Infrastructure Committee, Data Centers and RINEX

International GNSS Service (IGS)
IGS Workshop 2022 – Splinter Session

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27 June 2022

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Welcome

- We will use an interactive polling tool called *Menti* within the session
  - We recommend to use a second screen or device for the polling
  - All results will be made available for future reference
- Please place questions into the chat as we go or raise your hand
- Participants are expected to abide the "IGS Code of Conduct"

Code of Conduct

IGS Workshop Agenda

1 **IGS Network**
[40 minutes]

2 **IGS IT Infrastructure**
[40 minutes]

3 **RINEX 4.00**
[10 minutes]

IGS Workshop Goals

- Developing a vision and strategy to sustain and evolve the IGS tracking network and general IT infrastructure
- Include and receive feedback from the community
- Create decision-making references for the future of the IGS within the next 6 months
- Create and update central documents
- **Set up a roadmap for the Infrastructure Committee for the next years**

IGS Workshop Icebreaker

Visit https://www.menti.com

and type in the following code: **9888 4707**

OR

scan the QR code on your mobile device

Mentimeter

01

IGS Network

Current Status, Participation and Roadmap

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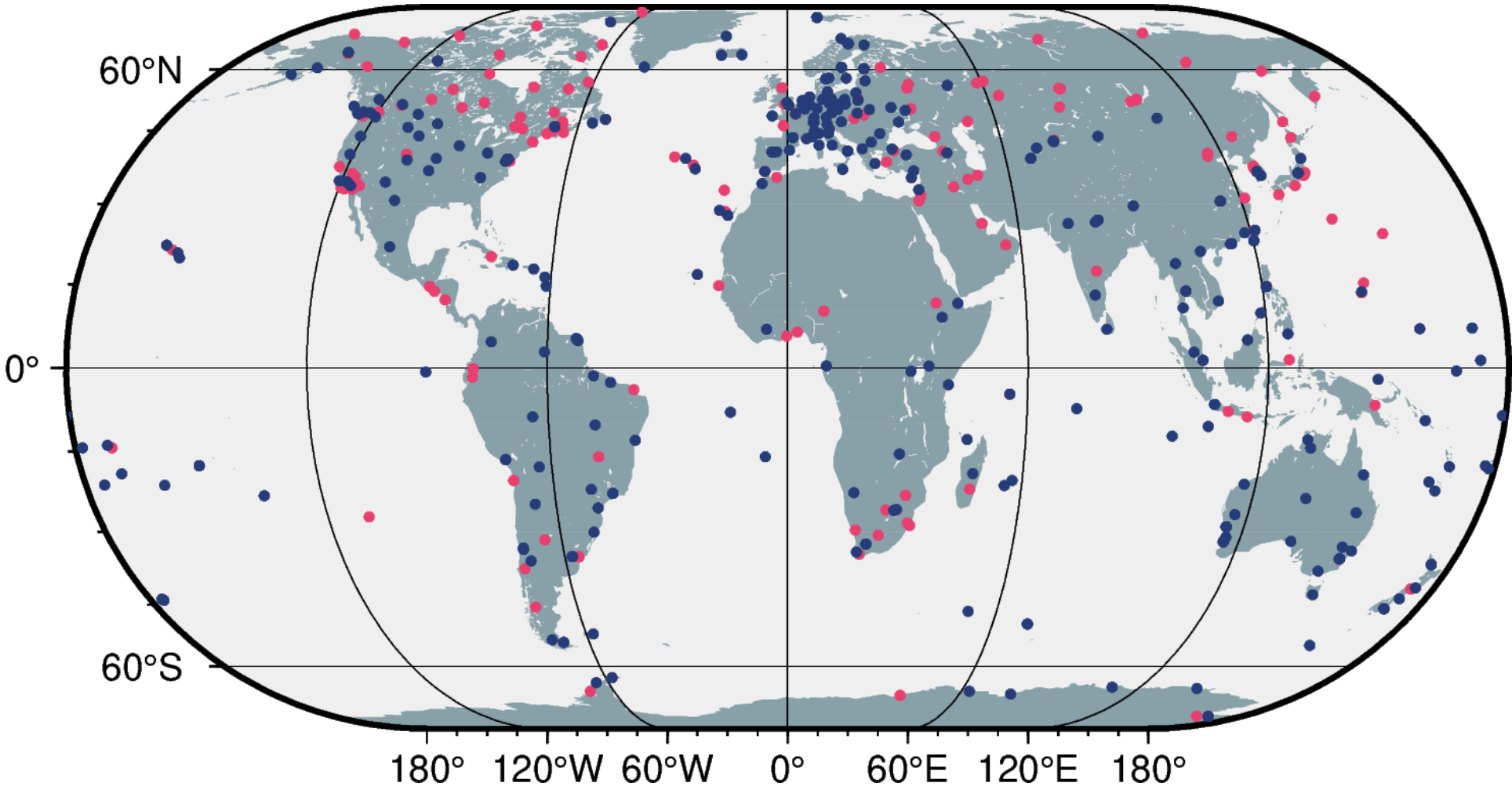
IGS Network

