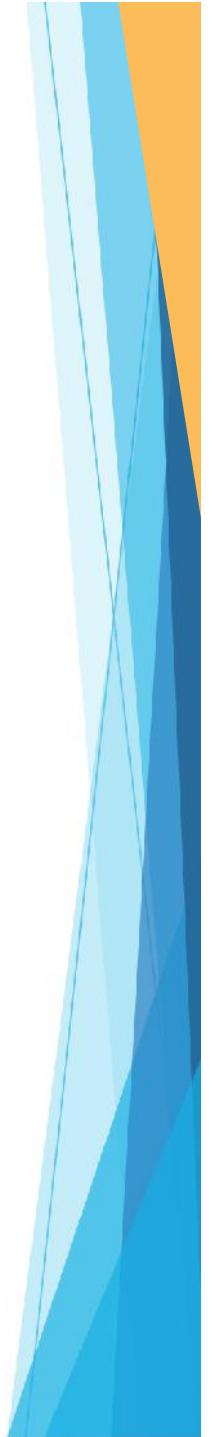


Sun Corridor Network Introduction to AZBSN

June 14, 2020



Sun Corridor Network
Arizona Research and Education Network



Sun Corridor Network Overview

- ▶ Collaboration among ASU, NAU, & UA
- ▶ Sponsored by ABOR
- ▶ 2013 creation as standalone research & education network
- ▶ Expanded mission to K-14 & other educationally focused users through Internet 2 U.S. UCAN sponsorship
- ▶ Alternative ISP, Gateway to Internet2, K-20/Libraries, Museums, Municipalities, etc.



EDUCATE • DISCOVER • IMPACT



Sun Corridor Network
Arizona Research and Education Network

Sun Corridor Network Overview



- ▶ Arizona's Internet2 Connector
- ▶ Three 100Gbps points-of-presence; Tucson, Phoenix & Flagstaff
- ▶ Dual direct 10Gbps connections between Tucson & Phoenix; Phoenix & Flagstaff
- ▶ Peering with multiple Tier 1 ISPs & Content Providers
- ▶ Commercial Internet Peering Service (I2PX)
 - ▶ Strategic connectivity to ~80 top content destinations
 - ▶ Low latency, one hop access to Google, Yahoo, YouTube, etc.
 - ▶ Supports IPv4, IPv6 & multicast

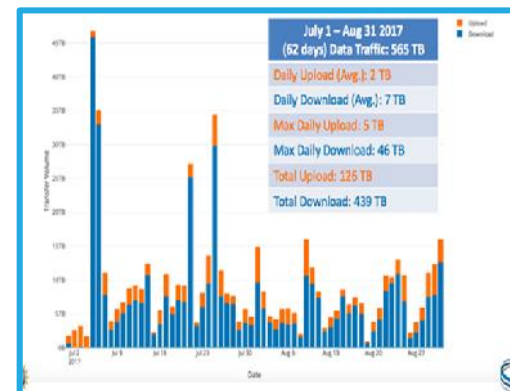


Sun Corridor Network
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Sun Corridor Network Overview



- ▶ High network performance & reliability to mission critical university functions
 - ▶ Redundancy down to module level
 - ▶ Low latency; tested to ~50% lower on comparable commercial routes
 - ▶ Jumbo frames support: 9Kb payload vs. 1.5Kb for most commercial ISPs
 - ▶ Less congestion
- ▶ ~ 90% of combined University traffic transits Sun Corridor Network
 - ▶ UA 95% @ ~12 Gbps peak
 - ▶ ASU 90% @ ~17 Gbps peak
 - ▶ NAU 100% @ ~ 10 Gbps peak



