# The Resilience of the Internet to Colluding Country Induced Connectivity Disruptions

**S&T Campaign: Information Sciences**
*Cybersecurity*

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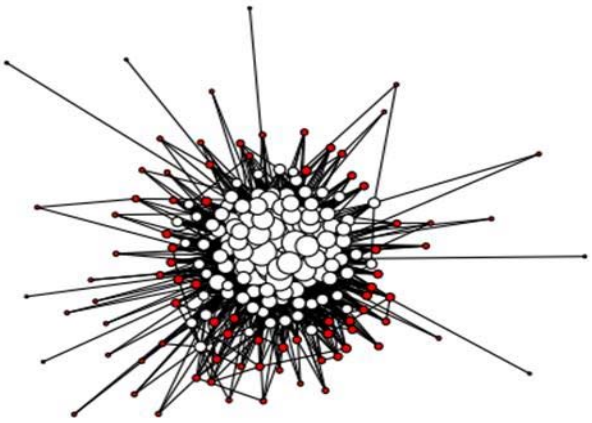
## Research Objective

- **Determine the risk to the functionality of the internet posed by various classes targeted attacks against the BGP routing infrastructure**



**Logical connectivity of the internet shows negative assortativity. Node sizes are proportional to their degree. The 84 red nodes have degree <= 10. Only 0.41 % of edges connect two red nodes.**

## Challenges

- **VSP less well-studied than other graph cut problems; current published approximation do not scale to our problem**
- **Limited availability of topological data**

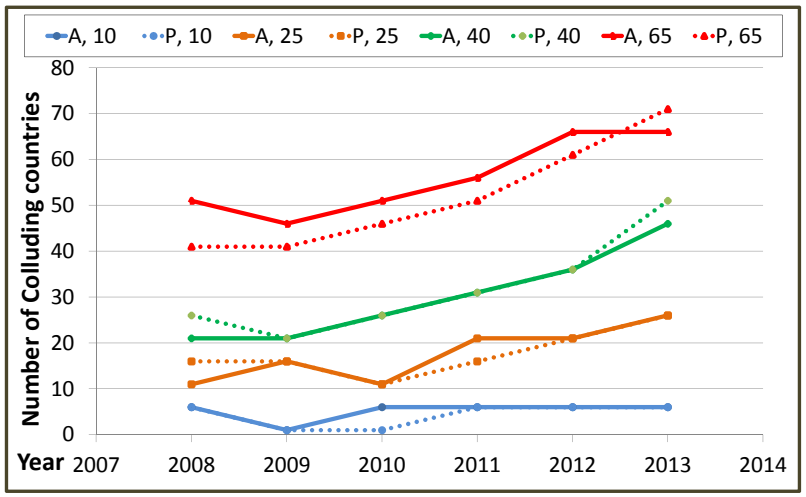

| Year | Number of Countries | Number of Edges | Number of Monitors |
|---|---|---|---|
| 2008 | 206 | 2235 | 33 |
| 2009 | 211 | 2343 | 42 |
| 2010 | 218 | 2644 | 54 |
| 2010 | 219 | 2925 | 59 |
| 2012 | 221 | 3138 | 65 |
| 2013 | 224 | 3452 | 89 |

## ARL Facilities and Capabilities Available to Support Collaborative Research

- **ARL Cyber Lab**
- **Network Science Research Lab (Q3 FY15)**
- **DOD HPC supercomputing resource center**

## Complimentary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **Expertise in or tools for vertex separator approximations for extremely large graphs (up to tens of millions of nodes)**
- **More complete sources of BGP routing data from more diverse perspectives, particularly geolocated data**




1. **Non-Communicative Clusters**: Into how many non-communicative clusters can a group of colluding countries divide the Internet?
2. **Country Isolation**: What is the maximal number of countries that can be cut off from the Internet by a group of colluding countries?