International Geospatial Standards

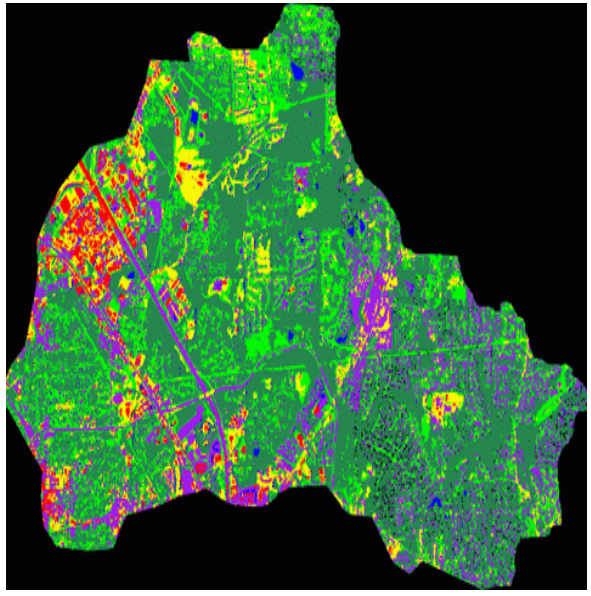
Presentation to
WGISS25
China, February 2008

Wyn Cudlip (BNSC/QinetiQ)
Steve Wallace (QinetiQ)

wcudlip@QinetiQ.com

- Presentation Structure

1. Why standards?
2. What are they and how do they fit together?
3. ISO TC211
4. OGC
5. CCSDS
6. Future developments and requirements
7. Practical implications



- 01

Why standards?

Consequences of having no standards

- Stove pipe, non-interoperable systems will evolve;
- Data handling may depend on specific vendor (researcher) solutions;
- Data formats may be proprietary to the researcher and not published;
- Software tools (where available) required to convert data between systems
- System specifications may become dependent on the vendor's product development policy;
- Future system modifications may depend on vendor/researcher support
- Through life costs are probably greater

Value of standards

- Standards, and the assurance that products conform to them, provide:
  - **Reliability**
    - Known behavior and interaction among elements
  - **Responsiveness**
    - Ability to respond to changing technology
  - **Cost Effectiveness**
    - Mitigates burden of complex software development
    - Availability of software tools
    - May be steep learning curve but familiarity more likely
  - **Ease of Use**
    - Less collateral changes to impact applications and users
  - **Information Flow**
    - Common behavior and semantics

Cost of implementing standards?

- Some conclusions for a study conducted for NASA (2005) to assess cost of implementing geospatial standards:

- "Overall, the project that adopted and implemented geospatial interoperability standards saved 26.2% compared to the project that relied upon a proprietary standard. One way to interpret this result is that for every $4.00 spent on projects based on proprietary platforms, the same value could be achieved with $3.00 if the project were based on open standards."
- "Standards lower transaction costs for sharing geospatial data when semantic agreement can be reached between parties. The cost of achieving semantic agreement can be high. Especially for data models. This cost is reflected in the higher implementation costs of [..the project which implemented open standards]. However, these costs are more than recouped in lower operations and maintenance (O&M) costs."

"Geospatial Interoperability Return on Investment Study", April 2005, conducted by Booz Allen Hamilton on behalf of NASA. http://gio.gsfc.nasa.gov/docs/ROI%20Study.pdf

- 02

What are they and how do they fit together?

The standards landscape

- Mainstream IT standards
  - OASIS, W3C, IETF…
- International Standards
  - ISO (TC 211), Open Geospatial Consortium (OGC)
  - ISO TC20 SC13 - CCSDS
- European Geospatial Standards
  - CEN (TC287)
- National Geospatial Standards
  - British Standards Institute (BSI)
- Domain Specific Geospatial Standards
  - Defence specific: DGIWG, NATO IGeoWG, US GWG
  - Hydrographic: IHO
  - Meteorological: IMO
  - Aeronautical: ICAO

Which standards to use?

- Currently around 100 standards which directly or indirectly support the deployment of geospatial information systems.
- Range of international, regional, national and domain specific standards
- The key standards and specifications are defined by
  - ISO TC 211
  - Open Geospatial Consortium
  - Consultative Committee on Space Data Standards

