RDNS01
Technical Specification

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should be sent to feedback@radiodns.org

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Technical Specification

Introduction

Radio devices should be aware of what applications are available on the Internet for each radio service it receives. Standardising the ability to locate these applications would allow a manufacturer to support internet-based applications on a per radio service basis directly on the device. The ability to locate applications is equally applicable for devices that have a permanent connection to the Internet as it is for devices with periodic connectivity, such as media players that dock with a computer or hand-held devices with WiFi capabilities.

This document proposes a standardised method to facilitate both the location of resources hosted by radio service providers and the the discovery of their associated applications. This method utilises the existing Domain Name System (DNS).

The definition of resource location is relevant across multiple non-IP based transmission systems; VHF/FM, DAB Digital Radio, DRM (Digital Radio Mondiale) / AMSS (AM Signalling System), HD Radio. Resources can be offered for both traditional “as live” linear listening as well as non-linear listening such as podcasts, time-shifted or on-demand content.

Resource location is not required for IP-delivered (“streamed”) radio services as they are already delivered through a resolvable DNS entry. However, there are some important considerations for IP-based service delivery which are covered in this document.

RadioDNS standardises a method for advertising applications, and applications wishing to use this methodology must use this method of advertising.

Concept

The methodology is based upon the existing Domain Name System - DNS (*RFC 1035, "Domain Names"*). DNS is utilised by converting existing broadcast parameters in to a resolvable FQDN, resolving the FQDN to locate a domain for the service provider and from this discover which applications are supported by the service provider.

In the case of non-IP transmission systems there is a need to compile service identifiers into a FQDN (Fully Qualified Domain Name) to allow look up via the Domain Name System. The basis for this methodology has been adapted from that used to map E.164 format telephone numbers to URIs (*RFC3761, "The E.164 to Uniform Resource Identifiers (URI) Dynamic Delegation Discovery System (DDDS) Application (ENUM)"*).

In this document the domain "**`radiodns.org`**" is used solely to illustrate a unique namespace against which to prepend service parameters to create a resolvable FQDN. Issues surrounding the fair and equitable management of such a domain and its sub-domains lie outside of this specification document. You are directed to read the separate document (*"RDNS02: Administration and Governance", RadioDNS.org*) concentrating on these issues for more information.

No user identifiable information is distributed.

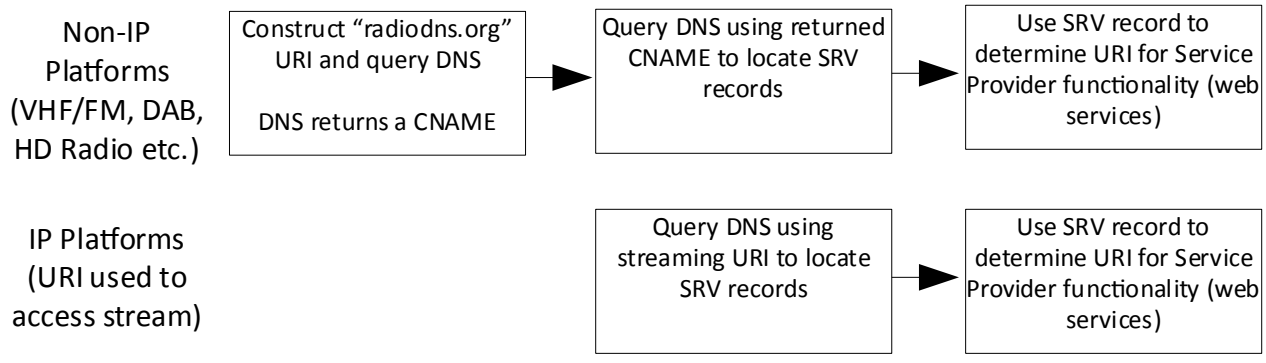

Table 1: Process for deriving SRV records

Implementation

FQDN construction for Broadcast Protocols

For broadcast protocols it is required to construct a FQDN based upon the broadcast parameters of the service being requested. Querying DNS with this FQDN will return a CNAME record for the radio service provider's own FQDN. The schema for this FQDN is dependent on the service bearer:

VHF/FM

The VHF/FM system supports identification of a radio service through transmission of meta-data by using the Radio Data System (RDS) (*IEC 62106:1999, "Radio Data System", RDS Forum*) or Radio Broadcast Data System (RBDS). The FQDN for a VHF/FM service is compiled as follows:

```
<freq>.<pi>.(<ecc>|<country>).fm.radiodns.org
```

The parameters are populated as follows:

Parameters	Description	Value	Status
`ecc`	**Extended Country Code (ECC) and country code** The broadcast RDS ECC code, concatenated with the first character of the broadcast RDS PI code (country code), must be supplied if available	*3-char hexadecimal*	*mutually exclusive*
`country`	**ISO 3166-1 alpha-2 country code** In the event that a broadcast ECC is unavailable, an ISO 2-letter country code must be provided	*2-char string*	
`pi`	**Programme Identification (PI)** The broadcast RDS PI code	*4-char hexadecimal*	*mandatory*
`freq`	**Frequency** The frequency on which the service is received, formatted to 5 digits in units of 10KHz. Frequencies below 100Mhz must be supplied with a leading zero (for example, 95.8Mhz would be represented as 09580, 104.9Mhz would be 10490)	*5-digit integer*	*mandatory*

The device should acquire the value for parameters **`ecc`** and **`pi`** by inspection of the RDS or RBDS for the received radio service.

The PI is a mandatory parameter.

