Aeronautical METeorology in Europe

Weather Information Modelling Activities

Dennis Hart
Aeronautical Information Management Division
EUROCONTROL

Overview

- ATM in Europe
  - Expectations
    - Single European Sky
  - Way Ahead
  - WXCM WXXM WXXS
    - OGC, GML etc….
    - !!! EXPAND THIS SLIDE ONCE REMAINDER IS FIXED

EUROCONTROL

Expectations
Single European Sky; State of Play

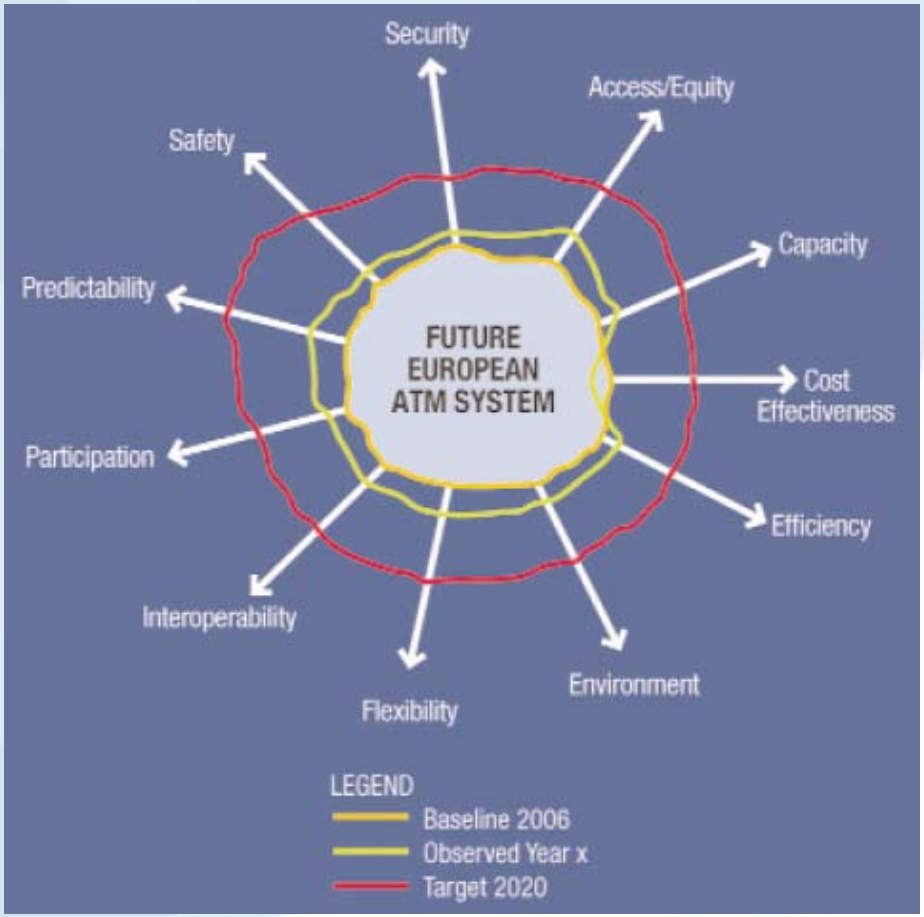
- Single European Sky
  - Initiative set up by the European Commission
    - 27 EU States plus Norway, Switzerland and Iceland (plus Israel)
  - Launched legislative package which should result in a seamless ATM System for Europe; includes ….
  - Supporting Research: Single European Sky ATM Research (SESAR)
    - Definition Phase finalised: ATM Target Concept and ATM Master Plan
    - R&D managed by the SESAR Joint Undertaking; Public Private Partnership
    - Program will run for the coming 8 years

