
E-Center Project

Internet2 Performance WG

Fairbanks JointTechs

July 12, 2011

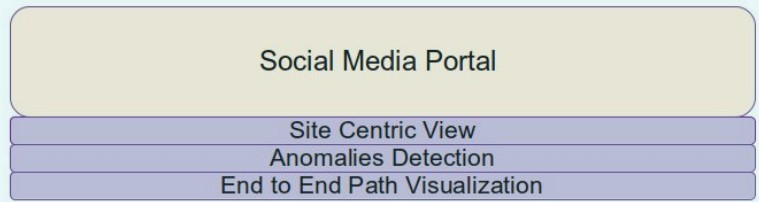


Project Goals

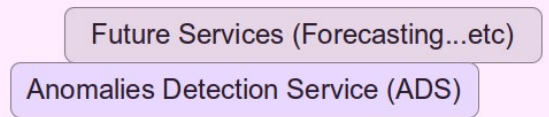
- Social Portal for the DOE Network Enterprise
- Place for network users to share issues, ideas, concerns
- Help set network performance expectations
- User friendly tools to help users in isolating their network problems



Front-End

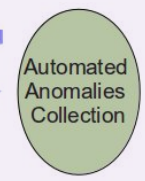
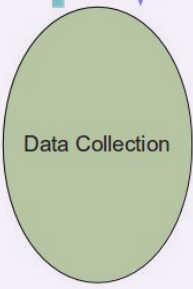
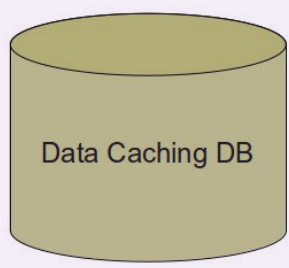
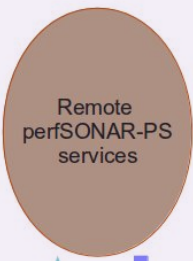
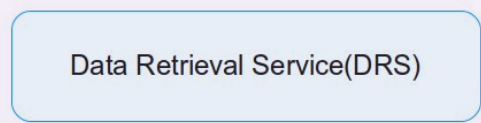


RESTful Interfaces



“External” Services

Back-End (DRS)



Data Collection

- **perfSONAR-PS** Metadata collected and cached – nightly
 - From ESnet hLS – home Lookup Services
 - From hLSs at DOE Labs
- Data collected and cached – nightly for the past 24 hours
- From **DOE labs** and **ESnet** measurement mesh:
 - OWAMP (delay, packet loss)
 - BWCTL (throughput)
 - PingER (RTT, packet loss)
- From ESnet centralized services:
 - Interface Utilization, Drops, Errors
 - ESnet Topology
 - Traceroutes between ESnet PoPs and DOE lab's



Data Collection: Just Numbers

- Monthly cached data for June 2011 (entries):
 - OWAMP 100M+
 - SNMP 50M
 - PingER 15M
 - Traceroute 587K
 - BWCTL 133K
- Collecting data from 294 service endpoints, about 20500 unique measurements (metadata entries).
- Nightly automated anomalies detection for BWCTL and OWAMP data - 8943 metadata entries for the past 7 days.



Front-end: Measurement mesh health

- Shows which perfSONAR data is being collected by DRS
- Helps identify/troubleshoot problems in measurement infrastructure

Hub status

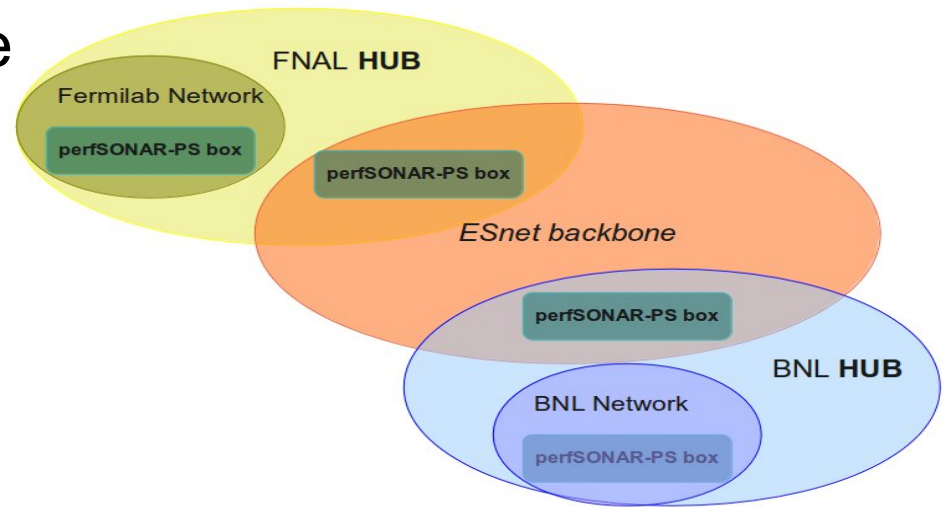
Hub	snmp	bwctl	traceroute	owamp	pinger
SLAC	■	■	■	■	■
FNAL	■	■	■	■	■
JGI	■	■	■	■	■
BNL	■	■	■	■	■
NERSC	■	■	■	■	■
SNLL	■	■	■	■	■
LBL	■	■	■	■	■
LLNL	■	■	■	■	■
PNWG	■	■	■	■	■
ANL	■	■	■	■	■
PPPL	■	■	■	■	■
ORNL	■	■	■	■	■

