Data Models
A Met and Marine Perspective

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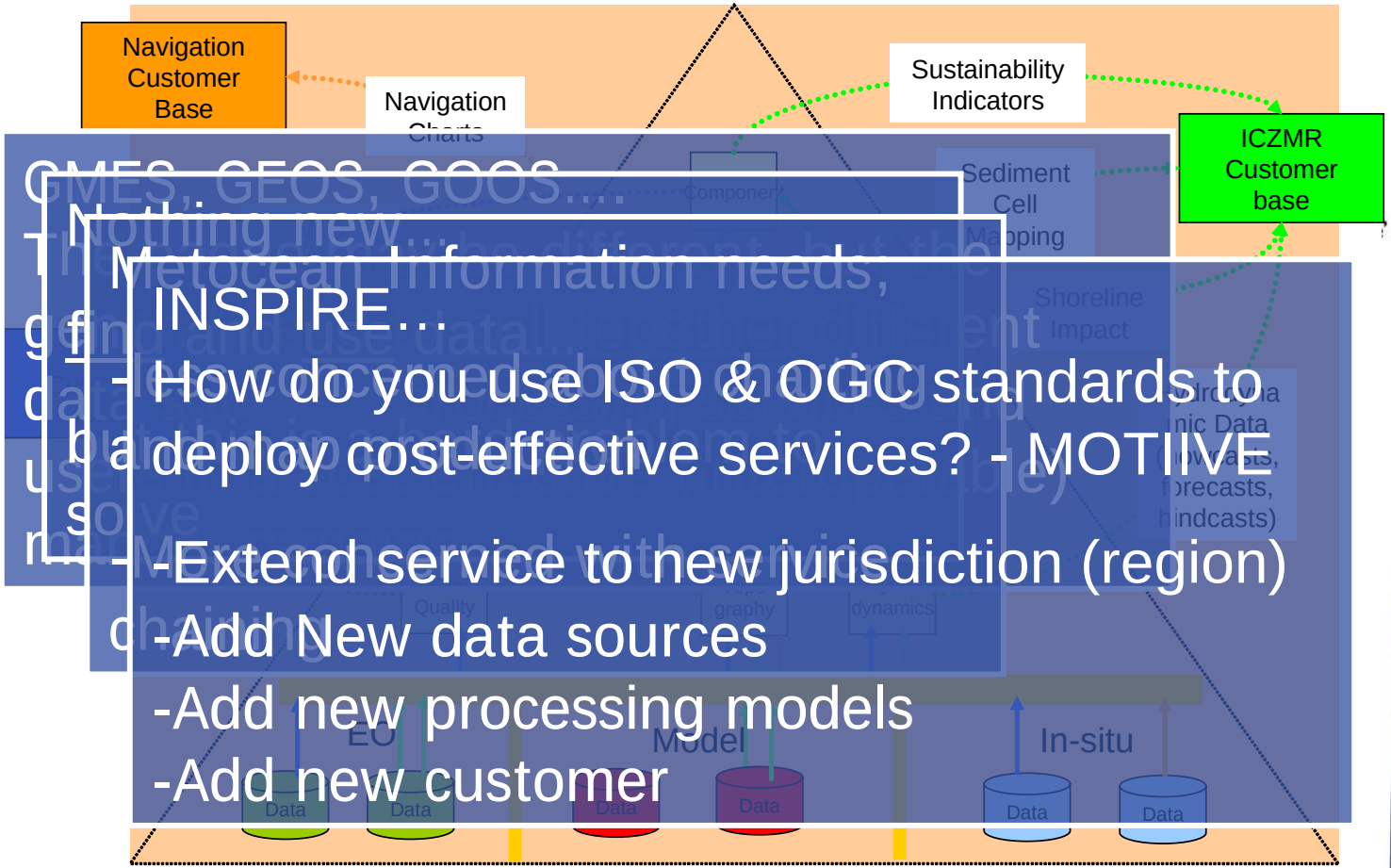
Developments in Marine Standards

- Why are there developments?
  - Increased demand for information to underpin improved risk and environmental management
  - GMES and INSPIRE
- What are these developments?
  - Application in the marine domain of the interoperability standards of ISO-TC211, CEN-TC287 and OGC
  - Detail in the paper
- How are they being implemented
  - 'Joined up' National, EC and International research
  - ***Auspices of IOC, WMO and IHO***
- When are first results expected
  - End of 2006