512
STATIONS*

309
MULTI-GNSS**

301
REAL-TIME



* Last updated 2 June 2022
** GPS+GLO+GAL+BDS (in **blue**)

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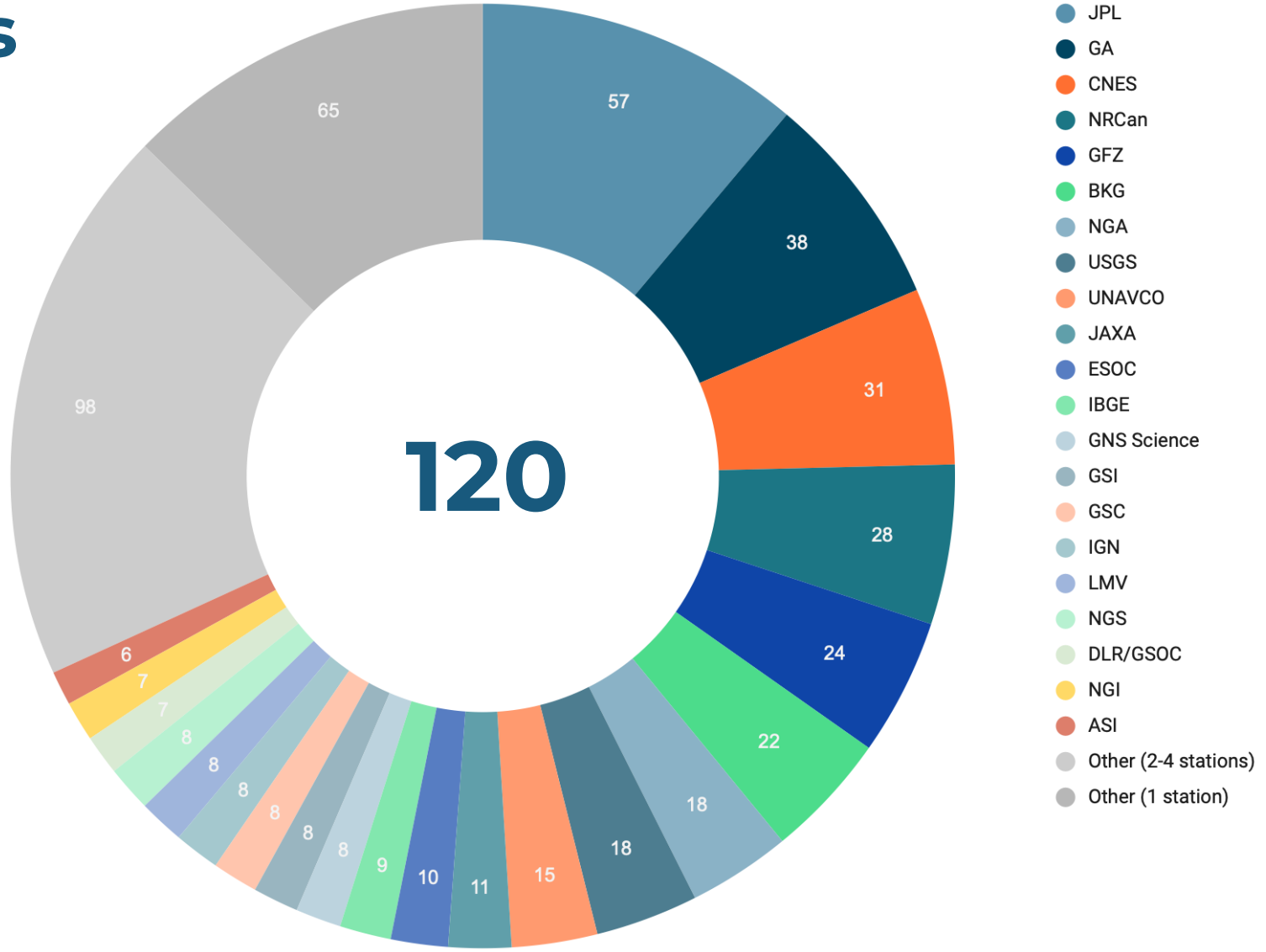
IGS Organisations

