I2 Services in 2022 and Beyond

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Agenda

1 | Highlights of the new Internet2 infrastructure
Two productive years. Program accomplishments during a busy pandemic!

2 | Planning for software-enabled capabilities

3 | Q & A – Areas of Focus and Directions for 2022 and beyond

Next Generation Infrastructure

Internet2 Next Generation Infrastructure Program

The Next Generation Infrastructure Program is a full set of activities to review and update the services, value and supporting technology of the Internet2 infrastructure portfolio (and relationships in the larger ecosystem)

- Includes the services and service models through which the community adopts Internet2 infrastructure services
- Includes new features, primarily driven by software, automation and systems virtualization to allow the infrastructure to be more readily integrated into the broader enterprise, campus, regional and cloud environment around us
- Started in 2016 with gathering of user requirements

Data-Intensive Research

Enhanced Cloud Access

Software-Driven Infrastructure

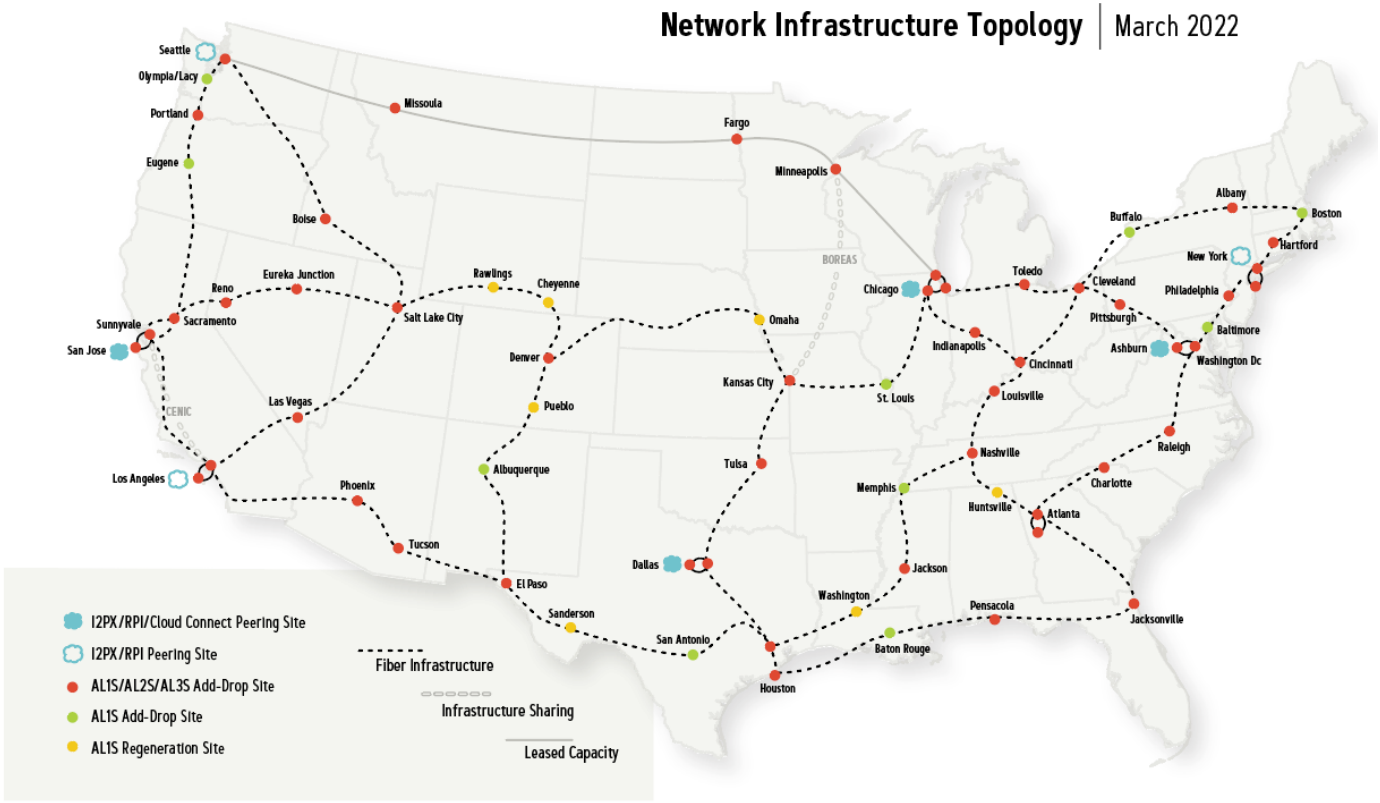
Sustainable Economics

Infrastructure Sharing

NGI Capabilities Update

- **Capacity**
- **Automation**
- **Measurement**
- **Security**
- **Operating Cost Reset**

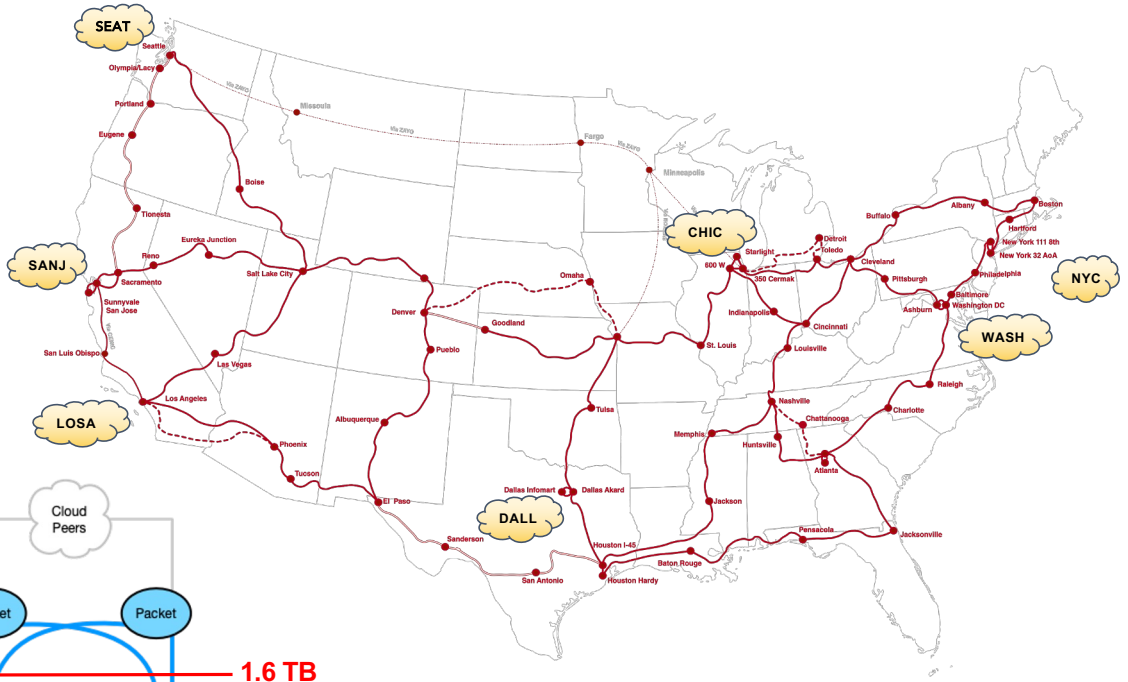
- Expanded Engineering Team
- New Software Team

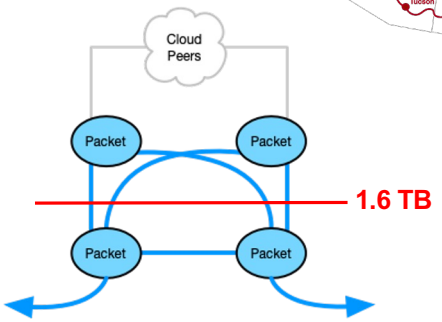


Cloud Capacity Enhancements

Internet2 Network now extends directly to these peering points

- Allows regionals and members to reach cities their own infrastructure doesn't reach
- Highly Resilient
- Rapid / low friction implementation
- Massive scale of the service
- Increasingly self-service





