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Cyber Big-Data Analytics

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Idaho Bailiff Cyberanalytics Visualization Examples

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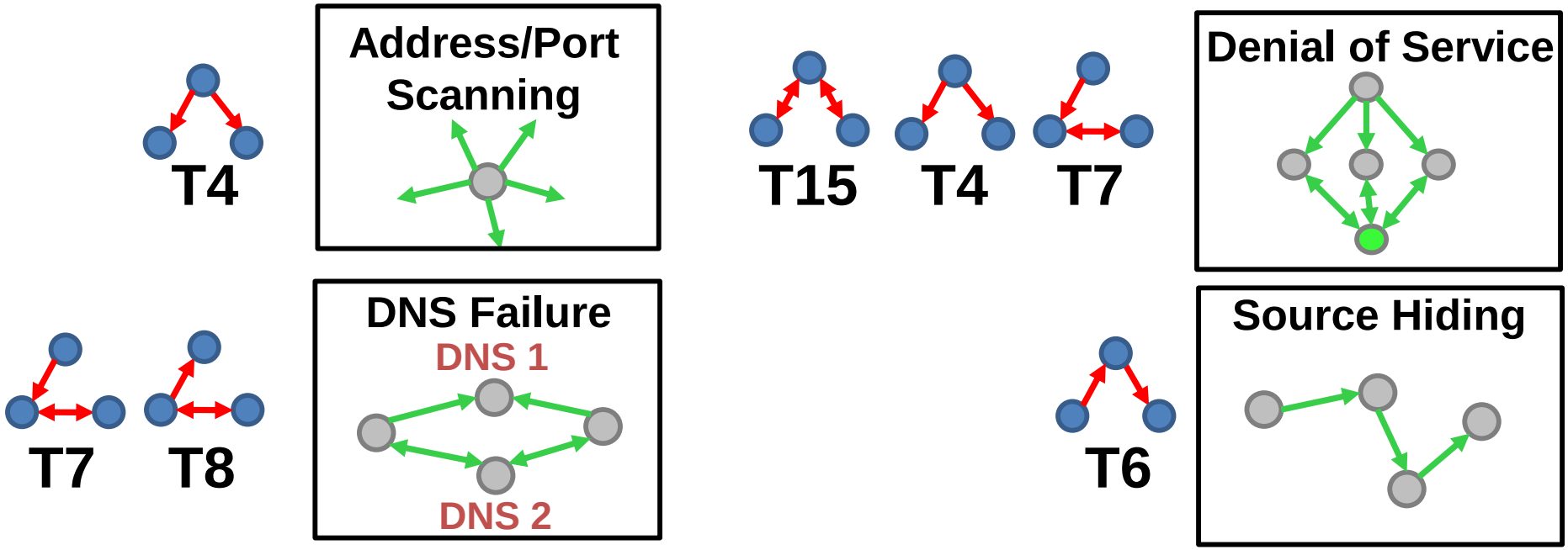
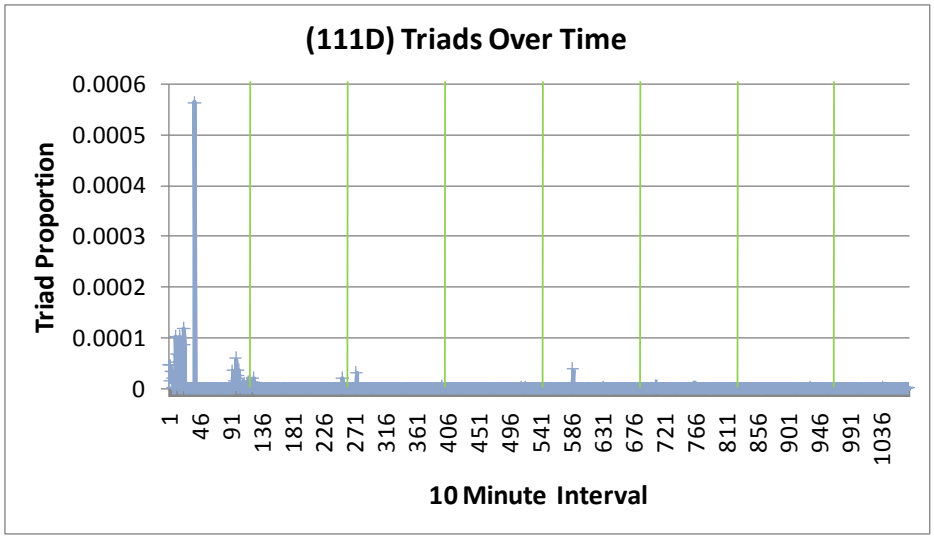
- Idaho Bailiff project focuses on following areas:
  - High performance computing platforms
  - Graph algorithms
  - Streaming data
  - Big data
  - Cyberanalytics applications
- Visualizations developed have following properties
  - Network/graph visualizations
  - Secondary area of research and development
  - Support pattern discovery
  - Extend to big data and/or fast data streaming rates

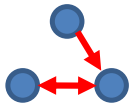
Computer Network Threat Detection Using Dynamic Triadic Analysis

