Update from the GeodesyML Working Group

International GNSS Service (IGS)
IGS Workshop 2022 – Splinter Session
International GNSS Monitoring and Assessment (IGMA), Site Log Manager (SLM) 2.0, and GeodesyML

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29 June 2022

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Background

Metadata History

- The IGS has relied on ASCII site logs since more than 20 years
- The maintenance of GNSS metadata using GeodesyML has been proposed in 2015 in the IGS DCWG
- Efforts have been made to advertise the standard but no final implementation on an IGS level
- Reinvigorated working group in July 2021 with members from Geoscience Australia, Royal Observatory of Belgium, GNS Science, UNAVCO, IGS Central Bureau, GFZ, and IRIS (Seismology)

Need for an improved Metadata Standard

- Geodetic services (IGS, IVS, ILRS, DORIS) provide data for an increasingly diverse community
- In the past, the user community was predominantly those from research and surveying authorities
- Nowadays society has a high interest in reliable positioning information
- New markets developed

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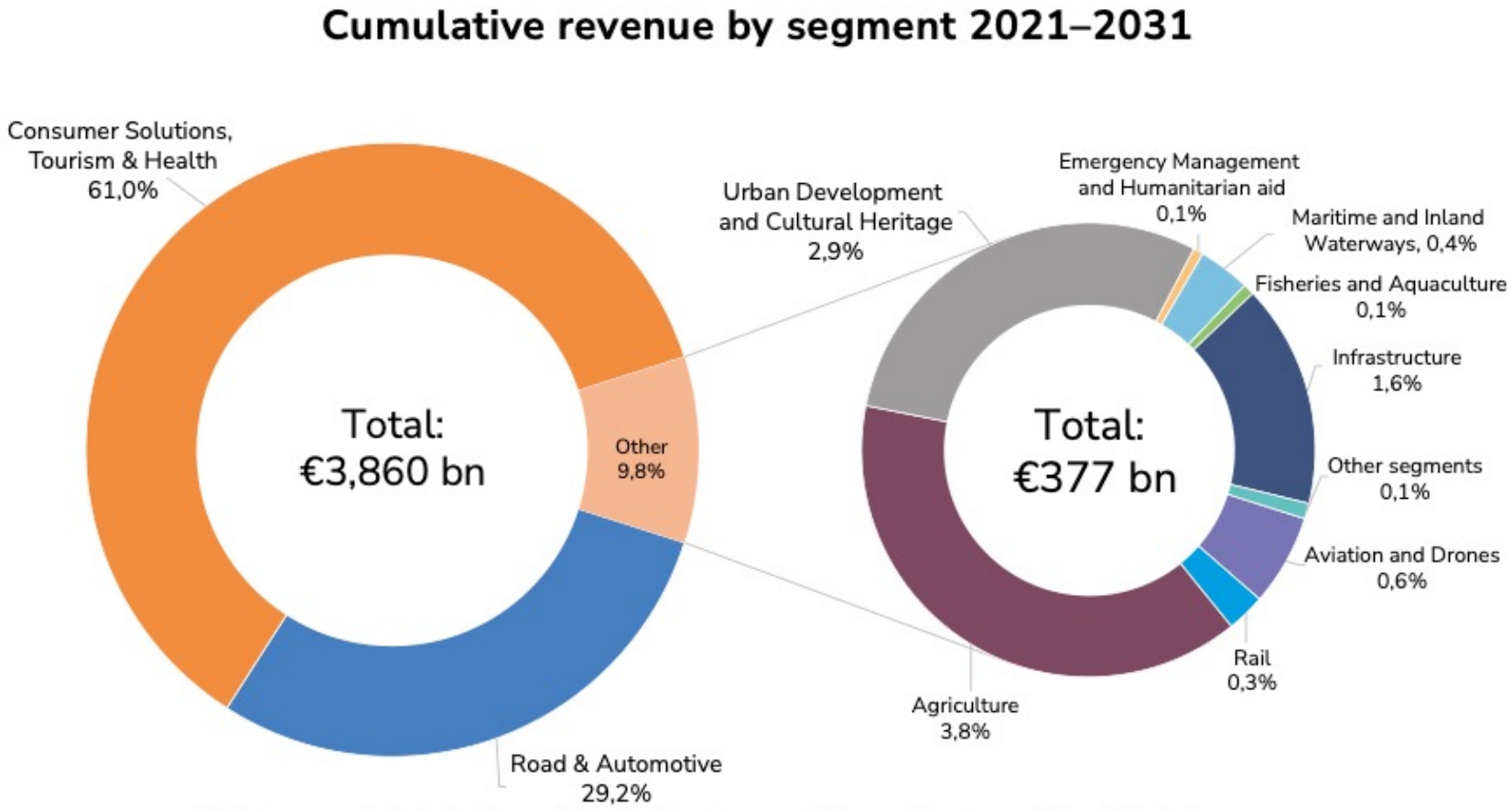
GNSS Market