Internet2 Cloud Connect **I2CC**

Internet2 Peer Exchange **I2PX**

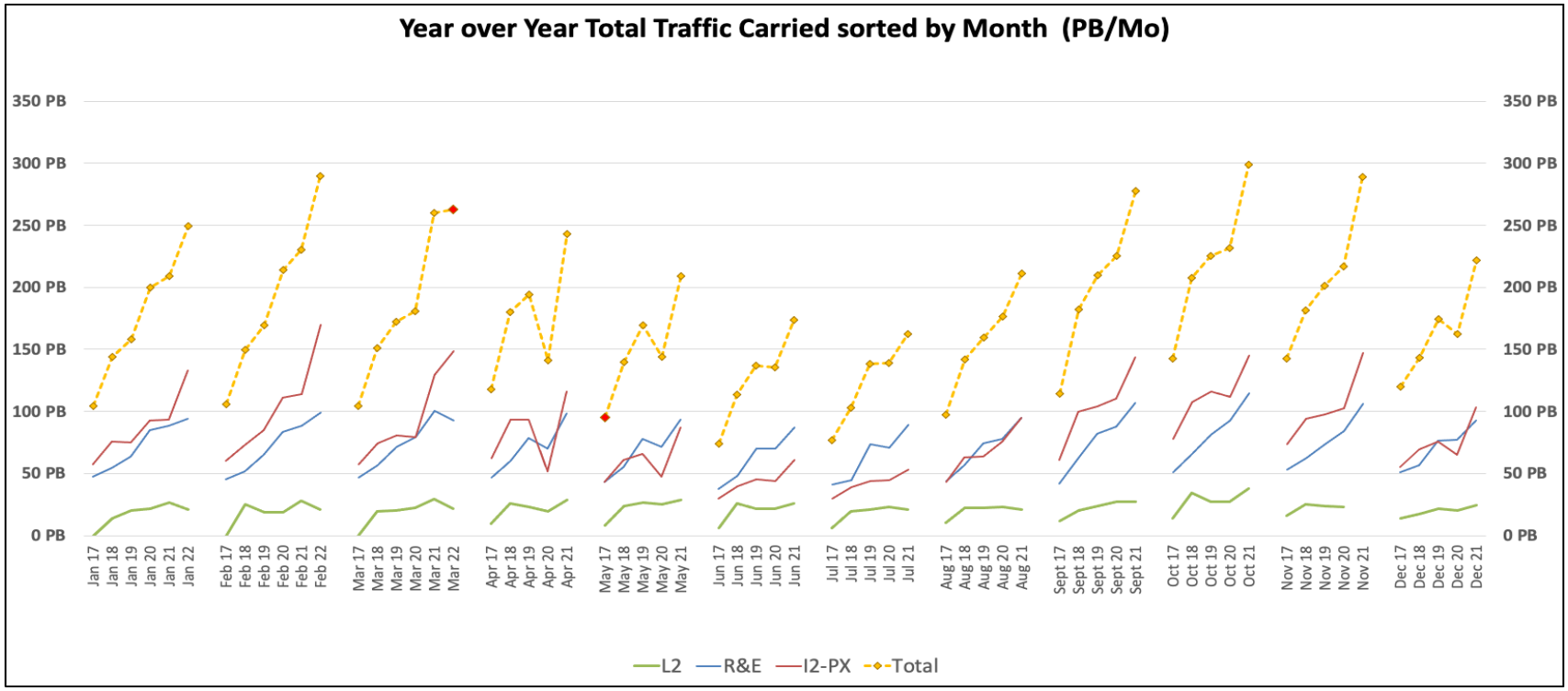
Internet2 Rapid Private Interconnect **I2RPI**

