xsd:element ref='roElementStat'/>
     <xsd:element ref='roItemCue'/>
     <xsd:element ref='roCtrl'/>
     <xsd:element ref='roStorySend'/>
     <xsd:element ref='keepAlive'/>
     <xsd:element ref='heartbeat'/>
     <xsd:element ref='reqMachInfo'/>
     <xsd:element ref='listMachInfo'/>
     <xsd:element ref='mosReqSearchableSchema'/>
     <xsd:element ref='mosListSearchableSchema'/>
     <xsd:element ref='mosReqObjList'/>
     <xsd:element ref='mosObjList'/>
     <xsd:element ref='mosReqObjAction'/>
     <xsd:element ref='roReqStoryAction'/>
    </xsd:choice>
   </xsd:sequence>
  </xsd:choice>
  <xsd:attribute name='version' type='xsd:string' fixed='-//MOS Group//DTD MOS 2.8.2//EN'/>
  <xsd:attribute name='changeDate' type='xsd:string' fixed='09 April 2005'/>
 </xsd:complexType>
</xsd:element>
<xsd:element name='mosAck'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='objID'/>
   <xsd:element ref='objRev'/>
   <xsd:element ref='status'/>
   <xsd:element ref='statusDescription'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosObj'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='objID'/>
   <xsd:element ref='objSlug'/>
   <xsd:element ref='mosAbstract' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objGroup' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objType'/>
   <xsd:element ref='objTB'/>
   <xsd:element ref='objRev'/>
   <xsd:element ref='objDur'/>
```

```
   <xsd:element ref='status'/>
   <xsd:element ref='objAir'/>
   <xsd:element ref='objPaths' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='createdBy'/>
   <xsd:element ref='created'/>
   <xsd:element ref='changedBy'/>
   <xsd:element ref='changed'/>
   <xsd:element ref='description'/>
   <!--<xsd:element ref='\' minOccurs='0' maxOccurs='unbounded'/>-->
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosReqObj'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='objID'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosReqAll'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='pause'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosListAll'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='mosObj' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosReqSearchableSchema'>
 <xsd:complexType>
  <xsd:attribute name='username' type='xsd:string' use='optional'/>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosListSearchableSchema'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='mosSchema'/>
  </xsd:sequence>
  <xsd:attribute name='username' type='xsd:string' use='optional'/>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosReqObjList'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='queryID'/>
   <xsd:element ref='listReturnStart'/>
   <xsd:element ref='listReturnEnd'/>
   <xsd:element ref='generalSearch'/>
   <xsd:element ref='mosSchema'/>
   <xsd:element ref='searchGroup' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
  <xsd:attribute name='username' type='xsd:string' use='optional'/>
 </xsd:complexType>
</xsd:element>
```

```
 <xsd:element name='searchGroup'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='searchField' maxOccurs='unbounded'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='searchField'>
  <xsd:complexType>
   <xsd:attribute name='XPath' type='xsd:string' use='required'/>
   <xsd:attribute name='sortByOrder' type='xsd:string' use='optional'/>
   <xsd:attribute name='sortType' type='xsd:string' use='optional'/>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='mosObjList'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='queryID'/>
    <xsd:element ref='listReturnStart'/>
    <xsd:element ref='listReturnEnd'/>
    <xsd:element ref='listReturnTotal'/>
    <xsd:element ref='listReturnStatus' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='list' minOccurs='0' maxOccurs='1'/>
   </xsd:sequence>
   <xsd:attribute name='username' type='xsd:string' use='optional'/>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='list'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='mosObj' maxOccurs='unbounded'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='generalSearch'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
 </xsd:simpleType>
 </xsd:element>

 <xsd:element name='listReturnStart'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:int">
   <!--Positive integers only-->
    <xsd:pattern value="^\d*\.{0,1}\d+$"/>
  </xsd:restriction>
 </xsd:simpleType>
 </xsd:element>

 <xsd:element name='listReturnEnd'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:int">
   <!--Positive integers only-->
    <xsd:pattern value="^\d*\.{0,1}\d+$"/>
  </xsd:restriction>
 </xsd:simpleType>
 </xsd:element>

