perfSONAR MDM updates for LHCONE: VRF monitoring, updated web UI, VM images

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Headorlines

- New LHCONE VRF monitoring infrastructure in place
  - Three NRENs already joined
  - First measurements already available
- perfSONAR MDM training for LHCONE (Autumn 2012, Berlin).
  - Places available!
- perfSONAR MDM pre-installed VM images
  - With all components to be interoperable with perfSONAR PS
- Revised version of the perfSONAR web UI:
  - Path analysis
  - On-demand one-way delay tests (using OWAMP)
  - End-point availability check
- Revised version of the perfSONAR weathermap:
  - Able to retrieve data from HADES and OWAMP archives

What's next?

- perfSONAR2Go: fully working perfSONAR MDM deployment on a USB stick
  - Any laptop can become a perfSONAR MP in 30 seconds

- perfSONAR App: iOS/Android application
  - To visualise perfSONAR metrics
  - Joint project with ESNet
  - First prototype will be focused
  on transatlantic links monitoring
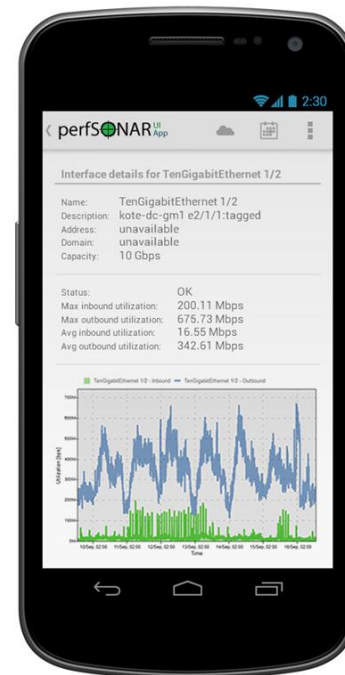
perfSONAR VRF monitoring

LHCONE VRF monitoring

- Three NRENs volunteered to start a first perfSONAR MDM deployment within the LHCONE L3VPN (VRF)
  - DFN
  - GARR
  - RENATER
- Each NREN deployed a perfSONAR MDM server within LHCONE VRF
- DANTE/GÉANT is running:
  - Central monitoring based on NAGIOS
  - Service desk (run by the Multi-Domain Service Desk)
  - Central archives
  - Central scheduling
  - perfSONAR web UI server
  - perfSONAR weathermap server

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Status of the VRF monitoring

- GARR, DFN, RENATER deployed three servers within LHCONE VRF
- A perfSONAR dedicated web UI has been deployed for LHCONE and soon made available to the community
- Nagios monitoring is in place
- Service desk function is in place
- More NRENs to come.
- Please feel free to contact us to be added to the infrastructure or for additional info
  - Open to MDM and PS sites
  - On-demand capabilities only available with perfSONAR MDM
  - You can use a pre-installed VM image to be immediately onboard:
    - *ftp://ftp.uni-ruse.bg/perfsonar-vm/*

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NAGIOS monitoring in place for LHCONE VRF MPs

First screenshot of the LHCONE VRF monitoring

First results from LHCONE VRF monitoring web UI

Training event for LHCONE NRENs/sites part of the VRF

perfSONAR MDM training for LHCONE

- First training event for sites/NRENs in the LHCONE VRF.
- Info: **http://www.terena.org/activities/training/perfsonar/ws4/**
- Focus on creating a live monitoring environment based on perfSONAR MDM
- The course will also explain how to access measurements from a web-interface
- Training objectives:
  - configuring perfSONAR MDM to create a real monitoring environment.
  - configuring of all the components required for the interoperability with perfSONAR PS and other deployments.
- It will include practical exercises, live, on-demand and scheduled measurements
- Date: Targeting **Autumn 2012, date to be confirmed soon**.

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perfSONAR web UI:
The new path analysis feature

New perfSONAR web UI

- New perfSONAR web interface for LHC:
  - http://psui-lhc.grid.aau.dk/perfsonar-ui/
  - Same credentials (username is perfsonar)
- Added path analysis
- Added OWAMP on-demand measurement
- In progress: retrieving OWAMP data from the perfSONAR PS OWAMP archives from this UI

Path analysis

- New functionality added to the perfSONAR User Interface
- Based on RRD-MA statistics
- Analyse IP paths
  - Hop by hop
  - Visualising link utilisation and error stats
  - Identifying immediately any bottleneck or drop
- Min/Max/Average inbound and outbound utilisation displayed
- How does it work:
  1. Copy and paste a traceroute output in a web text area
  2. Click on the analyse button
  3. The analysis tool will look for the statistics for the router interfaces along the way, reporting and graphing them

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Path analysis screenshot

perfSONAR web UI:
On-demand one-way delay measurement

On-demand one-way delay measurement (OWAMP)

- New functionality added to the perfSONAR User Interface
- A MP has been built around OWAMP enabling
  - Successful interaction with perfSONAR PS
  - On-demand one-way delay measurement from the web interface
- Interoperable with Internet2/ESnet perfSONAR PS Measurement Points
- Tests are fully configurable:
  - Number of packets
  - Wait time and start delay
  - Timeout
  - Packet Size