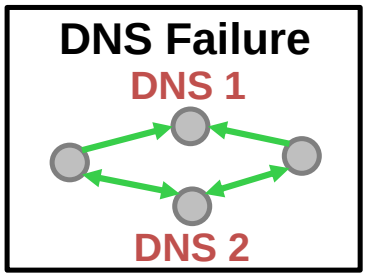


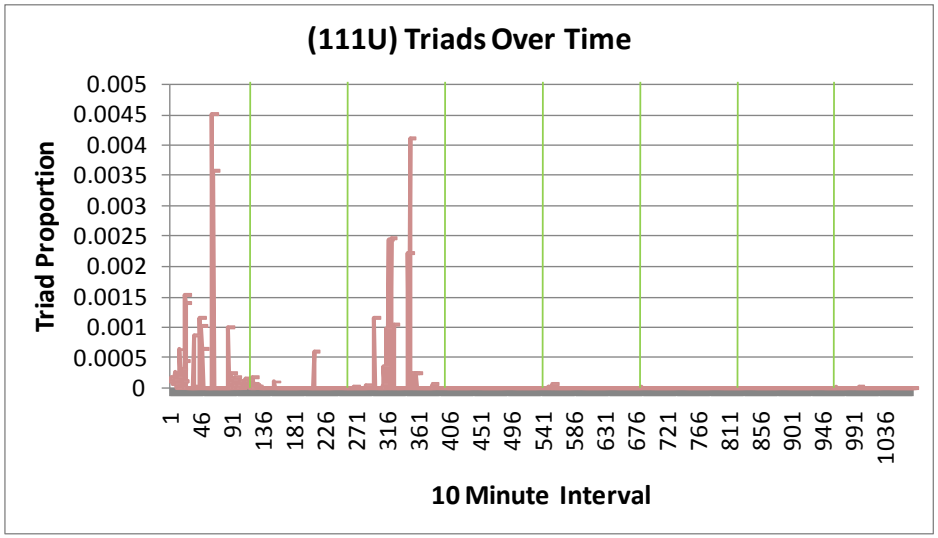
Computer Network Threat Detection Using Dynamic Triadic Analysis



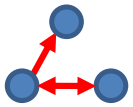
All initiator triads (T7)







All timeout triads (T8)



Computer Network Threat Detection Using Dynamic Triadic Analysis

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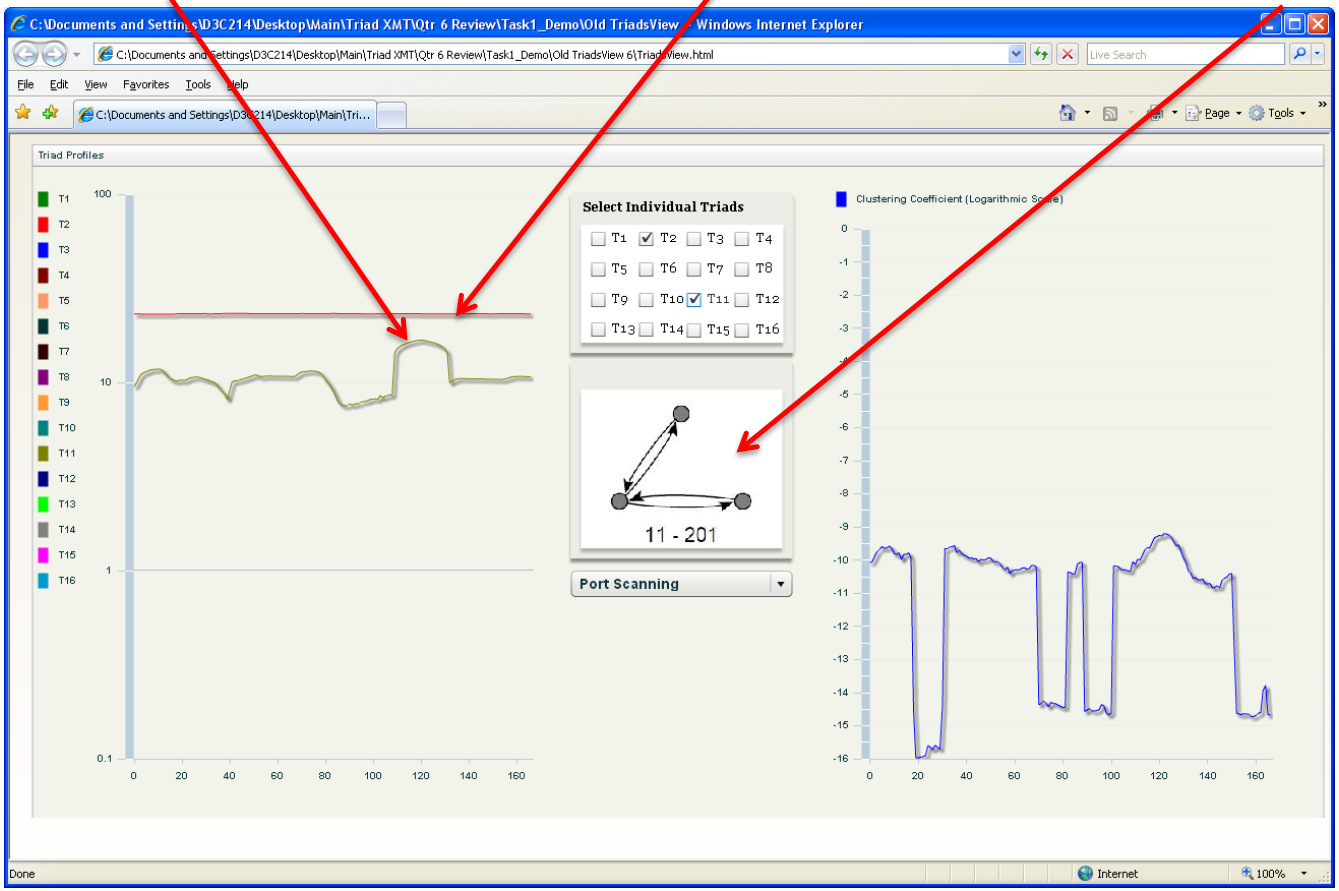
Changes in Specific Triad Patterns Signify a Potential Network Threat