EUROCONTROL

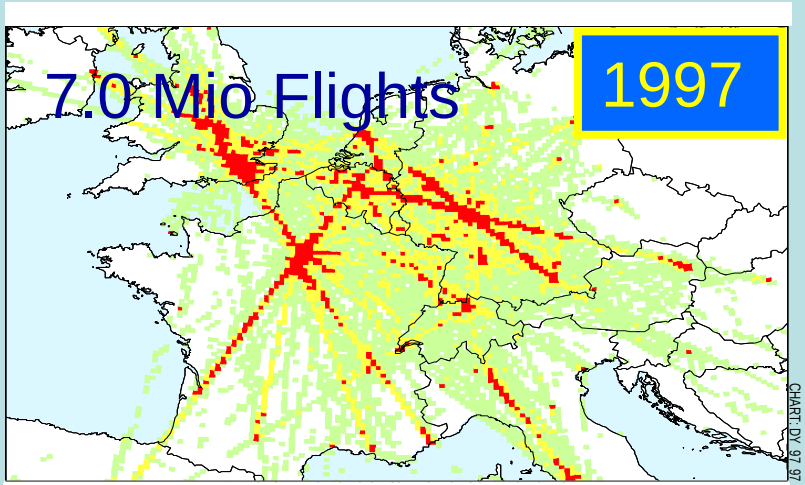
Expectations
SESAR Performance Framework

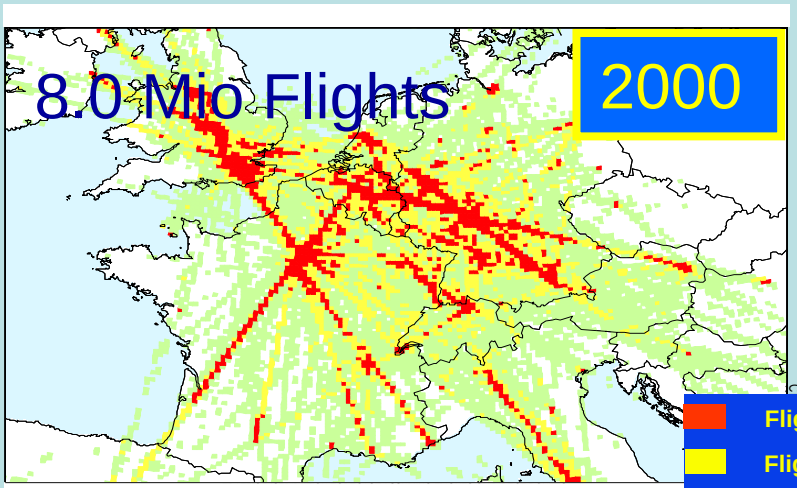
- Single European Sky ATM Research Program (SESAR)
  - Performance Framework
  - 11 Key Performance Areas

- Key Areas:
  - Prepare for three times more capacity
  - Drastically reduce environmental impact
  - Halve ATM costs
  - Improve the safety levels by ten

