



Normal view ABPing RTTime OS Links WAN Links Animated FDT traffic
 OnTop view 0 0 26.19 1374.86 Mbps 0 0 Mbps

Reset Action: Zoom Rotate Scale nodes Speed



Groups



TabPan



GMap



Topology



Load



WAN



VO JOBS



CIENA



Multi-view



Monitoring in US LHCNet

Starlight



Manlan



Netherlight



CERN

Artur Barczyk, Caltech LHCOPN Meeting London, 04/03/2010



The Stage



- ◆ **Monitoring in US LHCNet is designed and tuned to support 24x7x365 network operation and support with a minimum of trivial tasks**

- ◆ **US LHCNet is a multi-platform, multi-layer service network**
 - Ciena, Force10, Cisco, HP, SMC, GlimmerGlass
 - Layer 1, 1.5, 2, 3 services to the users

- ◆ **US LHCNet NOC:**
 - Small team (4 engineers)
 - Distributed NOC (main locations: CERN/Geneva, Caltech/Pasadena)
 - No permanence
 - Office hours in CET and PST
 - Response 24x7
 - Ability to perform tasks from any location world-wide



(Main) Requirements for Monitoring System



- ◆ **Reliability**
- ◆ **Resiliency**
- ◆ **Provide real-time status for overview, as well as expert level tools**
- ◆ **Support for multiple protocols and access methods**
 - **SNMP, TL1, netflow, sflow**
 - **Uniform presentation (not vendor or tool dependent)**
- ◆ **Support for Layer 1/1.5/2/3 monitoring**
- ◆ **Monitor all important parameters, with fast update cycle and fine granularity**
 - **Link status**
 - **Hardware status**
 - **Utilization**
 - **Loss rates**
 - **Topology**
- ◆ **Alarm generation and routing**
 - **E-mail, SMS**
- ◆ **Provide easy to generate overviews and summaries**
 - **Reduce administrative overhead**
- ◆ **Flexibility and customization**
- ◆ **No big \$\$\$**



MonALISA

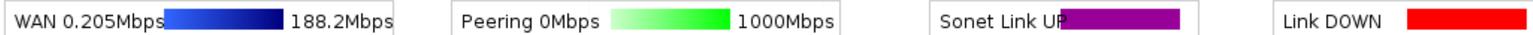
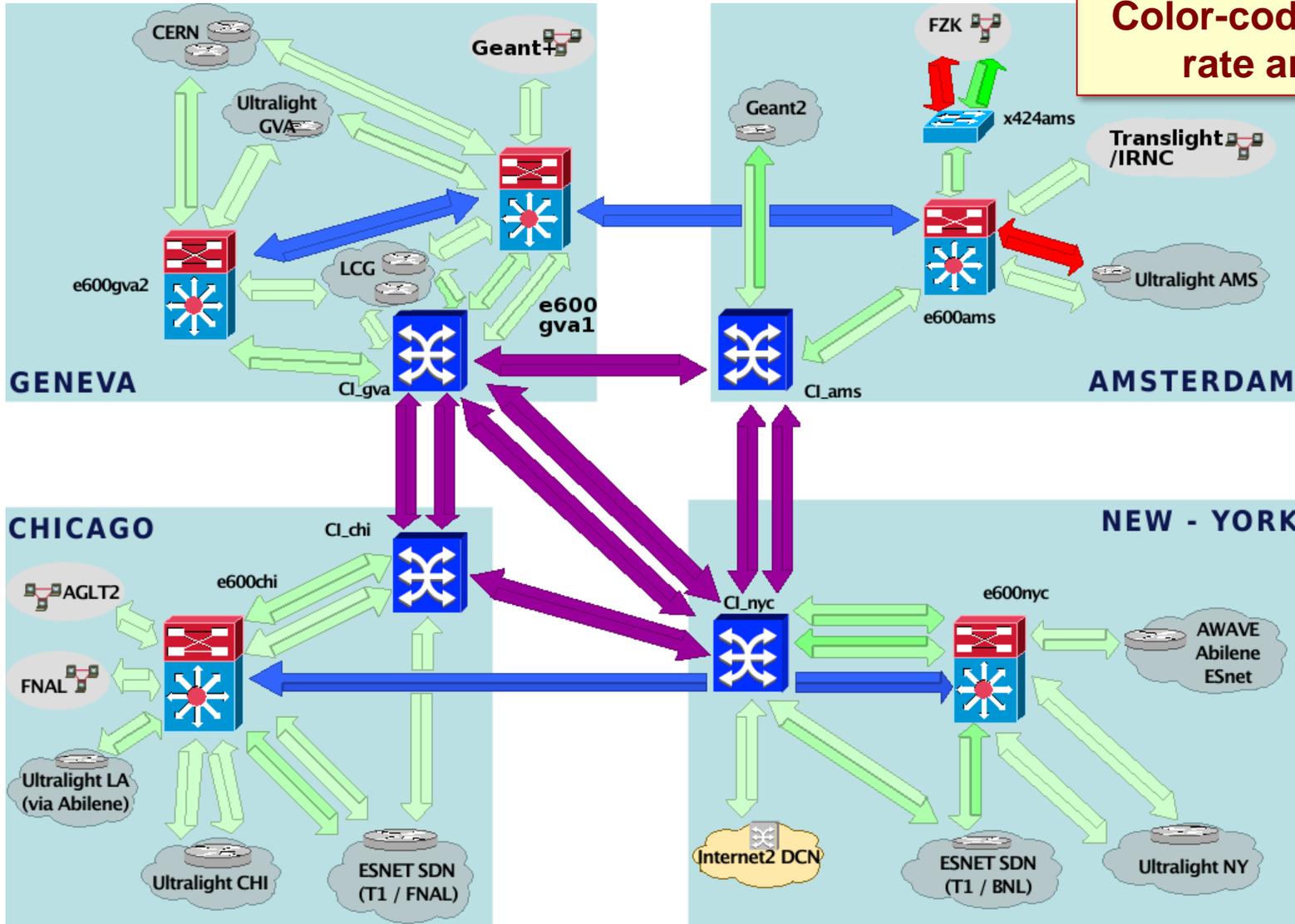


