



Global Network Advancement: Today and Tomorrow

Buseung Cho (KISTI), Ivana Golub (PSNC), Alex Moura (KAUST), Harvey Newman (Caltech), David Wilde (AARNet)

GNA-G Leadership Team

10 June 2024

GNA-G Side Meeting, TNC24, Rennes France

Agenda



14.00 - 14.05 Welcome, Intro - Ivana Golub (PSNC)

14.05 - 14.15 Welcome - Erik Huizer (GÉANT)

14:15 - 15:30 Session 1: Status update

- GNA-G LT team update + Q&A
- WG accomplishments + Q&A
- SKA Network Collaboration, Ian Collier (STFC UKRI)
- Update from TNC23 + Q&A - Chin Guok (ESnet), Mian Usman (GÉANT)

15.30 - 16:00 Break

16.00 - 16:30 Session 2: “Top 3” menti poll defining roadmap of GNA-G

16:30 - 17.20 Session 3: Discussion

17:20 - 17:30 Summary and wrap-up



- GNA-G LT update – Ivana Golub (PSNC)
- WG accomplishments – WG Leads and Ivana Golub (PSNC)
- Update from TNC23 + Q&A - Chin Guok (ESNet), Mian Usman (GÉANT)

Our vision



A unified global advanced network infrastructure
to support the unique needs of research and education.

Our mission



The GNA-G:

- International collaboration of the research and education (R&E) network organisations at the global scale

Global R&E networks (GREN):

- A large and diverse set of networks for advanced users with differences in speed, accessibility and capacity

GNA-G's purpose:

- Support data-intensive research and education and network advancement through more effective interconnectivity and global collaboration

Goals:

- Develop innovative architectures, services, and models for more effective use of GREN resources;
- Provide testbed resources for the demonstration of future capabilities;
- Agree on a blueprint for aligning equitable spending on intercontinental bandwidth for greatest value;
- Advance data movement capabilities and end-to-end experience;
- Provide a forum which brings together researchers, National Research and Education Networks (NRENs), Global eXchange Point (GXP) operators, regional and other R&E providers;
- Promote awareness of the capability, reach and connectedness of the Global R&E Network.

GNA-G - what is it?



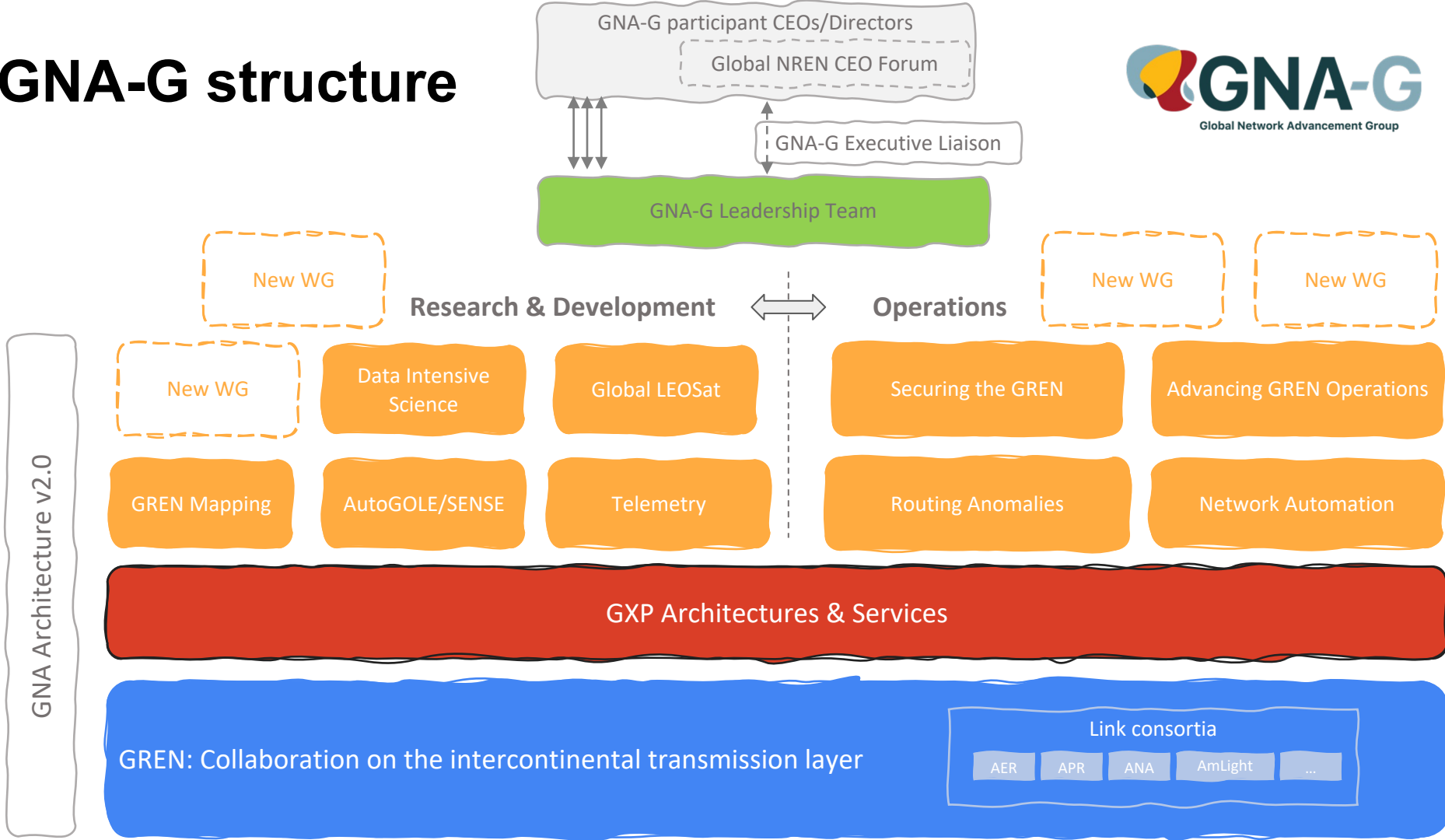
A global **network** testbed for innovation