On-demand one-way delay measurement screenshot

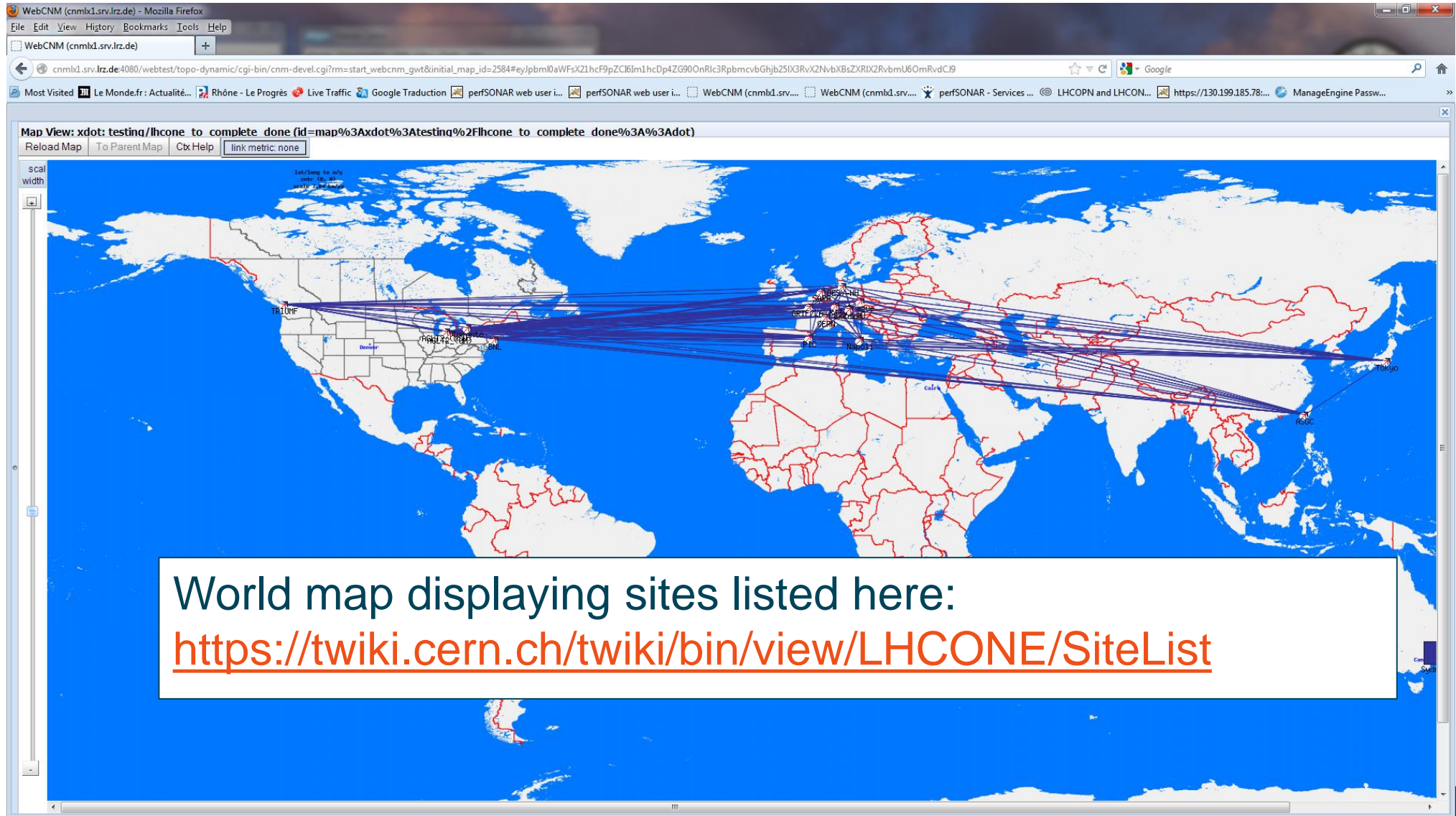# perfSONAR MDM weathermap for LHCONE (Interoperability use case)

New weathermap for LHCONE online now!

- New LHCONE weathermap
- http://tiny.cc/lhconemap
  - Credentials: webcnm_lhcopn with password: Txc5,Mb5
- World map displaying sites listed here:
  https://twiki.cern.ch/twiki/bin/view/LHCONE/SiteList
- It can retrieve data from both HADES and OWAMP archives
- Complete interoperability perfSONAR MDM/PS

- Previous version for LHCOPN is still working and reachable here:
- http://tiny.cc/lhcopn
  - Same credentials (webcnm_lhcopn)

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LHCONE weather-map displaying live active measurements

World map displaying sites listed here:
https://twiki.cern.ch/twiki/bin/view/LHCONE/SiteList

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It is possible to zoom in…

Clicking on any site it is possible to get detailed information (Ex. BNL)

Clicking on any link it is possible to access the measurements

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Max One-Way Delay to/from BNL to DESY
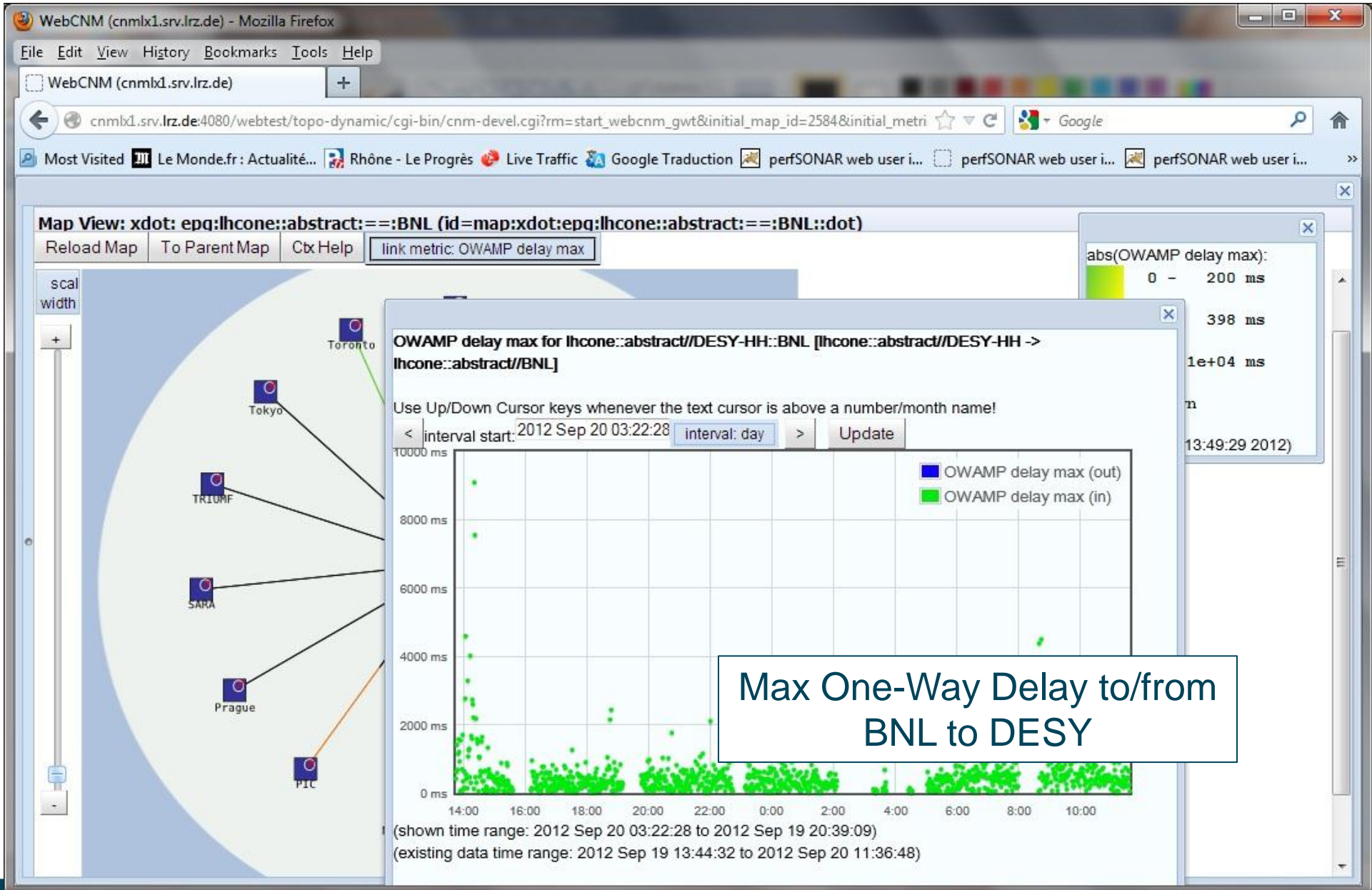
Details of the interoperability: perfSONAR MDM and PS connected

