Data collection, transfer and the development of national standards – critical components necessary for the success of a GIS in South Africa

Antony Cooper

CSIR

Email: acooper@csir.co.za

Phone: 012 841 4121

Data collection, transfer and the development of national standards – critical components necessary for the success of a GIS in South Africa

- National Government's responsibility in the creation of standards, collection, provision and maintenance of key spatial datasets
- Development and maintenance of data standards
- Generation of standards for spatial information by the SABS
- Development of International standards by ISO/TC 211
- Developing national data dictionaries and metadata repositories
- Improving awareness about, and reducing the duplication of, existing data sets
- Making available spatial and national datasets on the Internet

National Government's responsibility in the creation of standards (1)

- Spatial Data Infrastructure Act, No 54 of 2003
  - Will give a mandate when it comes into force
  - Preamble
    - "… to provide for the determination of standards …"
  - Clause 11, Spatial information standards and prescriptions
    - "(1) The Minister may determine standards and prescriptions to facilitate the sharing and integration of spatial information."
    - "(3) A data custodian and a data vendor must adhere to the standards and prescriptions referred to in this section."
- Committee for Spatial Information (CSI)
  - Established by the SDI Act
  - CSI can establish sub-committees
    - Probably will have a sub-committee for standards

National Government's responsibility in the creation of standards (2)

- The members of the CSI will represent
  - Various key National Departments
  - All nine Provinces
  - Local governments
    - A largely rural municipality
    - A largely urban municipality
  - Council of Government Information Technology Officers
  - GISc professional association
  - GISc teachers and researchers
  - Public entities
  - Each data custodian (as identified by the Minister)
- CSI will meet at least four times a year

National Government's responsibility in the creation of standards (3)

- CSI will really work through its sub-committees
  - Sub-committees can co-opt non-voting experts
- CSI will not work in isolation
- CSI is likely to adopt national and international standards

National Government and collecting, providing and maintaining key spatial datasets (1)

- SDI Act, Clause 3
  - "(1) The South African Spatial Data Infrastructure is hereby established as the national technical, institutional and policy framework to facilitate the capture management, maintenance, integration, distribution and use of spatial information."
- The key data providers are in government
  - "data custodians" in the SDI Act
  - SDI Act defines *base data set* as "those themes of spatial information which have been captured or collected by a data custodian"

National Government and collecting, providing and maintaining key spatial datasets (2)

- The problem is not the availability of data!
  - Vast amounts of free or very cheap data are available

Home
About CD:SM
Vendors
e-Sales
Career & Bursary
Order Products
List of Products
Identify Maps
Price List
MapAware
Trignet
Surveys Services
History
Technology
WGS 84
AFREF
Whats New
Contact Us
Links
Site Index

Digital Products

Digital topographical information
Digital elevation models
Digital maps
Digital orthophoto images

With developments in computer technology, and in particular geographical information systems, a number of products are available in digital form.

DIGITAL TOPOGRAPHICAL INFORMATION

Digital topographical information has been captured from the 1:500 000 map series and the 1:50 000 map series. This information has been topologically structured and sorted as features (objects). This information has been prepared primarily for use in geographical information systems (GIS) but can also be used in computer aided drawing (CAD) systems (Note: use in CAD systems can lead to some loss of information).

The applications to which the digital topographical information can be put are wide, similar to uses of the printed map, with the difference that users can use the power of computer application software that they are using to process and analyse spatial relationships between objects and other phenomena and thereby generate new information.

The information is available in various formats CD-ROM. The information is in a continuous form and is not sheet based.

DIGITAL ELEVATION MODEL (DEM)