Action-oriented **Working-Groups** for network advancement

A **forum for discussion** between operators, researchers and users of the GREN

Communicate, Contribute, Collaborate

GNA-G structure



GNA-G Working Groups



AutoGOLE/SENSE

autogole@lists.gna-g.net

Delivers global network services end-to-end in a fully automated way

Data Intensive Science gna-dis-wg@lists.gna-g.net

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New

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Provides a platform for discussion on LEOSat developments

<https://www.gna-g.net/working-groups/>

GNA-G meetings since TNC23

1. GNA-G Community VC February 2024

- Network Automation: WFO, Maat, updates from AmLight, Internet2, ESnet

2. GNA-G Community Meeting at SuperComputing Asia, February 2024

3. GNA-G Community Meeting at the 2024 Internet2 Community Exchange, March 2024

- Security bootcamps & GREN Engineering Advancement WGs, MetrANOVA

4. GNA-G Community VCs Q4 2023, December 5

- SC23 NREs (Caltech high throughput, GP4L, Polka), SC23 SCinet

5. GNA-G Community Meeting at SC23, November 2024

- Security bootcamps & GREN Engineering Advancement WGs, MetrANOVA

6. GNA-G Community Meeting at the 2024 Internet2 Technology Exchange, September 2024

- OAV Maturity Model, Routing Integrity
- TNC23 and APAN56 R&E Networks session summary

7. GNA-G Update at APAN56, August 2023

- GNA-G Update, RENs planning, Operations

Full details: <https://www.gna-g.net/meeting/>



Changes in the Leadership Team



Buseung Cho, Ivana Golub, Alex Moura, Harvey Newman, Marco Teixeira, David Wilde

GNA-G Leadership Team

6 June 2023

GNA-G Side Meeting, TNC23, Tirana, Albania

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Marco Teixeira

Thank you and all the best!



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The GNA-G Automation Working Group

Working group co-chairs: Warrick Mitchell (AARNet) & Migiel de Vos (SURF)

- Facilitate collaboration between NRENs (and beyond) on network automation and orchestration.
- Enabling NRENs to deploy network automation and orchestration more quickly and effectively.
- Innovate and shape the future of network automation for NRENs and the academic community.