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I2 Node with PS

GÉANT Node with MDM

LHCOPN weather map integration
19 perfSONAR parameters available

Weather map examples (One-way delay)
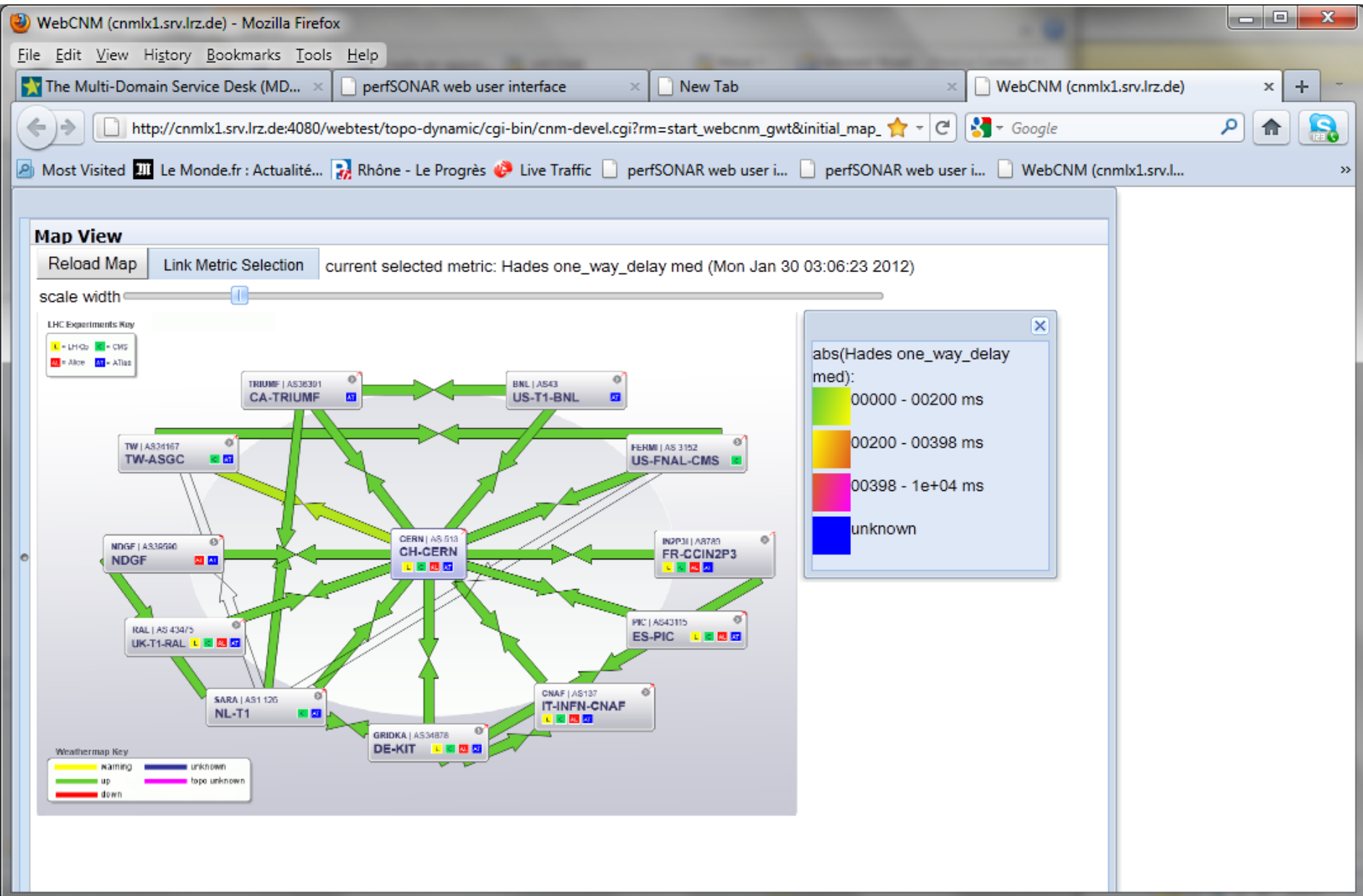
Example: Selecting one-way delay metric and cliicking on a link

