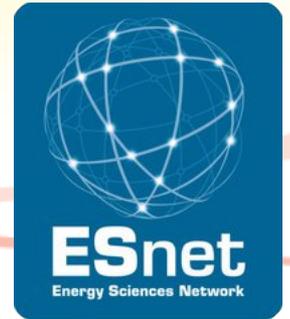


INTERNET
2



November 18th 2013, SC13 Network Performance Tutorial
Jason Zurawski – Internet2/ESnet

Software Configuration

Outline

- **Installation**
- Configuration
 - Administrative Information
 - NTP
 - Services
 - Regular Testing
- Measurement Results Tour
 - Home Page
 - Throughput Tools
 - Latency Tools

Configuration Based on Use Case

- The best source of information is here:
 - <http://code.google.com/p/perfsonar-ps/wiki/pSPerformanceToolkit33>
- There are two use cases for configuration:
 - Diagnostic
 - Burn CD, insert, boot, Done!
 - You can't configure regular testing, but you can test to this/log on and test with it
 - Permanent
 - Couple of steps to install the Linux Distro

Configuration - Permanent

- Booting:



Configuration - Permanent

- Installation through console:

```
Welcome to CentOS

Loading SCSI driver
Loading mptbase driver...

<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen
```

Configuration - Permanent

- Installation through console:

```
Welcome to CentOS
```

```
Package Installation
```

```
Name   : glibc-2.5-49.el5_5.6-i686
Size   : 12660k
Summary: The GNU libc libraries.
```

```
Status:
```

```
0%
```

	Packages	Bytes	Time
Total :	510	834M	0:09:31
Completed:	21	112M	0:01:16
Remaining:	489	722M	0:08:14

```
13%
```

```
<Space>,<+>,<-> selection | <F2> Group Details | <F12> next screen
```

Configuration - Permanent

- Logging on (first time):

```
CentOS release 5.5 (Final)
Kernel 2.6.18-194.3.1.el5.web100 on an i686

localhost login: root
Password:
You are required to change your password immediately (root enforced)
Changing password for root
(current) UNIX password:
New UNIX password: _
```

Configuration - Permanent

- Console Configuration Menu:

```
[root@localhost ~]# sudo /opt/perfsonar_ps/toolkit/scripts/nptoolkit-configure.py
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. Manage Users
0. exit

Make a selection: _
```

Configuration - Permanent

- Main Screen:

The screenshot displays the main configuration screen for a pS-Performance Node. The interface is organized into several sections:

- Host Information:** Fields for Organization Name, Host Location, Administrator Name, and Administrator Email.
- Communities This Host Participates In:** A table listing the community 'pS-NPToolkit-3.2.1'.
- Host Status:** A table showing Primary Address (No External Address Configured), MTU (Could not retrieve MTU), NTP Status (Synced), and Globally registered (No).
- Services Offered:** A list of services with their status:
 - Bandwidth Test Controller (BWCTL): Not Running
 - Lookup Service: Not Running
 - Network Diagnostic Tester (NDT): Running
 - Network Path and Application Diagnosis (NPAD): Running
 - One-Way Ping Service (OWAMP): Running
 - perfSONAR-BUOY Regular Testing (Throughput): Not Running
 - perfSONAR-BUOY Measurement Archive: Not Running
 - perfSONAR-BUOY Regular Testing (One-Way Latency): Not Running
 - PingER Measurement Archive and Regular Tester: Not Running
 - SNMP Measurement Archive: Not Running
 - Traceroute Measurement Archive: Running
 - Traceroute Regular Testing: Running
- Software Versions:** A table listing various software components and their versions:

pS-Performance Toolkit	3.2.1-rc3
perfSONAR-PS Lookup Service	3.2.1
perfSONAR-PS PingER MA/MP	3.2.1
perfSONAR-PS perfSONAR-BUOY	3.2.1
perfSONAR-PS SNMP MA	3.2.1
perfSONAR-PS Traceroute MA/MP	3.2.1
BWCTL	1.3
OWAMP	3.2rc2
NDT	3.6.4
NPAD	1.5.6
pinger	0.8.7e

The left sidebar contains navigation menus for User Tools, Service Graphs, Toolkit Administration, and Performance Toolkit. The perfSONAR logo is visible at the bottom left of the interface.



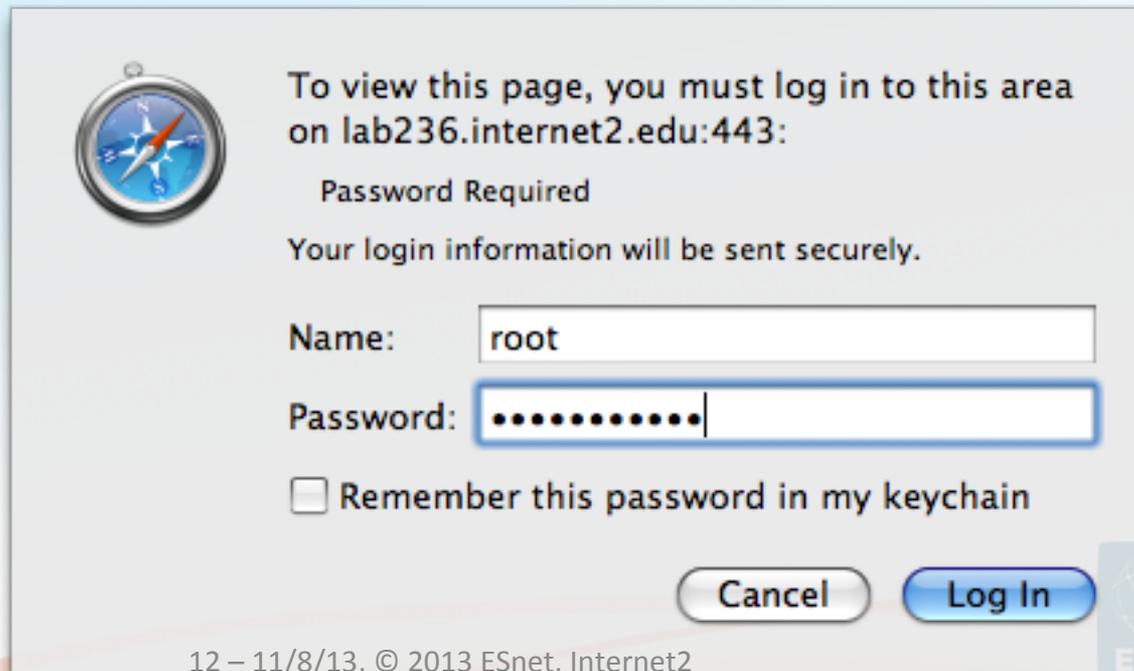
Outline

- Installation
- **Configuration**
 - **Administrative Information**
 - NTP
 - Services
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 - Latency Tools

Administrative Info

- Do this first, otherwise a lot of other stuff won't work.
- Authentication is required
- Always remember to save when you are done.

