Radio EPG

More than just a programme guide

What is RadioEPG?

What is RadioEPG?

- Part of the RadioDNS umbrella of applications.

- **A method of delivering service and programme information for a service across all platforms it can be consumed over**

- Implemented as an extension of the DAB EPG specification

  - Keeps existing PI and SI files

  - Extends the XML schema of both

  - Provides an additional document extending the existing SI file - the **Extended Service Information (XSI)** file.

- GI files not currently under consideration, but no technical reasons why this cannot be confirmed as part of the specification

Uses of RadioEPG

- Programme Guide

- Service Information

  ➡ Station Names and Descriptions

  ➡ Bearer Information

  ➡ Station Logos

- Initial focus was on a means to primarily provide programme information to devices, but it quickly became apparent that the Service Information - *especially bearers* - was more important.

- Perhaps it should be better known as an **Enhanced *Service* Guide**?

Why not just use DAB EPG?

- DAB EPG is almost perfect at describing schedules and service information to DAB devices, with simple and well-formed entities describing common attributes.

- But it has one fundamental drawback: **it always describes DAB**

- For example, the DAB EPG SI file format **starts** with a DAB ensemble, bearer IDs are restricted to describing DAB bearer IDs, and other shortcomings

- Still, its great for describing DAB services, so we can use the best of the existing specification and **extend and embrace** it with an additional file and XML elements

- The **X** in **XML** stands for **Extensible**, so we are almost expected to do things like this with XML schema

Lets start with the XSI document

XSI Document

The XSI document holds a definition of all services provided by the service provider, including any relevant metadata and bearer details, such as:

- Names (in different lengths and languages)

- Descriptions (in different lengths and languages)

- Logos

- Genres

- Keywords

- Other bearers on which the service can be received

Just like the SI document

XSI Document walkthrough

- Document contains a collection of **services**, not ensembles, maintaining a bearer-neutral stance on service organisation

- We use our own schema, although all documents also use the datatypes from the DAB EPG specification

```xml
<?xml version="1.0" encoding="UTF-8"?>
<serviceInformation xmlns="http://radiodns.org/schemas/repgXSI/10"
  xmlns:epg="http://www.worlddab.org/schemas/epgDataTypes/14"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://radiodns.org/schemas/repgXSI/10 repgXSI_10.xsd"
  creationTime="2009-12-01T00:00:00" originator="Global Radio" serviceProvider="Global
Radio"
  xml:lang="en-GB">
  <services>
     ....
  </services>
</serviceInformation>
```

- The general structure is *very similar to* the DAB EPG SI format

XSI Document
service definition

- Each service is defined in the **service** element, again *very similar* to that in the DAB EPG specification, and will use those datatypes

```xml
<service>
  <radiodns serviceIdentifier="25" fqdn="rdns.musicradio.com"/>
  <serviceID id="dab:ce1.c19d.c9cc.0" mime="audio/mpeg" cost="10"/>
  <serviceID id="dab:ce1.c1b0.c9cc.0" mime="audio/mpeg" cost="10"/>
  <serviceID id="fm:ce1.c586.09580" cost="30"/>
  <serviceID id="http://media-ice.musicradio.com/Capital" mime="audio/aacp" bitrate="48" cost="40"/>
  <serviceID id="http://media-ice.musicradio.com/CapitalV1" mime="audio/aacp" bitrate="48" cost="41"/>
  <serviceID id="http://media-ice.musicradio.com/CapitalMP3Low" mime="audio/mpeg" bitrate="48" cost="42"/>
  <serviceID id="http://media-ice.musicradio.com/CapitalMP3" mime="audio/mpeg" bitrate="128" cost="43"/>
  <epg:shortName xml:lang="en-GB">Capital</epg:shortName>
  <epg:mediumName xml:lang="en-GB">Capital FM</epg:mediumName>
  <epg:longName xml:lang="en-GB">Capital FM London</epg:longName>
  <mediaDescription>
    <epg:shortDescription xml:lang="en-GB">London's No.1 Hit Music Station</epg:shortDescription>
  </mediaDescription>
  <mediaDescription>
    <epg:multimedia url="http://owdo.thisisglobal.com/2.0/id/25/logo/640x480.png" type="logo_colour_square"/>
  </mediaDescription>
  <genre href="tva:metadata:cs:ContentCS:2004:3.6.10" type="main">
    <epg:name><![CDATA[ Hit-Chart/Song Requests ]]></epg:name>
  </genre>
  <keywords xml:lang="en-GB">London, hit music, artists, gossip, news, competitions, prizes</keywords>
  <link url="http://www.capitalfm.com/london/" mimeValue="text/html" xml:lang="en-GB"/>
</service>
```