- Contributions from 120 organisations
- Operated and supported by public funded organisations
- 20 organisations cover 70% of the entire network
- 65 organisations with just 1 station



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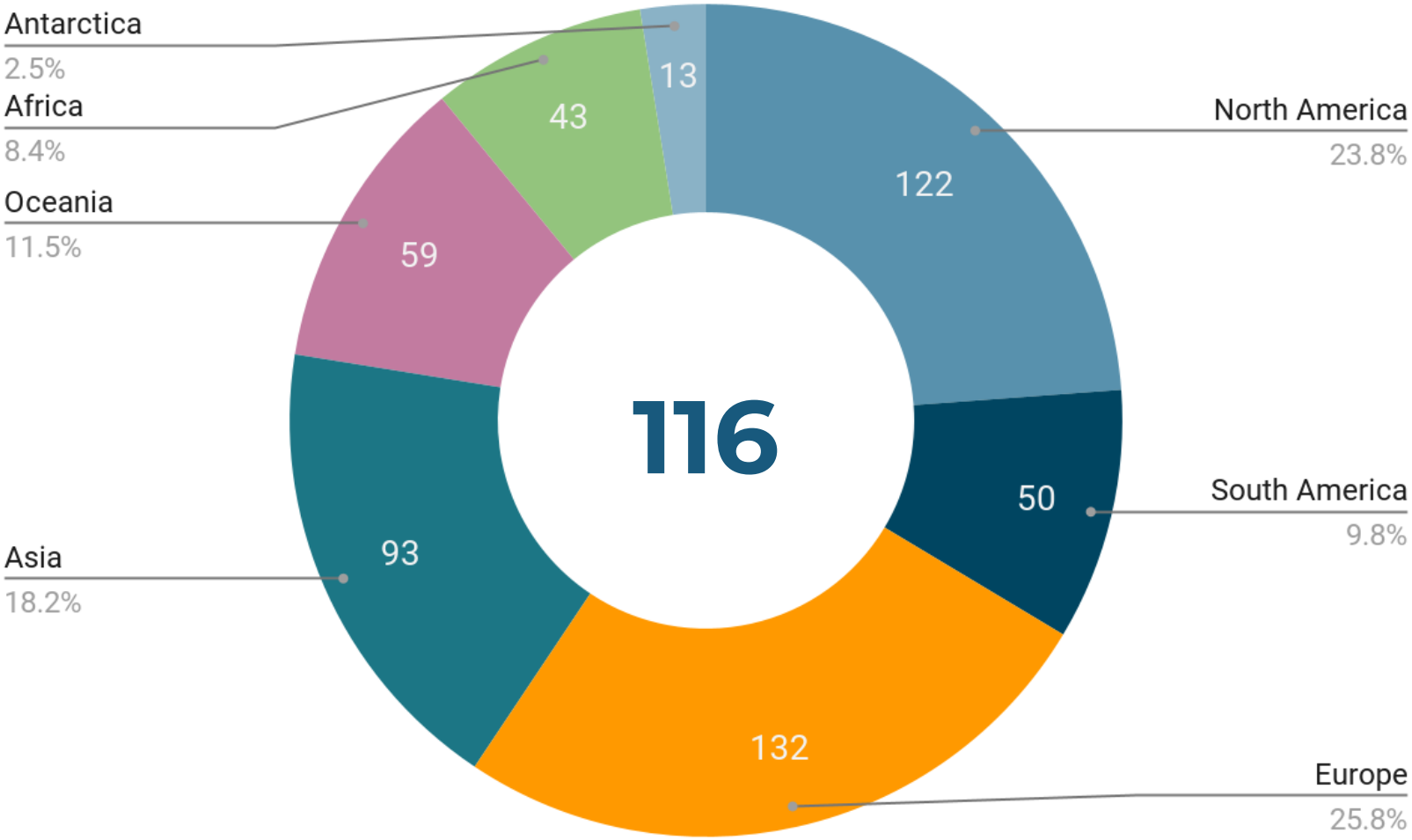
IGS Regions