While Other Triad Patterns are Unaffected

Specific Triad Types Indicate Specific Threats



DDoS Attack Query

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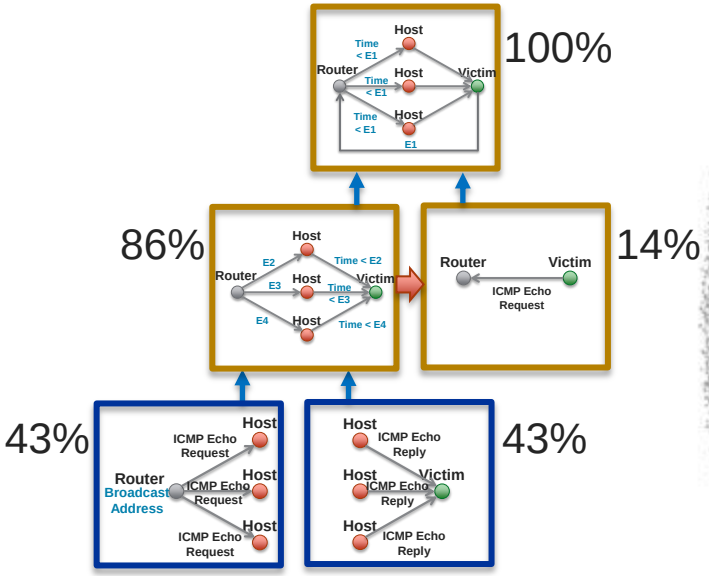
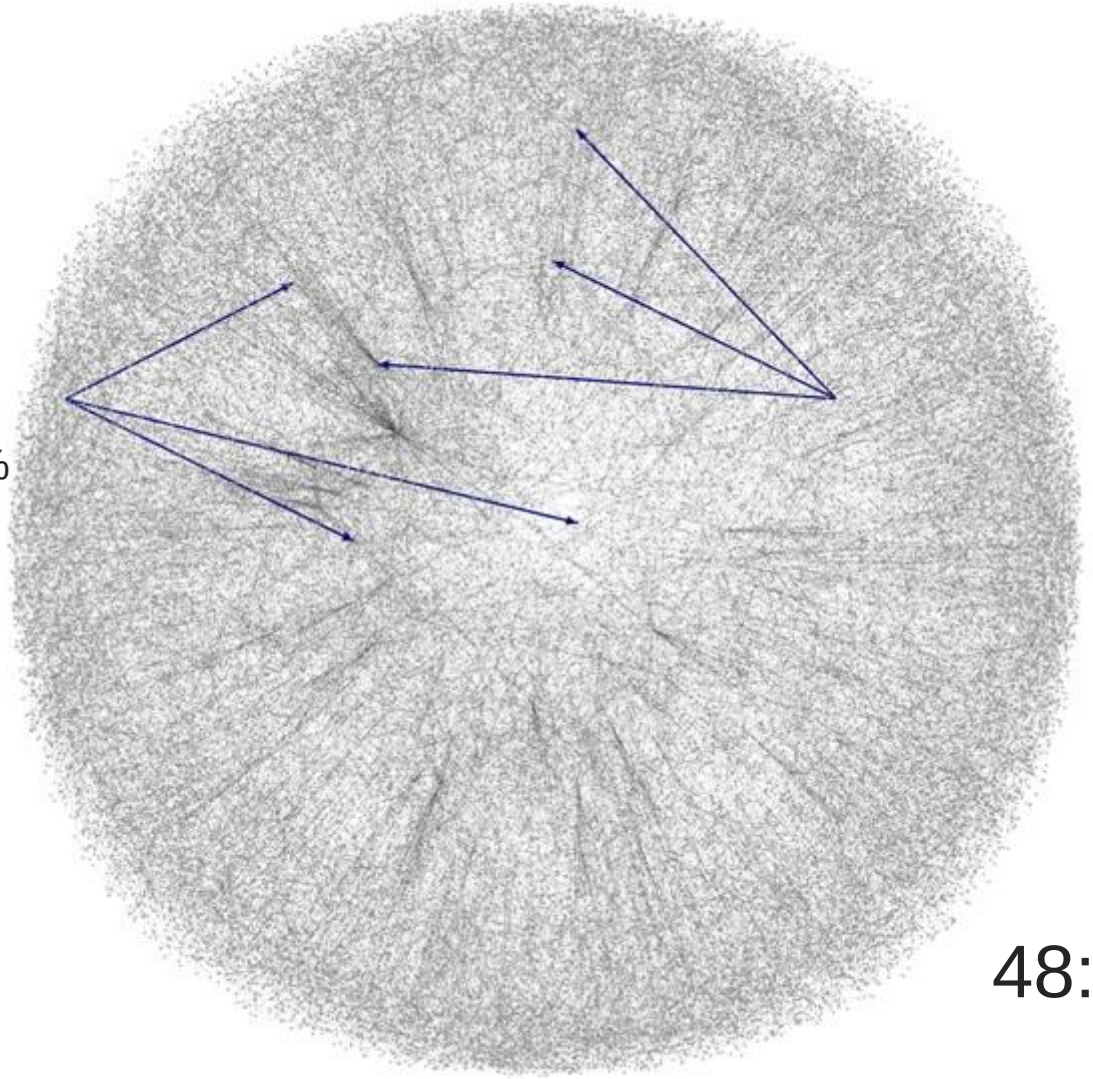
Subgraph Join Tree