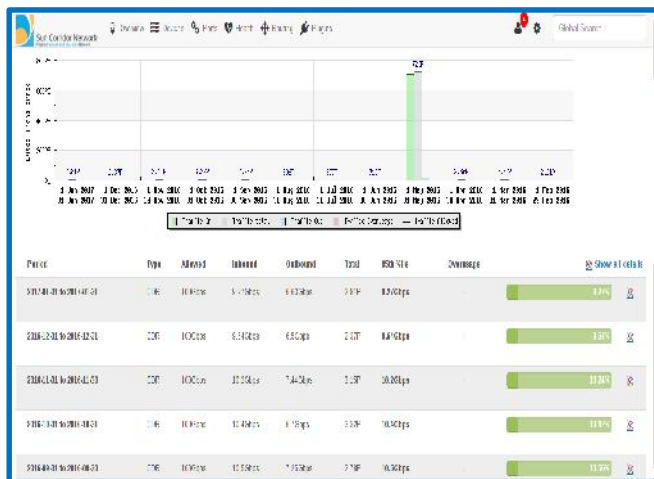
UA Cyverse Data Store



Sun Corridor Network
Arizona Research and Education Network

Sun Corridor Network SLA's

24/7/365 Network Operations Center (NOC)



Web Portal: Local Monitoring of All Circuits & Usage Reporting

- ▶ **Availability**
 - ▶ 99.999% availability all network components, exclusive of planned maintenance periods.
- ▶ **Outage Response Time**
 - ▶ Technician response \leq 30 minutes
- ▶ **Mean Time to Repair**
 - ▶ \leq Four hours
- ▶ **Mean Time Between Failures**
 - ▶ Cisco Service Aggregation Routers spec: 12.54 years.
- ▶ **Limiting or Throttling**
 - ▶ Bandwidth at contracted (CDR) per NSO



Sun Corridor Network Overview



- ▶ Enables access to;
 - ▶ Internet2 & commercial Internet
 - ▶ Cloud services at consortium pricing
 - ▶ DDoS service; self monitored at no cost
 - ▶ Cloud Connect: AWS & Azure
 - ▶ Eduroam
 - ▶ InCommon Trust & Identity
 - ▶ Regional/national research & academic communities
 - ▶ Leading science & technology partners
 - ▶ Partnerships & shared resources among Arizona members



Sun Corridor Network
Arizona Research and Education Network

What is Internet 2?

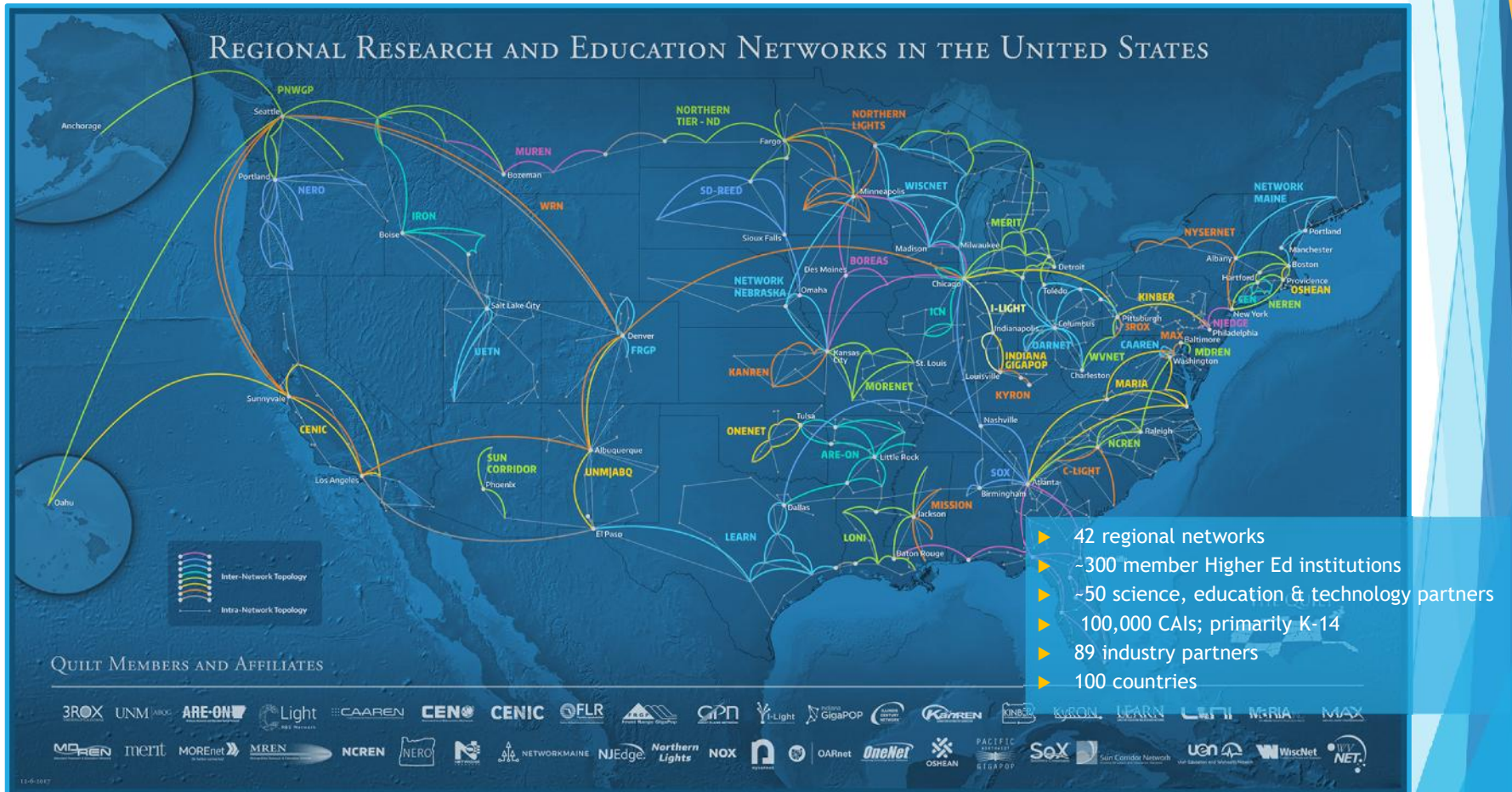
A national backbone network of the most advanced 100 gigabit networking technologies.