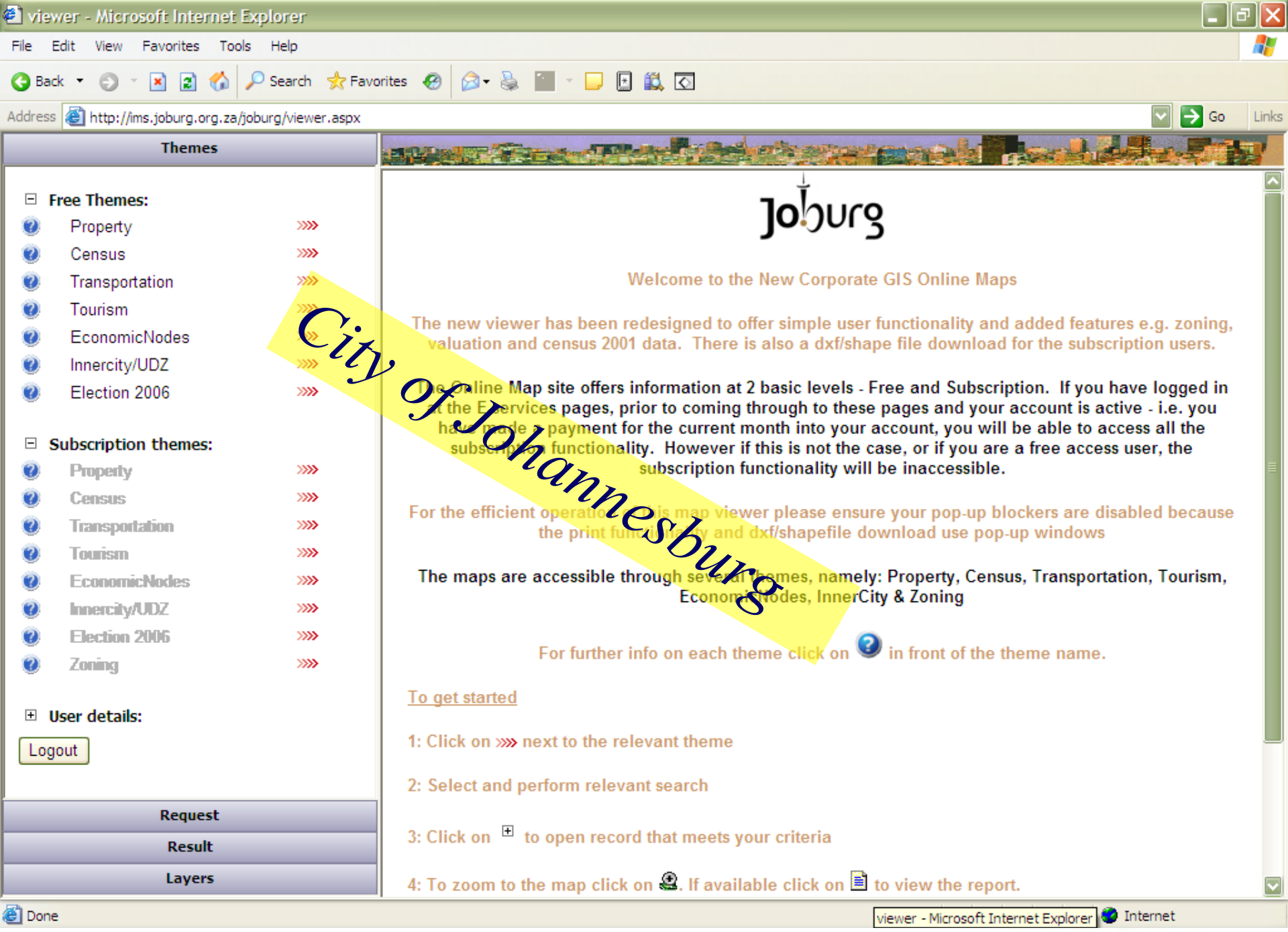
Digital elevation models are a collection of elevations (heights) in a digital form, giving a representation of the surface of the Earth. A digital elevation model can be used to determine the height of a point or place, the terrain profile between two points, the visibility from a point, and to calculate slopes and interpret the terrain forms. The DEMs are determined from photogrammetric (aerial photograph) measurements and computed in a regular grid of elevation points.

GIS CD

Description:
This product is designed for users with their own GIS software who use data other than census data. These digitised enumeration areas and place name boundaries can serve as a backdrop for any GIS system. The CD contains information about all geographical areas in the country, from province to enumeration area.

