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GEO Community Programme: Advancing Communication Infrastructure and Services

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Authors: Chris Atherton (GÉANT Association)

Table of Contents

Executive Summary

Programme Name: Advancing Communication Infrastructure and Services

Acronym: GEO-ACIS

Existing Category: Community Activity

Overview:

The transmission and exchange of data which is utilised in the realm of GEO and geospatial research, relies upon a number of communication layers and distribution systems. These layers and systems, controlled by a number of different actors, when inter-mixed form a transparent underlying service, otherwise known as the internet. In some respects, these layers are operated by a number Private (commercial), Non-Profit, Governmental and Non-Governmental Organisations (NGOs) to form a communications commons which the GEO community relies upon for its systems and services to work. GEO, through collaboration with existing and new contributors will explore possibilities of making non-commodity communication infrastructure resources available and advocate for adequate resources to develop the communication infrastructure that will ensure wider and sustainable access to and use of EO data and information.

Planned Activities:

1. Continued engagement and support for AfriGEOSS, aligning to their strategic aims;
2. Engage and align with AmeriGEOSS strategic aims to assist in outreach to EO research organisations and data centres in Latin America;
3. Engage with other GEO Flagships and GEO Initiatives to assess network requirements and possible improvements of data dissemination and federated identity management services;
4. Support National Research and Education Networks (NRENs) to discuss existing communication infrastructure, requirements and developing activities in various world regions which are aligned to GEO Flagships and initiatives;
5. Provide assistance to the GEO AWS Cloud programme;
6. Investigate state of art information technologies, such as trust and Identity and cloud services, available through existing and potential contributing networks and how these may be applied to the GEO community, GEO Flagship and other GEO initiatives;
7. Engage with GEO community data providers to seek potential cooperation with and requirements to the GEO communication infrastructures and associated services;
8. Investigate a potential trust and identity architecture which would allow GEO initiatives and Flagships to interconnect with other trust and identity AAI infrastructures and regional research collaborations, such as the European Open Science Cloud (EOSC).

Points of Contact:

Co-Chair: Beatrix Weber, Beatrix.weber@geant.org
Co-Chair: Chris Atherton, Chris.atherton@geant.org

1 Purpose

To meet the UN sustainable development goals, tackle climate change and to prepare for and respond to disasters (man-made or otherwise) requires data. This data is increasingly being centralised into large data sets from a variety of different sources and at varying volumes. As the pace of technology advances, the number of data sources and the volumes of data acquired continues to grow exponentially. While challenges exist in acquiring, transporting, storing, processing, analysing and then finally re-transmitting a subset of that data for the benefit of citizens and national governments, there also exists a growing divergence in the capabilities of a number of nations and citizens from global south countries to partake in this field at scale (in comparison to countries from the global north).

The transmission and exchange of data which is utilised in the realm of GEO and geospatial research, relies upon a number of communication layers, distribution systems and middleware. These layers and systems, controlled by a number of different actors, when inter-mixed, form a transparent underlying service, otherwise known as the internet. In some respects, these layers are operated by a number Private (commercial), Non-Profit, Governmental and Non-Governmental Organisations (NGOs) to form a communications commons which the GEO community relies upon for its systems and services to work.

In most cases these different layers of communication infrastructures operate transparently from the users which rely upon them. This gives the false impression that connectivity is ubiquitous and that anyone can participate in research, educational activities and or profit-making activities, in collaboration or competition with their peers around the world, all on a level playing field. Along with lack of connectivity, there are challenges with the types, speeds, inter-connections and sustainable costs of connectivity available to the variety of actors who produce, acquire, process and analyse geospatial data.

There are however, a number of organisations spread around the world who are working to reduce the barriers for nations, so as to affect a re-convergence in capabilities **[WB-NREN]**. Without this re-convergence, the full capabilities and opportunities for global research and or wealth generating activities would not be possible. It is through the varying underlying communication infrastructure layers that this workgroup intends to work towards providing a sustainable infrastructure for the benefit of the GEO community.

