

## Winter JTs 2011 – Network Performance Workshop

### 1. NDT Testing

- a. Go to <http://www.measurementlab.net>
- b. Select "Test Your Internet Connection"
- c. Select "Network Diagnostic Tool"
- d. Select "Run the network diagnostic tool"
- e. Run the test by clicking "START"
- f. Questions to answer:
  - i. What is the performance from client to server?
  - ii. What is the performance from server to client?
  - iii. What does NDT think is the cause of the network performance?
  - iv. What does NDT think is the cause of the network performance?
  - v. Look at the "Statistics" and "More Details" buttons. What additional information are you learning?

### 2. NPAD Testing

- a. Go to <http://www.measurementlab.net>
- b. Select "Test Your Internet Connection"
- c. Select "Network path & application diagnostics"
- d. Select "Run NPAD test"
- e. Select an RTT and Bandwidth number (e.g. 30ms and 10Mbps).
- f. Run the test by clicking "Start Test"
- g. Questions To Answer:
  - i. Was your host able to send at the requested rate/latency?
  - ii. What caused the failures, if any?
  - iii. Change the latency or bandwidth until you are able to complete a successful test. What latency/bandwidth did you choose?

**For all subsequent questions, you will need to login to the hosts. Get your username/password from Aaron or Jason. Use this password and use SSH to login to "npw.internet2.edu". Open a web browser and point it to "npw.internet2.edu"**

### 3. NTP Investigation

- a. Investigate the NTP configuration on the "head" host.
- b. You will need to use the "ntpq" command to do this. You can learn about ntpq by using "man ntpq". In particular, learn what commands will display the NTP peers.
- c. Questions To Answer:
  - i. What are the peers of the "head" host?
  - ii. Which host is the "head" host synchronizing against?
  - iii. What is the "stratum" of the "head" host?

#### 4. Testbed Layout

- a. There are 4 hosts in our network:
  - i. head
  - ii. red-pc1
  - iii. green-pc1
  - iv. blue-pc1.
- b. Your key will work on each, so feel free to SSH as needed. Check the status of NTP on each host.
- c. Use "ping" to investigate how the various hosts are connected. You can find out more information about ping by running "man ping"
- d. Questions To Answer:
  - i. Are all of the clocks stable? If not, which hosts are suspect?
  - ii. Draw a diagram of all the hosts containing their IP addresses and hostnames, their links to other hosts, and the round-trip time between each host.

#### 5. OWAMP Investigation

- a. Use the "owping" tool to discover the one-way latencies between the hosts. You can find out more information on owping by running "man owping".
- b. Questions To Answer:
  - i. Using the information from above, draw another diagram of all the hosts, and the one-way delay between each host on all links. Take note of any loss or duplicate packets seen (May need to investigate by running the tool more than once, or running with a longer number of packets than the default of 100)
  - ii. Based on the results of the NTP comparison, how will the stability of the clocks change the measurement results?
  - iii. Based on the latency, duplicates and loss rates, which links do you think will perform best and which will perform the worst?

#### 6. BWCTL Investigation

- a. Use the "bwctl" tool to perform bandwidth tests between the hosts. You can find out more information on bwctl by running "man bwctl".
- b. Do 'TCP' testing for now.
- c. Questions To Answer:
  - i. How long did you have to wait to get the results?
  - ii. Draw yet another diagram of all the hosts using the information from above, and note the bandwidth (in Mbps, use the '-f m' option to get this format) between each host. Did the bandwidth match your expectations based on the information you found above?
  - iii. Do 'UDP' testing if possible, a 10 second test should be long enough. Be sure to use an interval of 1 or 2 seconds. What do

the results of these tests convey about Jitter and Loss? Are the bandwidth results higher than for TCP? Why?

#### 7. NDT Command Line

- a. Use the "web100clt" tool to perform ndt tests between the hosts. You can find out more information on web100clt by running "man web100clt" or "web100clt -h".
- b. Use the "-d" and "-l" flags (sometimes more than once...) to get more information.
- c. Questions To Answer:
  - i. NDT will deliver an answer on bandwidth that is similar to BWCTL, but with more information. What sort of information are you seeing, and does this agree with previous observations?
  - ii. Are there any problems (e.g. buffer sizes, queueing) noted between the hosts?

#### 8. **Optional** - NPAD Command Line

- a. Use the "pathdiag.py" tool to perform NPAD tests between the hosts. You can find out more information on pathdiag by running "/opt/npad/pathdiag.py -h"
- b. Questions to Answer:
  - i. What local infrastructure problems had NPAD identified?
  - ii. Does this meet what we have seen with the other tools?

#### 9. perfSONAR Tools Investigation

- a. As a way to verify your findings, we're running regular performance tests between the various hosts, and recording the results.
- b. Browse to <http://npw.internet2.edu/toolkit/>
  - i. Select the "One-Way Latency" option from the "Service Graphs"
    1. Look at each host, use a "4 hour" or "12 Hour" graph. Does the performance match what you saw?
  - ii. Select the "Throughput" option from the "Service Graphs"
    1. Look at each host, use a "1 Hour" graph. Does the performance match what you saw in the diagnostic section? What can you notice if you look at the "1 Month" graph?
  - iii. Select the "Head Ping Latency" option from the "Service Graphs"
    1. Examine the graphs for host pairs that you perceive to have a problem
  - iv. Select the "Red PC Ping Latency" option from the "Service Graphs"
    1. Examine the graphs for host pairs that you perceive to have a problem

- v. Select the "Green PC Ping Latency" option from the "Service Graphs"
  - 1. Examine the graphs for host pairs that you perceive to have a problem
- vi. Select the "Blue PC Ping Latency" option from the "Service Graphs"
  - 1. Examine the graphs for host pairs that you perceive to have a problem
- c. Based on the knowledge of using the tools in a diagnostic fashion, how do the regular monitoring results compare?

**We will now make a change to the network. This will either increase or decrease the performance from the observations we have noted.**

10. What was the change? Use the tools to figure this out. Pick a tool and start the diagnostic process over again.
- a. Use Ping to make another RTT Map
  - b. Use OWPing to make another OWD Map
  - c. Use BWCTL to make another BW Map
  - d. Use NDT and NPAD Command Line Tools to make more observations about the change.
  - e. Questions & Procedures:
    - i. Work systematically, before choosing one of the tools think about what the results will give you (e.g. measurement type)
    - ii. Think about what the "underlying cause" could be as you debug. Networks have many layers (from the OSI stack) and the problems could be on any of them (e.g. a dirty optical fiber, a bad host driver, or switches w/ small buffers)
    - iii. Always capture results, and make sure you can repeat them (due to the size of our testbed note that repeatability may vary – take the results of a couple tests and use the average).