 <xsd:element name='listReturnTotal'>
 <xsd:simpleType>
```

```
   <xsd:restriction base="xsd:int">
   <!--Positive integers only-->
    <xsd:pattern value="^\d*\.{0,1}\d+$"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='listReturnStatus'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='queryID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='mosObjCreate'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='objSlug'/>
    <xsd:element ref='objGroup' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='objType'/>
    <xsd:element ref='objTB'/>
    <xsd:element ref='objDur' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='time' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='createdBy' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='description' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='mosItemReplace'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='roID'/>
    <xsd:element ref='storyID'/>
    <xsd:element ref='item'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>


 <xsd:element name='ncsAck'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='status'/>
    <xsd:element ref='statusDescription' minOccurs='0' maxOccurs='1'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='ncsAppInfo'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='mosObj' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='roID' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='storyID' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='item' minOccurs='0' maxOccurs='1'/>
```

```
   <xsd:element ref='ncsInformation'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roAck'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='roStatus'/>
   <xsd:sequence minOccurs='0' maxOccurs='unbounded'>
    <xsd:element ref='storyID'/>
    <xsd:element ref='itemID'/>
    <xsd:element ref='objID'/>
    <xsd:element ref='itemChannel' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='status'/>
   </xsd:sequence>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roCreate'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='roSlug'/>
   <xsd:element ref='roChannel' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdStart' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roTrigger' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroIn' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroOut' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
   <xsd:element ref='story' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roReplace'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='roSlug'/>
   <xsd:element ref='roChannel' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdStart' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roTrigger' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroIn' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroOut' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
   <xsd:element ref='story' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roMetadataReplace'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='roSlug'/>
   <xsd:element ref='roChannel' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdStart' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roTrigger' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroIn' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroOut' minOccurs='0' maxOccurs='1'/>
```

```
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='1'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roDelete'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roReq'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roList'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='roSlug'/>
   <xsd:element ref='roChannel' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdStart' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roTrigger' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroIn' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroOut' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
   <xsd:element ref='story' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roListAll'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='ro' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='ro'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='roSlug' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roChannel' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdStart' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roEdDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='roTrigger' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roReadyToAir'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='roAir'/>
  </xsd:sequence>
```

```
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStoryAppend'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='story' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStoryInsert'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='story' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStoryReplace'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='story' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStoryMove'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='storyID'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStorySwap'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='storyID'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStoryDelete'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStoryMoveMultiple'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID' maxOccurs='unbounded'/>
```

```
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roItemInsert'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='itemID'/>
   <xsd:element ref='item' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roItemReplace'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='itemID'/>
   <xsd:element ref='item' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roItemMoveMultiple'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='itemID' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roItemDelete'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='itemID' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

 <xsd:element name='roElementAction'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='element_target' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='element_source'/>
  </xsd:sequence>
  <xsd:attribute name='operation' use='required'>
              <xsd:simpleType>
                        <xsd:restriction base="xsd:string">
                                  <xsd:enumeration value="INSERT"/>
                                  <xsd:enumeration value="REPLACE"/>
                                  <xsd:enumeration value="MOVE"/>
                                  <xsd:enumeration value="DELETE"/>
                                  <xsd:enumeration value="SWAP"/>
   </xsd:restriction>
          </xsd:simpleType>
          </xsd:attribute>
 </xsd:complexType>
</xsd:element>
```

```
<xsd:element name='element_target'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='storyID'/>
   <xsd:element ref='itemID' minOccurs='0' maxOccurs='1'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='element_source'>
 <xsd:complexType>
  <xsd:choice>
   <xsd:element ref='story' maxOccurs='unbounded'/>
   <xsd:element ref='item' maxOccurs='unbounded'/>
   <xsd:element ref='storyID' maxOccurs='unbounded'/>
   <xsd:element ref='itemID' maxOccurs='unbounded'/>
  </xsd:choice>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosReqObjAction'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='objSlug' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosAbstract' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objGroup' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objType' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objTB' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='time' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='createdBy' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='changedBy' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='changed' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='description' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
  <xsd:attribute name='operation' type='xsd:string' use='required'/>
  <xsd:attribute name='objID' type='xsd:string' use='optional'/>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roReqStoryAction'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roStorySend'/>
  </xsd:sequence>
  <xsd:attribute name='operation' type='xsd:string' use='required'/>
  <xsd:attribute name='leaseLock' type='xsd:string' use='optional'/>
  <xsd:attribute name='username' type='xsd:string' use='optional'/>
 </xsd:complexType>
</xsd:element>