An example of this cooperation is the dissemination of the European Copernicus data resources to global partners and research institutions in Africa, via the GÉANT, Ubuntunet Alliance and partner communications infrastructures, for the purposes of meteorological research, climate change research, sustainable development goals adoption and disaster response and reduction.

GEO, through collaboration with existing and new contributors will explore possibilities of making non-commodity communication infrastructure resources available and advocate for adequate resources to develop the communication infrastructure and middleware services that will ensure wider and sustainable access to, and use of, EO data and information.

2 Background and Previous Achievements

The previous incarnation of this work package was via the Advancing Communication Networks work package. The following activities were worked upon during the 2017-2019 work programme period and their status at the time of writing this document.

1. Document existing communication infrastructure within GEOSS and develop concept architecture for a worldwide communication network of networks available to GEOSS. This concept should incorporate how to complement existing use of the Internet and operational data transmission services such as the WMO Information Systems (WIS) and GEONETCast;

- This is now more a lesson learned document for delivering global EO services which is still in development.

2. Draft a plan delineating how individual services could complement the other networks for the benefit of GEO Members, outlining requirements for operation, maintenance and administration;

- Still to be completed

3. Engage with AfriGEOSS and potentially other Flagships and Initiatives to assess network requirements and possible improvements of data dissemination;

- The ACN group has surveyed a number of research establishments and facilities across Africa, who are members of AfriGEOSS, to understand their connectivity requirements. This work was led by representatives of ASREN.

4. Support AfriGEOSS and the African National Research and Education Networks (NRENs) to discuss existing communication infrastructure, requirements and developing activities in the region;

- GÉANT has worked with Ubuntunet Alliance and the Kenyan Research and education network (KENET) to enable native support for EUMETCast services on their network. This resulted in RCMRD in Kenya acquiring EUMETCast data via the R&E internet, rather than solely via satellite.

5. Investigate state of art information technologies, such as cloud services, available through existing and potential contributing networks and how these may be applied to GEOSS.

- GÉANT presented at GEO Plenary on latest GÉANT services as well as AOGEOSS and AfriGEOSS latest developments

6. Engage with GEOSS data providers to seek potential cooperation with and requirements to the GEOSS communication networks;

- GÉANT led a communications infrastructure requirement gathering session at GEO data providers workshop in 2018.

7. Discuss further development and seek cooperation with new GEO partners on the initial progress and findings of this task (e.g., Single Sign On, Cloud Computing, Multi Cast), which were reported at the 16th session of the WMO Commission for Basic Systems (CBS) held in November 2016.

- GÉANT worked with AOGEOSS and AmeriGEOSS to investigate existing and future network requirements. GÉANT also established contact with EuroGEOSS and NEXTGEOSS projects to offer support for t&i services. GÉANT also facilitated a meeting between the GEO secretariat and R&E global cloud coordination group to

explore cloud services. During this period the WMO presented on latest cloud services they have developed for the GEO data providers workshop in 2018.

3 Key Activities

1. Continued engagement and support for AfriGEOSS, aligning to their strategic aims;

2. Engage and align with AmeriGEOSS strategic aims to assist in outreach to EO research organisations and data centres in Latin America;

3. Engage with other GEO Flagships and GEO Initiatives to assess network requirements and possible improvements of data dissemination and federated identity management services;

4. Support National Research and Education Networks (NRENs) to discuss existing communication infrastructure, requirements and developing activities in various world regions which are aligned to GEO Flagships and initiatives;

5. Provide assistance to the GEO AWS Cloud programme;

6. Investigate state of art information technologies, such as trust and Identity and cloud services, available through existing and potential contributing networks and how these may be applied to the GEO community, GEO Flagship and other GEO initiatives;

7. Engage with GEO community data providers to seek potential cooperation with and requirements to the GEO communication infrastructures and associated services;

8. Investigate a potential trust and identity architecture which would allow GEO initiatives and Flagships to interconnect with other trust and identity AAI infrastructures and regional research collaborations, such as the European Open Science Cloud (EOSC).