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Emerging Cyberattack Patterns

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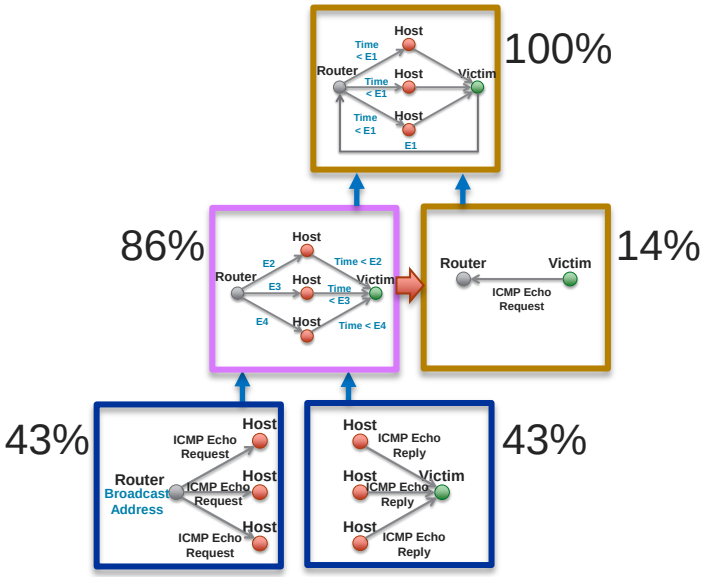
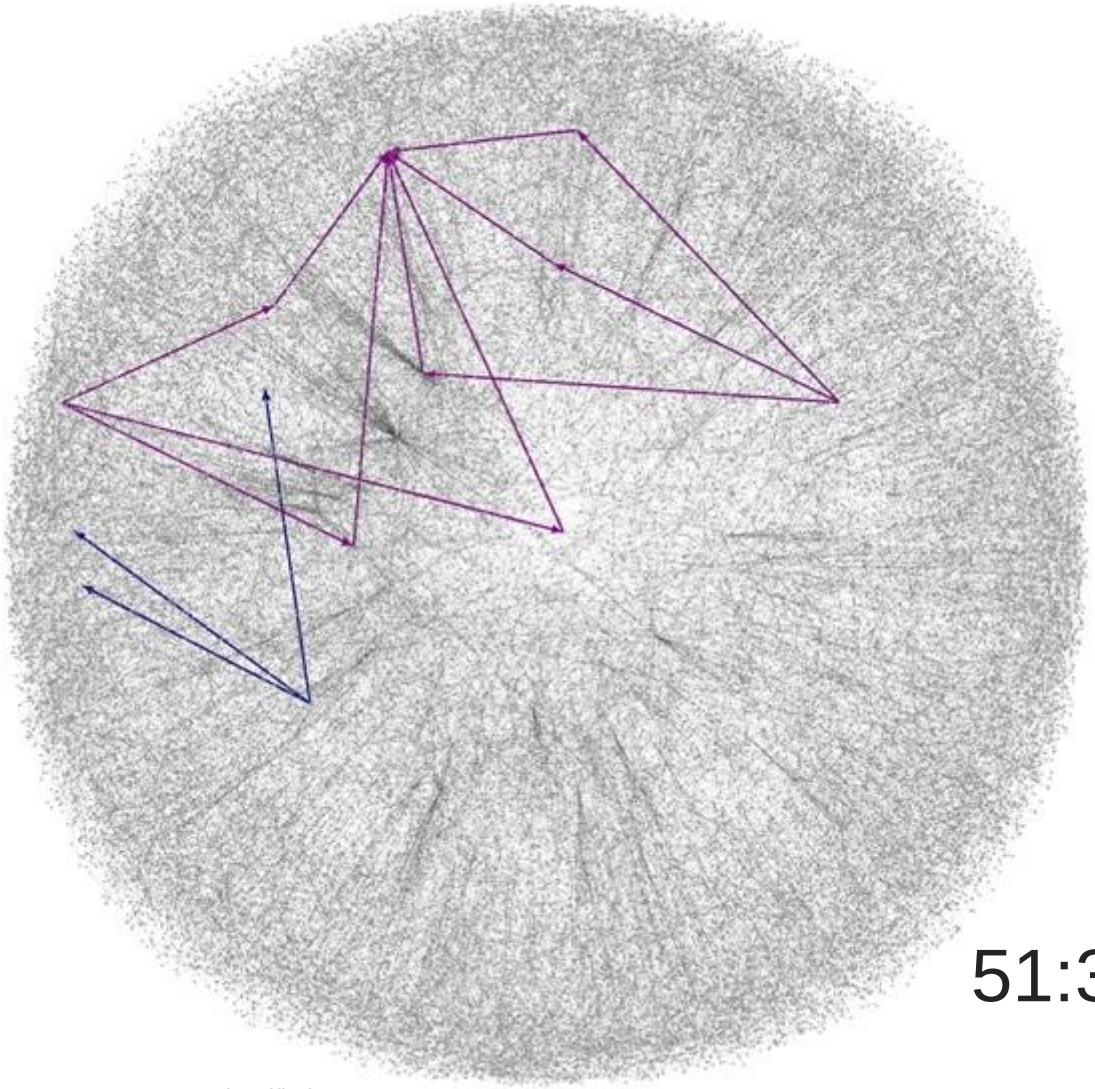
Subgraph Join Tree