<xsd:element name='roStorySend'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='roID'/>
   <xsd:element ref='storyID'/>
   <xsd:element ref='storySlug' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='storyNum' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='storyBody'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>
```

```
 <xsd:element name='roItemStat'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='roID'/>
    <xsd:element ref='storyID'/>
    <xsd:element ref='itemID'/>
    <xsd:element ref='objID'/>
    <xsd:element ref='itemChannel' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='status'/>
    <xsd:element ref='time'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='roElementStat'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='roID'/>
    <xsd:element ref='storyID' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='itemID'/>
    <xsd:element ref='objID' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='itemChannel' minOccurs='0' maxOccurs='1'/>
    <xsd:element ref='status'/>
    <xsd:element ref='time'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='roItemCue'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='mosID'/>
    <xsd:element ref='roID'/>
    <xsd:element ref='storyID'/>
    <xsd:element ref='itemID'/>
    <xsd:element ref='roEventType'/>
    <xsd:element ref='roEventTime'/>
    <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='roCtrl'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='roID'/>
    <xsd:element ref='storyID'/>
    <xsd:element ref='itemID'/>
    <xsd:element ref='command'/>
    <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

<xsd:element name='keepAlive'>
</xsd:element>

 <xsd:element name='heartbeat'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='time'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='listMachInfo'>
```

```
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='manufacturer'/>
   <xsd:element ref='model'/>
   <xsd:element ref='hwRev'/>
   <xsd:element ref='swRev'/>
   <xsd:element ref='DOM'/>
   <xsd:element ref='SN'/>
   <xsd:element ref='ID'/>
   <xsd:element ref='time'/>
   <xsd:element ref='opTime' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosRev'/>
   <xsd:element ref='SupportedProfiles'/>
   <xsd:element ref='defaultActiveX' minOccurs='0' maxOccurs='unbounded'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='defaultActiveX'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='mode'/>
   <xsd:element ref='controlFileLocation'/>
   <xsd:element ref='controlSlug'/>
   <xsd:element ref='controlName'/>
   <xsd:element ref='controlDefaultParams'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='story'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='storyID'/>
   <xsd:element ref='storySlug' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='storyNum' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
   <xsd:element ref='item' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='description'>
 <xsd:complexType mixed='true'>
  <xsd:choice minOccurs='0' maxOccurs='unbounded'>
   <xsd:element ref='p'/>
   <xsd:element ref='em'/>
   <xsd:element ref='tab'/>
  </xsd:choice>
 </xsd:complexType>
</xsd:element>

<xsd:element name='storyBody'>
 <xsd:complexType>
  <xsd:sequence minOccurs='0' maxOccurs='unbounded'>
   <!-- These elements should reside inside the p tag
            <xsd:element ref='storyPresenter' minOccurs='0' maxOccurs='unbounded'/>
   <xsd:element ref='storyPresenterRR' minOccurs='0' maxOccurs='unbounded'/>
            -->
   <xsd:element ref='p' minOccurs='0' maxOccurs='unbounded'/>
   <!-- Should reside in the p tag
            <xsd:element ref='storyItem' minOccurs='0' maxOccurs='unbounded'/>
            -->
  </xsd:sequence>
  <xsd:attribute name='Read1stMEMasBody' type='xsd:string' use='optional'/>
```

```
 </xsd:complexType>
</xsd:element>

<xsd:element name='storyItem'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='itemID'/>
   <xsd:element ref='itemSlug' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objID'/>
   <xsd:element ref='mosID'/>
   <xsd:element ref='mosAbstract' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemChannel' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemEdStart' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemEdDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemUserTimingDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemTrigger' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroIn' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroOut' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='item'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='itemID'/>
   <xsd:element ref='itemSlug' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objID'/>
   <xsd:element ref='mosID'/>
   <xsd:element ref='mosPlugInID' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosAbstract' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='objPaths' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemChannel' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemEdStart' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemEdDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemUserTimingDur' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='itemTrigger' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroIn' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='macroOut' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosExternalMetadata' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='mosExternalMetadata'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='mosScope' minOccurs='0' maxOccurs='1'/>
   <xsd:element ref='mosSchema'/>
   <xsd:element ref='mosPayload'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='ncsInformation'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='userID'/>
   <xsd:element ref='runContext'/>
   <xsd:element ref='software'/>
   <xsd:element ref='UImetric' minOccurs='0' maxOccurs='unbounded'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>
```

