INTERNATIONAL NETWORKS
At Indiana University

NEA^{3}R

Networks for European, American, African, and Arctic Research

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NEA^{3}R collaboration

- US National Science Foundation: International Research Network Connections (IRNC) program (Core : Improvements)
- Builds off current NEAAR project
- Complementary to AfricaConnect3 project
- Adds NORDUnet as a formal partner
- African activities led and coordinated by the Ubuntunet Alliance
- Principal Investigators: Jen Schopf (IU), Ed Moynihan (IU), Tom Fryer (GEANT), Rene Buch (NORDUnet), Matthews Mtumbuka (UbuntuNet Alliance)
- 3 main focus areas
  - Physical
  - Logical
  - Service

NEA^{3}R : Physical

- 2 100G USA<>Europe research connections
  - NY-London AEC-1
  - NY-Copenhagen-Amsterdam AEC-2
- Advanced North Atlantic (ANA) collaboration
  - 7 partners
  - 9x100G USA-Europe
  - Coordinated backups, peering, and capacity sharing

NEA^{3}R : Logical

- System of logical “Sister” circuits
  - Partner provided circuits as named points of collaboration.
    - GÉANT
      - New York and Paris;
    - NORDUnet circuits:
      - CPH<>Svalbard, Norway
      - CPH<>Kajaani, Finland;
    - UbuntuNet Alliance
      - Cape Town<>London
  - Future additions:
    - ArcticConnect
    - Africa<>Europe

NEA^{3}R : Service

- NetSage Measurement and Monitoring Framework
- Science Engagement
  - LHCONE support
  - Bioinformatics and Genomics
  - Astronomy
- Outreach to international research collaborations
- Routing Anomaly detection
- Support for Network Experimentation
  - FABRIC

Current Project Status

- Project officially started October 1, 2020
- Working on getting circuits up

Next Steps:

- Set-up of measurement infrastructure
- Begin additional Science Engagement outreach
- Expanding partnerships

Opportunities for African collaboration

- Peering in Amsterdam or London
- Measurement and monitoring deployments
- Support for research collaborations
- Follow-up to NEAAR perfSONAR workshops:
  - Who is using the network?
  - What does performance look like?
  - Can we help improve the service?

Monitoring using NetSage

- NetSage advanced measurement services for R&E data traffic
  - Better understanding of current traffic patterns across instrumented circuits
  - Better understanding of large flow sources/sinks
  - Performance information for data transfers
- Collaboration between Indiana University, LBNL, and University Hawaii Manoa
- Originally funded by the NSF international program, software is now being deployed domestically as well
- International networks dashboards: http://portal.netsage.global

What NetSage Does Best

- Answers questions asked by network engineers and network owners
- Human-readable summaries and patterns
- Gives people the higher level pattern so they can narrow down a time frame and then use local tools that have more detail
- Simplifies and makes accessible basic data

NetSage Data Sources

- Flow data from routers (Passive)
  - Data is de-identified, and only flows >10M collected
- SNMP data (Passive) - Basic bandwidth data
- perfSONAR (Active)
  - Active tests between sites, if present (most deployments don't use this)
- Tstat-based traffic analysis for archives (Passive)
  - TCP flow statistics: congestion window size, number of packets retransmitted, etc
  - Also de-identified before archived

So lets try a few things out….

NEA3R data:

- https://portal.netsage.global/grafana/d/xk26lFhmk/flow-data-for-circuits?orgId=2&var-Sensors=NEAAR%20New%20York%20sFlow&var-Sensors=NEA3R%20NY-CPH-AMS&var-country_scope=All&var-is_net_test=yes

NetSage Focus on Use Cases

- Flow Data Dashboards
  - What are the top sites using my circuits?
  - What are the top sources/destinations for an organization?
  - Who's using my archive?
- Moving towards debugging dashboards
  - What are the flows like between these two orgs?
  - There was a performance spike on my circuit – what was it?
  - Who's transferring a lot of data really slowly?
- If SNMP data then Bandwidth Dashboard:
  - How used are the links? (http://portal.netsage.global)
  - Where are congestion points?

NetSage Science Registry

- A tool to understand science use of networks
- As part of flow collection process, we add tags
  - ASN
  - Organization
  - Science project and science discipline, if known
- Then the end of the IP address is removed
- Currently ~450 entries

Things that are coming….

- Who is transferring a lot of data to/from my organization but getting poor performance?
  - Set an end point
  - Pick a minimum data size
  - Pick a maximum transfer rate

Thank You

- Questions to edmoyn@iu.edu
- https://internationalnetworks.iu.edu
- https://portal.netsage.global/
- NEA^{3}R: NSF #2028495
- NetSage: NSF #1540933