ICSM
INTERGOVERNMENTAL COMMITTEE ON SURVEYING & MAPPING

Maximising interoperability and discoverability of geodetic products and services

Nicholas Brown[1], Roger Fraser[2] and Gary Johnston[1]

1. Geoscience Australia

2. Victorian Department of Environment, Land, Water and Planning

Background

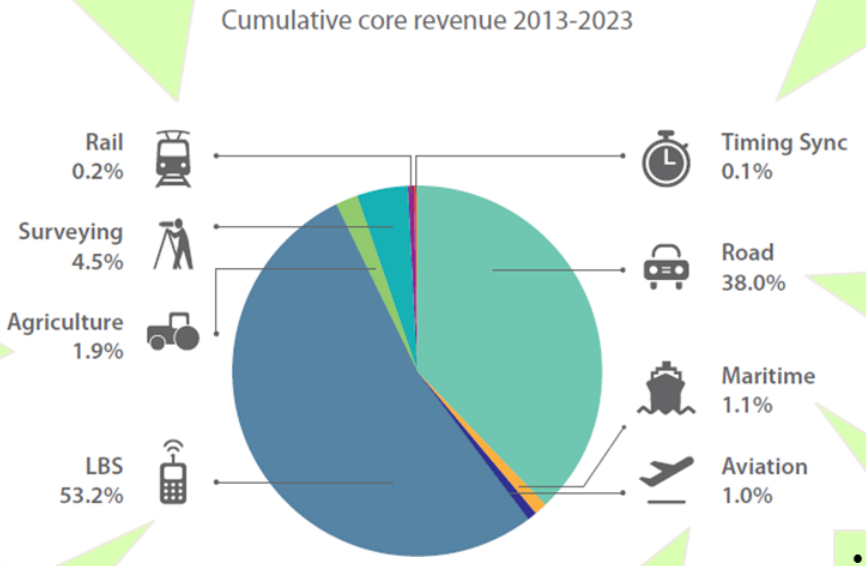
- Geodetic services (like IGS) provide data for an increasingly diverse community
- In the past, the user community was predominantly those from the geodesy and surveying industry, governments and academia
- More recently there has been widespread uptake across society of accurate and reliable positioning information in new markets

Changing world …

- Automated Train Management Systems
- Accurate Rail Centreline & Curvature Data
- Autonomous Trains (e.g. Mines and Ports)
- Reduced Maintenance Costs

- Time Synchronisation (e.g. Energy, Finance, Telecommunications, Transport Networks)
- Time-Stamping (e.g. Financial Transactions and Network Issues)

- Consistent Spatial Data
- Higher Productivity
- Lower Equipment Costs



- Autonomous Vehicles
- Reduced Fatalities
- Congestion Avoidance
- Reduced Emissions
- Reduced Road damage
- Incident Detection
- Dynamic Navigation
- Situational Awareness

- Increased Yield
- Improved Safety
- Reduced Water Run-off, Soil Compaction, Soil Erosion & Fuel Usage
- Lower Emissions
- Preserved Water Quality

- Accurate Location Awareness
- Emergency Services
- Augmented Reality
- Value-Added Applications

- Safety-of-Life Services
- Integrity Monitoring
- Fuel Efficiency
- Internationally Standardised

- Higher Tonnage
- Public Safety
- Environmental Protection
- Fuel Efficiency
- Internationally Standardised

European GNSS Agency (GSA, 2015)