Metadata 87
Cached data 9584



HUBs

- Logical aggregation of the End-to-End pS-PS monitoring endpoints - End Site located with ESnet edge located
- Allows one to see all available data for WAN network path
- Every pS-PS service and as result every measurement is mapped to specific HUB upon discovery



Technical Details

- Choice of the **REST** Data services – simple, flexible
- Data cache - **MySQL DB** engine – ACID transactions, scalable, supports replication and clustering for the future extension, ***data sharding*** – slicing each data set in pieces for fast retrieval
- **Gearman** distributed Job submission manager for all backend tasks – to provide desired level of scalability
- **Modern Perl** for the backend and services – stable, 20+ yr old language, great variety of APIs, mature web development framework, availability of the perfSONAR-PS client API
- **PHP, Drupal, and jQuery** for the front-end – popular, well-known open-source development and contentment management tools with strong support for social functionality.



Front-end: Dashboard

Dynamic, per-user dashboard:

- encourages users to interact with site and each other
- user-selectable site-centric view and other data tools to give user instant snapshot of network status
- site-wide activities using familiar "activity stream" interface
- activity stream includes detected anomalies, new content, comments, and more, based on user's group membership

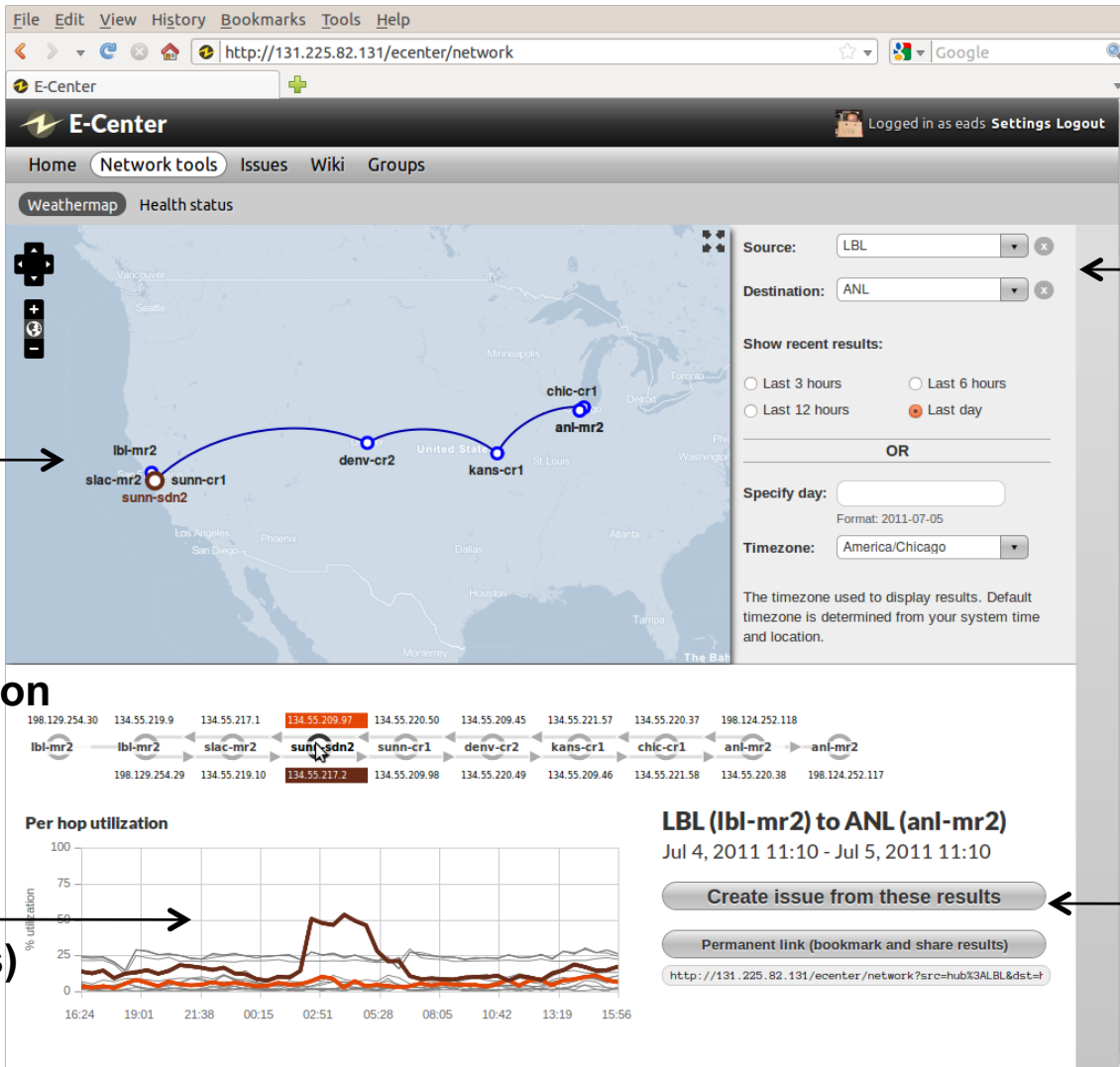
The screenshot displays the E-Center dashboard interface. At the top, there's a navigation bar with 'Home', 'Network tools', 'Issues', 'Wiki', and 'Groups'. The main content area is titled 'E-Center dashboard' and features a central 'SLAC status' section with a network diagram showing SLAC at the center connected to various sites: PPPL, ANL, FNAL, PNWG, LLNL, LBL, BNL, and SNLL. A 'Tools' panel is open over the diagram, showing 'Forward' and 'Reverse' traffic statistics for the selected link. Below the network status, there's a 'Site activity' section with a list of recent network issues and comments. The activity stream includes entries like 'Network issue SLAC to BNL, 2011-06-22 12:00:15 - 2011-06-22 15:00:15 (UTC)' and 'Network issue FNAL to BNL, 2011-06-16 12:00:00 - 2011-06-16 15:00:00 (UTC)'. Each entry shows the user who created it and any associated comments.