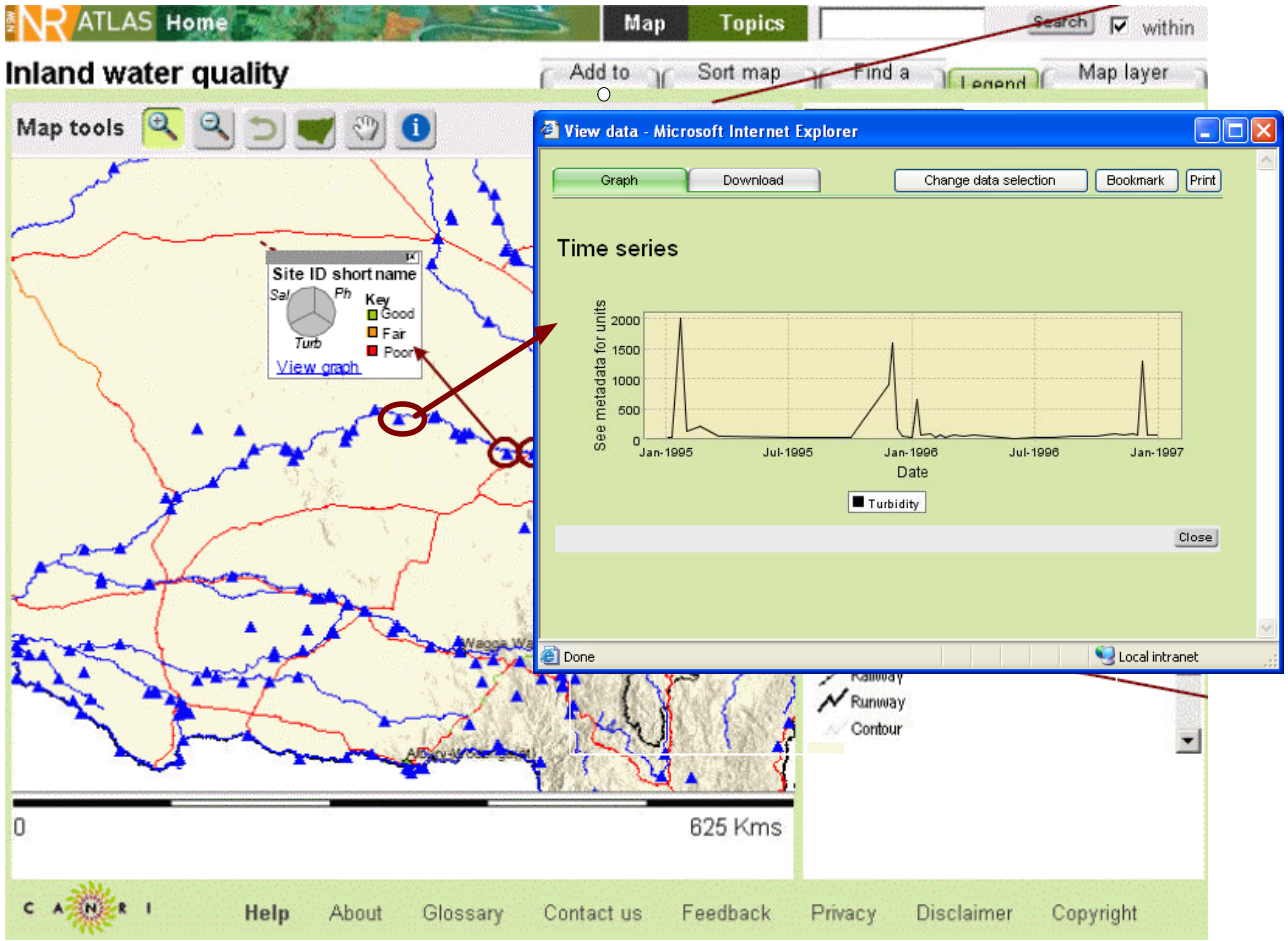
Emphasis in EuroSDR workshop

- Meteorology and Marine
  - Feature / object data models
    - "Separation of Concerns"
  - Operational Service Chains
    - "Processing Affordance"
- Land Meets Sea
  - What differences drive different data models?
    - Same issues - but more critical in met/marine
  - What similarities are there?
    - Navigation community (DNF Offshore)

What's driving the developments?