Sun Corridor Network
Arizona Research and Education Network

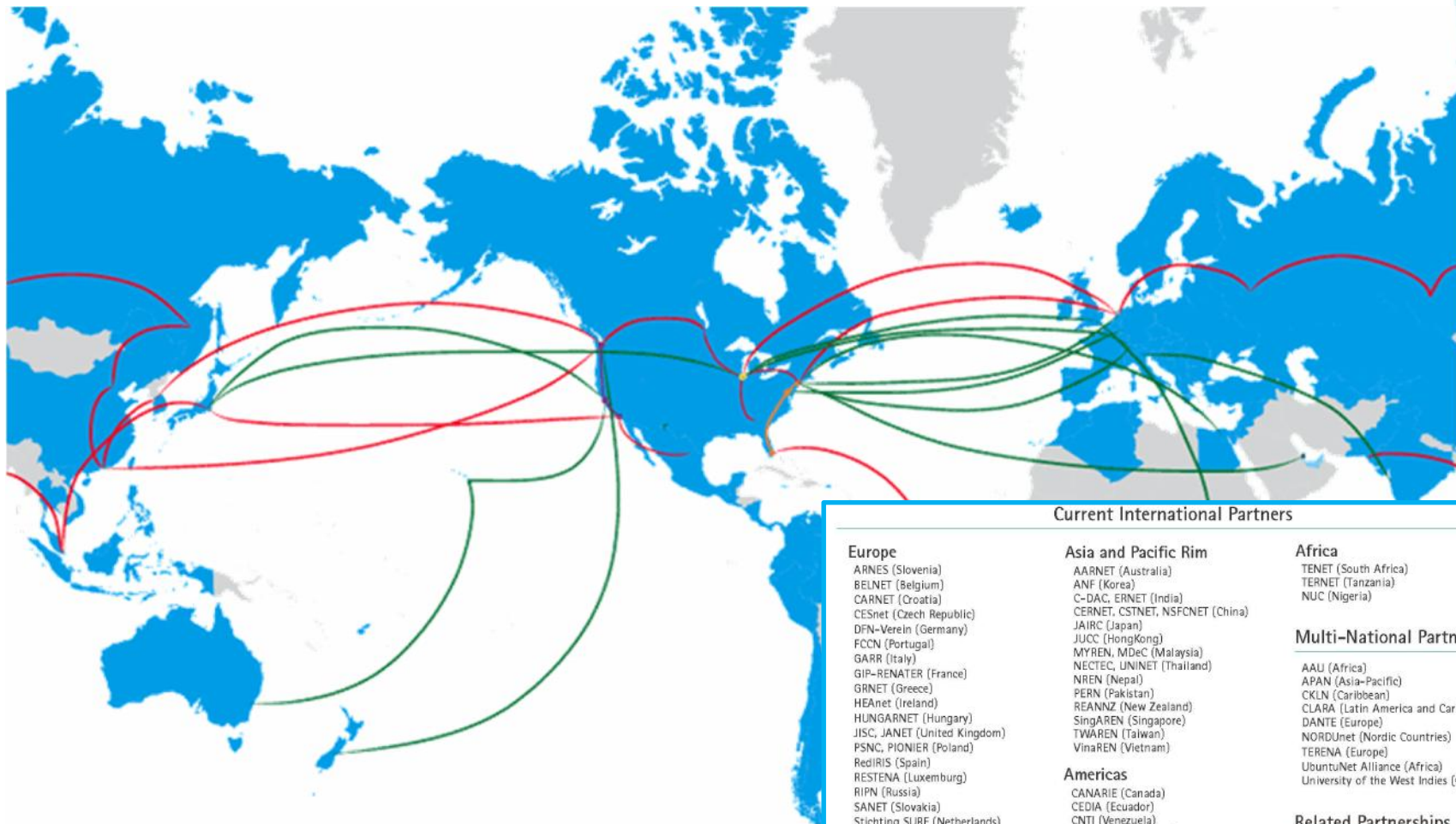
What is Internet 2?

