
This version of the RadioVIS specification has been superseded by **"Visual Slideshow for Hybrid Radio" (TS 101 499 v3.1.1)** which can be downloaded from

https://radiodns.org/developers/documentation

# RadioVIS Technical Specification

## RVIS01 V1.1.0 (2012-04)

**The RadioDNS Project**

http://radiodns.org/

feedback@radiodns.org

**Important notice**

If you find errors in the present document, please send your comment to the document editors
feedback@radiodns.org

## Copyright Notification

# Contents

# Intellectual Property Rights

The contributors to the present document have declared that they have no IPRs in respect of their contributions. However no investigation, including IPR searches, has been carried out, so no guarantee can be given as to the existence of other IPRs which are, or may be, or may become, essential to the present document.

# Foreword

Radio functionality is often included in devices with colour displays capable of showing texts and images.

An existing specification allows the transmission of slideshow over DAB Digital Radio [1]. The present document defines a similar methodology based on IP which, in conjunction with RadioDNS [2], allows the transmission of slideshow images and text to support audio services carried over multiple audio delivery protocols such as VHF/FM and IP.

# Scope

The present document defines the protocol for RadioVIS to allow implementation from both a service provider and receiver perspective.

# References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.


[1] ETSI TS 101 499: 'SlideShow; User application specification'

[2] RDNS01: 'RadioDNS Technical Specification'

[3] RFC 1035 (1987): 'Domain Names – Implementation and Specification'

[4] RFC 2782 (2000): 'A DNS RR for specifying the location of services (DNS SRV)'

[5] 'Stomp Protocol Specification, Version 1.0', http://docs.codehaus.org/display/STOMP/Protocol

[6] RFC 793 (1981): 'Transmission Control Protocol'

[7] IEC 62106 (2009): 'Specification of the Radio Data System (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 MHz to 108,0 MHz'

[8] ISO 3166-1, 'Codes for the representation of names of countries and their subdivisions – Part 1: Country codes'

[9] ETSI EN 300 401: 'Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers'

[10] ETSI ES 201 980, 'Digital Radio Mondiale (DRM); System Specification'

[11] ETSI TS 102 386, 'Digital Radio Mondiale (DRM); AM signalling system (AMSS)'

[12] NRSC-5-B:2008, 'In-band/on-channel Digital Radio Broadcasting Standard'

[13] RFC 2616 (1999): 'Hypertext Transfer Protocol – HTTP/1.1'

[14] ISO 8601:2004 (2004): 'International standard date and time notation'

[15] RFC 1738 (1994): 'Uniform Resource Locators (URL)'

[16] T.81 (1993): 'Information Technology – Digital Compression and Coding of Continuous-Tone Still Images – Requirements and Guidelines'

[17] ISO/IEC 15948:2004: 'Portable Network Graphics (PNG): Functional Specification'

[18] Annex A TS 101 499 V2.2.1 (2008-07): 'APNG 1.0 Specification – Animated Portable Network Graphics'

[19] 'Pixels Per Inch', http://en.wikipedia.org/wiki/Pixel_Density

[20] 'JSON-P', http://en.wikipedia.org/wiki/JSONP

[21] RFC 4627 (2006): 'The application/json Media Type for Javascript Object Notation (JSON) '

[22] RFC 4329 (2006): 'Scripting Media Types'

[23] ECMA-262 (2011-06): 'ECMAScript Language Specification'

# Definitions and abbreviations

For the purposes of the present document, the following terms and definitions apply:

| | |
|---|---|
| **RadioDNS** | Centralised lookup for radio services, allowing the resolution of broadcast parameters to an authoritative FQDN as detailed in the RadioDNS specification [2] |
| **service** | A service such as a talk or music radio station |
| **service provider** | The organisation providing a service |
| **slide** | A single image containing content related to the service |
| **slideshow** | The presentation of slides controlled by the service provider |
| **transport** | Means by which the RadioVIS feed is conveyed |
| **receiver** | Client or device receiving the RadioVIS feed |