4 Relationship to GEO Engagement Priorities and to other Work Programme Activities

This work package intends to address a number of sustainable development goals. Below is a list of the SDGs this activity is aiming to support followed in brackets with the key activities which are to meet the SDGs:

- 9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States (1, 2, 3, 4, 5)

- 9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending (1, 2, 3, 4, 5, 6, 7, 8)

- 10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status (1, 2).

- 10.9 Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular least developed countries, African countries, small island developing States and landlocked developing countries, in accordance with their national plans and programmes (1, 2, 3).

- 17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge-sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism (1, 2, 3, 4, 5, 6, 7, 8).

- 17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation (1, 2, 3, 4, 7).

The GEO flagships that this task intends to work with are:

- AfriGEOSS
- AmeriGEOSS
- EuroGEOSS
- AOGEOSS
- GEO Cloud Programme
- Other potential GEO Initiatives and Flagships

This work package intends to liaise with the above activities and programmes and with them, coordinate our actions to support their overall objectives and strategic goals.

5 Governance

The work package will be co-ordinated by two co-chairs. They will facilitate the virtual meetings and provide an agenda for the participants, as well as take and circulate notes from the meeting. The work package members would constitute the steering committee and act as members of the work package. Any members can propose a potential new member to the work package. There is a requirement for members to attend at least 1 of the 4 virtual meetings that take place throughout the year. Beatrix Webber and Chris Atherton are to act as the initial chair people for the work package.

The mandate for the work package members is to work towards achieving the key activities of the ACIS work package via their respective institutions.

6 Data Policy

This workgroup will adhere to the GEOSS Data Sharing Principles and GEOSS Data Management Principles.

Outputs from the workgroup will be made available via a wiki page which is to be setup during the initiation phase of the work programme. This page will be accessible to anyone with an internet access. Further work will be publicised through a variety of publications and the GEO secretariat informed along with an accessible link to the work.

Appendix A

Please see spreadsheet document “gwp2020_GEO-ACIS_Contributer.xsls for a description of the members and their contributions to the work package.

References

WB-NREN **The Role and Status of National Research and Education Networks in Africa.** https://openknowledge.worldbank.org/handle/10986/26258

Glossary

AAI	**Authentication, Authorisation Infrastructure**
ACN	**Advancing Communication Networks**
AfriGEOSS	**African GEO flagship initiative**
AmeriGEOSS	**American GEO Flagship initiative**
AOGEOSS	**Asia-Oceania GEO Flagship Initiative**
ASREN	**Arab States Research and Education Network**
CBS	**Commission for Basic Systems**
EO	**Earth Observation**
EOSC	**European Open Science Cloud**
EUMETCast	**Metrological data distribution service provided by EUMETSAT**
EUMETSAT	**The European Organisation for the Exploitation of Meteorological Satellites**
EuroGEOSS	**European GEO Flagship initiative**
GÉANT	**Pan-European research and education communications infrastructure**
GEO	**Group on Earth Observations**
GEO AWS Cloud Programme	**GEO Amazon Web Services Programme**
GEO-ACIS	**GEO Advancing Communications Infrastructure and Services**
GEOSS	**GEO System of Systems**
GEONETCast	**Global network of satellite-based data dissemination systems**
KENET	**Kenyan Research and Education Network**
NextGEOSS	**A GEO Initiative acting as a pathfinder for the EuroGEOSS flagship initiative**
NGO	**Non-Governmental Organisation**
NREN	**National Research and Education Network**
R&E	**Research and Education**
RCMRD	**Regional Centre for Mapping Resource for Development**
SDG	**See UN Sustainable development Goals**
SSO	**Single Sign On**
T&I	**Trust and Identity**
Ubuntunet Alliance	**The R&E communications infrastructure covering East and Southern Africa**
UN	**United Nations**
UN Sustainable Goals	**United Nations Sustainable Development Goals**
WACREN	**West African research and education communications infrastructure**
WIS	**WMO Information System**
WMO	**World Meteorological Organisation**