```
<xsd:element name='UImetric'>
 <xsd:complexType>
  <xsd:sequence minOccurs='0' maxOccurs='1'>
   <xsd:element ref='startx'/>
   <xsd:element ref='starty'/>
   <xsd:element ref='endx'/>
   <xsd:element ref='endy'/>
   <xsd:element ref='mode'/>
   <xsd:element ref='canClose' minOccurs='0' maxOccurs='1'/>
  </xsd:sequence>
  <xsd:attribute name='num' type='xsd:string' use='required'/>
 </xsd:complexType>
</xsd:element>

<xsd:element name='ncsItem'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='item'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

 <xsd:element name='ncsReqStoryAction'>
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref='roStorySend'/>
    </xsd:sequence>
    <xsd:attribute name='operation' use='required'>
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:enumeration value="NEW"/>
          <xsd:enumeration value="UPDATE"/>
          <xsd:enumeration value="REPLACE"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:complexType>
 </xsd:element>

<xsd:element name='ncsReqAppMode'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='UImetric'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='software'>
 <xsd:complexType>
  <xsd:sequence>
   <xsd:element ref='manufacturer'/>
   <xsd:element ref='product'/>
   <xsd:element ref='version'/>
  </xsd:sequence>
 </xsd:complexType>
</xsd:element>

<xsd:element name='b'>
 <xsd:complexType mixed='true'>
  <xsd:choice minOccurs='0' maxOccurs='unbounded'>
   <xsd:element ref='i'/>
   <xsd:element ref='u'/>
  </xsd:choice>
 </xsd:complexType>
</xsd:element>
```

```
 <xsd:element name='i'>
  <xsd:complexType mixed='true'>
   <xsd:choice minOccurs='0' maxOccurs='unbounded'>
    <xsd:element ref='b'/>
    <xsd:element ref='u'/>
   </xsd:choice>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='p'>
  <xsd:complexType mixed='true'>
   <xsd:choice minOccurs='0' maxOccurs='unbounded'>
    <xsd:element ref='em'/>
    <xsd:element ref='tab'/>
    <xsd:element ref='pi'/>
    <xsd:element ref='pkg'/>
    <xsd:element ref='b'/>
    <xsd:element ref='i'/>
    <xsd:element ref='u'/>
    <xsd:element ref='storyItem'/>
    <xsd:element ref='storyPresenter'/>
    <xsd:element ref='storyPresenterRR'/>
   </xsd:choice>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='pi'>
  <xsd:complexType mixed='true'>
   <xsd:choice minOccurs='0' maxOccurs='unbounded'>
    <xsd:element ref='b'/>
    <xsd:element ref='i'/>
    <xsd:element ref='u'/>
   </xsd:choice>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='pkg'>
  <xsd:complexType mixed='true'>
   <xsd:choice minOccurs='0' maxOccurs='unbounded'>
    <xsd:element ref='b'/>
    <xsd:element ref='i'/>
    <xsd:element ref='u'/>
   </xsd:choice>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='u'>
  <xsd:complexType mixed='true'>
   <xsd:choice minOccurs='0' maxOccurs='unbounded'>
    <xsd:element ref='b'/>
    <xsd:element ref='i'/>
   </xsd:choice>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='mosID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
 </xsd:simpleType>
</xsd:element>

 <xsd:element name='ncsID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
```

```
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='canClose' type='xsd:boolean'>
 </xsd:element>

 <xsd:element name='changed' type='xsd:string'>
</xsd:element>

 <xsd:element name='changedBy'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='command' type='xsd:string'>
 </xsd:element>

 <xsd:element name='controlDefaultParams' type='xsd:string'>
 </xsd:element>

 <xsd:element name='controlFileLocation' type='xsd:string'>
 </xsd:element>

 <xsd:element name='controlName'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='controlSlug'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='created' type='xsd:string'>
</xsd:element>

 <xsd:element name='createdBy'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='DOM' type='xsd:string'>
 </xsd:element>

 <xsd:element name='em' type='xsd:string'>
 </xsd:element>
 <xsd:element name='endx' type='xsd:string'>
 </xsd:element>