Measurement	Value	Interface
Utilization	87.12	134.55.219.122
Errors	0.00	NA
Drops	0.00	NA

Measurement	Value	Interface
Utilization	55.51	134.55.209.45
Errors	0.00	NA
Drops	0.00	NA



Front-end: Weather Map Results (I)



[1] Select source & destination

[2] Visual representation of path

[3] Link(s) utilization(s)

[4] "Issue" capture



Front-end: Weather Map Results (II)

End to end results

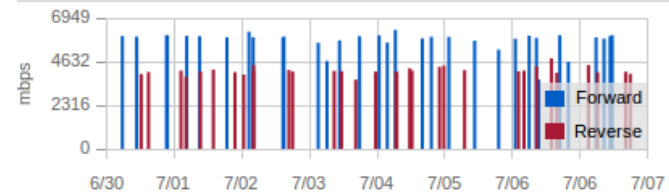
▶ Anomaly detection settings

Detect anomalies

Measurement	Average	Max	Min
Forward Throughput	5778mbps	6317mbps	3690mbps
Reverse Throughput	4157mbps	4810mbps	3678mbps
Forward Duplicates	0	0	0
Reverse Duplicates	0	0	0
Forward Loss	0.0	0.0	0.0
Reverse Loss	0.0	0.0	0.0
Forward Max delay	85ms	531ms	2ms
Reverse Max delay	88ms	476ms	2ms
Forward Min delay	1ms	2ms	1ms
Reverse Min delay	2ms	2ms	1ms

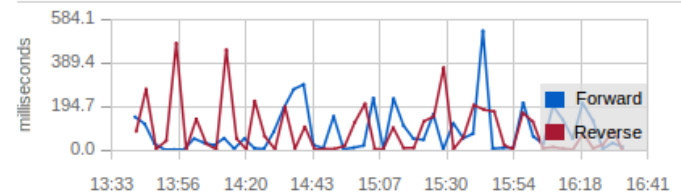
Throughput

Jun 30, 2011 21:26 - Jul 7, 2011 13:24



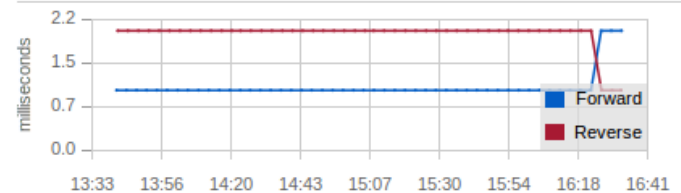
Max delay

Jul 7, 2011 13:42 - Jul 7, 2011 16:32



Min delay

Jul 7, 2011 13:42 - Jul 7, 2011 16:32



Future Plans

- Support for user-provided traceroute feeds
- Circuit-based network path monitoring
- On-demand measurement test capabilities:
 - Traceroute
 - BWCTL
 - Forecasting Service
- UI improvements: Provide more tools for "drilling down" into data and isolating individual charts



E-Center PIs & Developers

■ PI's:

- Phil DeMar (FNAL) demar@fnal.gov
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■ Developers:

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- Front-End (User Experience)
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- ESnet PerfSONAR Services (TraceRoute; Circuit)
Andy Lake (ESnet) - andy@es.net

■ Pay no attention to the man behind the curtain...

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