NRSC GUIDELINE

NATIONAL RADIO SYSTEMS COMMITTEE

NRSC-G301
Creation and Distribution Practices for Audio Program Metadata Guideline
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FOREWORD

This document has been created by the NRSC to assist broadcasters, broadcast network operators and broadcast equipment manufacturers in the creation, packaging, distribution and interpretation of metadata intended for delivery to listeners alongside radio programming.

The information contained in this NRSC Guideline is the work of the RDS Usage Working Group (RUWG), a subgroup of the Radio Broadcast Data System (RBDS) Subcommittee of the NRSC. At the time of first adoption of this Guideline, the RUWG was chaired by Alan Jurison, Clear Channel Media and Entertainment, and the RBDS Subcommittee was chaired by Dan Mansergh, KQED Public Radio. The NRSC chairman at the time of adoption of NRSC-G300 was Milford Smith, Greater Media, Inc.

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CREATION AND DISTRIBUTION PRACTICES FOR AUDIO PROGRAM METADATA GUIDELINE

1 SCOPE

This is an informative Guideline document that sets forth the recommendations for creation, packaging, distribution and interpretation of metadata intended for delivery to listeners alongside radio programming. This Guideline covers methods for managing metadata created both by local broadcasters and networks, independent producers, centralized production facilities or other program sources outside the broadcast station.

2 REFERENCES

2.1 Normative References

This is an informative specification. There are no normative references.

2.2 Informative References

The following references contain information that may be useful to those implementing this Guideline document. At the time of publication the editions indicated were valid. All standards are subject to revision, and users of this Guideline document are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

[1] *NRSC G200-A, Harmonization of RDS and IBOC Program Service Data (PSD) Guideline*, National Radio Systems Committee, March 2010

[2] *NRSC G300, RDS Usage Guideline*, National Radio Systems Committee, September 2012

[3] *NRSC-4-B, United States RBDS Standard*, National Radio Systems Committee, April 2011

[4] *HD Radio Artist Experience Basics*, HD Radio Alliance White Paper, http://www.hdradioalliance.com/assets/file/07HDRadio-Artist-Experience-Basics.pdf

2.3 Informative Reference Acquisition

Documents [1]-[3] are distributed free of charge via the NRSC website at: http://www.nrscstandards.org.

2.4 Symbols and abbreviations

In this Guideline the following abbreviations are used:

FCC	Federal Communications Commission (U.S.)
FM	Frequency Modulation
IBOC	In-Band/On-Channel
NRSC	National Radio Systems Committee
ODA	Open Data Application
PAD	Program Associated Data
PSD	Program Service Data
PTY	Program Type
PTYN	Program Type Name
RDS	Radio Data System
RBDS	Radio Broadcast Data System

RUWG	RDS Usage Working Group
RT	RadioText
RT+	Name of an industry-standard ODA extension to RT
VHF	Very High Frequency

3 SYSTEM ARCHITECTURE

3.1 Metadata Distribution System

For the purposes of this Guideline, the various hardware and software components used to create, package, distribute, parse, schedule and broadcast program associated metadata shall be considered as a unified "System," although each individual implementation will vary significantly. To enable this level of operational flexibility, a widely supported metadata packaging framework is recommended.

3.2 Metadata Creation and Packaging

Each unique audio item within the System is considered to be a separate segment. A program may have one or more segments ranging in length from one second to several hours. The organization and management of the segments as they relate to the audio programs is left to the network or program producer; however, for the purposes of metadata delivery each audio segment is assumed to have an accompanying XML package that contains the metadata related to that segment.

Well-formed XML documents must be identified and packaged consistently to be seen as valid by parsers and ingestion services throughout the System. However, since the XML may be delivered in different forms—either all at once or in small chunks over time—the packaging will vary depending on the delivery method.

3.3 Distribution Methods

Delivery of metadata through the System is intended to be platform-agnostic, as long as the distribution method supports packaging of the source XML data without modification. Integration with IP-based satellite audio distribution systems, internet content libraries, and proprietary program databases are all possible.

In particular, three metadata distribution scenarios are envisioned:

- Real-time delivery of XML metadata embedded in audio streams;
- XML metadata embedded in audio file header;
- Standalone XML files in a catalog or sent as feeds via TCP/IP.

3.4 Parsing and Scheduling

At the receiving end of the distribution link (typically a station, regional hub, or Broadcast Operations Center), the metadata from various sources needs to be aggregated, parsed, and scheduled for broadcast. Typically, this is performed by the broadcast automation system or a standalone data automation system, with the contents of specific XML fields extracted and mapped to a local database. Timing and usage attributes in the XML are parsed and the metadata rundown for each audio segment is created and scheduled for playout.

3.5 Local Metadata Handling

The broadcast announcer or station operator may wish to insert locally-created metadata into the program stream, either manually generated or relayed from another source. Typically these messages will be merged into the schedule (commercial messages from a traffic system) or override the scheduled data as live events (emergency messages).

3.6 Broadcast and Stream Distribution

Once the scheduled playout time for each data package is reached, the local automation system will format and relay the appropriate metadata for each of the program stream encoders (RDS, IBOC, IP stream). In the case of live stream metadata, the source of the live program data is received, repackaged and relayed directly to the appropriate encoders in real time.

4 DATA MODEL

4.1 XML Structural Elements

Each set of metadata (XML package) delivered through the System is either a complete XML document or smaller groupings of specific XML elements (XML chunks) distributed alongside live audio streams. To ensure consistent usage throughout the system, basic conventions of XML formatting are required.[1]

4.1.1 XML Header

For standalone XML file delivery, the XML document must begin with the standard XML header: `<?xml version="1.0" encoding="UTF-8"?>`

For embedded (Cart Chunk) or live RTP delivery, the XML header does not need to be included within each XML chunk. However, storage or export of the delivered XML from a data delivery or automation system in native XML format must include the header for those documents to be considered valid.