GNA-G NAWG 2024H1 update

- Organised an in-person meeting at TNC'24 on Monday morning.
- GNA-G NAWG Github live! (<https://github.com/gna-g/NAWG>)
 - First version of the NREN Component overview
 - NRENs that are advanced in network automation & orchestration demonstrate which tools they are using.
 - NRENs that wish to contribute are warmly welcomed.
 - NREN models and scripts
 - Various NRENs have made relevant configuration models and scripts openly available to inspire NRENs interested in starting with automation and orchestration.
 - We encourage NRENs that wish to make their network automation and/or orchestration models and scripts publicly available to do so.

NREN component overview

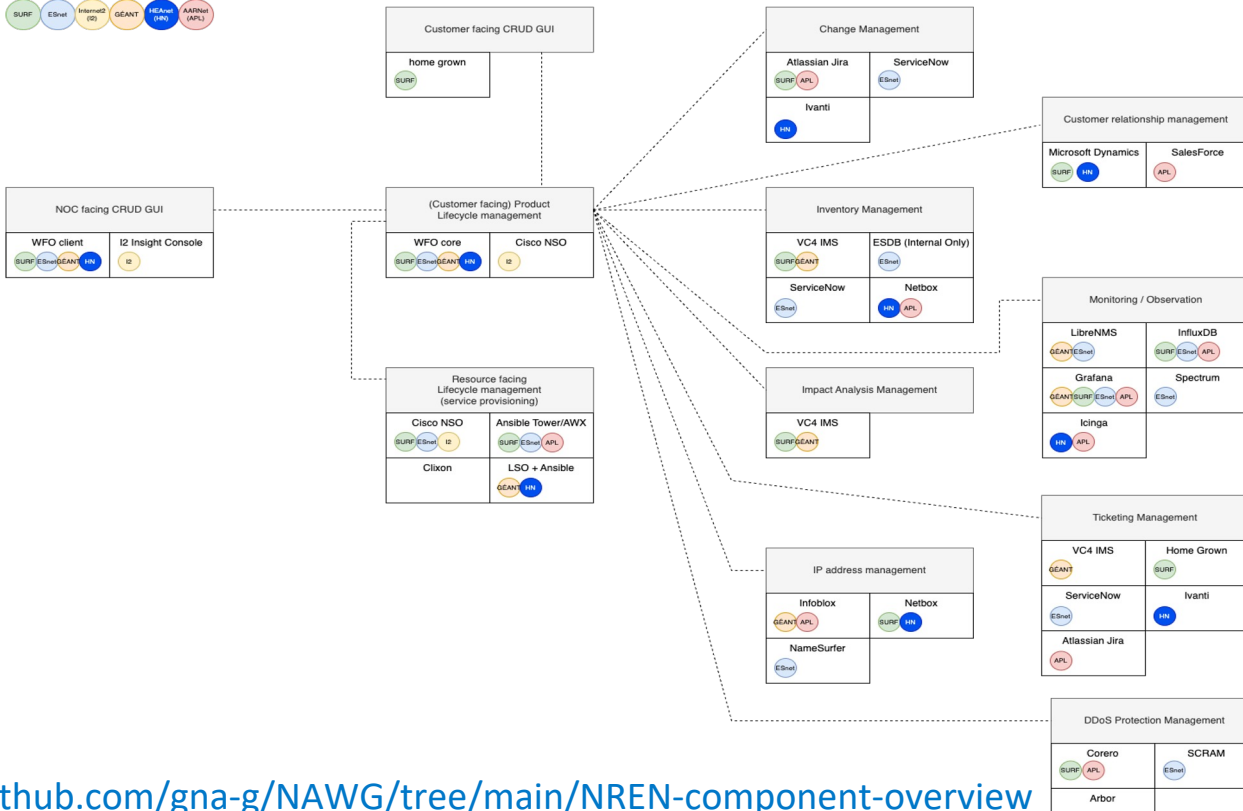
GNA-G Automation Working Group

Overview of automated components in use at the GNA-G Automation Working Group participating NRENs
 version 4 - may 2024

Initial draft - not
 complete - request
 for input

please note that components are only listed if actually used in the automation process to deliver services to customers

Included NRENs in this version are (if available links to architecture mappings are included):