- ◆ It's the only system satisfying all requirements
- ◆ Two components:
 - Web portal: <http://repository.uslhcn.net.org>
 - GUI: client available at <http://monalisa.caltech.edu>
- ◆ Following slides show main components used in US LHCNet
- ◆ More details on MonALISA in tomorrow's presentation

Weather map

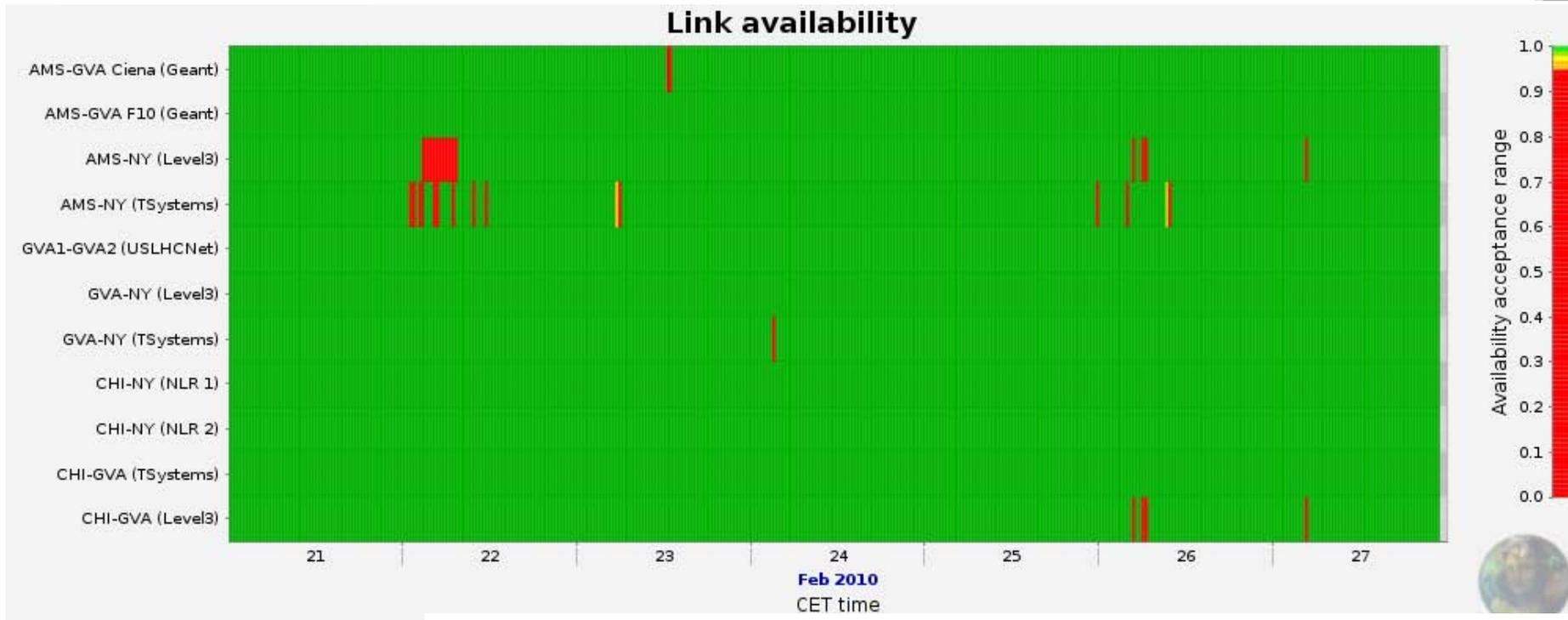
Interactive, single-screen instant overview