It is possible to select an area to magnify for further inspection
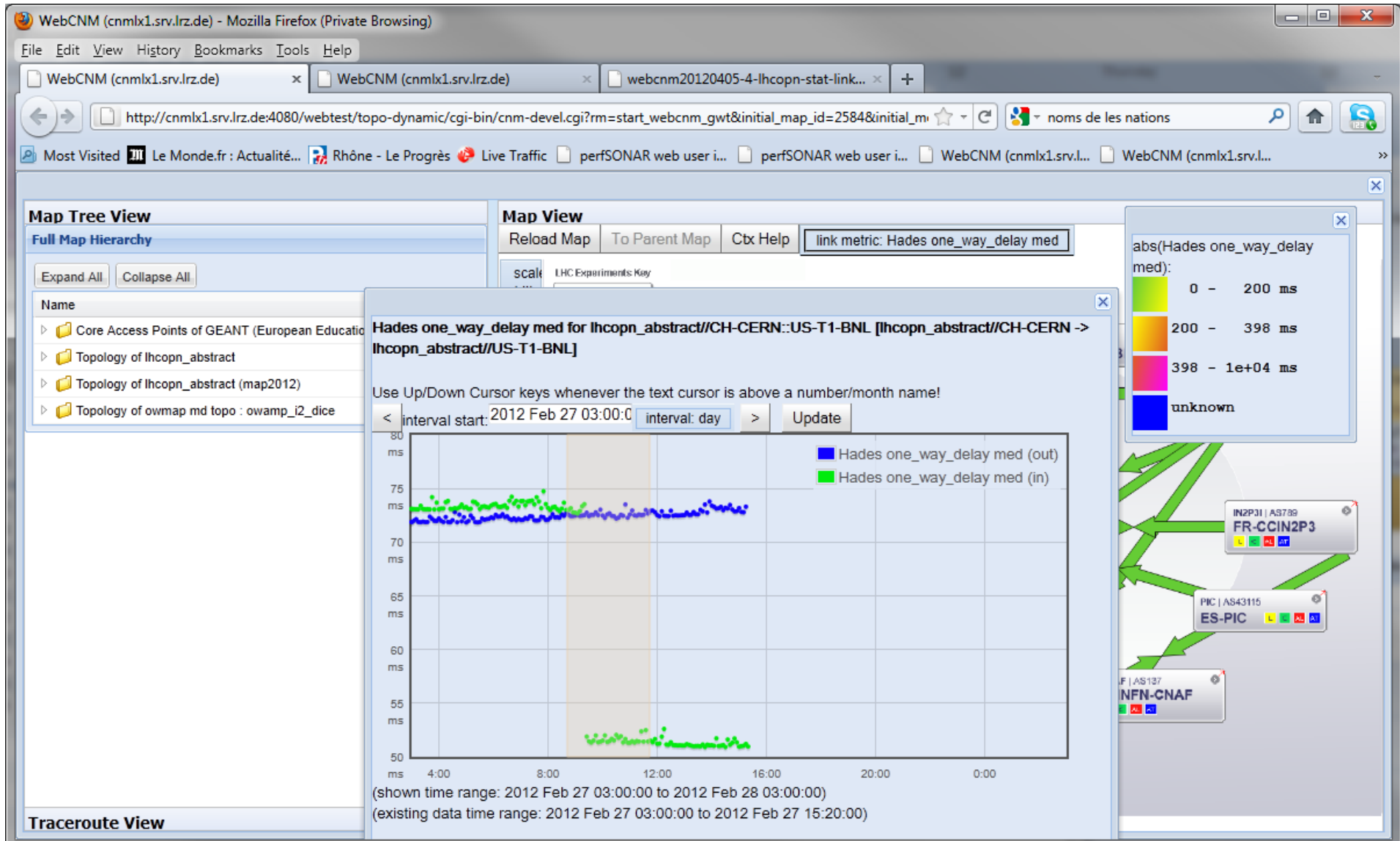
The OWD results after having magnified the area
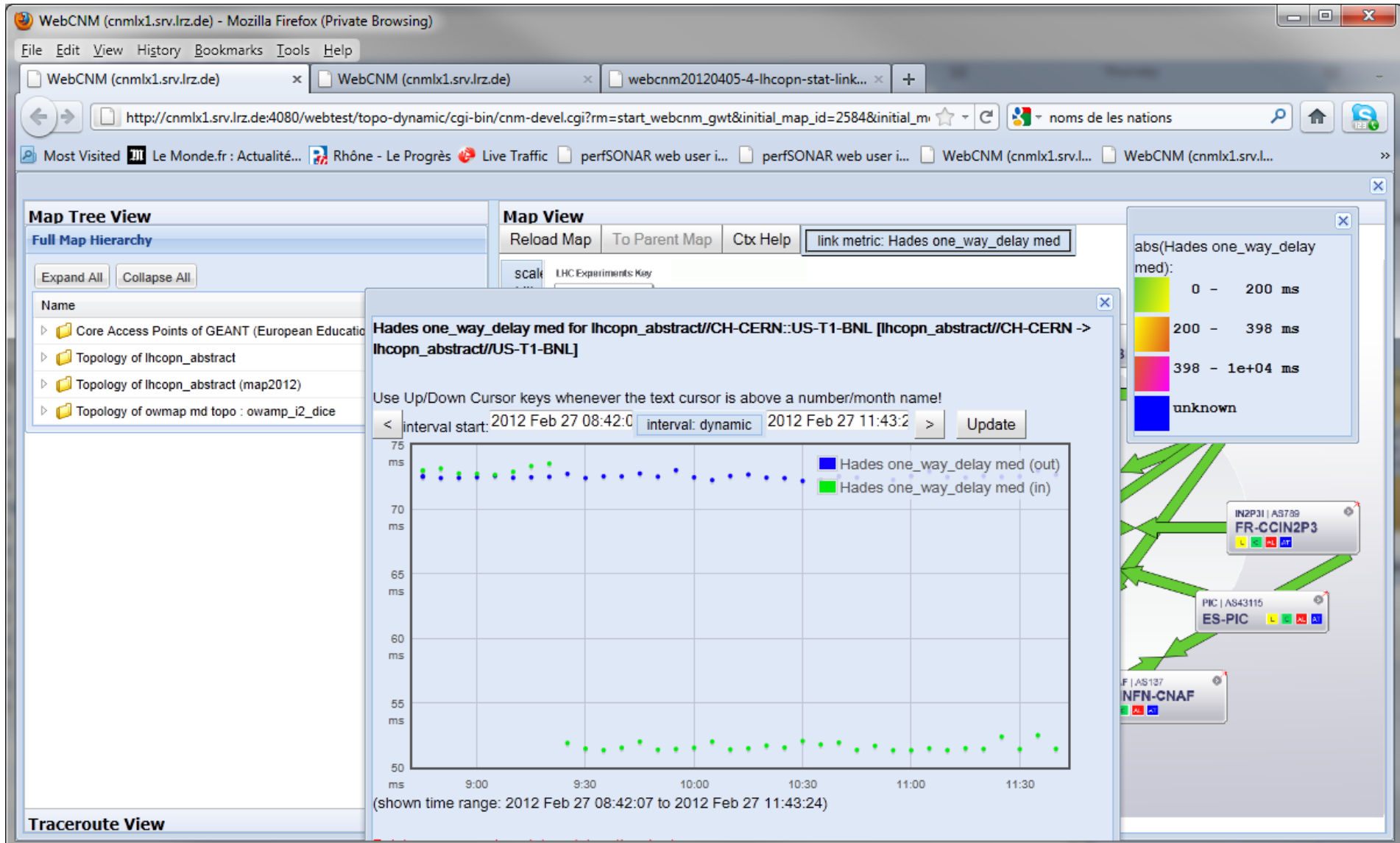
Coming soon: perfSONAR UI App