A Land Example



Back to ISO TC211

- The key to interoperability is the formalisation of shared knowledge in communities through the definition and cataloguing of 'feature types'.
  - But *what is* 'a Feature?' and how should is be defined?
- Conceptual models for features can be formalised in a canonical XML encoding through the Geography Markup Language (GML).
  - But what is the best way to develop a GML Application Schema? – *RISE Methodology*
- Registries can be used to manage Features
  - But we don't have a reference registry implementation

Marine Community defining Features?

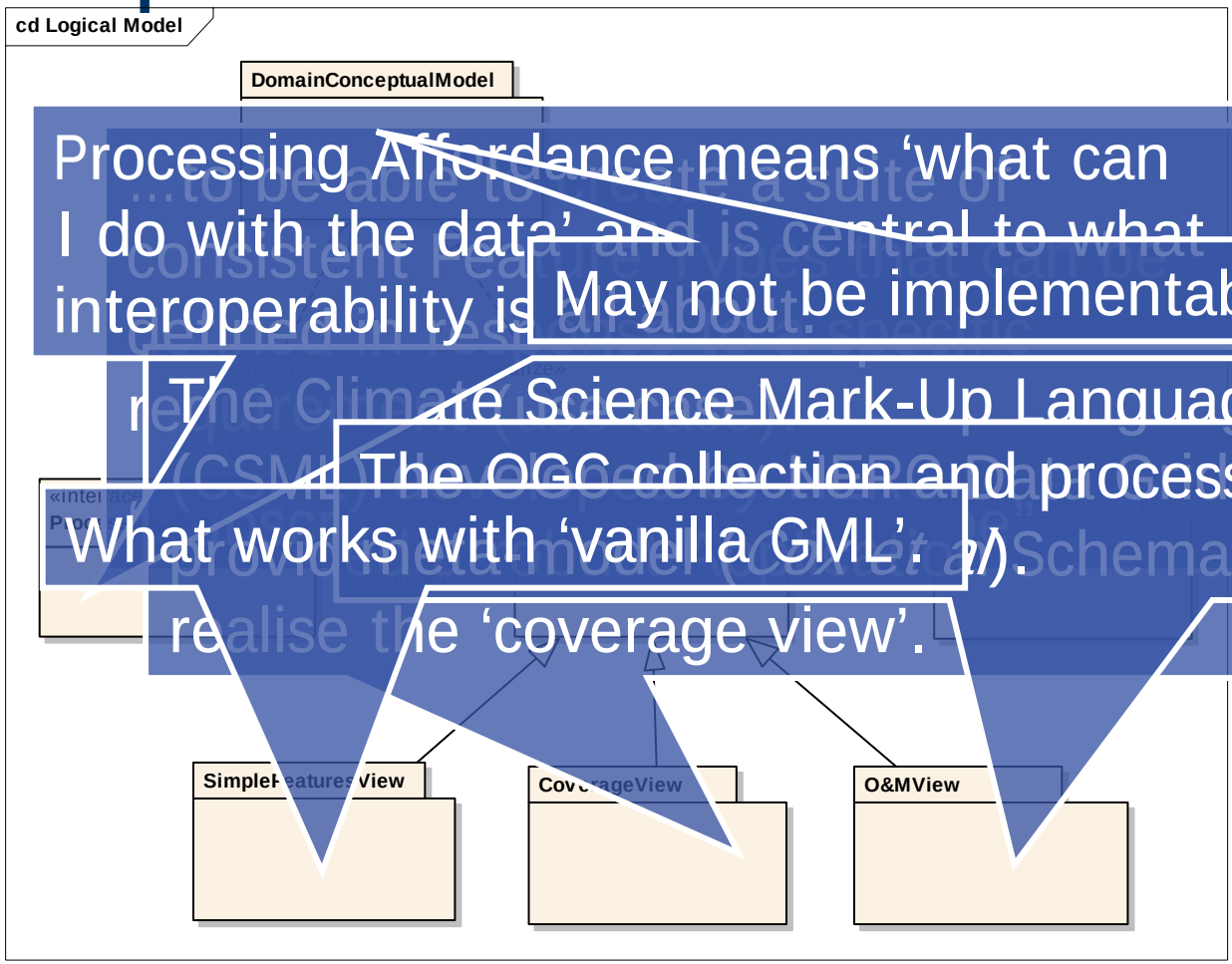
The marine community is broad and there is no 'one size fits all' marine feature (*MarineXML Position Paper 2005*).