Administrative Info



Administrative Info

- Blank Information, click on 'edit':

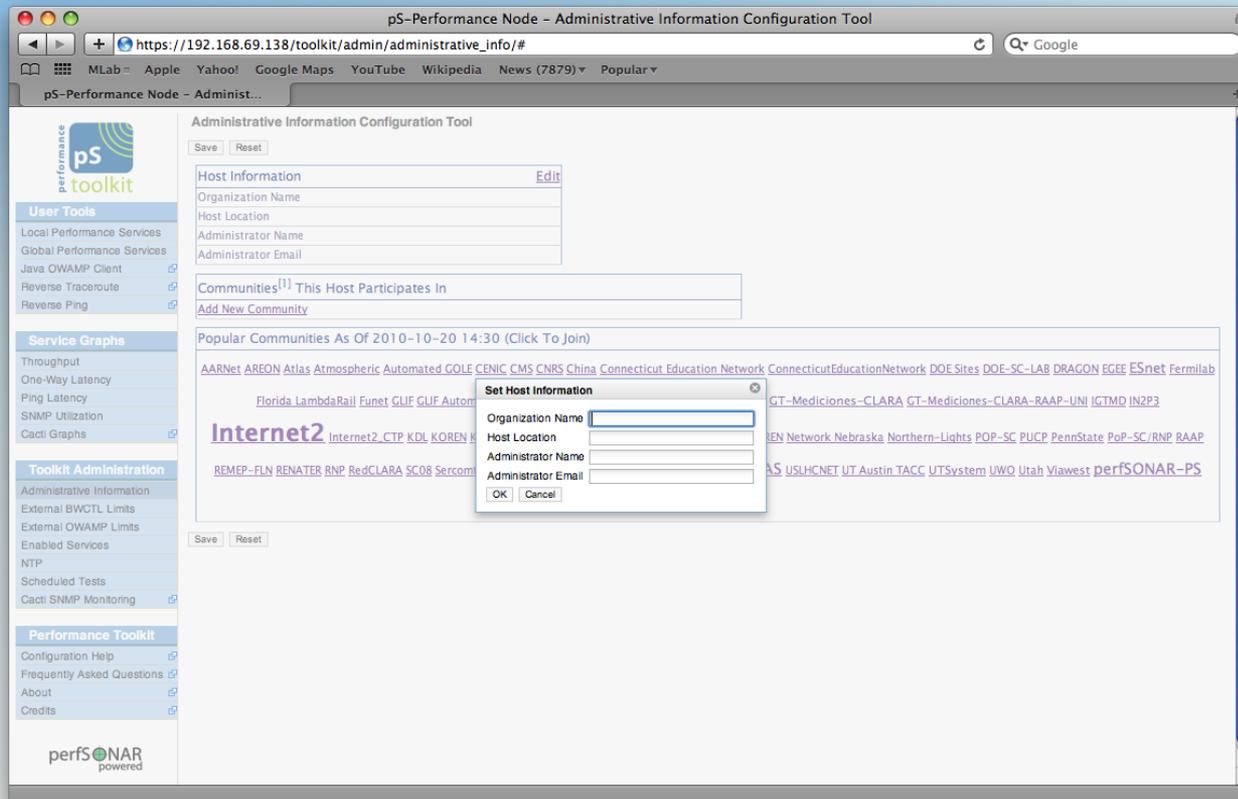
The screenshot shows a web browser window titled "pS-Performance Node - Administrative Information Configuration Tool". The address bar shows the URL "https://192.168.69.138/toolkit/admin/administrative_info/". The page content is organized into several sections:

- Administrative Information Configuration Tool**: Contains "Save" and "Reset" buttons.
- Host Information**: A table with fields for "Organization Name", "Host Location", "Administrator Name", and "Administrator Email". An "Edit" link is visible to the right of the table.
- Communities**: A section titled "Communities^[1] This Host Participates In" with an "Add New Community" link.
- Popular Communities**: A list of communities with a "Click To Join" link. The list includes: AARNet, AREON Atlas, Atmospheric Automated, GOLE, CENIC, CMS, CNRS China, Connecticut Education Network, ConnecticutEducationNetwork, DOE Sites, DOE-SC-LAB, DRAGON, EGEE, ESnet, Fermilab, Florida LambdaRail, Funet, GLIF, GLIF Automated, GOLE Project, GT-MEDICIONES - CLARA-RAAP-UNI, GT-Mediciones-CLARA, GT-Mediciones-CLARA-RAAP-UNI, ICTMD, IN2P3, **Internet2**, Internet2_CTP, KDL, KOREN, KREONET, LHC, LHCOPN, LLNL-GDO, Los Nettos, MAX, NCREN, Network Nebraska, Northern-Lights, POP-SC, PUCP, PennState, PoP-SC/RNP, RAAP, REMEP-FLN, RENATER, RNP, RedCLARA, SC08, Sercomtel, Server, StarLight, ThaiREN, UARK, UCR, UFSC, **USATLAS**, USLHCNET, UT Austin, TACC, UTSysstem, UWQ, Utah, Viawest, **perfSONAR-PS**, and **roedunet**.
- User Tools**: Local Performance Services, Global Performance Services, Java OWAMP Client, Reverse Traceroute, Reverse Ping.
- Service Graphs**: Throughput, One-Way Latency, Ping Latency, SNMP Utilization, Cacti Graphs.
- Toolkit Administration**: Administrative Information, External BWCTL Limits, External OWAMP Limits, Enabled Services, NTP, Scheduled Tests, Cacti SNMP Monitoring.
- Performance Toolkit**: Configuration Help, Frequently Asked Questions, About, Credits.

The footer of the page features the "perfSONAR powered" logo on the left and the "ESnet Energy Science Network" logo on the right. A large "INTERNET 2" logo is also visible in the bottom right corner.

Administrative Info

- Dialog Box, press “ok” and “save” when done:



Outline

- Installation
- **Configuration**
 - Administrative Information
 - **NTP**
 - Services
 - Regular Testing
- Measurement Results Tour
 - Home Page
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NTP

- Do this second. Note that it may take a day to fully stabilize the clock
- Pick 4 – 5 Close servers for NTP
- We have a fast way to do this, or you can manually select
- Can also add your own servers if you don't like ours
- **Note: Clocks are stable, no one should 'save', but feel free to play around and select closer ones if you want.**

NTP

- The List. Press “select closest” to run a selection

NTP Configuration Tool

Save Reset

Server	Description	Actions
<input checked="" type="checkbox"/> chronos.es.net	ESnet - New York, NY USA	Delete
<input type="checkbox"/> saturn.es.net	ESnet - Sunnyvale, CA USA	Delete
<input checked="" type="checkbox"/> owamp.atla.net.internet2.edu	Internet2 - Atlanta, GA USA	Delete
<input checked="" type="checkbox"/> owamp.chic.net.internet2.edu	Internet2 - Chicago, IL USA	Delete
<input type="checkbox"/> owamp.hous.net.internet2.edu	Internet2 - Houston, TX USA	Delete
<input type="checkbox"/> owamp.losa.net.internet2.edu	Internet2 - Los Angeles, CA USA	Delete
<input checked="" type="checkbox"/> owamp.newy.net.internet2.edu	Internet2 - New York, NY USA	Delete
<input type="checkbox"/> owamp.salt.net.internet2.edu	Internet2 - Salt Lake City, UT USA	Delete
<input type="checkbox"/> tick.mhpc.hpc.mil	Maui HPC Center - Maui, HI USA	Delete
<input type="checkbox"/> time-a.nist.gov	NIST - Gaithersburg, MD USA	Delete
<input type="checkbox"/> tick.usnogps.navy.mil	Naval Observatory - Colorado Springs, CO USA	Delete
<input checked="" type="checkbox"/> navobs1.oar.net	Naval Observatory - Columbus, OH USA	Delete
<input type="checkbox"/> ntp-ua.usno.navy.mil	Naval Observatory - Fairbanks, AK USA	Delete
<input type="checkbox"/> ntp-ucla.usno.navy.mil	Naval Observatory - Los Angeles, CA USA	Delete
<input type="checkbox"/> ntp-uw.usno.navy.mil	Naval Observatory - Seattle, WA USA	Delete
<input type="checkbox"/> ntp0.usno.navy.mil	Naval Observatory - Washington, DC USA	Delete
<input type="checkbox"/> a.ntp.monipe.rnp.br	RNP Time Server #1 - Brazil	Delete
<input type="checkbox"/> b.ntp.monipe.rnp.br	RNP Time Server #2 - Brazil	Delete
<input type="checkbox"/> c.ntp.monipe.rnp.br	RNP Time Server #3 - Brazil	Delete
<input type="checkbox"/> d.ntp.monipe.rnp.br	RNP Time Server #4 - Brazil	Delete
<input type="checkbox"/> e.ntp.monipe.rnp.br	RNP Time Server #5 - Brazil	Delete