4.1.2 Tag

Each set of XML elements relating to discrete blocks of programming must be enclosed within leading `<segment>` and closing `</segment>` tags. The `id` and `ref` attributes support methods for identifying related audio segments and synchronizing separate audio and data automation systems. Although technically optional, their use is strongly recommended. The `numItem` and `seq` attributes provide a method for validating segment sequencing and internal consistency.

4.1.3 <program> Tag

In situations when program level information is distinct from segments, relationships between programs and segments need to be explicitly defined, or a hierarchical XML document containing all program information is desired, the optional `<program>` element is used. As with segments, use of the `id` and `ref` attributes to identify related audio segments and synchronize separate audio and data automation systems is strongly recommended. The `numSeg` attribute provides a method for validating segment sequencing and internal consistency.

4.1.4 <item> Tag

For segments that contain multiple discrete logical objects (such as individual songs in a music program or stories in a newscast), the optional `<item>` tag may be used. Usage and structure is similar to the `<segment>` tag, with leading `<item>` and closing `</item>` tags enclosing a set of elements that relate to a particular object. Use of the `id`, `ref` and `seq` structural attributes is supported, as is use of the `type` and `offset content` attribute where all elements of an item share the same attributes.

4.1.5 id Attribute

To relate XML data to each audio element or grouping delivered from a network, program producer, or other distribution resources, the `<segment>`, `<program>`,and `<item>` tags should include an identification string in the `id` attribute. Use of a Universal Resource Identifier (URI) convention for this purpose is recommended to aid in consistent identification of programs and segments regardless of distribution channel, although the only requirement is that it be a unique id within a particular library of

[1] The casing convention followed herein is as follows: use all lowercase for element names, camelcase for attributes and internal XML structures. This makes integration with other systems easier, yet helps with attribute readability.

programming. For live delivery of XML chunks, it is recommended that the `id` attribute be included at least in the first XML chunk for a particular segment. Use of the `ref` attribute in the first and all subsequent segments allows separate XML chunks to be captured and aggregated into a complete XML document with a reduced bandwidth requirement should that be required.

4.1.6 `ref` Attribute

To provide a secondary means of identifying segments, programs and items,, unique or recurring system reference identifiers can be delivered in the `ref` attribute of the `<segment>`, `<program>`,or `<item>` tag. This is typically used to relate an XML package to a database key, cut ID, song number, spot number, or other internal reference. Consistent use of this attribute is particularly useful for coordinating automation systems and is strongly recommended.

4.1.7 Program `numSeg` Attribute

This optional attribute supports an identifying string needed to relate a particular segment to the program that contains it. This may be useful if the format used in the segment `id` attribute does not contain program information or is not human-readable.

4.1.8 Segment `numItem` Attribute

This optional attribute supports secondary references to programs for scheduling and compatibility with automation systems where the use of a unique reference key at the program level is required.

4.1.9 Segment or Item `seq` Attribute

This optional attribute supports sequence information for a particular segment within a program or item within a segment. It is an integer representing the number of the item or segment in the sequence.

4.2 Baseline XML Elements

The XML elements supported through the System are largely based on the content-specific data fields defined in [1], and all data usage recommendations from that Guideline should be followed.

4.2.1 `<start>` Tag

The actual or scheduled start time of the audio segment, in UTC Zulu reference, used by the data automation system to sequence segments and accurately calculate offset data spooling times. Ideally this value is generated by the distribution system headend for consistent time reference across program segments. No attributes are supported.

4.2.2 `<duration>` Tag

The actual or scheduled duration of the audio segment, in `mm:ss` or `hh:mm:ss` format. No attributes are supported.

4.2.3 <title> Tag

The title of a song, topic or subject of a news/talk element, as defined in [1] 4.1; All attributes are supported.

4.2.4 <artist> Tag

The musical artist or host of a news/talk element, as defined in [1] 4.2; All attributes are supported.

4.2.5 <album> Tag

The music album or program name, as defined in [1] 4.3; All attributes are supported.

4.2.6 <genre> Tag

The genre or format of a song or news/talk element, as defined in [1] 4.5; `type` and `offset` attributes are supported.

4.2.7 <comment> Tag

Descriptive or other text, as defined in [1] 4.6; `type` and `offset` attributes are supported.

4.2.8 <commercial> Tag

Commercial or non-commercial underwriting message for IBOC as defined in [1] 4.7; All attributes are supported.

4.2.9 <ufid> Tag

Item reference identifier as defined in [1] 4.8; all attributes are supported.

4.3 RDS-Designated XML Elements

To support unique features of RDS, such as dynamic PS scrolling or enhanced metadata through RadioText Plus, additional optional elements are supported by the System. Full definitions and expected usage of all RDS, RadioText and RadioText Plus fields are given in [3]. This section defines elements for dedicated RDS fields and the most commonly-used RadioText Plus fields; for completeness, elements for all RadioText Plus fields are defined in Annex 2.

4.3.1 <rdsps> Tag

Text specifically formatted for 8-character dynamic PS display, as defined in [1] 4.9; `offset` attribute is supported.

4.3.2 <rdsrt> Tag

Text specifically formatted for 64-character radio text display, as defined in [3]; `offset` attribute is supported.

4.3.3 <rtitemtitle> Tag

Text specifically formatted for the RadioText Plus *item-title* field; `offset` attribute is supported.

4.3.4 <rtitemalbum> Tag

Text specifically formatted for the RadioText Plus *item-album* field; `offset` attribute is supported.

4.3.5 <rtitemartist> Tag

Text specifically formatted for the RadioText Plus *item-artist* field; `offset` attribute is supported.

4.3.6 <rtinfourl> Tag

Informational URL for the RadioText Plus *info-url* field; `offset` attribute is supported.

4.3.7 <rtprogramhost> Tag

Text specifically formatted for the RadioText Plus *program-host* field; `offset` attribute is supported.