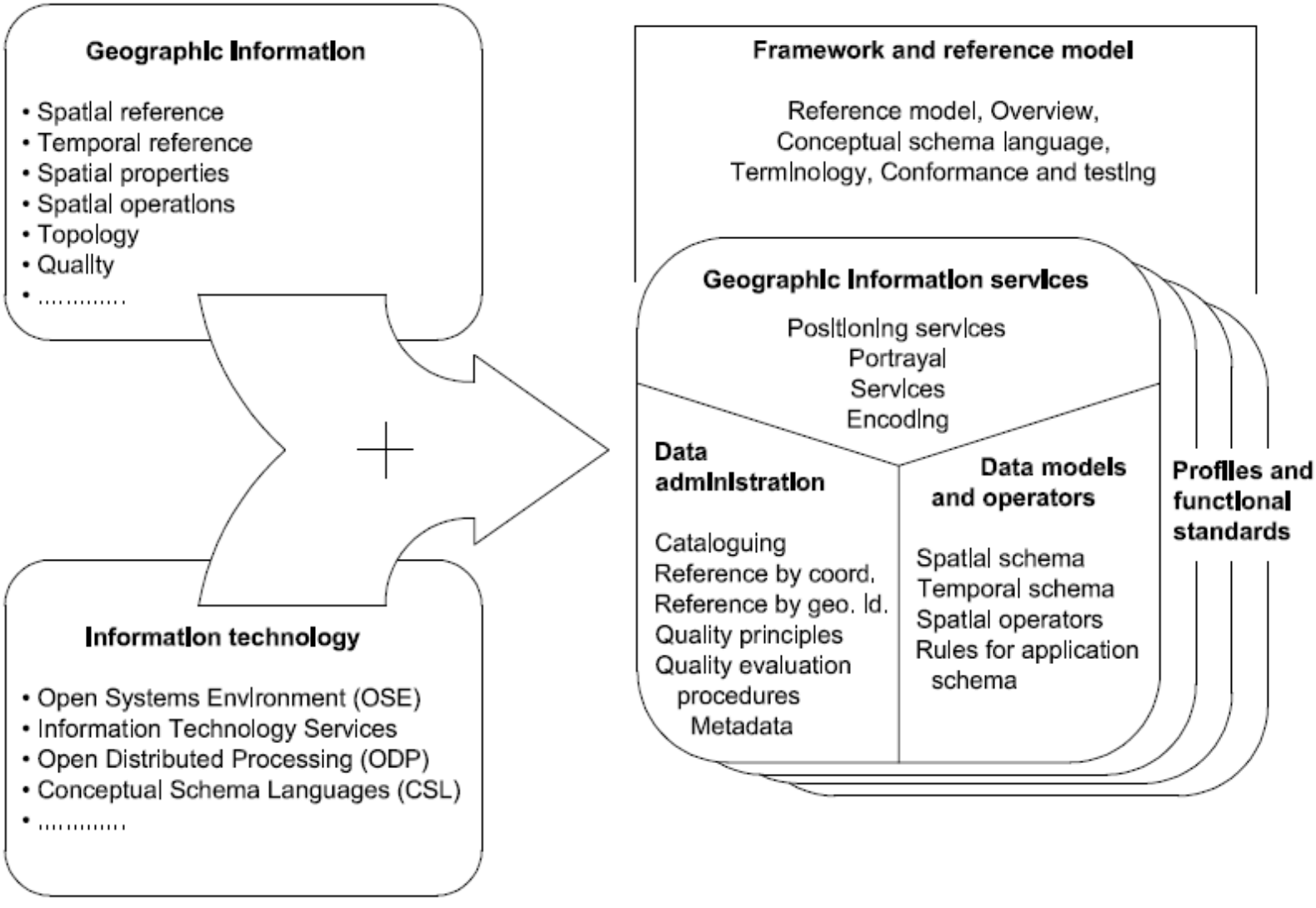
- 03

ISO TC211

ISO Technical Committee 211

- Worldwide federation of national standards bodies
- The standards produced are based on a consensus view from a broad base of stakeholder groups
- Standards development work carried out within Technical Committees
- Technical Committee ISO/TC 211, *Geographic information/Geomatics*
- Progressively developing standards in the series ISO191xx (currently up to 19150)
- Provides the foundation stones for geospatial standards
- DGIWG, OGC, IHO, WMO all members of ISO TC211
- standards are developed not through a centrally financed office, but by contributing partners who are self financing; progress is therefore not guaranteed

ISO view of integration of geo information and information technology



Selection of ISO TC211 standards

- ISO 19101 – Reference Model
- ISO 19106 – Profiles
- ISO 19107 – Spatial Schema
- ISO 19109 – Application Schemas
- ISO 19111 – Referencing by Geographic Coordinates
- ISO 19118 – Encoding
- ISO 19115 – Metadata
- ISO 19119 – Services
- ISO 19128 – Web Map Service
- ISO 19136 – GML
- ISO 19139 – XML encoding of Metadata

Example of how the standards work together

	Standard	Title
Framework	ISO 19129	'Geographic information – Imagery, gridded and coverage data framework'
Conceptual Modelling	ISO 19123	'Geographic information – Schema for coverage geometry and functions'
	ISO 19130	'Geographic information – Sensor and data model for imagery and gridded data'
	OGC 07-022, 07-002	'Observations and Measurements'
	ISO 19109	'Geographic information – Rules for application schema'
Metadata	ISO 19115	'Geographic information – Metadata'
Encoding	ISO 19121	'Geographic Information – Imagery and Gridded Data'
	ISO 19136	'Geographic information – Geography Markup Language'
	OGC 05-047r3	'GML in JPEG 2000 for Geographic Imagery (GMLJP2) Encoding Specification'
Services	ISO 19128	'Geographic information – Web map server interface'
	ISO 19142	'Geographic information – Web Feature Service'
	OGC 06-083r8	'Web Coverage Service (WCS) Implementation Specification'
Application Profiles	IHO S-100	'Imagery and Gridded Data Component'
	NGA ESM	'Implementing Profile for Elevation Surface Models'

- 04

The OGC

The Open Geospatial Consortium

- The OGC is a non-profit, international, member driven consensus organisation
- Its objective is to develop standards for geospatial and location based services
- OGC works with government, private industry, and academia to create open and extensible software application programming *interfaces* for geographic information systems (GIS) and other mainstream technologies
- The OGC Vision is:

"A world in which everyone benefits from geographic information and services made available across any network, application, or platform"

- The core Mission is:

"…to deliver interface specifications that are freely and openly available for global use and that enable interoperable geospatial data, services, and applications"

Primary focus

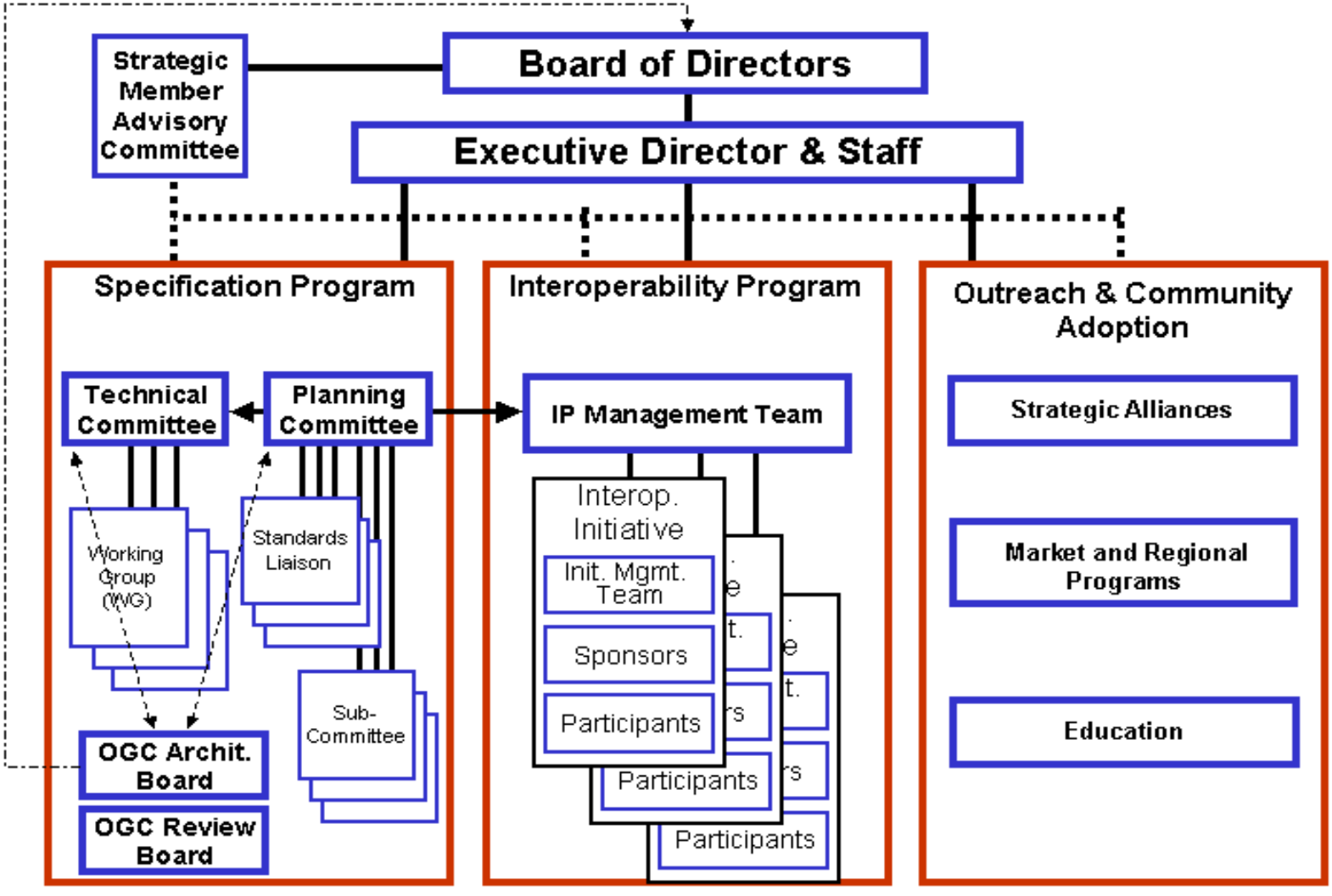
- The key word in the Mission statement above is and in subsequent paragraphs is “interface”.
- This is important to note since OGC focuses almost exclusively on *interface* specifications, that is, specifications which allow disparate system components to communicate in a standardised manner.
- It does not generally deal with *content* standards, or what is traditionally called formats, but it does investigate and generate encoding specifications (most notably Geography Markup Language).