Comprised of Regional Research & Education Networks serving K-20 ecosystem



What is Internet 2?

Global Reach



Current International Partners

Europe

ARNES (Slovenia)
BELNET (Belgium)
CARNET (Croatia)
CESNet (Czech Republic)
DFN-Verein (Germany)
FCCN (Portugal)
GARR (Italy)
GIP-RENATER (France)
GRNET (Greece)
HEAnet (Ireland)
HUNGARNET (Hungary)
JISC, JANET (United Kingdom)
PSNC, PIONIER (Poland)
RedIRIS (Spain)
RESTENA (Luxemburg)
RIPN (Russia)
SANET (Slovakia)
Stichting SURF (Netherlands)
SWITCH (Switzerland)

Middle East and Gulf States

ANKABUT (UAE)
Israel-IUCC (Israel)
KACST (Saudi Arabia)
MCIT [EUN, ENSTINET] (Egypt)
Qatar Foundation (Qatar)

Asia and Pacific Rim

AARNET (Australia)
ANF (Korea)
C-DAC, ERNET (India)
CERNET, CSTNET, NSFCNET (China)
JAIRC (Japan)
JUCC (HongKong)
MYREN, MDeC (Malaysia)
NECTEC, UNINET (Thailand)
NREN (Nepal)
PERN (Pakistan)
REANNZ (New Zealand)
SingAREN (Singapore)
TWAREN (Taiwan)
VinaREN (Vietnam)

Americas

CANARIE (Canada)
CEDIA (Ecuador)
CNTI (Venezuela)
CR2Net (Costa Rica)
CUDI (Mexico)
INNOVA[RED] (Argentina)
REUNA (Chile)
RNP [FAPESP] (Brazil)
SENACYT (Panama)

Africa

TENET (South Africa)
TERNET (Tanzania)
NUC (Nigeria)

Multi-National Partners

AAU (Africa)
APAN (Asia-Pacific)
CKLN (Caribbean)
CLARA (Latin America and Caribbean)
DANTE (Europe)
NORDUnet (Nordic Countries)
TERENA (Europe)
UbuntuNet Alliance (Africa)
University of the West Indies (Caribbean)

Related Partnerships

APRU
IEEAF



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Internet2 Backbone Latency



Internet2 Backbone Latency



Internet2 Community College Benefits



- ▶ Access to Internet2 - the fastest, most advanced network for Higher Education in the U.S. - & Arizona's Regional Research & Education Network - Sun Corridor Network

Internet2 **NET+**

- ▶ Enjoy rapid deployment & ease of integration of commercial cloud services uniquely configured for academic needs, legal terms negotiated via large community power, frequently substantial financial savings.



