



Met Office

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;



Met Office

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/weathermap/>



Where is Invent?



Met Office

Weather Climate Change Science

Home

This area showcases new forecasts and products. For up-to-date forecasts please visit the [main weather website](#).


Invent

Met Office Invent will showcase some of our future products and allow you to become involved in the formation of new weather forecasts.

The content will be regularly changed and is being tested. It should not be used to make operational or personal decisions.

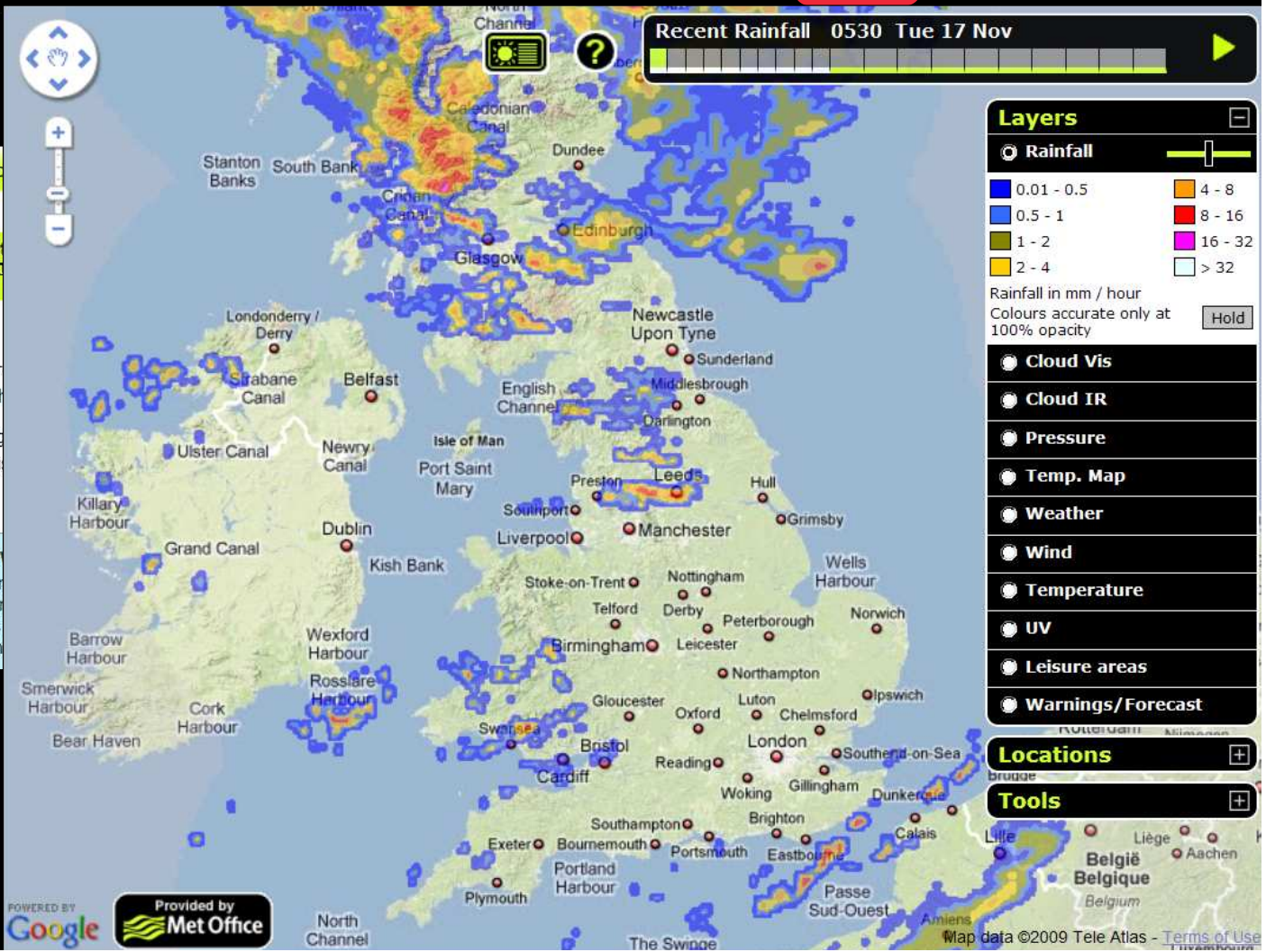
Weather map

Explore Met Office Invent by looking at our new weather map visualisation.



