



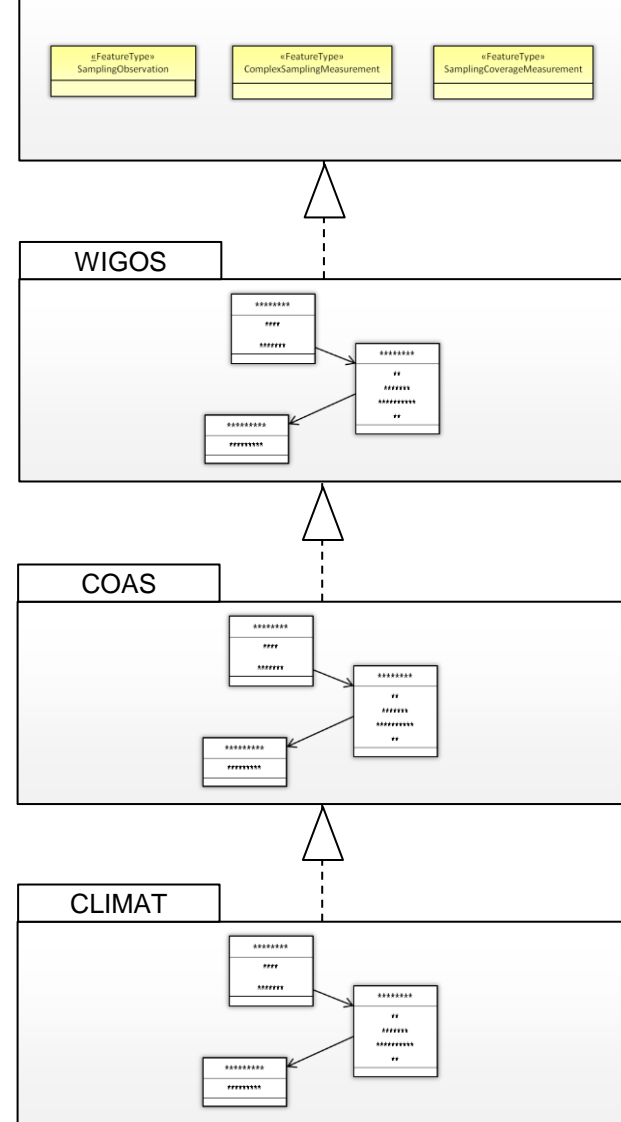
World Meteorological Organization

Weather • Climate • Water

Approach to model-driven development of data exchange standards

Jeremy Tandy

... more Profiles



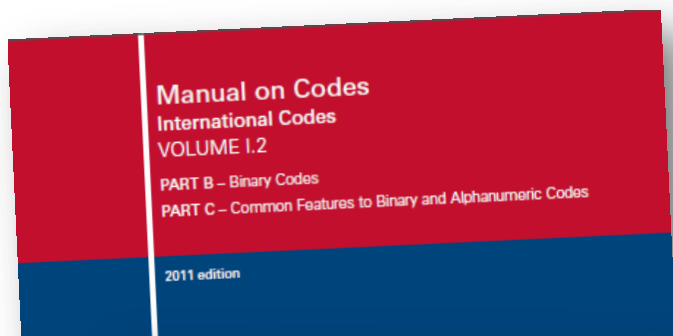
- ▶ *(land-surface based) Climate Observations Application Schema (COAS)*

- ▶ *CLIMAT message (derived from FM-71) – report of monthly values from a land station*

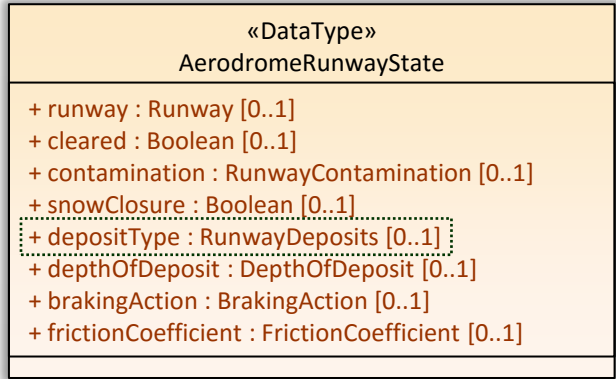
Further specialisation provides more detail – removes the ‘degrees of freedom’ in data exchange and makes for more robust data exchange



Nominal value-types; regulated set of terms (code-table)