Internet2 Last Resort Full Internet Access **rIPcord**

Traffic Trends, Peering and Cloud Capacity Augments

COMMERCIAL PEERING CAPACITY

2019	2021
980 Gbps	5,640 Gbps

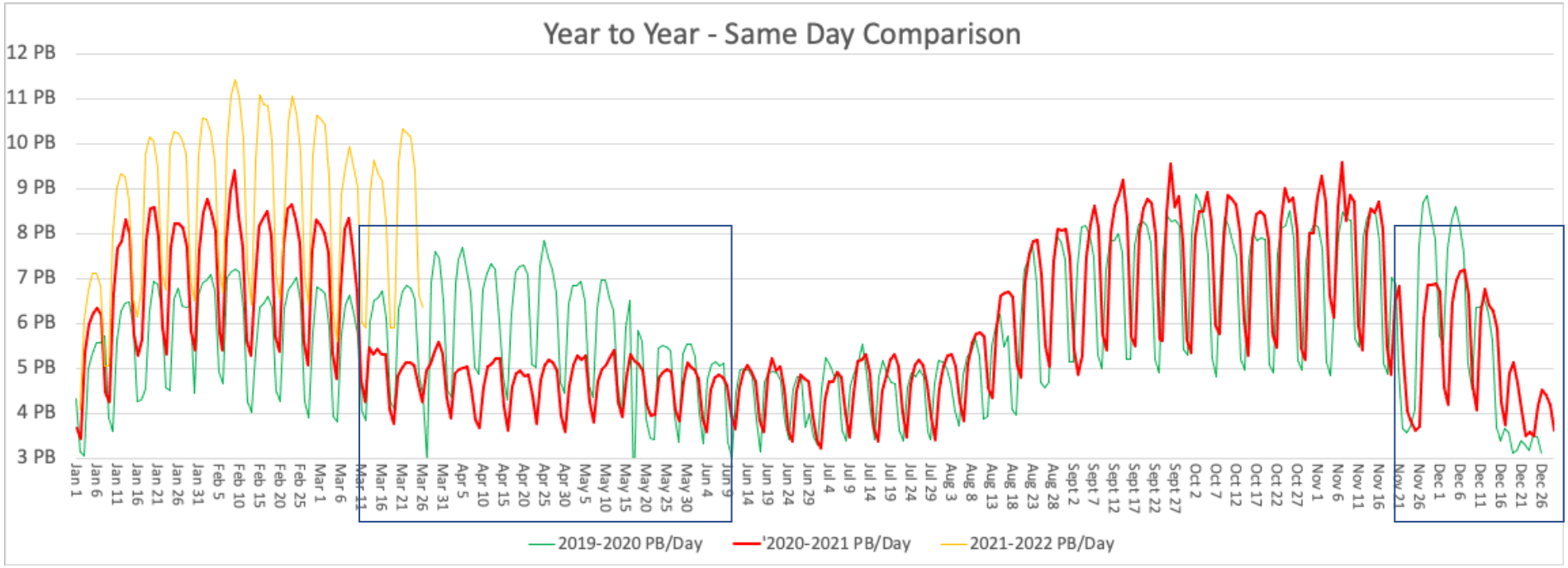


By the Numbers – Network Traffic Carried

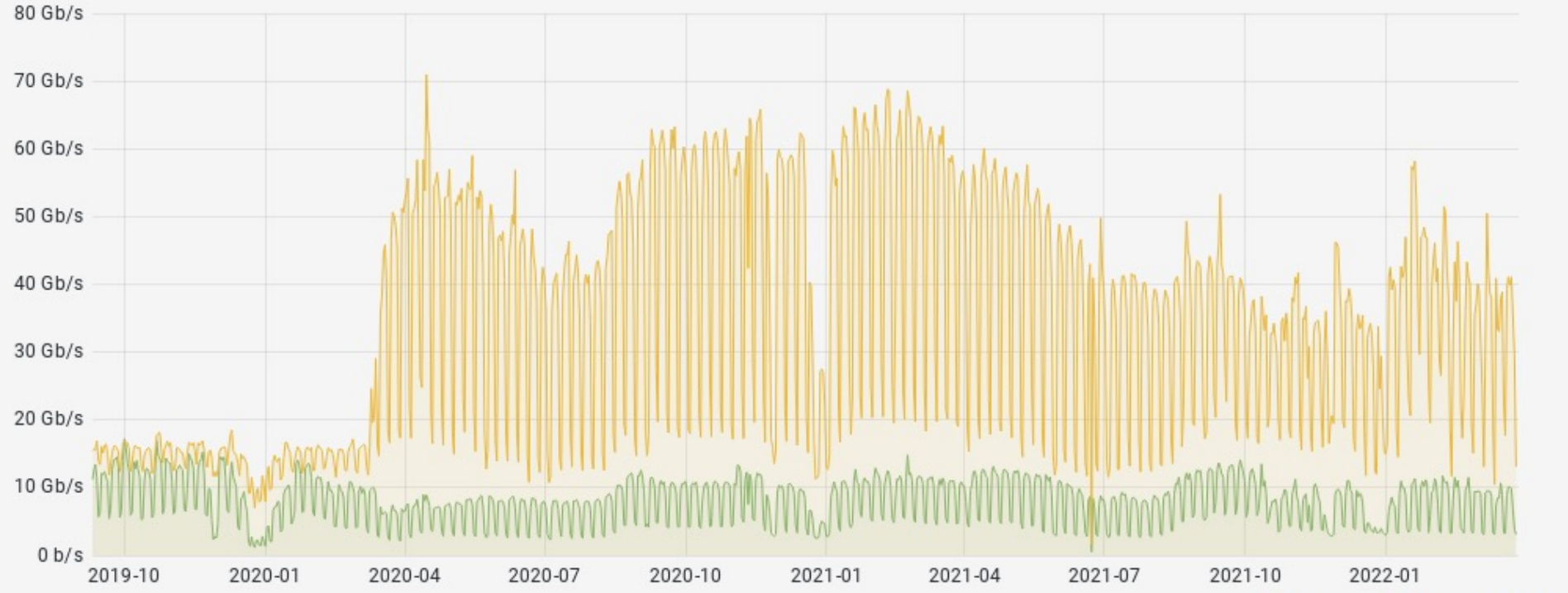
70% less space / 70% less power

	2010	NGI Online (Dec 21)
• Total Annual Traffic	104 PB	2,785 PB
• Total I2PX Traffic	56 PB	1,288 PB
• Total R&E Traffic	48 PB	1,161 PB
• Total ”Other” Traffic (Cloud Connect, LHCOne, L2, etc.)	0PB	334 PB
• Total Contracted Bandwidth	203 Gbps	10,290 Gbps
• Backbone Link Capacity	250 Gbps	127,700 Gbps
• Total Device Capacity (installed 100g/400g ports)	453 Gbps	810,000 Gbps