NREN models and scripts

- <https://github.com/gna-g/NAWG/tree/main/NREN-models-and-scripts>
 - Esnet
 - WFO Domain Models
 - NSO Service Models
 - GÉANT
 - WFO Domain Models
 - Ansible Playbooks (+LSO)
 - Internet2
 - NSO Service Models
 - SURF
 - WFO Domain Models
 - NSO Service Models

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2024 Status

170 Members on the mailing list and slack

~25 attendees per meeting

24 cases

3 paused

21 solved

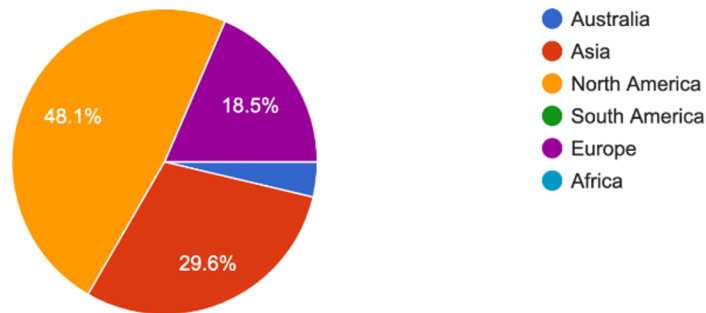
2 new cases in 2024

Routing Working Group Survey

30 responses

Creating new subgroups to create best practices and other deliverables

- Routing Security - Led by Steve Wallace (Internet2)
- Common practices around accepting routes
- BGP Community Strings
- Routing / BGP Training Materials



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GREN Map Working Group Update

Updates

Versioned map at release
1.0.0

Moved the code base to
GitHub

Deploying the GREN Map
**demo at TNC24 Community
Hub 3**

Tuesday: 12:45 - 13:15),
Potential Challenges

Regaining Working Group momentum

Enabling all RENs to participate

Upcoming

Engage the Working Group to
encouraging more
deployments

Complete GNA-G home page
for GREN Map general
information

Planning a global node

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GNA-G GREN Engineering Advancement

FACILITATORS & ACTIVITIES

Dale Carder, ESnet, dwcarder@es.net

Marijke Kaat, SURF, marijke.kaat@surf.nl

Chris Wilkinson, Internet2, cwilkinson@internet2.edu

Testbed	Lead by Marijke Kaat and the team at the University of Amsterdam. Has specific programmatic outcomes centered on experimental outcomes.
New Architectures	<p><u>Currently a joint effort</u> of “ANA 2.0” Engineering Subgroup” and GNA-G focused on the rapid development of requirements, infrastructure, and operational paradigms with initial basis on the Atlantic Consortium.</p> <p>Will likely culminate in series of small workshops:</p> <ul style="list-style-type: none">- September / October 2024 (Location TBD)- APAN Q1 2025



GNA-G GREN Engineering Advancement

INITIAL START

Starting up within the ANA Engineering WG / Platform Requirements Sub-WG

- Requirements
- Service Catalog
- Operational Paradigms
 - Fully Disaggregated
 - Partially Disaggregated
 - Single Domain
- Engineering Approaches

Plans for a survey of operational parameters

Need to be mindful of overlap with routing WG

[Pages](#) [🔍](#) [📊](#) [Analytics](#)

Advanced North Atlantic Engineering Home

Created by Drew Aschenbrener, last modified by Thomas Araneta on Feb 19, 2024

Welcome to the Advanced North Atlantic Engineering Wiki page.

- [ANA Dashboards](#)
 - [Link Status](#)
 - [Bandwidth Dashboard](#)
- [ANA ENG WG Subgroups](#)
 - [Dashboard Creation](#)
 - [VLAN Collection and Analysis](#)
 - [Future Platform Requirements and Solutions](#)
- [ANA Member Documentation](#)
 - [CANARIE](#)
 - [ESnet](#)
 - [GEANT](#)
 - [Internet2](#)
 - [KREONET/KREONet2](#)
 - [NEA3R - Indiana University](#)
 - [NORDUnet](#)
 - [SINET](#)
 - [SURF](#)
- [ANA Overview](#)
 - [ANA Collaborative System – Overview and Service Description](#)
 - [ANA ENG WG Administrative Information](#)
 - [ANA ENG WG Meeting Recordings and Notes](#)
 - [March 14, 2024](#)
- [Standard Operating Procedures](#)
 - [Coordination of Troubleshooting Efforts / Incident Management](#)
 - [Configuring backups or outage related services](#)
 - [Adding Services](#)
 - [Removing Services](#)
 - [Maintenance & Change management](#)
- [Peering and VLAN Documentation](#)
 - [High Value VLAN Documentation \(BGP, high traffic, etc\)](#)