4.3.8 <rtprogramhomepage> Tag

URL for the RadioText Plus *program-homepage* field; `offset` attribute is supported.

4.3.9 <rtphonehotline> Tag

Telephone number formatted as text for the RadioText Plus *phone-hotline* field; `offset` attribute is supported.

4.3.10 <rtphonestudio> Tag

Telephone number formatted as text for the RadioText Plus *phone-studio* field; `offset` attribute is supported.

4.3.11 <rtphoneother> Tag

Telephone number formatted as text for the RadioText Plus *phone-other* field; `offset` attribute is supported.

4.3.12 <rtsmsstudio> Tag

Telephone number/SMS account identifier formatted as text for the RadioText Plus *sms-studio* field; `offset` attribute is supported.

4.3.13 <rtsmsother> Tag

Telephone number/ SMS account identifier formatted as text for the RadioText Plus *sms-other* field; `offset` attribute is supported.

4.3.14 `<rtemailhotline>` Tag

Email address formatted as text for the RadioText Plus *email-hotline* field; `offset` attribute is supported.

4.3.15 `<rtemailstudio>` Tag

Email address formatted as text for the RadioText Plus *email-studio* field; `offset` attribute is supported.

4.3.16 `<rtemailother>` Tag

Email address formatted as text for the RadioText Plus *email-other* field; `offset` attribute is supported.

4.3.17 `<rtplace>` Tag

Location name formatted as text for the RadioText Plus *place* field; `offset` attribute is supported.

4.3.18 `<rtappointment>` Tag

Time and date information formatted as text for the RadioText Plus *appointment* field; `offset` attribute is supported.

4.4 IBOC-designated XML Elements

To support unique features of IBOC, such as image transmission, additional optional elements are supported by the System.

4.4.1 `<image>` Tag

The URL of a properly formatted image for delivery to IBOC receivers, as defined in [4]; All attributes are supported.

4.5 XML Attributes

To support repurposing and reuse of metadata for multiple destination platforms and to allow the use of common element names, XML attributes denote specific characteristics of each element. Not all elements support all attributes.

4.5.1 `type` Attribute

The `type` attribute defines the category of a particular element for redistribution or processing by the data automation system. For most elements, this specifies the formatting of the text based on character set and field length constraints for various distribution systems (RDS, IBOC, streaming). Supported values:

`uni`	Text formatted for all uses, this is the default formatting option.
`rds`	Text for RDS receivers only
`hd`	Text for IBOC receivers only
`id3`	Text for streaming and other applications supporting ID3 tags only
`desc`	Long-form text for use on rich displays, such as enhanced IBOC AAS services, web pages, mobile applications, POS displays, etc.

If no attribute is specified, value uni is the default value. The data in the element is assumed to be usable for all distribution platforms and compliant with NRSC G-200 guidelines. For XML elements supporting RDS- or IBOC-specific features, the `type` attribute is not needed and, if present, will be ignored.

4.5.2 `ref` Attribute

The `ref` attribute is used to provide a reference to internal or public data collections for a specific element. In an `<image>` element, the `ref` attribute may be used to store a database key for an internal image library.

4.5.3 `offset` Attribute

The `offset` attribute defines the duration from the start of the audio segment when a particular metadata field should be sent, in the form `offset="mm:ss"` or `offset="hh:mm:ss"`. This allows the use of multiple instances of a tag within a particular segment. Use of the offset attribute is optional; if not specified its default value is 00:00.

4.6 XML Examples

4.6.1 Single Music Track

```
<?xml version="1.0" encoding="UTF-8"?>
<item>
 <start>2011-04-10T11:34:10Z</start>
  <duration>00:03:51</duration>
  <artist>Natasha Beddingfield</artist>
    <title>Unwritten</title>
    <album>Unwritten</album>
    <comment>#48</comment>
    <image ref="gn399071">//localdb/gracenote/artist/gn399071_beddingfield.jpg</image>
  </item>
```

4.6.2 News Program Segment

```
<?xml version="1.0" encoding="UTF-8"?>
<segment id="prss.org/contentdepot/npr/weekendeditionsaturday/2011-04-10/seg03"
       ref="12345">
       <start>2011-04-10T11:34:10Z</start>
       <duration>12:59</duration>
       <title type="uni">Biodegradable Golf Balls</title>
       <title type="hd">Biodegradable Golf Balls are Bad News for Lobsters</title>
       <title type="desc">David Green in conversation with University of Maine
biological and chemical engineering professor David Neivandt about a new type of
biodegradable golf ball made from lobster shells.</title>
       <title type=" uni" offset="10:49">Pieces of Eight</title>
       <artist offset="10:49">Neil Peart</artist>
       <album>Weekend Edition Saturday</album>
       <genre>News</genre>
       <genre offset="10:49">Rock</genre>
       <comment offset="10:49">Live from Toronto</comment>
       <commercial>Support provided by ABC Foundation</commercial>
       <ufid>12345</ufid>
       <rdsps>Weekend Edition Saturday</rdsps>
       <image ref="67890">www.npr.org/images/shows/wesat_hd.jpg</image>
       <image ref="gn399071" offset="10:49">
       //localdb/gracenote/artist/gn399071_peart.jpg</image>
</segment>
```