For the purposes of the present document, the following abbreviations apply:

| | |
|---|---|
| AMSS | Amplitude Modulation Signalling System |

| | |
|---|---|
| APNG | Animated Portable Network Graphics |
| CNAME | DNS Canonical Name record |
| DAB | Digital Audio Broadcasting |
| DLS | Dynamic Label Segment |
| DNS | Domain Name System |
| DRM | Digital Radio Mondiale |
| FQDN | Fully Qualified Domain Name |
| HTTP | Hypertext Transfer Protocol |
| IP | Internet Protocol |
| JPEG | Joint Photographic Experts Group |
| PNG | Portable Network Graphics |
| RDS | Radio Data System |
| SRV | DNS nameserver Service record |
| Stomp | Streaming Text Orientated Messaging Protocol |
| TCP | Transmission Control Protocol |
| URL | Uniform Resource Locator |
| VHF/FM | Very High Frequency/Frequency Modulation |
| PPI | Pixels Per Inch |

# 1 Application discovery and transport selection

## 1.1 Application discovery

A receiver must be capable of resolving the authoritative FQDN for a service via the methodology defined in the RadioDNS specification [2].

Application lookup for RadioVIS services must then be performed by using the service name specific to the transport used to carry the RadioVIS data.

The present document defines two transports: **Stomp** and **HTTP**, leading to the following service names:

| **Transport Used** | **SRV Record Service Name** |
|---|---|
| **Stomp** | `radiovis` |
| **HTTP** | `radiovis-http` |

Each available transport must be signalled as a separate SRV record. For each transport, the port number within the SRV record returned defines the server port that the receiver should connect to for that transport.

If at least one SRV record is successfully returned for either transport, the service supports the RadioVIS application, accessed using the associated transport on the host and port indicated in the relevant SRV record.

For example, for a query made to:

```
_radiovis._tcp.rdns.musicradio.com
```

Using the `nslookup` tool, this would yield the following SRV record:

```
service = 0 100 61613 vis.musicradio.com.
```

This indicates that the RadioVIS application can be accessed using the Stomp transport on the host `vis.musicradio.com`, port `61613`.

Note that more than one SRV record may be returned for a transport, with different values. This can potentially be used for loadbalancing purposes by providing different hosts/ports with different priorities/weightings. See the SRV record specification [4] for a more detailed explanation on handling SRV resolution results.

## 1.2 Transport selection

For service providers implementing a RadioVIS server:

- You are **STRONGLY RECOMMENDED** to implement Stomp.
- You **MAY** implement HTTP transport.
- You **MUST** implement at least one transport in order to signal support for the RadioVIS application.

- You **MAY** implement any number of transports.
- You **MAY** implement a transport on more than one host and/or port.
- You are **STRONGLY RECOMMENDED** to implement transports on their standard ports due to the possibility that traffic on its non-standard port may be rejected by firewall/proxy configurations. This is currently defined as port 61613 for Stomp and port 80 for HTTP.

For manufacturers and developers implementing a RadioVIS receiver:

- You are **STRONGLY RECOMMENDED** to implement the Stomp protocol
- You **MAY** implement the HTTP transport
- You **MUST** implement at least one transport in order to support the RadioVIS application.

You should recognise that Stomp may not traverse strict HTTP proxies, whereas HTTP will correctly pass through most proxies. However, Stomp should be preferred over HTTP due to its more efficient nature as a true push notification transport.

In the case where both a Stomp and HTTP transport are available for a service, and the Stomp transport is unavailable or inaccessible, it is **STRONGLY RECOMMENDED** that a receiver 'fall-back' to using the HTTP transport.

# 2 Topics

The host and port discovered using an SRV record lookup, define the server details to be used for that particular transport to convey a RadioVIS feed – the specific feed itself is described by the broadcast parameters and the required content type. This is referred to as the *topic*.

The topics used are constructed from a combination of broadcast parameters and the required content type.

`/topic/<broadcast-parameters>/<content-type>`

The `content-type` should have a value of either **`image`** or **`text`**. This separation allows receivers that wish to use only text or only images, to differentiate between their desired content type. Receivers that wish to use both should subscribe to both topics.

The `broadcast-parameters` are based on the bearer of the service being consumed and the format of each are specified in the following sections of the present document.