- Stations located in 116 countries/regions
- 13 countries provide 10+ stations → 50% of the network
- 82 countries with less than 4 stations



Feedback and Participation

General question: **Is the current IGS network fit for purpose?**

IGS Network Feedback (1/3)

Network Coverage:

- Closing network gaps (Russia, China, Arabian Peninsula) and optimisation of geographic distribution of stations
- Poor Multi-GNSS coverage in selected areas (e.g., Northern Canada)
- No proper support of NavIC/IRNSS due to lack of S-band capable stations
- More real-time stations and harmonisation of their classification
- Include more BIPM CCTF stations for timing services and time scale generation

IGS Network Feedback (2/3)

Station Quality:

- Study error sources for IGS stations, attenuate them and build/accept stations with high quality standards
- Establish clear methods and guidelines on how to measure position offsets (discontinuities) due to hardware changes
- Incorporate GNSS-provider stations or implement collocated IGS stations with surveyed local ties
- Revive operation of multi-receiver testbeds to understand receiver characteristics (generation of code and fractional phase biases, PPP)

IGS Network Feedback (3/3)

Metadata:

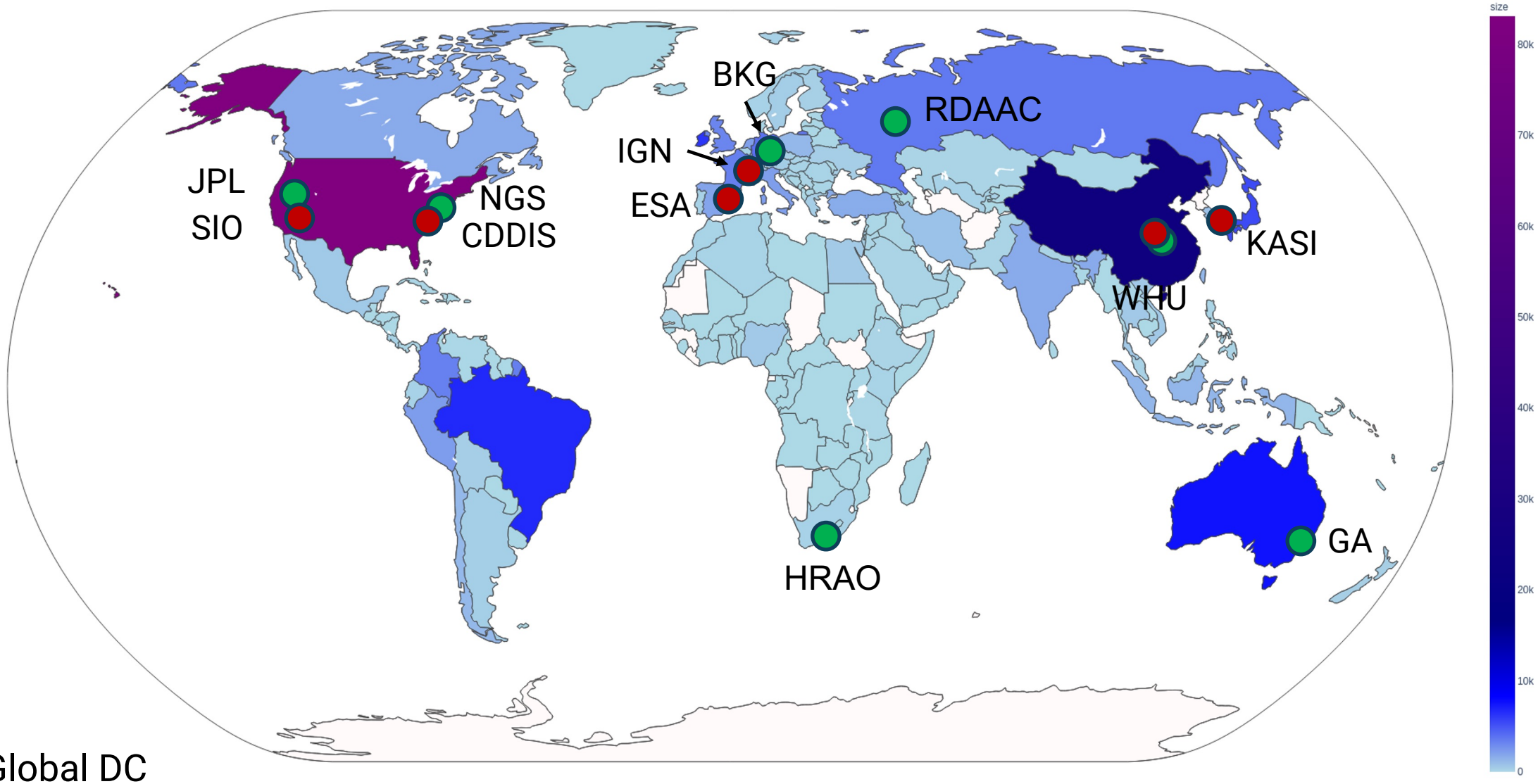
- Provide station pictures for **all** IGS stations
- Accurately provide alignment from True North in the metadata