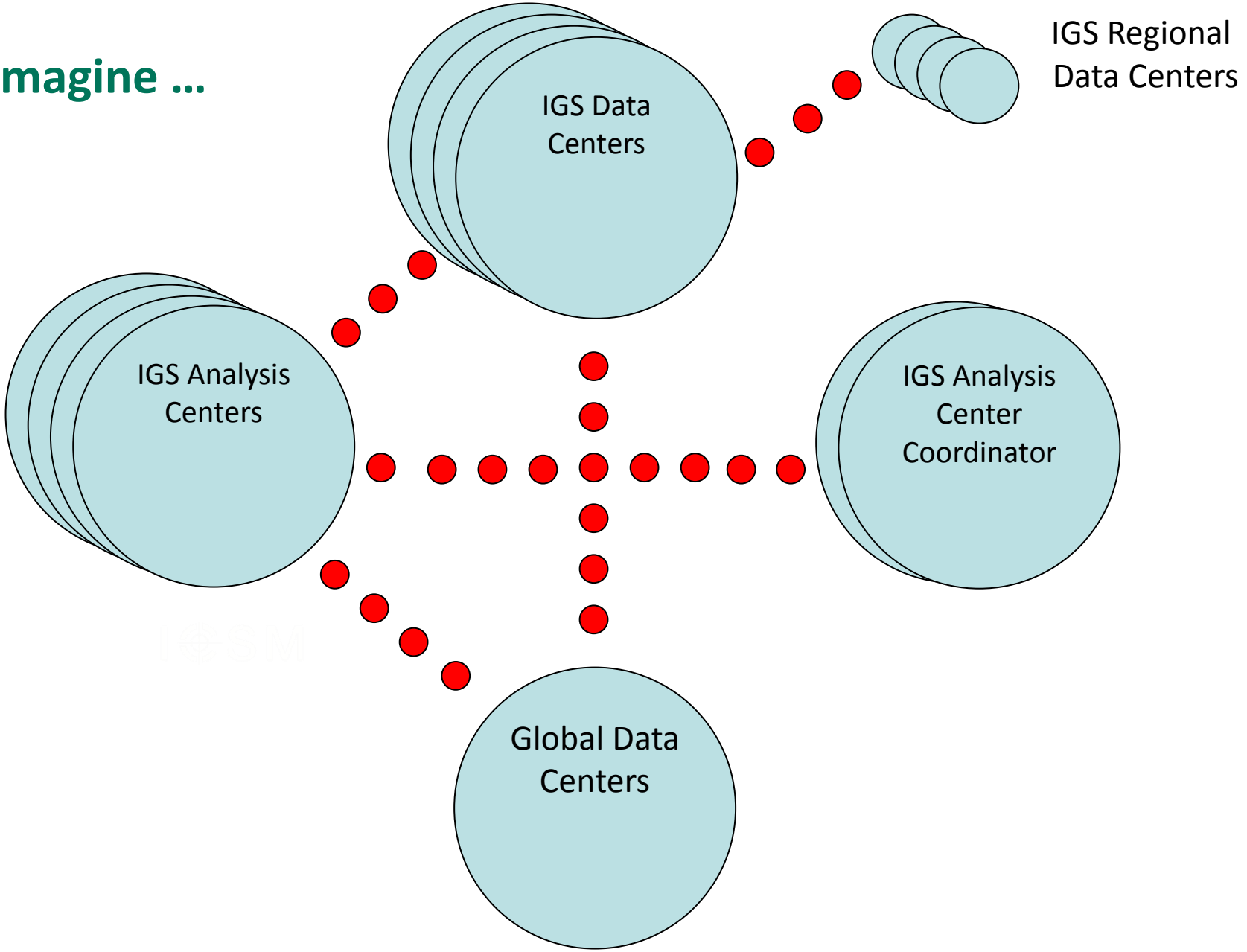
Growing need for real-time data and interoperability