It should be assumed that systems handling topics are case sensitive and therefore topics **MUST** be entirely in lowercase.

**The following note is for users of previous versions of this specification in order to highlight an important clarification, and will not be present in subsequent versions:**

> Previous versions of this specification specified `ecc` as a parameter for some bearers. This was potentially confusing as it was not the same as ECC provided by DAB/DAB+ and VHF/FM RDS. To clarify this, the parameter has been renamed `gcc`. The construction of `gcc` as a compound parameter of ECC and the Country Code remains unchanged.

## 2.1 VHF/FM

The broadcast parameters value for a VHF/FM service topic is constructed as follows:

`fm/(<gcc>|<country>)/<pi>/<frequency>`

The parameters are populated with the following values:

| Parameters | Description | Value | Status |
|---|---|---|---|
| `gcc` | **Global Country Code**<br>The Country Code (first nibble of the broadcast RDS PI code) concatenated with the broadcast RDS [7] ECC. | *3-char hexadecimal* | *mutually exclusive* |
| `country` | **ISO 3166 two-letter country code**<br>In the event that a service broadcast ECC is unavailable, an ISO 2-letter country code [8] must be provided. | *2-char string* | |
| `pi` | **Programme Identification (PI)**<br>Service broadcast RDS PI code. | *4-char hexadecimal* | *mandatory* |

| | | | |
|---|---|---|---|
| `frequency` | **Frequency**<br>Frequency on which the service broadcast is received, formatted to 5 characters in units of 100KHz. Frequencies below 100Mhz must be supplied with a leading zero, for example 95.8 would be represented as 09580, 104.9MHz as 10490. | *5-char string* | *mandatory* |

A service provider must implement topics for both `gcc` and `country` values to handle a situation where the receiver may not be able to acquire the RDS ECC.

For more detail on these parameters and their values, please refer to the VHF/FM section of the RadioDNS specification [2].

## 2.2 DAB/DAB+ Digital Radio

The broadcast parameters for a DAB/DAB+ Digital Radio service [9] topic are constructed as follows:

`dab/<gcc>/<eid>/<sid>/<scids>[/(<appty-uatype>|<pa>)]`

The parameters are populated with the following values:

| Parameters | Description | Value | Status |
|---|---|---|---|
| `gcc` | **Global Country Code**<br>For services with a 16-bit Service Identifier (SId), this is the first nibble of the SId followed by the Extended Country Code (ECC).<br>For services with a 32-bit SId, this is the third nibble of the SId followed by the first two nibbles of the SId. | *3-char hexadecimal* | *mandatory* |
| `eid` | **Ensemble Identifier (EId)**<br>Service broadcast multiplex ensemble ID code. | *4-char hexadecimal* | *mandatory* |
| `sid` | **Service Identifier (SId)**<br>Service broadcast identifier. | *4 or 8-char hexadecimal* | *mandatory* |
| `scids` | **Service Component Identifier within the Service (SCIdS)**<br>Service broadcast component identifier within the service. | *1 or 3-char hexadecimal* | *mandatory* |

If the service is delivered as data via X-PAD, the following additional parameter is mandatory:

| Parameters | Description | Value | Status |
|---|---|---|---|
| `appty-uatype` | **X-PAD Application Type (AppTy) and User Application type (UAtype)**<br>The X-PAD Application Type number and User Application Type, concatenated with a hyphen (only for applications broadcast in X-PAD). Where Application Types are allocated in pairs, the lower value (indicating the start of the application data group) must be used. | *2-char hexadecimal, hyphen, 3-char hexadecimal* | *mandatory, when referring to an X-PAD component, otherwise omitted* |

If the service is delivered as data in an independent Service Component, the following additional parameter is mandatory:

| Parameters | Description | Value | Status |
|---|---|---|---|
| pa | **Packet Address**<br>Packet address of the data service delivering the audio service. | *integer, between 1 and 1023* | *mandatory, when referring to a data service component, otherwise omitted* |

For more detail on these parameters and their values, please refer to the DAB/DAB+ section of the RadioDNS specification [2].

