October 7th 2009, Internet2 Fall Member Meeting
Eric Boyd, Deputy Technology Officer

pS-Performance Toolkit Overview
Overview

- Short history of toolkit
- Current deployments
- Enhancements in the current release
  - OWAMP regular tests
  - Wizard-configuration interface
  - no-config-mode
- Planned and Potential Future Enhancements
Network Performance Workshop

- Presentations and exercises geared at troubleshooting problems on networks
- Instruction on installation, use, and methodology of performance tools
- Original Format
  - Spend ½ the time installing/configuring the tools
  - Remainder of time learning how/why to use
Network Performance Workshop

• Installation/Configuration are important, but the real value of the workshop is the methodology
  – Require a ‘fast’ way to get started into workshop content
  – Idea: Package and pre-configure tools, distribute to attendees for workshop and home use

• 1st Generation NPToolkit (circa 2006)
  – Bootable CD with all tools installed/configured
  – Easy to install on any machine (non-destructive)
Network Performance Workshop

• Tools Included on NPToolkit 1.x CDs
  – BWCTL – Bandwidth (iperf) Controller Daemon and Client
  – NDT – Network Diagnostic Tool
  – NPAD* - Network Path and Application Diagnosis
  – OWAMP – One Way Ping Daemon and Client
  – Other standard tools available:
    • Ping
    • Tracepath
    • Traceroute

* Developed by PSC
perfSONAR Introduction

- Most organizations perform monitoring and diagnostics of their own network
- Networking is increasingly a cross-domain effort
- Monitoring and diagnostics must also become a cross-domain effort
What is perfSONAR

• An architecture & a set of protocols
  – Services Oriented Architecture (SOA)
  – Web Services Interfaces
  – Protocols being standardized in the OGF NMC-WG

• Also
  – A collaboration
    • Production network operators focused on designing and building tools that they will deploy and use on their networks to provide monitoring and diagnostic capabilities to themselves and their user communities.
  – Several interoperable software implementations
    • Java & Perl
  – A Federated set of Deployed Measurement Infrastructures
perfSONAR Architecture

- Interoperable network measurement middleware (SOA):
  - Modular
  - Web services-based
  - Decentralized
  - Locally controlled

- Integrates:
  - Network measurement tools and archives
  - Data manipulation
  - Information Services
    - Discovery
    - Topology
    - Authentication and authorization

- Based on:
  - Open Grid Forum Network Measurement Working Group schema
  - Currently attempting to formalize specification of perfSONAR protocols in a new OGF WG (NMC)
perfSONAR Components

Data Services
- Measurement Points
- Measurement Archives
- Transformations

Information Services
- Service Lookup
- Topology
- Service Configuration
- Auth(n/z) Services

Infrastructure

Analysis/Visualization
- User GUIs
- Web Pages
- NOC Alarms
Decouple 3 phases of a Measurement Infrastructure

- Analysis & Visualization
- Measurement Infrastructure
- Data Collection

- API
- Measurement Infrastructure
- API
- Performance Tools
perfSONAR deployments (not complete)

- Networks
  - APAN, CENIC, CSTNET, ESnet, Geant, Gloriad, GPN, Internet2, JGN2, LONI, MAX, NOX, NYSERNET, RNP, Starlight, Transpac2, UEN
- Labs
  - ANL, BNL, FNAL **, NERSC, PNNL, PSC, SLAC
- International Sites
  - Chinese University of Hong Kong, Chonnam National University (Korea), KISTI (Korea), Monash University (Melbourne, Victoria, Australia), MRREE (Lima, Peru), NCHC (Taiwan), NICT (Japan), Simon Frazier (Burnaby, BC, Canada), Thaisarn Nectec (Bangkok, Thailand), UNIFACS (Salvador, Bahia, Brazil)
- Other
  - Cobham, Northop Gruman, Ocala Electric, Philadelphia Orchestra, REDDnet
- Current
  - http://www.perfsonar.net/activeServices/IS/

- Universities
  - Boston University *
  - College of William and Mary
  - George Mason Univ
  - Georgia Tech University
  - Hope College
  - Indiana University *
  - Leeward Community College
  - Lusiaanna State University
  - Michigan State University *
  - Middle Tennessee State University
  - Northwestern **
  - Oregon State
  - Penn State University
  - Southern Methodist University *
  - Syracuse
  - Texas A&M University *
  - Tufts *
  - University of California Los Angles
  - University of California San Diego **
  - University of Chicago *
  - University of Connecticut
  - University of Delaware
  - University of Hawaii
  - University of Michigan *
  - University of Northern Iowa
  - University of Oklahoma *
  - University of Texas *
  - University of Utah
  - University of Wisconsin (Condor)
  - University of Wisconsin (Madison) * **
  - Vanderbilt **
  - University of Florida **
Researcher Engagement (LHC)

- Specific set of available services at each participant site (Network Measurement System – NMS)
- Small number of ‘support’ services supported by backbone network organizations
- Complimentary diagnostic services at backbone network locations
- Analysis clients
  - Some directly available to end researchers, some specifically designed for NOC personnel
perfSONAR integration on Toolkit

