EGOWS 2011

Intelligent Data Services

Peter Trevelyan, 7th June 2011

Contents

This presentation covers the following areas

- A consideration of the Question

- A description of the supported data types;

- A description of the data extraction services;

- A description of the post processing math's library;

- Questions and answers;

The Question:

First an outline of the questions posed in Sprint04

Some Background

- Context:

  - The INVENT" project has delivered the streamlined visualisation through the use of OGC web services.

  - The next thing is to deliver data through the same web services.

- Firstly a review of the "INVENT" project: see

  - http://www.metoffice.gov.uk/public/pws/invent/weather map/

Where is Invent?

What can Invent Weather Map do? (1

Different parameters
Different display styles
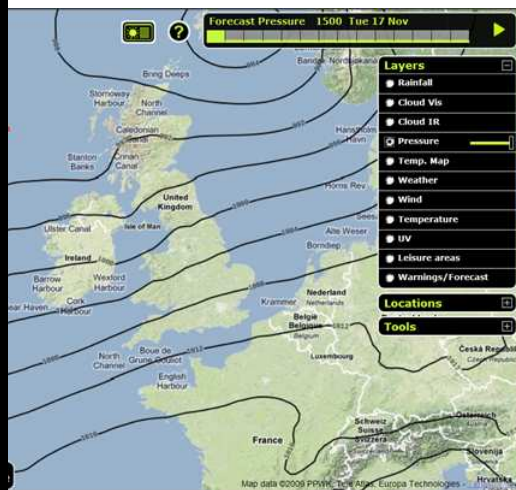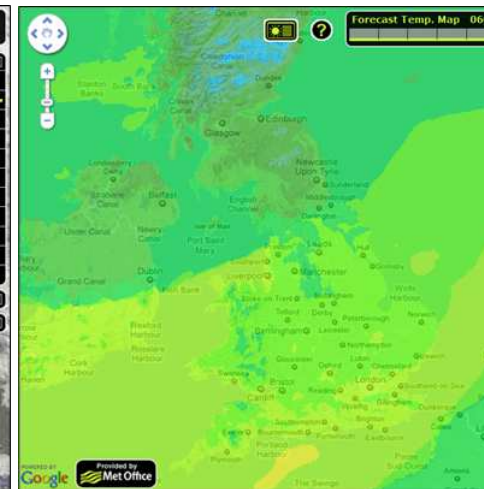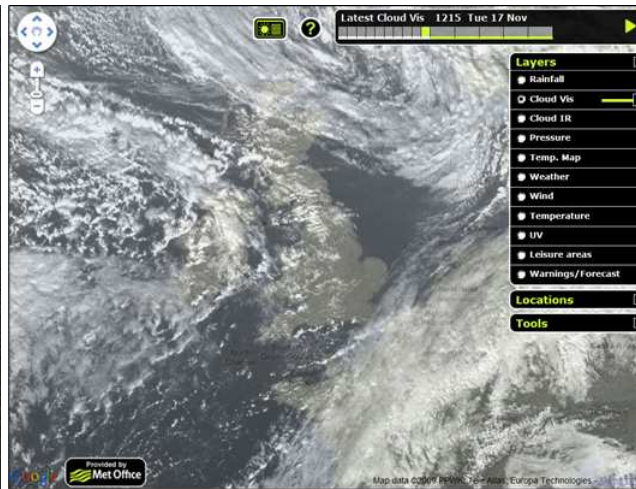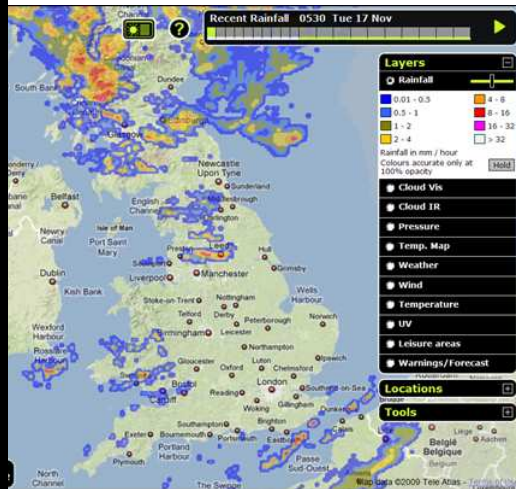
What can Invent Weather Map do? (1