Add New NTP Server Select Closest Servers

Save Reset

NTP

- Add in a server manually:

The screenshot shows the 'NTP Configuration Tool' web interface. The browser address bar displays 'https://lab236.internet2.edu/toolkit/admin/ntp/'. The page title is 'pS-Performance Node - NTP Configuration Tool'. The interface includes a sidebar with navigation menus for 'User Tools', 'Service Graphs', 'Toolkit Administration', and 'Performance Toolkit'. The main content area features a table of NTP servers with columns for 'Server', 'Description', and 'Actions'. A modal dialog titled 'Add New NTP Server' is open, showing the 'Address' field with 'clock.psu.edu' and the 'Description' field with 'Penn State - University Park PA'. The dialog has 'OK' and 'Cancel' buttons.

Server	Description	Actions
<input checked="" type="checkbox"/> chronos.es.net	ESnet - New York, NY USA	Delete
<input type="checkbox"/> saturn.es.net	ESnet - Sunnyvale, CA USA	Delete
<input checked="" type="checkbox"/> owamp.atla.net.internet2.edu	Internet2 - Atlanta, GA USA	Delete
<input checked="" type="checkbox"/> owamp.chic.net.internet2.edu	Internet2 - Chicago, IL USA	Delete
<input type="checkbox"/> owamp.hous.net.internet2.edu	Internet2 - Houston, TX USA	Delete
<input type="checkbox"/> owamp.losa.net.internet2.edu	Internet2 - Los Angeles, CA USA	Delete
<input checked="" type="checkbox"/> owamp.newy.net.internet2.edu	Internet2 - New York, NY USA	Delete
<input type="checkbox"/> owamp.salt.net.internet2.edu	Internet2 - Salt Lake City, UT USA	Delete
<input type="checkbox"/> tick.mhpc.hpc.mil	Maui HPC Center - Maui, HI USA	Delete
<input type="checkbox"/> time-a.nist.gov		Delete
<input type="checkbox"/> tick.usnogps.navy.mil		Delete
<input checked="" type="checkbox"/> navobs1.oar.net		Delete
<input type="checkbox"/> ntp-ua.usno.navy.mil		Delete
<input type="checkbox"/> ntp-ucla.usno.navy.mil		Delete
<input type="checkbox"/> ntp-uw.usno.navy.mil	Naval Observatory - Seattle, WA USA	Delete
<input type="checkbox"/> ntp0.usno.navy.mil	Naval Observatory - Washington, DC USA	Delete
<input type="checkbox"/> a.ntp.monipe.rnp.br	RNP Time Server #1 - Brazil	Delete
<input type="checkbox"/> b.ntp.monipe.rnp.br	RNP Time Server #2 - Brazil	Delete
<input type="checkbox"/> c.ntp.monipe.rnp.br	RNP Time Server #3 - Brazil	Delete
<input type="checkbox"/> d.ntp.monipe.rnp.br	RNP Time Server #4 - Brazil	Delete
<input type="checkbox"/> e.ntp.monipe.rnp.br	RNP Time Server #5 - Brazil	Delete

Outline

- Installation
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 - **Services**
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 - Home Page
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Services

- Services should be enabled/disabled from this screen (don't use chkconfig, we overwrite that with each save...)
- Shortcuts to enable bandwidth only vs latency only
- SSH is disabled by default!
- **Note: Don't 'save' after this part either, but feel free to see what the buttons do.**

Services

- All services, pressing either of the enable buttons will select/de-select:

performance
pS
toolkit

User Tools

- Local Performance Services
- Global Performance Services
- Java OWAMP Client
- Reverse Traceroute
- Reverse Ping

Service Graphs

- Throughput
- One-Way Latency
- Ping Latency
- SNMP Utilization
- Cacti Graphs

Toolkit Administration

- Administrative Information
- External BWCTL Limits
- External OWAMP Limits
- Enabled Services
- NTP
- Scheduled Tests
- Cacti SNMP Monitoring
- perfSONAR Logs

Performance Toolkit

- Configuration Help
- Frequently Asked Questions
- About
- Credits

perfSONAR

Enabled Services Configuration Tool

Save Reset

Services	Description
<input checked="" type="checkbox"/> PingER	Enables this host to perform scheduled ping tests. These tests will periodically ping configured hosts giving administrators a view of the latency from their site over time.
<input checked="" type="checkbox"/> perfSONAR-BUOY Throughput Testing	Enables this host to perform scheduled throughput tests. These tests will run periodically giving administrators a view of the throughput to and from their site over time.
<input checked="" type="checkbox"/> perfSONAR-BUOY Latency Testing	Enables this host to perform scheduled one-way latency tests. These tests will run periodically giving administrators a view of the latency from their site over time.
<input checked="" type="checkbox"/> perfSONAR-BUOY Measurement Archive	Makes available the data collected by the perfSONAR-BUOY Latency and Throughput tests.
<input checked="" type="checkbox"/> NDT	Allows clients at other sites to run NDT tests to this host.
<input checked="" type="checkbox"/> NPAD	Allows clients at other sites to run NPAD tests to this host.
<input checked="" type="checkbox"/> BWCTL	Allows clients at other sites to run Throughput tests to this host
<input checked="" type="checkbox"/> OWAMP	Allows clients at other sites to run One-Way Latency tests to this host
<input type="checkbox"/> SSH	Allows administrators to remotely connect to this host using SSH
<input checked="" type="checkbox"/> SNMP MA	Makes available SNMP statistics collected by Cacti (Note: you must configure cacti for this to work)
<input checked="" type="checkbox"/> Traceroute MA	Makes available results of data collected by scheduled traceroute tests
<input checked="" type="checkbox"/> Traceroute Scheduler	Enables this host to run scheduled traceroute tests.
<input checked="" type="checkbox"/> Lookup Service	Registers your services into the global set of perfSONAR services so that they can be discovered

Only Enable Bandwidth Services Only Enable Latency Services

Save Reset

Outline

- Installation
- **Configuration**
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 - **Regular Testing**
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 - Latency Tools

Regular Testing

- All regular testing follows the same pattern:
 - Select a Type
 - Select Parameters
 - Add Hosts
 - Save
- Will only go over BWCTL here

Regular Testing

- Blank Screen:

The screenshot shows a web browser window titled "pS-Performance Node - Scheduled Tests Configuration Tool". The address bar shows the URL "https://lab236.internet2.edu/toolkit/admin/regular_testing/". The page content includes a sidebar with navigation menus for "User Tools", "Service Graphs", "Toolkit Administration", and "Performance Toolkit". The main content area is titled "Scheduled Tests Configuration Tool" and contains a "Save" and "Reset" button pair, a "Scheduled Tests" table with the message "No Tests Configured", and three buttons: "Add New Throughput Test", "Add New Ping Test", and "Add New One-Way Delay Test". A second "Save" and "Reset" button pair is located below these buttons. The browser's status bar at the bottom indicates the page was opened in a new tab.