User requirements

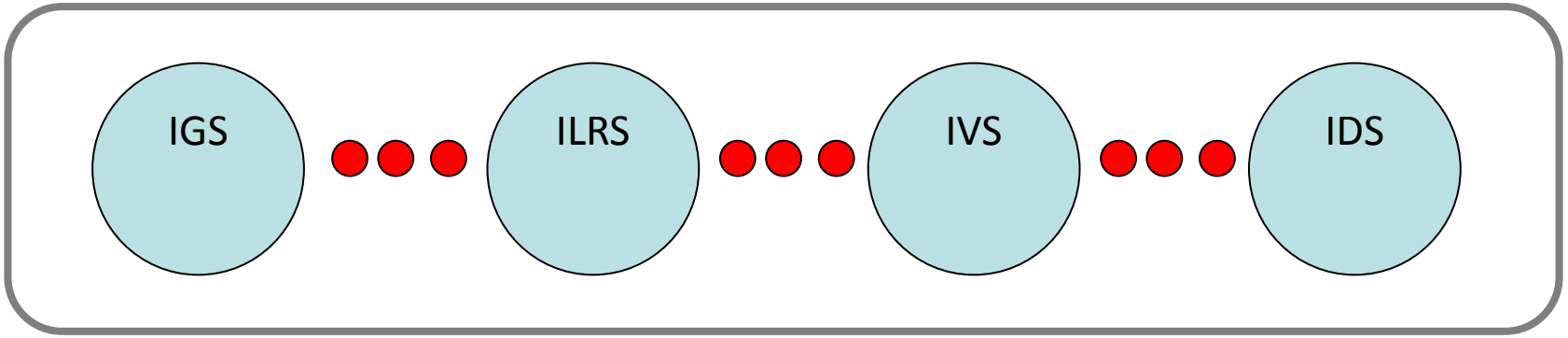
- In order to service these user demands our geodetic data and the associated metadata need to be **standardised, discoverable**, **interoperable** and **authoritative**
- The continual increase in the volume and complexity of data means we also need to generate, transfer and use data and metadata via a machine readable form
- There is a need to develop a standard to encode* and exchange geodetic data and metadata

* (where standards are not currently available)

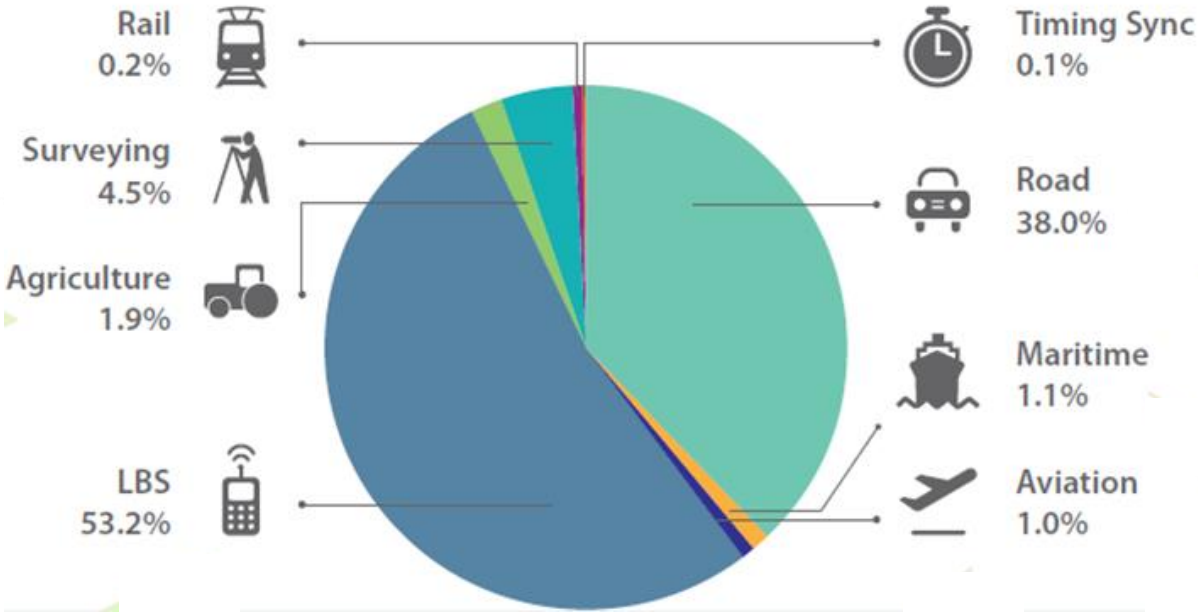
Imagine …



Reference Frame



Discover **Share** **Combine** **Display**



+ government
+ academia

The need for a geodetic metadata standard

- Well known standards are available for encoding fundamental geodetic data (e.g. SINEX, RINEX, ANTEX, SP3 etc.)
- But not all users (now and future) know where or how to look for information (e.g. coordinates in a SINEX file) to fit their requirements
- Users need to be able to query, access and retrieve data in near real-time without knowing how (e.g. format) or where (e.g. data centre) the information is stored
- No international standard is available which makes geodetic data and metadata openly accessible, machine-to-machine readable and interoperable for these emerging markets