4.6.3 Music Countdown Program

```
<?xml version="1.0" encoding="UTF-8"?>
<program id="rick.com/dbserv/shows/weeklytop40/11-28" ref="12345" desc="Rick Dees
Weekly Top 40 Show 11-28 Air July 9-10-2011">
<title>Rick Dees Weekly Top 40</title>
<title type="desc">Rick Dees Weekly Top 40 - Special edition.  Rick counts down the #1
Hits of the last decade.</title>
<title type="uni">Rick Dees Weekly Top 40</title>
<title type="hd">Rick Dees Weekly Top 40</title>
<comment>Special edition. #1 Hits of the last decade</comment>
<comment>Show 11-28</comment>
<comment>Airdate: July 9-10, 2011</comment>
<genre>Top 40</genre>
<ufid>12345</ufid>

        <segment id="Hour 1 Segment 1" duration="00:18:31">
                <title type="hd">Rick Dees Weekly Top 40</title>
                <title type="uni">Rick Dees Weekly Top 40</title>
                <title type="desc">Rick Dees Weekly Top 40 - Special edition.  Rick
counts down the #1 Hits of the last decade.</title>
                <genre>Top 40</genre>
                <ufid>12345</ufid>
                <image ref="67890">http://www.rick.com/rickdeeslogo.jpg</image>

<!-- Rick Talks for the first 51 seconds with no song data, should display defaults
here -->

                <item offset="00:00:00" duration="00:00:51">
                </item>

                <item offset="00:00:52" duration="00:03:51">
                        <artist>Natasha Beddingfield</artist>
                        <title>Unwritten</title>
                        <album>Unwritten</album>
                        <comment>#48</comment>
                         <image
ref="gn399071">//localdb/gracenote/artist/gn399071_beddingfield.jpg</image>
                </item>
                <item offset="00:04:43" duration="00:04:13">
                        <artist>The Fray</artist>
                        <title>How to Save a Life</title>
                        <album>How to Save a Life</album>
                        <comment>#47</comment>
                         <image
ref="gn399072">//localdb/gracenote/artist/gn399071_fray.jpg</image>
                </item>
                <item offset="00:08:56" duration="00:03:58">
                        <artist>Lady Gaga</artist>
                        <title>Just Dance</title>
                        <album>The Fame</album>
                        <comment>#46</comment>
                         <image
ref="gn399073">//localdb/gracenote/artist/gn399071_gaga.jpg</image>
                </item>
                <item offset="00:12:54" duration="00:03:26">
                        <artist>Linkin Park</artist>
                        <title>In The End</title>
                        <album>Hybrid Theory</album>
                        <comment>#45</comment>
                         <image
```

```
ref="gn399074">//localdb/gracenote/artist/gn399071_linkin.jpg</image>
                </item>

<!-- Linkin Park ends 00:16:20,  note duration tag -- Rick Talks for 14 seconds with
no song data, should display defaults here -->

                <item offset="00:16:20" duration="00:00:14">
                </item>

                <item offset="00:16:34" duration="00:00:30">
                        <commercial>Progressive<commercial>
                        <title>Progressive Auto Insurance</title>
                         <image
ref="cm1234">//localdb/commercials/progressive.jpg</image>
                </item>
                <item offset="00:17:04" duration="00:00:29">
                        <commercial>NBC - Today Show<commercial>
                        <title>NBC - Today Show</title>
                         <image
ref="cm1234">//localdb/commercials/todayshow.jpg</image>
                </item>
                <item offset="00:17:33" duration="00:00:29">
                        <commercial>NARAS - Bob Marley Grammy Museum<commercial>
                        <title>NBC</title>
                        <url>grammymuseum.org</url>
                         <image
ref="cm1234">//localdb/commercials/bobmarley.jpg</image>
                </item>
                <item offset="00:18:02" duration="00:00:29">
                        <commercial>GIECO Car Insurance<commercial>
                        <title>GIECO Car Insurance</title>
                        <comment>Q: ...On Car Insurance.</comment>
                         <image ref="cm1234">//localdb/commercials/GIECO.jpg</image>
                </item>
        </segment>

        <segment id="Hour 1 Commercial Break 1" duration="00:02:05">
                <item offset="00:00:00" duration="00:02:00">
                <comment>Local Spots 2:00 </comment>
                </item>
                <item offset="00:02:00" duration="00:00:05">
                <comment>Station ID :05</comment>
                </item>
         </segment>

        <segment id="Hour 1 Segment 2" duration="00:12:59">

                <title type="uni">Rick Dees Weekly Top 40</title>
                <title type="desc">Rick Dees Weekly Top 40 - Special edition.  Rick
counts down the #1 Hits of the last decade.</title>
                <genre>Top 40</genre>
                <ufid>12345</ufid>
                <image ref="67890">http://www.rick.com/rickdeeslogo.jpg</image>

<!-- Jingle for the first 5 seconds should display defaults here -->

                <item offset="00:00:00" duration="00:00:05">
                </item>

                <item offset="00:00:05" duration="00:03:06">
                        <artist>Jason Derulo</artist>
                        <title>In My Head</title>
                        <album>Jason Derulo</album>
```

```
                        <comment>#44</comment>
                         <image
ref="gn399071">//localdb/gracenote/artist/gn399071_derulo.jpg</image>
                </item>
                <item offset="00:03:11" duration="00:03:41">
                        <artist>Nelly Furtado</artist>
                        <title>Say It Right</title>
                        <album>Loose</album>
                        <comment>#43</comment>
                         <image
ref="gn399072">//localdb/gracenote/artist/gn399071_furtado.jpg</image>
                </item>
                <item offset="00:06:52" duration="00:02:45">
                        <artist>Neon Trees</artist>
                        <title>Animal</title>
                        <album>Animal</album>
                        <comment>#42</comment>
                         <image
ref="gn399073">//localdb/gracenote/artist/gn399071_neon.jpg</image>
                </item>

<!--  Neon Trees ends at 00:09:37, note duration tag -- Rick Talks for 1 min 23
seconds with no song data, should display defaults here -->

                <item offset="00:09:37" duration="00:01:23">
                </item>

                <item offset="00:11:00" duration="00:00:30">
                        <commercial>Progressive<commercial>
                        <title>Progressive Auto Insurance</title>
                         <image
ref="cm1234">//localdb/commercials/progressive.jpg</image>
                </item>
                <item offset="00:11:30" duration="00:00:30">
                        <commercial>Parts Plus Auto Parts<commercial>
                        <title>Parts Plus Auto Parts</title>
                         <image
ref="cm1234">//localdb/commercials/partsplus.jpg</image>
                </item>
                <item offset="00:11:59" duration="00:00:29">
                        <commercial>HCG Extreme Weight Loss<commercial>
                        <title>HCG Extreme Weight Loss</title>
                        <phone>800-463-3814</phone>
                         <image
ref="cm1234">//localdb/commercials/HCGweightloss.jpg</image>
                </item>
        </segment>


        <segment id="Hour 1 Commercial Break 2" duration="00:02:05">
                <item offset="00:00:00" duration="00:02:00">
                <comment>Local Spots 2:00 </comment>
                </item>
                <item offset="00:02:00" duration="00:00:05">
                <comment>Station ID :05</comment>
                </item>
         </segment>
```