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Emerging Cyberattack Patterns

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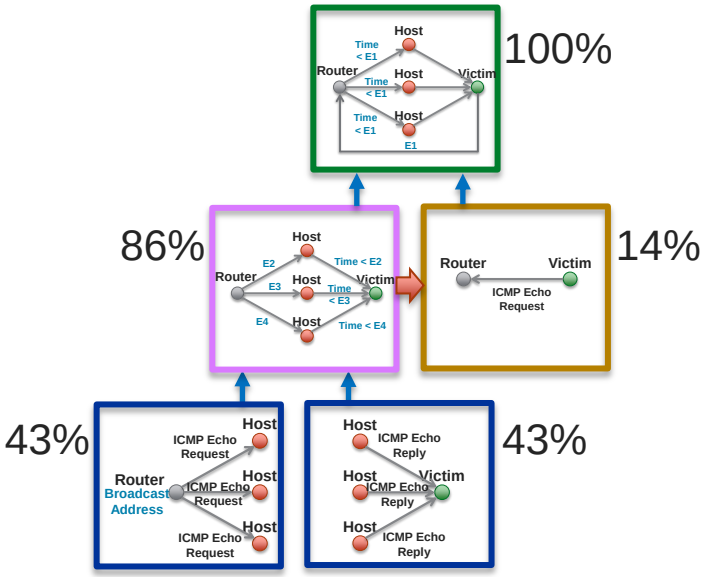
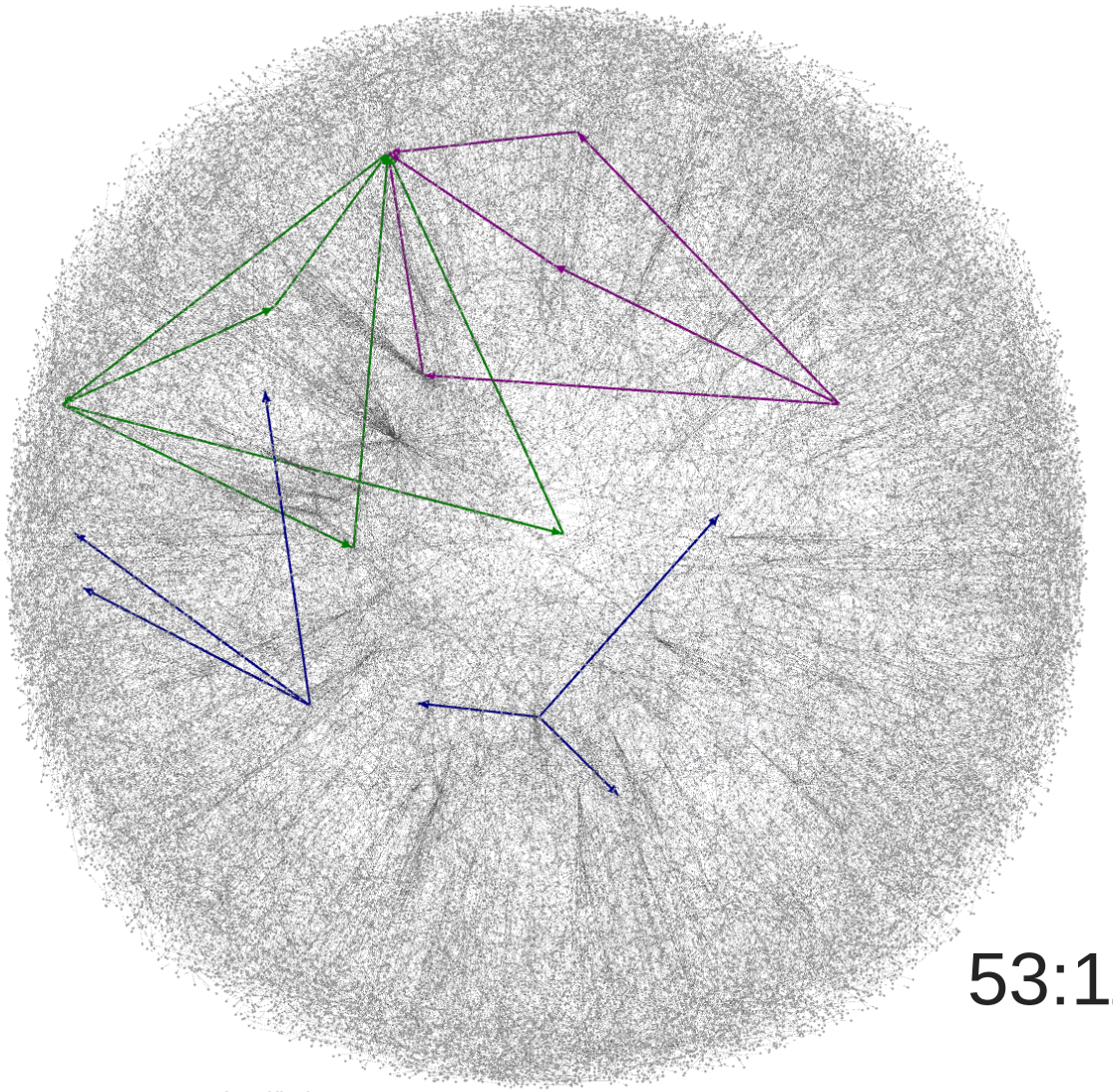
Subgraph Join Tree