02

IGS IT Infrastructure

Security, Quality Control, Feedback and Participation

When talking IT in the IGS everyone thinks this!



Global DC
Regional DC

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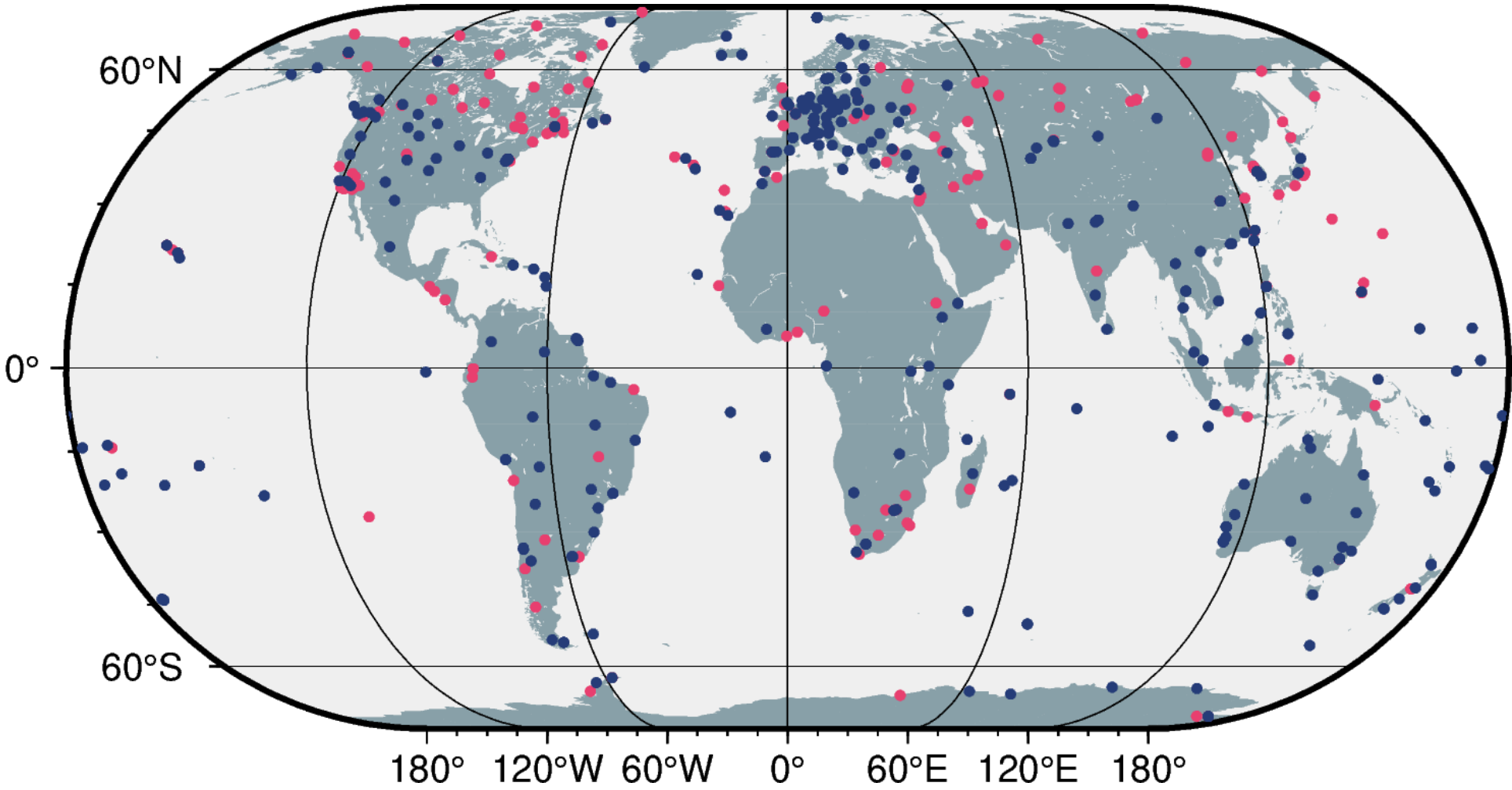