Regular Testing

- Configure parameters (for our purposes, lets do a test every 10 minutes, 20 second duration):

The screenshot displays the 'Scheduled Tests Configuration Tool' interface. The browser address bar shows the URL: https://lab236.internet2.edu/toolkit/admin/regular_testing/. The page title is 'Scheduled Tests Configuration Tool'. The main content area shows 'No Tests Configured' and buttons for 'Add New Throughput Test', 'Add New Ping Test', and 'Add New One-Way Delay Test'. A modal window titled 'Add New Throughput Test' is open, showing the following configuration fields:

- Description: BWCTL Testing
- Time Between Tests: 1 Hours
- Test Duration^[1]: 10 Seconds
- Bandwidth Tester: lperf
- Protocol: TCP
- Use Autotuning:

The left sidebar contains navigation menus for 'User Tools', 'Service Graphs', and 'Toolkit Administration'.

Regular Testing

- After setting up the test, now add hosts:

The screenshot shows a web browser window titled "pS-Performance Node - Scheduled Tests Configuration Tool" with the URL "https://lab236.internet2.edu/toolkit/admin/regular_testing/". The page displays a configuration interface for a "BWCTL Testing" test. A green message at the top states "Test BWCTL Testing Added" and "Throughput tests will be running 0% of the time". Below this, there are "Save" and "Reset" buttons. The main content area is divided into several sections:

- Scheduled Tests:** A table with one entry: "BWCTL Testing" (Throughput Test) with "Configure" and "Delete" links.
- Add New Test Buttons:** "Add New Throughput Test", "Add New Ping Test", and "Add New One-Way Delay Test".
- Test Parameters:** A table with the following data:

Description	BWCTL Testing
Test Duration (seconds)	10
Inter-Test Interval (seconds)	3600
Bandwidth Tester	Iperf
Protocol	TCP
Use Autotuning	yes
- Test Members:** A section indicating "No Members In Test" with an "Add New Host" button.
- Find Hosts To Test With:** A section titled "Communities This Host Participates In (Click To Find Community Hosts)" with a link for "Internet2".
- Other Communities As Of 2010-10-21 11:03 (Click To Find Community Hosts):** A section for finding other community hosts.

The left sidebar contains navigation menus for "User Tools", "Service Graphs", "Toolkit Administration", and "Performance Toolkit".

Regular Testing

- Manually add hosts:

Scheduled Tests Configuration Tool

Test BWCTL Testing Added

Throughput tests will be running 0% of the time

Save Reset

Scheduled Tests

Test Name	Test Type	Actions
BWCTL Testing	Throughput Test	Configure Delete

Add New Throughput Test Add New Ping Test Add New One-Way Delay Test

Test Parameters

Description BWCTL Testing

Test Duration (seconds)

Inter-Test Interval (seconds)

Bandwidth Tester

Protocol

Use Autotuning

Edit Test Parameters

Test Members

No Members In Test

Add New Host

Find Hosts To Test With

Communities This Host Participates In (Click To Find Community Hosts)

Internet2

Other Communities As Of 2010-10-21 11:03 (Click To Find Community Hosts)

Regular Testing

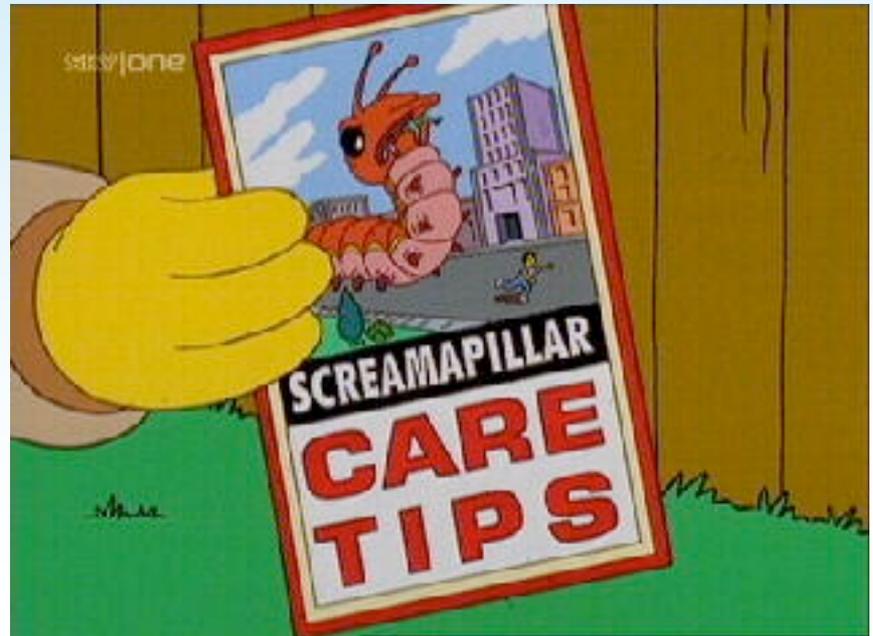
- Lets use these:
 - Test to 1 or 2 of your neighbors (perfsonar-ws-X.internet2.edu)
 - Test to Internet2
 - Ping/OWAMP: owamp.losa.net.internet2.edu, owamp.chic.net.internet2.edu, owamp.hous.net.internet2.edu, owamp.salt.net.internet2.edu
 - Traceroute/BWCTL: bwctl.losa.net.internet2.edu, bwctl.chic.net.internet2.edu, nms-bwctl.hous.net.internet2.edu, nms-bwctl.salt.net.internet2.edu
- Set up Latency, BW, Ping, and Traceroute tests

Outline

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Your pSPT Deployment and You

- The pSPT nodes are designed to help two constituencies
 - Engineers – Regular monitoring to catch problems earlier
 - Users – Distributed test points to validate their own performance
- Work as a system, the following will describe:
 - The tools
 - The operations methodology
 - Maintenance steps
- Can integrate with others
 - Deployed on Backbones
 - Other regionals
 - Campuses



Home Page

performance
pS
toolkit

User Tools

- Local Performance Services
- Global Performance Services
- Java OWAMP Client
- Reverse Traceroute
- Reverse Ping

Service Graphs

- Throughput
- One-Way Latency
- Head Ping Latency
- Red PC Ping Latency
- Green PC Ping Latency
- Blue PC Ping Latency
- SNMP Utilization
- Cacti Graphs

Performance Toolkit

- Configuration Help
- Frequently Asked Questions
- About
- Credits

perfsONAR
powered

pS-Performance Node

Host Information

Organization Name
Host Location
Administrator Name
Administrator Email

Communities This Host Participates In

--

Host Status

Primary Address	npw.internet2.edu
-----------------	-------------------

Services Offered

Bandwidth Test Controller (BWCTL)	Running
<ul style="list-style-type: none">tcp://npw.internet2.edu:4823tcp://ipv6-annarbor-ofc.internet2.edu:4823tcp://192.168.0.1:4823	
Lookup Service	Disabled
<ul style="list-style-type: none">http://npw.internet2.edu:9995/perfSONAR_PS/services/hLShttp://ipv6-annarbor-ofc.internet2.edu:9995/perfSONAR_PS/services/hLShttp://192.168.0.1:9995/perfSONAR_PS/services/hLS	
Network Diagnostic Tester (NDT)	Running
<ul style="list-style-type: none">tcp://npw.internet2.edu:3001http://npw.internet2.edu:7123tcp://ipv6-annarbor-ofc.internet2.edu:3001http://ipv6-annarbor-ofc.internet2.edu:7123tcp://192.168.0.1:3001	