- ▶ Global wireless network access service developed for the international research and education community, allowing researchers, faculty, and staff seamless wireless access at all participating institutions.



- ▶ Internet2's InCommon Trust & Identity in Education and Research initiative will provide a common framework for campus identity & access management (IAM) components.



Sun Corridor Network
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Internet2 Membership Model

- ▶ Must be Regional Connector (Sun Corridor Network) user
- ▶ Sponsored into Internet2 through Sun Corridor Network paid US UCAN fees
- ▶ If CC desires access to other I2 services (Net+), fee Model based on a formula factoring;
 - ▶ IPEDS Total Annual Expenditures
 - ▶ Total Annual R&D Expenditures
- ▶ Membership comprised of Membership Dues & a Network Participation Fee
 - ▶ Estimated Per College: \$11,8000 annually
 - ▶ EduRoam Fee waived (\$0.10 per student/faculty annually)
 - ▶ InCommon Fee waived (\$1750 per college annually)



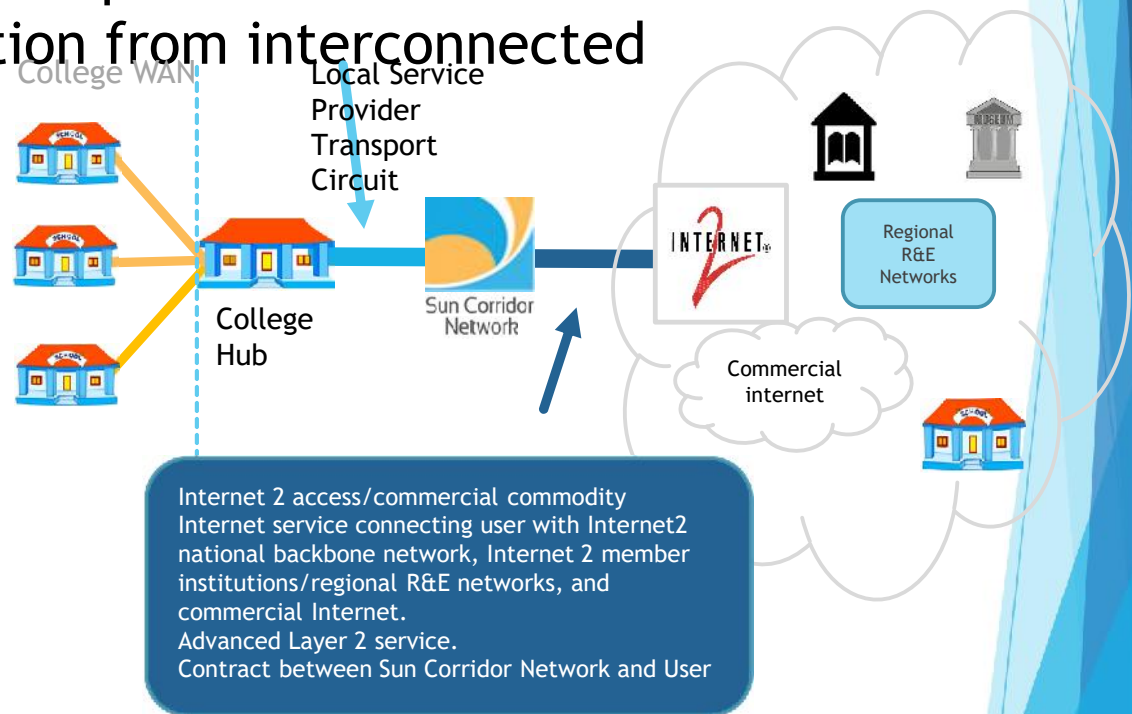
Sun Corridor Service Offering

- ▶ Internet2 & commercial commodity Internet Access
- ▶ Market competitive ISP rates; any data rate; any term length
- ▶ 6 IP Addresses at no additional charge. More available.
- ▶ DNS Zone hosting included
- ▶ Eligible user - any public entity with an educational mission
- ▶ Distributed Denial of Service (DDoS) Mitigation Service as no-charge feature of ISP offering
- ▶ Cloud Service access (AWS, Azure) at no additional charge