A new weather map

Explore Met Office Invent by looking at our new weather map visualisation.

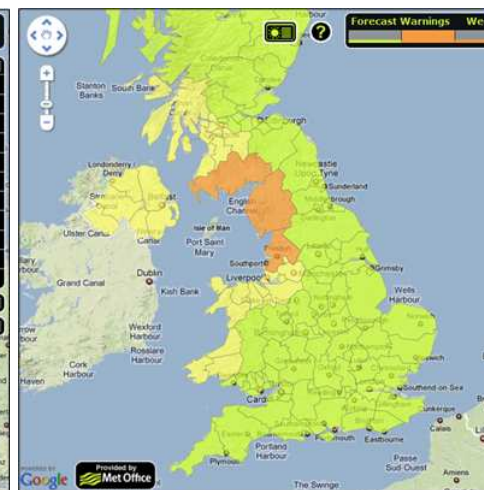
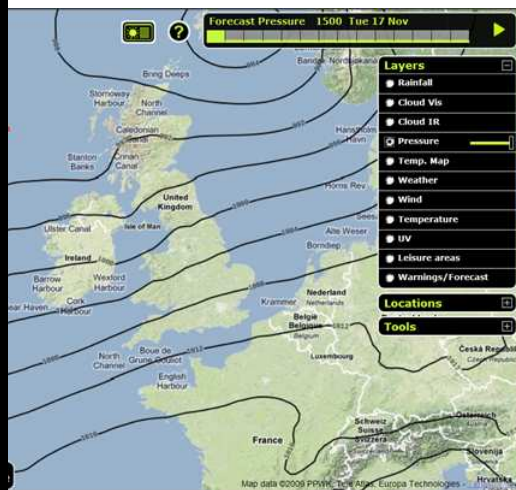
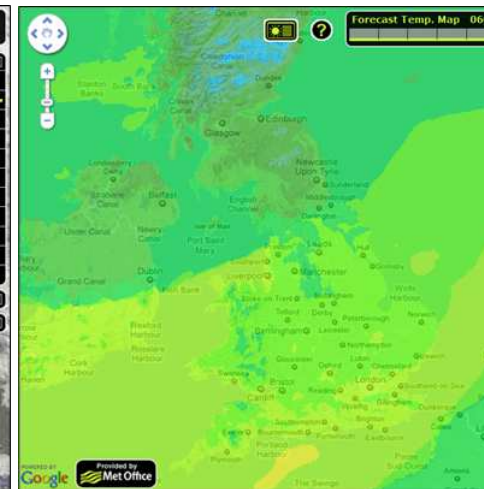
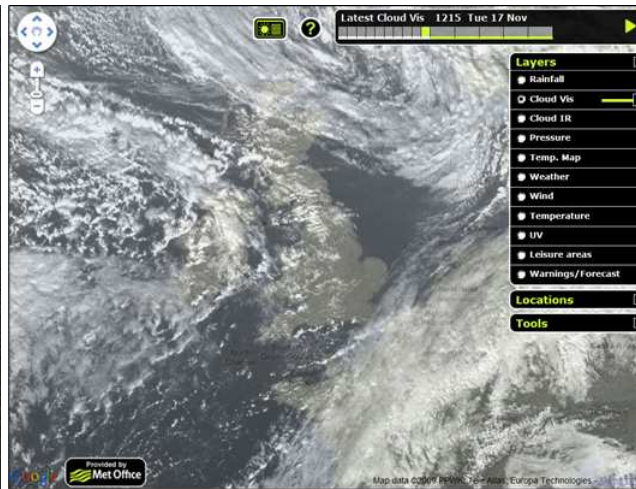
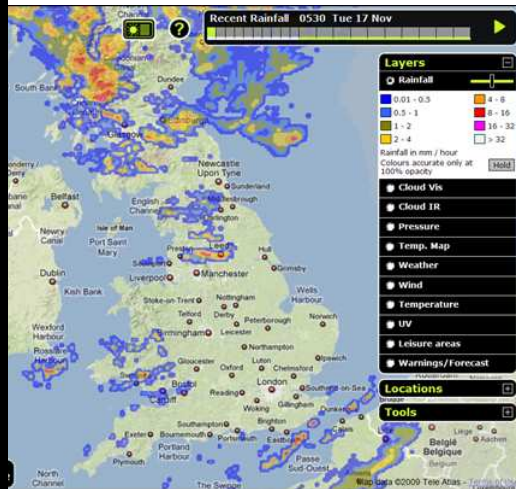