- Key differences are the extra elements (e.g. **radiodns**) and the modified elements such as **serviceID**, now defined to be able to refer to **NON-DAB BEARERS**

XSI Document
bearer definition

- Each service may have a collection of bearers, contained with a **serviceID** element

- Each bearer has possible attributes: **id**, **mime**, **cost**, **bitrate -** some of which are optional dependant on the bearer type

- **id** is the bearer details expressed in a **URI** form

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

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

(drm|amss):<sid>

hd:<cc>.<tx>.<frequency>

http://<path>/<resource>
```

XSI Document
bearer definition

- Looking at some of the examples in our XSI:

  ```
  dab:ce1.c19d.c9cc.0
  dab:ce1.c1b0.c9cc.0
  fm:ce1.c586.09580
  http://media-ice.musicradio.com/Capital
  http://media-ice.musicradio.com/CapitalV1
  http://media-ice.musicradio.com/CapitalMP3Low
  http://media-ice.musicradio.com/CapitalMP3
  ```

- Additional attributes exist depending on the bearer type:

- **Cost**: exists for all bearer types and indicates the relative *cost* to the broadcaster of the device using this bearer - the lower cost the better and devices should *prefer* to use these should they support reception of the bearer described

- **MIME Type**: used as a hint to the device, and a possible filter for support when dealing with different codecs on the same platform

- **Bitrate**: used as a hint to the device, and a possible filter for support when dealing with similar bearers at different bitrates

XSI Document
radiodns element

- For situations where the XSI is discovered by a *client*, and no broadcast parameters have been acquired, this can be used in conjunction with the proposals in the proposed RadioDNS specification (v1.0.0)

```
<radiodns serviceIdentifier="25" fqdn="rdns.musicradio.com"/>
```

- Defines the basic information in order to discover RadioDNS applications - i.e. the **FQDN** is used to query against for SRV records and the **serviceIdentifier** used as a unique identifer for the particular service - *to be used in a defined way by each application*, e.g. in topic construction for a RadioVIS feed.

- Can be used when either by a device when the broadcast parameters do not exist, e.g. for IP streams

- ...Or by alternative methods of service discovery

More on this later!

PI Document

The PI document **still** holds programme information for its relevant service, but uses the bearer formats defined for the XSI document, along with our own XML extensions to signal that the programme is available on additional bearers