Proposed Solution - GeodesyML

- The geodetic community requires a standard which makes data and metadata:
  - discoverable and interoperable,
  - easily transferable via web services, and
  - based on internationally recognised standards.
- In response to these needs Australia and New Zealand have created the Geodesy Markup Language (GeodesyML)
- GeodesyML describes how geodetic data and metadata can be described and transferred in XML format
- GeodesyML is proposed Application Schema of the Geography Markup Language (GML) (ISO Standard)

Standards

Standards

International Organisation for Standardization

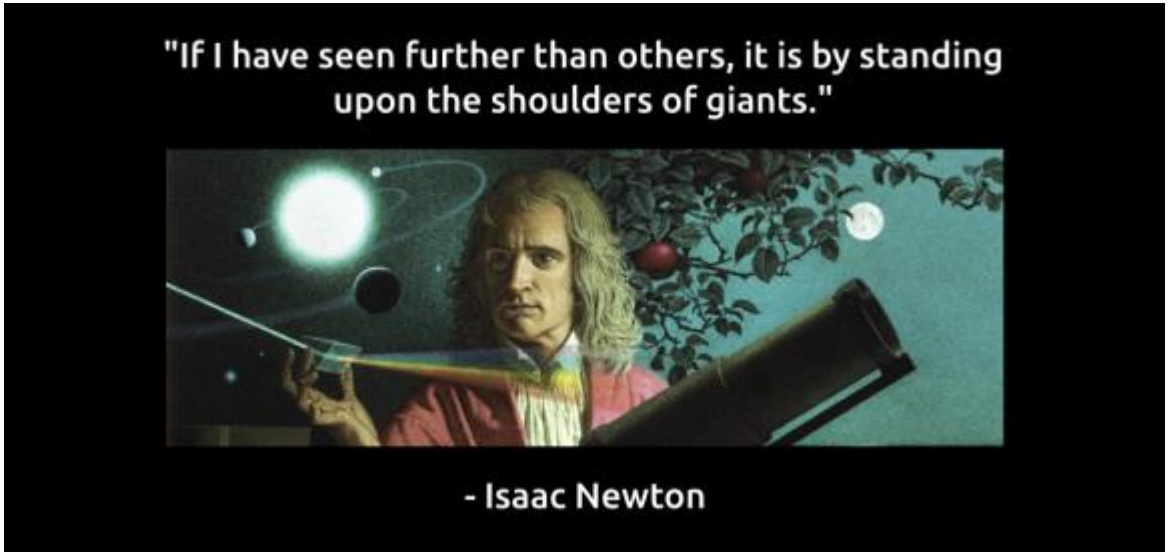
ISO 19136:2007

+ GeodesyML (proposed GML Application Schema)

Extending GML

- GML provides a rich set of primitive objects like (geometry, coordinate reference system, time etc.)
- But not detailed / specific standards
  - e.g. GML can not be used to describe everything about a GNSS, VLBI, SLR, DORIS site.
- The geodetic standard needs objects like antenna, receiver, cable, adjustments etc.
- GML Application Schemas extend GML to meet the needs of a specific community of interest (e.g. SensorML, GeoSciML, GeodesyML (proposed))