5 DISTRIBUTION

Three main scenarios for metadata delivery are envisioned: real-time delivery, file header delivery and standalone XML. The specific methods and systems chosen to implement a network-based metadata ecosystem are dependent on operational requirements and the technologies available to network participants.

5.1 Real-time Delivery (Live Programs)

To support live/real-time delivery of programs to stations, metadata must be delivered via a synchronized data channel alongside program audio or made accessible through a high-availability real-time Internet data services portal. Some IP-based satellite distribution systems enable the packaging of G301-compliant metadata in its native form in RTP headers of the audio bit stream, while other systems designed to provide legacy support for serial data channels may require implementation-specific mapping of XML to predefined serial group identifiers in order to work within constrained data channel bandwidth. Real-time data may also be made available through an Internet backchannel, using technologies such as RSS and custom APIs to allow station data systems to request and receive specific information when needed.

In either case, data is delivered in XML chunks rather than as complete XML documents containing all information needed about a particular program segment. If later rebroadcast is required, the chunks need to be captured and time referenced to the program audio in a system that supports simultaneous recording and metadata capture or the chunks can be parsed and written as they are received to a standalone G301 XML document.

5.2 File Header Delivery

For systems providing delivery of segments or complete programs to stations as audio files, embedding metadata in the file header is an elegant option. This ensures that the audio and metadata stay together as files are transferred, copied or moved. Current industry-supported header standards such as BWF and the Cart Chunk extension provide for modest metadata capacity; large embedded G301 XML documents may exceed the storage limits of current headers.

5.3 Standalone XML File Delivery

In its simplest form, G301 XML may be distributed as individual documents containing all producer-generated metadata for particular segments. These can be made available on producer or network file servers, delivered to stations via RSS, or sent alongside audio files to network receivers at subscribing stations.

6 LOCAL METADATA CREATION

To ensure consistency in a station's program metadata service, local programming needs to mesh with network-delivered programs by using similar mapping, frequency, style and level of detail in the metadata presentation.

6.1 Baseline Metadata (Artist, Title, Album)

At the very least, stations should attempt to populate the three basic metadata fields Artist, Title and Album throughout the day, regardless of program source. For music stations, this is fairly straightforward, since most automation systems now provide metadata broadcast functionality as a built-in or optional feature. For news, talk and sports stations, this will require some ongoing data entry since scheduled coverage and discussion topics may change.

6.2 Local Scheduled Messaging (Promos, Spots)

Many stations may also choose to insert promotional or commercial messages into their broadcast metadata service. Using traffic or automation schedules to manage the rotation and tracking of these messages minimizes the amount of manual attention required; more elaborate and sophisticated schedules will require specialized metadata software or services.

6.3 Real-time Override

All stations need a method to override any scheduled metadata in case the program is pre-empted with local announcements for emergency information, breaking news, or specific messaging as part of a live program.

7 STATION CONSIDERATIONS

The key to a successful implementation of a broadcast data service including network-delivered programming is selecting the right tools to support the station's particular requirements. In some cases, the network or group owners may have a preferred solution. For most, the decision is left to the individual station management, programming and engineering staff. Information about metadata systems and services available to broadcasters is available as part of NRSC-G300.

7.1 Data Sources

Stations may be receiving programming and metadata from a number of sources, including multiple producers delivering content through networks, independent producers, and station staff. Some information may also be provided through automation system databases, EAS, and data services for sports scores, news headlines, weather or traffic. The station metadata management system must also be able to handle time-shifting for recording and rebroadcasting of live programs.

7.2 Data Quality and Filtering

With a variety of data sources, there are likely to be inconsistencies in presentation, formatting and content. Wherever possible, incoming data sources should be filtered to correct mechanical formatting problems (such as all caps/initial cap mismatch), perform routine spell check and/or controlled dictionary matching, and remapping improper field usage (artist/title substitution). Certain data sources will need to be manually reviewed, and all data sources should be regularly spot-checked for consistency and quality.

7.3 Data Storage and Reuse

Programs intended for rebroadcast or archiving need to have their metadata stored as well. Some data systems allow grouping of content as individual objects that can be reused; others treat the data as a continuous stream of "new" content. If needed, G301 XML from live programs can be cached to a file and reingested for later rebroadcast.

7.4 Consistency of the User Experience

The data service should be monitored and evaluated from the listener's point of view. A well-constructed service will appear to originate from the station, with network, local and automated data content meshing together into a seamless flow of information.

8 CASE STUDIES

8.1 PRSS Live Stream Delivery

The Public Radio Satellite System (PRSS) aggregates and delivers audio programs to more than 400 individual public radio station operators. The ContentDepot system, deployed in 2007, delivered the capability to deliver live metadata along with individual program streams.

Based on the DVB-S transmission standard, ContentDepot's transport system packages multiple MPEG Layer 2-encoded audio channels into Real-time Transport Protocol (RTP) IP streams. System receivers are programmed through a web-based portal to detect and decode desired programs from individual streams, allowing stations to broadcast or record live programs on schedule. Metadata is incorporated into RTP packet headers for each stream by the ContentDepot system control software and delivered via the Ethernet network interface on station receivers.