## 2.3 Digital Radio Mondiale (DRM)/AM Signalling System (AMSS)

The broadcast parameters for a DRM [10] / AMSS [11] service topic are constructed as follows:

```
(drm|amss)/<sid>
```

The parameters are populated with the following values:

| Parameters | Description | Value | Status |
|---|---|---|---|
| sid | **Service Identifier (SId)**<br>Service broadcast identifier. | *6-char hexadecimal* | mandatory |

For a detailed explanation on these parameters and their values, please refer to the DRM/AMSS section of the RadioDNS specification [2].

## 2.4 iBiquity Digital Corporation's HD Radio™ (HD Radio™)

The broadcast parameters value for a HD Radio™ [12] service topic ID is constructed as follows:

```
hd/<cc>/<tx>
```

The parameters are populated with the following values:

| Parameters | Description | Value | Status |
|---|---|---|---|
| tx | **Transmitter Identifier**<br>Service broadcast identifier | *5-char hexadecimal* | *mandatory* |
| cc | **Country Code**<br>Service broadcast country code | *3-char hexadecimal* | *mandatory* |

For a detailed explanation on these parameters and their values, please refer to the HD Radio™ section of the

RadioDNS specification [2].

## 2.5 IP-delivered audio service

In the case where broadcast parameters are not available, such as for IP-delivered audio services, the RadioDNS specification [2] defines alternative methods that will provide the Authoritative FQDN to perform the RadioVIS application lookup, and a Service Identifier for use in disambiguating the desired service.

This is used to form the topic in the following format:

`id/<fqdn>/<serviceIdentifier>`

The parameters are populated with the following values:

| Parameters | Description | Value | Status |
|---|---|---|---|
| `fqdn` | **Authoritative FQDN**<br>Authoritative FQDN, as given by one of the methods for performing lookup for IP-based services, in the RadioDNS specification [2]. | *Valid domain name* | *mandatory* |
| `serviceIdentifier` | **Service Identifier**<br>Service Identifier, as given by one of the methods for performing lookup for IP-based services, in the RadioDNS specification [2]. | *Maximum 16 lower case characters in the range [a-z][0-9]* | *mandatory* |

# 3 Message bodies

Regardless of the transport, RadioVIS will convey a set of message bodies to a receiver. These follow a specific format in order to indicate text or slides, as detailed in the following sections:

## 3.1 TEXT message

Provides a text message to be displayed on the receiver.

```
TEXT <message>
```

The message **MUST NOT** be longer than 128 characters. A receiver receiving a message longer than this should ignore the message.

A valid message must be displayed immediately and will replace any existing text message on the receiver.

## 3.2 SHOW message

Provides an HTTP URL to a slide image to be acquired and displayed on the receiver

```
SHOW <url>
```

Where `url` is the HTTP URL of the slide image.

The length of this URL must not exceed 512 characters [15].

# 4 Stomp transport

The Stomp transport is based upon the Stomp specification [5]. The version used may be negotiated between receiver and service provider as detailed in the specification, but both **MUST** support and be backward compatible with version 1.0.

A receiver connects to the Stomp server and then subscribes to one or more *destinations*. Once the receiver subscribed, text-based frames are then received related to the chosen destination.

The destinations used in the RadioVIS Stomp transport are the topics as defined in Section 2, and are constructed specific to the bearer of the desired service.

Stomp messages are sent and received as frames. Each frame consists of a set of headers and a body. All frames should be encoded as UTF-8 with Unicode character encoding. All frames are terminated using a NULL ASCII character `^@` (control-@).

The following sections define the essential frames used in RadioVIS. Please refer to the Stomp specification [5] for specific and detailed protocol definitions.

## 4.1 Connecting to the server

Connect to the server on a socket and send a CONNECT frame to the server:

```
CONNECT

^@
```

It is **RECOMMENDED** the server be configured to allow receivers to receive Stomp messages without first having authenticated, and that the receiver does not provide any authentication parameters whilst connecting.

The server will respond with an acknowledgement frame:

```
CONNECTED
session: <session-id>

^@
```

Any returned session ID currently has no current use within the RadioVIS specification.

