use XMLTV::Compile;

Configuration of channels and video sources in MythTV with Perl

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mk.pm, May 2012

"*Man came by to hook up my cable TV*

We settled in for the night my baby and me

We switched 'round and 'round 'til half-past dawn

There was fifty-seven channels and nothin' on"

Bruce Springsteen

"*57 Channels (And Nothin' On)*"

Background

- MythTV is a powerful, open source digital video recorder, supporting DVB-T/S/C tuners and analog MPEG-2 encoders

- MythTV configuration is stored in a MySQL database

- **Configuration and maintenance of channels (especially with XMLTV) can be a PITA**

Current solutions

- Configure once and never touch again

- Configure with a likely out-of-date shell/SQL script

- Stick to EIT (over-the-air) listings and default channel assignments

Motivation

- Make channel reconfiguration a simple and reproducible process

- Cater for users with Sky/Virgin services where all channels must be added and reconfigured manually (that's 100's...)

- Learn more about XML::Compile, XML Schema creation, XPath and XSLT

My Cunning Plan

1) Implement the oft-talked-about "lineups" feature within the XMLTV project for managing available channel listings

2) Write a tool for managing channel configuration in MythTV using this data

3) ???

4) Profit!

In case you were wondering...

- Step 3 on the previous slide turned out to be "happen to attend 2011's mk.pm technical talk where Colin Bradford talked about XML::Compile"

- I overestimated Step 4...

Part 1
Generating Lineups

XMLTV Lineups

- Problem: XMLTV needs an agreed way to describe available channels on a given TV/radio/IP platform

- A couple of proposals were drafted in 2008, but nothing happened

- After hearing about XML::Compile at a previous mk.pm I thought I'd have a go

Lineups Implementation

- Write an XSD to describe the concept and structure of a lineup

- Write a tool to generate a code structure representing the XML document structure described in the XSD

- Use XML::Compile to validate the code structure and generate XML

Lineups XSD

- Intended to describe an Electronic Programme Guide (EPG) and its entries

- Separates the concept of stations (content, e.g. BBC1 West Midlands) from channels (physical broadcast, e.g. DVB-T, onid 9018, sid 4165), with 1-to-many relationship

- Each channel element will contain only the tuning information relevant to its sub-type

Assembling the data

- EPG lineups are retrieved by scraping Wikipedia (and updated if necessary)

- Digital channel data is obtained via `scan` from DVB-T/S tuners

- XMLTV configuration and channel logo data is obtained from tv_grab_uk_rt

- A utility merges these sources, producing the input data structure for XML::Compile

XML::Compile

```perl
use XML::Compile::Schema;
use XML::LibXML;

my $schema = XML::Compile::Schema->new('xmltv-lineups.xsd');
my $doc = XML::LibXML::Document->new('1.0', 'UTF-8');
my $writer = $schema->compile(WRITER => 'xmltv-lineups');
my $xml = $writer->($doc, $xml_lineups_href);

my $pi = $doc->createProcessingInstruction("xml-stylesheet");
$pi->setData(type=>'application/xml', href=>'xmltv-lineups.xsl');
$doc->appendChild($pi);
$doc->setDocumentElement($xml);
print $doc->toString(2);
```

TV platform support

- The lineup generator currently creates "master" channel lineups for:
    - Freeview
    - Freesat
    - Sky
    - Virgin
    - Saorview
    - UPC Ireland

Sample Freeview <lineup-entry>

```
<lineup-entry>
  <preset>2</preset>
  <section>General entertainment</section>
  <package type="basic">Free-to-air</package>
  <availability area="country">England</availability>
  <station>...</station>
  <dvb-channel>...</dvb-channel>
<lineup-entry>
```

Sample <station>

```xml
<station rfc2838="bbc2.bbc.co.uk" type="TV">
  <name lang="en-GB">BBC Two England</name>
  <short-name lang="en-GB">BBC Two</short-name>
  <logo
    url="http://www.lyngsat-logo.com/logo/tv/bb/bbc2.jpg"
    height="99" width="132"/>
  <commercial-free>true</commercial-free>
  <video>
    <format>SDTV</format>
    <aspect-ratio>16:9</aspect-ratio>
  </video>
</station>
```

Sample <dvb-channel>

```
<dvb-channel>
  <original-network-id>9018</original-network-id>
  <service-id>4287</service-id>
  <lcn>2</lcn>
  <service-name>BBC TWO</service-name>
  <encrypted>false</encrypted>
 </dvb-channel>
</lineup-entry>
```