The present: Interface accessible from mobile devices
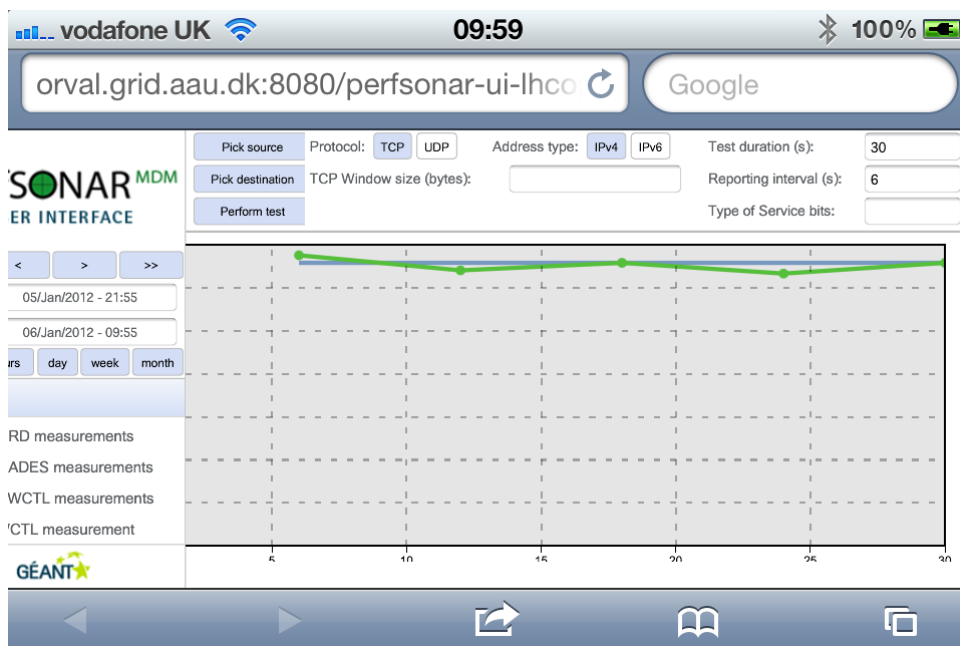
The interface on a smartphone (Apple iPhone)

Current interface enabling troubleshooting on the move
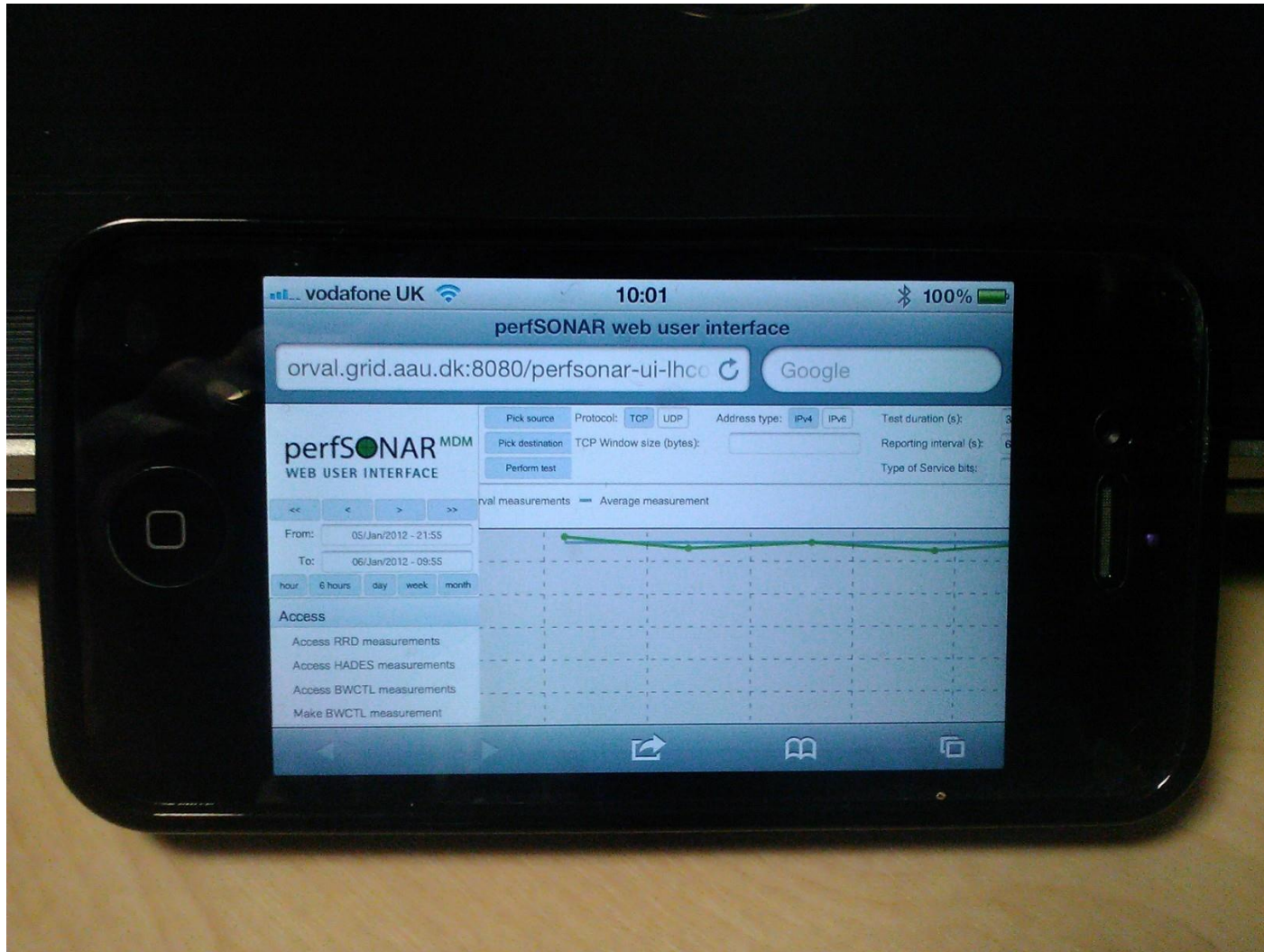
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The result of an on-demand Bandwidth test run from an iPhone

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The future: perfSONAR UI App