## 4.2 Subscribing to a topic

Send a SUBSCRIBE frame to the server, indicating the topic to subscribe to:

```
SUBSCRIBE
destination: <topic>

^@
```

The Stomp specification states that the default behaviour is that the receiver need not acknowledge every frame sent back from the server after successfully subscribing.

## 4.3 Receiving a message

Once subscribed to a destination, the receiver will receive messages in the following format:

```
MESSAGE
destination: <topic>
message-id: <message-identifier>
content-length: <body byte length>

<body>^@
```

The destination header confirms which topic the message has been received from to help differentiate when subscribed to multiple topics over the same connection, and thus it **MUST** be parsed.

The `content-length` header is recommended within the Stomp specification as a byte count of the message body minus the terminator, but within RadioVIS is used only as a check. Parsing must end when a null terminator occurs, regardless of the `content-length` header value. If the `content-length` is missing then no length check should be performed.

Additional headers may be received, depending on the Stomp server. A receiver may ignore any additional non-mandatory headers.

The body of a MESSAGE frame contains the message bodies specific to the RadioVIS protocol defined in Section 3, Message bodies.

## 4.4 Handling Errors

A Stomp server can potentially send other frames, including the **ERROR** frame, although this is not proscribed by the Stomp specification and not all Stomp servers will implement this functionality. Indeed, some servers may respond with error feedback outside of the Stomp frame structure.

It is recommended that the receiver handles, but does not surface any errors, framed or non-framed, to the user and retain previously received text or visual content.

## 4.5 Custom Headers

Information specific to RadioVIS are implemented as Stomp headers, additional to those stated in the Stomp specification, and are specific to the MESSAGE frame in which they apply. The following sections detail these additional headers, with their indicated names.

### 4.5.1 trigger-time

An **OPTIONAL** header sent with a SHOW message body.

Determines if and when the slide is shown, with the content as specified in Section 6.2, Slide Triggering.

### 4.5.2 link

An **OPTIONAL** header sent with a SHOW message body.

This must be a valid URL and can be used by the receiver to provide associated content when the slide is interacted with. The URL must only be an HTTP-based resource and should be an (X)HTML document that can be rendered in a web browser on the receiver.

The length of this URL must not exceed 512 characters [15].

# 5 HTTP transport

For the purposes of RadioVIS, this is defined as *Long Polling HTTP* (sometimes referred to as *Comet*).

The implementation is a HTTP request, which is then held open until the server has a response to return. Once available, the server sends a response in JSON/JSONP format and closes the connection once finished.

The receiver should then send another request to the server to wait for the next response, unless the service provider does not respond with a message containing a valid ID (as detailed in Section 5.2.1, RadioVIS-Message-ID).

## 5.1 Request

The HTTP request URL is constructed using both the FQDN of the server returned in the HTTP transport SRV record being used, and the following path structure:

```
/radiodns/vis/vis.json?topic=<topic>[[&topic=<topic>]...][&last_id=<last_id>][&callback=<callback>]
```

The parameters are populated as follows:

| Parameters | Description | Value | Status |
|---|---|---|---|
| `topic` | **Topic**<br>Topic(s) the receiver wishes to subscribe to, as defined in Section 2, Topics.<br><br>It is possible to specify multiple topics, each of which should be provided as an individual query parameter. This is so a receiver need only keep open one HTTP connection when attempting to acquire a message for multiple topics (i.e. if the receiver wishes to be notified for both slides and text). | *string* | *mandatory to supply at least one topic* |
| `last_id` | **Last message ID**<br>Provide the message ID returned from the last RadioVIS HTTP transport response (see 5.2.1).<br><br>This parameter may be omitted in the first request for the service, but sent in all subsequent requests using the last returned value. | *string* | *mandatory for each request after the initial response, otherwise omitted* |
| `callback` | **JSON-P Callback**<br>Wraps the response in a JavaScript method style in order for it to be evaluated directly within JavaScript, as per the JSON-P methodology [20]. This is explained in more detail in Section 5.3, JSON-P Response. | *string* | *optional* |

All query parameter values must be properly URL-encoded [15]. For example, the following two topics:

```
/topic/fm/ce1/c586/09580/image
/topic/fm/ce1/c586/09580/text
```

Would result in a request path of:

```
/radiodns/vis/vis.json?topic=%2Ftopic%2Ffm%2Fce1%2Fc586%2F09580%2Fimage&top
ic=%2Ftopic%2Ffm%2Fce1%2Fc586%2F09580%2Ftext
```

It is **RECOMMENDED** that a timeout period of at least 60 seconds be used on the request.