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Security WG

Security Bootcamps

Ana Alves – GÉANT CISO

GNA G Meeting

10th June 2024

tnc24

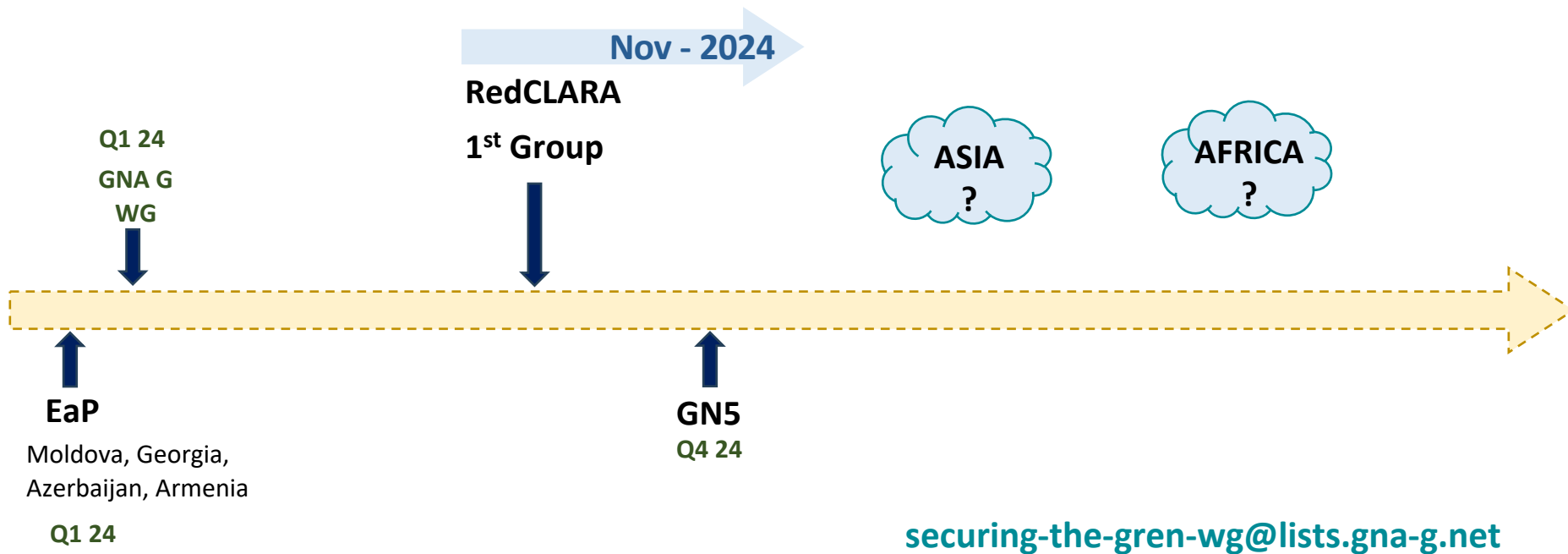
RENDEZVOUS À RENNES
Rennes, France | **10-14 JUNE 2024**



Co-funded by
the European Union



Security WG - Security Bootcamps



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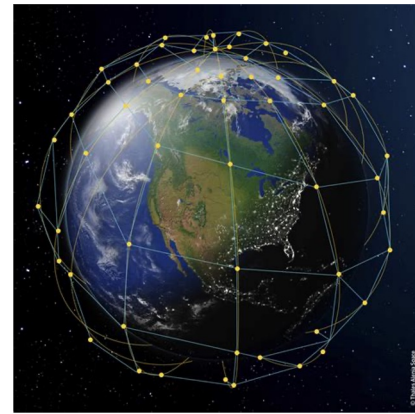
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Global LEOSat WG