- Targeting mobile users
- Joint GÉANT/Esnet project (in collaboration with FH Luebeck) to develop a native iOS/Android mobile App
  - September 2012 till January 2013
  - Interest in showing LHCONE data:
- Allowing them to get an overview of the network performance
  - With an easy to use interface
  - Created for the features of their devices
- Next slides are showing screenshots from our first mock-up/prototype

perfsonarUI App: Example Map View

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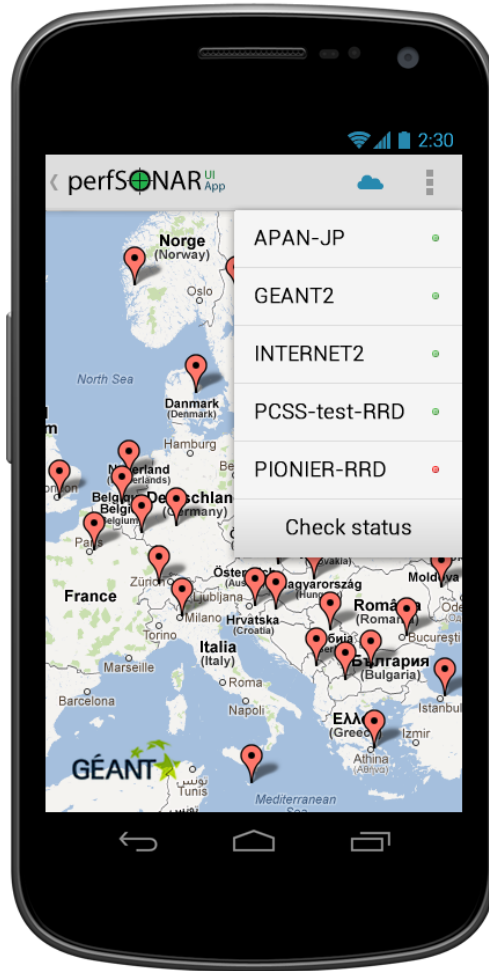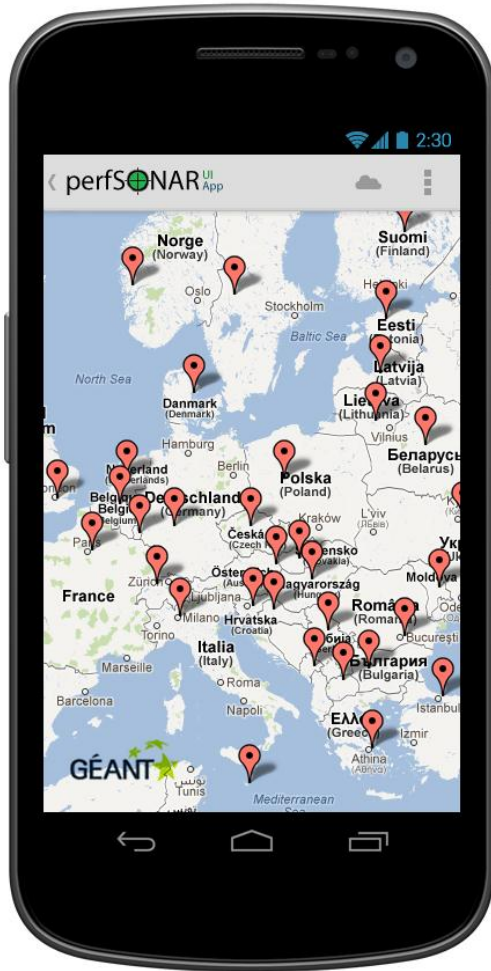
- **Map View**
  - Check service availability
  - Display interfaces

- **Feasibility pending**
  - Connection status
  - Detailed status

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perfsonarUI App: Example Metric Query
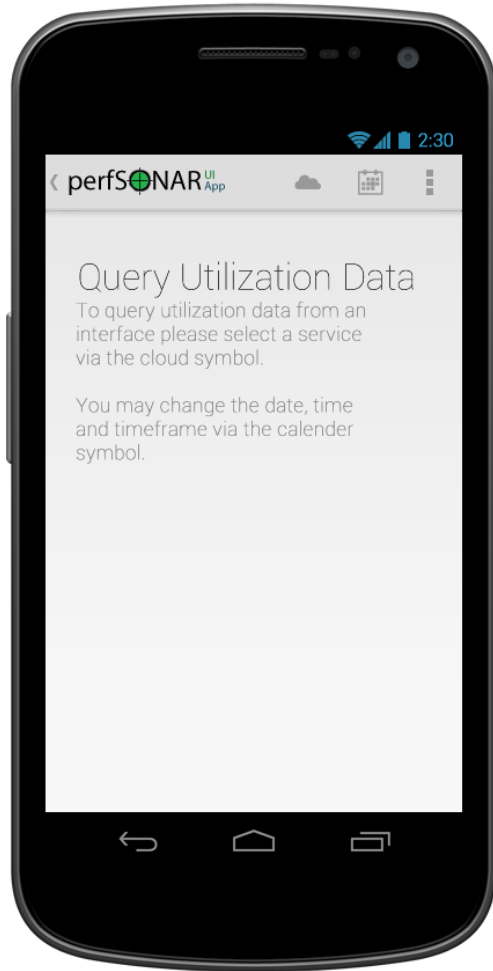
- Query data
  - Direct access to detailed data

- Access a multitude of data
  - Utilization data
  - Delay, jitter, loss, traceroute
  - Historical throughput data

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perfsonarUI App: Example Configuration
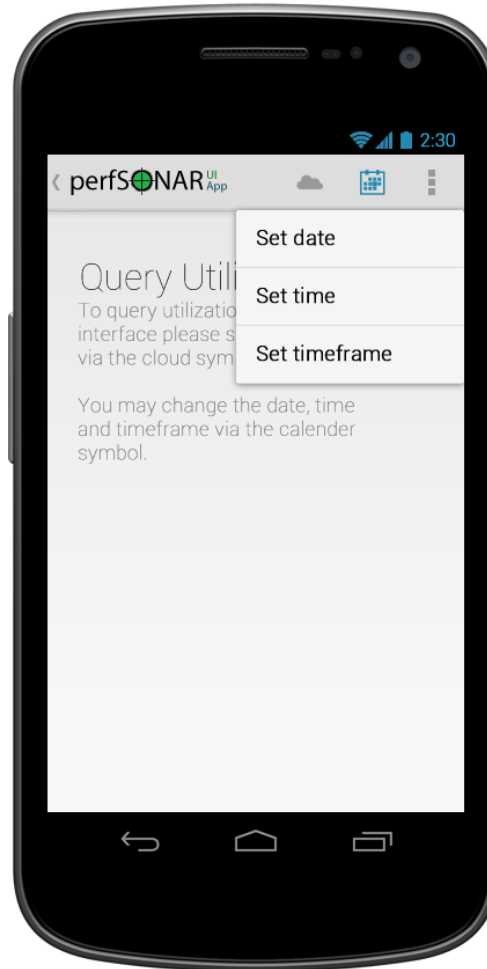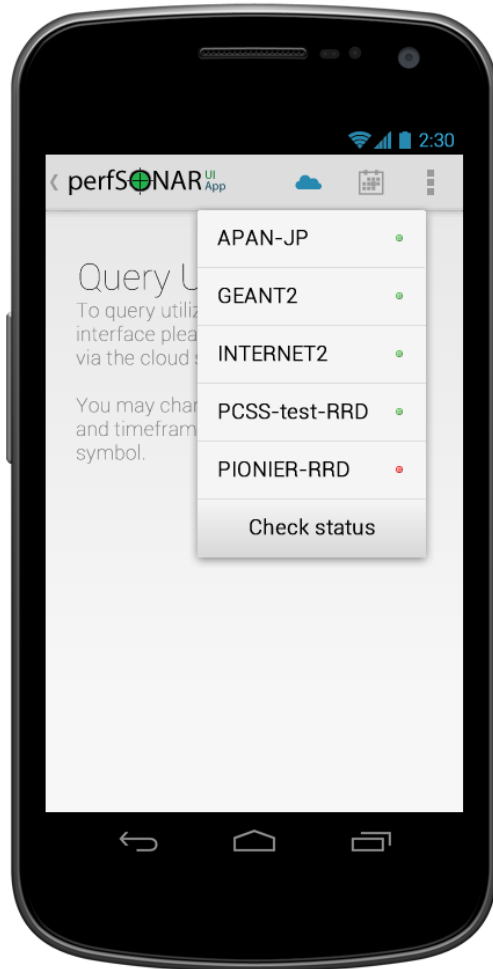
- Set service
  - Quickly accessible
  - Check service availability

