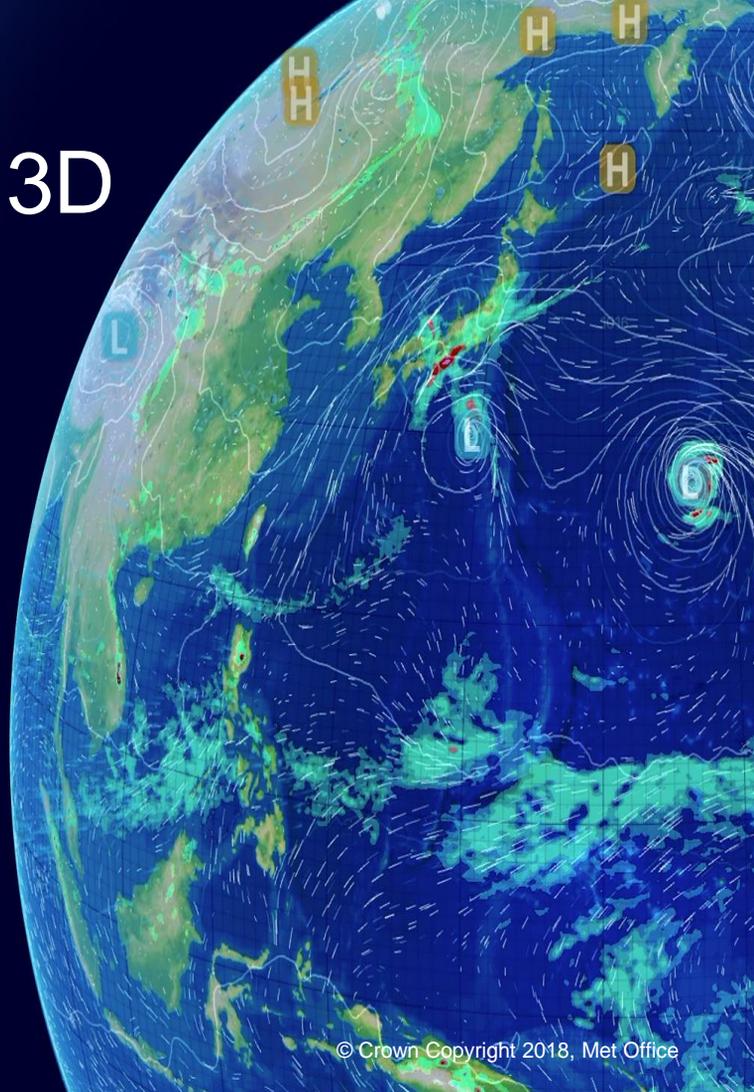


Activities around 3D

Chris Little, Met Office
IT Fellow
OGC Architecture Board

ECMWF Reading, 2018-10-16



Met Office Other Standard Organisations

- WMO
- ICAO
- ISO
- ITU
- UNESCO/IOC
- IHO
- IMO
- ...
- IETF (Internet Engineering Task Force)
- IANA (Internet Assigned Name Authority)
- IEEE (Institute of Electrical and Electronic Engineers)
- ...
- W3C (World Wide Web Consortium)
- OASIS (Organization for the Advancement of Structured Information Standards)
- OMG (Object Management Group)
- ...

Met Office Graphics Standards Organisations

- ISO: (GKS, CGM), GKS-3D, PHIGS, Web3D
- W3C: (SVG, SVGv2, CSS, HTML5 Canvas, WebCGM)
- ISO/W3C: VRML/X3D
- Khronos consortium: OpenGL, WebGL, gITF ,
- ISO/Khronos: Collada
- OGC: ARML2.0, I3S (ESRI), 3D Portrayal
- Proprietary:
 - Adobe U3D for embedding in PDFs
 - Google O3D uses WebGL
 - Wavefront OBJ

- 2010 3rd Workshop on Use of GIS/OGC Standards in Meteorology
 - Re-established Interoperability Experiments,
SLD/SE styling started
- 2013 4th Workshop on Use of GIS/OGC Standards in Meteorology
 - Continued SLD/SE work
WMO and ICAO weather symbols in SVG on GitHub

Style Layer Description / Symbology Encoding

SLDv1.1.0 OGC 05-078r4 / SEv1.1.0 OGC 05-077r4

- 2D only
- Not well implemented
- Not very interoperable – vendors do their own extensions
- Designed for WMS but does not apply to WMTS
- Does not fit OGC policy of modularisation (core and extensions)
- Does not fit OGC policy of abstract model and encodings
- Based on pre-1985 computer graphics
 - Virtual pixel of 0.28 x 0.28 mm
 - Concrete not abstract styles
 - No recognition of SVG, CSS, HTML5, etc
- Symbology encoding fine – easy to do in 2D
- Style Layer is more complex – inheritance from complete map?