A receiver **MUST NOT** treat a timeout as an error.

## 5.2 JSON Response

The response format is a JSON representation of the data sent back in the Stomp transport, with the RadioVIS-specific headers, and the message body in a JSON structure, referred to as a *RadioVIS frame*.

An example showing a frame is shown below:

```
{
    "headers": {
        "RadioVIS-Message-ID": "00192-c667a8",
        "RadioVIS-Destination": "/topic/fm/ce1/c479/09580/image",
        "RadioVIS-Link": "http://www.capitalfm.com/onair",
        "RadioVIS-Trigger-Time": "NOW"
    },
    "body": "SHOW http://www.capitalfm.com/images/4abf.jpg",
}
```

Where `body` is the message body as detailed in Section 3.

The following headers in a frame are specified:

- `RadioVIS-Message-ID`
- `RadioVIS-Destination`
- `RadioVIS-Trigger-Time`
- `RadioVIS-Link`

It is **RECOMMENDED** that both receivers and servers use the same case as specified above.

The response can either be as the above example, containing a single frame in a top-level JSON object, or containing multiple frames in a top-level JSON array.

This can be used by the server to return frames for multiple topics in a single response, e.g. the response from an initial receiver request for both text and image topics . The server may also use this to return a set of messages back to the receiver, e.g. to send a set of slides with a trigger-time set in the future.

An example of such a response is shown below:

```
[
    {
        "headers": {
            "RadioVIS-Message-ID": "a46a8-bcd89",
            "RadioVIS-Destination": "/topic/fm/ce1/c479/09580/image",
            "RadioVIS-Link": "http://www.capitalfm.com/onair",
            "RadioVIS-Trigger-Time": "NOW"
        },
        "body": "SHOW http://www.capitalfm.com/images/4abf.jpg",
    },
    {
        "headers": {
            "RadioVIS-Message-ID": "ee789-de901",
            "RadioVIS-Destination": "/topic/fm/ce1/c479/09580/image",
            "RadioVIS-Link": "http://www.capitalfm.com/commercial",
            "RadioVIS-Trigger-Time": "2012-03-20T11:15:46.271Z"
        },
        "body": "SHOW http://www.capitalfm.com/images/commercial.jpg",
    }
]
```

A JSON Array is ordered, and the service provider **MUST** return the response in a time-ordered way from oldest to most recent.

A receiver **MUST** process the array in a time-ordered way such that processing starts at the oldest frame and proceeds to the newest frame. The receiver is not obliged to process all the frames returned in the response.

The Content Type parameter in the HTTP response **MUST** be set to `application/json` [21].

Any response from the server **MUST NOT** exceed 8 message frames, or a response body content length of 16kB, whichever is first reached.

The following sections explain the specific headers within a frame in more detail.

### 5.2.1 RadioVIS-Message-ID

An **OPTIONAL** header sent back with every response, for both SHOW and TEXT message bodies.

This reflects an ID allocation within the service provider's RadioVIS server, which can be used to identify whether a message is the latest message sent. The allocation should be unique for each individual message over all topics on that server for a period of at least 24 hours.

A receiver **MUST NOT** make any assumptions on the structure or sequence of this allocation.

If the service provider includes this within any frame in the response, the receiver should immediately make another request to the service provider, with the value of this header included by the receiver as the `last_id` querystring parameter (see Section 5.1, Request).

If multiple frames are returned in a response, the value used by the receiver should be the *most recent* value, i.e. the value specified in the last processed frame.

If the service provider does not include this header in the response, the receiver **MUST NOT** make another

request to the service provider for the relevant topic(s) in the same session. A session is deemed as having ended once the receiver stops receiving the service.