- When looking at the networking needs of LHC researchers it became clear the toolkit could be a useful distribution mechanism not only for the diagnostic tools but for the perfSONAR performance middleware (especially as the perfSONAR infrastructure began to support service discovery and other information services)
First perfSONAR enabled version

- Inspired as a way to help support the USATLAS community
- First perfSONAR enabled version 2008
  - First generation of web administration
  - Store regular active tests (PingER*, BWCTL)
  - SNMP data collection (SNMP)
  - Sharing of results (pS Information Services)
  - All the on-demand diagnostic tools from previous releases

* Developed by SLAC and Fermilab
Version 3.1 Goals

• Focus almost completely on stability and usability
Updated

- Linux kernel updated to 2.6.27.9
- Updated network drivers (e1000e, myricom, broadcom)
- Updated tool versions (bwctl, owamp, perfSONAR-PS etc...)
- Bug fixes (many/varied)
- Enhanced plots for collected throughput and latency data

New

- Regular active latency tests and archiving (perfSONAR-BUOY/OWAMP)
- Integrated (wizard-style) administrative screens
- Streamlined startup (no configuration needed to use as a ‘target’ of measurements)
pS-Performance Toolkit Futures

• 6 Month time horizon
  – Move to Fedora based distribution
    • RPM package management will make eventual network-based installs easier
  – Better data analysis GUIs
  – Alert infrastructure for services and data
  – Notify someone if bad results are seen

• Beyond
  – Admin GUIs for managing groups of pS-Performance Nodes
  – Network installs of pS-Performance Nodes
  – More diagnostic tools and archives
pS Performance Toolkit - Walkthrough
Welcome to the Internet2 pS-Performance Toolkit v3.1

To start configuration, login as user knoppix and run 'sudo nptoolkit-configure.py'. Once you set passwords, you can login to the web interface and finish configuration. The web interface should be available at: https://[host address]/

Debian GNU/Linux 4.0 Knoppix tty1

Knoppix login:
pS Performance Toolkit - Walkthrough

[knoppix@Knoppix ~]$ sudo nptoolkit-configure.py

We trust you have received the usual lecture from the local System Administrator. It usually boils down to these three things:

#1) Respect the privacy of others.
#2) Think before you type.
#3) With great power comes great responsibility.

Internet2 Network Performance Toolkit customization script
Options in **MAGENTA** have yet to be configured
Options in **GREEN** have already been configured

1. Configure drive to hold data/customizations
2. Set built-in account passwords
3. Configure Networking
4. Change Timezone
5. Manage Users
6. exit

Make a selection:
pS Performance Toolkit - Walkthrough

Internet2 Network Performance Toolkit customization script
Options in **MAGENTA** have yet to be configured
Options in **GREEN** have already been configured

1. **Configure drive to hold data/customizations**
2. **Set built-in account passwords**
3. **Configure Networking**
4. **Change Timezone**
5. **Manage Users**
6. **exit**

Make a selection:
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough

A screen capture of the pS Performance Toolkit showing a ping test with the server address 192.168.69.130 and 100 packets. The test started on Tuesday, September 8, 2009, at 9:46:56 EDT 2009. The server's MAC address is C0A845BDE65EDF2E47BEC3BAE6A6. The ping statistics show no reordering.
pS Performance Toolkit - Walkthrough

```
traceroute from 127.0.0.1 (192.168.69.130) to 192.168.69.1 (192.168.69.1) for 192.168.69.1

Download perl source code.
To perform a traceroute from 192.168.69.130, enter the desired target: host domain (e.g. www.yahoo.com) or internet address (e.g. 137.138.28.228) in the box below:

Enter target name or address: then push 'Enter' key.

Lookup: host name | mail domain | domain name | latitude & longitude | visual traceroute | contacting someone

Please note that traceroutes can appear similar to port scans. If you see a suspected port scan alert, for example from your firewall, with a series of ports in the range 33434 - 33465, coming from 192.168.69.130 it is probably a reverse traceroute from our web based reverse traceroute server. Please do NOT report this to us, it will almost certainly be a waste of both of our times. For more on this see Traceroute security issues.

traceroute to 192.168.69.1 (192.168.69.1), 30 hops max, 40 byte packets
1 192.168.69.1 (192.168.69.1) 0.205 ms 0.263 ms 0.187 ms
```
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough

Source: ps1.ochep.ou.edu (129.15.40.231) — Destination: psmsu02.aglt2.org (192.41.231.20)

Maximum ps1.ochep.ou.edu -> psmsu02.aglt2.org: 919.90 Mbps
Average ps1.ochep.ou.edu -> psmsu02.aglt2.org: 801.84 Mbps
Last ps1.ochep.ou.edu -> psmsu02.aglt2.org: 196.51 Mbps