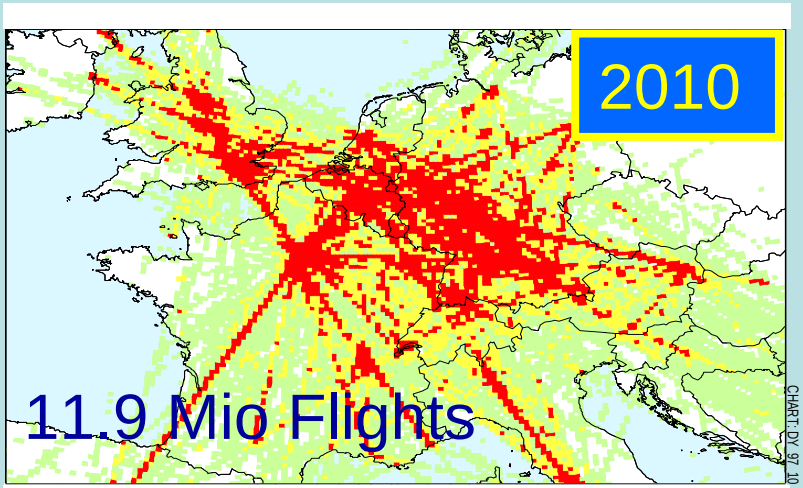


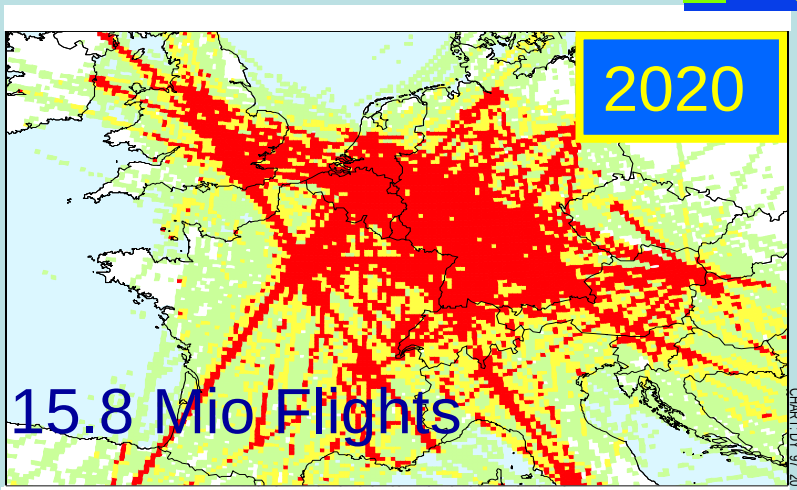
Expectations
Foreseen future of ATM





Flights 150 or more
Flights 100 to 150
Flights 50 to 100





EUROCONTROL

Expectations
Today's Problems

- CFMU Network Operations Report 2007
  - 25% of Total Delays attributed to Weather
  - 42% of Airport Delays attributed to Weather
  - En-route Delays attributed to Weather doubled last 5 years
    (2007: 13%)

± 5,000,000 Delay Minutes !

EUROCONTROL

Expectations
The questions for ATM

- Are we confident that we could make in time decisions to manage the ATM system safely, efficiently and with a high level of confidence?
  - Making decisions well in advance on:
    - Runway/airport configuration
    - Flow measures
    - Taking extra fuel for inbound flights to reduce diversions
    - Rebooking passengers
    - Having extra ground staff and prepare ground operation
    - Having extra flight crew
    - Having extra atco's
    - Cancel flights
    - Planning of Runway Maintenance
    - Planning of snow removal and de-icing
    - Etc.....

Could we really move to a predictable ATM system without the evolution of MET?