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Emerging Cyberattack Patterns Video

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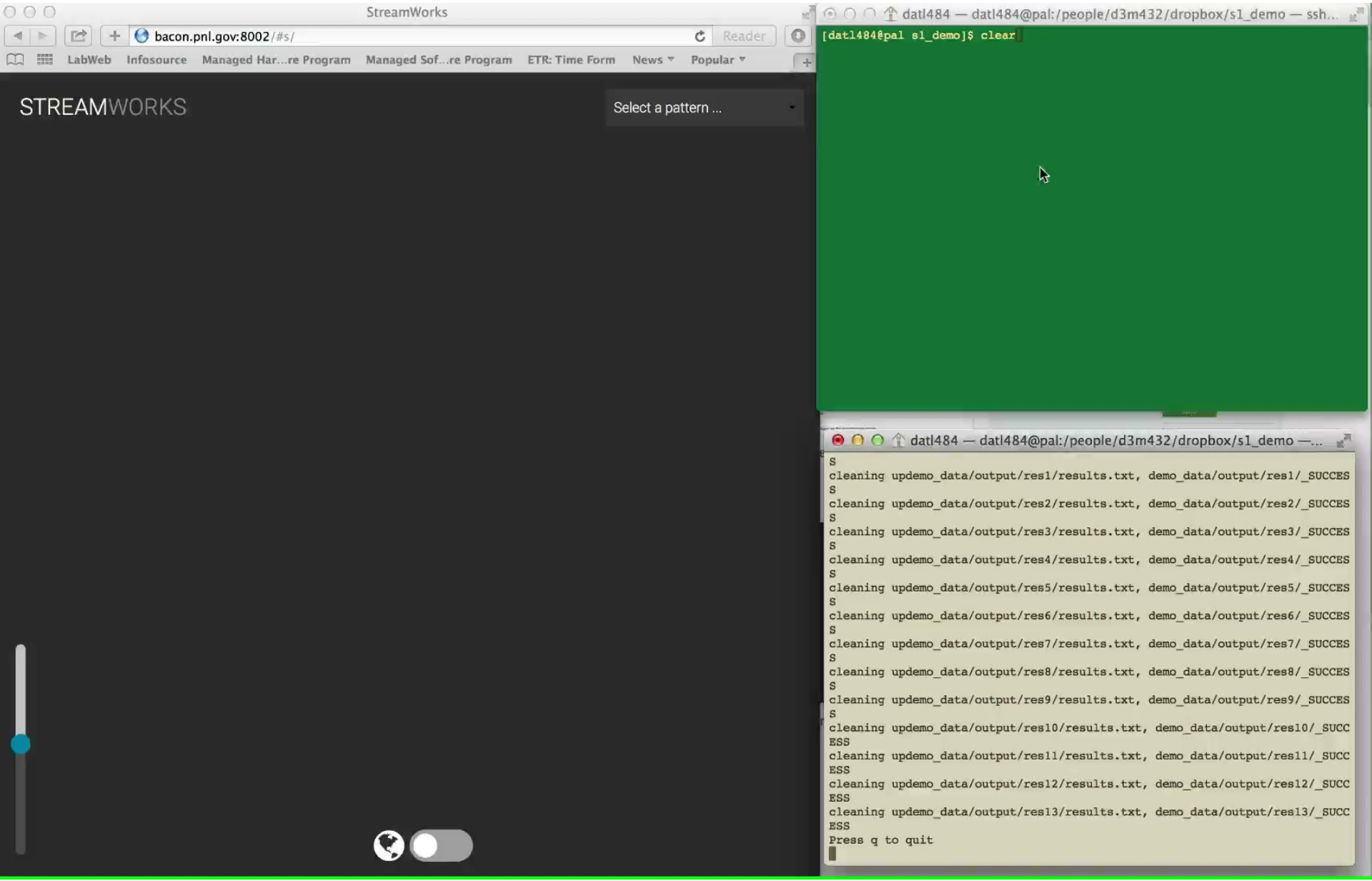
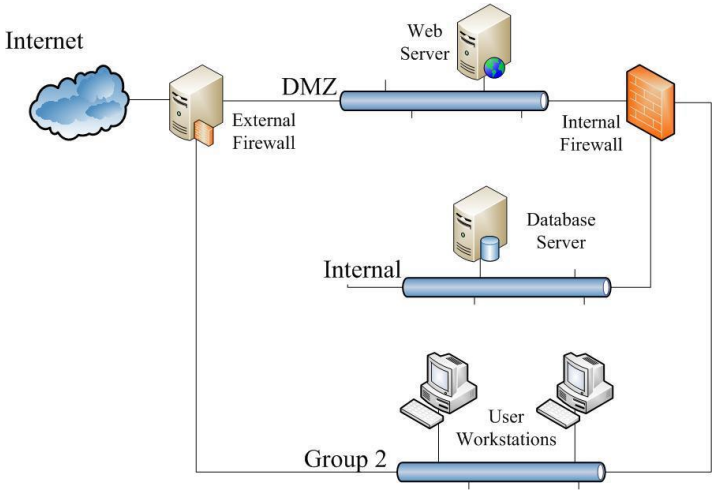
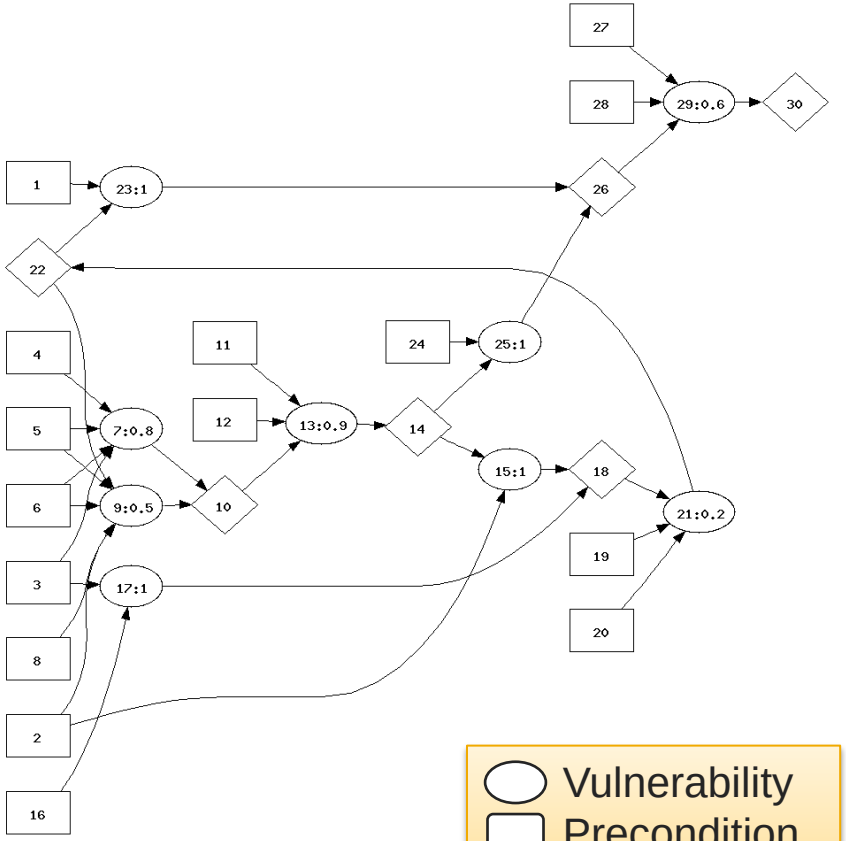