 <xsd:element name='endy' type='xsd:string'>
 </xsd:element>
```

```
 <xsd:element name='hwRev'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='ID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='itemChannel' type='xsd:string'>
 </xsd:element>

 <xsd:element name='itemEdDur'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:int">
   <!--Positive integers only-->
    <xsd:pattern value="^\d*\.{0,1}\d+$"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='itemEdStart'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:int">
   <!--Positive integers only-->
    <xsd:pattern value="^\d*\.{0,1}\d+$"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='itemID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='itemSlug'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='itemTrigger' type='xsd:string'>
 </xsd:element>

 <xsd:element name='itemUserTimingDur'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:int">
   <!--Positive integers only-->
    <xsd:pattern value="^\d*\.{0,1}\d+$"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='macroIn'>
```

```
 <xsd:simpleType>
  <xsd:restriction base="xsd:string">
   <xsd:maxLength value="128"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='macroOut'>
 <xsd:simpleType>
  <xsd:restriction base="xsd:string">
   <xsd:maxLength value="128"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='manufacturer'>
 <xsd:simpleType>
  <xsd:restriction base="xsd:string">
   <xsd:maxLength value="128"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='mode'>
        <xsd:simpleType>
                <xsd:restriction base="xsd:string">
                        <xsd:enumeration value="MODALDIALOG"/>
                        <xsd:enumeration value="MODELESS"/>
                        <xsd:enumeration value="CONTAINED"/>
                        <xsd:enumeration value="TOOLBAR"/>
                </xsd:restriction>
        </xsd:simpleType>
 </xsd:element>

 <xsd:element name='model'>
 <xsd:simpleType>
  <xsd:restriction base="xsd:string">
   <xsd:maxLength value="128"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='mosAbstract'>
  <xsd:complexType>
   <xsd:sequence>
   <xsd:any namespace="##any" processContents="skip"/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='mosPayload'>
   <!-- Does not match the examples provided on the mosProtocol web site nor doe it match what ENPS sends-->
  <xsd:complexType>
   <xsd:sequence>
   <xsd:any namespace="##any" processContents="skip"/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='mosPlugInID' type='xsd:string'>
 </xsd:element>
  <xsd:element name='SupportedProfiles'>
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref='mosProfile' minOccurs='1' maxOccurs='8'/>
      </xsd:sequence>
```

```
    <xsd:attribute name='deviceType' use='required'>
      <xsd:simpleType>
        <xsd:restriction base="xsd:string">
          <xsd:enumeration value="MOS"/>
          <xsd:enumeration value="NCS"/>
        </xsd:restriction>
      </xsd:simpleType>
    </xsd:attribute>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='mosProfile' >
  <xsd:complexType>
  <xsd:simpleContent>
    <xsd:extension base='xsd:boolean'>
      <xsd:attribute name='number' use='required'>
        <xsd:simpleType>
          <xsd:restriction base="xsd:int">
            <xsd:enumeration value="0"/>
            <xsd:enumeration value="1"/>
            <xsd:enumeration value="2"/>
            <xsd:enumeration value="3"/>
            <xsd:enumeration value="4"/>
            <xsd:enumeration value="5"/>
            <xsd:enumeration value="6"/>
            <xsd:enumeration value="7"/>
          </xsd:restriction>
        </xsd:simpleType>
      </xsd:attribute>
    </xsd:extension>
  </xsd:simpleContent>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='mosSchema' type='xsd:string'>
 </xsd:element>

 <xsd:element name='mosScope'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:enumeration value="OBJECT"/>
    <xsd:enumeration value="STORY"/>
    <xsd:enumeration value="PLAYLIST"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='mosRev'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>