As this is the community, the lack of clear rules means there is significant scope for variation in how the feature is defined; these feature types may lack coherence and consistency with each other. So....

What is a Feature in the Metocean Domain?

- If something has a specific name or classifier then it is probably a feature *(Met Office Workshop Communique)*
- Features are an implementable subset of a conceptual model that may be based on;
  - Geometry / topology
  - Semantics [Natural Language] / Governing equations
  - Sampling regime
- This separation of concerns results in the ability to create a set of consistent Feature Types

Separation of Concerns…



Processing Affordance means 'what can I do with the data' and is central to what interoperability is all about.

May not be implementable

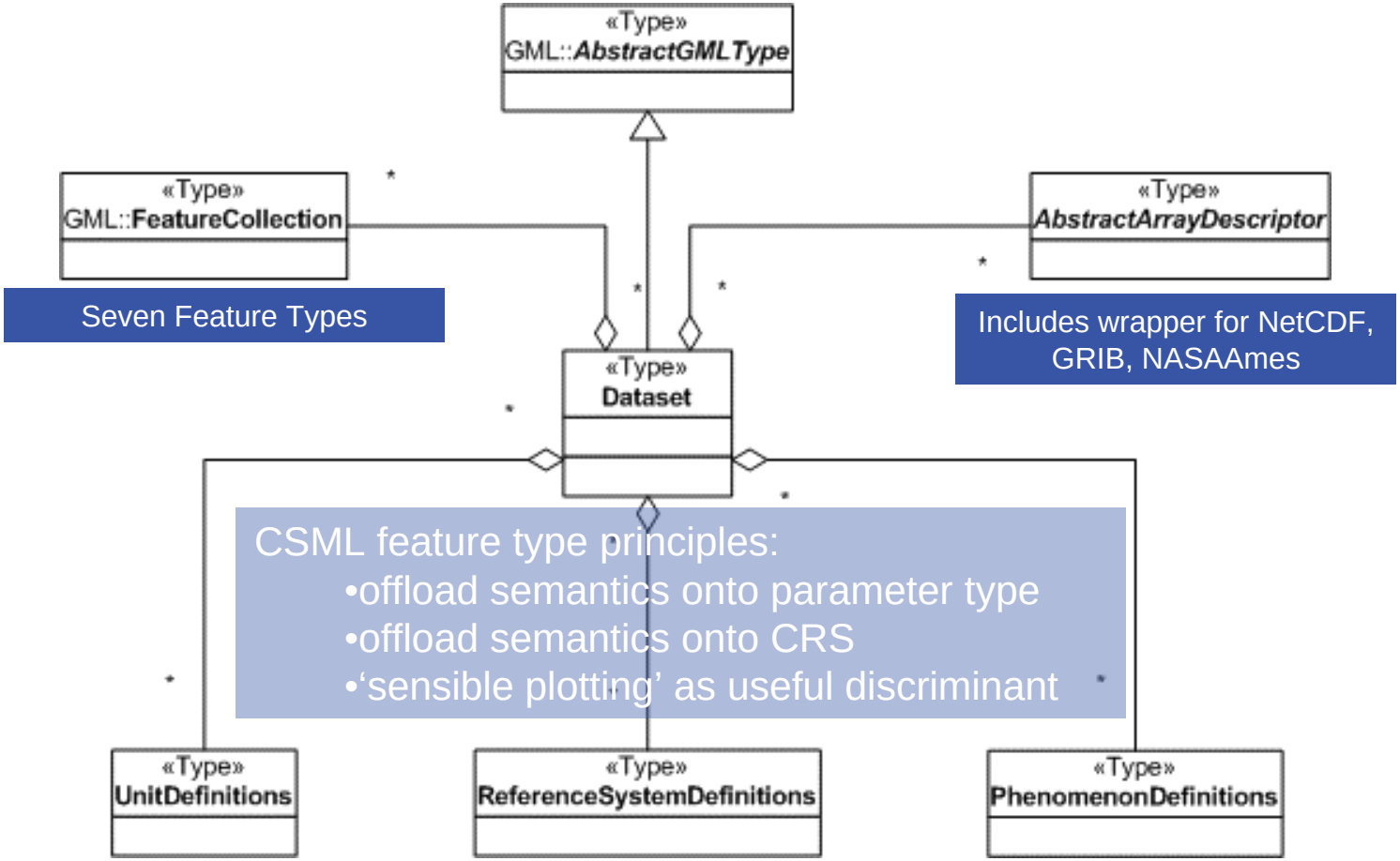
The Climate Science Mark-Up Language (CSML) The OGC collection and processing provide meta-model (Cox *et al.*) Schema to realise the 'coverage view'.

