Measuring Unnecessary Exposure of Network Traffic To Nation States

Jordan Holland and Max Schuchard
University of Tennessee, Knoxville

**Method**
- Examined over 23,000,000 traceroute paths from Ripe Atlas Traceroutes Data
- Mapped each IP address in the path back to an AS/Nation state tuple
- Compressed repeated tuple instances down to a single instance
- Path considered normal if no countries outside our previously defined set are found
- Only considered nations and ASes with over 200 traceroutes where they are the source, destination, and transit entity separately.

**General Degree of Normality**

<table>
<thead>
<tr>
<th>Region</th>
<th>DoN From</th>
<th>DoN To</th>
<th>DoN Transit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>0.2943</td>
<td>0.2563</td>
<td>0.1956</td>
</tr>
<tr>
<td>Americas</td>
<td>0.1863</td>
<td>0.3341</td>
<td>0.1690</td>
</tr>
<tr>
<td>Asia</td>
<td>1.0516</td>
<td>0.9091</td>
<td>1.0543</td>
</tr>
<tr>
<td>Europe</td>
<td>0.5430</td>
<td>0.4321</td>
<td>0.5020</td>
</tr>
<tr>
<td>Oceania</td>
<td>0.0070</td>
<td>0.1928</td>
<td>0.1336</td>
</tr>
</tbody>
</table>

**Regional Degree of Normality**

- The Americas have a higher than average DoN when they are the source or destination of a path, but when providing transit for a path they have a much lower DoN.
- In contrast, Europe sees very little change in DoN given their role in the path.
- All regions but Africa and Asia have above average DoN when staying inside the region.
- A path from Europe to the Americas has a better chance of being normal than a path staying inside Europe.
- DoN from one region to another is highly symmetrical.

**Case Study: Unnecessary Exposure to the Five Eyes**

- The Five Eyes is a known intelligence sharing alliance including Australia, Canada, New Zealand, the United Kingdom, and the United States.
- The DoN for paths from a Five Eyes country to a Five Eyes country is 0.471, about 13% higher than the overall average.
- Country A "benefits" from country B if country B needlessly exposes its traffic to country A, illustrated with the Five Eyes to the left.
- 4 out of the 5 members of the Five Eyes are in the top 15 countries that the group "benefits" from the most.