NEXT GENERATION INFRASTRUCTURE

Starting at 9:50

pShooter
pShooter
A Tool for Automating Troubleshooting with perfSONAR

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INTRODUCTION
pShooter

• Automated, perfSONAR-based performance troubleshooter

• Came about as a result of some discussions at Internet2 in early 2018.
Two Topics

• Adding performance data to existing visual traceroute tools

• Identifying perfSONAR nodes near points along a path
  – Initially for finding stored measurements
LOCATING PERFSONAR NODES
The Troubleshooting Process, Part 1

Observe poor performance

Trace the path between hosts

Identify nearby perfSONAR nodes
Where to Make Measurements?

- Lookup Service is geographic, not topological.
- Candidate nodes and the paths between them and the point along the path have to be checked out.
  - Recursive problem: Need to find other perfSONAR nodes to test these paths.
The Question We Want Answered

Q: My traffic passes through 198.51.100.26. What perfSONAR node should I use for testing to that point along the path?

A: Use perf2.nyc.foo.net.
The Question We Want Answered

• Network operators know the answer.

• They probably don’t want a lot of phone calls and emails asking about it.

• Automate the asking and answering.
A Low-Effort Solution

DNS

Yeah. We went there.
Using DNS to Distribute Nearest-Node Information

• Why use DNS?
  – Ubiquitous  
    Everybody runs a DNS server
  – Reliable  
    Robust infrastructure deployed worldwide
  – Cached  
    Helps mitigate outages of authoritative servers
  – Available  
    Rarely blocked, almost always at least proxied

• Better than a single, static directory
  – No central resources required
  – Network operators control their own DNS servers
  – Ability to give different answers to different questioners (e.g., BIND views)
How’s it Done?

• Start with an IP on the path 198.51.100.26
• Reverse resolve to FQDN e6-2.nyc.foo.net
• Add prefix _ipv4._perfsonar.e6-2.nyc.foo.net
• Resolve to TXT record { "pscheduler": "perf2.nyc.foo.net" }
• No record found means no operator-recommended perfSONAR node.
Special Provisions for Special Situations

• Single- and dual-stack IP environments
  – Prefix for IPv4  _ipv4._perfsonar
  – Prefix for IPv6  _ipv6._perfsonar
  – Last-resort, non-specific prefix  _perfsonar
  – Prefix avoids colliding with site’s other TXT records

• Redirection of queries to a URL
  – 255-byte length limit of TXT records on some DNS servers
  – Allows for dynamically-generated answers
The Complete Skinny

- The entire scheme is documented.
- URL at the end of the presentation.
- We’d like to encourage network operators to adopt it.
AUTOMATIC TROUBLESHOOTING
How to Make Measurements?

• Early analysis showed the traditional method of testing and storing everything to be impractical.
  – A full set of measurements would cover every possible path among all points on the network.
  – Intra-domain test time and traffic would be huge.
  – Measurement done *a priori* might not reflect the state of the network when it has a problem.
  – On-demand is a good better substitute.
The Troubleshooting Process, Part 2

- Test entire path
- Test shorter path
- Repeat until problem disappears
- Investigate likely sources
Going About It

• We know the path in question.
• We know the measurement of interest.
• We have a way to find perfSONAR nodes along the path.

• Measuring along the path can be automated.

• Enter *pShooter*. 


pShooter

• Web service: request goes in, results come out (eventually)
• Uses the pScheduler REST API to get the work done
• Lots of potential for integration with other systems
• Doesn’t make for a visually-interesting demo
pShooter from the Outside: What Goes In

- List of IPs from a trace between the two troublesome points
  - Easily extracted from the JSON result of a pScheduler trace test.

- pScheduler test specification template with special placeholders for “A” and “Z” ends
Demo

• `pScheduler trace` result

• Input
pShooter on the Inside

- Finds the nearest perfSONAR node for each point along the path
  - DNS method or direct check

- Runs tests from itself to each point along the path where perfSONAR is available
  - Will run single-participant tests (e.g., rtt, latency) directly to the hop IP if perfSONAR is not available but the right services are (e.g., ICMP, owampd)

- Collects the results and diagnostic information

- Produces a final result
pShooter from the Outside: What Comes Out

- Results of each test performed
  - JSON, Plain Text, HTML
  - Information about the test

- Hop and perfSONAR host information
- Other diagnostic information
Demo
Where pShooter Is

- Prototype
- Command-line program
- Does everything described so far
- Hooks to augment DNS for experimentation

- Code designed and built to be ready for production use with minimal additional work
Where pShooter is Headed

• Conversion into a consumable service with a REST API

• Integration with the perfSONAR toolkit and shipment with a future release.
Thanks!

• Brief: *DNS as a Locator Service for Nearby perfSONAR Nodes*

• Prototype for VirtualBox and Vagrant

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