Color-coding for link type, rate and utilisation





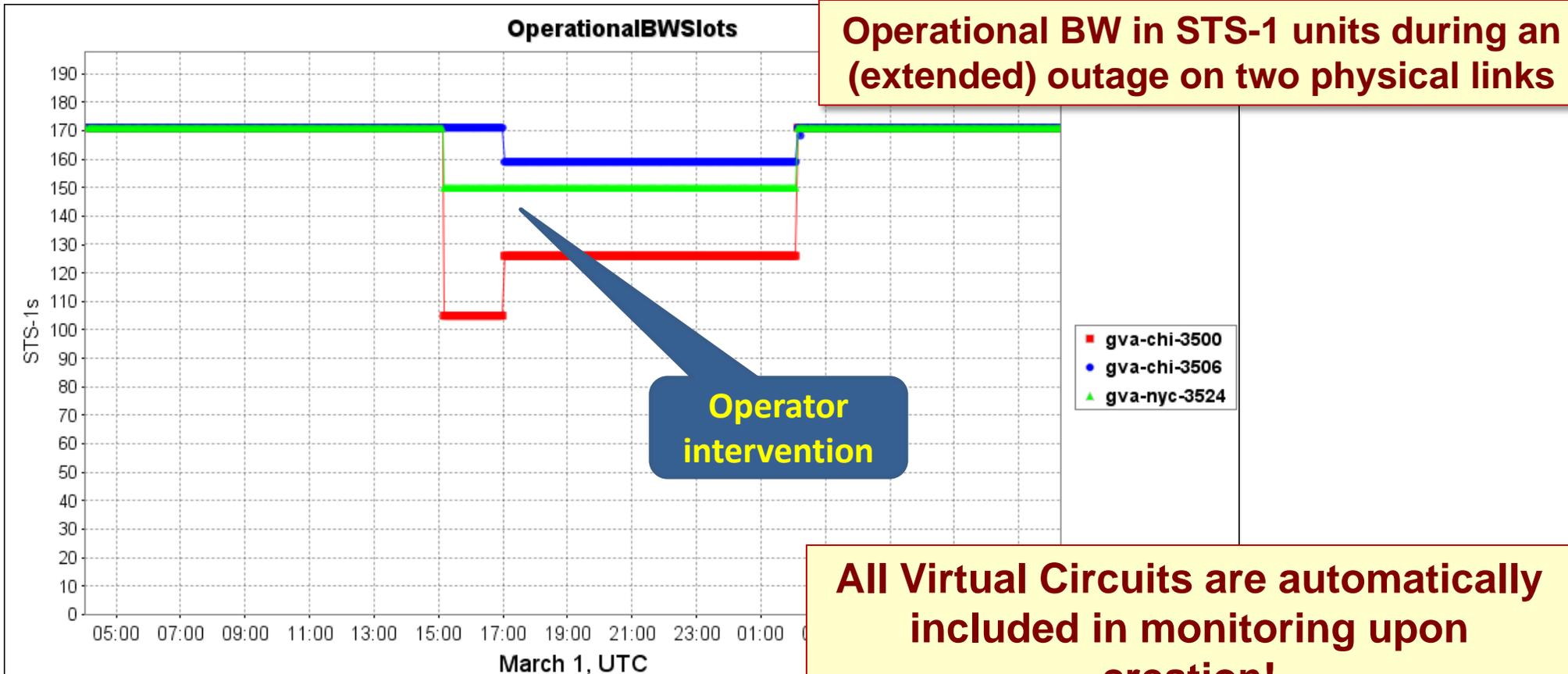
Link status and availability



1 minute to create the SLA report:

Statistics					
Link name	Data		Monitoring		Link
	Starts	Ends	Availability(%)	Gaps	Availability(%)
AMS-GVA Ciena (Geant)	21 Feb 2010 00:06	27 Feb 2010 23:06	100%	-	99.93%
AMS-GVA F10 (Geant)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	100%
AMS-NY (Level3)	21 Feb 2010 00:06	27 Feb 2010 23:06	100%	-	97.15%
AMS-NY (TSystems)	21 Feb 2010 00:06	27 Feb 2010 23:06	100%	-	98.80%
GVA1-GVA2 (USLHCNet)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	100%
GVA-NY (Level3)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	100%
GVA-NY (TSystems)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	99.98%
CHI-NY (NLR 1)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	100%
CHI-NY (NLR 2)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	100%
CHI-GVA (TSystems)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	100%
CHI-GVA (Level3)	21 Feb 2010 00:07	27 Feb 2010 23:06	100%	-	99.85%

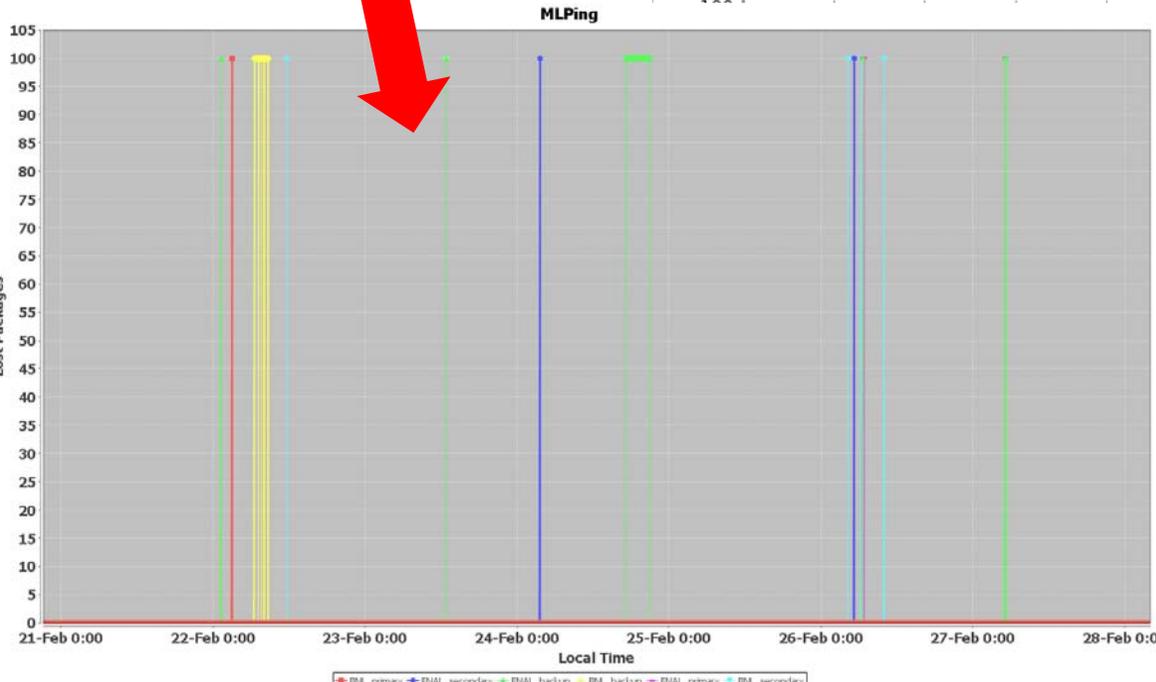
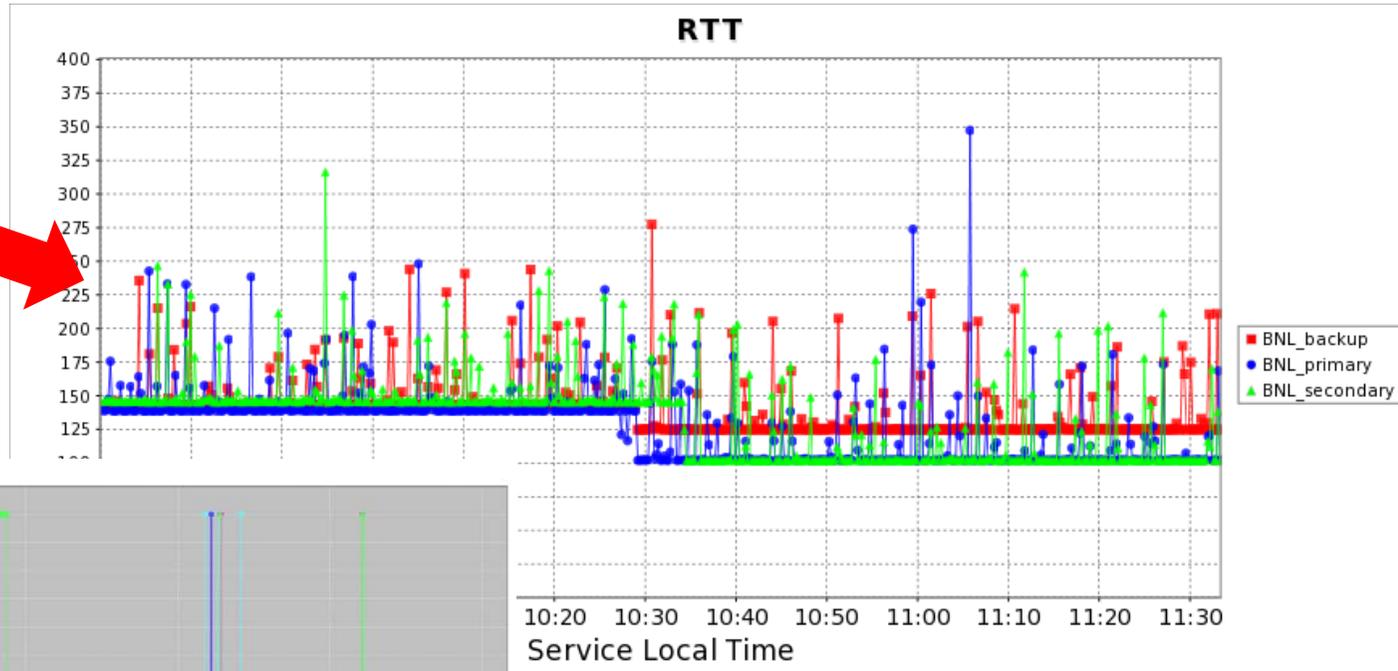
- ◆ All connections through USLHCNet are VCs in the core
- ◆ We monitor provisioned and operational bandwidth