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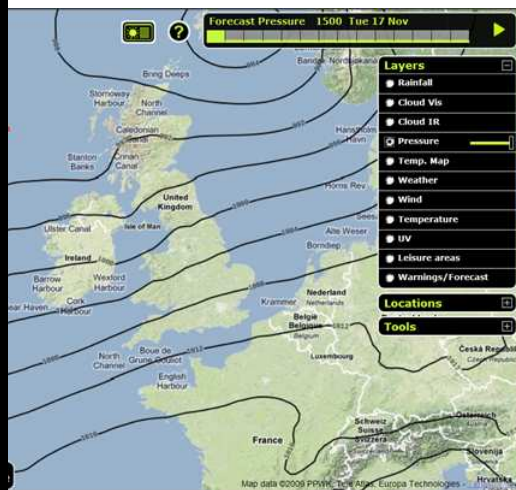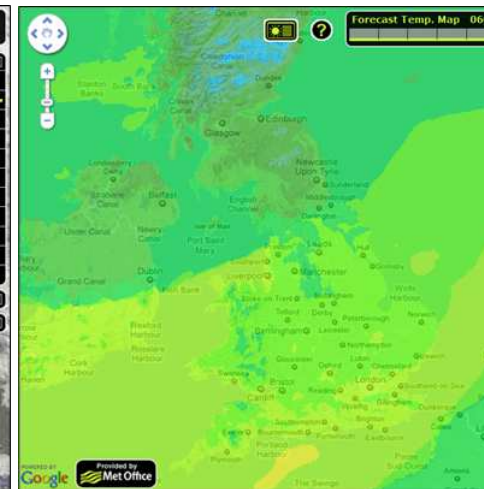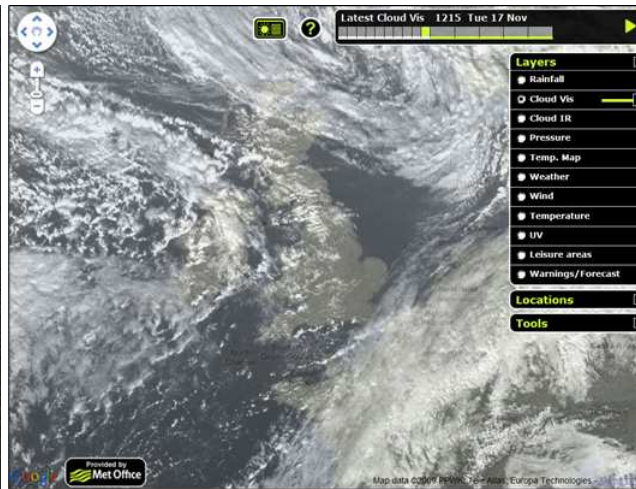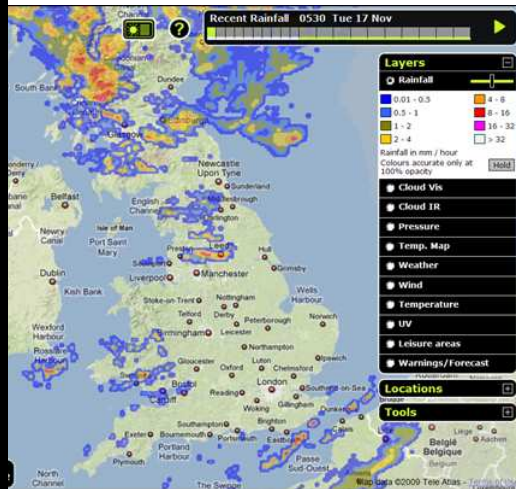