Expected release dates:
Available

Variables:
Queries should be directed to User Information Services on Tel. +27 12 310 8600, email info@statssa.gov.za


viewer - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://ims.joburg.org.za/joburg/viewer.aspx
Go Links
Themes
Free Themes:
Property
Census
Transportation
Tourism
EconomicNodes
Innercity/UDZ
Election 2006
Subscription themes:
Property
Census
Transportation
Tourism
EconomicNodes
Innercity/UDZ
Election 2006
Zoning
User details:
Logout
Request
Result
Layers
Joburg
Welcome to the New Corporate GIS Online Maps
The new viewer has been redesigned to offer simple user functionality and added features e.g. zoning, valuation and census 2001 data. There is also a dxf/shape file download for the subscription users.
The Online Map site offers information at 2 basic levels - Free and Subscription. If you have logged in at the E-services pages, prior to coming through to these pages and your account is active - i.e. you have made a payment for the current month into your account, you will be able to access all the subscription functionality. However if this is not the case, or if you are a free access user, the subscription functionality will be inaccessible.
For the efficient operation of this map viewer please ensure your pop-up blockers are disabled because the print functionality and dxf/shapefile download use pop-up windows
The maps are accessible through several themes, namely: Property, Census, Transportation, Tourism, EconomicNodes, InnerCity & Zoning
For further info on each theme click on in front of the theme name.
To get started
1: Click on next to the relevant theme
2: Select and perform relevant search
3: Click on to open record that meets your criteria
4: To zoom to the map click on. If available click on to view the report.
City of Johannesburg
Done
viewer - Microsoft Internet Explorer
Internet

Welcome to SA Explorer Online - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://www.saexplorer.org.za/ Go Links

Queries Contact

Municipal Demarcation Board

Internet

National Government and collecting, providing and maintaining key spatial datasets (3)

- The problem is not the availability of data!
  - Vast amounts of free or very cheap data are available
- The real problems are
  - Finding the data
  - Assessing the suitability of the data
    - Fitness for use
  - Data quality
    - Currency (timeliness), accuracy, resolution, consistency, completeness, etc
  - Integrating data together

Metadata!

National Government and collecting, providing and maintaining key spatial datasets (4)

- To find data sets that meet our needs, we need metadata
  - Data discovery, data retrieval and data use
- Spatial Data Discovery Facility (SDDF)
  - Was a world-class, pioneering site for metadata in the 1990s
  - Currently, it has stalled
    - Latest entry is from 2000
  - We need SDDF to be functioning and to be used
  - We need data custodians and vendors to populate SDDF with metadata

Development and maintenance of data standards (1)

- Standards generating bodies (SGBs)
  - International Organization for Standardization (ISO)
  - International Electrotechnical Commission (IEC)
  - ISO/IEC Joint Technical Committee 1 (JTC 1)
  - Standards South Africa (StanSA)
  - Open Geospatial Consortium (OGC)
  - African Regional Organization for Standardization (ARSO)
  - Southern African Development Community Cooperation in Standardization (SADCSTAN)
  - *Etc*
- SGBs facilitate the development of standards
  - The actual development is done by volunteers
  - Experts representing constituencies

The nice thing about standards is that there are so many to pick from!

Development and maintenance of data standards (2)

- Types of standards
  - Open standards (eg: ISO, IEC, StanSA)
    - Everyone theoretically on an equal footing
      - But costs can be a barrier (eg: attending meetings)
    - The standards are voluntary
      - But can be enforced by legislation
    - Market-driven
    - Developed by consensus
  - Industry standards groups (eg: OGC)
    - Closed
    - Dominated by the major financial contributors
  - De facto standards
    - Proprietary
    - Locked-in technology

Generation of standards for spatial information by the SABS (1)

- South African Bureau of Standards (SABS)
  - Commercial operations
    - Testing, Certification and Training
  - Design Institute
  - Regulatory Affairs and Consumer Protection
  - Standards South Africa (StanSA)
    - Standards development
      - Chemical and biological standards
      - Electrotechnical standards
      - Fibre technology standards
      - Mechanical, transportation and civil engineering standards
      - Systems standards
    - Sales of standards
    - Research and development
    - Liaison with other standardization bodies