Probabilistic Vulnerability Graph

Network Configuration



Vulnerability Graph



Probabilistic Vulnerability Graph Video

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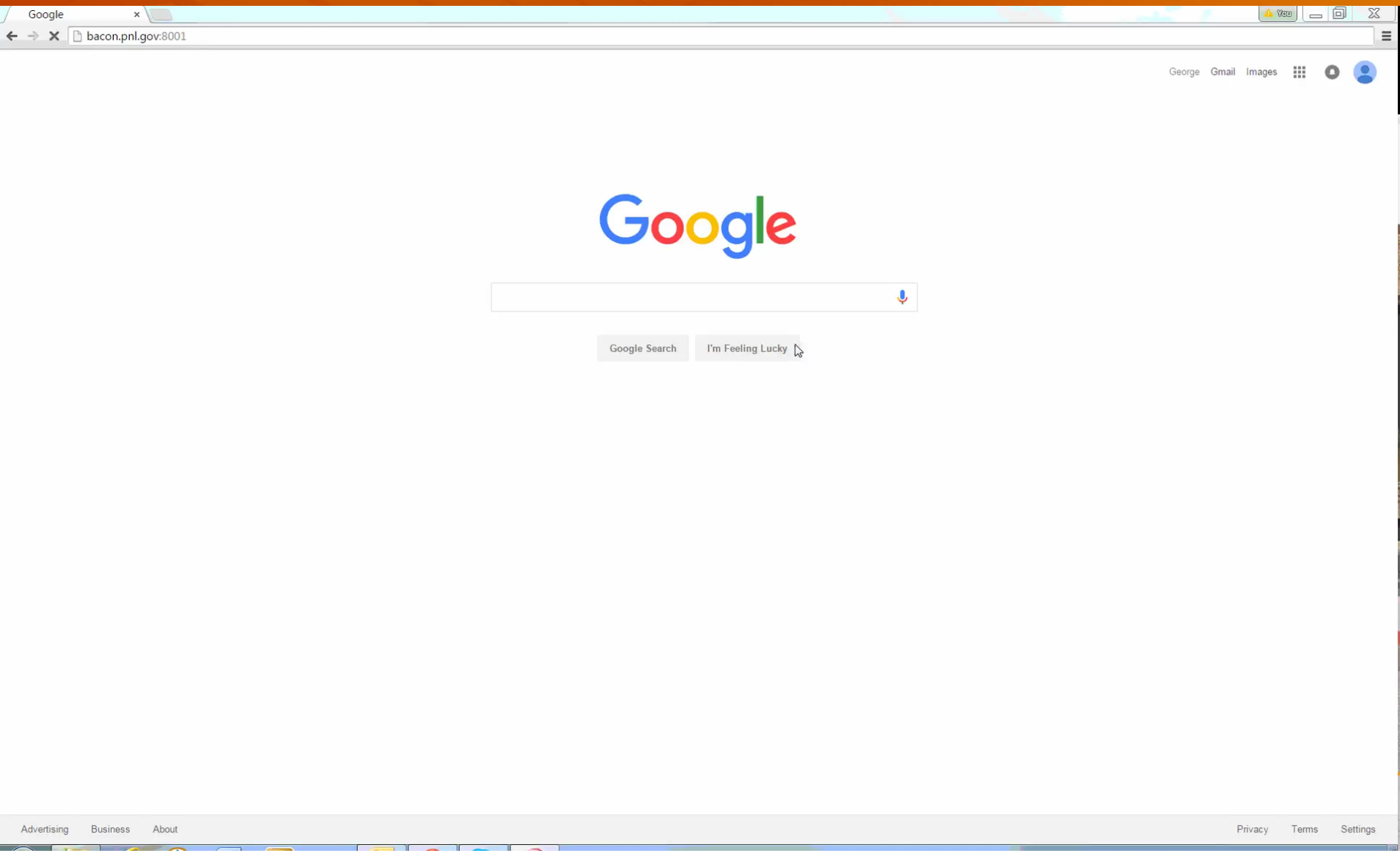