What can Invent Weather Map do? (1)

Different parameters

Different display styles

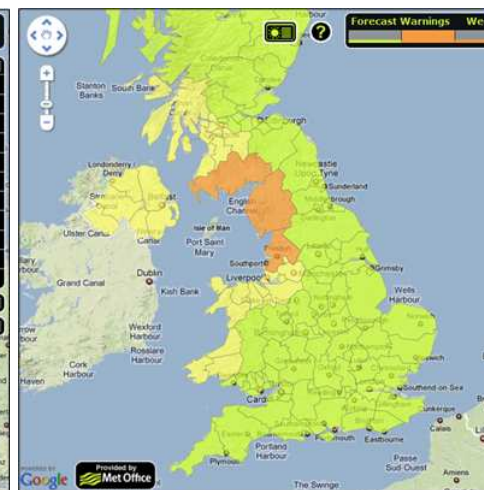
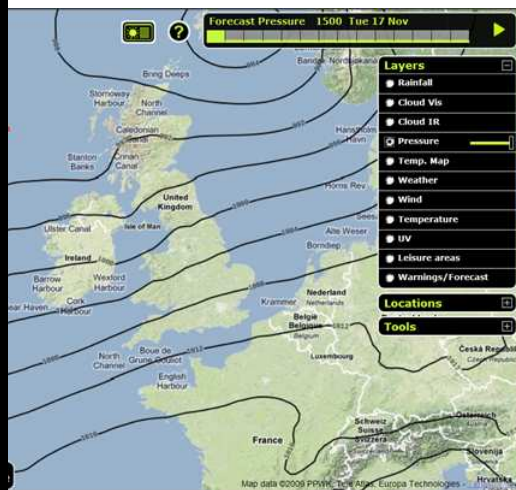
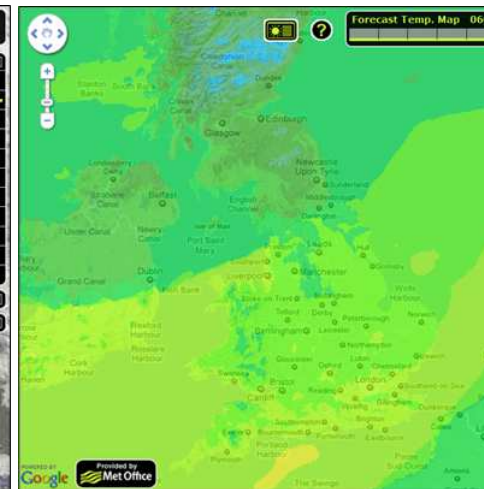
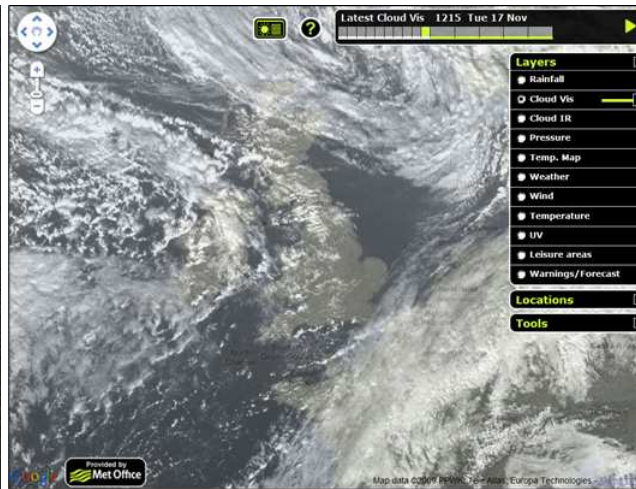
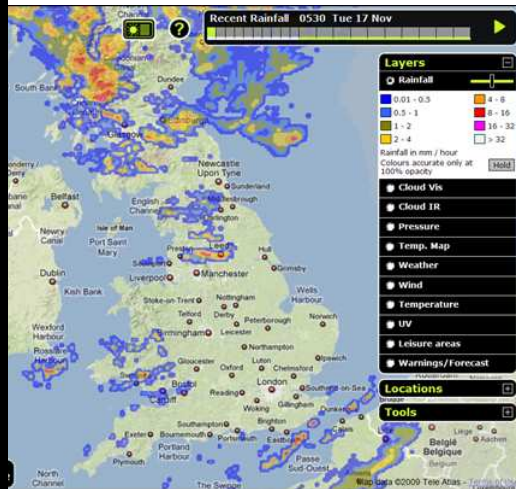