- Content standards are usually defined by domain specific bodies.
- For example, IODE (International Oceanographic Data & Information Exchange) have recently issued a report on standards generated by the IODE/JCOMM Forum on Oceanographic Data management & Exchange Standards. See http://www.iode.org/

Collaboration with other standards organisations

- OGC collaborate and work closely with:
  - International Organization for Standardization (ISO) TC 211 and 204
  - Defence Geospatial Information Working Group (DGIWG)
  - World Wide Web Consortium (W3C)
  - Internet Engineering Task Force (IETF)
  - OASIS
  - Automotive Mobile Information Consortium
  - Open Mobile Alliance
  - And others…

OGC structure



The OGC Process

Interoperability Requirements From members And Market

Requirements Documented as Part of OGC Interoperability Activity

Requirements used to Define new interface or Enhance existing Interface

Interface Implemented By Members, Tested And Documented

Members submit Interface for discussion And possible adoption Using OGC RFC or RWG processes

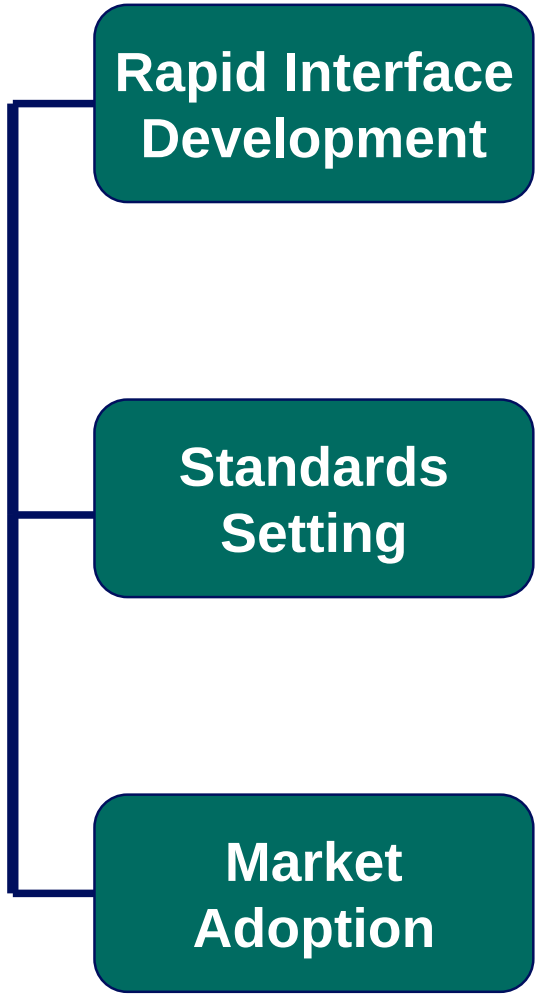
New or enhanced Interface provided to Community for Implementation

OGC Standards development

- ***Interoperability Program*** **(IP)** - a global, innovative, hands-on engineering and testing program designed to accelerate interface development and bring interoperability to the market.

- ***Specification Development Program*** **–Consensus processes similar to other Industry consortia (World Wide Web Consortium, OMG, etc.).**

- ***Outreach and Community Adoption Program*** **– education and training, encourage take up of OGC specifications, business development, communications programs**



How the work is undertaken

- Technical work within the OGC can be undertaken in three ways:

1. By individuals working on their own or as part of a team - introducing candidate specifications via the OGC Request for Comment (RFC) process.
2. As part of the Interoperability Programme (IP) initiative, work focuses on the rapid prototyping of technologies using draft specifications.
3. As part of the Specification Programme (SP), work items are discussed and specifications formalised within the Working Groups of the OGC Technical Committee.

- The results of the first two processes, RFC and IP, end up in the SP too, as that is where the consensus process is applied to all candidate specifications.

Outputs to the OGC process

- Interoperability Program Report (IPR)
- Discussion Paper
- OGC White Paper
- Best Practice (new)
- RFC – Candidate Specification
- Ballot (new)
- Adopted (OpenGIS Specifications)
  - Abstract
  - Implementation
    - Interface
    - Encoding
    - Profile
    - Application Schema

- 03

Current standards and activities

Subset of current approved specifications

•OpenGIS® Specifications are technical documents that detail interfaces or encodings. These specifications are the main "products" of the Open Geospatial Consortium and are available at no cost to everyone.

- Geography Markup Language
- GML in JPEG2000
- Grid Coverages
- Catalogue Services Specification
- Filter Encoding
- Simple Features Access
- Coordinate Transformation Service
- Symbology Encoding
- Web Map Service
- Web Feature Service
- Web Coverage Service
- Web Map Context Documents
- OpenLS Core Services

Location: Technical Committee* / Approved OGC Specifications / **Implementation Specificati**

	Title
	Candidate Implementation Specification for Geographic Information - Simple feature access - Part 1: Common Architecture v1.2.0 (06-103r3)
	Candidate Implementation Specification for Geographic Information - Simple feature access - Part 2: SQL option v1.2.0 (06-104r3)
	Geography Markup Language (02-023r4)
	Geography Markup Language (GML) Simple Features Profile (06-049r1)
	GML 3.1.1 common CRSs profile (05-095r1)
	GML 3.1.1 common CRSs profile 05-095r1 Corrigendum (06-113)
	GML 3.1.1 CRS support profile (05-094r1)
	GML 3.1.1 grid CRSs profile (05-096r1)
	GML 3.1.1 grid CRSs profile 05-096r1 Corrigendum (06-111)
	GML 3.1.1 simple dictionary profile (05-099r2)
	GML in JPEG 2000 for Geographic Imagery (05-047r3)
	GO-1 Application Objects (03-064r10)
	Grid Coverages (GC) Implementation Specification (01-004)
	OGC Web Services Common Specification Corrigendum (05-008)
	OGC Web Services Common Specification version 1.1.0 with Corrigendum 1 (06-121r3)
	OpenGIS Catalogue Services Specification 2.0.1 (04-021r3)
	OpenGIS Filter Encoding Implementation Specification V1.1 (04-095)
	OpenGIS Implementation Specification for Geographic information - Simple feature access - Part 1:Common architecture (05-126)
	OpenGIS Implementation Specification: Coordinate Transformation Services Revision 1.00 (01-009)
	OpenGIS Simple Features Specification For CORBA Revision 1.1 (99-054)

