S@NY

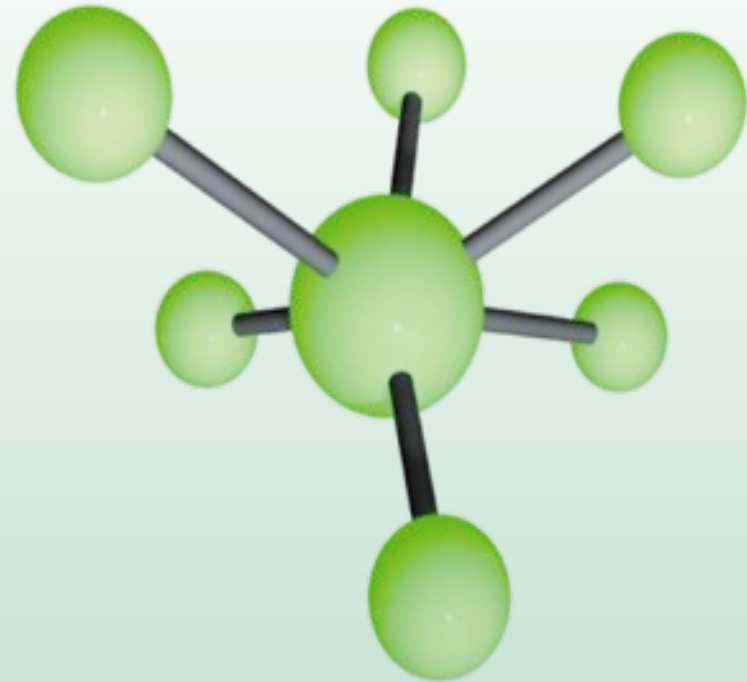## Sensors Anywhere
FP6-033564

SANY – Sensors Anywhere

GEOSS DA-07-04 Workshop 15/05/2008

Denis Havlik, Austrian Research Centres GmbH.

Content

- SANY at a glance

- SANY validation sub projects (pilots)

- SANY Baseline implementation

- Outlook (Infrastructure)

SANY Consortium

Project acronym	SANY
Project reference	IST-2006-033564
Project type	Integrated Project
Start date	01/09/2006
Duration	36 months
Budget	11,2 M€
EC contribution	7,0 M€

SANY & FP6/IST Monitoring cluster

Projects

SANY
In-situ monitoring

WINSOC
advanced sensors

Dyvine
Visual sensors

OSIRIS
crisis monitoring

EU-FIRE
Acoustic sensor

Warmer
Water monitoring
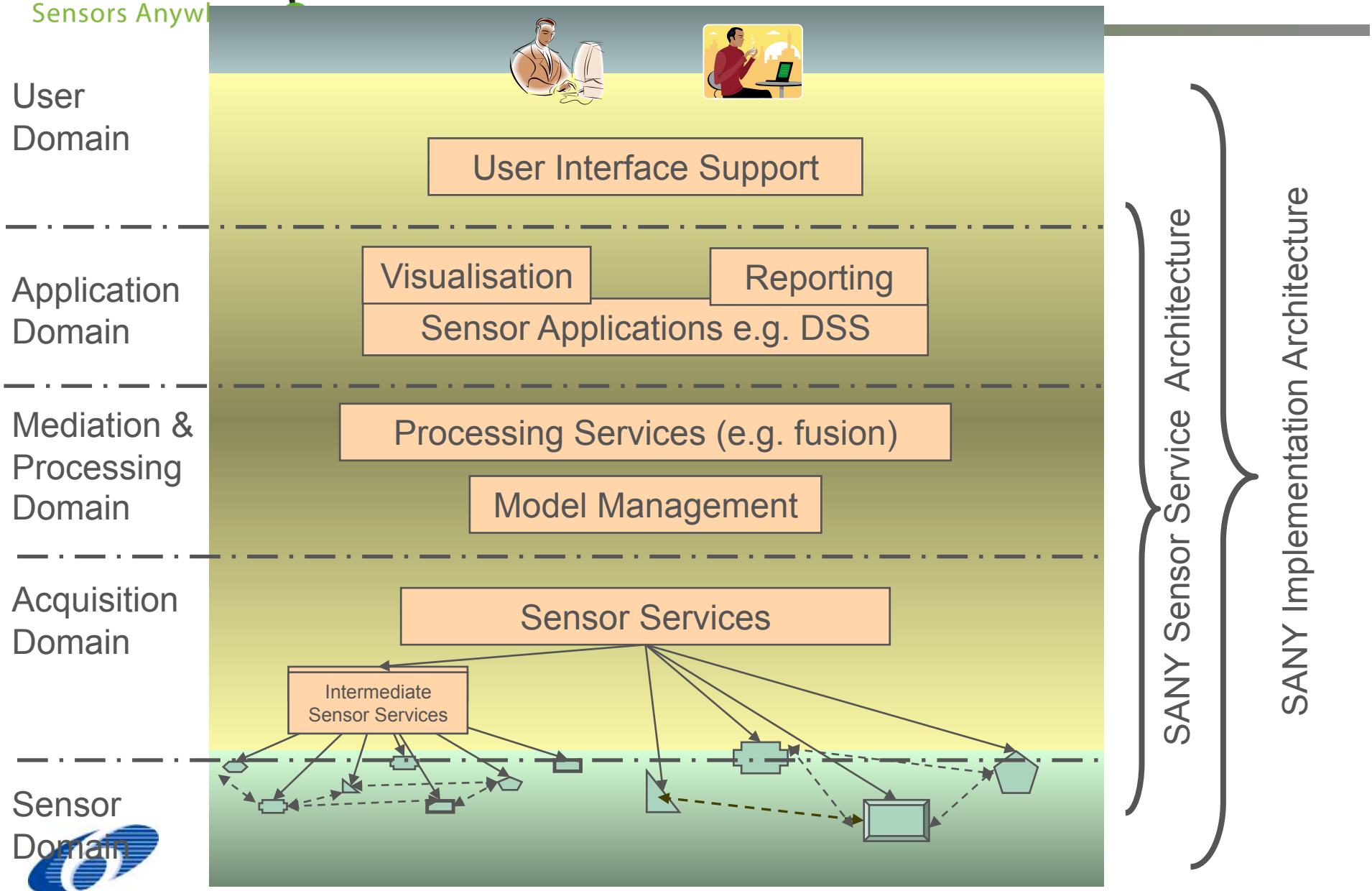
SCIER
Sensor fusion

STARRS
Search& rescue
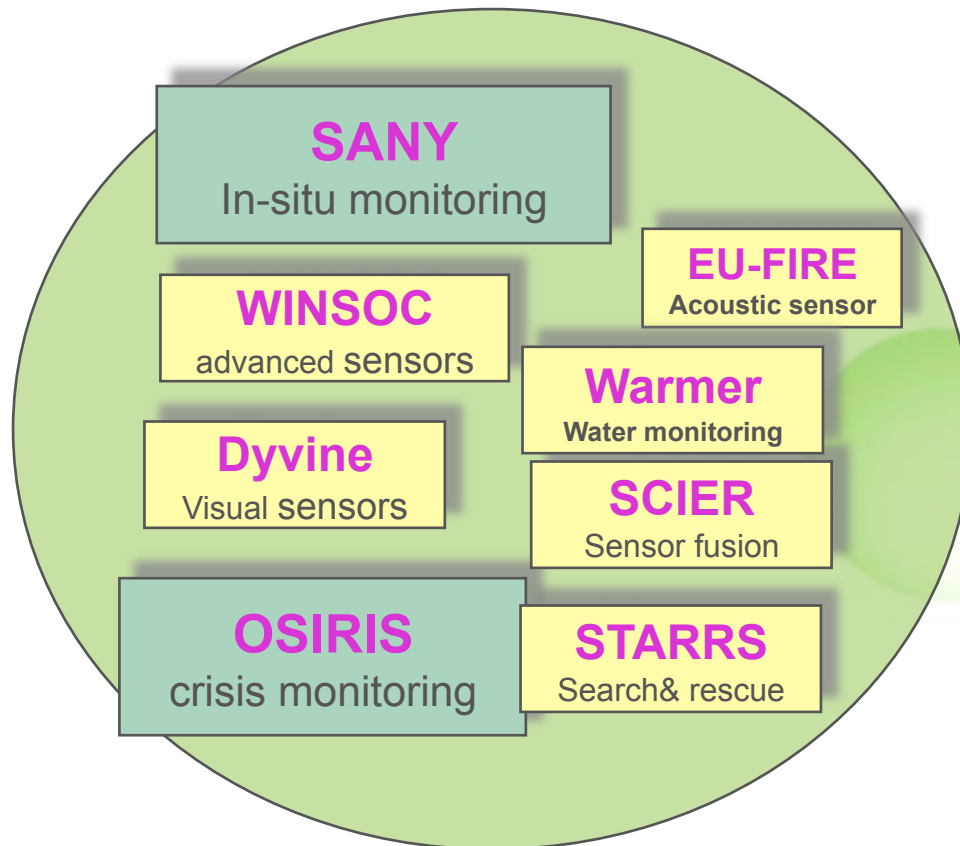
- SANY and OSIRIS are key IST/FP6-research projects in ICT for environment with a strong focus on „Monitoring of risks".