A demonstration of the full end-to-end live stream metadata delivery system was conducted in April 2012. Artist and Title metadata for public radio music service Classical 24 was extracted by a custom application from the Classical 24 website and ingested into the ContentDepot control software in real time. A custom application monitored the receiver at KNPR and KCNV in Las Vegas and formatted the metadata for the station's HD Radio Exporter.

In future deployments, it is envisioned that program producers will provide a direct link from originating automation systems to the ContentDepot control software for program metadata, and that stations will employ commercially available automation or data management applications to receive, route, cache and broadcast metadata for live programs.

8.2 PRSS ContentDepot File Delivery

In addition to live streams delivered via ContentDepot, the PRSS distribution system provides a method for file-based delivery of programs to stations. Programs are provided by producers in one or more segments, then packaged and delivered through the DVB transport to local storage on station receivers. Each segment is an MPEG Layer II file with a Cart Chunk wrapper; depending on the size of the XML data, an additional chunk may need to be added to accommodate the large quantity of information contained.

8.3 Live Concert Broadcast

Clear Channel Media + Entertainment (CCM+E) hosts the annual iHeartRadio Music Festival which is broadcast live on approximately 150 stations. As part of this broadcast, the transmission of metadata from the concert venue to all of the individual stations is considered. In advance of the concert, the performing artists are asked to provide a list of songs they plan on playing at the show. CCM+E collects this information and populates it in its internal systems. When the concert starts, someone is assigned to monitor the concert and identify the songs that the artist is playing. When the song is identified, the profanity delay duration is calculated, and when that expires, the information is sent from the concert site to CCM+E's centralized metadata distribution system. Because all metadata for all destinations are handled centrally, this information is then sent to each applicable station's distribution platforms such as RDS encoders, HD Radio transmission equipment, Internet streaming, and website "now playing/recently played" lists. It enriches the listening experience, and when applicable, allows the tagging and download capabilities on various platforms, and the display of album art via iHeartRadio and HD Radio.

While the data format of this system is proprietary, it is quite possible to design similar systems with the building blocks outlined in this Guideline.

Annex 1

XML Schema Definition (XSD)

Note: this is a baseline XSD for purposes of initial system development.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.nrscstandards.org"
xmlns="http://www.nrscstandards.org"
elementFormDefault="qualified">

<!-- Structural Type definitions -->
<xs:complexType name="baseType">
      <xs:attribute name="id" type="xs:string"/>
      <xs:attribute name="ref" type="xs:string"/>
</xs:complexType>
<xs:complexType name="unitType">
<xs:complexContent>
<xs:extension base="baseType">
<xs:attribute name="seq" type="xs:integer"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="progType">
<xs:complexContent>
<xs:extension base="baseType">
<xs:attribute name="numSeg" type="xs:integer"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="segType">
<xs:complexContent>
<xs:extension base="unitType">
<xs:attribute name="numItem" type="xs:integer"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="itemType">
<xs:complexContent>
<xs:extension base="unitType">
<xs:attribute name="type" type="xs:string"/>
<xs:attribute name="offset" type="xs:duration"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>

<!-- Content Type Definitions -->
<xs:complexType name="offsetType">
<xs:attribute name="offset" type="xs:duration"/>
</xs:complexType>
<xs:complexType name="typeOffsetType">
<xs:complexContent>
<xs:extension base="offsetType">
<xs:attribute name="type" type="xs:string"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="allType">
<xs:complexContent>
<xs:extension base="typeOffsetType">
```

```
<xs:attribute name="ref" type="xs:string"/>
</xs:extension>
</xs:complexContent>
</xs:complexType>

<!-- Structural Elements -->
<xs:element name="segment" type="segType"/>
<xs:element name="program" type="progType"/>
<xs:element name="item" type="itemType"/>