Current OGC Best Practise Documents

- **Best practices relate to the use and/or implementation of an adopted OGC document and for release to the public. Best Practices Documents are an official position of the OGC and thus represent an endorsement of the content of the paper.**

  - Currently 19 Best Practises Documents. These include:
    - City GML
    - Application profiles of existing specifications including:
      - Profiles of the Catalog Service (for FGDC)
      - Profiles of the Web Feature Service (for Gazetteers)
    - The use of KML (Google Earth) which has been put in the hands of OGC to standardise
    - Various specifications relating to the Sensor Web

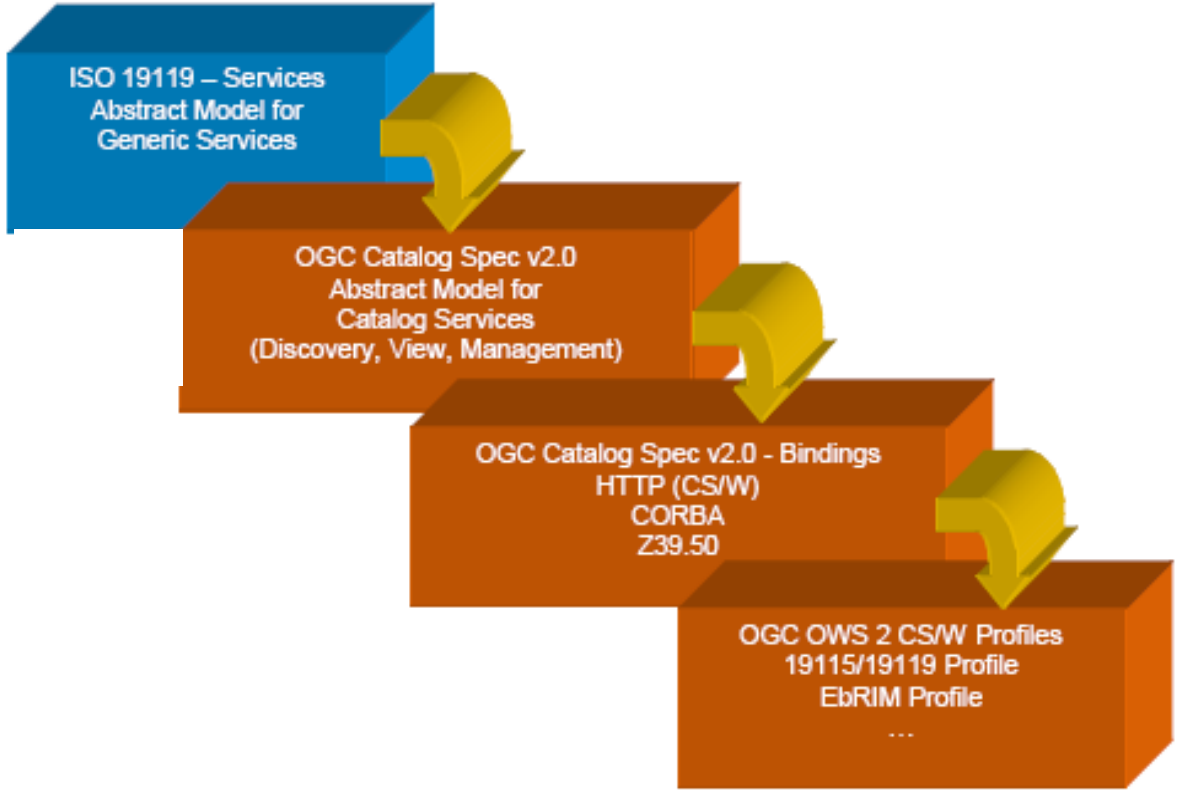
Current OGC discussion papers

These are documents that present technology issues being considered in the Working Groups of the Open Geospatial Consortium Technical Committee. Their purpose is to create discussion in the geospatial information industry on a specific topic. These papers do not represent the official position of the Open Geospatial Consortium nor of the OGC Technical Committee.

- Currently 74 discussion papers
- These deal with:
  - Additional profiles of existing specifications
  - Reports from Interoperability Experiments and Testbeds
  - Investigations relating to new technologies and protocols (e.g. SOAP/WSDL for OGC services)
  - New service specifications in mid-specification process including for example:
    - Web 3D Service
    - Web Coordinate Transformation Service
    - Sensor Observation Service
    - Geo Video Web Service

Relationship to ISO and profiles

- -



Current activities (1)

- Ongoing developments and revisions of specifications
  - Preserve of the Revision Working Groups (RWG). Currently have RWG setup for:
    - Catalog Specification
    - GML
    - OWS Common
    - Styled Layer Descriptor (SLD)
    - Web Map Service
    - Web Feature Service
    - Web Coverage Service
    - Web Processing Service