Outline

- Installation
- Configuration
 - Administrative Information
 - NTP
 - Services
 - Regular Testing
- **Measurement Results Tour**
 - Home Page
 - **Throughput Tools**
 - Latency Tools

Throughput Measurements

The screenshot shows a web browser window titled "pS-Performance Node - pS-Performance Node" with the URL "http://npw.internet2.edu/toolkit/". The page displays the "pS-Performance Node" interface. On the left, there is a navigation menu with sections: "User Tools" (Local Performance Services, Global Performance Services, Java OWAMP Client, Reverse Traceroute, Reverse Ping), "Service Graphs" (Throughput, One-Way Latency, Head Ping Latency, Red PC Ping Latency, Green PC Ping Latency, Blue PC Ping Latency, SNMP Utilization, Cacti Graphs), and "Performance Toolkit" (Configuration Help, Frequently Asked Questions, About, Credits). The "Throughput" option in the "Service Graphs" section is circled in red. The main content area shows "Host Information" (Organization Name, Host Location, Administrator Name, Administrator Email), "Communities This Host Participates In", "Host Status" (Primary Address: npw.internet2.edu), "Services Offered" (Bandwidth Test Controller (BWCTL) Running, Lookup Service Disabled, Network Diagnostic Tester (NDT) Running), and "perfSONAR powered" logo.

Regular testing between beacons

- TCP Testing
 - Recommend to do at least a 20 second test every 4 hours. (less duration is ok for short RTT, can test more or less often)
 - TCP is elastic, numbers should be close to capacity unless link is heavily used. If they drop it may be congestion related or real problem related
- UDP Testing
 - Be careful, not elastic. If you are going to do it, pick your peers. Set a bandwidth limit, try to mimic a UDP application (e.g. video)
- Testing from others:
 - Encourage connectors to test to a close beacon.
 - Test to Internet2/MCNC etc.

Throughput Tests

performance pS toolkit

User Tools

- Local Performance Services
- Global Performance Services
- Java OWAMP Client
- Reverse Traceroute
- Reverse Ping

Service Graphs

- Throughput
- One-Way Latency
- Head Ping Latency
- Red PC Ping Latency
- Green PC Ping Latency
- Blue PC Ping Latency
- SNMP Utilization
- Cacti Graphs

Performance Toolkit

- Configuration Help
- Frequently Asked Questions
- About
- Credits

perfsONAR powered

Throughput Tests

Active Data Sets

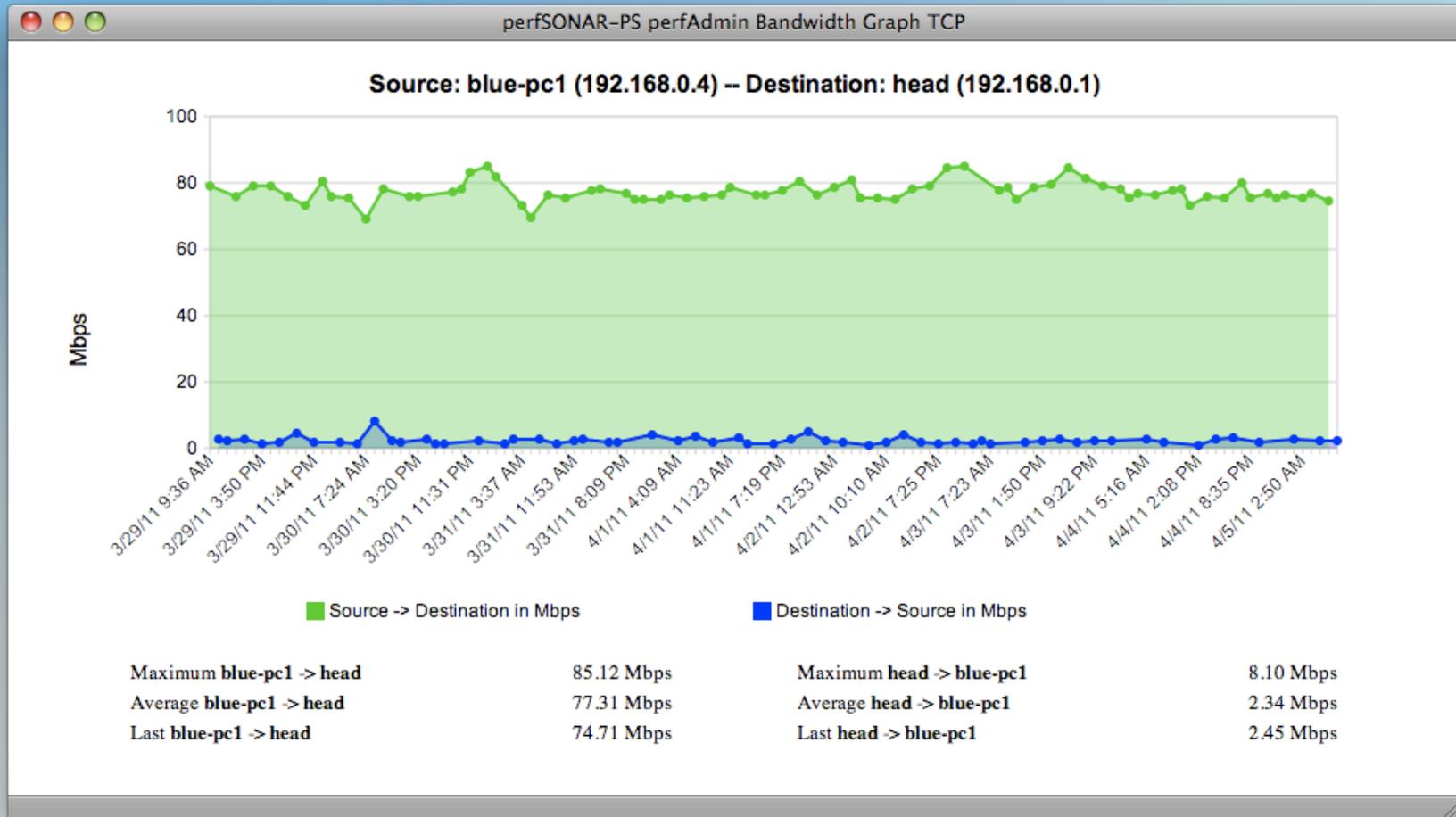
First Host	First Address	Second Host	Second Address	Protocol	Duration	Window Size	Bandwidth Limit	Bi-Directional	Line Graph	Scatter Graph
blue-pc1	192.168.0.4	green-pc1	192.168.0.3	TCP	20	4		Yes	--- Select ---	--- Select ---
blue-pc1	192.168.0.4	head	192.168.0.1	TCP	20	4		Yes	--- Select ---	--- Select ---
blue-pc1	192.168.0.4	red-pc1	192.168.0.2	TCP	20	4		Yes	--- Select ---	--- Select ---
green-pc1	192.168.0.3	head	192.168.0.1	TCP	20	4		Yes	--- Select ---	--- Select ---
green-pc1	192.168.0.3	red-pc1	192.168.0.2	TCP	20	4		Yes	--- Select ---	--- Select ---
head	192.168.0.1	red-pc1	192.168.0.2	TCP	20	4		Yes	--- Select ---	--- Select ---