 <xsd:element name='ncsItemRequest'>
  <xsd:complexType/>
 </xsd:element>

 <xsd:element name='ncsReqAppClose'>
  <xsd:complexType/>
 </xsd:element>

 <xsd:element name='ncsReqAppInfo'>
  <xsd:complexType/>
```

```
 </xsd:element>

 <xsd:element name='ncsStoryRequest'>
  <xsd:complexType/>
 </xsd:element>

 <xsd:element name='objAir'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:enumeration value="READY"/>
    <xsd:enumeration value="NOTREADY"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='objDur'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:int">
   <!--Positive integers only-->
    <xsd:pattern value="^\d*\.{0,1}\d+$"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='objGroup'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='objID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='objPaths'>
  <xsd:complexType>
   <xsd:sequence>
    <xsd:element ref='objPath' minOccurs='0' maxOccurs='unbounded'/>
    <xsd:element ref='objProxyPath' minOccurs='0' maxOccurs='unbounded'/>
    <xsd:element ref='objMetadataPath' minOccurs='0' maxOccurs='unbounded'/>
   </xsd:sequence>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='objPath'>
  <xsd:complexType>
  <xsd:simpleContent>
  <xsd:extension base='xsd:string'>
   <xsd:attribute name='techDescription' type='xsd:string' use='required'/>
   </xsd:extension>
   </xsd:simpleContent>
  </xsd:complexType>
 </xsd:element>

 <xsd:element name='objProxyPath'>
  <xsd:complexType>
  <xsd:simpleContent>
  <xsd:extension base='xsd:string'>
   <xsd:attribute name='techDescription' type='xsd:string' use='required'/>
   </xsd:extension>
```

```
  </xsd:simpleContent>
 </xsd:complexType>
</xsd:element>

<xsd:element name='objMetadataPath'>
 <xsd:complexType>
 <xsd:simpleContent>
 <xsd:extension base='xsd:string'>
  <xsd:attribute name='techDescription' type='xsd:string' use='required'/>
  </xsd:extension>
  </xsd:simpleContent>
 </xsd:complexType>
</xsd:element>


<xsd:element name='objRev'>
<xsd:simpleType>
  <xsd:restriction base="xsd:int">
  <!--Positive integers up to 999 only-->
   <xsd:pattern value="\d{3}$"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

<xsd:element name='objSlug'>
<xsd:simpleType>
  <xsd:restriction base="xsd:string">
   <xsd:maxLength value="128"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

<xsd:element name='objTB'>
<xsd:simpleType>
  <xsd:restriction base="xsd:int">
  <!--Positive integers only-->
   <xsd:pattern value="^\d*\.{0,1}\d+$"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

<xsd:element name='objType'>
<xsd:simpleType>
  <xsd:restriction base="xsd:string">
   <xsd:enumeration value="STILL"/>
   <xsd:enumeration value="AUDIO"/>
          <xsd:enumeration value="VIDEO"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

<xsd:element name='opTime'  type='xsd:string'>
</xsd:element>

<xsd:element name='pause'>
<xsd:simpleType>
  <xsd:restriction base="xsd:int">
  <!--Positive integers only-->
   <xsd:pattern value="^\d*\.{0,1}\d+$"/>
 </xsd:restriction>
</xsd:simpleType>
</xsd:element>

<xsd:element name='product' type='xsd:string'>
</xsd:element>
```

```
 <xsd:element name='messageID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:int">
   <!--Whole numbers start with 1, cannot start at 0 -->
    <xsd:pattern value="^[-+]?[1-9]\d*\.?[0]*$"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='reqMachInfo'>
  <xsd:complexType/>
 </xsd:element>

 <xsd:element name='roAir'>
  <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:enumeration value="READY"/>
            <xsd:enumeration value="NOTREADY"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='roID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='roChannel'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='roCtrlCmd'>
  <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:enumeration value="READY"/>
            <xsd:enumeration value="EXECUTE"/>
            <xsd:enumeration value="PAUSE"/>
            <xsd:enumeration value="STOP"/>
            <xsd:enumeration value="SIGNAL"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

<xsd:element  name='roCtrlTime' type='xsd:string'>
</xsd:element>

 <xsd:element name='roEdDur'  type='xsd:string'>
 </xsd:element>

 <xsd:element name='roEdStart' type='xsd:string'>
</xsd:element>

 <xsd:element name='roEventTime' type='xsd:string'>
</xsd:element>

 <xsd:element name='roEventType' type='xsd:string'>
 </xsd:element>

 <xsd:element name='roReqAll'>
```

```
 <xsd:complexType/>
 </xsd:element>

 <xsd:element name='roSlug'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='roStatus'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='roTrigger' type='xsd:string'>
 </xsd:element>

 <xsd:element name='runContext'>
  <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:enumeration value="BROWSE"/>
            <xsd:enumeration value="EDIT"/>
            <xsd:enumeration value="CREATE"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='SN'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

<xsd:element name='startx' type='xsd:string'>
 </xsd:element>

 <xsd:element name='starty' type='xsd:string'>
 </xsd:element>

 <xsd:element name='status'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='statusDescription'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='storyID'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
```