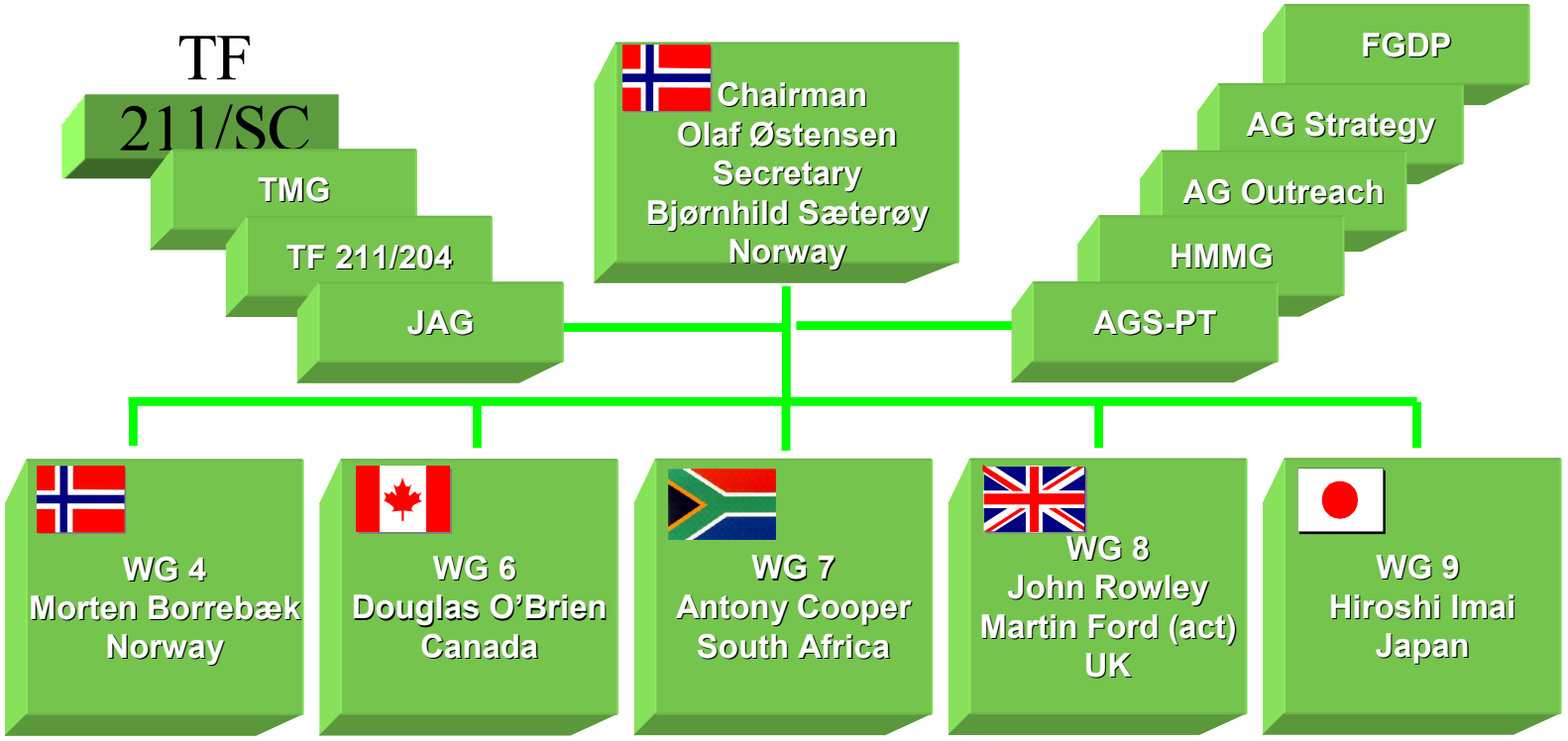
Generation of standards for spatial information by the SABS (2)

- Standards South Africa administers more than 450 technical committees and subcommittees
  - Standards are developed for South African industries
  - Developed by experts from across the industries
- Maintains approximately 5 000 standards
- About 400 new standards are developed annually
  - Many are international standards adopted as South African National Standards (SANS)
- StanSA/TC 71, Information technology
  - StanSA/SC 71E, Geographical information
    - Mirror committee for ISO/TC 211
    - Five South African standards