- SANY concentrates on architecture, generic services, and DS building blocks for GMES/GEOSS in the area of in-situ sensor integration

4

Why SANY?

In order to understanding the processes related to natural and man-made disasters, and improve the risk management and prevention, we need:

- **Interoperability** of *data and services*
  - across the man-made administrative and environmental domain borders.
- **Simple** *data and services* **discovery** mechanism.
- **Easy access** to *all relevant data* sources
  - free for research purpose!
- **Robust sensor networks** capable of surviving the disasters
- A mechanism that allows **fast deployment** of new sensor networks when needed.
- A simple and reliable way of building **relevant indicators** from heterogeneous data sources (including models)

Information Society
Technologies

SANY Scope

S@NY Sensors Anywh...

User Domain

User Interface Support

Application Domain

Visualisation | Reporting

Sensor Applications e.g. DSS

Mediation & Processing Domain

Processing Services (e.g. fusion)

Model Management

Acquisition Domain

Sensor Services

Intermediate Sensor Services

Sensor Domain

SANY Sensor Service Architecture

SANY Implementation Architecture

Out of scope

Transducer technology

– SANY IP shall use state of the art transducer technology.

Satellite and HAP technology

– SANY IP is only interested in assuring the interoperability with these sources of sensor data.

Communication technology and protocols

– SANY services and validation applications shall use state of the art communication technology and protocols (e.g. wireless networking components).

Information Society
Technologies

SANY work plan

- Three full development cycles + final architecture and services specifications
  - V0 ("baseline") based on existing technology
- Three validation applications, with demonstrations in at the end of each cycle
- Five training workshops (v0 and v1 in 2008)
- Intensive work on standardization (OGC)
- Uptake of GMES/GEO activities

contents

spec. level

V0 (Q2 2008)

V1 (Q4 2008)

V2 (Q2 2009)

V3 (Q4 2009)