```xml
<programme shortId="1190223" id="crid://thisisglobal.com/1190223" recommendation="yes">
  <epg:shortName>B'fast</epg:shortName>
  <epg:mediumName>Johnny &amp; Lisa</epg:mediumName>
  <epg:longName>Capital Breakfast With Johnny &amp; Lisa</epg:longName>
  <epg:location>
    <epg:time time="2009-10-05T06:00:00+01:00"
              duration="PT4H0M0S" actualTime="2009-10- 05T06:00:00+01:00" actualDuration="PT4H0M0S"/>
    <epg:bearer id="ce1.c185.c586.0"/>
    <repg:bearer id="dab:ce1.c185.c586.0" mime="audio/mpeg" bitrate="128" cost="10"/>
    <repg:bearer id="fm:ce1.c586.09580" cost="30"/>
    <repg:bearer id="http://media-ice.musicradio.com/Capital"
                 mime="audio/aacp" bitrate="56" cost="40"/>
    <repg:bearer id="http://vis.media-ice.musicradio.com/CapitalMP3Low"
                 mime="audio/mpeg" bitrate="56" cost="40"/>
  </epg:location>
</programme>
```

The **bearer** element in the **repg** namespace contains non-DAB bearer definitions.

This allows us to maintain the DAB EPG functionality of being able to define/restrict bearers on per-service basis

Document Discovery

- In DAB, EPG documents are received over a packet data channel as using the MOT protocol (with an MOT directory representing the range of files).

- In RadioEPG, documents are acquired using the HTTP protocol.

- In the circumstances of a device tuning to a service, it will use the broadcast parameters and RadioDNS discovery to locate the documents.
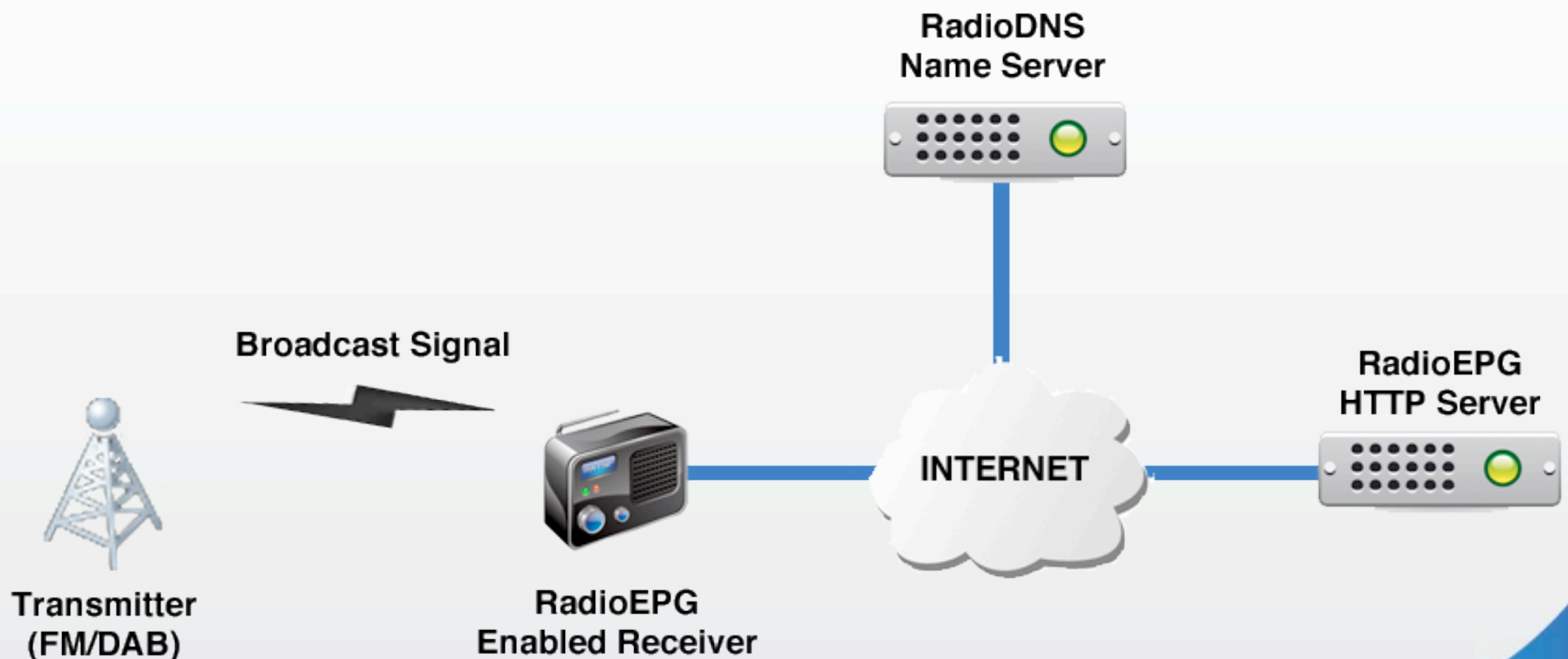
PI Document Discovery

- In the situation where a device listening to a service wishes to acquire RadioEPG documents, the PI documents are acquired using a URL constructed using the format:

  `http://<host>:<port>/<broadcast parameters>/<date>_PI.xml`

- Where host and port are populated by the host and port values obtained from the SRV record lookup for the RadioEPG application, as per the RadioDNS specification.

- Broadcast parameters are specified in a format determined by the bearer the service is being received on, as per the RadioEPG specification.

- PI documents are stored as a file per day's schedule contained within. The date value represents the day you wish to obtain the schedule for. It is populated in the format `YYYYMMDD`, for example Sunday, 9th October, 2011 would be represented as `20111009`.

XSI Document Discovery

- In the situation where a device listening to a service wishes to acquire RadioEPG documents, the XSI document for that *service provider* is acquired using a URL constructed using the format:

  ```
  http://<host>:<port>/radiodns/epg/XSI.xml
  ```

- Where host and port are populated by the host and port values obtained from the SRV record lookup for the RadioEPG application, as per the RadioDNS specification.

- The XSI document sits at the root of the *RadioEPG application folder* (the root of the returned server with path namespacing for the RadioEPG application).

- This is done so that document discovery can happen via **alternative** paths, as explained later.

**Demonstration**
Device usage of RadioEPG

Hybrid Radio

What is Hybrid Radio?

- Hybrid Radio can be defined as describing a **Service Oriented User Experience**

- Uses a range of sources to allow a listener to receive their desired service, regardless of the bearer actually used.

- Dependant on the capabilities of the device: e.g. whether it has DAB, FM, IP support - codecs, etc.

- User experience increases with increased device capabilities, e.g. multiple FM/DAB tuners, Mobile and WiFi IP support, etc.

A Better User Experience

RadioEPG data can be used to create an interface that allows user to select a service without consideration of the bearer.
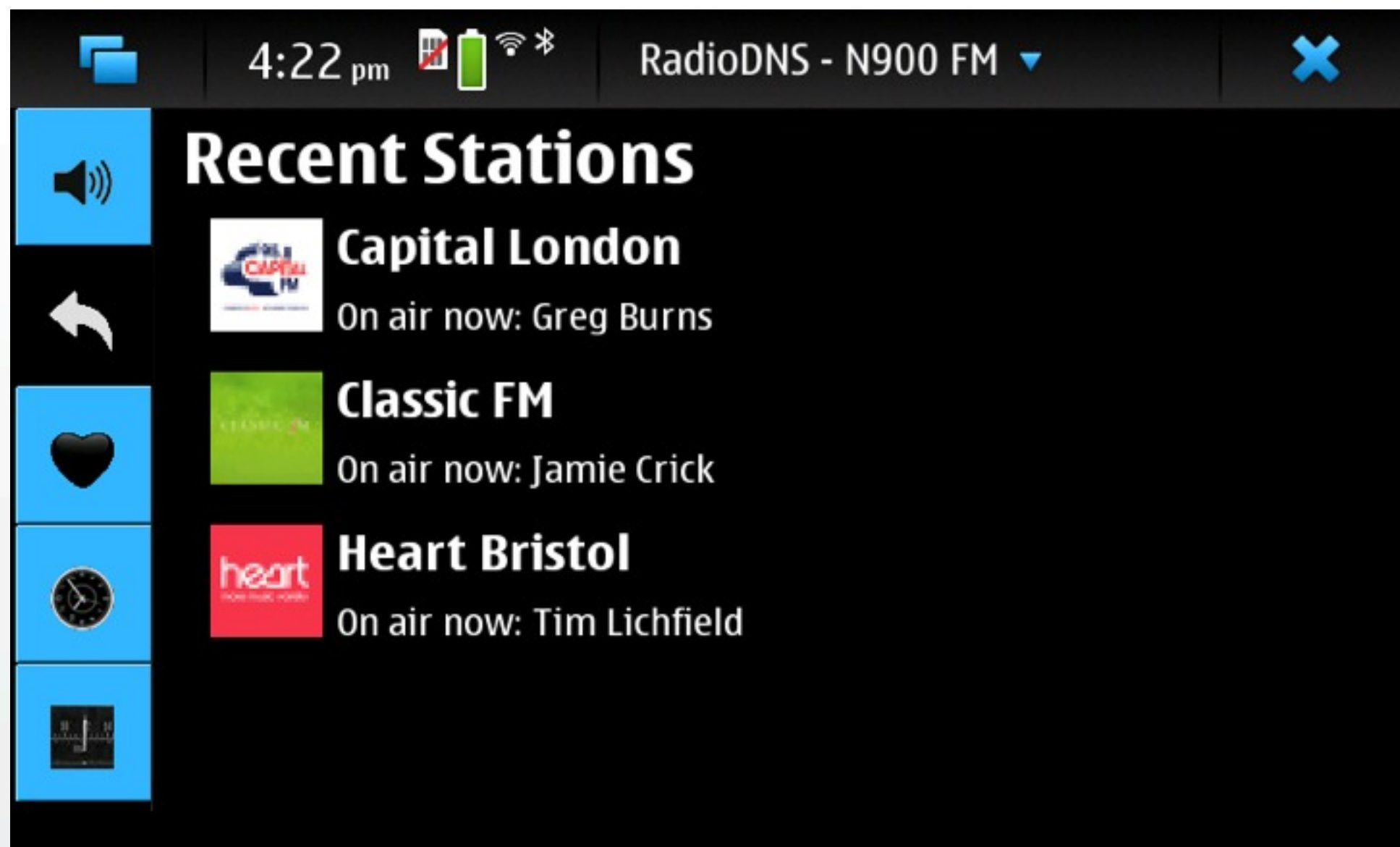
Service Following Principles

- Radio stations not available in all areas on all platforms.

- Signal strength is variable, especially inside buildings and areas of low bearer coverage.

- When a service cannot be received on the current platform at an acceptable quality, **switch to an alternative**

- Similar to AF in FM RDS and FIG0/6 in DAB but provides a common method across bearers, including IP

Alternative Programme Sources

- Returning to the list of bearers defined against a service/programme, we can use the list of bearers to determine the selection and order of bearers to switch to when deemed necessary