Current development of International standards by ISO TC 211

- *Geographic information/Geomatics*
- Started 1994
- 51 projects to date
- ISO 19100 series
  - Published 22 International Standards, 2 Technical Specifications and 3 Technical Reports
- Taking on new projects continuously
- Harmonized UML model
- 29 Active member countries (P-members)
- 30 Observing member countries (O-members)
- 25 Class A Liaisons (international bodies)
- http://www. isotc211.org

ISO/TC 211 organization



Geospatial services

Imagery

Information communities

Location based services

Information management

28 Participatory members of ISO/TC 211

Australia
Austria
Belgium
Canada
China
Czech Rep.
Denmark
Finland
Germany
Italy
Japan
Republic of Korea
Malaysia
Morocco
Netherlands
New Zealand
Norway
Portugal
Russian Federation
Saudi Arabia
Serbia & Montenegro
South Africa
Spain
Sweden
Switzerland
Thailand
United Kingdom
United States of America

30 Observing members of ISO/TC 211

Argentina
Bahrain
Brunei Darussalam
Colombia
Croatia
Cuba
Estonia
France
Greece
Hong Kong
Hungary
Iceland
India
Indonesia
Isl. Rep. of Iran
Ireland
Jamaica
Kenya
Mauritius
Oman
Pakistan
Philippines
Poland
Slovakia
Slovenia
Tanzania
Turkey
Ukraine
Uruguay
Zimbabwe

External liaisons to ISO/TC 211 (1)

- CEOS, Committee on Earth Observation Satellites
- DGIWG, Digital Geographic Information Working Group
- EuroSDR, European Commission Joint Research Centre
- FIG, International Federation of Surveyors
- GSDI, Global Spatial Data Infrastructure
- IAG, International Association of Geodesy
- ICA, International Cartographic Association
- ICAO, International Civil Aviation Organization
- IEEE Geoscience and Remote Sensing Society
- IHB, International Hydrographic Bureau
- ISCGM, International Steering Committee for Global Mapping
- ISPRS, International Society for Photogrammetry and Remote Sensing
- JRC, Joint Research Centre, European Commission
- OGC, Open Geospatial Consortium, Inc.
- OGP, International Association of Oil and Gas Producers

External liaisons to ISO/TC 211 (2)

- PAIGH, Pan-American Institute of Geography and History
- PCGIAP, The Permanent Committee on GIS Infrastructure for Asia and the Pacific
- PC IDEA, Permanent Committee on Spatial Data Infrastructure for the Americas
- SCAR, Scientific Committee on Antarctic Research
- UN ECA, Economic Commission for Africa
- UN ECE, Economic Commission for Europe, Statistical Division
- UN/FAO, Food & Agriculture Organization of the United Nations
- UNGEGN, United Nations Group of Experts on Geographical Names
- UNGIWG, United Nations Geographic Information Working Group
- WMO, World Meteorological Organization
- CEN/TC 287, Geographic information
- CEN/ISSS Workshop on Metadata for Multimedia Information - Dublin Core
- CEN/TC 278, Road Transport and Traffic Telematics

ISO/TC 211 Projects (1)

Color legend: DIS, FDIS, IS

- **ISO 6709:1983 - Standard representation of latitude, longitude and altitude for geographic point locations**
- ISO 6709 - Revision
- **ISO 19101 - Reference model**
- ISO 19101-2 – Reference Model – Part 2: Imagery
- **ISO/TS 19103 - Conceptual schema language**
- ISO 19104 - Terminology
- **ISO 19105 - Conformance and testing**
- **ISO 19106 - Profiles**
- **ISO 19107 - Spatial schema**
- **ISO 19108 - Temporal schema**
- **ISO 19109 - Rules for application schema**
- **ISO 19110 - Feature cataloguing methodology**
- **ISO 19111 - Spatial referencing by coordinates**
- ISO 19111 – Revision
- **ISO 19112 - Spatial referencing by geographic identifiers**
- **ISO 19113 - Quality principles**
- **ISO 19114 - Quality evaluation procedures**
- **ISO 19115 – Metadata**
- ISO 19115-2 – Metadata – Part 2: Extensions for imagery and gridded data
- **ISO 19116 - Positioning services**
- **ISO 19117 – Portrayal**
- **ISO 19118 - Encoding**
- **ISO 19119 - Services**
- **ISO/TR 19120 - Functional standards**
- **ISO/TR 19121 - Imagery and gridded data**
- **ISO/TR 19122 - Qualifications and certification of personnel**
- **ISO 19123 - Schema for coverage geometry and functions**