The ECC parameter is optional and may only be transmitted periodically. As a region-identifying parameter is mandatory, either **`ecc`** or **`country`** must be provided.

It is required that the device provides a method for configuration to select the current region from a list derived from the ISO 3166-1 alpha-2 specification. This will provide a value for country which must be used only when no ECC value has been successfully decoded from RDS. The country value must be supplied in the ISO standard 2-character format (*ISO 3166-1, "ISO 3166-1-alpha-2 Codes"*).

If the ECC code is subsequently received from RDS, this ECC and PI derived country code combination must override the user configured country setting.

DAB Digital Radio

The FQDN construction for a DAB Digital Radio service is compiled as follows:

`[(<appty-uatype>|<pa>).]scids.sid.eid.ecc.dab.radiodns.org`

For standard audio services over DAB, the parameters are populated as follows:

Parameters	Description	Value	Status
`ecc`	**Extended Country Code (ECC)** The service's broadcast multiplex ECC code	*3-char hexadecimal*	*mandatory*
`eid`	**Ensemble Identifier (EId)** The service's broadcast multiplex ensemble ID	*4-char hexadecimal*	*mandatory*
`sid`	**Service Identifier (SId)** The service's broadcast identifier	*4 or 8-char hexadecimal*	*mandatory*
`scids`	**Service Component Identifier within the Service (SCIdS)** The service's broadcast component identifier	*1 or 3-char hexadecimal*	*mandatory*

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

`appty-uatype`	**X-PAD Application Type (AppTy) and User Application type (UAtype)** 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, omitted otherwise*

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

`pa`	**Packet Address** The packet address of the data service delivering the audio service	*integer between 0 and 1023*	*mandatory when referring to a data service component, omitted otherwise*

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

The FQDN construction for a Digital Radio Modiale or AM Signalling System is compiled as follows:

```
<sid>.(<drm>|<amss>).radiodns.org
```

The parameters are populated as follows:

Parameters	Description	Value	Status
`sid`	**Service Identifier (SId)** The service's broadcast identifier	*6-char hexadecimal*	*mandatory*

The SId value for DRM and AMSS are intended to be suitably unique internationally so as to not require region identification.

HD Radio (HD)

Whilst iBiquity Digital Corporation's HD Radio is a propriety format, it is expected that the broadcast identifiers will be used in FQDN construction as follows:

```
<tx>.<cc>.hd.radiodns.org
```

This will return a CNAME record for the radio service provider's own resource location. The parameters are populated as follows:

Parameters	Description	Value	Status
`tx`	**Transmitter Identifier** The service's broadcast transmitter identifier	*5-char hexadecimal*	*mandatory*
`cc`	**Country Code** The service's broadcast country code	*3-char hexadecimal*	*mandatory*

In the United States of America, the **`tx`** value is populated by the FCC facility code of the transmitter. However, this does not uniquely distinguish between multicast services (for example HD2 audio streams). As a result, in this current specification, distinguishing between services on the same frequency would have to be conducted at the application level.

FQDN construction for IP-delivered Services

RadioDNS is not required to translate broadcast parameters for IP-delivered services. However, the application discovery location is obtained from the domain name from which the content is served from. For example, if the audio is being served from the URL **`http://s1.stream.provider.net/audio.mp3`**, application discovery is performed on the FQDN **`s1.stream.provider.net`**.

There may be instances where one domain has multiple content streams mounted upon it from different service providers. In these instances it is important to uniquely identify different content providers to ensure successful resolution. A CNAME record unique to each radio service provider must be defined and used to deliver streaming content so that SRV records can be held against this domain instead.

Devices must lookup SRV records on the initial FQDN that the stream is located and not the resulting domain after CNAME resolution.

Application discovery

Once the relevant CNAME record has been derived for a service based on the details above, it is anticipated that broadcasters will advertise available applications through the use of SRV records associated with that domain record.

For non-IP services (in this example VHF/FM) , the process is as follows:

1. VHF/FM service with an ECC value of **`CE1`**, PI value of **`C586`** and a frequency of **`95.8 MHz`**
2. Derives the FQDN **`09580.c586.ce1.fm.radiodns.org`**
3. Resolution of the FQDN **`09580.c586.ce1.fm.radiodns.org`** returns the CNAME record **`musicradio.com`**
4. SRV lookup against supported applications on **`musicradio.com`** determines location and thereby availability.

For IP delivered services:

1. URL initially provided to the client **`http://fabfm.musicradio.com/stream.mp3`**
2. SRV lookup against supported applications on **`fabfm.musicradio.com`** determines location and thereby availability.
3. DNS returns CNAME record for **`stream.musicradio.com`**
4. Client connects and streams from resolved address **`http://stream.musicradio.com/stream.mp3`**

SRV record types are associated by name, for example the service provider's resource location for the **`foobar`** application would be held in the **`_foobar._tcp`** SRV record on the Service Provider's domain.

Advertisement of available applications

The presence of a particular applications related SRV record on the domain record confirms whether that radio service provider offers that particular application. A device should make interaction for all device-supported applications available to the end user until it is otherwise authoritatively established that the specific application is not supported by the audio service provider.

It is important to consider the differing connectivity states for devices. Where a continuous connection is available, such as a broadband Wi-Fi connection, it is preferred for a device to look ahead before any user interaction occurs to establish which services should remain advertised to the user. However on devices with limited or expensive connectivity, such as EDGE or GPRS, it is preferred to only perform application availability checks when interaction for that application occurs, minimising network activity.

Contributors

These individuals or corporations have contributed feedback to these proposals and their contributions are valued:

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