The MyESnet Portal: Making the Network Visible

Jon Dugan, Network Engineer
ESnet Tools Team
Scientific Networking Division
Lawrence Berkeley National Laboratory

JointTechs Summer 2012
Stanford University
July 16, 2012
Outline

1. Portal
2. Motivation
3. Scope
4. Examples
5. Design
6. Data
7. Development
8. Future
9. Questions?
What is the MyESnet Portal?

• A data-driven website for displaying information and visualizations about ESnet, its sites and community.
• Soon it will include access additional tools such as end to end debugging and a looking glass.
• There is also a data substrate which forms the basis for the portal, called the ESnet API.
Motivation

• Organize and visualize network information
• Complement user support by providing self service
• Increase transparency
  – Externally
  – Internally
• Outgrowth of ESnet’s mission
Scope

• Provide access to relevant data to anyone who uses or is interested in ESnet
  – If ESnet is in the path, provide available data
  – Share data rather than withhold it

• User personas
  – ESnet Site Coordinators
  – Scientists and their support staff
  – Lab directors / CIOs
  – DOE Program Managers
  – Network Operators
  – The Public
Information Architecture

Top level concepts:

- Network
- Sites / National Laboratories
- Collaborations / Virtual Organizations
- Peers / Other Networks
- Tools
- Network POPs (internal)
Site Summary

Traffic (for last 24 hrs)

Total traffic

Total OSCARS traffic

Top 10 countries (traffic avg for last 24 hrs)

<table>
<thead>
<tr>
<th>Country</th>
<th>Traffic (Mbps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITED STATES</td>
<td>432M</td>
</tr>
<tr>
<td>RUSSIAN FEDERATION</td>
<td>24.8M</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>13.2M</td>
</tr>
<tr>
<td>SPAIN</td>
<td>21.0M</td>
</tr>
<tr>
<td>BELGIUM</td>
<td>263M</td>
</tr>
</tbody>
</table>

Peering information

<table>
<thead>
<tr>
<th>Address</th>
<th>Speed</th>
<th>IPV6?</th>
</tr>
</thead>
<tbody>
<tr>
<td>198.151.133.254</td>
<td>1G</td>
<td>N</td>
</tr>
<tr>
<td>198.49.208.2</td>
<td>1G</td>
<td>N</td>
</tr>
<tr>
<td>198.49.208.210</td>
<td>10G</td>
<td>N</td>
</tr>
<tr>
<td>198.49.208.230</td>
<td>20G</td>
<td>N</td>
</tr>
<tr>
<td>2b01:400:2402:8:2</td>
<td>10G</td>
<td>Y</td>
</tr>
</tbody>
</table>

Availability

<table>
<thead>
<tr>
<th>Month</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 2012</td>
<td>100%</td>
</tr>
<tr>
<td>Mar 2012</td>
<td>100%</td>
</tr>
<tr>
<td>Feb 2012</td>
<td>100%</td>
</tr>
<tr>
<td>Jan 2012</td>
<td>100%</td>
</tr>
<tr>
<td>Dec 2011</td>
<td>100%</td>
</tr>
<tr>
<td>Nov 2011</td>
<td>100%</td>
</tr>
<tr>
<td>Oct 2011</td>
<td>100%</td>
</tr>
</tbody>
</table>
Flow (Application Breakdown)
Flow (Top Talkers)
DICE Dashboard

Throughput >= 500Mbps
Throughput < 500Mbps
Unable to retrieve data
Check has not yet run

ESnet to GEANT OWAMP Tests

ESnet to GEANT BWCTL Tests

chic-owamp.es.net
newy-owamp.es.net
pnwg-owamp.es.net
sunn-owamp.es.net
wash-owamp.es.net

chic-pt1.es.net
newy-pt1.es.net
pnwg-pt1.es.net
sunn-pt1.es.net
wash-pt1.es.net
Power Visualization

Network Power Consumption [BETA]

As part of the ANI project ESnet is measuring the power utilization of the entire prototype network. This visualization shows the power consumption of the ANI network both as the number of Joules consumed per bit and as the raw Watts (Joules/sec) consumed. This power utilization is measured for the five ANI testbed routers. This does not include the power consumed by the optical transport gear.