Current activities (2) – Open Web Services Phase 5 (OWS-5)

- Sponsors put funding up to
  - Test existing standards
  - Develop new services
  - Bring a range of software vendors, integrators and niche providers to meet sponsors requirements
- Sponsors of OWS5 include:
  - NGA (the largest contributor)
  - NASA
  - GeoConnections Canada
- 4 threads to the development
  - Sensor Web Enablement
  - Agile developments (use of “lite” profiles like KML)
  - Compliance testing (CITE)
  - Geo Processing Workflow

- 05

Future developments and requirements

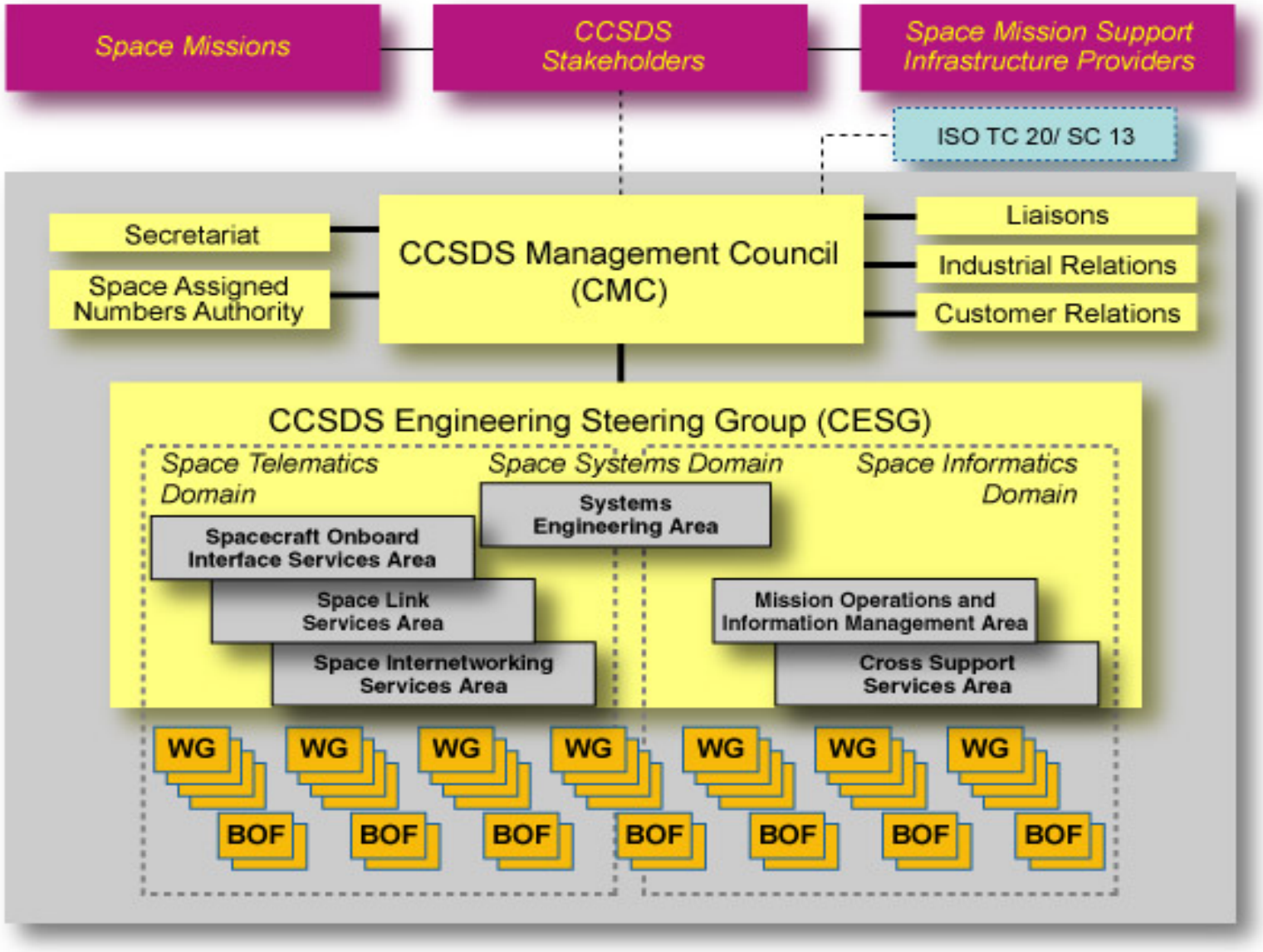
What are the future directions?