What can Invent Weather Map do? (1)

Different parameters

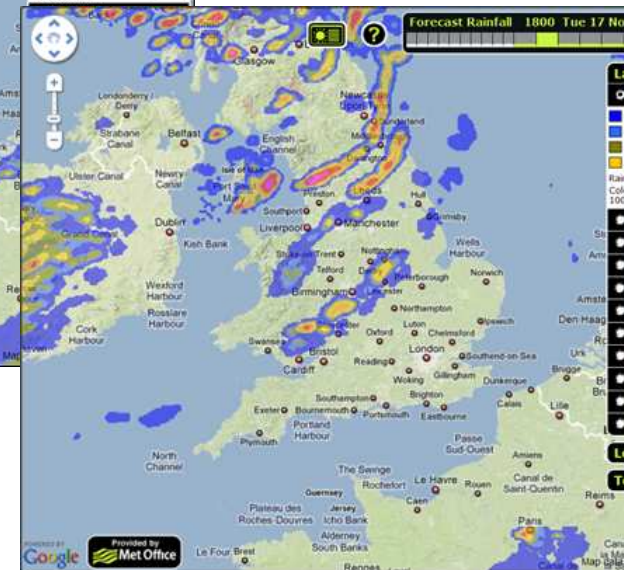
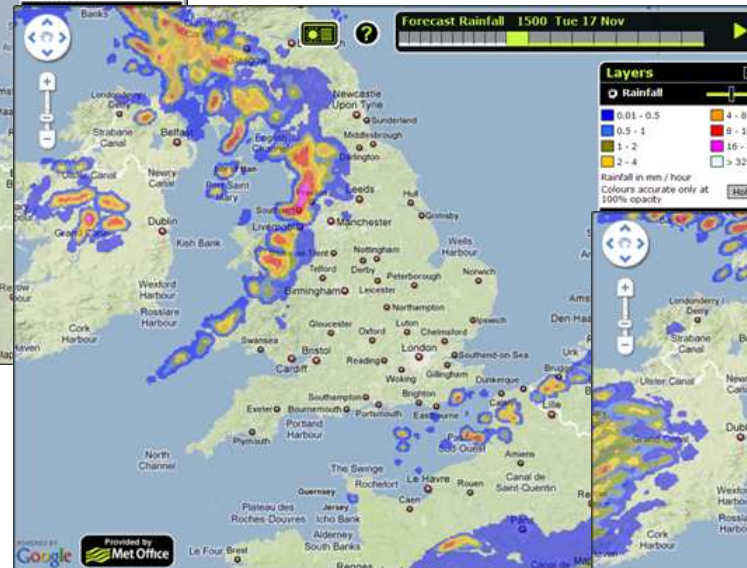
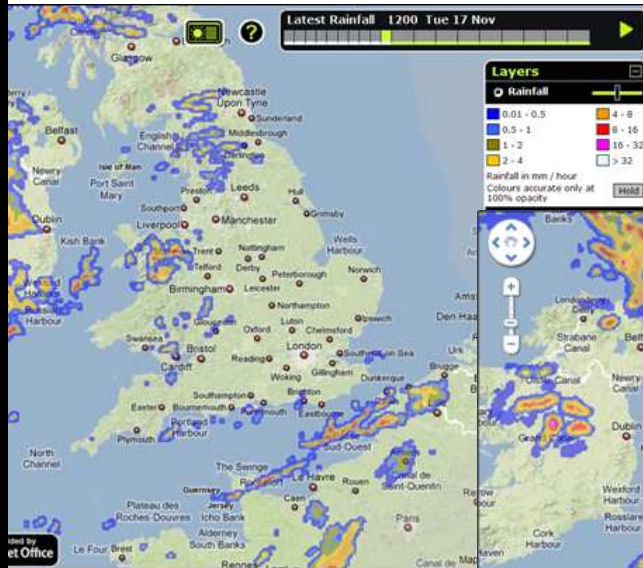
Different display styles