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IT security is not something; it is everything

- It is everything!
  - Receiver infrastructure
  - Data centers
  - Analysis centers
- Security is not taken seriously until you feel the “PAIN”
- Current state within IGS infrastructure
- Three tenants of Information Security
  - Confidentiality
  - Integrity
  - Availability

Data Centers Current Status

- Data center, repositories and archives: what's the difference?
- CDDIS larger than all the GDC and RDC combined!
- Data synchronization between the GDCs has never been a requirement nor is it currently feasible
- Each center is essentially independent in how it handles IT security, QC, protocols to use, etc.
- GDC's that can't accept data input
- QC standards from high to non-existent
- **NO** data provenance

Quality Control Items for Archive Centers

5 main categories of checks

1: Basic file checks

- Antivirus
- Empty file
- Unknown file name
- File size

2: File name checks

- Marker name matches filename
- RINEX naming scheme
- Minute check (high-rate only)
- Correct case for RINEX type

3: Date/time checks

- Future dates
- Older than 2 years
- Date matches filename
- Invalid day of year
- Unaccepted data interval

4: Compression issues

- Unexpected end of file errors
- Corrupt input errors
- Unknown or unexpected compression type

5: Header content checks

- RINEX version check

Path Forward

Information Security

- Data provider agreements with IT security requirements
- Cryptographic checksums originating from the receivers
- Requirement to use encryption protocols **ONLY**
- Data archive centers must undergo independent IT security audits yearly

Data Archive Centers

- 2-3 Global Data Archive Centers
- Data archive QC standards as published by the IGS
- Service Level Agreement (SLA)
- Metadata collection
- Synchronization method between the global data archive centers
- 30 second availability time

Feedback and Participation

Comments, questions on the presentation

General questions:

1. How does your organization treat information security?
2. Would there be interest if advanced programing interfaces (API) were available at the archive centers?

03

RINEX 4.00

Timeline and Status

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Timeline

- Accepted by IGS GB

- Development Transition Plan
- Data Center Implementation(s)*

- Start trial period with parallel uploads
- Receive feedback

- Merge RINEX 4.00 into operational archive

* CDDIS and BKG accept files

Status

- DLR provides summary broadcast navigation file in RINEX 4.00 (**BRD400DLR**)
- GFZ provides RINEX 4.00 station-wise observation, navigation and meteorological files (upgraded using gfzrnx from RINEX 3.0x) since DOY 2022/142
- DLR provides first native RINEX 4.00 observation files for its Septentrio POLARX5 (FW 5.5.0b) receivers since DOY 2022/158
- Other GNSS vendors anticipate to implement native RINEX 4.00 in Q4/2022
- Please **test** RINEX 4.00 files **and report problems** back to the IC and RINEX WG

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More Information

https://files.igs.org/pub/resource/pubs/workshop/2021/TourDeIGS%202%20-%2004%20-%20Romero.pdf

YouTube https://youtu.be/w_85yP9E30w

04

GNSS Metadata

Update on GeodesyML and SLM 2.0

Session on June 29 @ 21:00 UTC

05

Wrap-Up

Take-away and Workshop Recommendations

Wrap-Up

- Define workshop recommendations in the upcoming days
- Prioritise 1 or 2 key points per block (network, IT) and year
- Presented at the outbrief session on July 1, 13:00 UTC

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