For a response containing a single frame, this would be the topic indicated in the `RadioVIS-Destination` header of that frame. For a response containing multiple frames, this would be the set of topics indicated in the `RadioVIS-Destination` header of any frames missing the `RadioVIS-Message-ID` field.

If the `last_id` parameter is included in the request to the server, and the server identifies that this does not identify the latest sent messages for the requested topics, it may respond with any intermediate messages in order to bring the receiver up-to-date, taking into account the upper limit on number of frames and total response size.

If no `last_id` parameter is included in the request to the server (i.e. for the initial request), or a value is given that the server does not recognise or cannot determine which message it corresponds to, the server shall send back the latest sent message(s) for the requested topic(s) to the receiver.

### 5.2.2 RadioVIS-Destination

A **MANDATORY** header sent back with both SHOW and TEXT message body.

This is the RadioVIS topic that the message was sent from, and the same as the `destination` header in the Stomp transport.

This is useful when a receiver is sending a request to multiple topics, and will indicate which topic is responding to the request.

### 5.2.3 RadioVIS-Trigger-Time

An **OPTIONAL** header sent with a SHOW message body.

Determines if and when the slide is shown, as specified in Section 6.2.

### 5.2.4 RadioVIS-Link

An **OPTIONAL** header sent with a SHOW message body.

This must be a valid URL and can be used by the receiver to provide associated content when the slide is interacted with. The URL must only be an HTTP-based resource and should be an (X)HTML document that can be rendered in a web browser on the receiver.

The length of this URL must not exceed 512 characters [15].

## 5.3 JSON-P Response

Should the receiver specify a JSON-P callback method, the server will return the response in a JSON-P container, wrapping the data in the specified method.

For example, if a request is made with a callback method of `onCometResponse`, the HTTP response body would be of the form:

```
onCometResponse(<JSON>)
```

Where JSON is the JSON data as described in Section 5.2. The method should be named according to the Identifier naming guidelines given in the ECMAScript specification [23].

The Content Type parameter in the HTTP response must be set to `application/javascript` [22].

## 5.4 Handling HTTP Status Codes

The HTTP response may include any valid response within the HTTP specification, meaning a receiver should properly handle responses with common HTTP status code, with the following recommendations:

- It is **RECOMMENDED** that the receiver follows indicated redirects.
- It is **RECOMMENDED** that a receiver handles, but does not surface any errors to the user and retain previously received text or visual content.
- It is **RECOMMENDED** that a receiver does not respond to any request for authentication from the HTTP server.

# 6 Slide Acquisition

Once the slide URL has been received, the receiver should make an HTTP request in order to acquire the slide contents for display.

The slide associated with the URL provided must be of either JPEG [16], PNG [17] or animated PNG (APNG) [18] format, and must conform with the implementation details in this section.

## 6.1 Slide Caching

It is **RECOMMENDED** that receivers implement a cache to store acquired slides. This cache **MUST** identify each acquired slide by its URL, and store the acquired image data with any other optional metadata attached to the image (e.g. trigger-time, link).

When a SHOW message is received the receiver **MUST** check the cache to see if the slide has already been downloaded.

- If the asset does not exist in the cache it **MUST** acquire and store the slide.
- If the asset does exist in the cache, it **MUST** use the cached slide.

When multiple images are stored, each image may be a different size and/or colour depth.

## 6.2 Slide Triggering

If the value is specified as `NOW`, then the slide **MUST** be shown immediately.

If there is no cache available on the receiver, any slide with a value other than `NOW` must be ignored and not shown.

Any other value must be interpreted as an ISO 8601 combined date and time representation [14] and the slide **MUST** be stored in the cache and not shown until the specified date and time has been reached.

This representation should use both the extended date and time formats, down to a precision in the milliseconds (i.e. 3 decimal places). The timezone **MUST** be given in UTC. For example,

```
2011-07-08T11:41:46.271Z
```

If the parameter is not specified, or the time is historical, the receiver **MUST NOT** display the slide, but is **RECOMMENDED** to be loaded to the receiver cache, should one exist.