```
dab:ce1.c19d.c9cc.0
dab:ce1.c1b0.c9cc.0
fm:ce1.c586.09580
http://media-ice.musicradio.com/Capital
http://media-ice.musicradio.com/CapitalV1
http://media-ice.musicradio.com/CapitalMP3Low
http://media-ice.musicradio.com/CapitalMP3
```
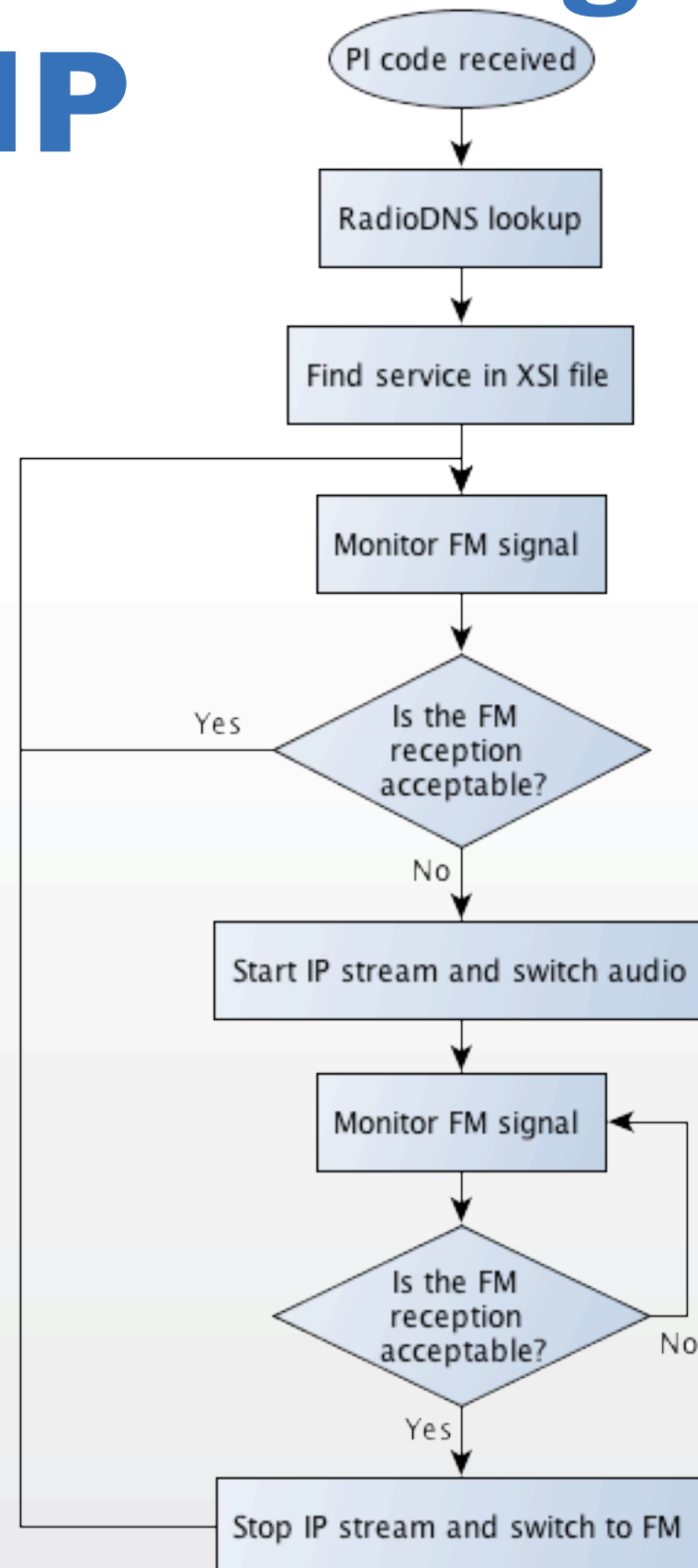
Service following between FM and IP

Monitoring Coverage

- RSSI - Received Signal Strength Indication.

- For FM we can use the RSSI as a guide to the quality of the received FM signal.

- For DAB, we could use the Bit Error Rate (BER).

- When the RSSI falls below a pre-defined limit, we switch the source from FM to IP.

- We could also monitor IP coverage on appropriate platforms

Hysteresis

- Reception can fluctuate a lot, especially when using a portable device, making it necessary to implement a method to stop frequent switching between sources.

➡️ **Schmitt Trigger**

- High and low set points
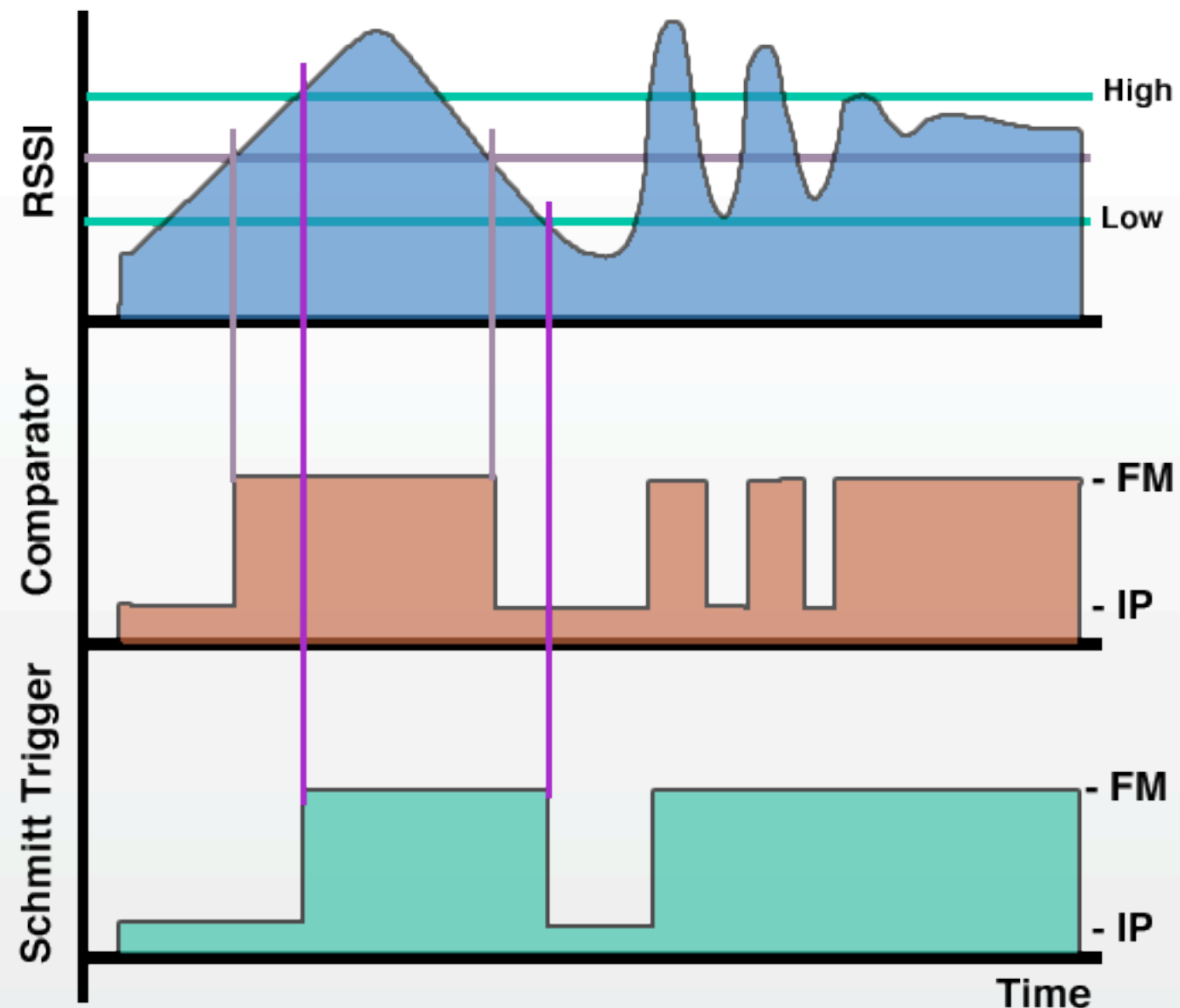
Demonstration
Service Following

Handling Source Delays

- The received programme will most likely not be synchronised between the various bearers.

- This is a consequence of three delays:

  - **Broadcaster Delay:** Time from start of broadcast chain to the point where the signal/packets leave the broadcaster's control

  - **Transmission Delay:** Time taken to traverse the transmission mechanism from when it leaves the broadcaster's control to reaching the device

  - **Device Delay:** Time taken between the device receiving the signal/packets and playing the audio to the listener