This visualization is in beta testing and is not fully production quality yet. There may be missing or incorrect data. Please report bugs to the ESnet Tools Team.

Joules per Bit

This graph monitors the power being used by the entire ANI network to do "useful work" in moving bits of information from ingress to egress. The current graph shows wide variations as the network traffic changes – the main reason for that is because the current network equipment power consumption is not "traffic proportional" i.e., the power consumed by the network does not reduce or change dramatically if it is forwarding useful bits or not. There is a good reason for this, as the network equipment vendors have been dealing with rapid growth of end-user internet use, thus preferring performance over energy efficiency. We would like to observe a very steady Joules/bit consumption with low variation with traffic. This can be accomplished by moving the network design process towards traffic-proportional energy consumption in the equipment.
Scaling the Earth System Grid to 100Gbps Networks (LBNL)

Presenters: Alex Sim and Mehmet Balcan (LBNL Computational Research Division)

Venue: Booth 512

Climate change research is one of the critical data intensive sciences, and the amount of data is continuously growing. Climate simulation data is geographically distributed over the world, and it needs to be accessed from many sources for fast and efficient analysis and intercomparison of simulations. This demonstration will leverage a 100 Gbps link connecting the National Energy Research Scientific

Live demo stats

<table>
<thead>
<tr>
<th>Throughput (Gbps)</th>
<th>Thd</th>
<th>1d</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Throughput (current)

85 Gbps

Topology

Visualizing the Universe at 100 Gbps (LBNL)

Global Range 400Gbps InfiniBand Demo (BSTA)

Demonstration of High Performance 100 Gbps Networking for Petascale Science (NASA)

The new NPO cloud: Data-intensive scientific applications, Lustre-WAN, and OpenFlow over 1000Gb Ethernet (Indiana)

RFTTP: RDMA-based file transfer application for ultra-high speed networks (BNL)

End-to-End Virtualization: Campus, WAN and Data Center (ESnet/UDel)

Just in Time Data Placement for UHC Analysis (FNAL/UCSD)

400 Gbps Data Transfer Between SC11 and Univ Michigan (Caltech)

Dynamic, On-demand Resources and Provisioning (RENCI)
OSCARS Visualization
Network Topology

Advanced Networking Initiative (ANI)

Summary

ANI Prototype Network, Phase II
The network in this phase will be the first step towards the next generation of ESnet.
Design Methodology

User Centered
• Determine user needs
• Gather requirements
• Solicit Feedback
• Observe users

Agile
• Small team
• Release Cadence
Development Platform

Developed using FOSS tools

Some code will be made available
  – Widgets

Some code is very ESnet specific

Software stack

• Client side
  – d3.js
  – jQuery

• Server side
  – Django
  – PostgreSQL
Data

The portal visualizes and organizes data, but sometimes the raw data is preferable:

– Mashups with other data
– Monitoring
– Analytics

ESnet REST API

– All portal data is or will be available
– Used internally
– Data: http://api.es.net/
– Docs: http://developer.es.net/
API Example

```
$ curl -k https://api.es.net/v1/esnet_site/
{
  "meta": {
    "previous": null,
    "total_count": 44,
    "offset": 0,
    "limit": 20,
    "next": "/api/v1/esnet_site/?limit=20&offset=20"
  },
  "objects": [
    {
      "website": "http://www.ameslab.gov/",
      "name": "Ames Laboratory",
      "short_name": "ames",
      "id": "5",
      "asn": 2640,
      "resource_uri": "/api/v1/esnet_site/5/"
    },
    {
      "website": "http://www.anl.gov/",
      "name": "Argonne National Laboratory",
      "short_name": "anl",
      "id": "1",
      "asn": 683,
      "resource_uri": "/api/v1/esnet_site/1/"
    },
    ... additional sites elided ...
  ]
}
```
Future

- Improved Power Visualizations
- Detailed View of Peers
- Additional Site Metadata
- Map centric views
- Historical Stats and Trends
- Multi domain OSCARS

- SC12 Demo Visualization
- Network “neighborhood”
- Internal/Staff dashboard
Questions?

Thanks!

Jon Dugan <jdugan@es.net>
https://my.es.net/
http://www.es.net/
http://fasterdata.es.net/