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TNC 19 : Automation, Orchestration & Virtualization BoF

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Agenda

Internet2 Background

Use Case Stories / Requirements

Automation, Orchestration & Virtualization Program Status Update & Next Steps

Discussion



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Internet2 Network Today

Services:

- Advanced Layer 1 Spectrum & Waves
 Advanced Layer 2 Ethernet VLANS
 Point to Point vlan networks
 Point to Multipoint vlan Networks
 Point to Cloud Direct connect Networks
 Portal and API Driven on demand networks
 Advanced Layer 3 Virtual Networks
 Research and Education Network
 Internet2 Peer Exchange (formerly TR-CPS)
 Internet2 Cloud Connect Multicloud VRF
 MANRS Support
 Portal and API Driven on demand networks
 Other: Private Networks, dDOS, etc
- With regional & global partners, Internet2 extends throughout the US and to Africa, Asia, Australia, Europe & South America



15,500 Miles Dark Fiber • 65 Ciena 6500 Optical Add Drops • 45 Juniper MX960 MPLS Nodes • 180-200 petabytes moved per month • 1.85 exabytes moved in 2018

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What is NGI?

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 a number of infrastructure upgrade projects

Includes new features, primarily driven by software, automation and systems virtualization to allow the infrastructure to be more readily integrated in to the broader campus, regional and cloud environment around us.

2022 Community Requirements:

Support of Research Automated & Programmable Cloud & Peer Connected Embedded Security Regional/National Integration Infrastructure Sharing Academic Enterprise Support Global Reachability Operational Telemetry Research Data Resilient

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Economics & Scalability Operations Secure

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5 Stories NGI Must Support

Support the Data Intensive Researcher

- Support Software Driven Infrastructure
- Support Cloud for Research and Administration
- Deliver Ecosystem-wide Solutions
- Reset Internet2 Economics for Scale

All of these, perhaps except network economics, are reliant on evolving software/automation capabilities

2020 Automation, Orchestration, Virtualization Planning Agenda





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Our Evolving Service Portfolio

Research & Education	Interconnect Services	Cloud Connect Services
Services	(to/from Peer exchanges)	(enabling campus move to the cloud)
 L3 Global R&E L3 I2-Peering Exchange L3 on-demand L3 LHC/OSG/NRP/ERN Science Networks L3 dDOS Service L2 Circuits L1 Waves/Spectrum 	 L3 I2-Peering Exchange (reduced restrictions) L2/L3 Rapid Private Network Ports (low cost bundles of ports) L3 (yourAS) on-demand VRF L3 Router on demand L2 Circuits L1 Waves/Spectrum 	 L3 Multi-Cloud Private VRF L3 I2-Peering Exchange AWS / GCP / MAER Integration L2 Circuits L1 Waves/Spectrum

Advanced Expectations / Advanced Operations / Telemetry / Automation / Orchestration



NEXT GENERATION INFRASTRUCTURE



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NGI: Software, Systems, Automation

Systems supporting Service Evolution:

- Telemetry Service
- Performance Assurance Systems & Services
- Self Service Network Services
 - Cloud Connect Portal / OESS 2.0
 - Future evolution includes flow and telemetry influenced orchestrated services

Supporting Technology: Automation Virtualization Orchestration Trust & Identity



NEXT GENERATION INFRASTRUCTURE



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NGI: Software, Systems, Automation

- Goal: Automate internal processes & configurations
 - consistency, rapid delivery
- Goal: Add self-service & API features
 - reduce time to results
 - enable infrastructure sharing
 - Support network researchers and distributed operations
- Goal: Update measurement & analytics tools
- Goal: Provide leading network security capabilities
 - Enable and protect science & administrative workflows





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NGI: *Today's environment*

- Cloud-connect portal (OESS 2.0.2) Is our primary user-facing self-service tool, includes cloud connectivity, on demand L3 VRF, on demand L2
- GlobalNOC tools our primary backend support system (dB, alarming, measurement,
- Pacific Research Platform & Open Science Grid are our experimental efforts in NFV/Virtualization above the network









Today's environment (cont'd)

Released cloud-connect portal (OESS 2.0.2)

- L2 PtP and PtMP
- L3 Cloud VRF (Internet2 AS)
 - AWS, GCP, Azure API's
- Traffic and BGP status
- Manual Workgroup and Directory Services

Evolution Items -

- Grouper/CoManage support (migration of workgroups)
- Prefix Lists
- Your-AS
- On Demand perfSONAR at interconnection points

Cloud Connect Portal 2.0.2

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Automation: GlobalNOC Tools Automation Agenda

Year One goal of the GRP Automation project is to automate 80% of the changes to the core L2/3 equipment for networks the GlobalNOC staff actively configure.

- Project 1 "Set System", beginning Monday, May 20
- Project 2 Global Prefix lists
- Project 3 Per-Peer Prefix lists
- Project 4 Campus
- Project 5 Interface Backbone
- Project 6 Interface Customer/Peer
- Project 7 Service Provisioning
- Project 8 Campus



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Telemetry

Current State

- SNMP polling, data stored in TSDS
 - Query via Grafana and API
- Netflow to Deepfield
 - Limited sharing if shared it is anonymized
- Syslog to aggregators and Splunk

Future State

- SNMP will continue to survive on life support
- Netflow broader sharing
- Syslog
- Streaming Telemetry
 - Data (interface stats, buffers, etc) streamed frequently (1-2 sec)
 - Opportunities for end to end monitoring
- BMP BGP Monitoring Protocol

Telemetry - Community Collaboration



Service Provisioning at the edges

Current State	Potential Future State
 OESS for Layer 2/3 VPNs across Internet2 Access to cloud providers and other members Connectors/regionals provision VLANs or separate VPNs Process involves coordination between multiple entities 5+ for campus to campus No orchestration, minimal automation 	 Service orchestration and provisioning across multiple domains Seamless MPLS Works with differing topologies and label transport protocols Internet2 using Segment Routing, connector using RSVP, campus using LDP Segment routing simplifies this Developing a model for service provisioning at the edges

Pilot opportunity!



Discussion?

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