Maximum psmsu02.aglt2.org -> ps1.ochep.ou.edu: 633.46 Mbps
Average psmsu02.aglt2.org -> ps1.ochep.ou.edu: 239.21 Mbps
Last psmsu02.aglt2.org -> ps1.ochep.ou.edu: 120.77 Mbps
### pS Performance Toolkit - Walkthrough

#### One-Way Latency Tests

<table>
<thead>
<tr>
<th>First Host</th>
<th>First Address</th>
<th>Second Host</th>
<th>Second Address</th>
<th>Bi-Directional</th>
<th>Graph</th>
</tr>
</thead>
<tbody>
<tr>
<td>dc205.internet2.edu</td>
<td>192.52.179.205</td>
<td>lab246.internet2.edu</td>
<td>207.75.164.246</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>dc205.internet2.edu</td>
<td>192.52.179.205</td>
<td>nms-flat-eth1.wash.net.internet2.edu</td>
<td>64.57.16.34</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>dc205.internet2.edu</td>
<td>192.52.179.205</td>
<td>nms-flat NEWY3200.net.internet2.edu</td>
<td>64.57.17.98</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>owampl.internet2.edu</td>
<td>207.75.164.106</td>
<td>dc205.internet2.edu</td>
<td>102.52.179.205</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

#### 12 Hour Performance Summary (Min/Max Delay (msec))

<table>
<thead>
<tr>
<th>First Host</th>
<th>Min</th>
<th>Max</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>dc205.internet2.edu</td>
<td>* / *</td>
<td>7.3938 / 61.4608</td>
<td>1.6670 / 66.8008</td>
<td>5.1012 / 45.2032</td>
</tr>
<tr>
<td>lab246.internet2.edu</td>
<td>2.7279 / 49.3779</td>
<td>* / *</td>
<td>* / *</td>
<td>* / *</td>
</tr>
<tr>
<td>nms-flat-eth1.wash.net.internet2.edu</td>
<td>0.0563 / 18.5823</td>
<td>* / *</td>
<td>* / *</td>
<td>* / *</td>
</tr>
<tr>
<td>nms-flat NEWY3200.net.internet2.edu</td>
<td>2.0704 / 29.2082</td>
<td>* / *</td>
<td>* / *</td>
<td>* / *</td>
</tr>
<tr>
<td>nms-flat NEWY3200.net.internet2.edu</td>
<td>6.5731 / 31.7588</td>
<td>* / *</td>
<td>* / *</td>
<td>* / *</td>
</tr>
</tbody>
</table>

#### Non-Active Data Sets

<table>
<thead>
<tr>
<th>First Host</th>
<th>First Address</th>
<th>Second Host</th>
<th>Second Address</th>
<th>Bi-Directional</th>
<th>Graph</th>
</tr>
</thead>
</table>
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough

Device: rtr.atla.net.internet2.edu (64.57.28.243) – xe-0/1/0.0

Traffic in MBps

- Incoming Traffic in MBps
- Outgoing Traffic in MBps

Maximum In: 415.22 MBps
Average In: 130.70 MBps
Current In: 105.28 MBps

Maximum Out: 368.83 MBps
Average Out: 87.73 MBps
Current Out: 62.69 MBps
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
pS Performance Toolkit - Walkthrough
### pS Performance Toolkit - Walkthrough

![Screen Shot of pS Performance Toolkit](image)

#### NTP Configuration Tool

<table>
<thead>
<tr>
<th>Server</th>
<th>Description</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>chronos.as.net</td>
<td>ESnet - New York, NY USA</td>
<td>Delete</td>
</tr>
<tr>
<td>satarn.as.net</td>
<td>ESnet - Sunnyvale, CA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:00:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Chicago, IL USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:01:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Houston, TX USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:02:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Los Angeles, CA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:03:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - New York, NY USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:04:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:05:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:06:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:07:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:08:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:09:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:10:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:11:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
<tr>
<td>ntpmp:12:00:00:00:00:00:00:00::00:00:00:00:00:00:00:00</td>
<td>ESnet - Seattle City, WA USA</td>
<td>Delete</td>
</tr>
</tbody>
</table>

---

50 – 10/7/09, © 2009 Internet2
More Information

- **Web**
  - psps.perfsonar.net/toolkit
- **Mailing Lists**
  - perfSONAR Users Group
    - https://mail.internet2.edu/wws/info/perfsonar-user
  - Performance Node Users
    - https://mail.internet2.edu/wws/info/performance-node-users
  - perfSONAR Announcements
    - https://mail.internet2.edu/wws/info/perfsonar-announce
  - Performance Node Announcements
    - https://mail.internet2.edu/wws/info/performance-node-announce
  - NTAC Information Services Working Group
    - https://mail.internet2.edu/wws/info/is-wg
  - NTAC Performance Working Group
    - https://mail.internet2.edu/wws/info/performance-wg
pS-Performance Toolkit Overview

October 7th 2009, Internet2 Fall Member Meeting
Eric Boyd, Deputy Technology Officer

For more information, visit psp5.perfsonar.net/toolkit