Information Society
Technologies
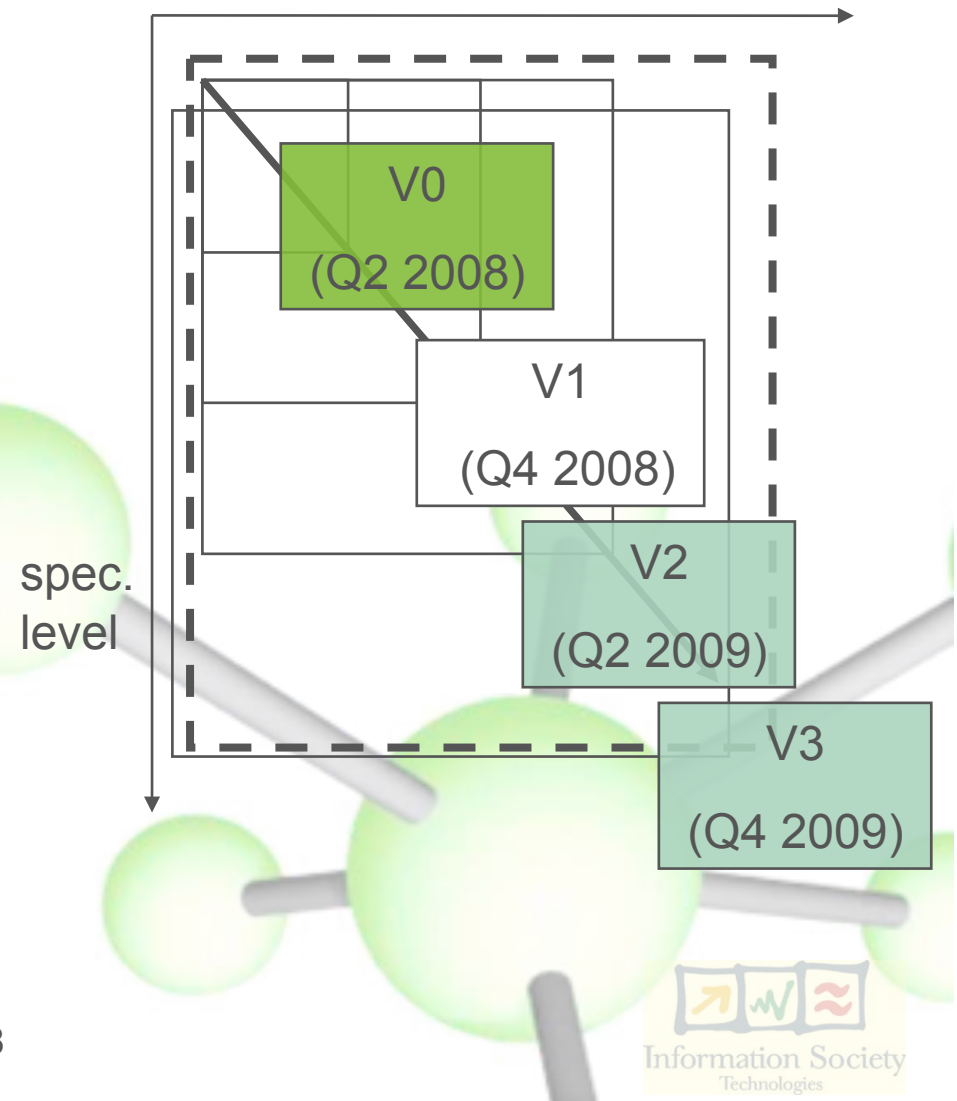
- **OGC Sensor Services**
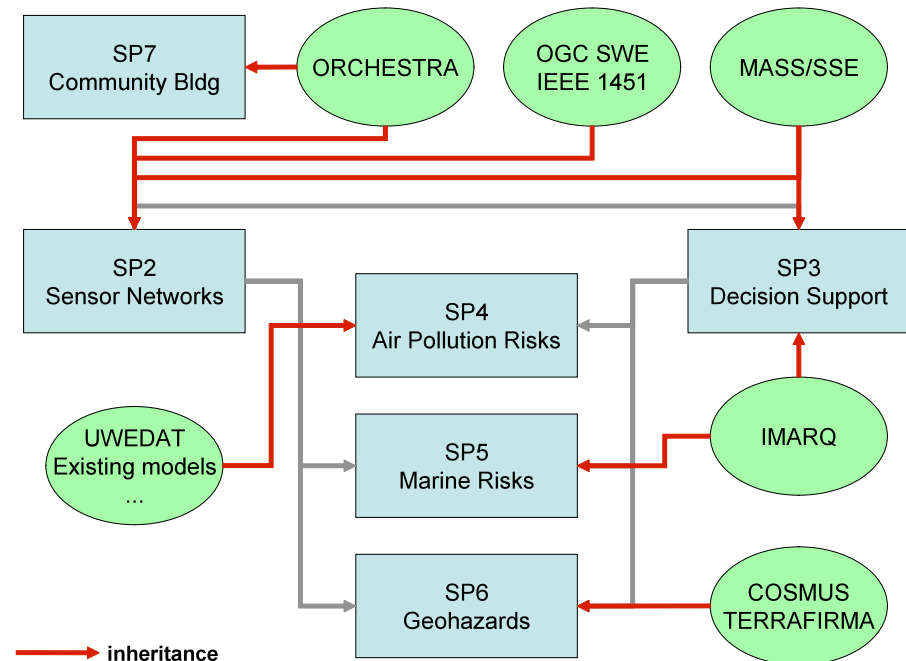 - SWE: SOS, SPS, SAS, WNS, SensorML, O&M
- **ORCHESTRA IP**
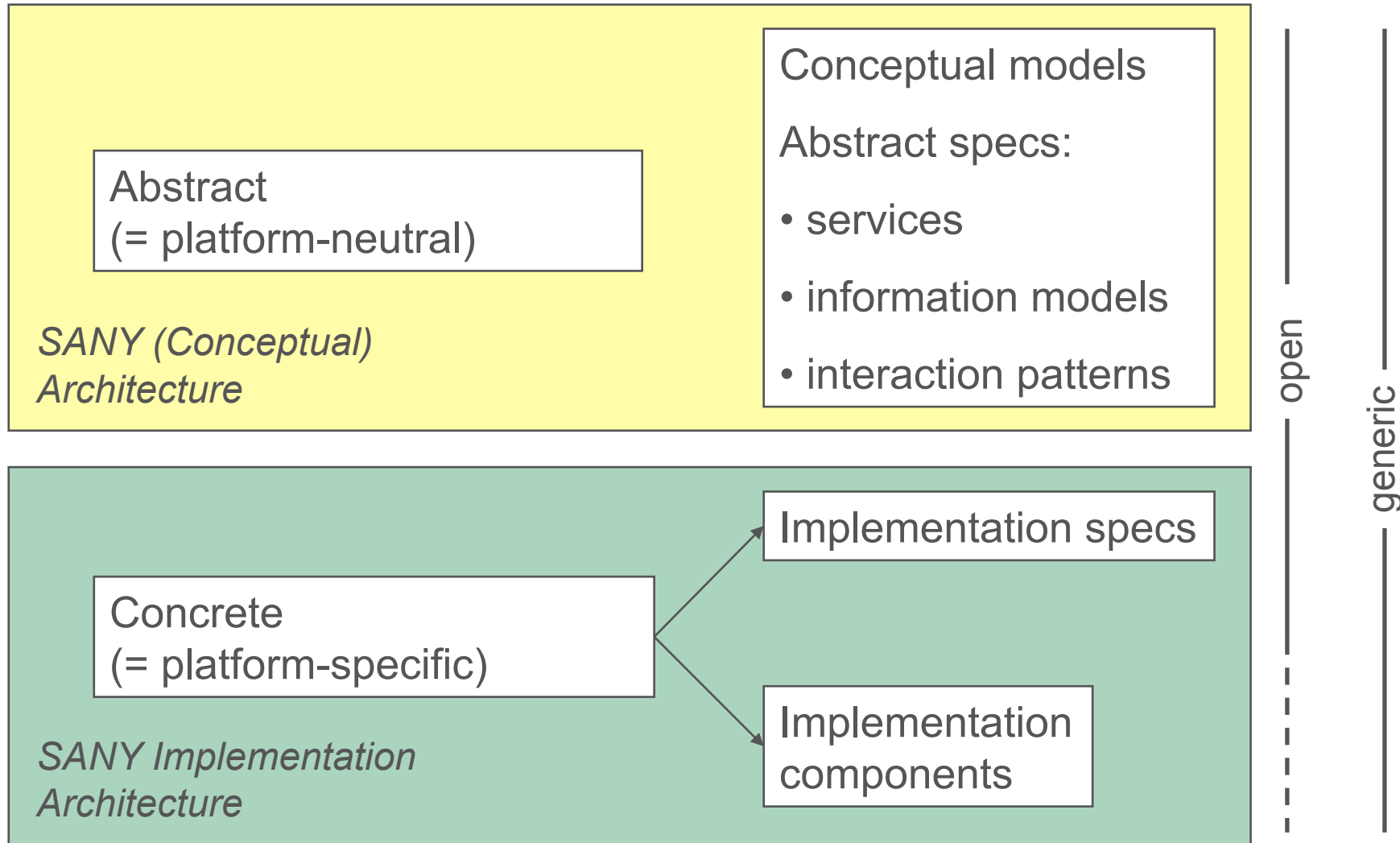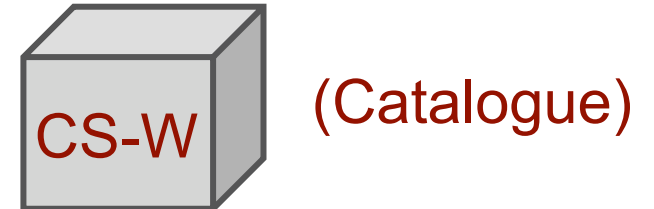 - ORCHESTRA Catalogue, Map & Diagram service, UAA, FAS
  - Architectural principles
- **SSE**
  - Web based clients
  - Visualization

- **Public availability of the architecture specifications**
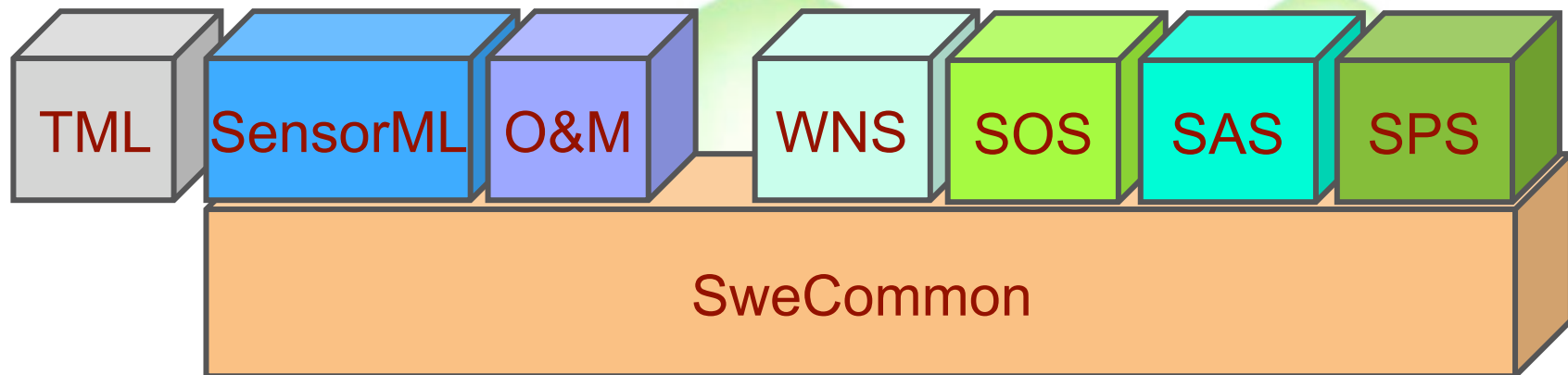- **Standardization approach through Open Geospatial Consortium**

SANY Architectural principles

Abstract
(= platform-neutral)

Conceptual models

Abstract specs:

- services

- information models

- interaction patterns

SANY (Conceptual)
Architecture

Concrete
(= platform-specific)