- In simple terms “whatever the membership request”
- Hot subjects are currently:
  - Use of SOAP/WSDL for OGC Web Services
  - The Sensor Web
  - “Agile” mapping (the use of simple encodings and markup languages – GML too complex?)
  - Chaining services and associated specifications (Geo Processing Workflow)
  - Geo Digital Rights Management (with Ordnance Survey at the forefront)
  - High resolution 3D – linking to architectural models and BIM
  - Trying to bring an more consistent architectural approach to the specification process (hence the creation of the Architectural Board)

- 04

CCSDS
Consultative Committee for Space Data Systems

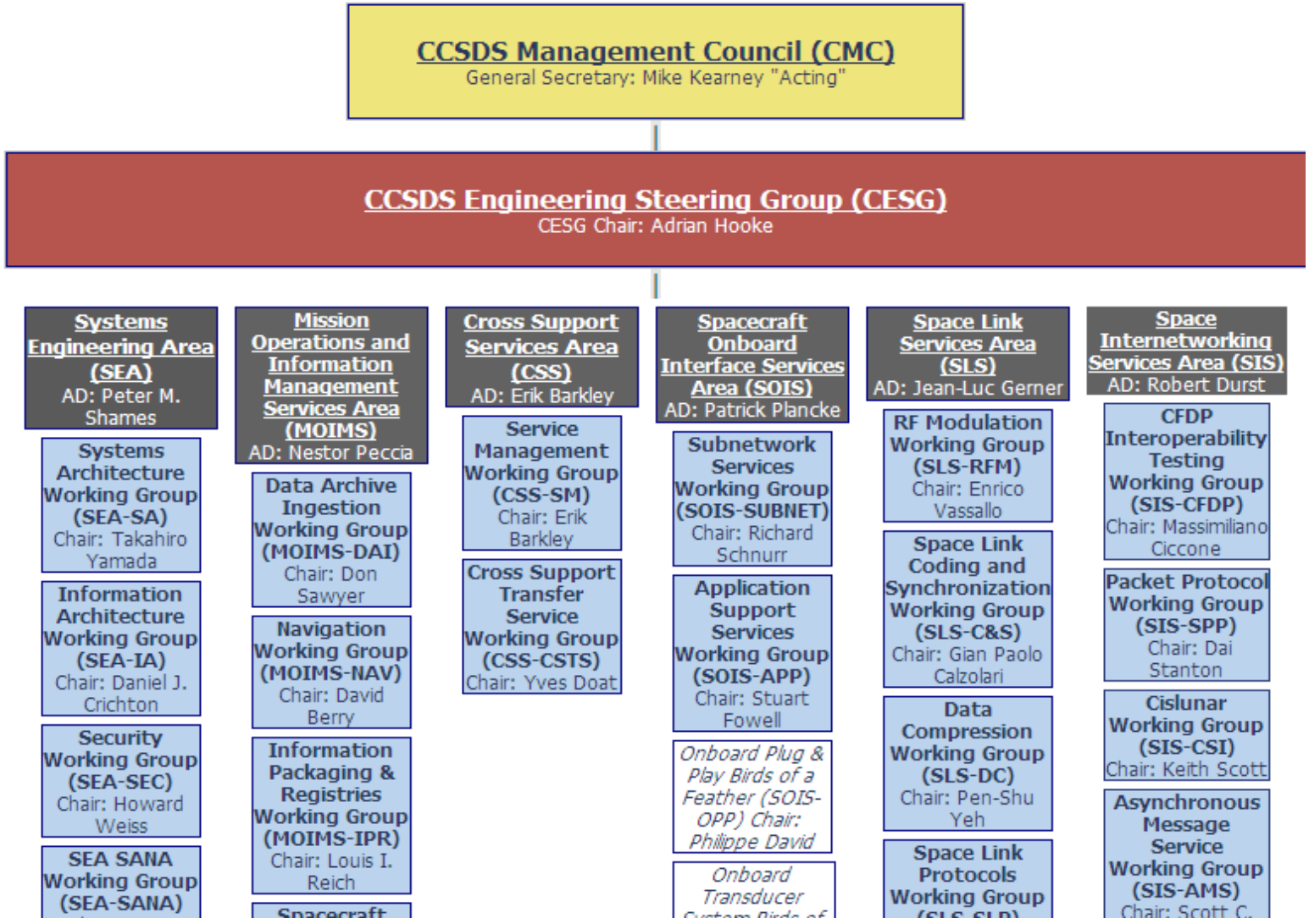
CCSDS Structure



ISO Technical Committees (TC)