What can Invent Weather Map do? (2)

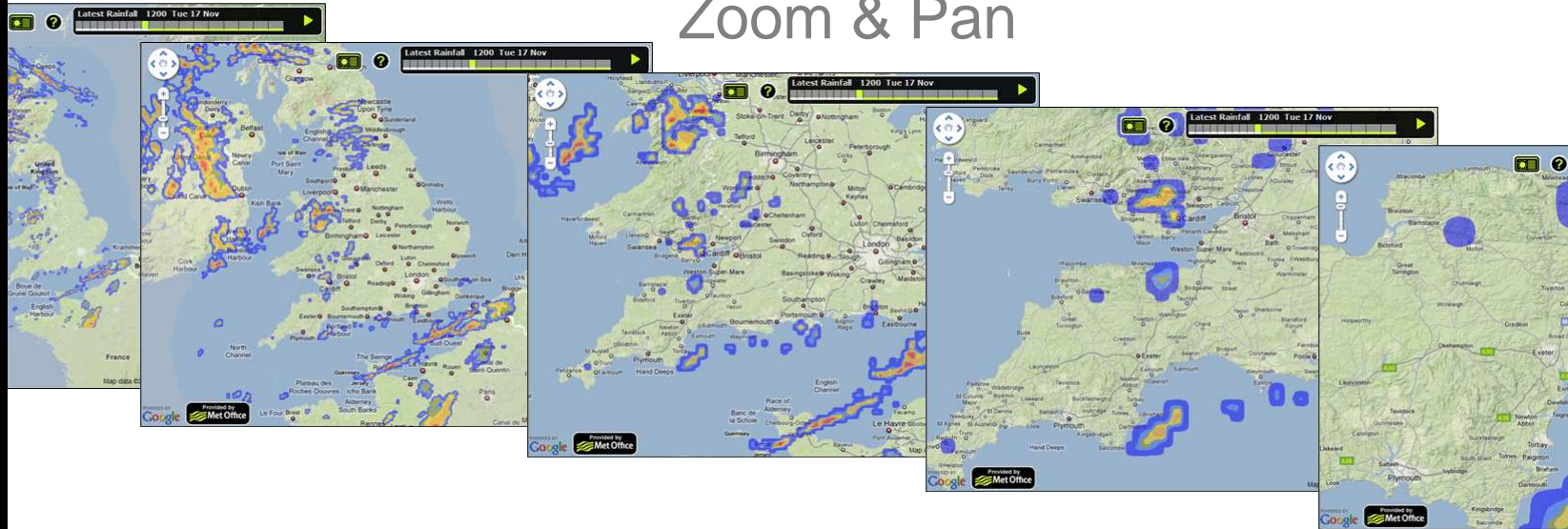
Observation & Forecasts



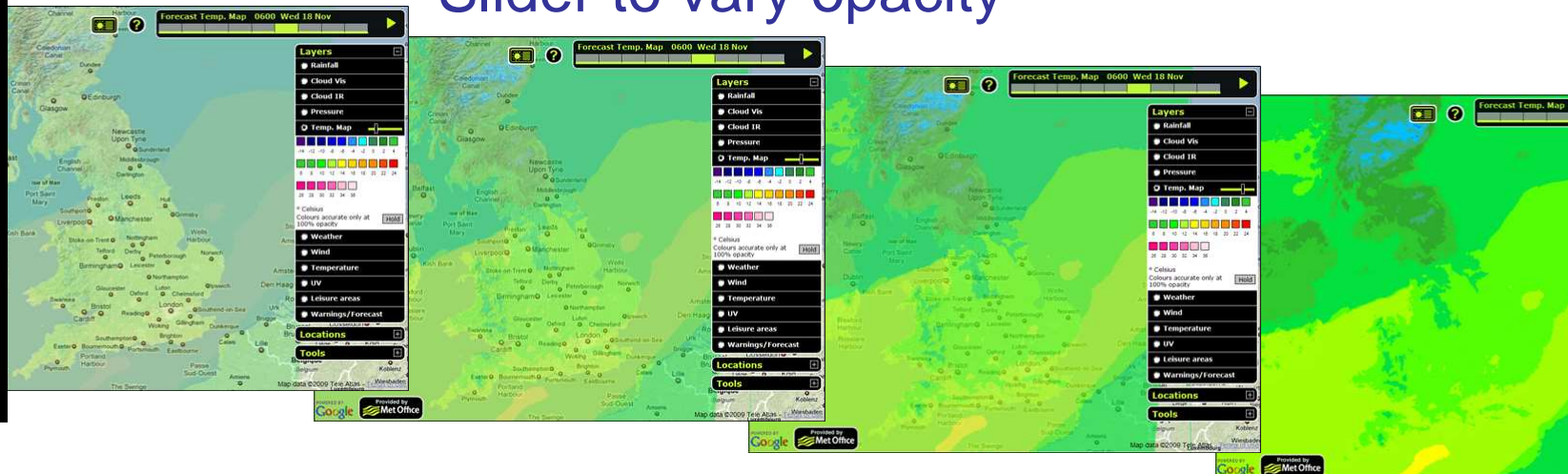


What can Invent Weather Map do? (3)

Zoom & Pan



Slider to vary opacity





Data at every three hours:-

Met Office: Invent - Weather: Text view - Location: Stornoway Airport - Mozilla Firefox

http://www.metoffice.gov.uk/public/pws/invent/weather/text/index.html?353720

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Weather Climate Change Research Services News Learning Invent About us Search Met Office

You are here: Home Invent Text view

Location: Stornoway Airport
Altitude: 2 m

MAP VIEW RESET CUSTOMISE

Please enter a town, city, region, first half of a UK Postcode or Mountain area.

5 Day Forecast : Stornoway Airport English (Saesneg)

Time	Weather	Description	Temp (°C)	Wind Dir	Wind Speed (mph)	Wind Gust (mph)	Visibility	UV	Feels Like Temp	
Tue 18 Jan 2011										
Wed 19 Jan 2011										
0000		Clear sky (night)	5	W	9	-	Excellent	0	2	
Thu 20 Jan 2011										
0300		Clear sky (night)	5	WSW	6	-	Excellent	0	2	
Fri 21 Jan 2011										
0600		Partly cloudy (night)	3	SW	6	-	Excellent	0	1	
Sat 22 Jan 2011										
0900		Clear sky (night)	3	SW	6	-	Excellent	0	0	
1200		Sunny intervals	6	SSW	7	-	Excellent	1	3	
1500		Sunny	6	SW	10	-	Excellent	1	3	
1800		Clear sky (night)	5	SSW	10	-	Very good	0	1	