GNA-G Meeting – Rennes, FR – 10 June 2024

slides by Mark Wolff (CANARIE) & Erik-Jan Bos (NORDUnet)



Contents

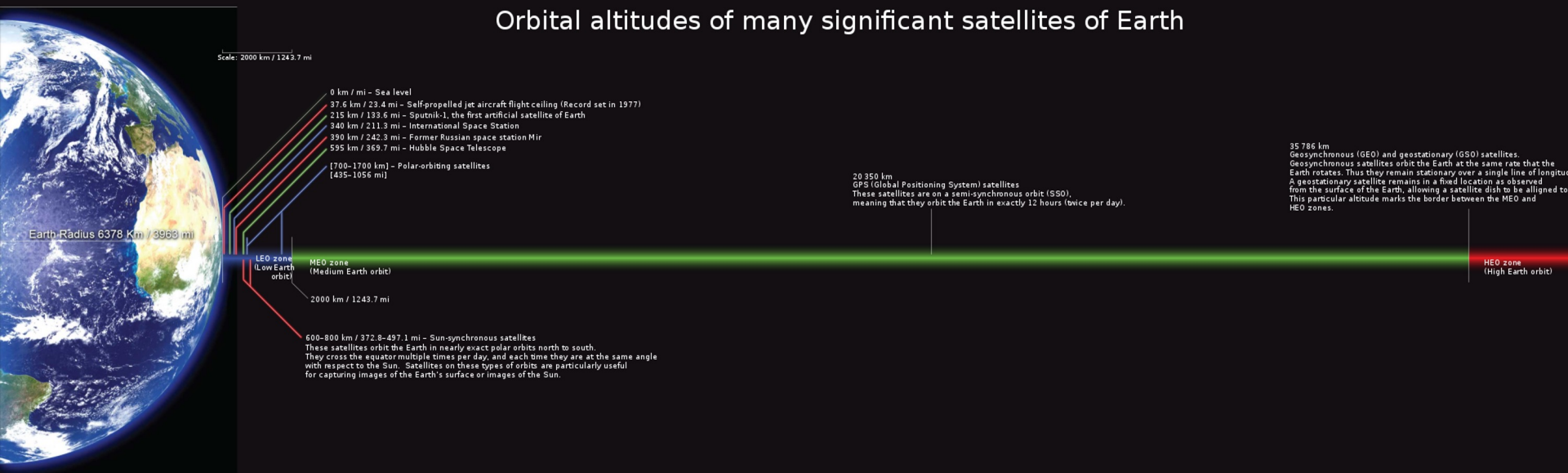
- Introduction
- Summary of the Global LEOSat WG (draft) Charter
- Addressing the topics

-
- The diagram illustrates the orbital altitudes of various satellites around Earth, categorized into several groups:
- Low Earth Orbit (LEO):**
 - Orbiting at 100 to 1,000 km.
 - Includes: GPS, Iridium, Starlink, and other communication satellites.
 - Altitudes: 1,000 km, 800 km, 600 km, 400 km, 300 km, 200 km, 100 km.
 - Medium Earth Orbit (MEO):**
 - Orbiting at 1,000 to 10,000 km.
 - Includes: GPS, Galileo, and other navigation satellites.
 - Altitudes: 10,000 km, 8,000 km, 6,000 km, 4,000 km, 3,000 km, 2,000 km, 1,000 km.
 - High Earth Orbit (HEO):**
 - Orbiting at 10,000 to 100,000 km.
 - Includes: GPS, Galileo, and other navigation satellites.
 - Altitudes: 100,000 km, 80,000 km, 60,000 km, 40,000 km, 30,000 km, 20,000 km, 10,000 km.
 - Geostationary Orbit (GEO):**
 - Orbiting at 35,786 km.
 - Includes: GPS, Galileo, and other navigation satellites.
 - Other Orbits:**
 - Orbiting at 100 to 1,000 km.
 - Includes: GPS, Galileo, and other navigation satellites.
 - Altitudes: 1,000 km, 800 km, 600 km, 400 km, 300 km, 200 km, 100 km.
- The diagram also shows the Earth's surface and the atmosphere, with a scale bar indicating distances in kilometers.