Implementation specs

Implementation
components

SANY Implementation
Architecture

open

generic

SWE Building Blocks

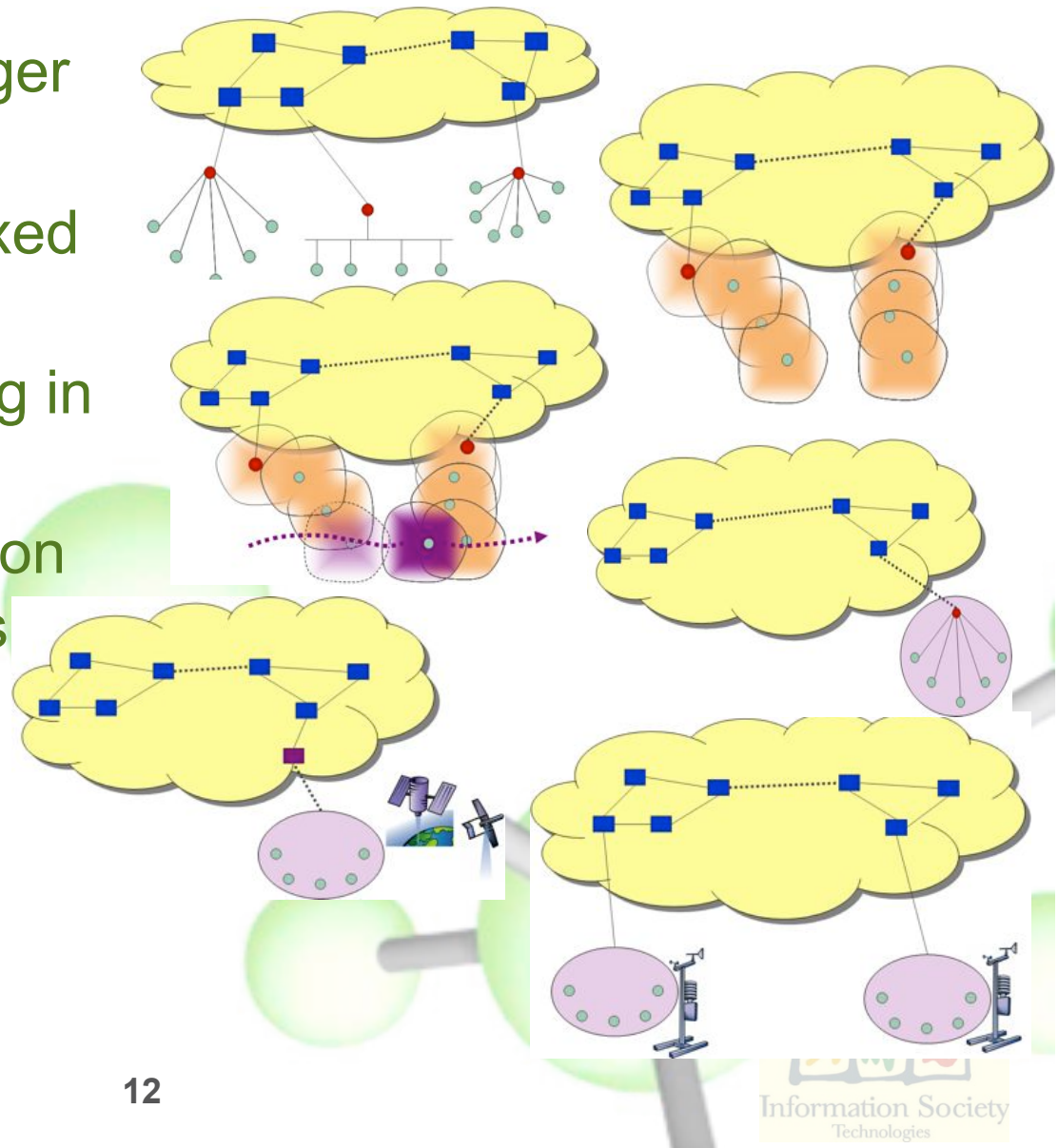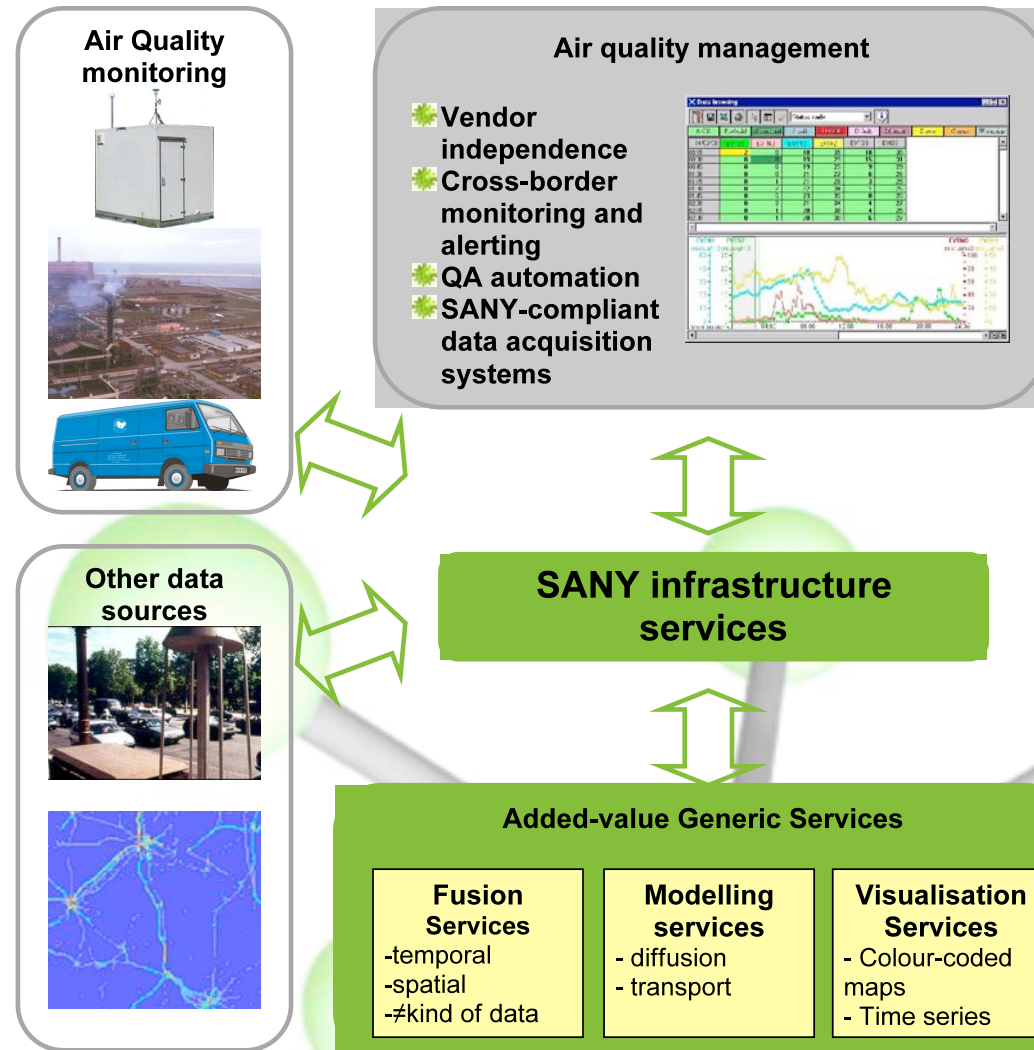# SANY Sensor Scenarios

