Application-Based Network Operations (ABNO)


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Control of Today’s Networks

• Current network operation is not adapted to flexible networking
• Multiple manual configuration actions are needed for network nodes
• Network solutions from different vendors typically use specific OSS/NMS implementations
• Very long provisioning times
• Lack of network bandwidth flexibility and inefficient use of inherent function
Network Operation Requirements

- The network does not need to be seen any longer as a composition of individual elements.
- Applications need to be capable of interaction with the network.
- Support of the next generation of variable and dynamic transport characteristics.
- Automated deployment and operation of services.
  - “Create a new transport connection for me”
  - “Reoptimize my network after restoration switching”
  - “Respond to how my network is being used”
  - “Schedule these services”
  - “Resize tunnels”
Network Operation Framework
Building Blocks

• Avoiding the mistake of a single “controller” architecture
  • As it encourages the expansion and use of specific protocols

• Discovery of network resources

• Network resource abstraction, and presentation

• Routing and path computation

• Multi-layer coordination and interworking
  • Multi-domain & multi-vendor network resources provisioning through different control mechanisms (e.g., Optical, OpenFlow, GMPLS, MPLS)

• Policy Control

• OAM and performance monitoring

• Leveraging existing technologies
  • What is currently available?
  • Must integrate with existing and developing standards
Application-Based Network Operations (ABNO)

- Application-Based Network Operation (ABNO) framework.
- “A PCE-based Architecture for Application-based Network Operations”
  - draft-farrkingel-pce-abno-architecture
Application-Based Network Operation (ABNO)

- “Standardized” components and co-operation.
- Policy Management
- Network Topology
  - LSP-DB
  - TED
  - Inventory Management
- Path Computation and Traffic Engineering
  - PCE, PCC
  - Stateful & Stateless
  - Online & Offline
  - P2P, P2MP, MP2MP
- Multi-layer Coordination
  - Virtual Network Topology Manager
- Network Signaling & Programming
  - RSVP-TE
  - ForCES and OpenFlow
  - Interface to the Routing System (I2RS)

Figure 1: Generic ABNO Architecture
ABNO Use Cases

- The following slides present various use cases shaping the development of ABNO:
  - Multi-layer Path Provisioning
  - Multi-layer Restoration
  - Network Optimization after Restoration
1. OSS requests for a path between two L3 nodes.
2. ABNO controller verifies OSS user rights using the Policy Manager.
3. ABNO controller requests to L3-PCE (active) for a path between both locations.
4. As L3-PCE finds a path, it configures L3 nodes using Provisioning Manager.
5. Provisioning manager configures L3 nodes using the required interface (RSVP-TE, OpenFlow, etc.).
6. OSS is notified that the connection has been set-up.
ABNO - Multi-Layer Restoration

1. Upon network failure, the OSS notifies the ABNO controller of all failed E-2-E connection and possible root cause.
2. NMS requests a new E-2-E connection.
3. ABNO controller verifies request via the Policy Manager.
4. ABNO controller requests to L3-PCE (active) for a path between both locations.
5. As L3-PCE finds a path, it configures L3 nodes using Provisioning Manager.
6. Provisioning Manager configures L3 nodes using the required interface (RSVP-TE, OpenFlow, etc.)
7. OAM Handler verifies new connectivity.
8. OSS is notified that the new IP links are up and tested (SNMP, etc.).
Next Steps for ABNO

- Further discussion on key components
  - Policy
  - Capability discovery and registration
  - Resilience
  - North-bound Interfaces
  - Use of Common Network Models

- Continued development and polishing of Use Cases

- Prototyping
  - European Commission Project FP7 IDEALIST