Atmospheric Sensor Network Dynamic Bayesian Network

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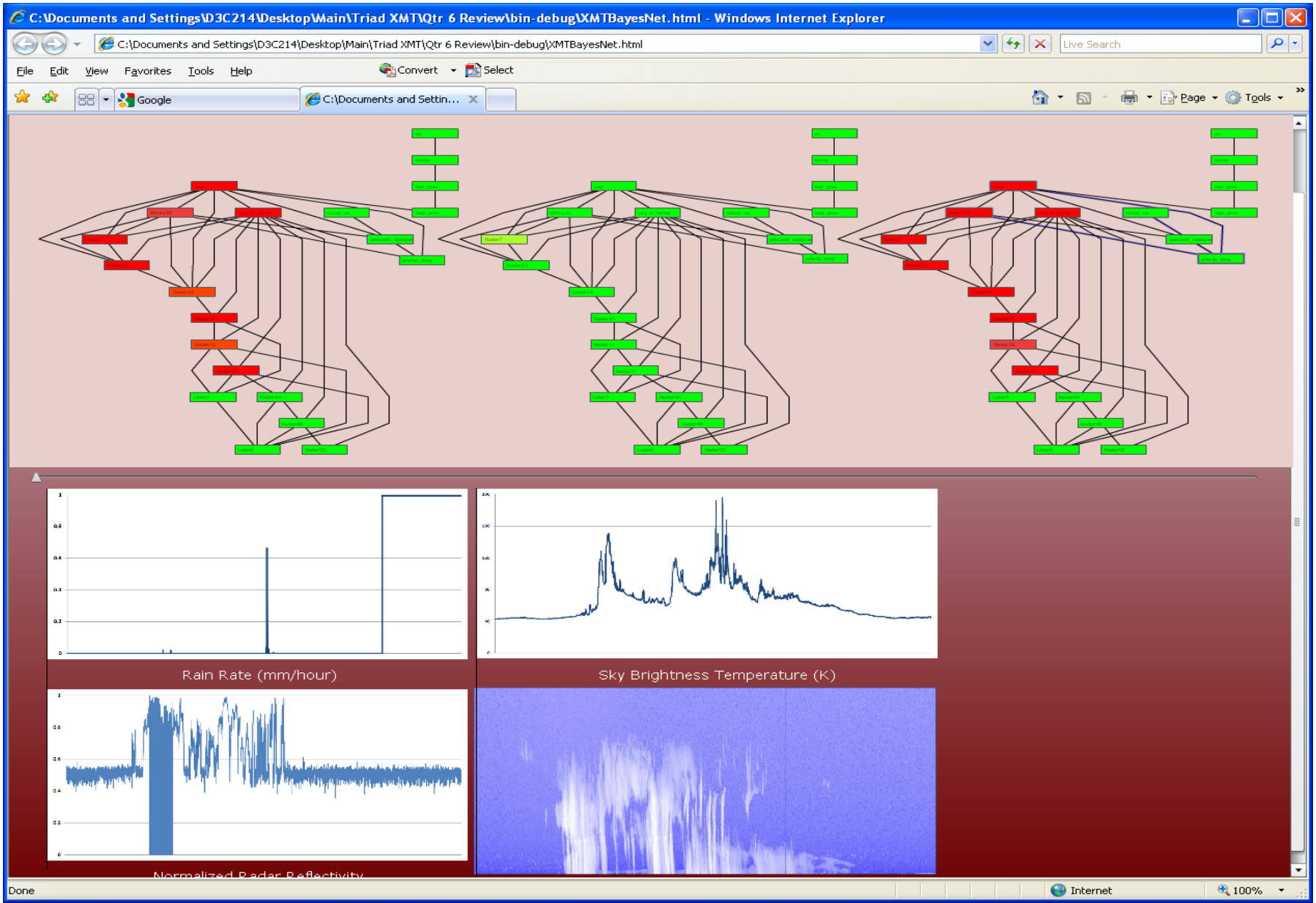

Applications to the Future Power Grid

- A graph or network is a natural and intuitive way to visually represent the power grid
- Like computer network flow data, power grid data may be streaming in at fast rates
- Pattern discovery and network analysis approaches algorithms may be useful in representing and detecting anomalies and behaviors in the power grid
- Probabilistic graphical models may also be useful in power grid predictions and diagnostics
- Associated network visualizations should be equally enabling and useful