- Information/data Services
- Better utilization

Way Ahead
MET-ATM

- Better integrate Weather Information into ATM Decision Making

Weather-Assimilated Decision-Making

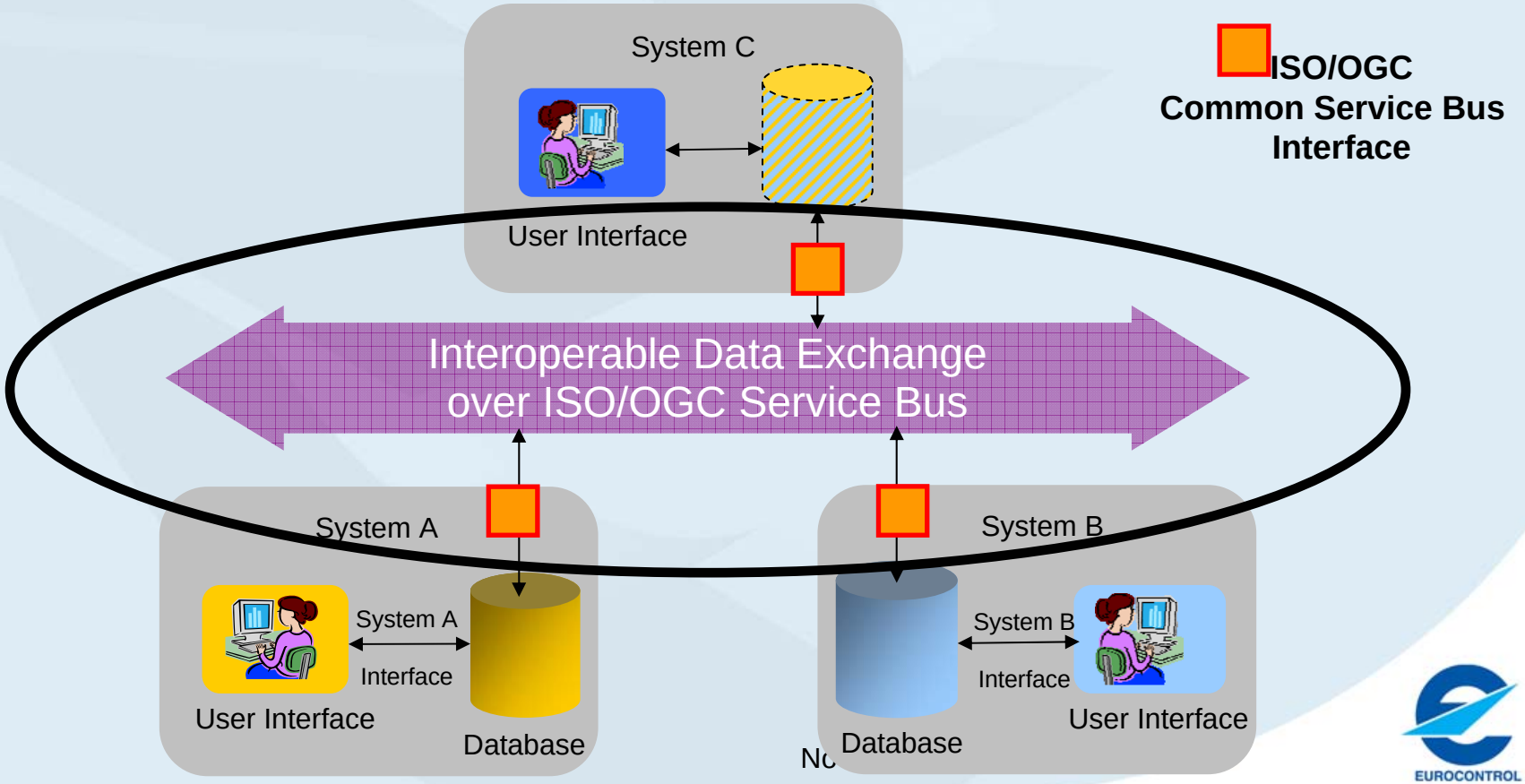
- Weather delays will not be prevented
  - MET will not ‘solve’ the weather
- The system becomes more predictable

Managing Uncertainty with a High Level of Confidence

EUROCONTROL

Way Ahead
Interoperable Data Exchange

- Key is the Interoperable Data Exchange



Way Ahead
Net-centricity

- … or Net-centricity

"the true Intranet of ATM"