2100		Clear sky (night)	4	SSW	11	-	Very good	0	1	
Night		Clear sky (night)	4 Min	SSW	20	31	Excellent	-	1	

Back to Overview

Show in Table Weather Description Temp Wind Dir Wind Speed Wind Gust Visibility UV Feels Like Temp

Severe Weather Warnings & Advisories: Highlands & Eilean Siar

Today Tomorrow Thursday Friday Saturday

No warnings or advisories are in force for this region on this day.

javascript:void(0);

start Met Office: Invent - ... Microsoft PowerPoint ...



Met Office: Invent - Weather: Text view - Location: Stornoway Airport - Mozilla Firefox

http://www.metoffice.gov.uk/public/pws/invent/weathertext/index.html?353720

Date	Time	Weather	Wind Speed	Direction	Temp	Humidity	Visibility	Sea State	Other
Tue 18 Jan 2011	1400	Sunny	5.3	WSW	11	-	Excellent	Rising	1023
Tue 18 Jan 2011	1300	Sunny intervals	4.2	WSW	13	-	Excellent	Rising	1023
Tue 18 Jan 2011	1200	Heavy rain shower (day)	3.5	W	11	-	Very good	Rising	1022
Tue 18 Jan 2011	1100	Sunny	3.5	W	11	-	Very good	Rising	1022

Show 6 more

Development Product - Temperature Range Forecast : Stornoway Airport

Maximum Temperature Range Max Min

Date	High Range	Most Likely	Low Range
Tue 18 Jan 11	9°C	5°C	4°C
Wed 19 Jan 11	8°C	6°C	5°C
Thu 20 Jan 11	9°C	7°C	6°C
Fri 21 Jan 11	9°C	8°C	7°C
Sat 22 Jan 11	10°C	9°C	8°C

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 develop and improve this product.