- Set region of interest
  - Set date
  - Set time
  - Set timeframe

App Design by Daniel Neckel | University of Applied Sciences Lübeck

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perfsonarUI App: Example of Access to Utilization Data

- List of interfaces
  - Quick view list
  - Easy to browse

- Detailed information
  - Basic data
  - Inbound / Outbound Utilization data
  - Interactive graph
  - Fullscreen graph in landscape mode

App Design by Daniel Neckel | University of Applied Sciences Lübeck

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perfSONAR MDM website: http://perfsonar.geant.net

Goals:
- Single point of access for perfSONAR
- Contact points, FAQs, resources & downloads, and support
- **Host news and success stories from Users**

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perfSONAR Twitter

Weekly tweets

Messages re-tweeted by other sister networks and organisations

Growing community of followers around the world

@perfSONAR MDM

perfSONAR MDM. Be part of it.

Follow perfSONAR at:
http://twitter.com/#!/perfSONARMDM

- Website: http://perfsonar.geant.net
- Twitter: @perfSONARMDM
- Info: domenico.vicinanza@dante.net

Extra slides for questions

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Why multi-domain monitoring?

- Collaboration in R&E is becoming increasingly international:
  - Sharing experiences
  - Offering remote access to unique resources
  - Creating virtual stages for artistic events

In a way which is unimaginable only a few years ago!

GÉANT launch event performance:
Musicians in Stockholm
Dancers in Kuala Lumpur

http://www.geant.net/Events/LaunchEvent/Pages/EventHighlights-Day1.aspx

Collaboration + brilliant performances: effective monitoring

- Collaboration requires effective coordinated network operations
- Effective operations require proper **network troubleshooting** at an international scale
- The solution: perfSONAR
  - Gathering information from different network domains and building a global picture
- Two main implementations committed to interoperate:
  - perfSONAR MDM within GÉANT: http://perfsonar.geant.net
  - perfSONAR PS within I2/ESnet: http://psps.perfsonar.net/
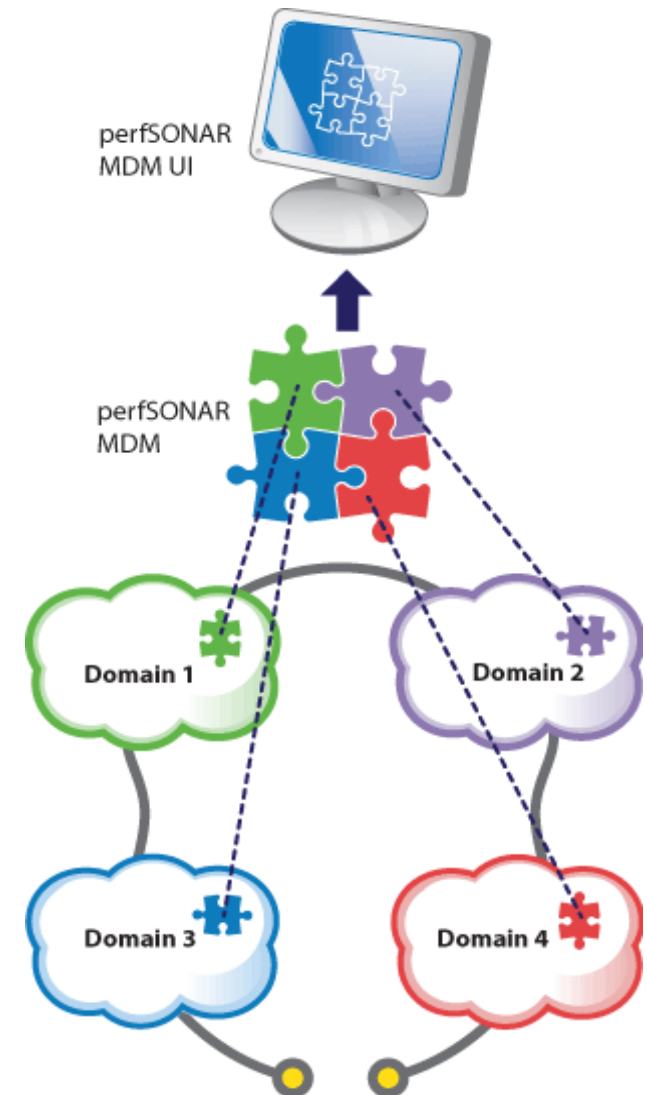
What is perfSONAR MDM?

- perfSONAR MDM (Multi-Domain-Monitoring) is the multi-domain monitoring service part of the GEANT portfolio
- Based on the perfSONAR protocol
  - Interoperable with hundreds of deployments around the world
- Suitable for NRENs, research projects, international collaborations
- With dedicated support from the GÉANT MultiDomain Service Desk

perfSONAR MDM
The multi-domain monitoring service for the GÉANT Service Area enabling NREN NOCs and PERTs to collaborate in providing seamless network performance for their network users.

NREN NOC
& PERT engineers
Find out how perfSONAR can make your life easier.