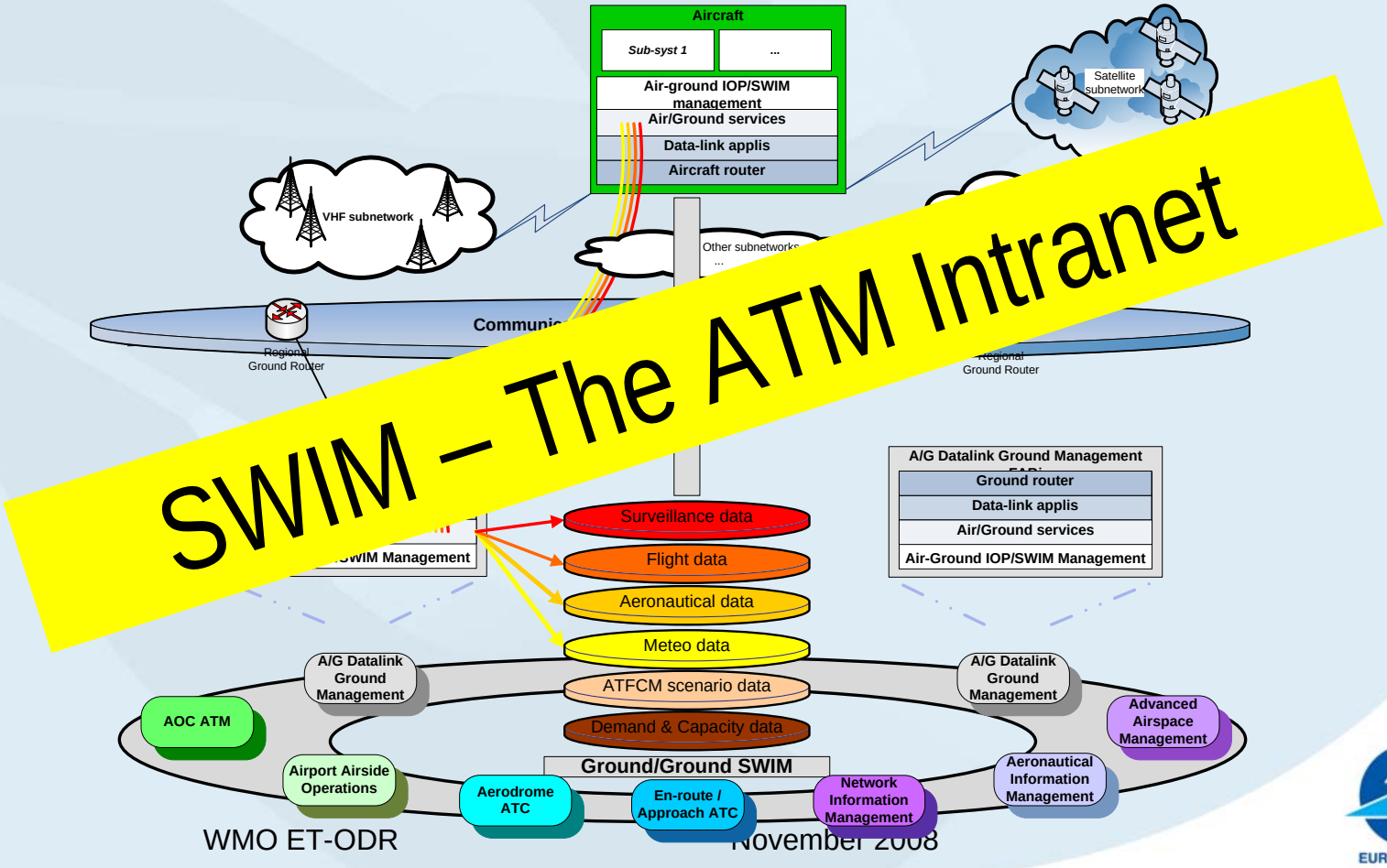
"A continuously-evolving, complex community of people, devices, information and services interconnected by a communications network to optimize resource management and provide superior information on events and conditions needed to empower decision makers"

- … or in ATM and SESAR especially referred to as the 'Concept of System Wide Information Management (SWIM)'

EUROCONTROL

Way Ahead
Net-centricity

- Visualise ‘Net-centric’ ATM…technical architecture SESAR



EUROCONTROL

Way Ahead
Overarching Generic Needs

- Creation of a Common Situational Awareness
- Network-centric based management
- Creation of a time ordered system
- Collaborative information sharing