- Sensors and data logger with fixed locations
- Mobile sensors and fixed or mobile data logger
- Mobile sensors moving in different sub networks
- Mobile sensor cluster on vehicles (e.g. on ships) block data transfer
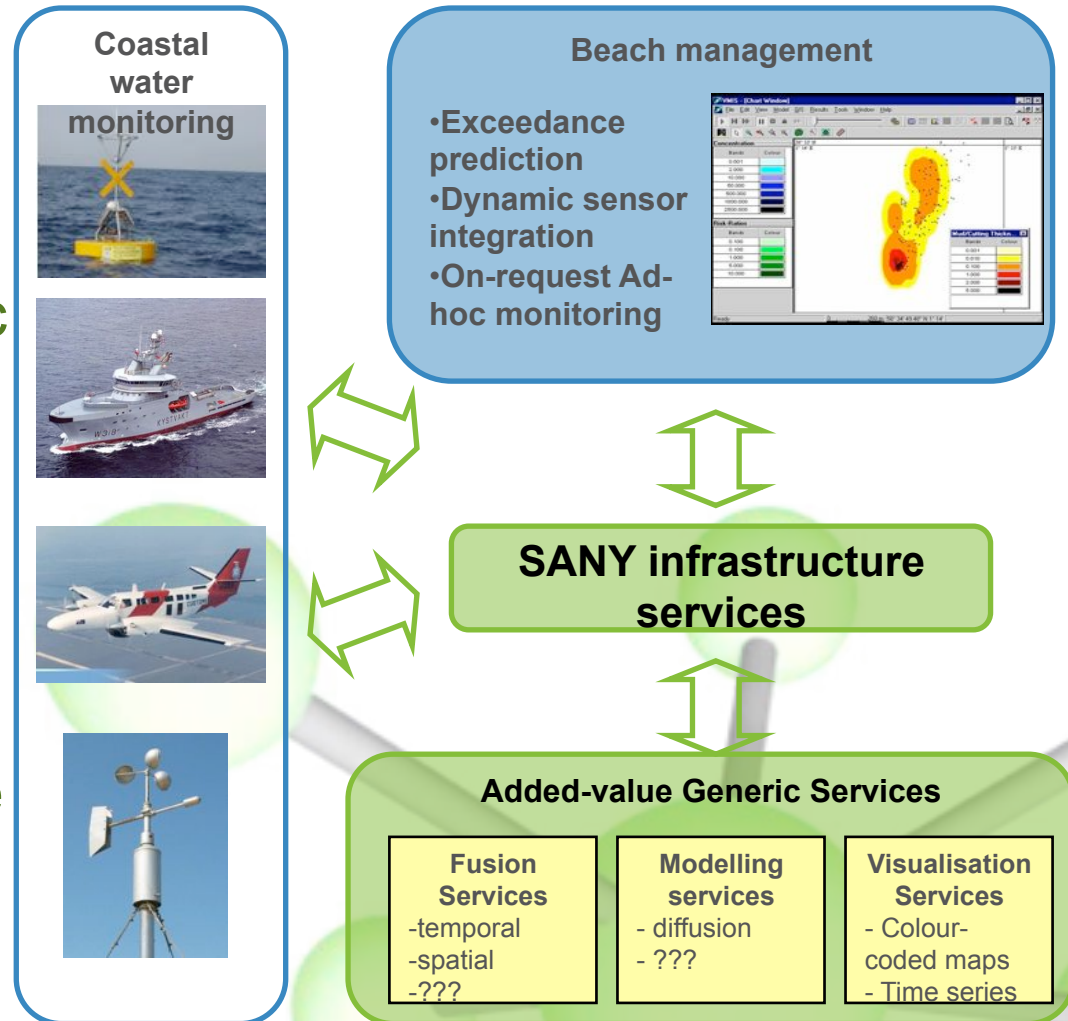- Mobile EO sensors (satellite, airborne)
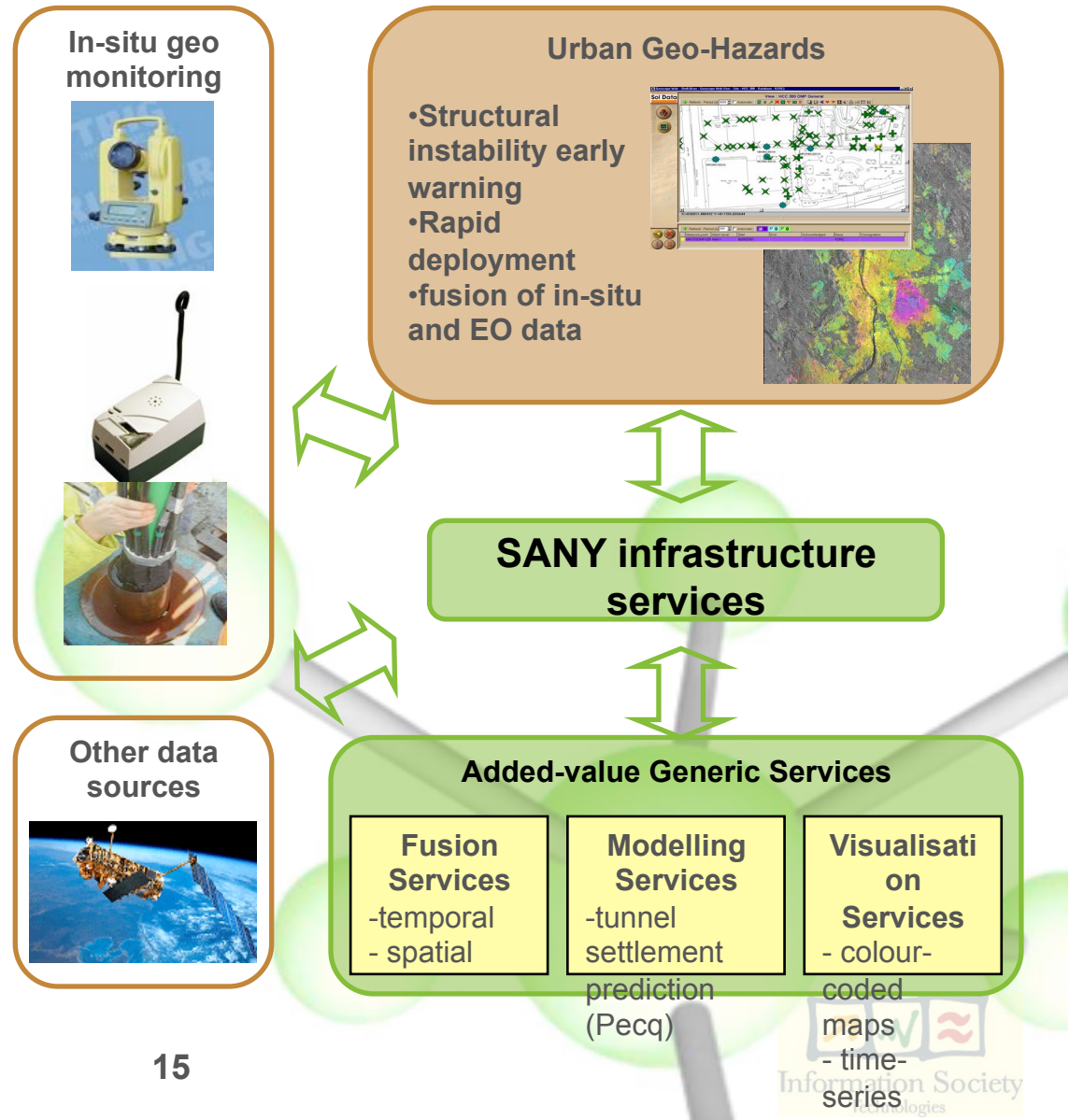- Web enabled sensors

Air quality monitoring pilot

- Emission/imission modeling in Moulin, Fr (simple site) and Linz (complex site; more data sources)
- cross border integration on French/Belgium border in Flanders
- Two separate Data Aquisition implementations by ARC and ISEO to test compatibility.

