Carnegie Mellon

DNA of Simulated Comm Intercepts:
Sample of ORA Capabilities

Ph.D. Program in **C**omputation, **&** **O**rganizations **S**ociety

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### In Collaboration with Major Ian McCulloh and Jamie Olsen
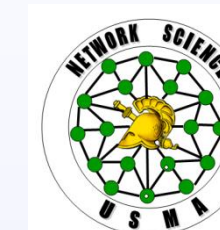
Demonstration of ingesting realistic battlefield data & providing tactically relevant analyses
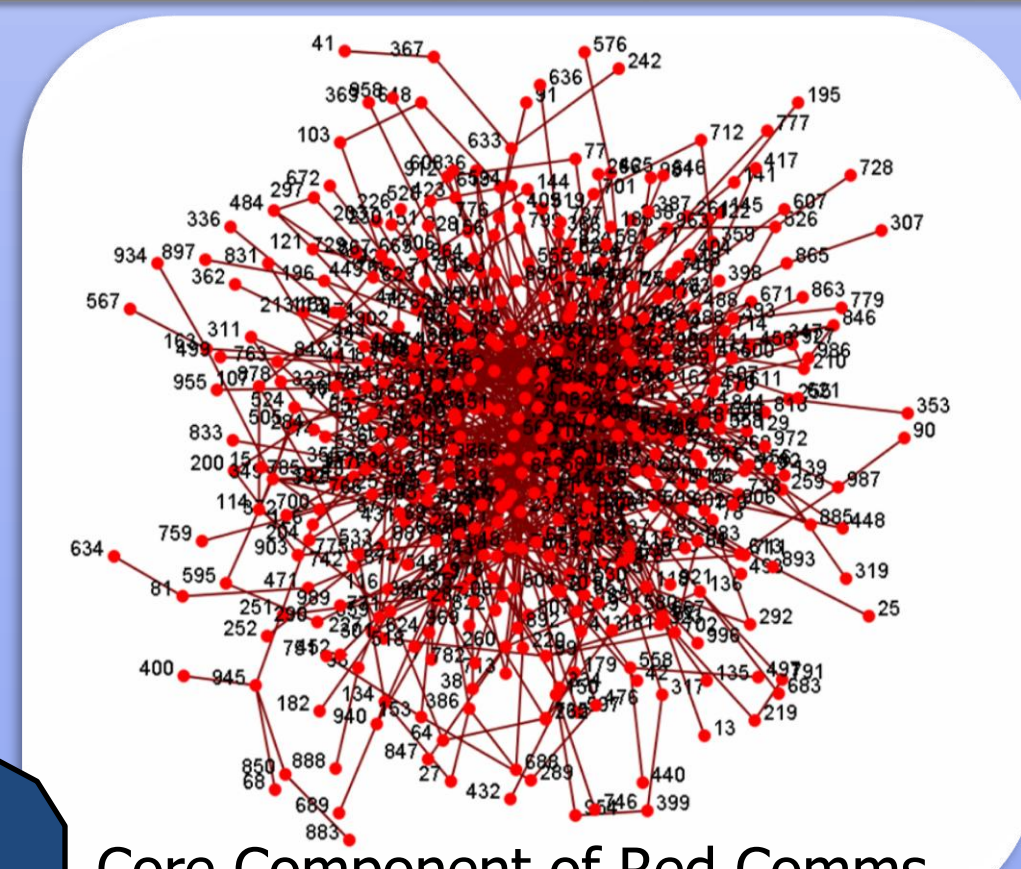
ArtisTech sent CASOS:

Tech Specs:
1. XML of comms from ArtisTech's simulator
2. Pre-processing
   a. MS Excel → CSV table
   b. SAS → monadic attributes, augmented CSV table for ORA
3. ORA
   a. DNA of deep structure in scenario
   b. Visualizations