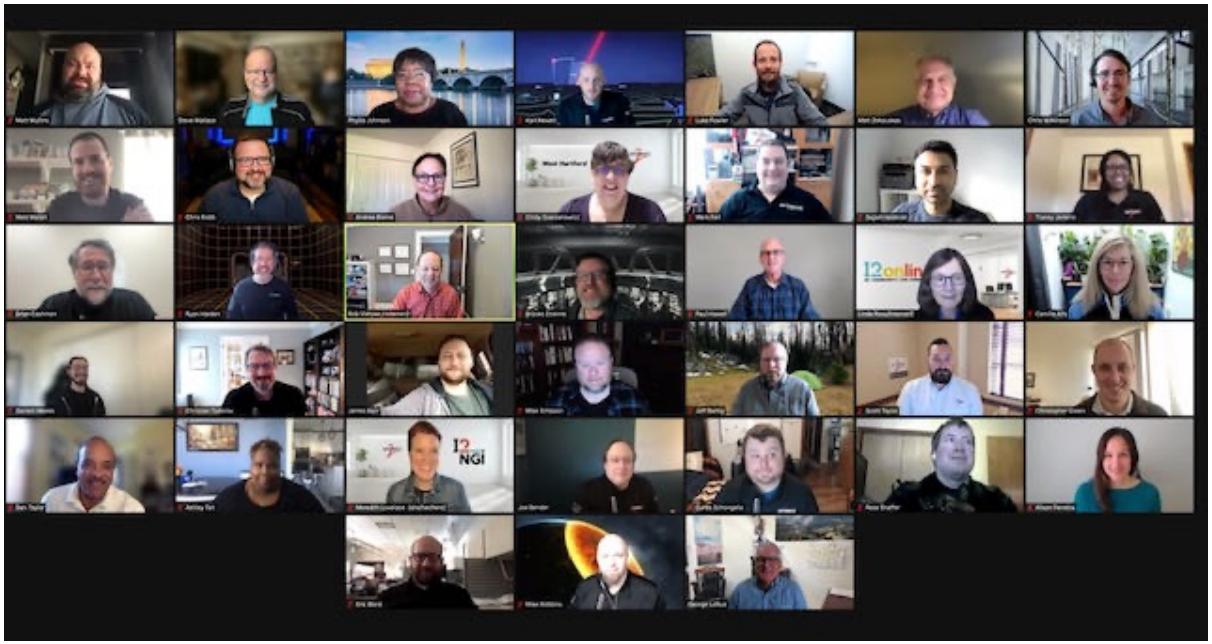
Internet2 Overall Pandemic Traffic History



One Large Home Broadband Provider During the Pandemic



An Enormous Community Effort. Thank you!



There are many additional Internet2 and GlobalNOC contributors who didn't make the photo. THANK YOU TOO!

Towards the Future!

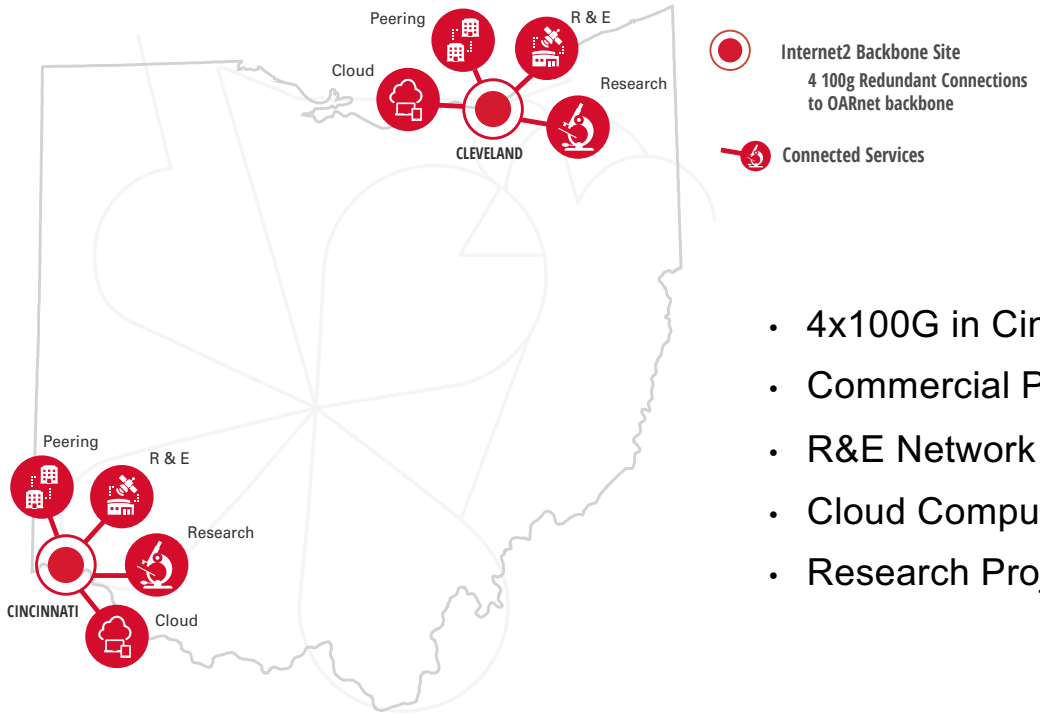
FIRST TO 400G


I2 COMPLETE NGI
FIRST TO 400G
FLR
Florida LambdaRail
Florida's Research and Education Network
Indiana GigaPOP
MAX
MID-ATLANTIC CROSSROADS
OARnet
uen
Utah Education and Telehealth Network