1 Week Average Bandwidth in Mbps

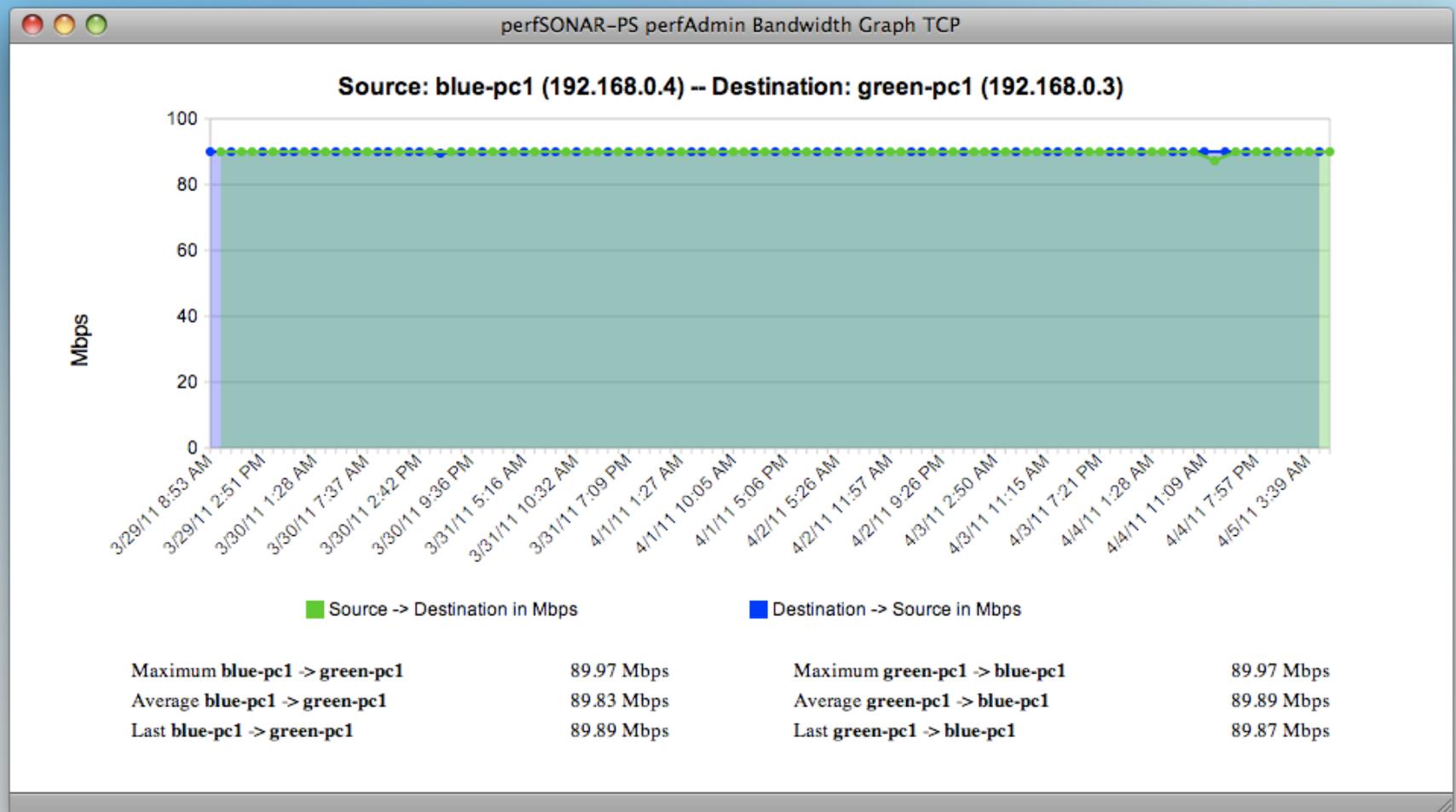
Host	In BW (Mbps)	Out BW (Mbps)
blue-pc1	~60	~85
green-pc1	~90	~90
head	~85	~45
red-pc1	~75	~90

Open "http://npw.internet2.edu/toolkit/gui/perfAdmin/serviceTest.cgi?url=http://localhost:8085/perfSONAR_PS/services/pSB&eventType=http://ggf.org/ns/nmwg/tools/iperf/2.0" in a new tab

Bad Throughput ... What Next?



Expected Throughput



Outline

- Installation
- Configuration
 - Administrative Information
 - NTP
 - Services
 - Regular Testing
- **Measurement Results Tour**
 - Home Page
 - Throughput Tools
 - **Latency Tools**

One Way Latency Tests

performance pS toolkit

User Tools

- Local Performance Services
- Global Performance Services
- Java OWAMP Client
- Reverse Traceroute
- Reverse Ping

Service Graphs

- Throughput
- One-Way Latency
- Head Ping Latency
- Red PC Ping Latency
- Green PC Ping Latency
- Blue PC Ping Latency
- SNMP Utilization
- Cacti Graphs

Performance Toolkit

- Configuration Help
- Frequently Asked Questions
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- Credits

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pS-Performance Node

Host Information

Organization Name
Host Location
Administrator Name
Administrator Email

Communities This Host Participates In

Host Status

Primary Address	npw.internet2.edu
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Services Offered

Bandwidth Test Controller (BWCTL)	Running
Lookup Service	Disabled
Network Diagnostic Tester (NDT)	Running

- tcp://npw.internet2.edu:4823
- tcp://ipv6-annarbor-ofc.internet2.edu:4823
- tcp://192.168.0.1:4823

- http://npw.internet2.edu:9995/perfSONAR_PS/services/hLS
- http://ipv6-annarbor-ofc.internet2.edu:9995/perfSONAR_PS/services/hLS
- http://192.168.0.1:9995/perfSONAR_PS/services/hLS

- tcp://npw.internet2.edu:3001
- http://npw.internet2.edu:7123
- tcp://ipv6-annarbor-ofc.internet2.edu:3001
- http://ipv6-annarbor-ofc.internet2.edu:7123
- tcp://192.168.0.1:3001

One Way Latency != Round Trip Latency

- One Way:
 - Detect problems in one direction vs the other (e.g. queueing, loss, out of order packets)
 - Helps detect “download” vs “upload” issues
- RTT:
 - Masks problems like queueing
 - ICMP packets are not respected
- OWAMP Graphs:
 - Feature two lines for each direction.
 - Very sensitive, even to NTP differences
 - Loss/duplication shows up as an event flag
 - Congestive loss as well loss caused by other reasons (equipment failures)

All OWAMP Tests

ps-Performance Node – One-Way Latency Tests

http://npw.internet2.edu/toolkit/gui/perfAdmin/serviceTest.cgi?url=http://localhost:8085/perfSONAR_PS/services/pSB&eventTyp

MLab = Apple Yahoo! Google Maps YouTube Wikipedia News (7937) Popular



User Tools

- Local Performance Services
- Global Performance Services
- Java OWAMP Client
- Reverse Traceroute
- Reverse Ping