What works with 'vanilla GML'.

Processing Affordance.

- Operational Interfaces for Feature Types
  - This leads to true interoperability; allowing a user to discover an object of interest, browse by navigating associations and execute a chain of processes on some dataset to derive added value.
- Defines a declaration of intent, describing the operations that can be invoked
  - Feature has attributes p,q,r to support f(p,q,r)
- Is supported by the GFM, but not XML Schema
  - One possible approach is to define PA as an object in a registry
  - Likely need for an extension of the GML profile of UML (changes to rules of mapping UML to GML)

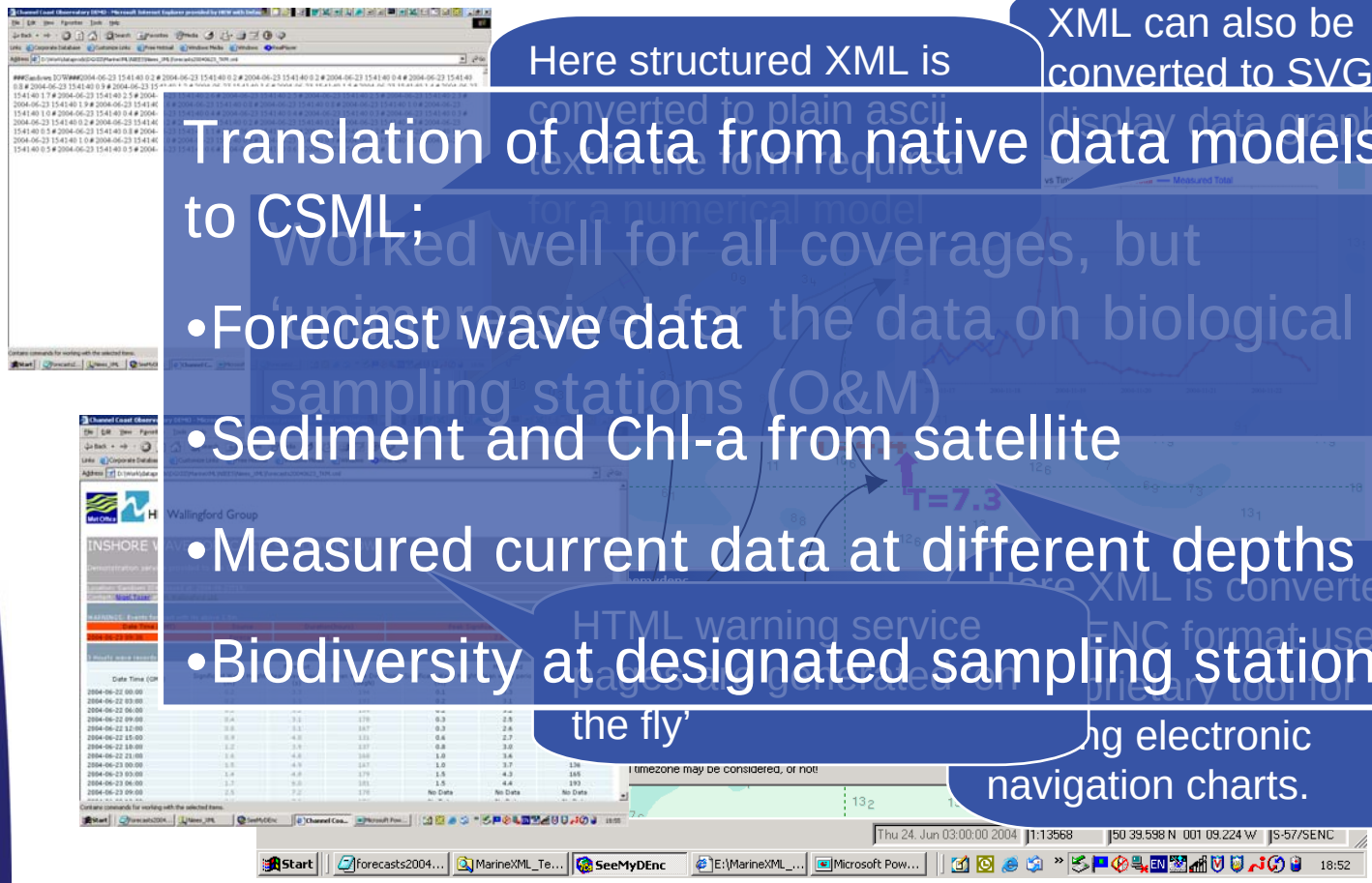
CSML Features



CSML Features

CSML feature type	*Description*	*Examples*
TrajectoryFeature	Discrete path in time and space of a platform or instrument.	ship's cruise track, aircraft's flight path
PointFeature	Single point measurement.	raingauge measurement
ProfileFeature	Single 'profile' of some parameter along a directed line in space.	wind sounding, XBT, CTD, radiosonde
GridFeature	Single time-snapshot of a gridded field.	gridded analysis field
PointSeriesFeature	Series of single datum measurements.	tidegauge, rainfall timeseries
ProfileSeriesFeature	Series of profile-type measurements.	vertical or scanning radar, shipborne ADCP, thermistor chain timeseries
GridSeriesFeature	Timeseries of gridded parameter fields.	numerical weather prediction model, ocean general circulation model

CSML in MarineXML Test Bed



Here structured XML is converted to plain ascii text in the form required for a numerical model

XML can also be converted to SVG to display data graphically

Worked well for all coverages, but [unintelligible] for the data on biological sampling stations (O&M)

HTML warning service page generated on the fly'

XML is converted to ENC format used in [unintelligible] electronic navigation charts.

- Translation of data from native data models to CSML;
- Forecast wave data
- Sediment and Chl-a from satellite
- Measured current data at different depths
- Biodiversity at designated sampling stations

Interoperability cannot be achieved by an application schema alone.