ISO/TC 211 Projects (2)

Color legend: DIS, FDIS, IS

- **ISO/RS 19124 - Imagery and gridded data components**
- **ISO 19125 - Simple feature access – Parts 1-2**
- **ISO 19127 - Geodetic codes and parameters**
- ISO 19128 - Web Map Server Interface
- ISO 19129 - Imagery, gridded and coverage data framework
- ISO 19130 - Sensor and data model for imagery and gridded data
- ISO 19131 - Data product specification
- ISO 19132 - Location based services possible standards
- ISO 19133 - Location based services tracking and navigation
- ISO 19134 - Multimodal location based services for routing and navigation
- **ISO 19135 - Procedures for item registration**
- ISO 19136 - Geography Markup Language (GML)
- ISO 19137 - Generally used profiles of the spatial schema and of similar important other schemas
- ISO 19138 - Data quality measures
- ISO 19139 - Metadata – Implementation specification
- ISO 19141 - Schema for moving features
- ISO 19142 - Web Feature Service
- ISO 19143 - Filter encoding
- ISO 19144 - Classification Systems – Parts 1-2
- Stage 0 - Amd to ISO 19113:2002 - Quality principles and ISO 19115:2003 - Metadata

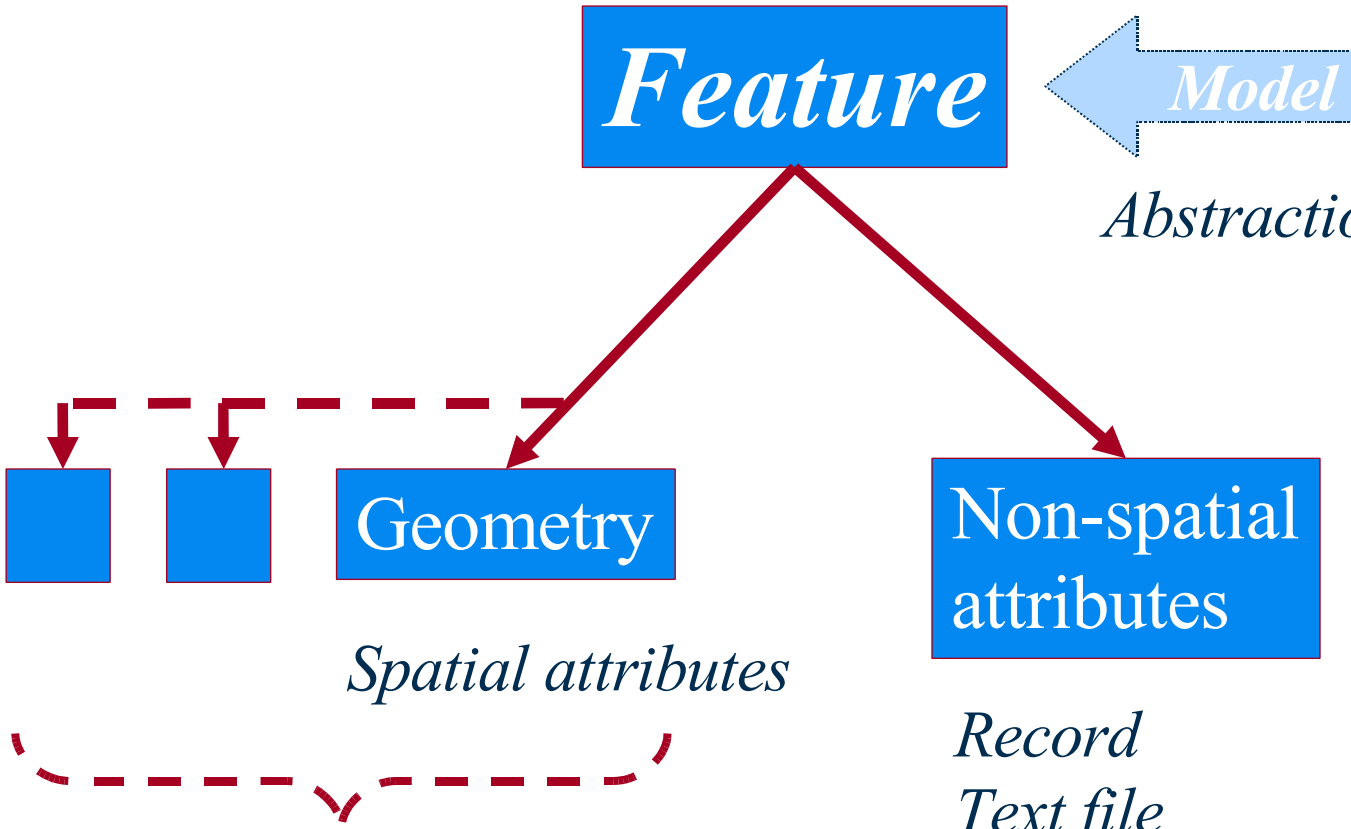
ISO 19100 series

- Many interdependencies between the standards
  - Harmonized UML model of the technical components of all the ISO 19100 standards
- Several standards are highly technical
  - Aimed at the developers of GISs, etc
    - ISO/TS 19103, Conceptual schema language
    - ISO 19107, Spatial schema
    - ISO 19109, Rules for application schema
- Others of immediate relevance to end users
    - ISO 19111 – Spatial referencing by coordinates
    - ISO 19112 – Spatial referencing by geographic identifiers
    - ISO 19113 – Quality principles
    - ISO 19114 – Quality evaluation procedures
    - ISO 19115 – Metadata

ISO/TC 211 statistics

- More than 1000 persons involved internationally since start
- More than 600 have attended one or more plenaries
- 21 plenary meetings have been convened in 17 different countries on 5 continents

NB! Figures are approximate and vary over time



Real world

Developing national data dictionaries and metadata repositories (1)

- Some terminology
  - Feature data dictionary
    - A set of independent specifications of the feature types, feature attributes, attribute listed values and feature associations that may be used to describe geographic data
  - Feature catalogue