Service Graphs

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One-Way Latency Tests

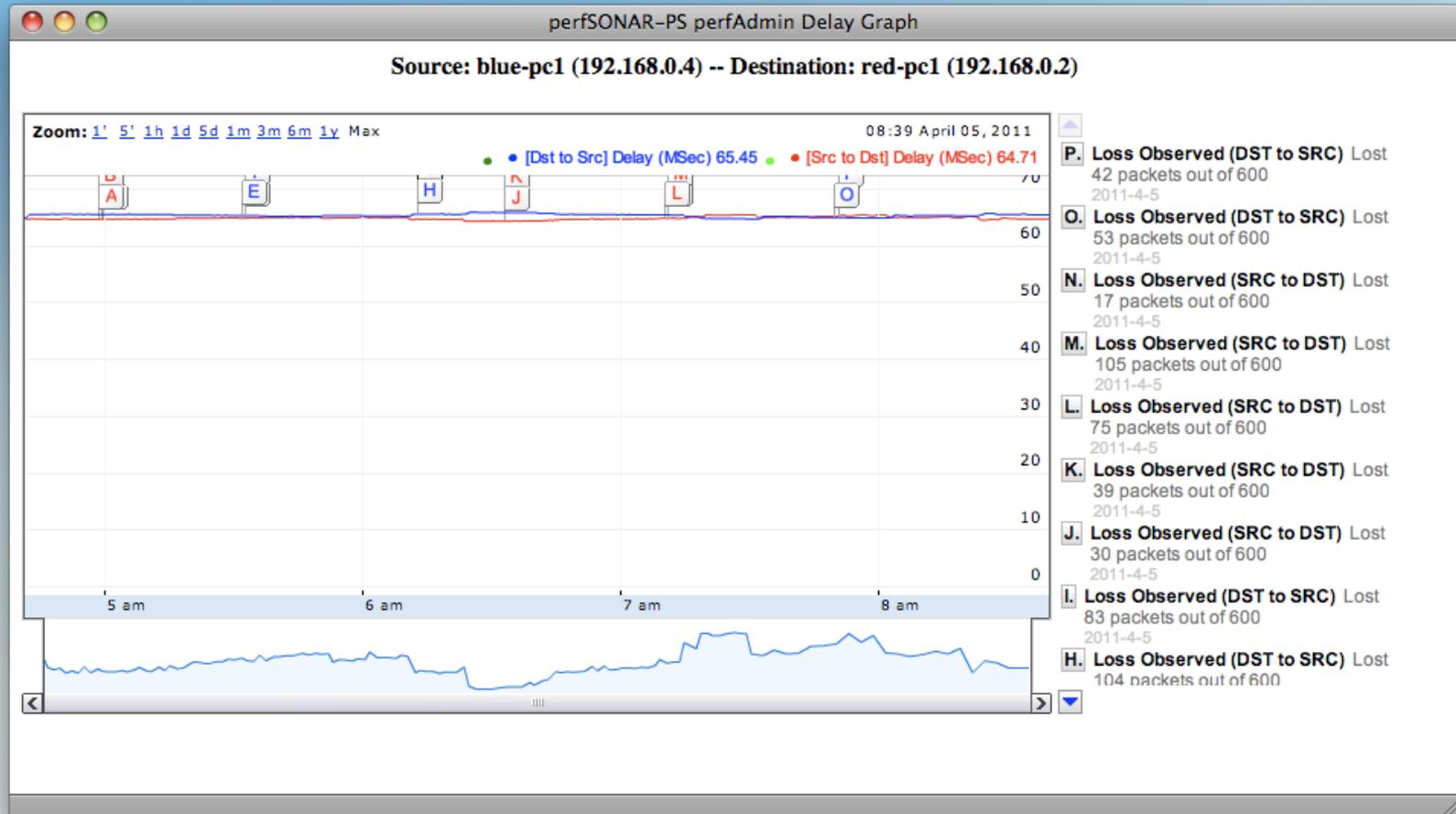
Active Data Sets					
First Host	First Address	Second Host	Second Address	Bi-Directional	Graph
blue-pc1	192.168.0.4	blue-pc1	192.168.0.4	Yes	-- Select --
blue-pc1	192.168.0.4	green-pc1	192.168.0.3	Yes	-- Select --
blue-pc1	192.168.0.4	head	192.168.0.1	Yes	-- Select --
blue-pc1	192.168.0.4	red-pc1	192.168.0.2	Yes	-- Select --
green-pc1	192.168.0.3	green-pc1	192.168.0.3	Yes	-- Select --
green-pc1	192.168.0.3	head	192.168.0.1	Yes	-- Select --
green-pc1	192.168.0.3	red-pc1	192.168.0.2	Yes	-- Select --
head	192.168.0.1	head	192.168.0.1	Yes	-- Select --
head	192.168.0.1	red-pc1	192.168.0.2	Yes	-- Select --
red-pc1	192.168.0.2	red-pc1	192.168.0.2	Yes	-- Select --

30 Minute Performance Summary (Min/Max Delay [MSec])				
	blue-pc1	green-pc1	head	red-pc1
blue-pc1	0.0067 / 0.0710	34.6718 / 65.7053	74.6770 / 215.7650	64.5232 / 135.7020
green-pc1	45.3148 / 9976.4500	0.0048 / 1.0490	30.0083 / 504.6930	19.9013 / 98.6629
head	75.2988 / 76.8461	30.0231 / 36.5620	0.0062 / 1.1902	9.9220 / 11.1976
red-pc1	65.2380 / 68.4700	19.8088 / 93.0333	9.8529 / 51.2662	0.0062 / 0.4311

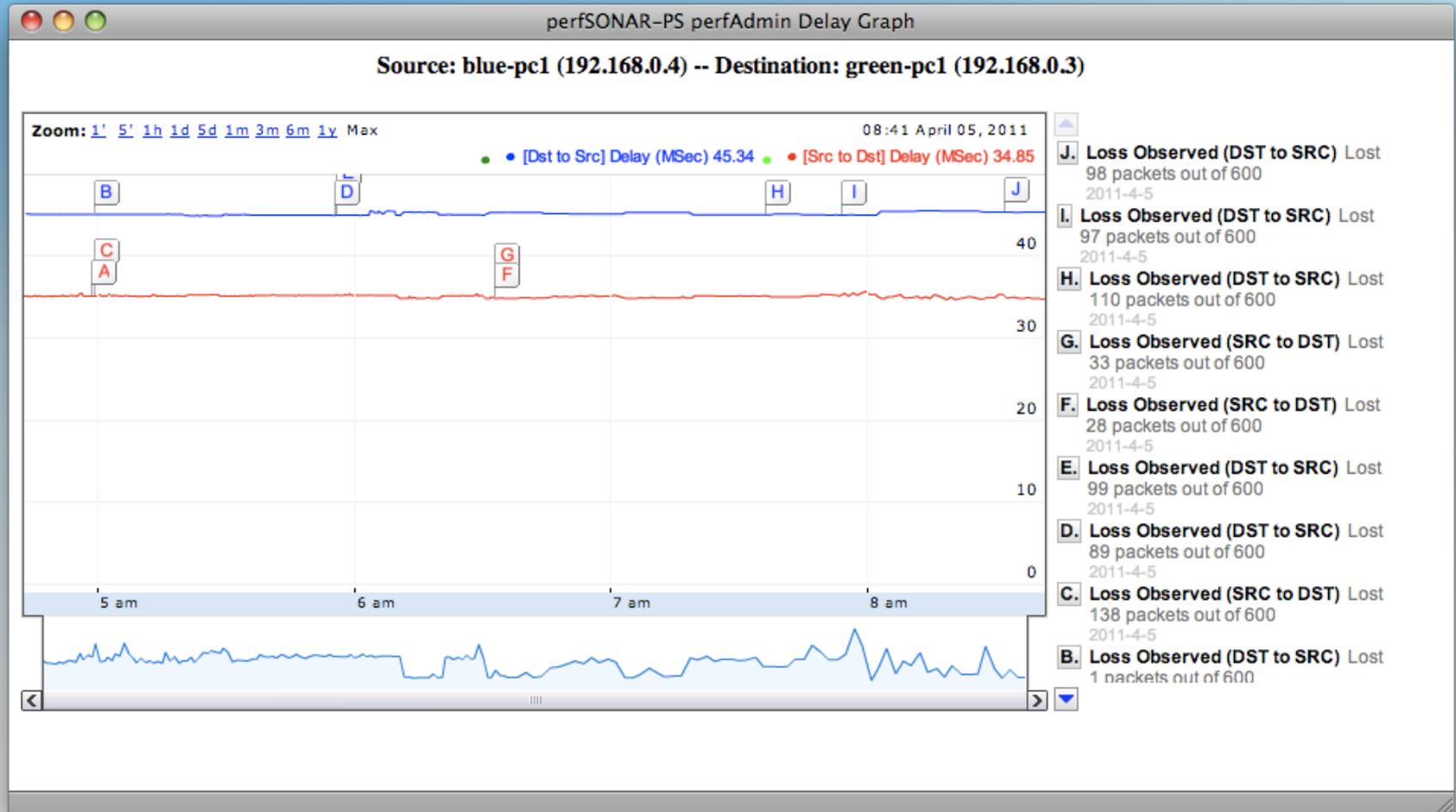
Non-Active Data Sets					
First Host	First Address	Second Host	Second Address	Bi-Directional	Graph