Sun Corridor Service Offering

- ▶ Intergovernmental Agreement, Master Service Agreement, or E-Rate RFP response
- ▶ SCN can provide transport services
- ▶ Customer can secure transport to a Sun Corridor Point of Presence location from interconnected local service provider.
 - ▶ Cox Business
 - ▶ Centurylink
 - ▶ Zayo
- ▶ Potential bundled dark fiber transport opportunity for some



Sun Corridor Network
Arizona Research and Education Network

Current Users



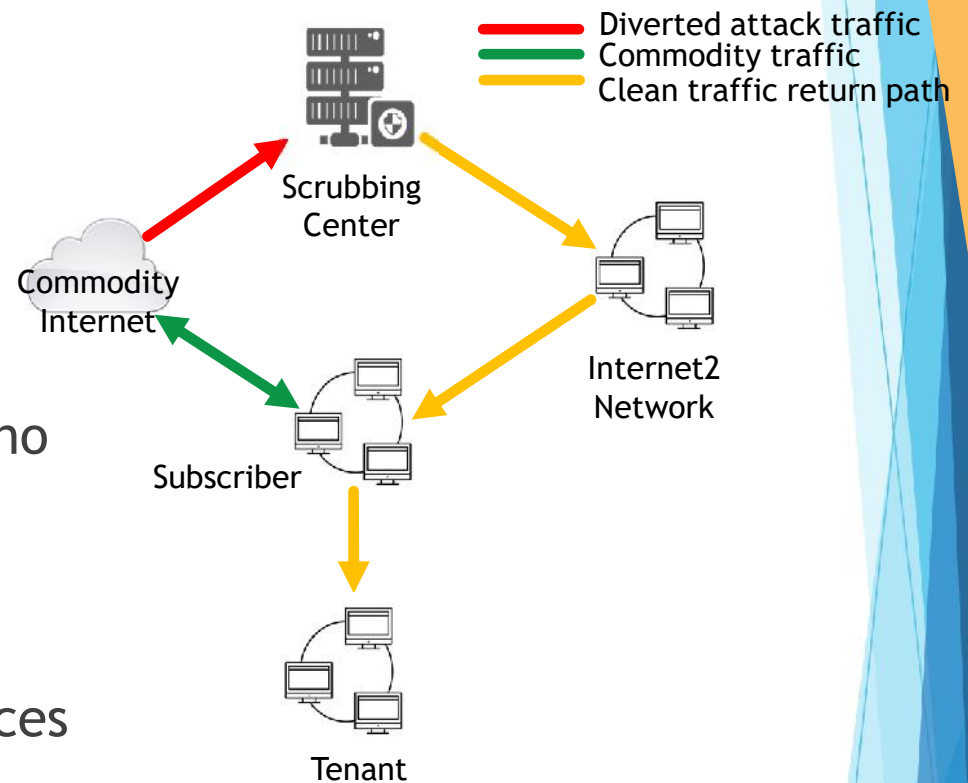
Internet2 DDoS Mitigation Service Discussion

- ▶ Cloud-based, shared capacity, subscription-based Distributed Denial of Service (DDoS) Mitigation Service
- ▶ Users direct attack traffic to the I2 DDoS provider; clean traffic back via vlan on their existing Internet2 connection
- ▶ 1G of clean pipe capacity (commit rate) burstable into the available 10G capacity (initially)
- ▶ Access to Security Operations Center (SOC), services portal and a direct vlan back to edge



Internet2 DDoS Mitigation Service

- ▶ Subscriber - Tenant model
 - ▶ Sun Corridor as Subscriber
 - ▶ NAU, UA, ASU as Tenants
- ▶ K-14 users as Tenants; shared Sun Corridor capacity. On-demand (self monitored) service no charge feature of ISP service.
- ▶ “Monitored Router” service available to Tenants without on-premise attack detection appliances \$750 MRC



Internet2 Cloud Exchange

- ▶ Aggregated service through Internet2
- ▶ Direct physical connection; 2 - 4 cities
- ▶ Internet2 Cloud Exchange would allow subscribers to access any of several cloud providers
 - ▶ AWS Direct Connect
 - ▶ Microsoft Azure
 - ▶ Google (2019)
- ▶ No additional cost to Connector Networks like Sun Corridor