GEO & MEO LEO or... RTTs in the Satellite Realm



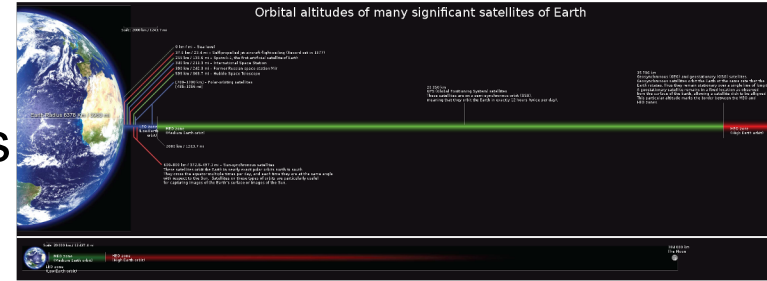
Orbital altitudes of many significant satellites of Earth





Introduction

- From GEO and MEO to LEO Satellites
- Promise of LEOSat:
 - Acceptable roundtrip times
 - More bandwidth available per satellite
- Not to replace fiber, but for:
 - Hard to reach locations, e.g. a remote research station or field work
 - Moving objects, e.g. a research vessel
- In 2019, small group started discussions on LEOSat at TNC19
 - Stalled during the pandemic





Global LEOSat WG (draft) Charter (1/2)

- Goals of the WG:
 - Be a platform for discussion on LEOSat developments, in the areas of technology, service delivery, commercial, and legal
 - Discussing deployments, use cases and user stories
- Topics of interest include:
 - Exploring possible mechanisms for joint procurement of LEOSat services
 - R&E Network connectivity to LEOSat providers
- Proposal to be an open group for R&E, under the GNA-G:
 - Anyone working in the realm of R&E Networking is welcome
 - From time to time, a (future) LEOSat operator can be invited to share their developments



Global LEOSat WG (draft) Charter (2/2)

- Proposed deliverables:
 - An up to date and agreed Working Group Charter
 - A half-yearly report on the state of play of LEOSat in R&E, under responsibility of the WG Chairs
 - Presentations at community events, by members of the WG
- Initial co-chairs:
 - Mark Wolff (CANARIE)
 - Erik-Jan Bos (NORDUnet)
 - Others welcome ☐ please contact Mark and EJB



Addressing the topics



- Track four vendors/initiatives & the experiences with them:
 - Eutelsat OneWeb
 - StarLink
 - Telesat
 - Kuiper Systems
- Collaboration methods:
 - Zoom/Teams and occasional face-to-face WG meetings at community events
 - Mailing-list: Global LEOSat WG <leosat-wg@lists.nordu.net>
 - Box folder: Global LEOSat WG (to be moved onto the GNA-G Box folder)



Interesting resources

- Websites of operators or projects:
 - Eutelsat OneWeb: <https://oneweb.net/our-network>
 - StarLink: <https://www.starlink.com/>
 - Telesat: <https://www.telesat.com/leo-satellites/>
 - Kuiper Systems: <https://www.aboutamazon.com/what-we-do/devices-services/project-kuiper>
- Testing and tracking:
 - Satellite Map: <https://satellitemap.space/>
 - LEOScope: <https://leoscope.surrey.ac.uk/>



Thank You! Questions?

Please approach me afterwards if you want to participate

Or send mail to bos@nordu.net or
Mark.Wolff@canarie.ca



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TNC23 Planning and Development in R&E Networks [Recap]

(Side meeting) June 9, 2023

What did we discuss?

Areas

- Intercontinental Connectivity
- Packet Layer Renewal
- Automation and Orchestration
- Big Science Requirements

Focus

- Information consolidation and sharing
- Coordination of efforts

Reflection

Discussions were lively and productive. A large portion of the R&E networking community were represented in the session.