```
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='storyNum'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='storyPresenter' type='xsd:string'>
 </xsd:element>

 <xsd:element name='storyPresenterRR' type='xsd:string'>
 </xsd:element>

 <xsd:element name='storySlug'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='swRev'>
 <xsd:simpleType>
   <xsd:restriction base="xsd:string">
    <xsd:maxLength value="128"/>
  </xsd:restriction>
</xsd:simpleType>
</xsd:element>

 <xsd:element name='tab' type='xsd:string'>
 </xsd:element>

 <xsd:element name='time' type='xsd:string'>
</xsd:element>

 <xsd:element name='userID' type='xsd:string'>
 </xsd:element>

 <xsd:element name='version' type='xsd:string'>
 </xsd:element>
</xsd:schema>
```

10. References and Resources

10.1

The primary site for MOS protocol information is http://www.mosprotocol.com/.

10.2 XML FAQ

http://www.ucc.ie/xml/ contains an extensive document of Frequently Asked Questions regarding XML.

10.3 Recommended Reading

Just XML: John E. Simpson; 1999. Prentice Hall PTR. ISBN 0-13-9434417-8. ($34.99)
XML for Dummies Quick Reference: Mariva H. Aviram; 1998. IDG Books Worldwide, Inc. ISBN 0-7645-0383-9. ($14.99)

The Unicode Standard, Version 2.0: The Unicode Consortium. Addison-Wesley. ISBN 0-201-48345-9. ($62.95)

10.4 XML Web Sites

The mission of XML.com is to help you discover XML and learn how this new Internet technology can solve real-world problems in information management and electronic commerce. http://www.xml.com/xml/pub/

Robin Cover's XML resource page is perhaps the most useful and extensive available on the Web. http://www.oasis-open.org/cover/xml.html

10.5 Web Services Security References

WebSocket Overview
https://en.wikipedia.org/wiki/WebSocket

About HTML5 WebSocket
https://www.websocket.org/aboutwebsocket.html

Jetty WebSocket Example
http://www.eclipse.org/jetty/documentation/9.4.x/jetty-websocket-server- api.html

Apache MosProxyWsTunnel
https://httpd.apache.org/docs/2.4/mod/mod_proxy_wstunnel.html

WebSocket Security
https://devcenter.heroku.com/articles/websocket-security

11. Appendix A – Sample Code for Web-Based Controls

Examples

The examples provided in the following sections are proof-of-concept, and have been demonstrated as working across all major browser implementations. They use standard behavior as noted in the HTML specification for messaging. See http://www.w3.org/TR/webmessaging/ for more information.

Newsroom Implementation Example

The newsroom is responsible for hosting a container capable of running the web control. This could be an embedded web browser control (such as an Internet Explorer, Firefox, or Chrome embedded browser inside the NCS). The specific interface between the NCS and this browser is proprietary, and defined by the vendor. The browser itself must host an iframe or similar container that is reachable in the device plugin via the window.parent value, and the NCS must subscribe to 'message' window events supplied by the browser.The example below illustrates this, with the assumption that the NCS itself is web-based for simplicity,and using an iframe control to host the device plugin.

What is the Origin?

To overcome cross-site scripting and cross-domain/same-origin policy limitations inside a web browser,we're building the message flow over a standard messaging service built into all major browsers, and defined as part of the HTML5 specification. We're effectively piggybacking the MOS messages across this secure messaging service. One of the requirements for this to work is the concept of origin, to ensure that you're only receiving and handling messages from windows that you expect. In this case, the NCS origin is the URL/host of the newsroom server. The origin should appear in the form is PROTOCOL://URL[:PORT], for example http://192.168.1.100, or a hostname is also valid, such as https://myncsserver. If a non-standard (not 80/443) port is used, it should be suffixed onto the origin. When the NCS opens the URL for the device, we add the origin as a parameter at the end that URL, indicating to the device the origin of the NCS that it should expect to receive messages from. The NCS can determine the origin of the device by inspecting the URL to that device plugin, the origin being the protocol, hostname, and (optional) port elements of that URL.

To Send a Message to the Device

In this case, the NCS would invoke the mosMsgFromHost message, which locates the iframe container by ID, and invokes a "postMessage" method, passing in both the message, and the device origin (thetarget) URL. If there is a reply to be expected to this message, it will be handled as an inbound message in the mosMsgFromPlugin event.

To Receive and Reply to a Message from the Device

The mosMsgFromPlugin function is defined, and receives an event. This function is registered against the current window, so that whenever an event from the iframe is received, this function is invoked. The body of the message is located in event.data, as defined as part of the HTML specification. To reply to this message, simply invoke the postMessage method on the event.source, passing in the reply message, and the event origin.

Sample Code for Messaging

