Performance Analysis Comparison between Academic and Commercial Networks
Workgroup & Time Plan

2018
May - Aug
PREPARATION
Sep - Oct
TESTS

2019
Nov - Feb
ANALYSIS
Mar - Apr
TESTS
May-Jun
ANALYSIS

COORDINATOR

CESGA
RedIRIS
Universitat de València
Previous work:
REANNZ: Research grade dataset transfer from New Zealand to Europe.

Commercial ISP: Data transfer rates only reached **2.7 Gbps** before failing entirely.

REANNZ: Data transfer rate reached **9.98 Gbps** for 6 hours and completed.
Previous work:
GEANT: Research grade dataset transfer from London to Sidney.

Commercial ISP1:
- Transfer rate reached **0.9 Gbps** (200MB buffer size).
- Transfer rate reached **1.72 Gbps** (300MB buffer size) (after 40s it dropped to 0).

Commercial ISP2:
- Transfer rate reached **110 Mbps** (after 15s dropped to 0).

GEANT: Data transfer rate reached **9.27Gbps**.
Our Methodology and Test Scenario:

- Conduct continuous short bandwidth tests for several days. Obtain Latency and hops.
- Two scenarios: Commercial vs Academic Routing
- Test infrastructure: Perfsonar & BWCTL
  - Traffic Source: 152 BWCTL servers located worldwide
  - Traffic Destination: 2 optimized/tuned BWCTL servers located at RedIRIS
Testbed servers selection(*)
Commercial/Academic Selection.
Commercial/Academic Selection.

SOURCE NETWORK

COMMERCIAL TRANSPORT

ACADEMIC TRANSPORT

REDIR

GAL DESTINATION SERVER
185.205.149.1

CESGA

UNIV. OF VALENCIA

SOURCED SERVER

185.205.148.1

BGP Adv: 185.205.148.0/22

VAL DESTINATION SERVER
Commercial/Academic Selection.

 SOURCE NETWORK

 COMMERCIAL TRANSPORT

 ACADEMIC TRANSPORT

 BGP Adv: 185.205.148.0/22

 REDIRIS

 GAL DESTINATION SERVER
 185.205.149.1

 CESGA

 UNIV. Of VALENCIA

 VAL DESTINATION SERVER
 185.205.148.1
Testbed figures.

2.5 months (*)

13.5K samples (out of 40K)

Bandwidth, Latency and Num. hops

2 destination servers
152 source servers

23 source countries

(*) Non continuous. Each scenario about 10 days and 24h/day.
Results. Number of hops.

<table>
<thead>
<tr>
<th>Country</th>
<th>Num. Hops</th>
<th>Commercial</th>
<th>Academic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>25</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>New Zealand</td>
<td>25</td>
<td>0</td>
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<tr>
<td>Japan</td>
<td>25</td>
<td>0</td>
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<tr>
<td>Republic of Korea</td>
<td>25</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Serbia</td>
<td>13</td>
<td>14</td>
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<td>Portugal</td>
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<td>Sweden</td>
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</tbody>
</table>

Avg. Com: 14 hops
Avg. Acad: 13 hops
Results. Average Latency.

Average Latency (ms)

Country

Commercial
Academic

Avg. Com: 128 ms
Avg. Acad: 127 ms
% of samples < 5 Gbps

0-1 Gbps

80%

% of samples

0%

“1G bands”

1-2 Gbps

2-3 Gbps

3-4 Gbps

4-5 Gbps

Commercial

Academic
% of samples > 5 Gbps

- 5% of samples

- 1G bands
  - 5-6 Gbps
  - 6-7 Gbps
  - 7-8 Gbps
  - 8-9 Gbps
  - 9-10 Gbps

- Commercial
- Academic
Testbed Results. Average Bandwidth.

- **PERFSONAR LIST**
  - **Academic**: Avg. Bandwidth = 1.27 Gbps
  - **Commercial**: Avg. Bandwidth = 0.77 Gbps

- **ESNET LIST**
  - **Academic**: Avg. Bandwidth = 4.60 Gbps
  - **Commercial**: Avg. Bandwidth = 1.50 Gbps

**Test Group**

**Avg. Acad**: 2 Gbps

**Avg. Com**: 0.9 Gbps
Avg & Max

PERFSONAR list
Avg & Max

ESNET list

Country

Bandwidth (Gbps)

10G

0

Country

Bandwidth (Gbps)

10G

0

ACADEMIC

COMMERICAL

The Netherlands
United Kingdom
Switzerland
United States
New Zealand

United States
United Kingdom
Switzerland
The Netherlands
New Zealand
Thank you to the Xunta de Galicia and the Centro de Xestión de Red for their collaboration in Phase 2.
Thank you to the Xunta de Galicia and the Centro de Xestión de Red for their collaboration in Phase 2.
Results.
Conclusions

- **Results**: Average traffic in academic is higher than commercial at least > 62% and almost 3x when nodes are properly configured and connected.

- **Higher bands**: It is more likely to obtain values higher than 5Gbps in academic networks.

- **Latency & Hops**: Latency and hops do not (apparently) make a huge difference.

- **Briefly...**: In general, an institution gets better performance when it is connected to academic networks than when it is not.
Some tips…

- The whole chain is relevant and should be optimized: applications, protocols, network architecture, devices capabilities and configurations.
- The whole chain should also be monitorized to control packet loss (congestion, faulty devices and links, etc)

- An intangible advantage of academic networks is the strong cooperation between entities.
And some questions...

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Are these results good enough?</td>
</tr>
<tr>
<td>2</td>
<td>How can we improve the e2e service with reasonable time/resources spending?</td>
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<tr>
<td>3</td>
<td>Is it easy to move data among institutions? Do all users benefit from our high capacity nets or only the “superusers”?</td>
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<tr>
<td>4</td>
<td>What about transport providers and exchange points? Many resources are located in commercial nets.</td>
</tr>
</tbody>
</table>
Thank you!

Miguel Angel Sotos (RedIRIS)
Jose Miguel Femenía (UV)
Natalia Costas (CESGA)