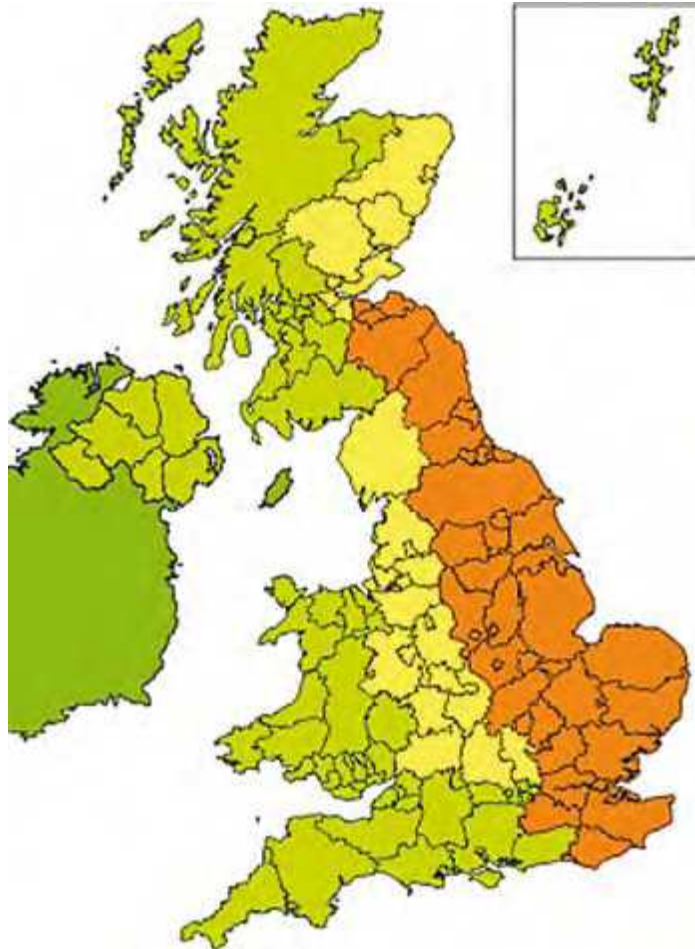
Extremes: Highlands & Eilean Siar - 24 hours ending 2100 on 17 Jan 2011

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

start | Met Office: Invent - ... | Microsoft PowerPoint ...



National Severe Weather Warning Service



Advisory of severe or extreme weather		
These advisories are issued by 1100 daily as routine and indicate confidence of expected severe or extreme weather. Early warnings and Flash Warnings supersede advisories when confidence levels are 60% or greater.		
Risk of disruption	Warning	Valid
UK regions: <u>East of England</u> <u>South West England</u> <u>West Midlands</u> <u>London & South East England</u> <u>East Midlands</u>	Heavy Rain	Mon 2 Jun
There is a moderate risk of a severe weather event affecting central, and southeastern parts of England on Monday evening. There is a potential for heavy showers, or longer spells of heavy rain moving northwards this evening and overnight. Issued at: 1221 Mon 2 Jun		
UK regions: <u>East of England</u> <u>North West England</u> <u>Central, Tayside & Fife</u> <u>Yorkshire & Humber</u> <u>London & South East England</u> <u>East Midlands</u> <u>SW Scotland, Lothian & Borders</u> <u>South West England</u> <u>Grampian</u> <u>West Midlands</u> <u>North East England</u>	Heavy Rain	Tue 3 Jun
There is a moderate risk of a severe weather event affecting much of central, northern and eastern England and eastern Scotland. There is a potential for heavy showers or prolonged spells of rain moving north through the day. Issued at: 1219 Mon 2 Jun		



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.



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CSML feature types

The “Feature Types”

Type: Business Service-Information Diagram

Description

CSML
List

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.



Met Office


CSML feature type maths library

Gridded Data Extraction

Type: Business Service-Information Diagram


Description

Version:
Created By: Trevely
Last Modified By: Tr

 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 time* A *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)*