IWXXM METAR/SPECI



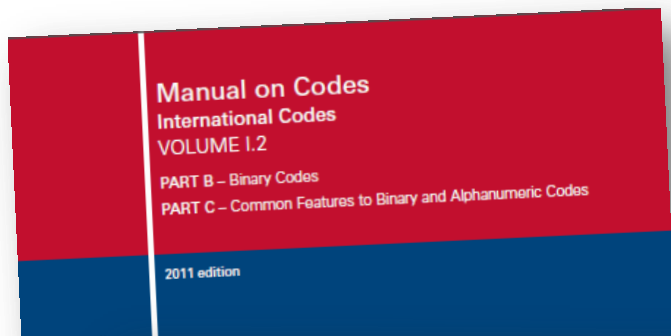
0 20 086
Runway deposits

Code figure		
0	Clear and dry	
1	Damp	
2	Wet with water patches	
3	Rime and frost covered (depth normally less than 1	
4	Dry snow	
5	Wet snow	
6	Slush	
7	Ice	
8	Compacted or rolled snow	
9	Frozen ruts or ridges	
10-14	Reserved	Operational
15	Missing or not reported (e.g. due to runway clearance in progress)	Operational

Technical Regulation mandates the use of terms only from a specified controlled vocabulary

Excerpt from BUFR edition 4 Code- and Flag-tables

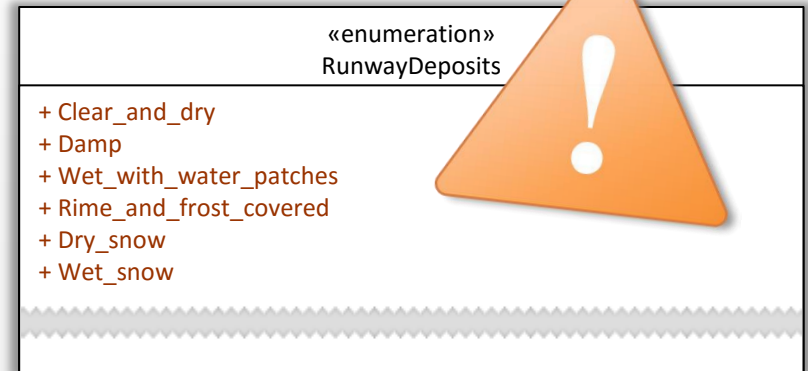
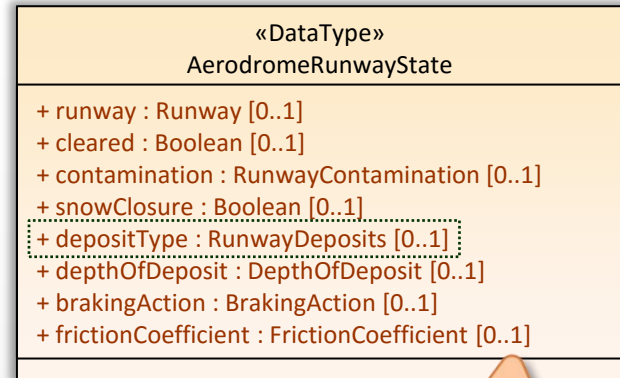
Design choice: avoid use of «enumeration» entities (*fragile*)



0 20 086 Runway deposits

Code figure		
0	Clear and dry	
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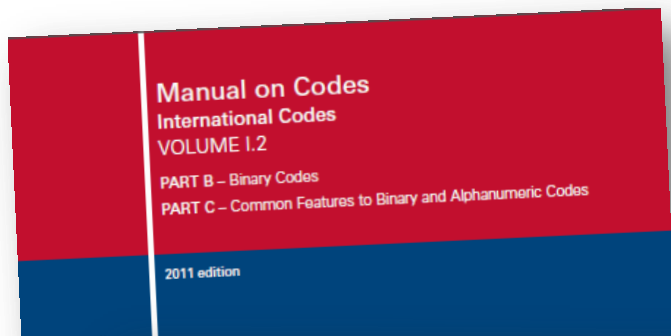
IWXXM METAR/SPECI