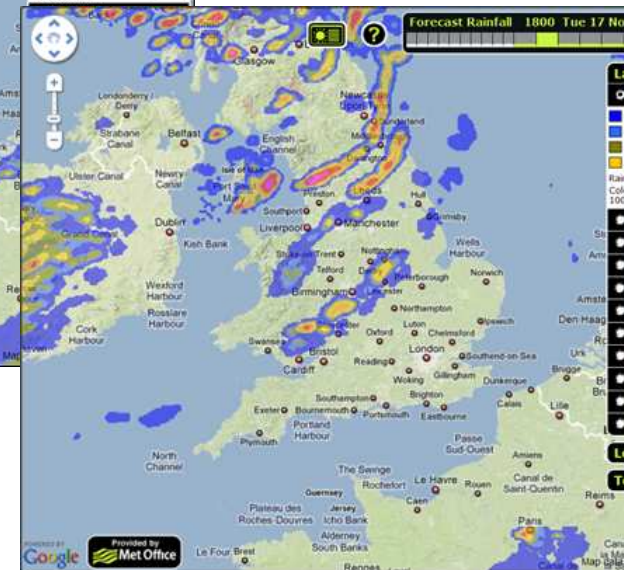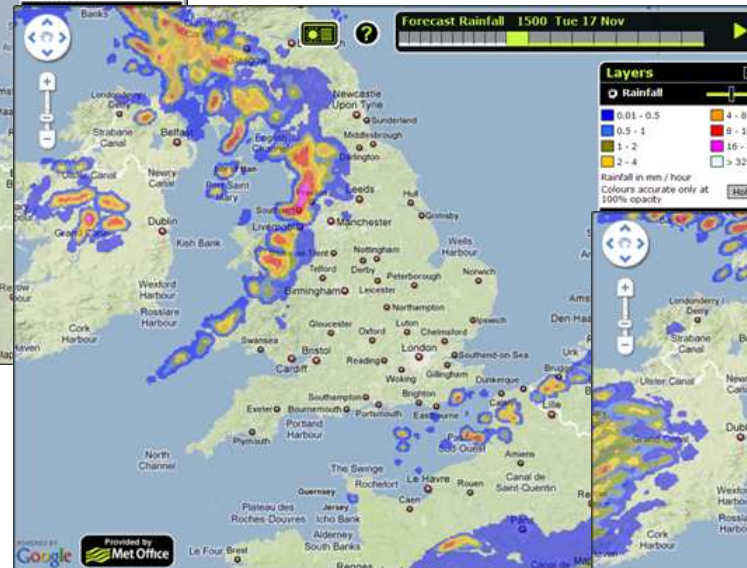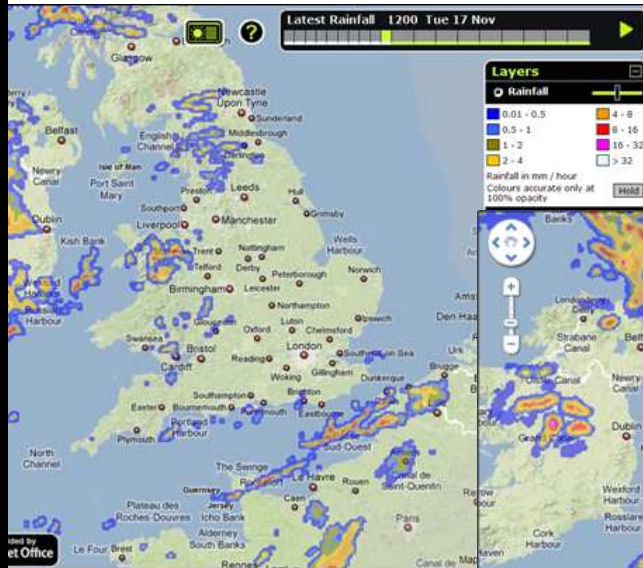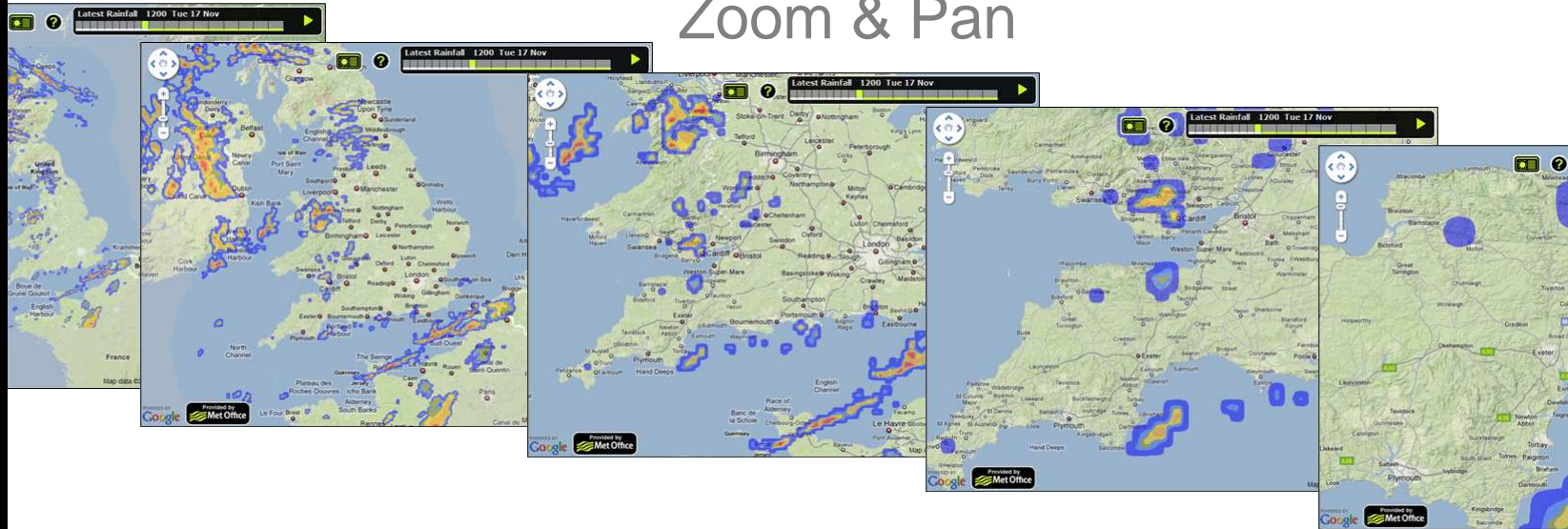Different display styles