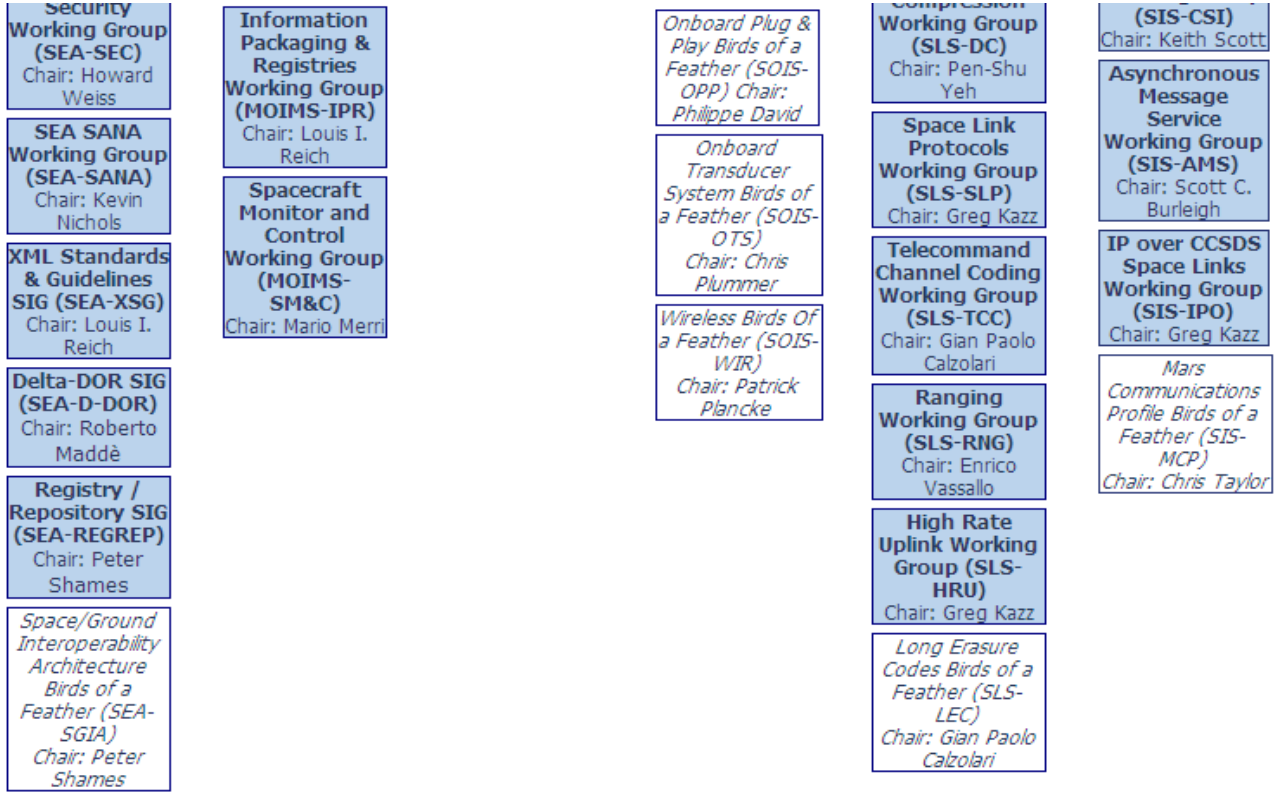
- ISO TC20 Aircraft and Space Vehicles
- Sub-Committee-13 (SC13 (CCSDS))
  - Space Data and Information Transfer Systems
- Sub-Committee-14 (SC-14)
  - Space Systems and Operations

CCSDS Working Groups



More working groups below

CCSDS Working Groups (contd.)



MISSION OPERATIONS AND INFORMATION MANAGEMENT SERVICES AREA (MOIMS)

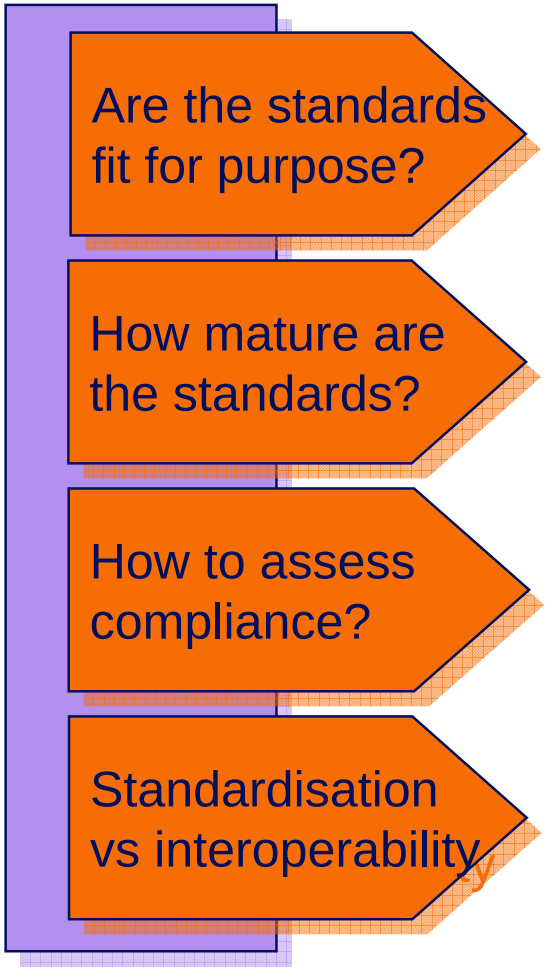
- Area Director, Nestor Peccia (ESA)
- **The MOIMS Area includes all of the flight execution phase applications required to operate the spacecraft mission and its ground system in response to mission objectives, and associated detailed information management standards and processes.**
  - **Open Archival Information Systems (OAIS)**
  - **Data Archive Ingestion (DAI) - follow-up to OAIS**
  - Navigation (NAV)
  - **Information Packaging & Registries (IPR) – includes XFDU**
  - Spacecraft Monitor & Control (SM&C)

  - **“SAFE” format for archiving being worked on in this Area**

- 05

Practical implications?

What are the key decisions to make in the use of standards?



- Do they cover all the elements required? Need to be tested!
- How do you define mature? How much vendor support is there? How widely used are they?
- Once defined, how do you ensure correct implementation of that standard or specification?
- Adoption of standards does not guarantee interoperability. Since it is interoperability that is the fundamental requirement, how to ensure this?

Conclusions

- Relevant international Geospatial Standards are being developed by ISO TC211 and OGC
- Possible to influence OGC Standards by participating in RFC, OGC Technical Committee meetings (4 per year) and OWS Test Bed activities (typically annually).
- Content Standards defined by domain specific organisations

Thank you for your attention.