Intercontinental Connectivity [Recap]

- Information consolidation and sharing
 - **Systems view** of trans-oceanic connectivity as well as terrestrial footprints [*GNA coordination*]
 - Logical **connectivity** view of **experiments** and **large science collaborations**, e.g., partnership resource map [*GNA coordination*]
- Coordinated groups
 - Science engagement group to experiments approach to **coordinate requirements, co-design, solutions**, etc. [*Joint collaboration based on requirements of experiment, inform GNA of outcomes*]
 - Technical coordination group to **explore efficiency, resiliency**, etc, across the various trans-oceanic connectivity, and potentially joint operations. [*Joint collaboration based on requirements of experiment, inform GNA of outcomes*]
- Dedicate effort to work on the various coordinated tasks

NB: Statements in brackets “[]” indicate potential follow up actions

Packet Layer Renewal [Recap]

- Information consolidation and sharing
 - List of networks and associated **services, hardware, and protocols**. *[GNA coordination]*
 - **Tender information**, e.g., RFP, and potentially reasoning for selection. *[Bilateral (for sensitive information), public information can be shared with GNA]*
 - **Technology and vendor roadmaps**. *[Bilateral (for sensitive information), public information can be shared with GNA]*
 - Network element **testing tools, methodology and results**. *[Bilateral for testing collaborations and sensitive information, general/public results/information shared with GNA]*
 - Work towards a **unified view** of what we could be **tendering in 5-7 years**. *[General sharing with GNA, more focused (bilateral) discussions among like minded NRENs]*
- Service coordination
 - Building **consistent end-to-end services**. May require us to review our services and simplify if warranted. *[Bespoke services would require bilateral cooperation and shared with GNA, general services can be addressed in GNA]*

NB: Statements in brackets "[]" indicate potential follow up actions

Automation and Orchestration

- Information consolidation and sharing
 - **System level architecture design** documentation, e.g., block diagram. *[GNA coordination]*
 - **Workflow models and functions.** *[GNA coordination]*
 - Taking **lessons learned** from bi-lateral collaborations and sharing that in a larger forum. *[GNA coordination]*
 - **Socialize** the NREN SLACK Automation channel. *[SLACK communications]*
- Coordinated **training and outreach** activities. *[Bilateral activities for focused engagement, might hand over to GNA for general engagement (and if process is more matured)]*

NB: Statements in brackets “[]” indicate potential follow up actions

Big Science Requirements

- Information consolidation and sharing
 - Sharing **requirements gathering reports** among the NRENs. *[GNA coordination]*
 - ESnet can share how requirements workshops are done. *[Multiple forums]*
 - A **register** that tracks the current connectivity asks (understanding that there may be big error bars). *[GNA coordination]*
- External engagements
 - Create a **unified “global” R&E network pitch** that we can use for funding agencies, experiments, etc. *[GNA coordination]*

NB: Statements in brackets “[]” indicate potential follow up actions

How did we do?

- Outcomes of the meeting were presented at other events, e.g., 4GRP, etc
- Follow up discussions with GNA-G leadership
- Progress on some fronts, e.g., Automation and Orchestration
- Unable to get resource commitments from community to start (new) activities

Reflection

GNA-G is a community forum and requires community resources to accomplish its goals. Community resources are scarce, and asks may not have been explicitly scoped and well defined.

Where do we go from here?

- Reaffirm the if the four areas are still of interest to the community. Do we want to add/subtract from the list.
- Prioritize the topics to allow us to focus and scope down efforts as needed.
- Invest some upfront effort to develop a more detailed plan for each topic in order to make the ask for resources clear and concise.

Reflection

Help us understand how we can package the topics and resource asks (to your management) that will help you get involved in efforts that you are interested in.

More in the next session!



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Conclusion

GNA-G meetings

Meetings planned for 2024 (so far):

1. TNC24 (10-14 June - Rennes, France)

- Network Automation WG: Monday 10 June, 9am-12.30pm
- GNA-G full meeting: Monday 10 June, 2-5.30pm
- WFO users meeting: Monday 10 June, 2-5.30pm

2. GNA-G Q2 Community VC - Global LEOSat

- 19 June (Wednesday) 8-10 CEST, and 20 June (Thursday) 21-23 CEST

Full details: <https://www.gna-g.net/meeting/>



How can you get involved?

Join the GNA-G Community mailing-list:

<https://lists.gna-g.net/postorius/lists/all.lists.gna-g.net/>

Join a working-group

<https://www.gna-g.net/working-groups/>

Contribute your thoughts & ideas at the next meeting/VC:

<https://www.gna-g.net/meeting/>

Reach out to the Leadership Team

Web: <https://www.gna-g.net/contact-us/>

Email: leadershipteam@lists.gna-g.net



Thank you