- This calls for an open, flexible, modular and secure data environment

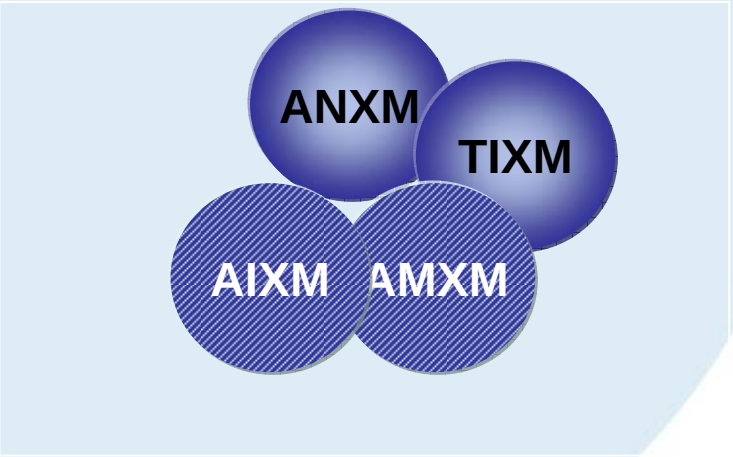
The right information at the right time at the right place

- Starting point for developing the WXCM / WXXM

EUROCONTROL

Way Ahead
Family of Data Models

- Interoperable Data Exchange over ISO/OGC Service Bus
  - The development of a family of Information Models that will enable transparent and open access to data well underway
    - Aeronautical Information Model
    - Airport Mapping Model
    - Airport Network Information Model
    - Terrain Information Model
    - Weather Information Model



EUROCONTROL

WXCM / WXXM Background

- The Weather Information Conceptual Model (WXCM) describes the differences and correlations (semantics) of Weather Information for the ATM system
- The WXXM is the Weather Information Exchange Model
  - Based on the Conceptual Model
  - Introduces exchange-specific entities (XML, GML etc.)