Part 2
Using Lineups in XMLTV

Supporting lineups in XMLTV

- Add new grabber capability "lineups"

- Implement required functionality:
  - Add support to core XMLTV libs
  - Implement callbacks in tv_grab_uk_rt

- New grabber options available:
  - --list-lineups
  - --get-lineup

Lineups grabber options

- --list-lineups

  - Produces an XML document listing all platform lineups supported

- --get-lineup

  - Produces a (filtered) lineup using the information provided at configuration

(XML produced by these options must validate against the xmltv-lineups XSD)

Refining a lineup
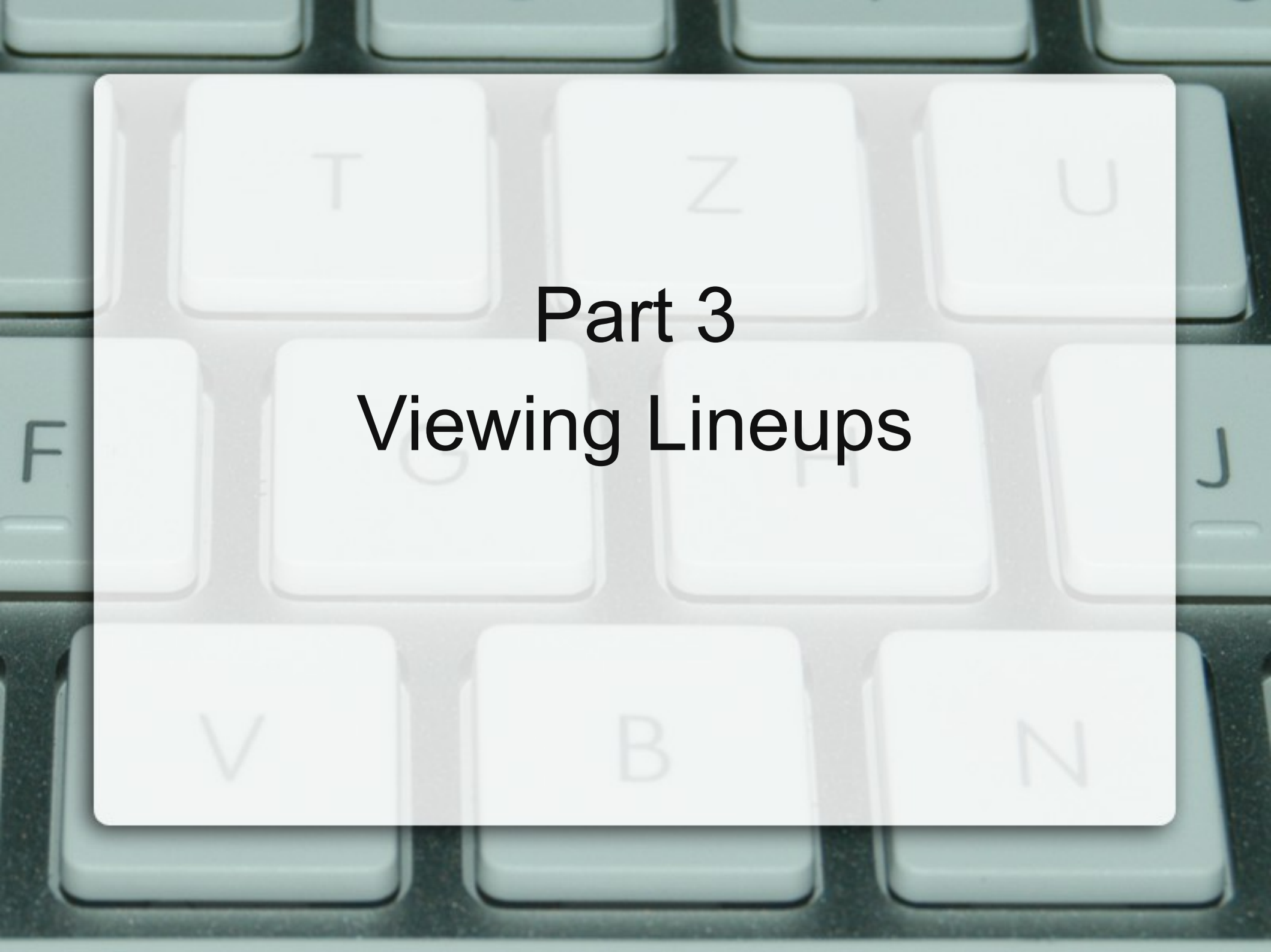
- Each "master" platform lineup generated by XML::Compile covers all regions served by a platform, permitting a single document per platform, but...