- A set of well defined service interfaces are vital to ensure that data can be accessed in an implementation agnostic fashion .
- A key enabler of interoperability is the registry. The registry provides the capability to publish (and govern) application schemas, phenomena dictionaries, controlled vocabularies, service bindings etc. for all to see and use.
- Furthermore, it is the registry that enables associations between objects to be expressed.
- This leads to true interoperability; for example, allowing a user to discover an object of interest, browse by navigating associations and execute a chain of processes on some dataset to derive added value.

Implementation

- The EU MOTIIVE and the Australian Oceans Portal project are collaborating to deliver an ebRIM registry/repository implementation, focusing on delivering a feature type catalogue
  - service bindings, data standards driven query models, presentation resources and processing chains will also be exposed within the registry.
- The Met Office has proposed to initiate a parallel track to develop a second reference implementation based on the OGC Catalogue Services for Web (CSW) for (at least) the same set of use cases.
- A number of interoperability tests across MOTIIVE/ Oceans Portal, MarineXML and Met Office registries could be scheduled for late 2006, perhaps forming the basis of an OGC interoperability experiment.

Tools Being Used

- UML Modelling
  - Enterprise Architect and “Hollow World” UML template for GML3.2
- UML to GML
  - Shape Change Tool

Issues to Address – OGC Change Requests

- Data access query model (05-022r1)
  - Builds on the OGC Filter Specification and allows the definition of pre-defined queries
  - Deployment of the interfaces that support the processing affordance concept.
- Service coherence model (05-008)
  - Should be extended to formally model the metaclasses associated with OGC service interfaces to show relationships between the objects exposed and the various interface types (WMS, WGFS, WCS, SOS, WPS etc.)

Developments in Marine Standards

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