OARnet

An OH·TECH Consortium Member

OARnet is one of the first five networks to implement a 400G connection to theInternet2 Network



- 4x100G in Cleveland
- Commercial Peering
- R&E Network
- Cloud Computing
- Research Projects

- 4x100G in Cincinnati
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Enabling Science & Enterprise Services

2022 Network Services Activities

Delivery of member-facing self-service software-driven network products
- Updated Router Proxy
- New Routing and Routing Security Portal
- Updated Cloud-Connect Portal
- More enhanced role-based access / authorization for services via InCommon

Platform Services Agreement – Complete new agreement transition

Rallying Routing Security Across the Community

Community Telemetry Sharing Project – Research Data Tagging – Automation

Operations RFP Award & Transition – RFP Implementation & Onboarding Senior Staff

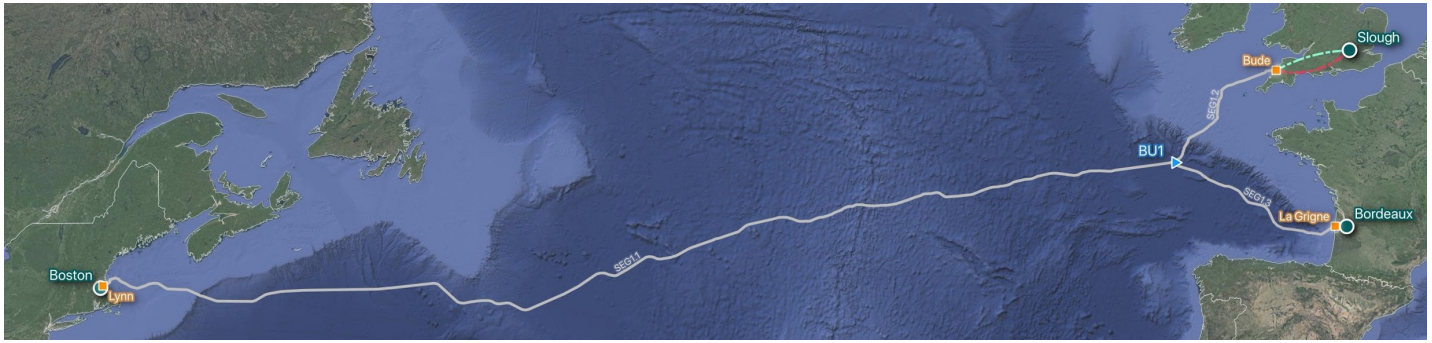
Supporting community interests in federal infrastructure programs

… and a few others ..

2022 International Global Connectivity Highlights

400G Transatlantic Capacity Additions/Upgrades on Amitié cable
- 1 x 400G for Internet2/CANARIE (Boston – Bordeaux)
- 2 x 400G for ESnet (Boston – London, Boston – Bordeaux)
- late 2022 / early 2023 (due to construction of both wet-plant and terrestrial)

Potential upgrade of exchange-points (MAN/LAN and WIX
- Hardware (Juniper QFX likely replaced with Cisco NCS or ASR)
- Automation (support for FABRIC)
- Protocols (move to EVPN)