- With FM and DAB, the transmission time from broadcaster to receiver can be calculated.

- For IP-based transmission, this becomes more complicated.

- Current draft XSI document has an 'offset' field as a hint to the receiver as to how long the broadcast delay is, although this is subject to change.

Handling Source Delays

- There are various techniques available for handling these differences in transmission on a device:

  - **Do nothing.**

  - **Build up incremental buffer.**

  - **Buffer in the background and then jump back.**

Alternative means of Discovery

Other Ways to find an XSI

- We've already talked about the familiar RadioDNS method for discovery of the XSI, but what if you're not a device currently tuned to that particular service, or require the Service Information for more than the current service?

- **Directory Service Providers**: a server-side aggregator of service information, providing that information for multiple services, sometimes to devices in a proprietary manner

- We require alternative methods of discovery for the **XSI -** this gives us the starting point for **further discovery** using the information contained within it (i.e. the **radiodns** element against each service).

- Two **additional** methods exist:

  - Defined location on the Service Website

  - Link within Service Website HTML

Defined Location

- The URL to obtain the XSI document is constructed as follows:

`http://<host>:<port>/radiodns/epg/XSI.xml`

- Where `host` and `port` are populated by the host and port of the service website.

- For example, for a service with a website at `http://www.capitalfm.com/london`, the URL will be:

`http://www.capitalfm.com/radiodns/epg/XSI.xml`

Link within Service Website

- The URL of the XSI document is contained within the (X)HTML header section `<link>` tag of any HTML pages likely to be discovered by a Directory Service Provider.

- For example, for a service with a website at **`http://www.capitalfm.com/london`**, the header section may contain:

```
<head> ...

   <link rel="radioepg" href="http://epg.musicradio.com/XSI.xml">
... </head>
```

- Similarly, a service with a website at **`http://www.classicfm.com`**, the header section may contain the same link as above, representing the XSI document for that service provider across all the service website it manages.

- Or, you could have different XSI documents for your services.

Project Status

Handling Source Delays

- Draft version of the 1.0 specification exists on the RadioDNS website for public consideration: **REPG01 V1.0.0-DRAFT**

- Please give your consideration and feedback to this!

- Active community on the RadioEPG Developers List: **http://groups.google.com/group/radioepg-developers**

- Proposed specification tightly linked with the latest RadioDNS draft specification under consideration currently, due to the provisions for handling lookup for IP streamed services.

- Hope to put forward the 1.0 specification of RadioEPG for ratification this **April** at the earliest, after more work on Synchronisation and Prototyping has been completed.

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