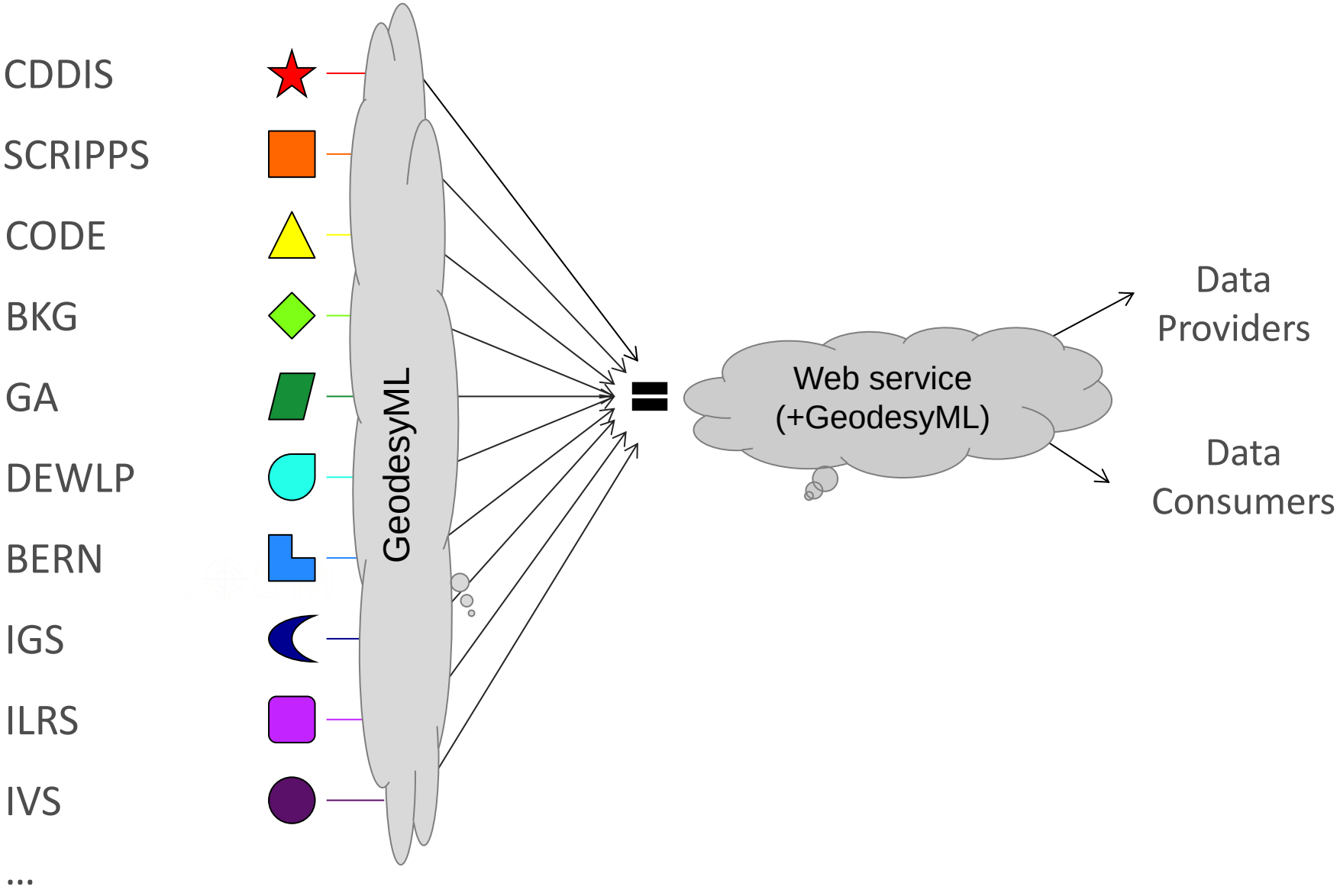
GML Application Schemas



- Coordinate Reference System, Time, Unit of measures
- Many proprietary and open-source software vendors and database technology providers support GML

GeodesyML includes

- Standard way to encode and exchange:
  - GNSS related data and metadata
  - Terrestrial observations
  - Reference frames
  - Adjustments
  - Measurements
  - Site
  - Quality
  - Local Ties
- Future work will extend GeodesyML for the other techniques SLR, VLBI, DORIS.



Key points

- Users of our data are changing
- We need to do things more efficiently (and break habits!)
- Standards are needed for geodetic metadata to make it easier to **Discover, Share, Combine & Display**
- The current version is GeodesyML v0.2 (BETA)
- GeodesyML has been proposed by the IGS-DCWG as the new XML Standard for IGS to encode and transfer site log information
- More information (https://icsm.govspace.gov.au/egeodesy/)

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