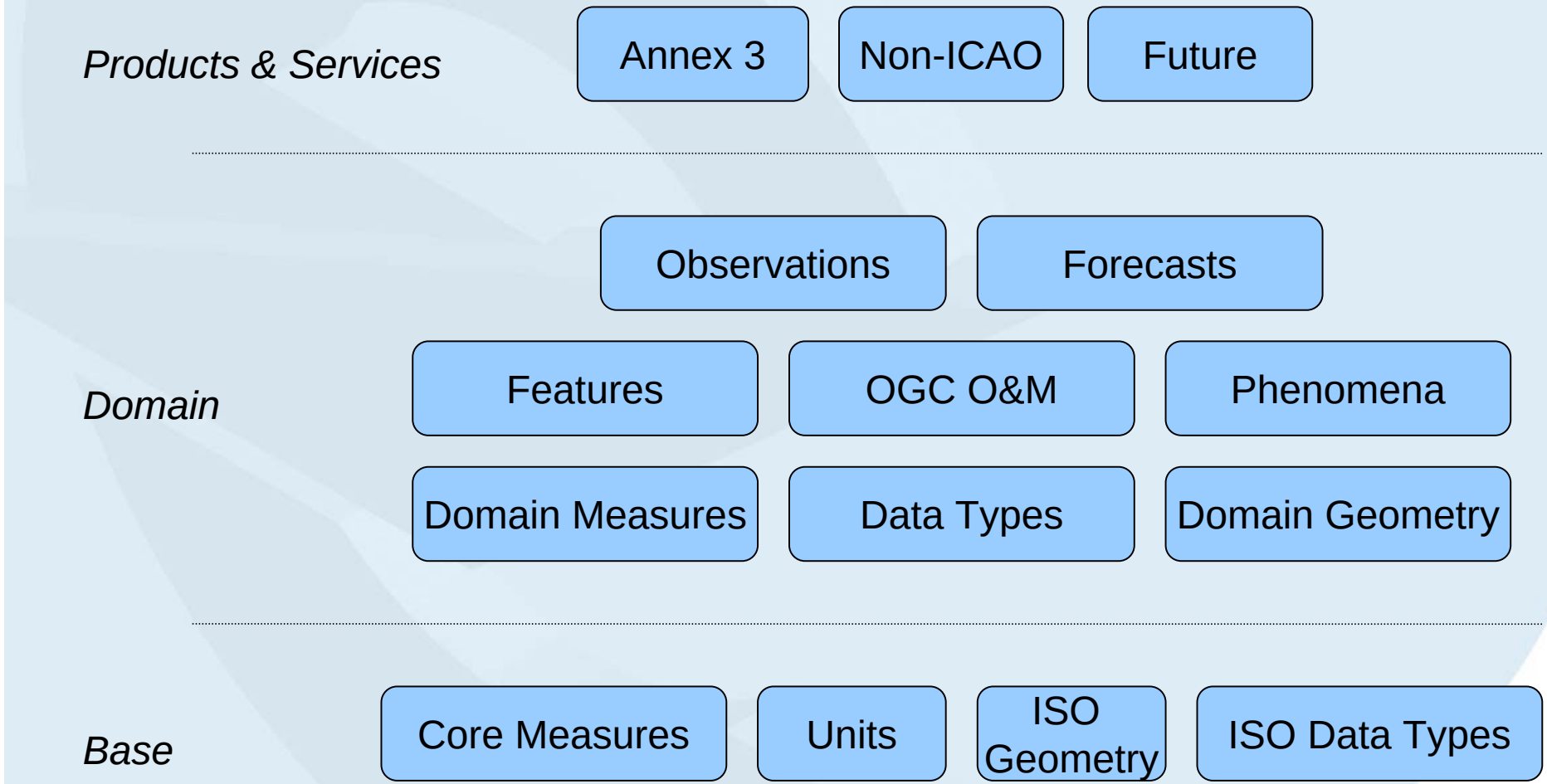
EUROCONTROL

WXCM / WXXM Background

- The third iteration of the Conceptual Model is available (called version 1.0!)
- Built on previous versions
  - Data-centric
  - Enables Annex 3 messages
  - Incorporate recommendations from stakeholders
  - Adopted the ISO/OGC O&M Model
- More generic, supporting a wider range of products and increasing usability
  - Increase modularity
  - Bottom-up approach; build products from constituent parts

EUROCONTROL

WXCM / WXXM Model Structure



WXCM / WXXM
OGC Observation Model

- Feature: abstraction of a real world phenomenon.
- Feature of interest: subject of observation.
- Property: characteristic of a feature type.
- Procedure : a method, algorithm or instrument.
- Result: an estimate of the value of some property generated by a known procedure.

- “Observation” in the OGC sense includes forecasts; the difference is implied by the procedure used and the period of validity.

WXCM / WXXM
OGC Observation Model

- The WXCM restricts the OGC model to make it:
  - Specific to MET
  - Extensible
  - Consistent with other Eurocontrol/FAA models such as the Aeronautical Information Model (AIXM)
  - Useable!

WXCM / WXXM Demonstrators

- ‘Weather in a web services environment’
  - MET data acquisition from multiple sources in standard formats
  - Transformation of the data in WXXM compliant format
  - Make WXXM data available as OGC web services
  - Demonstrate the use of OGC Weather Web Services in a D-AIM context
    - Based on existing trials in the EUROCONTROL-LFV context
      - Aeronautical Information
      - Airport Mapping
      - ICAO Annex 3 products
      - More info: www.d-aim.aero
  - Expanded ‘Limited Time’ Proof of Concept for MET information operational in 2009

WXCM / WXXM Evolution

- WXCM / WXXM / WXXS version 1.0.1; available
- WXXM to WXXS transformation script; available
- WXXM / WXXS 1.1; March 2009
  - US FAA (MIT, UCAR, NOAA) will lead development based on FAA-EUROCONTROL partnership
  - Foreseen changes:
    - GML 3.2 Best Practice ‘Unified Code for Units of Measurement (UCUM)’ will be used.
    - The current built-in separation between Observations and Forecasts will be revisited
    - Changes are foreseen to facilitate the use of ontologies, soft-typing of classes and coupling, besides the existing structure of hard-typed classes closely aligned with WMO Feature Catalogue activities
    - Foreseen potential alignment with Climate Science Modelling Language (CSML) for 'coverages'

EUROCONTROL


EUROCONTROL