(from the perfsonar.geant.net website)

(from the perfsonar.geant.net website)

A new perfSONAR MDM:
Compatible, open, interoperable

- Actively working with the user community
  - Using **direct user feedback** to keep meeting their expectations
  - perfSONAR **User Panel** to gather requirements and steer development
- **Simplifying** installation procedure
  - RPMs and DEB packages available
  - Pre-installed, ready to use, Virtual Machines available
    - *Currently working on perfSONAR-take-away (live distribution on a USB stick)*
- Revised documentation (lightweight and modular)
- **Interoperable with perfSONAR-PS**
- Successful use-cases: http://bit.ly/pdJJlf, http://bit.ly/pc5sZO,

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perfSONAR MDM / perfSONAR PS

Similarities: both perfSONAR PS and MDM

- use the perfSONAR protocol to exchange data
- both share the same overall design goals

But they have different

- Software development process, product life cycles, interaction with the users
- implementation and deployment models

Summarising:

- perfSONAR MDM is designed to provide a service, with federated deployment, centrally monitored and coordinated, and full support.
- perfSONAR PS has a distributed support model with the goal of proliferating the number of performance nodes deployed across the community.

How does perfSONAR work?

- PerfSONAR operates by installing measurement points (MPs) across the networks.
- The MP is a small server (or virtual server) connected to a suitable network interface in the Point of Presence
- Each MP runs the perfSONAR software to measure the following metrics:
  - Available Bandwidth
  - One Way Delay
  - Jitter (One Way Delay variation)
  - Route Tracing
- At any time, network engineers can access the PerfSONAR MDM web interface to
  - Inspect measurements regularly scheduled between any two MPs
  - Request a variety of ad hoc measurements.
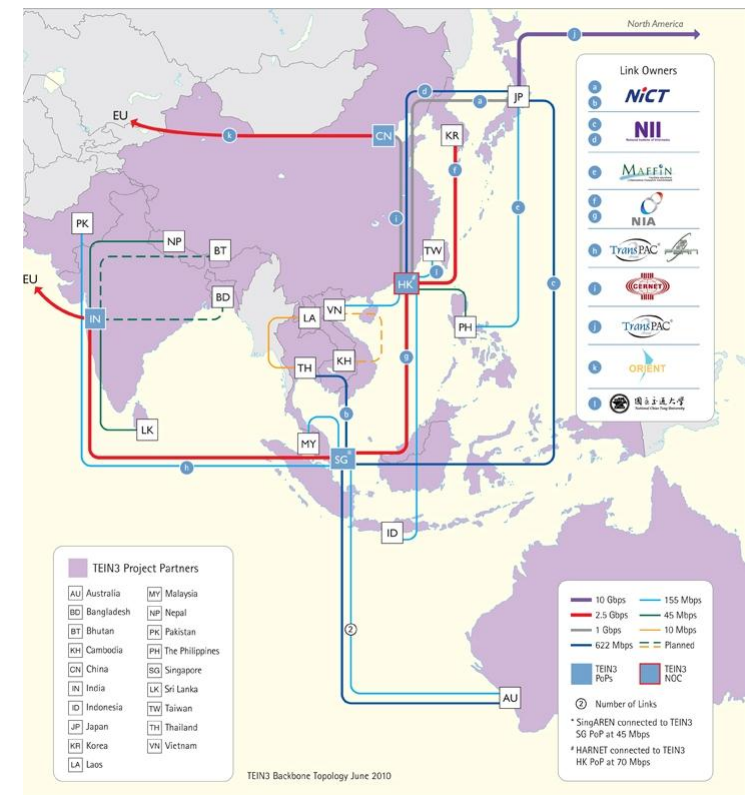
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perfSONAR MDM adoption

- 13 NRENs (+GEANT Backbone) evaluating/implementing the perfSONAR MDM service for their NOC/PERT engineers.
- Second group of 8 NRENs now targeted → More NRENs will join the pilot
- Liaising with other communities outside EU:
  - TEIN, RedCLARA, GISELA, …

Deployment Status Jan 2012
- In trial
- Deployed

perfSONAR MDM deployment in Asia/Pacific

- Within the TEIN3 project
  - three PoPs are going to be instrumented with perfSONAR MDM
- Hardware has been already installed in three locations:
  - Singapore
  - Hong Kong (under deployment)
  - Beijing (deployment finished)

- perfSONAR software is currently being installed in the three locations.

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The interoperability with perfSONAR PS?

- perfSONAR MDM servers are being equipped with everything needed for the perfSONAR PS interoperability
- perfSONAR user interface is able to interact with either perfSONAR MDM and PS measurement points
- perfSONAR weathermap is already able to retrieve data from OWAMP archives
- Currently working on retrieving OWAMP archives data from the web UI
  - Retrieving and displaying measurements from any MP in the world

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Interoperability with perfSONAR PS

- 43 measurement points in the **GÉANT** service area
- 8 measurement points in **ESnet**
- 9 measurement points in **Internet2**
- Measurements between perfSONAR MDM and PS from the same interface
  - **Towards a full interoperability with perfSONAR-PS**

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perfSONAR MDM monitoring components and the new web user interface

RRD-MA

- **Purpose**:
  - Monitor link utilisation, input errors, packet drops
  - Provide access to historical measurements
- **Strategy**:
  - Query router interfaces using SNMP from a perfSONAR server
  - Store data into RRD files
    - *made accessible through web-service*

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RRD-MA User Interface (web version)

RRD-MA Path analysis using traceroute (web interface)

Easy way to track utilisation across a path

HADES-MA/MP
(OWD, jitter, packet loss, traceroute)|

- **Purpose**:
  - Monitor OWD, jitter, packet loss, traceroute variations
    - *Regularly scheduled*
    - *On demand (to be implemented)*
  - Provide access to historical measurements
- **Strategy**:
  - Sending 9 packets every minute from pS server (Meas. Point)
    - *Measure OWD, jitter, packet loss and tracking IP route*
  - Store data into perfSONAR SQL-MA archive
    - *made accessible through web-service*

HADES User Interface – OWD, jitter packet loss (web version)

HADES User Interface – route comparison (web version)

Simple route comparison

BWCTL-MP/MA
(Achievable bandwidth)

- **Purpose**:
  - Measure the achievable bandwidth between two MPs
    - *Regularly scheduled and*
    - *on demand (only for NREN NOC/PERT engineers)*
  - Provide access to historical measurements
- **Strategy**:
  - Run bandwidth test between MPs using a web-service interface to BWCTL
  - Display data with graph and store into perfSONAR SQL-MA archive
    - *made accessible through web-service*

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Accessing BWCTL Historic Measurements

Each dot is a measurement run. Clicking on the dot a window displays the details

…and getting the results in two clicks from the web interface