What can Invent Weather Map do? (2

Observation & Forecasts

What can Invent Weather Map do? (3

Zoom & Pan

Slider to vary opacity
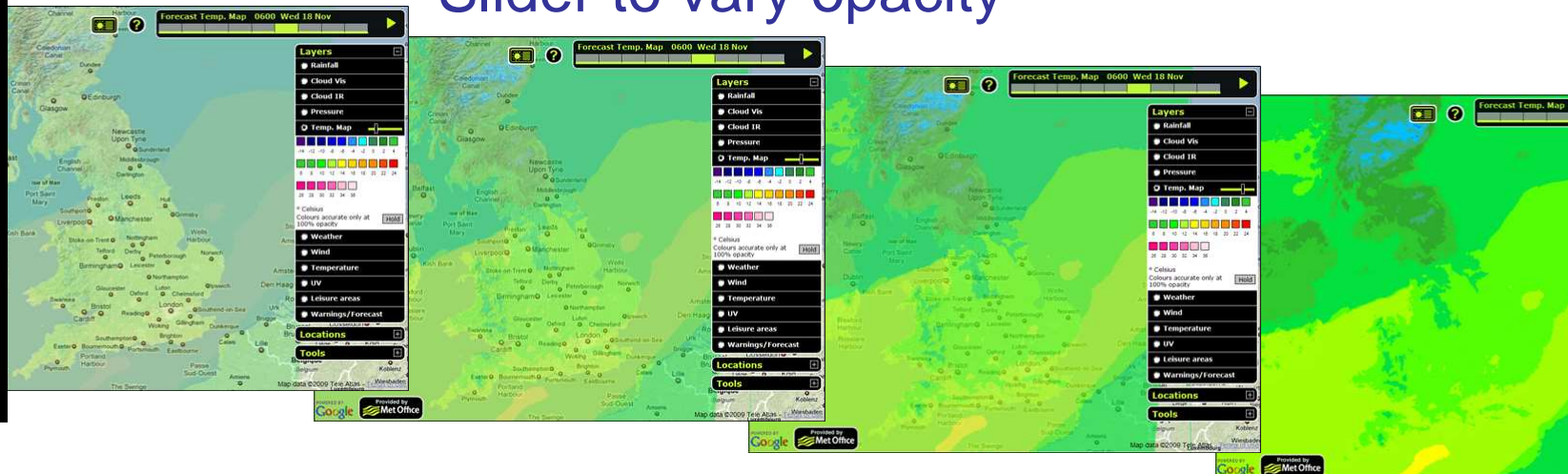
Data at every three hours:-

								Rising
Tue 18 Jan 2011	1400		Sunny	5.3	WSW	11	-	Excellent	1023 Rising
Tue 18 Jan 2011	1300		Sunny intervals	4.2	WSW	13	-	Excellent	1023 Rising
Tue 18 Jan 2011	1200		Heavy rain shower (day)	3.5	W	11	-	Very good	1022 Rising
Tue 18 Jan 2011	1100		Sunny	3.5	W	11	-	Very good	1022 Rising

Show 6 more

Development Product - Temperature Range Forecast : Stornoway Airport

Maximum Temperature Range

Max   Min

9°C
8°C
9°C
9°C
10°C
9°C
8°C
7°C
8°C
6°C
7°C
5°C
6°C
5°C
4°C

Tue 18 Jan 11   Wed 19 Jan 11   Thu 20 Jan 11   Fri 21 Jan 11   Sat 22 Jan 11

Product Description

Following public consultation this is a new way for the Met Office to present forecast information. Temperatures will fall within the indicated range roughly 9 times out of 10 with the most likely temperature shown in green. There may be variations between this product and the 5 day forecast. We will continue to improve this product.