Source: https://www.euspa.europa.eu/sites/default/files/uploads/euspa_market_report_2022.pdf

User Requirements

- Current standards don’t serve the needs of new (non-geodetic) users
- Need for multi-domain standards to connect to other domains
- In order to service these user demands our geodetic data and the associated metadata need to be standardised and **FAIR** (**F**indable, **A**ccessible, **I**nteroperable, **R**eusable)
- Increase in volume and complexity of data means we also need to create, transfer and use data and metadata using a machine readable format
- Users need to be able to query, access and retrieve data without knowing **how** (e.g., format) or **where** (e.g., data centre) the information is stored

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GeodesyML in a Nutshell

GeodesyML in a Nutshell (1/2)

- New Application Schema of GML (Geography Markup Language)
- Developed by staff from Australian and New Zealand government geodetic agencies with input from the former IGS DCWG
- Describes how geodetic data and metadata can be described and transferred in XML format
- Standard which makes data and metadata:
  - Discoverable and interoperable
  - Easily transferable via web services
  - Based on internationally recognised standards

GeodesyML in a Nutshell (2/2)

- GML provides a rich set of primitive objects (geometry, coordinate reference system, time, etc.)
- But it does not contain detailed features to describe a GNSS or other geodetic site (e.g., describing antennas or receiver)
- GML Application Schemas extend GML to meet the needs of a specific community of interest (e.g., SensorML)
- http://geodesyml.org

Example ASCII Sitelog

```
2.   Site Location Information

     City or Town                : Buckleboo
     State or Province           : South Australia
     Country                     : AUSTRALIA
     Tectonic Plate              : AUSTRALIAN
     Approximate Position (ITRF)
       X coordinate (m)          : -3863895.1956
       Y coordinate (m)          : 3723681.6450
       Z coordinate (m)          : -3436457.3281
       Latitude (N is +)         : -324837.29
       Longitude (E is +)        : +1360331.21
       Elevation (m,ellips.)     :   288.7
     Additional Information      :
```

- ASCII based/human readable
- No schema = no rules
- No versioning
- Not standardised
- Very hard to parse
- Metadata needed in other formats
- SLR/VLBI/DORIS with similar logs

Example GeodesyML Sitelog

```
<geo:SiteLocation gml:id="site-location">
    <geo:city>Buckleboo</geo:city>
    <geo:state>South Australia</geo:state>
    <geo:countryCodeISO codeList="" codeListValue="AUS" codeSpace="urn:xml-gov-
    au:icsm:egeodesy:0.5">Australia</geo:countryCodeISO>
    <geo:tectonicPlate codeSpace="urn:ga-gov-au:plate-type">AUSTRALIAN</geo:tectonicPlate>
    <geo:approximatePositionITRF>
     <geo:cartesianPosition>
           <gml:Point gml:id="itrf_cartesian">
             <gml:pos srsName="EPSG:7789">-3863895.1956 3723681.645 -3436457.3281</gml:pos>
           </gml:Point>
     </geo:cartesianPosition>
     <geo:geodeticPosition>
              <gml:Point gml:id="itrf_geodetic">
                 <gml:pos srsName="EPSG:7912">-32.8103572889 136.058668739 288.7264</gml:pos>
              </gml:Point>
     </geo:geodeticPosition>
   </geo:approximatePositionITRF>
</geo:SiteLocation>
```

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Working Group Updates

Current Status

- Geoscience Australia and the Royal Observatory of Belgium (ROB) already use GeodesyML operationally
- Two apps in implementation:
  - IGS (SLM 2.0, Python)
  - GFZ (Laravel Backend with REST API, React MUI Frontend)
  - Implementation phase: 07/2021 to 07/2022
  - Both planned to be open-source
- Accessibility of tools to use GeodesyML for the community

New Features

- Add features to accommodate **FAIR** principles (proposed by ROB):
  - Licence information and keywords
  - Network information with code list (e.g., IGS, EPN, APREF, etc.)
  - Data centre information with code list (e.g., CDDIS, IGN, BKG, etc.)
- Move away from free-text and create code lists:
  - Monument and marker description
  - Tectonic plates
  - Geological features
  - Receiver firmware
  - Meteorological sensors

What's Next?

- Defining standardised way(s) to exchange metadata (e.g., using RSS feeds) between different organisations (e.g., IGS ⇔ EPN)
- Linking other instruments/domains (e.g., seismometers, InSAR corner reflectors) including PID
- Checking incorporation of SensorML

Current Members

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