<!-- Content Elements -->
<xs:element name="start" type="xs:dateTime"/>
<xs:element name="duration" type="xs:duration"/>
<xs:element name="title" type="xs:string"/>
<xs:element name="artist" type="xs:string"/>
<xs:element name="album" type="xs:string"/>
<xs:element name="genre" type="xs:string"/>
<xs:element name="comment" type="xs:string"/>
<xs:element name="commercial" type="xs:string"/>
<xs:element name="rdsps" type="xs:string"/>
<xs:element name="rdsrt" type="xs:string"/>
<xs:element name="rtitemtitle" type="xs:string"/>
<xs:element name="rtitemalbum" type="xs:string"/>
<xs:element name="rtitemartist" type="xs:string"/>
<xs:element name="rtinfourl" type="xs:string"/>
<xs:element name="rtprogramhost" type="xs:string"/>
<xs:element name="rtprogramhomepage" type="xs:string"/>
<xs:element name="rtphonehotline" type="xs:string"/>
<xs:element name="rtphonestudio" type="xs:string"/>
<xs:element name="rtphoneother" type="xs:string"/>
<xs:element name="rtsmsstudio" type="xs:string"/>
<xs:element name="rtsmsother" type="xs:string"/>
<xs:element name="rtemailhotline" type="xs:string"/>
<xs:element name="rtemailstudio" type="xs:string"/>
<xs:element name="rtemailother" type="xs:string"/>
<xs:element name="rtplace" type="xs:string"/>
<xs:element name="rtappointment" type="xs:string"/>
<xs:element name="image" type="xs:string"/>
</xs:schema>
```

Annex 2

Element Index for RadioText Plus Elements

Element index for RadioText+ elements:

RT+ Code	RT+ Category	RT+ Category.Class	NRSC G-301 XML tag	NRSC-G301 Description Section
1	Item	Item.Title	<rtitemtitle>	4.3.3
2	Item	Item.Album	<rtitemalbum>	4.3.4
3	Item	Item.TrackNumber	<rtitemtracknumber>	
4	Item	Item.Artist	<rtitemartist>	4.3.5
5	Item	Item.Composition	<rtitemcomposition>	
6	Item	Item.Movement	<rtitemmovement>	
7	Item	Item.Conductor	<rtitemconductor>	
8	Item	Item.Composer	<rtitemcomposer>	
9	Item	Item.Band	<rtitemband>	
10	Item	Item.Comment	<rtitemcomment>	
11	Item	Item.Genre	<rtitemgenre>	
12	Info	Info.News	<rtinfonews>	
13	Info	Info.News.Local	<rtinfonewslocal>	
14	Info	Info.StockMarket	<rtinfostockmarket>	
15	Info	Info.Sport	<rtinfosport>	
16	Info	Info.Lottery	<rtinfolottery>	
17	Info	Info.Horoscope	<rtinfohoroscope>	
18	Info	Info.Daily_Diversion	<rtinfodaily_diversion>	
19	Info	Info.Health	<rtinfohealth>	
20	Info	Info.Event	<rtinfoevent>	
21	Info	Info.Scene	<rtinfoscene>	
22	Info	Info.Cinema	<rtinfocinema>	
23	Info	Info.TV	<rtinfotv>	
24	Info	Info.Date_Time	<rtinfodate_time>	
25	Info	Info.Weather	<rtinfoweather>	
26	Info	Info.Traffic	<rtinfotraffic>	
27	Info	Info.Alarm	<rtinfoalarm>	
28	Info	Info.Advertisement	<rtinfoadvertisement>	
29	Info	Info.Url	<rtinfourl>	4.3.6
30	Info	Info.Other	<rtinfoother>	
31	Program	StationName.Short	<rtstationnameshort>	
32	Program	StationName.Long	<rtstationnamelong>	
33	Program	Program.Now	<rtprogramnow>	
34	Program	Program.Next	<rtprogramnext>	
35	Program	Program.Part	<rtprogrampart>	
36	Program	Program.Host	<rtprogramhost>	4.3.7
37	Program	Program.Editorial_Staff	<rtprogrameditorial_staff>	
38	Program	Program.Frequency	<rtprogramfrequency>	
39	Program	Program.Homepage	<rtprogramhomepage>	4.3.8

RT+ Code	RT+ Category	RT+ Category.Class	NRSC G-301 XML tag	NRSC-G301 Description Section
40	Program	Program.SubChannel	<rtprogramsubchannel>	
41	Interactivity	Phone.Hotline	<rtphonehotline>	4.3.9
42	Interactivity	Phone.Studio	<rtphonestudio>	4.3.10
43	Interactivity	Phone.Other	<rtphoneother>	4.3.11
44	Interactivity	SMS.Studio	<rtsmsstudio>	4.3.12
45	Interactivity	SMS.Other	<rtsmsother>	4.3.13
46	Interactivity	Email.Hotline	<rtemailhotline>	4.3.14
47	Interactivity	Email.Studio	<rtemailstudio>	4.3.15
48	Interactivity	Email.Other	<rtemailother>	4.3.16
49	Interactivity	MMS.Other	<rtmmsother>	
50	Interactivity	Chat	<rtchat>	
51	Interactivity	Chat.Center	<rtchatcenter>	
52	Interactivity	Vote.Question	<rtvotequestion>	
53	Interactivity	Vote.Center	<rtvotecenter>	
54	rfu	Reserved for Future Use	<rtrfu54>	
55	rfu	Reserved for Future Use	<rtrfu55>	
56	Private Classes	Private Classes	<rtprivate56>	
57	Private Classes	Private Classes	<rtprivate57>	
58	Private Classes	Private Classes	<rtprivate58>	
59	Descriptor	Place	<rtplace>	4.3.17
60	Descriptor	Appointment	<rtappointment>	4.3.18
61	Descriptor	Identifier	<rtidentifier>	
62	Descriptor	Purchase	<rtpurchase>	
63	Descriptor	Get Data	<rtgetdata>	

See also RT+ Specification IEC 62106 Edition 2, Annex P, Table P.2

Annex 3

Element Index for ID3 Tag Elements

Element index for ID3 tag elements:

No.	ID3 Frame ID	Category	Description	NRSC-G301 XML Tag	Usage Notes
1	UFID	ID	Unique File Identifier	<id3ufid ownerid="_">	ownerid attribute contains source URL; text UFID only
2	TALB	Text	Album/Show Title	<id3talb>	
3	TBPM	Text	Beats per Minute	<id3tbpm>	Integer
4	TCOM	Text	Composer(s)	<id3tcom>	Separated by "/" when multiple composers are specified
5	TCON	Text	Content Type	<id3tcon>	Numeric string, defined in ID3v1.1
6	TCOP	Text	Copyright message	<id3tcop>	
7	TDAT	Text	Recording Date	<id3tdat>	Four-character numeric string, DDMM format
8	TDLY	Text	Playlist Delay	<id3tdly>	Numeric string
9	TENC	Text	Encoded by	<id3tenc>	
10	TEXT	Text	Lyricist/Text Author(s)	<id3text>	Separated by "/" when multiple authors are specified
11	TFLT	Text	File Type	<id3tflt>	Usage defined in ID3v2.3
12	TIME	Text	Time	<id3time>	Four-character numeric string, HHMM format