Air Quality monitoring

Other data sources

Air quality management

- Vendor independence
- Cross-border monitoring and alerting
- QA automation
- SANY-compliant data acquisition systems

SANY infrastructure services

Added-value Generic Services

Fusion Services	Modelling services	Visualisation Services
-temporal	- diffusion	- Colour-coded maps
-spatial	- transport	- Time series
-≠kind of data		

Marine pilot
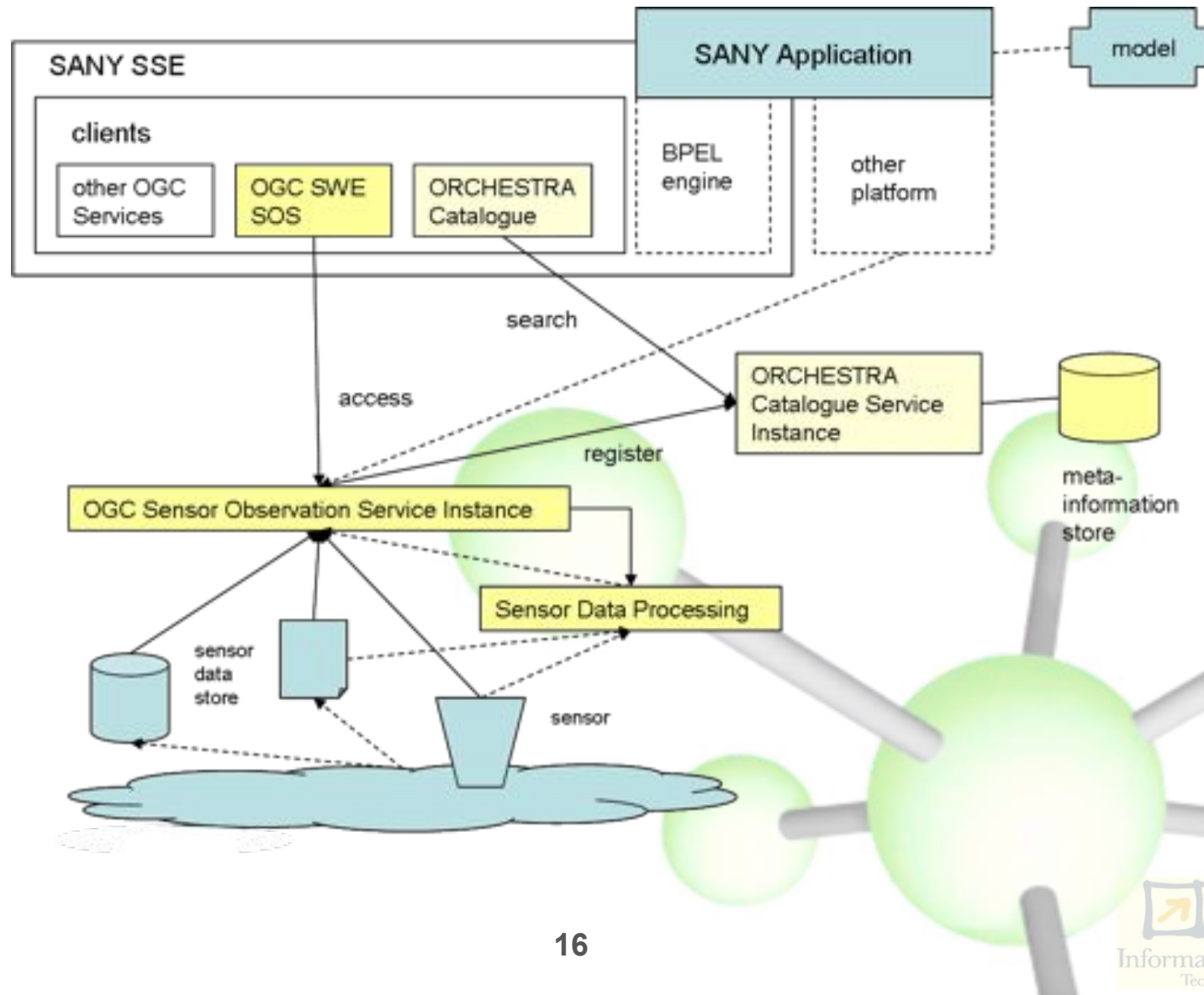
- Bathing water monitoring and prediction (Poland)
- Combination of static and ad-hoc sensors; vessels of opportunity
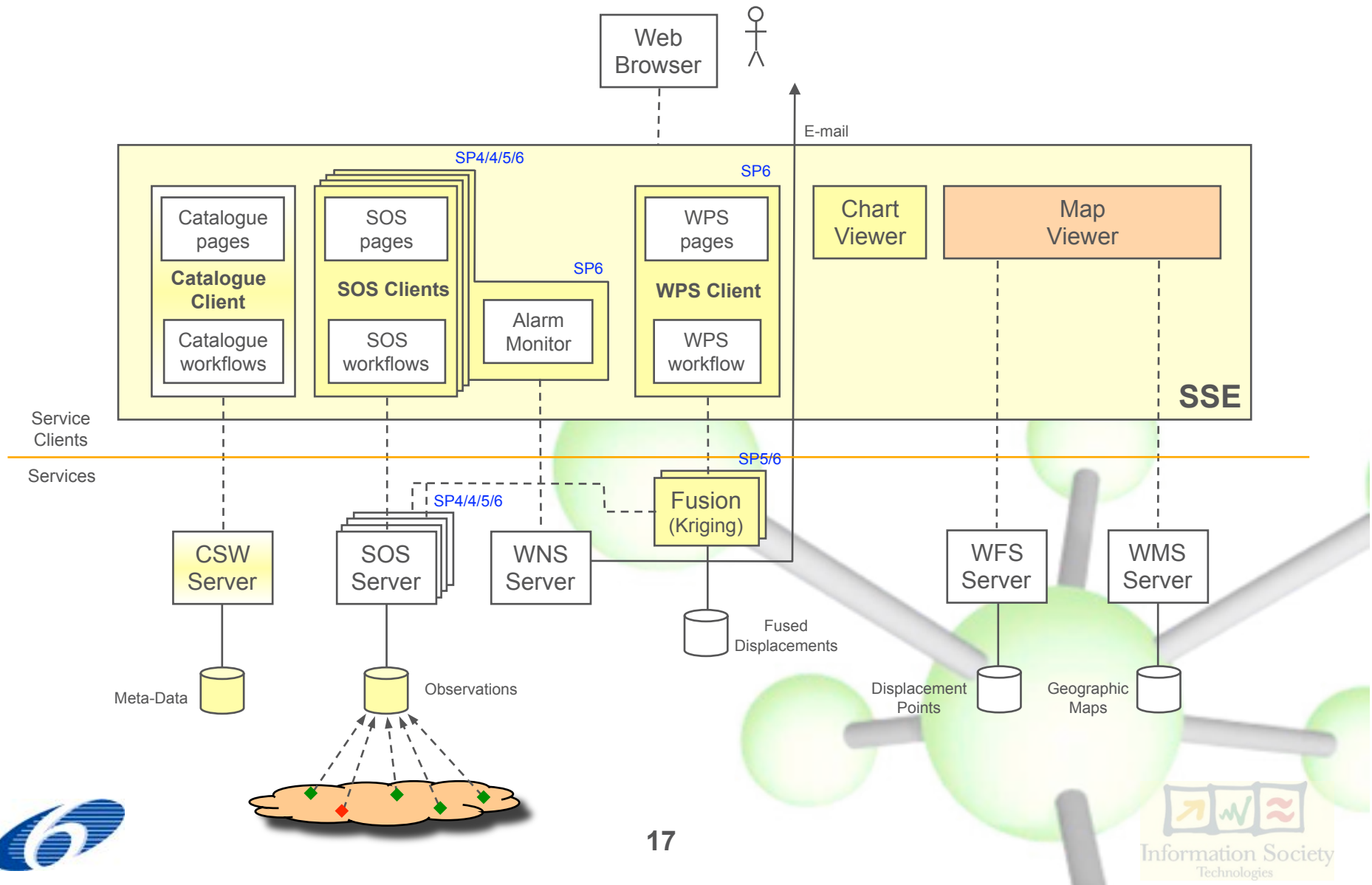- Infrastructure services reused for traffic monitoring use case (Baltic sea)

Coastal water monitoring

Beach management

- Exceedance prediction
- Dynamic sensor integration
- On-request Ad-hoc monitoring