```
<html>
<head>

<script type="text/javascript">
  var DEVICE_URL = 'http://mydevice:8080/index.html';
  var NCS_ORIGIN = window.location.protocol + "//" +
window.location.host;
  var DEVICE_ORIGIN = DEVICE_URL;

if (DEVICE_URL.indexOf('/', 8) >= 0) {
  DEVICE_ORIGIN = url.substring(0, url.indexOf('/', 8));
}

function mosMsgFromPlugIn(event) {
  var message = event.data;
  // Handle the Message
  // To Reply, issue a postMessage on the event source.
  var reply = "SOME MESSAGE";
  event.source.postMessage(reply, event.origin);
}

function mosMsgFromHost(message) {
  document.getElementById('plugin').contentWindow.postMessage(message,
'http://DEVICE_ORIGIN');
}

// Register the Event Handler – Cross Browser
if (window.addEventListener) {
  window.addEventListener('message', mosMsgFromPlugIn, false);
} else if (window.attachEvent) {
  window.attachEvent('message', mosMsgFromPlugIn, false);
}

</script>

</head>
<body>
<iframe id="plugin" src="DEVICE_ URL?origin=NCS_ORIGIN"/>
</body>
</html>
```

Device Implementation Example

The device implementation is similar to the newsroom implementation, but slightly simpler as it does not have to concern itself with embedding any control, it is entirely written in HTML and hosted on the device as an HTTP service. The device is expected to provide the NCS with a public URL for which, when requested, serves up an HTML document. This document needs to register the appropriate listeners (as noted in the code example below) to subscribe to MOS messages received by the window.

Sample Code for Messaging

The NCS ORIGIN is provided to the device as a parameter in the invoked URL called "origin". This should be validated whenever we receive a message to ensure it came from the expected window.

```
<html>
<head>

<script type="text/javascript">

function getNewsroomOrigin() {
  var qs = document.location.search.split("+").join(" ");
  var params = {};
  var regex = /[?&]?([^=]+)=([^&]*)/g;
  while (tokens = regex.exec(qs)) {
    params[decodeURIComponent(tokens[1])] =
decodeURIComponent(tokens[2]);
  }

  return params['origin'];
}

function mosMsgFromHost(event) {
  var message = event.data;
  // Check the Origin in event.origin to ensure it matches our expected
  // NCS origin parameter.
  if (event.origin != getNewsroomOrigin()) {
    alert('Origin does not match');
    return;
  }

  // Handle the Message
  // To Reply, issue a postMessage on the event source.
  var reply = "SOME MOS MESSAGE";
  event.source.postMessage(reply, event.origin);
}

function mosMsgFromPlugIn(message) {
  window.parent.postMessage(message, getNewsroomOrigin());
}

// Register the Event Handler - Cross Browser
if (window.addEventListener) {
  window.addEventListener('message', mosMsgFromHost, false);
} else if (window.attachEvent) {
```

```
  window.attachEvent('message', mosMsgFromHost, false);
}

</script>
</head>
<body><!—My Plugin HTML--></body>
</html>
```

Sample Code for Drag and Drop

MOS devices that wish to support object drag and drop into the NCS will be required to add the following code to the specific object they wish to make draggable. If IE10 or above is used as the web browsing container, a security setting must be enabled to allow for cross-origin/cross-domain drag and drop.

```
<html>
<head>

<script type="text/javascript">

function startObjectDrag(event) {
  event.dataTransfer.setData('Text', 'MOS_OBJECT');
  event.dataTransfer.effectAllowed = "copyMove";
  event.dataTransfer.dropEffect = "copy";
}

function endObjectDrag(event) {

}

</script>

<body>
<img src="SOME_IMAGE" ondragstart="startObjectDrag(event)"
ondragend="endObjectDrag(event)"/>
</body>

</html>
```