Open "http://npw.internet2.edu/toolkit/gui/perfAdmin/serviceTest.cgi?url=http://localhost:8085/perfSONAR_PS/services/pSB&eventType=http://ggf.org/ns/nmwg/characteristic/delay/summary/20070921" in a new tab

Similar Latencies, Some Loss



Different Latencies with pockets of Loss



PingER Select Data

The screenshot shows a web browser window with the URL `https://ps-data.kanren.net/toolkit/gui/perfAdmin/serviceTest.cgi?url=http://ps-wsu-lt.kanren.net:8075/perfSC`. The page title is "PingER Tests At http://ps-wsu-lt.kanren.net:8075/perfSONAR_PS/services/pinger/ma".

performance ps toolkit

User Tools

- Local Performance Services
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- Reverse Traceroute
- Reverse Ping

Service Graphs

- Throughput
- One-Way Latency
- WSU Ping Latency
- KSU Ping Latency
- KU Ping Latency
- 1102 Grand Ping Latency
- OWAMP Jitter
- Cacti Graphs

Toolkit Administration

- Administrative Information
- External BWCTL Limits
- External OWAMP Limits
- Enabled Services
- NTP
- Scheduled Tests

PingER Tests At http://ps-wsu-lt.kanren.net:8075/perfSONAR_PS/services/pinger/ma

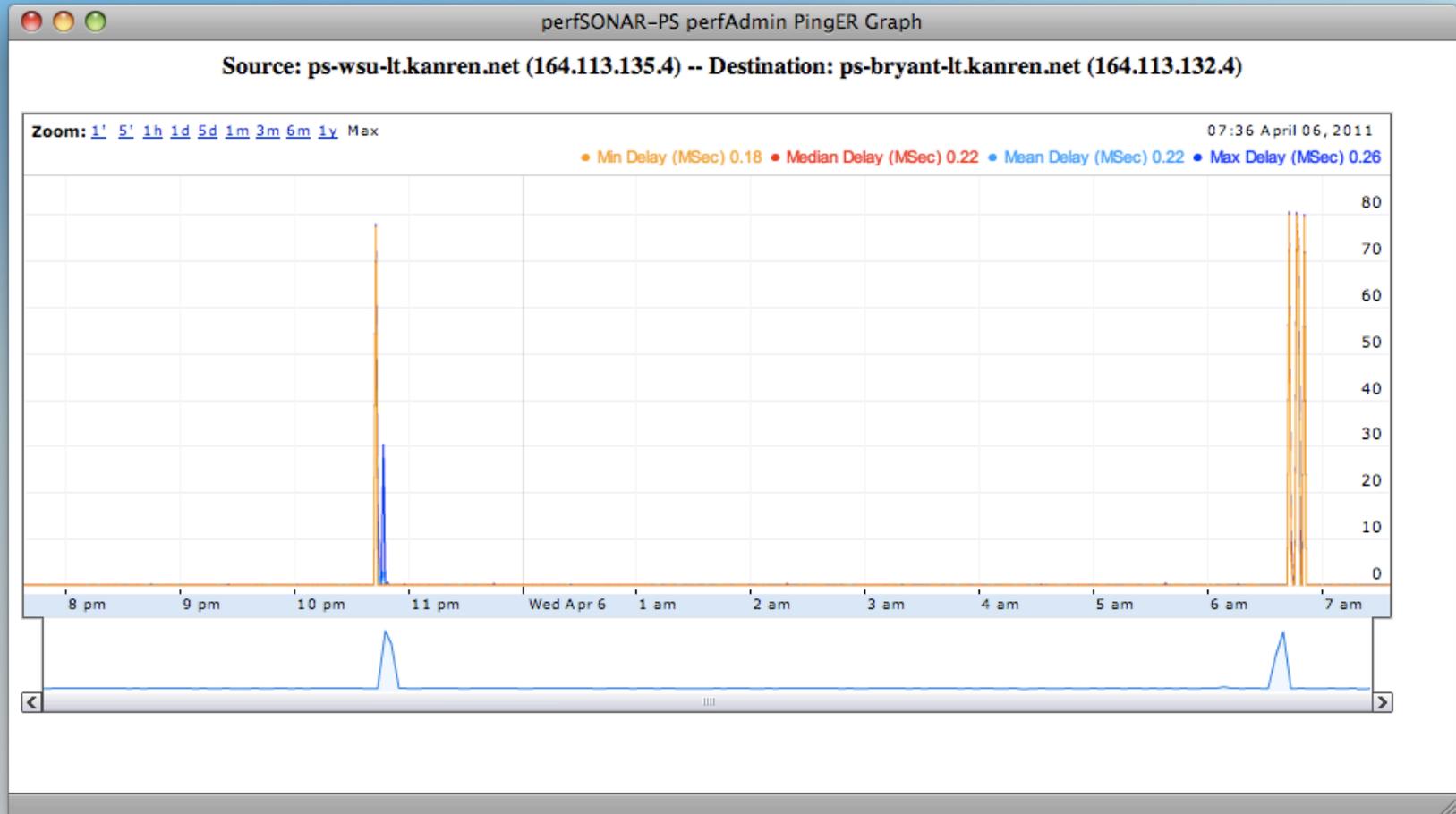
Active Data Sets

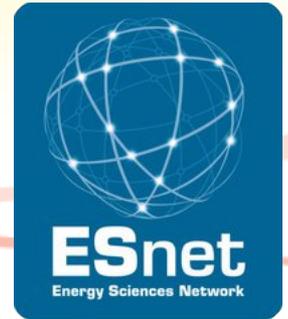
Source Address	Source Host	Destination Address	Destination Host	Graph
164.113.135.4	ps-wsu-lt.kanren.net	164.113.132.4	ps-bryant-lt.kanren.net	-- Select --
164.113.135.4	ps-wsu-lt.kanren.net	164.113.134.4	ps-ksu-lt.kanren.net	-- Select --
164.113.135.4	ps-wsu-lt.kanren.net	164.113.133.4	ps-ku-lt.kanren.net	-- Select --
164.113.135.4	ps-wsu-lt.kanren.net	164.113.135.4	ps-wsu-lt.kanren.net	-- Select --

Non-Active Data Sets

Source Address	Source Host	Destination Address	Destination Host	Graph
164.113.135.4	ps-wsu-lt.kanren.net	127.0.0.1	localhost	Start: Feb 6 2011 End: Apr 6 2011 Graph

PingER Graph with spikes of activity





Software Configuration

November 18th 2013, SC13 Network Performance Tutorial
Jason Zurawski – Internet2/ESnet

For more information, visit <http://www.internet2.edu/workshops/npw>