If a **SHOW** message is received with a valid trigger time for a slide already cached but not currently being displayed, the cached slide **MUST** be updated to reflect the new value.

If a **SHOW** message is received for a slide that is currently being displayed, it must not trigger a refresh on the receiver display. If the slide has been cached before display, the cached slide trigger time **MUST** still be updated.

All times should be compared to the time on the receiver, taking into account any timezone difference.

## 6.3 Minimum Receiver Requirements

The minimum receiver requirements are a set of attributes that a receiver **MUST** have to be deemed to be supporting the RadioVIS specification:

- Receivers **MUST** be able to display images of original size 320 x 240 pixels, at a colour depth of at least 15 bits per pixel.
- Receivers are **RECOMMENDED** to implement a display equal to or larger than 320 × 240 pixels, at a colour depth of at least 15 bits per pixel.
- Receivers **MAY** scale the original image to fit the available display.
- Receivers **MUST NOT** implement RadioVIS on displays smaller than 160 × 120 pixels
- The displayed image **MAY** be rotated to best fit the physical display aspect ratio (portrait or landscape), assuming that the majority of content will be formatted to fit a landscape display. However the orientation of the display **MUST** be consistent across all services, and individual images received by the application **MUST NOT** be rotated on a case-by-case basis.
- The original aspect ratio of the image **MUST** be preserved.
- The use of anti-aliasing and similar techniques is **RECOMMENDED** to optimise the quality of the scaled images.
- Receivers **MUST** support display of JPG [16] and PNG [17] images.
- Receivers **MUST** support the backward compatibility feature of APNG [18], i.e. displaying the first frame as a normal PNG file.

## 6.4 Slide Sizes

As specified in the minimum receiver requirements, a receiver **MUST** be able to display an image of 320 x 240 pixels. A service provider **MUST** therefore be able to service a slide request with an image of size 320 x 240 pixels.

The receiver **MAY** indicate desired dimensions and pixel densities, in the request used to acquire the slide, by sending the following HTTP headers:

- `Display-Width`
- `Display-Height`
- `Display-PPI`

Giving values of the desired width and height in pixels, and Pixels Per Inch (PPI) [19], respectively. It is **RECOMMENDED** that the values for width and height reflect the orientation of display the receiver will apply to the returned image.

The service provider receiving this request **MAY** use this information to return a slide image better suited to the requesting receiver. This **MAY** be greater but **MUST NOT** be less than the dimensions required in Section 6.3.

The dimensions of the image returned to the receiver may be different to the requested dimensions, meaning the receiver **MUST** examine the returned slide image size before display.

The slide returned may be of a different aspect ratio than requested by the receiver. In this case, the receiver **MUST NOT** rescale the original image so as to alter its aspect ratio. It **MAY** rescale keeping the same aspect ratio and/or vertically/horizontally pad the image as deemed appropriate.

If the service provider determines that any indicated receiver size cannot be properly fulfilled, it **MUST** return a slide of size 320x240 pixels.

## 6.5 Handling HTTP Status Codes

The HTTP response to a slide acquisition request may include any valid response within the HTTP specification, meaning a receiver should properly handle responses with HTTP status codes other than 200.

This should be in line with standard responses to those status codes.

It is **RECOMMENDED** that a receiver handle a redirect indicated by the response, by following that redirect.

It is **RECOMMENDED** that a receiver handles, but does not surface any errors to the user and retain previously received visual content.

It is **RECOMMENDED** that a receiver does not respond to any request for authentication from the HTTP server.

# 7 History

| Document history | | |
|---|---|---|
| First Release | September, 2008 | Initial release |
| 0.6.1 | June, 2009 | No changes to Visualisation spec, number jump to align all RadioDNS specification documents |
| 1.0.0 | September, 2009 | Final production release |
| 1.1.0 | April, 2012 | Changes to document structure and minor corrections<br>Added Slide content negotiation<br>Replaced HTTP transport<br>Clarified SRV service names<br>Guidance on Stomp transport errors<br>Clarified trigger-time format<br>Clarified topic construction for VHF/FM and DAB/DAB+ |