Met Office OGC Portrayal Current Work

- 2016 Test Bed-12 Portrayal Engineering Report
- 2017 Test Bed-13 Geopackage Engineering Report
 - Improve styling and symbology
 - Introduce semantic mediation for styling ('features' in a database)
 - Implement grouping and ordering of layers
- 2018 Test Bed-14 ongoing
 - Revamp Symbology with abstract conceptual model
 - 2D only, cartographic
 - Claim 3/4D can be done by extension
- I am drafting OGC 18-071 "Use of Computer Graphics as a basis for an OGC Portrayal Conceptual Model"
 - Use 3/4D world/scene view as basis
 - Maps are views from above
 - Cross sections are view from the side
 - Time series are views from another 'side'
 - Recognise modern CG processing pipelines
- **Volunteers/Co-authors needed as I am out of date!**

2D vs 4D

- WMS Best Practices built on 'Layers Model'
- Traditional cartographic model of layers broken
- 100 parameters x 100 times x 100 levels x 100 ensembles x 10 different models = 1 billion layers to select from.

Lots of 3+D activity:

- Multi-player Gaming, military & aviation simulation
- Drones & autonomous vehicles: above / on / below surface
- Indoor navigation
- Smart Cities
- Underground
- Marine, Space, Met Ocean, Point Clouds, etc
- **None is built on traditional 2D cartography**

Changed W3C world

Big Data (in the Cloud) hard to move, “Move apps to data”

- Cross domain science is where the action is
- Improve Discovery metadata
- But metadata open ended, does not describe how to use data
- Metadata not granular enough (ICSU RDA Research Data Alliance, formed Task Force this month)
- Metadata also in knowledge graphs on the Semantic Web
- Data stays in domain specific binary formats
- **Visualisation is just another ‘app’**
- Use APIs, REST architecture, OpenAPI framework, registers and registries
- Latest OGC standard WFSv3 uses this pattern