High Range
Most Likely
Low Range

Extremes: Highlands & Eilean Siar - 24 hours ending 2100 on 17 Jan 2011

Measurement type	Location	Value
Highest max	KINLOCHEWE	8.8 °C
Lowest max	LOCH GLASCARNOCH	4.5 °C

National Severe Weather Warning Service

Met Office

Some Principles:

- Separate the extraction of the data from a "N" dimensional grid from the possible mathematical operations that might be performed on the extracted feature e.g. find the maximum value of temperature along a trajectory.

- The mathematical operations are specific to the extracted "feature type" and are classified as such.

The "Feature Types"

CSML feature types

Type: Business Service-Information Diagram   **Description**

DATA ENTITY
PointSeriesFeature: (Time-series of single datum measurements at a fixed location in space.)

DATA ENTITY
TrajectoryFeature: (Measurement along a discrete path in time and space)

DATA ENTITY
ProfileSeriesFeature (Time-series of profiles on fixed vertical levels at a fixed location):

DATA ENTITY
RaggedProfileSeriesFeature: (Time-series of unequal-length profiles, but on fixed vertical levels, at a fixed location.)

So Why CSML Feature Types?

- A lot of work has gone into categorising data into various shapes and this means there is a lot of support from the MetOC community, especially Unidata.

- The OGC standards bodies for gridded data are based on the common data model used by NetCDF and this is has a direct equivalence with CSML.

- The CSML feature types are supported by UML models and can therefore be expressed as GML.

- The feature types are based on **ISO 19110**

So Why CSML Feature Types?

- The Aviation community has made extensive use of CSML and it forms a large part of WXCM (Weather exchange concept model)

- Unidata have created a set of NetCDF libraries based on a Java API for some of the main feature types i.e. Point collection, GRID, Trajectory, Profiles and Sections.

- The WCS (Web Coverage Service) as a reference implementation for these five main types (courtesy of Unidata).

The "Service Contract"

- Service contracts should be defined very carefully and clearly. The architecture performance will be based on these contract characteristics.

- The contract should describe functional requirements; that is, what a provider will give to any consumer that chooses to abide by the terms of the contract. The contract should define what functionality is provided, what data it will return, or typically some combination of both.

The "Service Contract"

- Contracts must also specify non-functional requirements that detail not what the service does, but the way in which it goes about its business.

- A contract is an expression of the visible aspects of service behaviour. In addition, since consumers vary just as much as providers, there might be multiple contracts for a single service.

The Service Providers

- There will be a set of services that extract the "Feature Types" from the "N" dimensional grid. These services are listed in the following slides and have a link to a service contract.

- This work will need to be refined as work commences, but using the 80/20 rule they are a good start.

- These contracts start to describe the information that will be required by each services and the sub-services, e.g. Interpolation routines they will need.

Gridded Data Extraction

Met Office

CSML feature type maths library

SERVICE

TrajectoryFeature Extraction Maths
- Interpolation in space;
- Interpolation in the vertical
- Interpolation in time

SERVICE

PointCollectionFeature Extraction Maths
- Interpolation in space;
- Interpolation in the vertical
- Interpolation in time

SERVICE

RaggedProfileSeriesFeature Extraction Maths
- Interpolation in space;
- Interpolation in the vertical
- Interpolation in time

SERVICE

SectionFeature Extraction Maths
- Interpolation in space;
- Interpolation in the vertical
- Interpolation in time

The CSML Feature types

- ## __PointCollectionFeature:__

  - *StationFeature at fixed timeA StationFeature is a time series of PointFeatures at a named location. The inner table, called pointObs here, is connected in the coordinate it contains, namely time.*

- ## __ProfileFeature:__

  - *A ProfileFeature is a set of PointFeatures along a vertical line. The inner table is connected in z and optionally time:*

- ## __ProfileSeriesFeature__

  - *Station Profile feature: a time-series of profile features at a named location)*