2022 Open Science Grid Long Term Vision

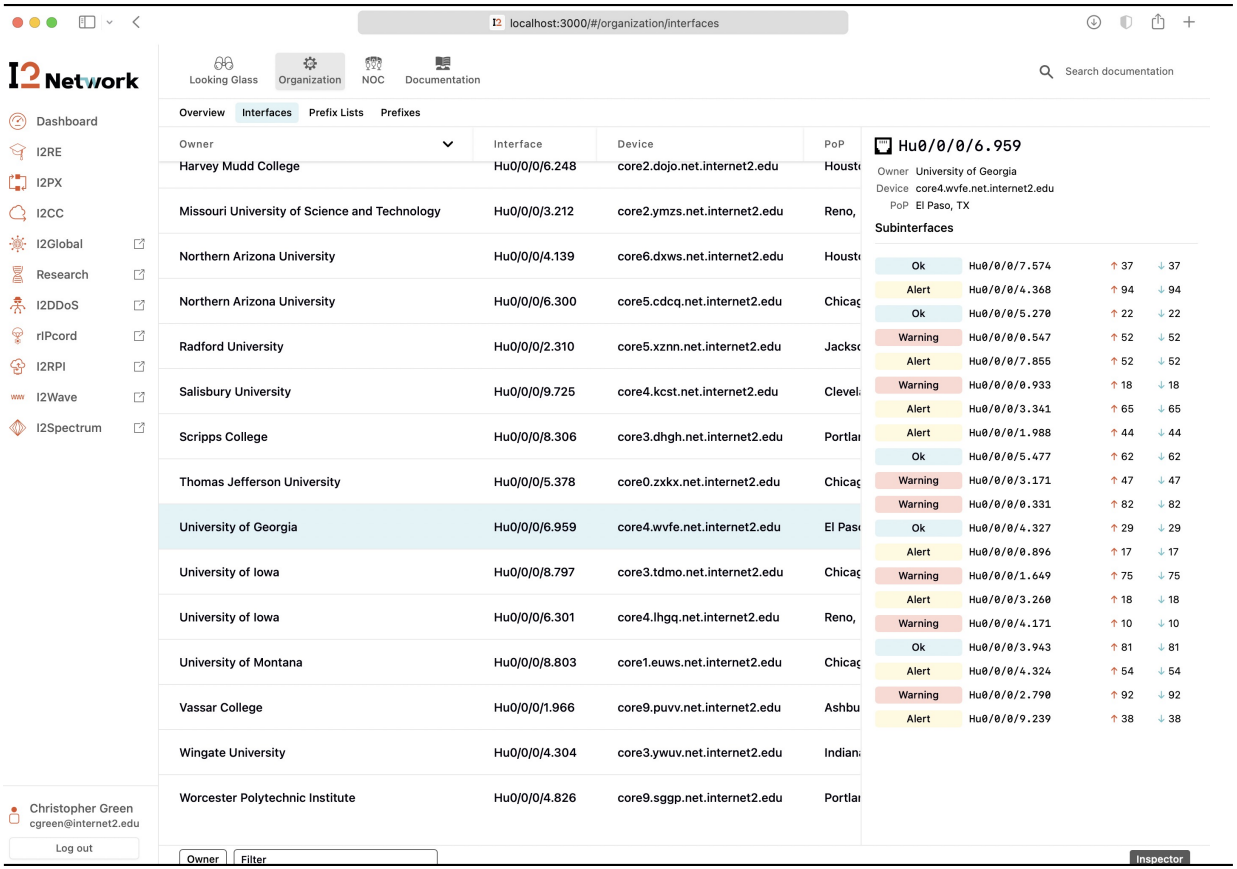
Create an Open National Cyberinfrastructure that allows the federation of CI at all 3,900 accredited degree granting higher education institutions.

- Open Science
- Open Data
- Open Source
- Open Infrastructure

Internet2 will be hosting 5 additional open science grid caches in the network this year.

- Existing Internet2-hosted nodes are the highest utilization in the world.
- Our piece of the national research platform proposal award.

New Network Services Web Portal and API Set



"Internet2 Insight"

Access to many of our software-controlled services

"Interface status" example


2022
TECHNOLOGY
exchange
DENVER
INTERNET2
DECEMBER 5-9

Questions?