Operational
Operational
Operational

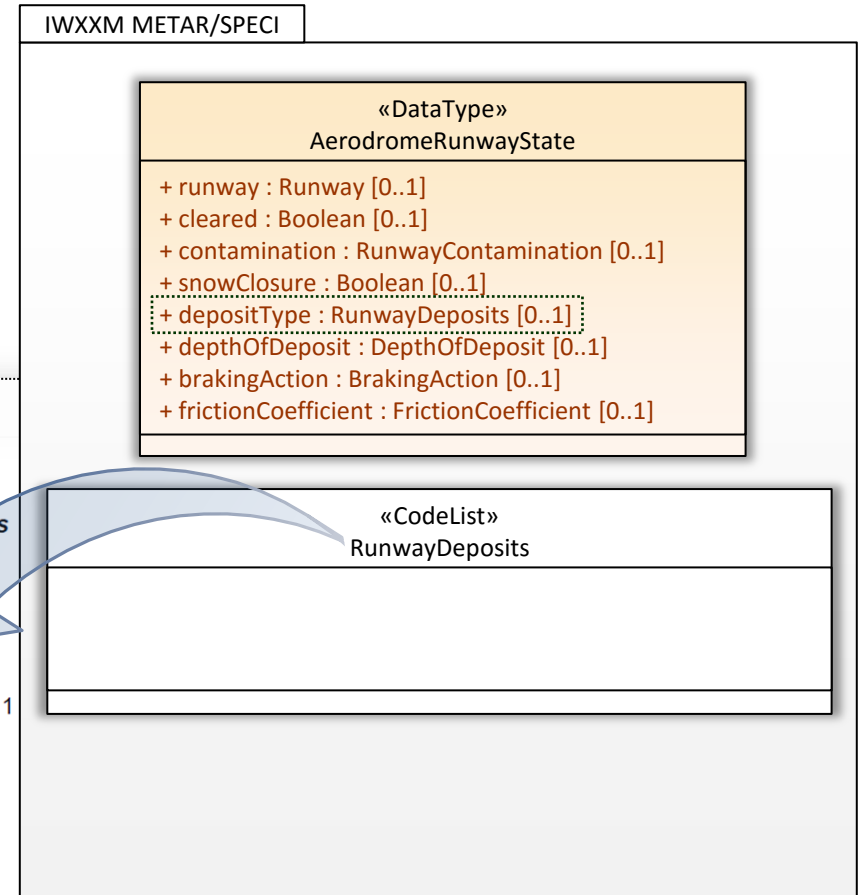
Excerpt from BUFR edition 4 Code- and Flag-tables

Best practice: use «CodeList» class (*external reference*)



Code figure			
0	Clear and dry		
1	Damp		
2	Wet with water patches		
3	Rime and frost covered (depth normally less than 1		
4	Dry snow		
5	Wet snow		
6	Slush		
7	Ice		
8	Compacted or rolled snow		
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10-14	Reserved		Operational
15	Missing or not reported (e.g. due to runway clearance in progress)		Operational

0 20 086
Runway deposits



The WMO Codes Registry service: resolving identifiers

```
<iwxxm:runwayState>  
  <iwxxm:AerodromeRunwayState>  
    <iwxxm:depositType  
      xlink:href="http://codes.wmo.int/bufr4/codeflag/0-20-086/1"  
      xlink:title="Damp"/>  
    </iwxxm:AerodromeRunwayState>  
</iwxxm:runwayState>
```

***“codes” sub-domain prefix
added to wmo.int Internet
domain name to enable
redirection using DNS ...***



The WMO Codes Registry service: resolving identifiers

The screenshot shows a Firefox browser window displaying the WMO Codes Registry page for the entity 'Damp'. The browser address bar shows the URL `codes.wmo.int/bufr4/codeflag/0-20-086/1`. The page header includes navigation links for 'Check URI', 'Datasets', 'Admin', 'Sparql', and 'About', along with a search bar and a 'Not logged in' status. The main content area displays the entity name 'Entity: Damp' in large blue text, followed by its URI: `http://codes.wmo.int/bufr4/codeflag/0-20-086/1`. The type is listed as 'runwayDeposits' and there is a note that 'no description supplied'. A green 'Stable' badge is visible next to the URI. Below this, there are tabs for 'Properties', 'Metadata', and 'History'. The 'Properties' tab is active, showing a table with two rows: 'label' with the value 'Damp' and 'type' with the value 'runwayDeposits'. To the right of the main content, there is a box with a share icon and two options: 'plain: ttl | rdf/xml' and 'with metadata: ttl | rdf/xml'. Below this is a section titled 'About the Item' with a dark blue header, containing the submission date 'submitted on 25 Sep 2013 12:56:34.668' and the submitter 'submitted by bootstrap'. At the bottom right of the page, it says 'Developed by Epimorphics Ltd'.