SANY infrastructure services

Added-value Generic Services

Fusion Services	Modelling services	Visualisation Services
-temporal -spatial -???	- diffusion - ???	- Colour-coded maps - Time series

Information Society
Technologies

Geo-hazards pilot

- Urban tunel excavation use case

- Monitoring the structural (in)stability of buildings

- Use of ad-hoc sensor networks (ZigBee)

- Fusion of in-situ and satelite data

In-situ geo monitoring

Urban Geo-Hazards

- Structural instability early warning
- Rapid deployment
- fusion of in-situ and EO data

Other data sources

SANY infrastructure services

Added-value Generic Services

Fusion Services	Modelling Services	Visualisation Services
-temporal - spatial	-tunnel settlement prediction (Pecq)	- colour-coded maps - time-series

17

Lessons learned

- **GOOD:**
  - SWE is versatile; general purpose;
  - compatible with RM-OA
 - Usable for all sensor-like information sources
- **BAD:**
  - semantic interoperability; lack of "best practices"
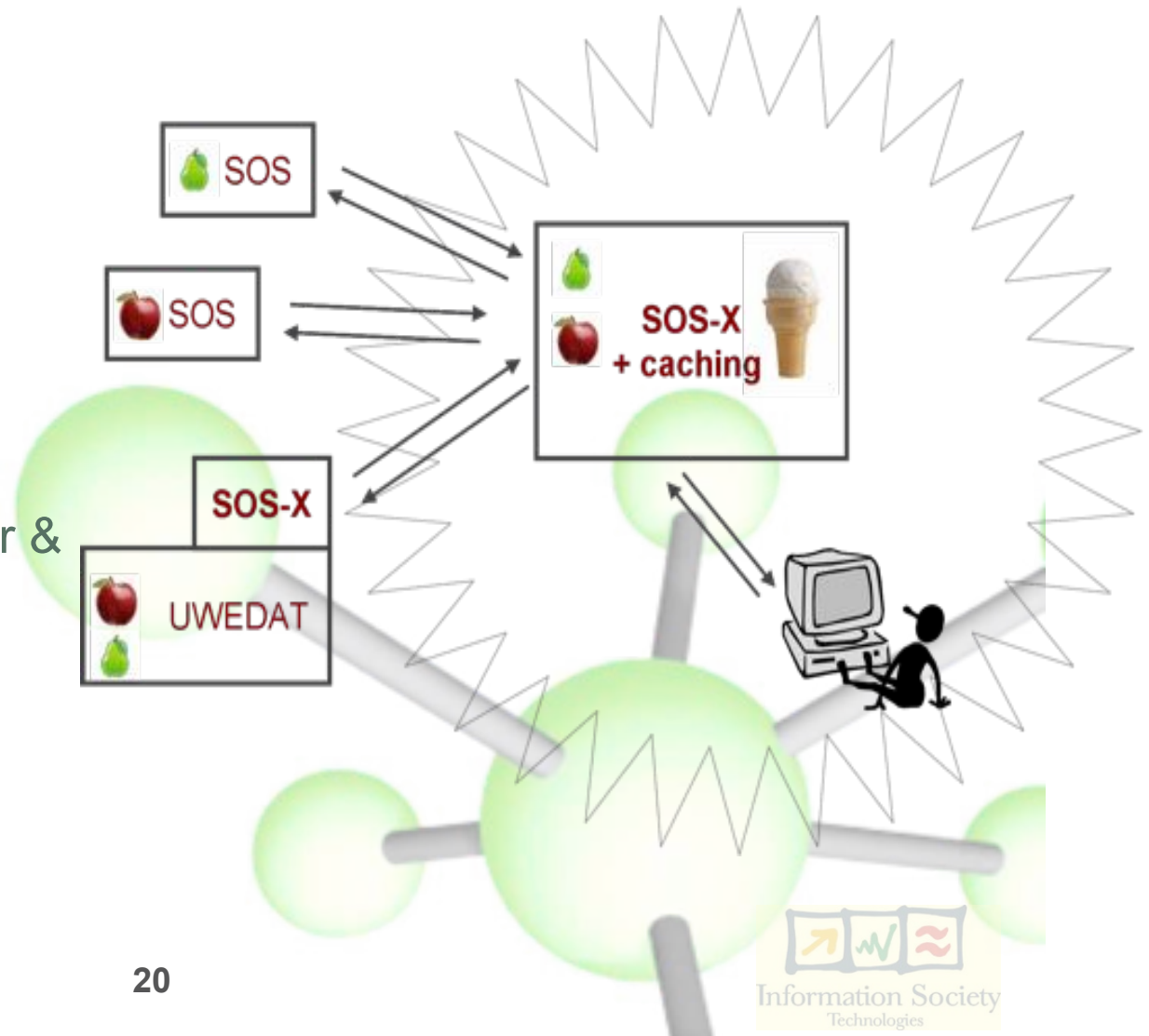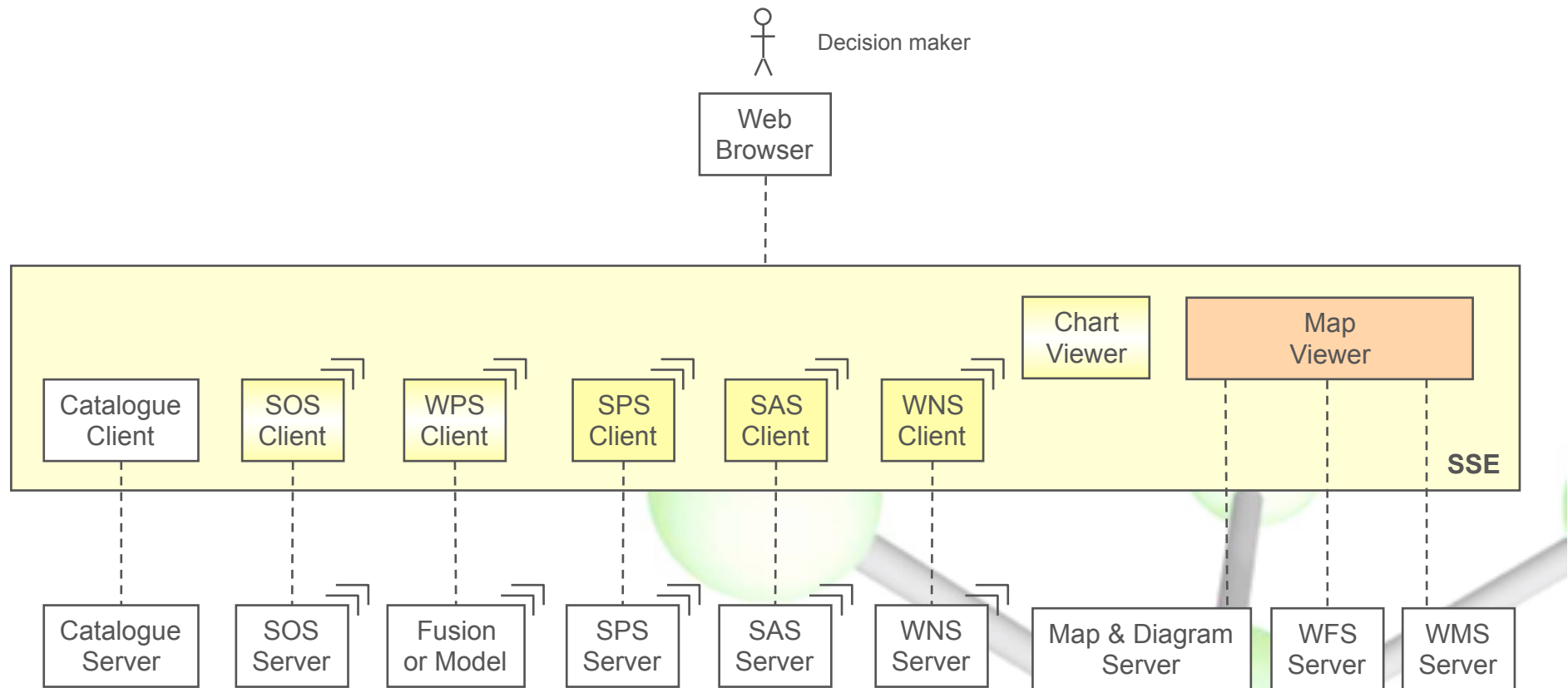 - Dynamic sensor networks/moving sensors
- **UGLY:**
  - standard data model & data flow (slow)
  - Integration of services in complete system
  - Interactive work with SOS
  - General purpose clients