13	TIT1	Text	Content Group Description	<id3tit1>	
14	TIT2	Text	Title/Songname/Content Description	<id3tit2>	
15	TIT3	Text	Subtitle/Description Refinement	<id3tit3>	
16	TKEY	Text	Initial Key	<id3tkey>	Usage defined in ID3v2.3
17	TLAN	Text	Language(s)	<id3tlan>	Language codes defined in ISO-639-2
18	TLEN	Text	Length	<id3tlen>	Numeric string, in milliseconds
19	TMED	Text	Media type	<id3tmed>	Usage defined in ID3v2.3
20	TOAL	Text	Original Album/Show Title	<id3toal>	
21	TOFN	Text	Original Filename	<id3tofn>	
22	TOLY	Text	Original Original Lyricist/Text Author(s)	<id3toly>	Separated by "/" when multiple authors are specified
23	TOPE	Text	Original Artist/Performer(s)	<id3tope>	Separated by "/" when multiple performers are specified
24	TORY	Text	Original Release Year	<id3tory>	Four-character numeric string
25	TOWN	Text	File Owner/Licensee	<id3town>	

No.	ID3 Frame ID	Category	Description	NRSC-G301 XML Tag	Usage Notes
26	TPE1	Text	Lead Artist/Soloist/Group(s)	<id3tpe1>	Separated by "/" when multiple performers are specified
27	TPE2	Text	Band/Orchestra/Accompaniment	<id3tpe2>	
28	TPE3	Text	Conductor	<id3tpe3>	
29	TPE4	Text	Interpreted, Remixed or Modified by	<id3tpe4>	
30	TPOS	Text	Part of a Set	<id3tpos>	Usage defined in ID3v2.3
31	TPUB	Text	Publisher	<id3tpub>	
32	TRCK	Text	Track Number/Position in Set	<id3trck>	Usage defined in ID3v2.3
33	TRDA	Text	Recording Dates	<id3trda>	
34	TRSN	Text	Radio Station Name	<id3trsn>	
35	TRSO	Text	Radio Station Owner	<id3trso>	
36	TSIZ	Text	Size	<id3tsiz>	Numeric string, in bytes (excluding ID3 tag)
37	TSRC	Text	ISRC	<id3tsrc>	International Standard Recording Code
38	TSSE	Text	Encoding Settings	<id3tsse>	
39	TYER	Text	Year	<id3tyer>	Four-character numeric string
40	TXXX	Text	User Defined Text	<id3txxx desc="_">	desc attribute contains description of user defined text field
41	WCOM	Weblink	Commercial Information URL	<id3wcom>	
42	WCOP	Weblink	Copyright/Legal Information URL	<id3wcop>	
43	WOAF	Weblink	Official Audio File Webpage URL	<id3woaf>	
44	WOAR	Weblink	Official Artist/Performer Webpage URL	<id3woar>	
45	WOAS	Weblink	Official Audio Source Webpage URL	<id3woas>	
46	WORS	Weblink	Official Radio Station Webpage URL	<id3wors>	
47	WPAY	Weblink	Payment Webpage	<id3wpay>	
48	WPUB	Weblink	Publisher Webpage	<id3wpub>	
49	WXXX	Weblink	User Defined Link	<id3wxxx desc="_">	desc attribute contains description of user defined text field
50	IPLS	Credit	Involved People List	<id3ipls>	Usage defined in ID3v2.3
51	MCDI	ID	Music CD Identifier	<id3mcdi>	Binary data formatted as hex text string

No.	ID3 Frame ID	Category	Description	NRSC-G301 XML Tag	Usage Notes
52	ETCO	Timing	Event Timing Codes	<id3etco>	Binary data formatted as hex text string
53	MLLT	Timing	MPEG Location Lookup Table	<id3mllt>	Binary data formatted as hex text string
54	SYTC	Timing	Synchronized Tempo Codes	<id3sytc>	Binary data formatted as hex text string
55	USLT	Transcript	Unsynchronized Transcription	<id3uslt desc="_">	desc attribute contains description of transcription content
56	SYLT	Transcript	Synchronized Transcription	<id3sylt>	Mixed text and data container; usage defined in ID3v2.3
57	COMM	Info	Comment	<id3comm desc="_">	desc attribute contains description of comment
58	RVAD	Audio	Relative Volume Adjustment	<id3rvad>	Binary data formatted as hex text string
59	EQUA	Audio	Equalization	<id3equa>	Binary data formatted as hex text string
60	RVRB	Audio	Reverb	<id3rvrb>	Binary data formatted as hex text string
61	APIC	Image	Attached Picture	<id3apic>	Only URL linking is supported; usage defined in ID3v2.3
62	GEOB	Object	General Encapsulated Object	Not Supported	
63	PCNT	Info	Play Counter	<id3pcnt>	Binary data formatted as hex text string
64	POPM	Info	Popularimeter	<id3popm>	Binary data formatted as hex text string
65	RBUF	Info	Recommended Buffer Size	<id3rbuf>	Binary data formatted as hex text string
66	AENC	Info	Audio Encryption	<id3aenc>	Binary data formatted as hex text string
67	LINK	Info	Linked Information	<id3link>	Binary data formatted as hex text string
68	POSS	Info	Position Synchronization	<id3poss>	Binary data formatted as hex text string
69	USER	Info	Terms of Use	<id3user>	Binary data formatted as hex text string
70	OWNE	Info	Ownership	<id3owne>	Binary data formatted as hex text string
71	COMR	Info	Commercial Information	<id3comr>	Binary data formatted as hex text string
72	ENCR	Info	Encryption Method Registration	<id3encr>	Binary data formatted as hex text string
73	GRID	Info	Group Identification Registration	<id3grid>	Binary data formatted as hex text string
74	PRIV	Info	Private Frame	<id3priv>	Binary data formatted as hex text string

(FUTURE)
Annex 4

Implementation Guidelines for Data Automation Systems

This Annex is currently planned for future revisions of the NRSC-G301 document. With this Guideline now released, we hope to start a public dialogue with automation system vendors, software solution providers and broadcasters on best practices in implementing this Guideline.

NRSC Document Improvement Proposal

If in the review or use of this document a potential change appears needed for safety, health or technical reasons, please fill in the appropriate information below and email, mail or fax to:

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c/o Consumer Electronics Association
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NAB
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