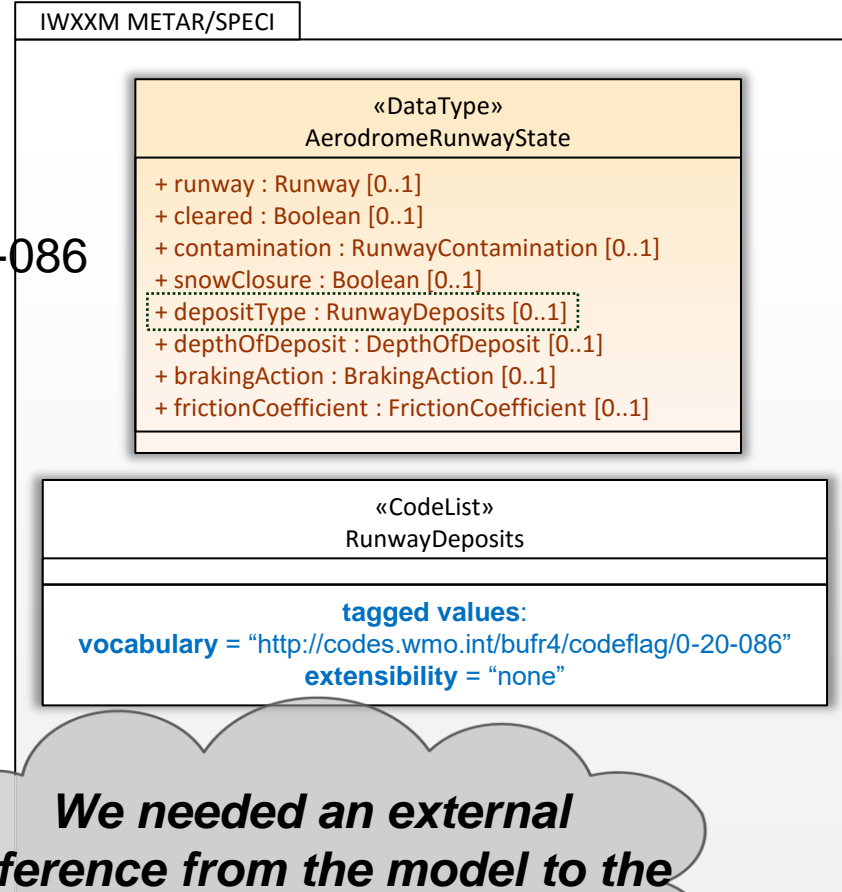
WMO Codes Registry

- [WMO Codes Registry](#) is the Service that resolves these HTTP URIs
- Provides *useful* information about each identified resource or concept (as determined by WMO) – using [content negotiation](#) to render both human- and machine-readable content ([HTML](#), [RDF/XML](#), [Turtle](#) & [JSON-LD](#))
- Operated by Met Office on behalf of WMO
- Built using [open-source Registry software](#) developed by UK Government



HTTP URIs assigned to code-tables too ...

```
<complexType name="RunwayDepositsType">
  <annotation>
    <appinfo>
      <vocabulary>
        http://codes.wmo.int/bufr4/codeflag/0-20-086
      </vocabulary>
      <extensibility>none</extensibility>
    </appinfo>
    <documentation>
      Type of deposit on a runway [..snip..]
    </documentation>
  </annotation>
  <complexContent>
    <extension base="gml:ReferenceType"/>
  </complexContent>
</complexType>
```



We needed an external reference from the model to the code-table; "vocabulary" tagged value is code-table URI



HTTP URIs assigned to code-tables too ...

Firefox

WMO Codes Registry: bufr4/codeflag/0-...

codes.wmo.int/bufr4/codeflag/0-20-086

WMO Codes Registry | Check URI | Datasets | Admin | Sparql | About | Search | Not logged in

<http://codes.wmo.int/bufr4/codeflag/0-20-086>

Register: Runway deposits

WMO No. 306 Vol I.2 FM 94 BUFR (edition 4) Code-table 0 20 086 'Runway deposits'.

List | **Table** | Properties | Metadata

Members

Item: 0 - Clear and dry	Type: runwayDeposits	Stable
Item: 1 - Damp	Type: runwayDeposits	Stable
Item: 2 - Wet with water patches	Type: runwayDeposits	Stable
Item: 3 - Rime and frost covered (depth normally less than 1mm)	Type: runwayDeposits	Stable
Item: 4 - Dry snow	Type: runwayDeposits	Stable
Item: 5 - Wet snow	Type: runwayDeposits	Stable
Item: 6 - Slush	Type: runwayDeposits	Stable

plain: ttl | rdf/xml
with metadata: ttl | rdf/xml

About the Register

owned by	wmo
managed by	www-dm
submitted on	25 Sep 2013 12:56:34.607
submitted by	bootstrap

Each code-table is published as a "Register" ... which registers do we need to publish?





**World
Meteorological
Organization**

Weather • Climate • Water

Thank you

...