- The end-user (or consuming app) wants a lineup that (ideally) only includes the channels available in the user's location and to which they subscribe

Personalising lineups

- During configuration of tv_grab_uk_rt, the user is asked for details of:
    - Country
    - Postcode
    - TV platform
    - Subscribed packages*
    - Premium channels*

(* if relevant)

Lineup filtering

- Retrieve "master" platform lineup

- Process the document with XML::LibXML using XPath to get details of geographic and package availability for channels

- Remove extraneous <lineup-entry> entries

- Output filtered lineup (when called with --get-lineup)

Part 3
Viewing Lineups

Quick and dirty validation

- Problem: The lineups XML is human-readable, but it's not easy to quickly see if it contains what you expect.

- Solution: Use XSL Transformations (XSLT) to transform the lineups document into a simple HTML document that can be scanned quickly

Preset	Icon	Name
101		BBC One West Midlands
102		BBC Two England
103		ITV1
104		Channel 4
105		Channel 5
106		BBC Three
107		BBC Four

Not much further to go...

- At this point, filtering available channels (and therefore TV listings) is available within the tv_grab_uk_rt grabber - and - we can view lineups

  BUT

- Most users want XMLTV configured in their PVR software (and this is where the pain lies)

Part 4

Configuring MythTV with XMLTV Lineups

MythTV Perl bindings

- MythTV has included Perl bindings for several releases

- Auto-detect database connection settings

- Use Perl DBI to talk to the MythTV database:

```
use MythTV;
my $Myth = new MythTV();
my $sh = $Myth->{'dbh'}->prepare("UPDATE channel...
```

MythTV Services API

- MythTV 0.25 (released April 2012) includes a new Services API framework

- Allows configuration of many MythTV aspects with HTTP/REST

- However, many users are still using older versions of MythTV so I went with the bindings for the first version

MythTV Lineup Tool

- Intended to be "the one ring"

- Allow existing DVB-based videosources and channels to be reconfigured

- Allow STB-based videosources (e.g. Virgin, Sky) to be created and populated with configured channels

- Permit use of either EIT (where available) or XMLTV listings data

What does it do?

- Renumbers channels per platform EPG

- Updates channel name/short-name/callsign

- Downloads and configures channel icons

- Configures XMLTV ID

- Hides all extraneous channels on source (e.g. this removes ~400 FTA non-Freesat channels from the MythTV EPG)

Example Usage

- Generate lineup file:

    tv_grab_uk_rt –configure
    tv_grab_uk_rt –get-lineup > freesat.xml

- Configure MythTV (DVB sources):

    lineup_tool --source-id 1 --lineup-xml freesat.xml

- Configure MythTV (STB sources):

    lineup_tool --source-name "Virgin" --lineup-xml virgin.xml

Freesat (before lineup tool, 558 channels)

◀	08:00 PM	08:15 PM	08:30 PM	08:45 PM	09:00 PM	09:15 PM	09:30 PM	09:45 PM
1013 (4013)	NO DATA							
1024 (52220)	NO DATA							
1025 (52250)	NO DATA							
1028 (52280)	NO DATA							
1029 (55280)	NO DATA							
3081 (3081)	NO DATA							
3082 (3082)	NO DATA							
3083 (3083)	NO DATA							

Freesat (after lineup tool, 165 channels)

	08:00 PM	08:15 PM	08:30 PM	08:45 PM	09:00 PM	09:15 PM	09:30 PM	09:45 PM
one 101	Holby City: Coercion				Crimewatch			
TWO 102	Hairy Bikers' Bakeation: Spain				Meet the Romans with Mary Beard: Behind Closed Doors			
itv 1 103	William and Kate: The First Year				The Hunt for bin Laden			
4 104	Supersize vs Superskinny				Hidden Talent			
5 105	War Hero In My Family				CSI: Crime Scene Investigation			
three 106	Young, Dumb and Living off Mum				Britain Unzipped			
FOUR 107	The Story of British Pathé: The Birth of the News				Yellowstone: Unnatural Histories			

Future plans

- Support for renumbering channels on a given platform's EPG to those of another

- Testing across all supported platforms

- Develop XSD

- Support for MythTV's Services API

- Investigate adding support directly into MythTV using XMLTV's apiconfig feature

Questions?

"I can see by your eyes friend you're just about gone

Fifty-seven channels and nothin' on"

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Code

- XMLTV

    http://sourceforge.net/projects/xmltv/

- Lineup generator / Lineups / MythTV configuration tool

    https://github.com/knowledgejunkie