(BW Plots also available in Mbps)

All Virtual Circuits are automatically included in monitoring upon creation!
No configuration change in MonALISA necessary!

- ◆ Currently we monitor packet loss and RTT on all VCs between CERN and US Tier1s
- ◆ RTT change can indicate route changes
 - ➔ Carrier operation
 - ➔ Failover
- ◆ ML agent pinging border router virtual interface



MonALISA correlates loss rate with link utilisation to identify alarm conditions



Alarm Generation and Notification

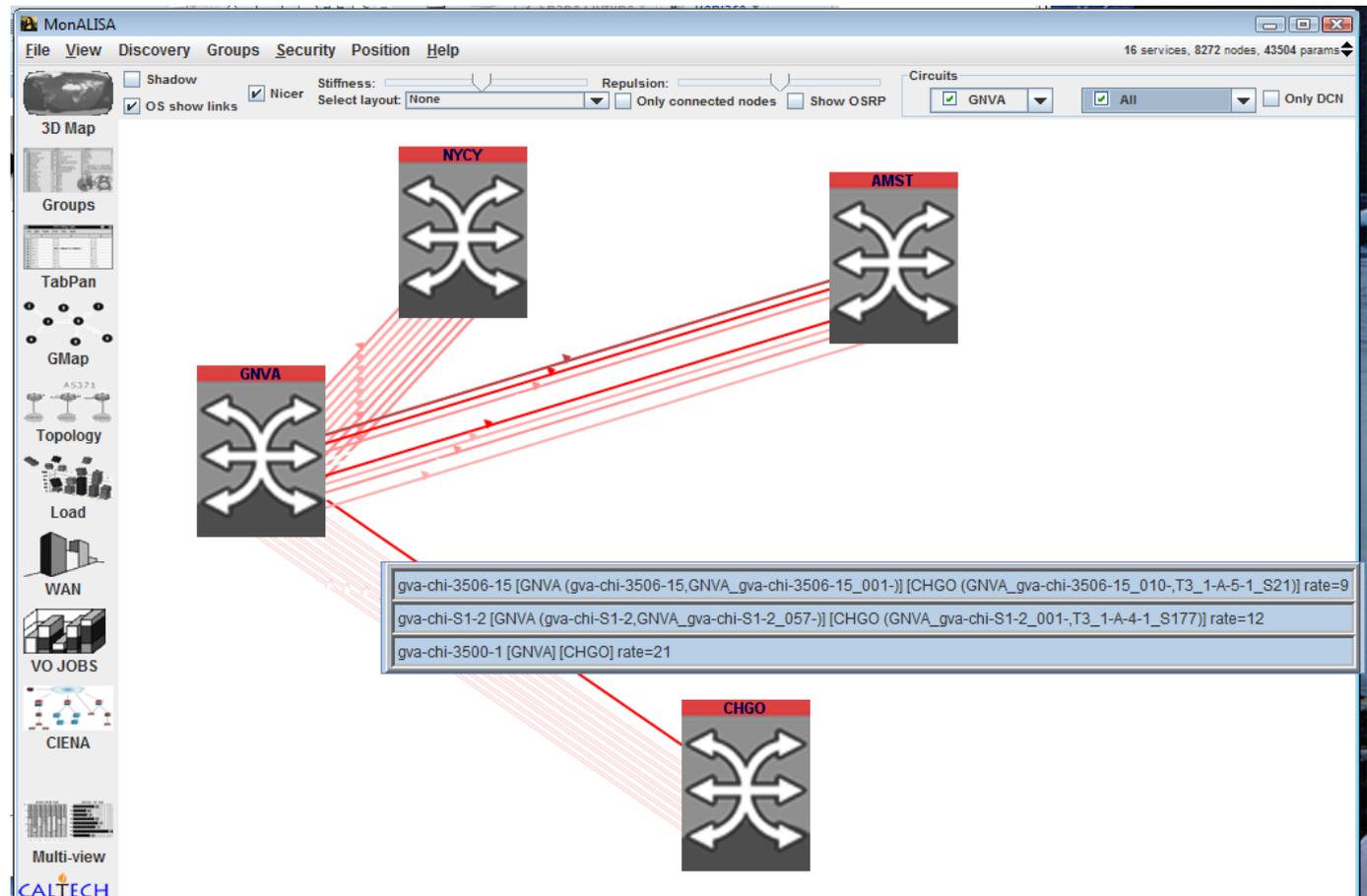


- ◆ **MonALISA reads alarms from all devices and stores in its database**
- ◆ **Generates alarms for**
 - Link status changes
 - Hardware failures
 - MLPinger losses above threshold, and anti-correlate with conditions
 - Link (VC) utilisation
 - Operational bandwidth / link failures
- ◆ **Alarm notification**
 - E-mail to NOC and/or personal accounts
 - Customized based on alarm type (alarm duration could be also taken into consideration)
 - SMS to NOC operators for serious events requiring immediate action
- ◆ **Alarm-off notification when condition back to normal**

- ◆ MonALISA actively monitors topology changes
- ◆ In US LHCNet we are mainly interested in Layer 1 - 2
- ◆ GUI allows us to selectively look into portions of the network, e.g. all circuits to/from the Geneva node:

- ◆ Interactive map, placing mouse over a line shows information about the virtual circuits

- ◆ More on topology (e.g. at Layer 3) in tomorrow's presentation





PerfSONAR



- ◆ **US LHCNet is running a PerfSONAR-PS instance with TL1 support**
 - This release is necessary for providing correct status to E2EMON
 - Avoids gateway “procreation” (TL1->Spectrum->PS)
 - Very important: monitoring VCG instead of link status
 - E.g. LHC OPN circuits are protected
 - Works flawlessly with E2EMON, providing status (up/down) of virtual connections

- ◆ **Need to monitor also VC operational bandwidth**
 - Depending on configuration, VC can continue to operate during an outage, possibly at reduced bandwidth
 - New circuit status: “degraded” in case of operational bandwidth falling below provisioned bandwidth
 - E2EMON needs to correctly interpret this information



Questions?