    - A structured collection containing the definition and descriptions of the feature types, feature attributes and feature associations occurring in one or more sets of geographic data
    - All feature properties (attributes, etc) are bound to feature types
  - Basically, classification
- SANS 1880, *South African geospatial data dictionary (SAGDaD) and its application*

Developing national data dictionaries and metadata repositories (2)

- Spatial Data Discovery Facility (SDDF) is our national metadata repository
  - It needs to be populated with metadata
    - SANS 1878, *South African spatial metadata standard*
  - Data custodians and data vendors need to capture and make available their metadata through SDDF
    - Several data custodians already make metadata available online

Improving awareness about, and reducing the duplication of, existing data sets

- Metadata
  - We need a functioning spatial data infrastructure (SDI)
  - We need a functioning metadata repository
    - Eg: Spatial Data Discovery Facility (SDDF)
  - But we also need to capture metadata for our data
  - We need to make available our plans and our user requirement specifications (‘active’ metadata)
- Networking and coordination
  - Some countries do not consider it to be a problem if the capture of data sets is duplicated!
    - Eg: United Kingdom
    - It promotes competition in the market
    - But it does create confusion
    - Has inhibited some government programmes in the UK
      - Because of issues over data ownership

Making available spatial and national datasets on the Internet

- Bandwidth
  - Cost and capacity
  - Spatial data are bandwidth hungry
- Few people actually need real-time access to core data sets
- Everyone needs rapid and easy access to metadata
  - Identify available data
    - Different sources for similar data
    - Fitness for use
  - Plan projects
  - Determine what is technically feasible with available data
  - Determine what data capture one will need to commission
  - Cost estimates

Conclusions

- Data collection, transfer and the development of national standards – critical components necessary for the success of a GIS in South Africa
  - Spatial Data Infrastructure Act, No 54 of 2003
  - Committee for Spatial Information (CSI)
  - Standards
    - Standards South Africa
    - ISO/TC 211 and the ISO 19100 standards
  - Metadata
    - Access to up-to-date metadata
    - Capturing of metadata

Thank you!

Antony Cooper

CSIR

Email: acooper@csir.co.za

Phone: 012 841 4121