Automated Bandwidth Allocation across Heterogeneous Networks

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AutoBAHN is...

• … a research activity for engineering, automating and streamlining the inter-domain setup of guaranteed capacity (Gbps) end-to-end paths

• … a Joint Research Activity of the GN2 project
  – GN2 is an European Commission-funded project, with all the European Research and Education networks (NRENs) as partners
GÉANT2

- 25 POPs (+4) serve >30 NRENs
- 11600 km of fibre + 140 ILA sites
  - DWDM
- 50+ x (own) 10G lambdas, (leased) 10G lambda, 2.5G (leased) “lambdas” + some lower speed links
- Alcatel MCC 1678
- Juniper T640, M160, M40 routers
- NREN accesses at up to 10Gbps (+ backup) + P2P
- 4 x 10G to North America
- POP in NY
- connections to other R&E networks: Abilene, ESnet, CA*net4, SINET, TENET, RedCLARA, EUMEDCONNECT, TEIN2 (coming)
End-to-end paths over GÉANT2

- Multiple administrative domains
End-to-end paths around the world

- Multiple data plane technologies
AutoBAHN approach

- Control and provisioning has to be distributed
- Business-layer related interactions include AA, policies, advance reservations etc.
- Privacy and control of intra-domain resources must be safeguarded
AutoBAHN approach

• Definition of an architecture
  • Distributed operation
  • Inter-Domain manager (IDM)
  • Domain manager (DM)
  • Interfaces

• Reference implementation including business layer and control plane functionality
Inter-Domain Controller (IDC) protocol

A result of a joint effort between AutoBAHN (GÉANT2), Internet2, ESnet

AutoBAHN system overview
Resource scheduling

• Negotiations between IDMs
  – Each IDM is consulting the local DM for intra-domain provisioning
  – Negotiation of configuration parameters (e.g. VLAN ids) along the path
  – Two-phase commit
• States of reservations
Signaling

- Integration of the AutoBAHN system with different DM systems
  - The Alcatel NMS ISN interface as a technology proxy for the GÉANT2 testbed
    - TL1 like command line interface
    - A machine interface to most functions including topology recovery, path building and alarm reporting
  - Existing management tools in a number of NRENs for configuring port or VLAN mode links over native Ethernet and L2 MPLS VLL clouds
Features

• Diverse routing
• Future reservations
• Authentication through a federated infrastructure
• Intra-domain monitoring of circuits (Ethernet, SDH)
• IDC protocol proxy
• Google maps GUI
### AutoBAHN application (1)

**AutoBahn GUI**

**Login as:** null (null)

**Reservation form**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start port</td>
<td>10.11.32.6</td>
</tr>
<tr>
<td>End port</td>
<td>10.12.32.4</td>
</tr>
<tr>
<td>Choose time zone</td>
<td>(UTC)Coordinated Universal Time</td>
</tr>
<tr>
<td>Start time</td>
<td>2006-01-23T15:05:00</td>
</tr>
<tr>
<td>End time</td>
<td>2006-01-23T15:30:00</td>
</tr>
<tr>
<td>Delay [ms]</td>
<td>10</td>
</tr>
<tr>
<td>Capacity [bits/s]</td>
<td>1000000000</td>
</tr>
<tr>
<td>Resilience</td>
<td></td>
</tr>
<tr>
<td>Process now</td>
<td></td>
</tr>
<tr>
<td>Priority</td>
<td>normal</td>
</tr>
</tbody>
</table>

**Description**

Submit reservation
AutoBAHN application (2)
Current deployment

Connect. Communicate. Collaborate

GÉANT2

HEAnet

PIONIER

CESNET

CARnet

AutoBAHN

Client

GARR

GRNET
AutoBAHN is IDC-compatible
The AutoBAHN team

Connect. Communicate. Collaborate
Visit: http://www.geant2.net/autobahn

Thank you