Information Society
Technologies

Outlook: SANY Data Acquisition

- **SWE services on embedded PC**
  - Data exposed over SOS
  - Configuration & maintenance using SPS
  - Events generation with SAS & WNS

- **"Plug & Measure" with CAN-bus and Zigbee sensors**

Outlook: Cascading SOS
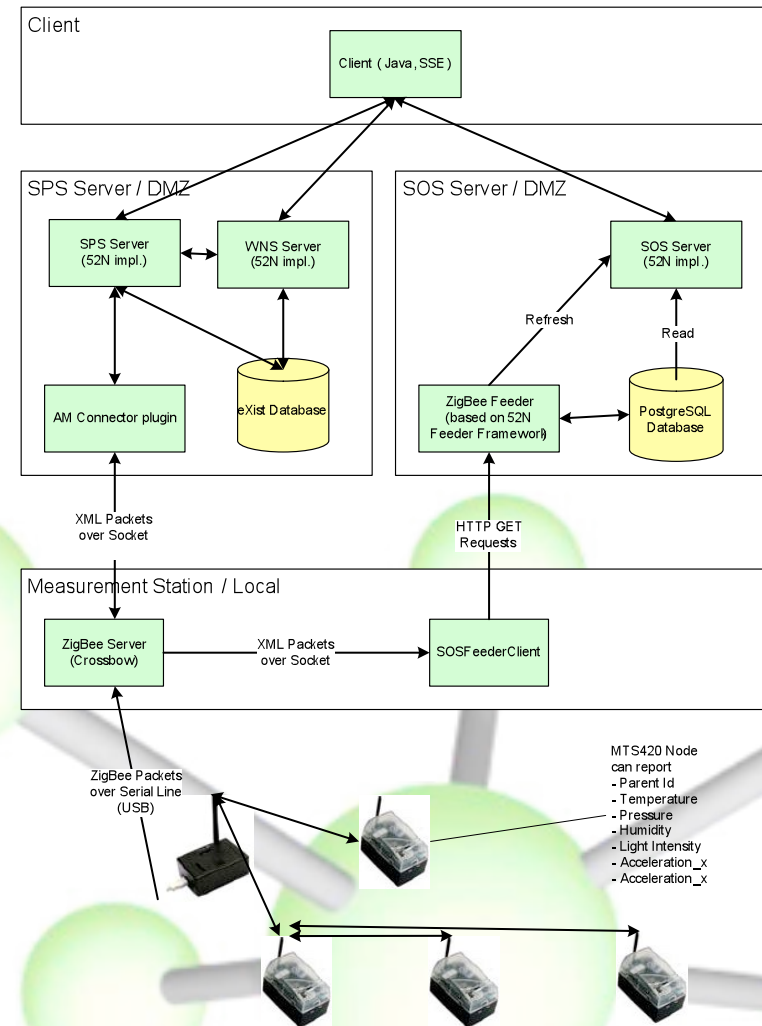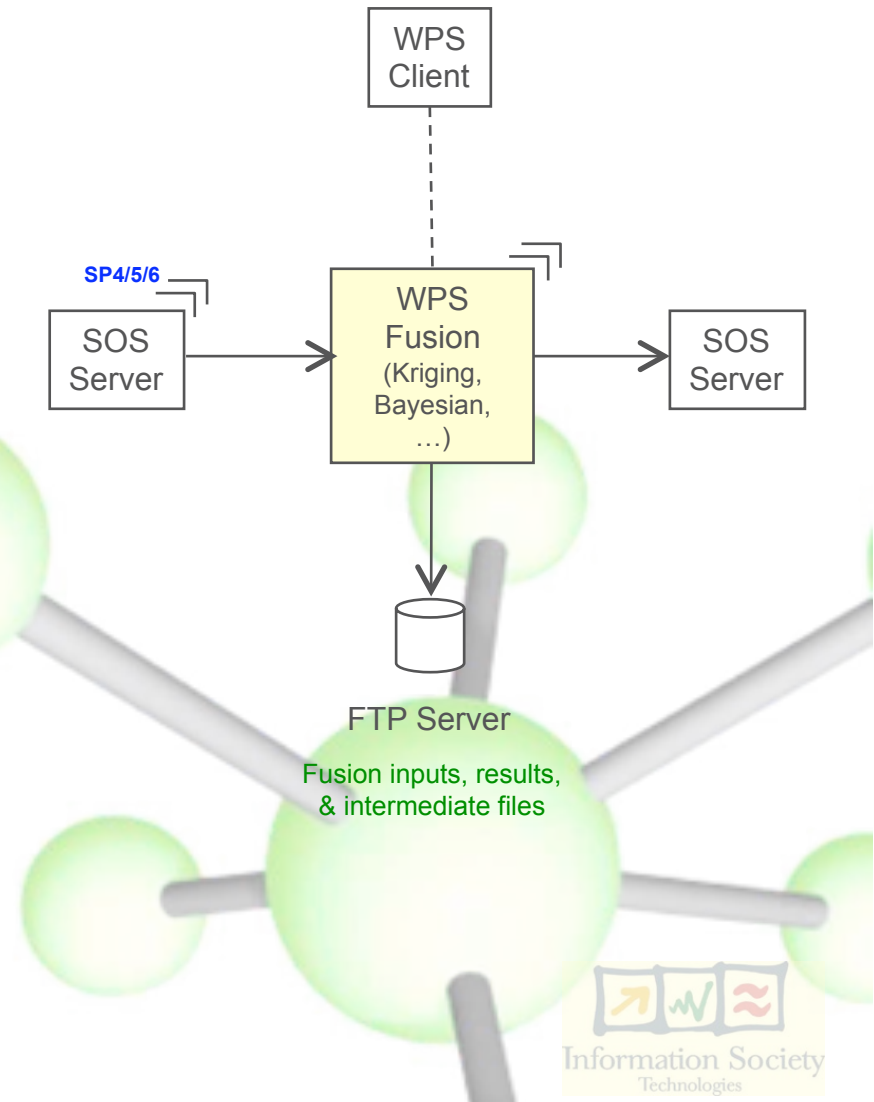
- Client to underlying SOS services (other sources possible)
- Data pre-processing:
  - Aggregation
  - Transformation
  - Re-sampling
  - Filtering
- Scenarios:
  - SANY DAS aggregator & archive
  - „GEOSS gateway" (publication)
  - GEOSS accelerator (consumption)

Outlook: DS building blocks

Decision maker

Web Browser

SSE

Catalogue Client — SOS Client — WPS Client — SPS Client — SAS Client — WNS Client — Chart Viewer — Map Viewer

Catalogue Server — SOS Server — Fusion or Model — SPS Server — SAS Server — WNS Server — Map & Diagram Server — WFS Server — WMS Server

21

Outlook: Data fusion as a service

- Fusion engine embedded in OGC Web Processing Service (WPS)

- Input and output using SOS
  - "Sensor-like"

- Proof of concept with re-usable algorithms:
  - Kriging
  - Auto Regression (analysis)
  - Bayesian Maximum Entropy
  - State-space modelling / statistical belief

WPS Client

SP4/5/6

SOS Server → WPS Fusion (Kriging, Bayesian, …) → SOS Server

FTP Server

Fusion inputs, results, & intermediate files

Acknowledgement

23

Thanks for your attention

More information and downloads on

SANY-IP.EU web site!

Subscribe to SANY newsletter!!!! ☺