MADE IN
SWITZERLAND



Cross Domain

Geography

Government

Life Sciences

Linguistics

Media

Publications

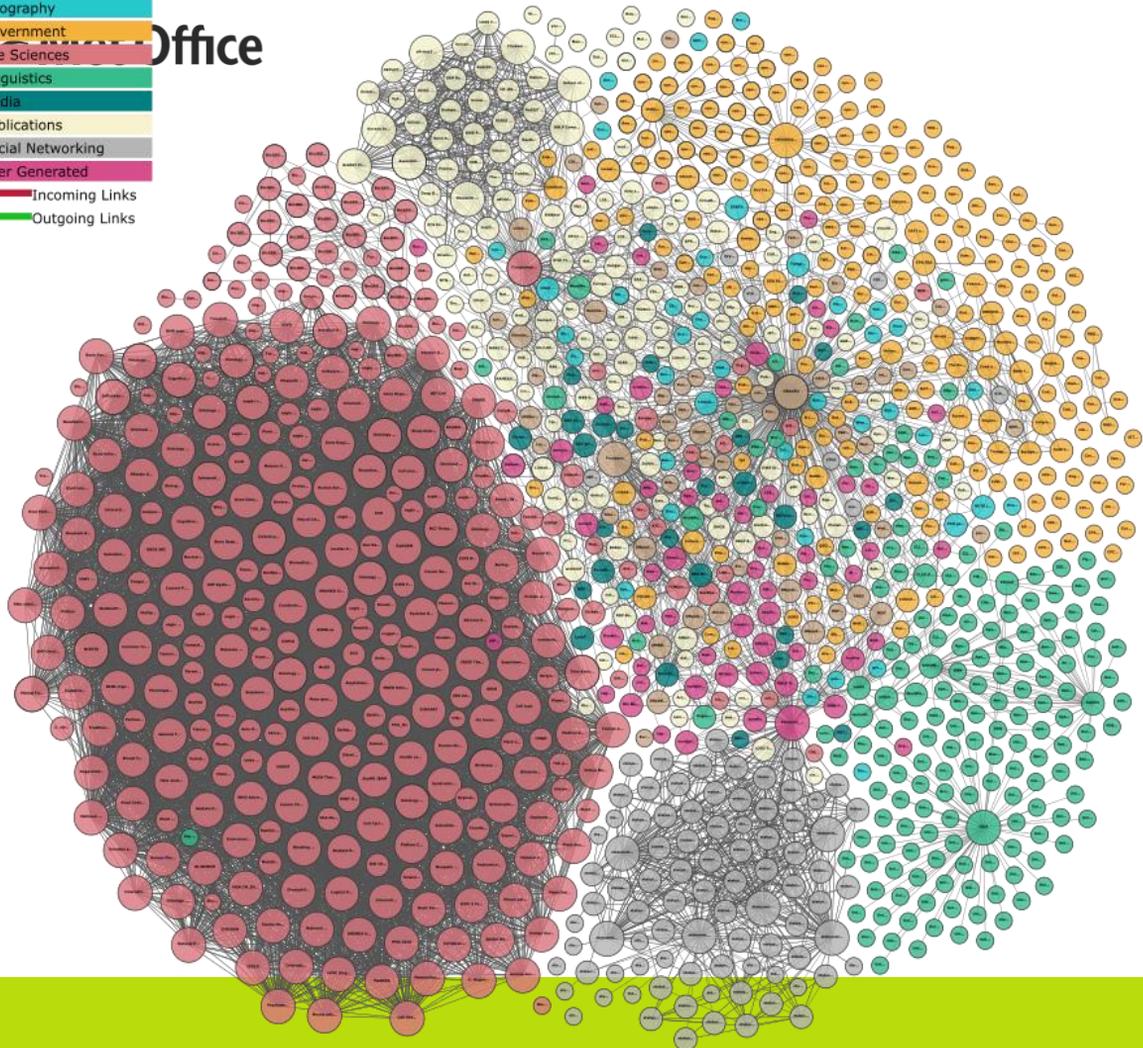
Social Networking

User Generated

Incoming Links

Outgoing Links

Office





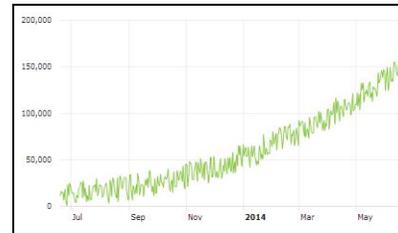
- **Domain Types:-**
 - **Single Point:**
 - **Collection of Points:**
 - **Time-series at a Point:**
 - **Time Series of a collection of Points:**



Point

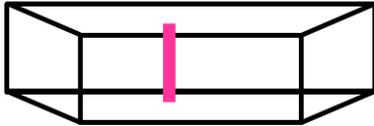


Point Collection

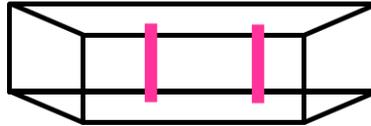


Time Series at a Point

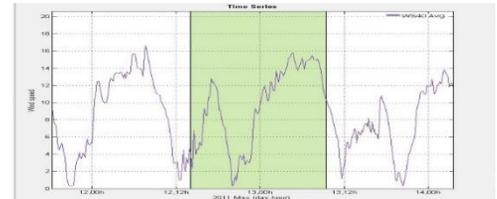
- **Domain Types-**
 - **Single Profile**
 - **Collection of Profiles**
 - **Time-series of a Profile**
 - **Time Series of a collection of Profiles**



Profile



Profile Collection



Time Series of a Profile

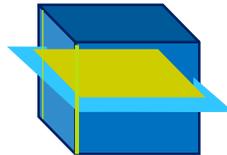
- **Domain Type**
 - **GRID Trimming**
 - **GRID Re-sizing and sampling**
 - **GRID Layers (Slicing)**
 - **GRID Time series**



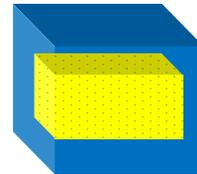
Trimming



Slicing

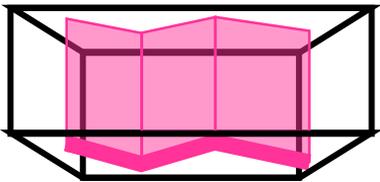


Slicing

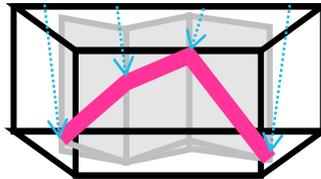


Re-sizing and sampling

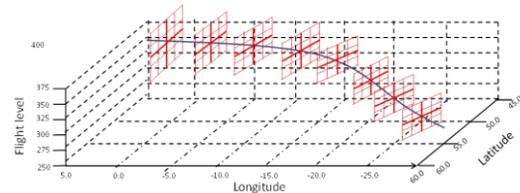
- **Domain Types**
 - **Cross sections / 'Curtains'**
 - **Trajectories**
 - **Corridors**



Cross Section



Trajectory



Corridor

Visualisation – not another app?

- Interaction makes the apps different
- Complex
- Large amounts to the display
- Very fast (refresh rates)
- Multiple interaction points in the process chain
 - Semantic features/objects in server database
 - Representation – vectors, imagery, text in CG
 - Rendering – textures, pixels on screen on client

Summary

- How to use Cesium/3D Tiles standard?
- How to use OGC I3S Community Standard?
- Cartographic 2D Portrayal Proposed standard:
 - 3D should be an extension
- Visualisation/Portrayal Early Draft Whitepaper:
 - Portrayal should start from 3/4D not 2D **Please join in!**
 - How to use client GPU based rendering/styling?
- API Weather on the Web
 - Using OpenAPI
 - Based on WFS3 patterns
 - Replace WCSv2.1 Extensions:
 - Points, Slices, Polygons, Trajectories, Corridors, Tiles, etc

Questions? Answers????



'you said there
would be biscuits!?'
/

W2 Teale 2011