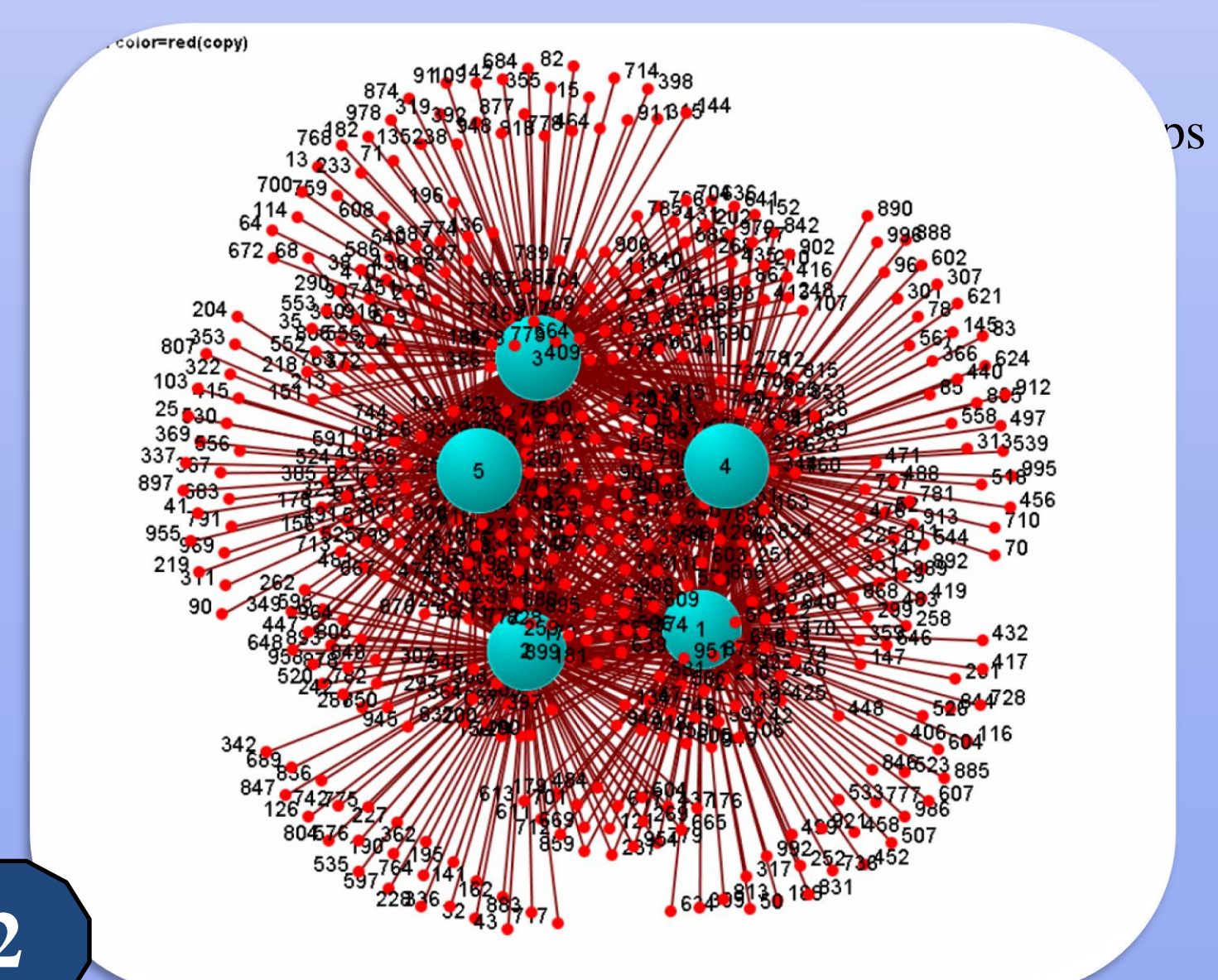### A Hairball of Relational Data … in a Scenario with Bad Guys Fleeing Adelphi…
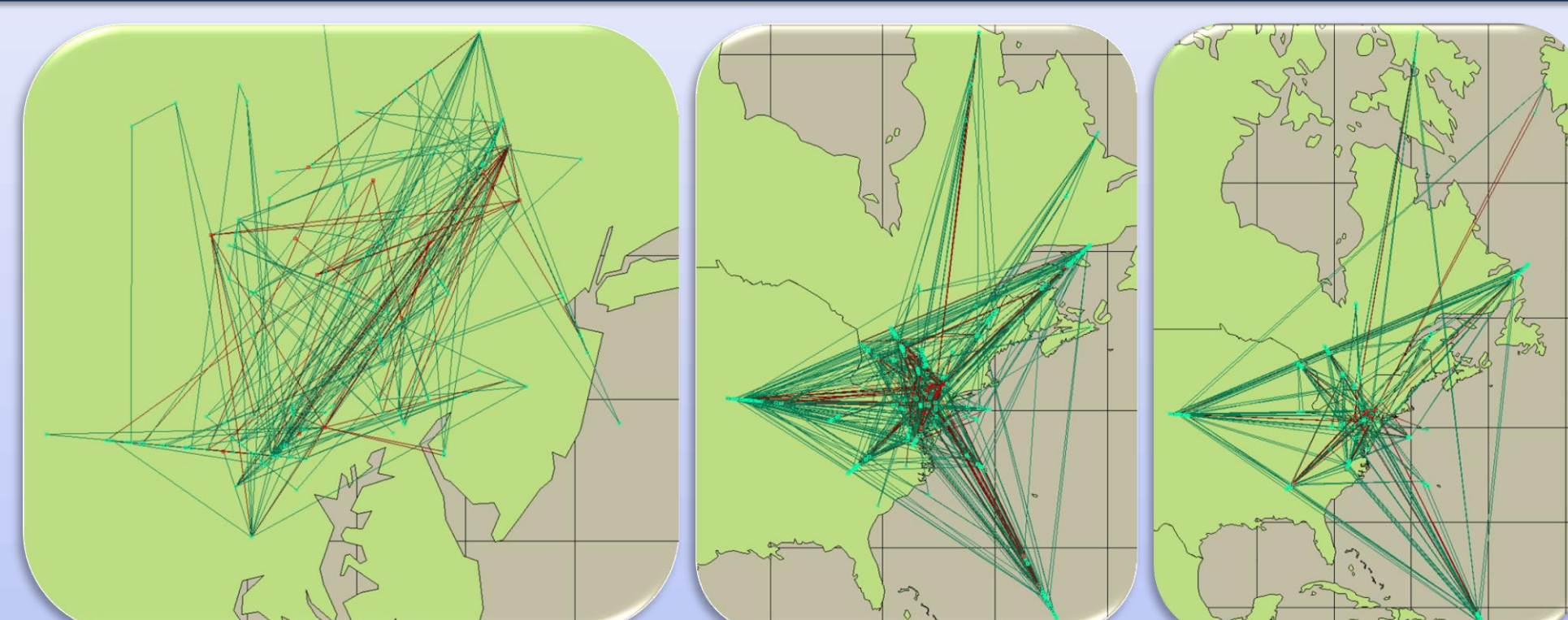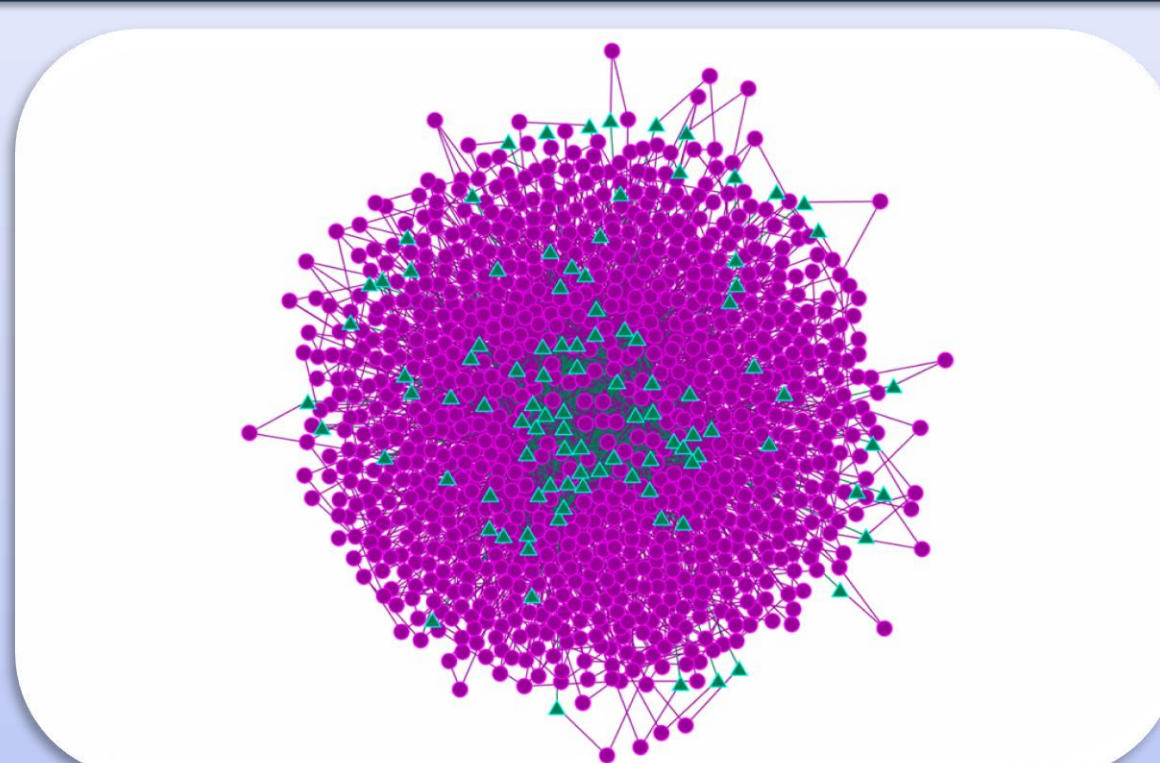
CMU CASOS used ORA to Provide Tactical Guidance …
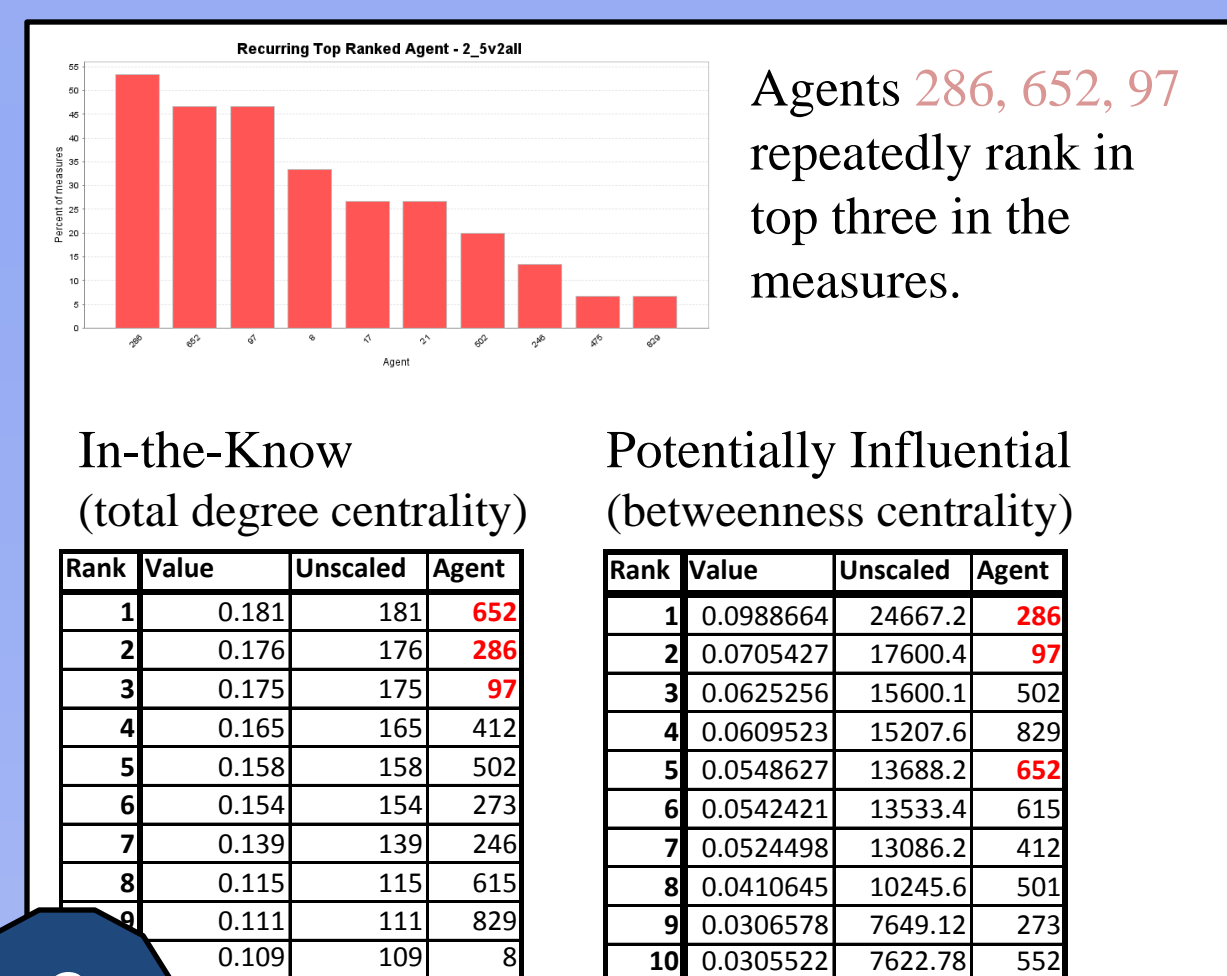
Dynamic Network Analysis

ORA
The Organizational Risk Analyzer

1 Core Component of Red Comms
Identified Bad-Guy Network

2
Characterized Organizational Structure

Agents 286, 652, 97 repeatedly rank in top three in the measures.

Recurring Top Ranked Agent - Z_1x1all

In-the-Know (total degree centrality)

Rank	Value	Unscaled	Agent
1	0.181	181	652
2	0.176	176	286
3	0.175	175	97
4	0.165	165	412
5	0.158	158	502
6	0.154	154	273
7	0.139	139	246
8	0.115	115	615
9	0.111	111	829
10	0.109	109	8

Potentially Influential (betweenness centrality)

Rank	Value	Unscaled	Agent
1	0.0988664	24667.2	286
2	0.0705427	17600.4	97
3	0.0625256	15600.1	502
4	0.0609523	15207.6	829
5	0.0548627	13688.2	652
6	0.0542421	13533.4	615
7	0.0524498	13086.2	412
8	0.0410645	10245.6	501
9	0.0306578	7649.12	273
10	0.0305522	7622.78	552

3
Identified Key Bad-Guys

Cumulative Sum (CUSUM) chart (Centrality-Betweenness)

— Increase — Decrease
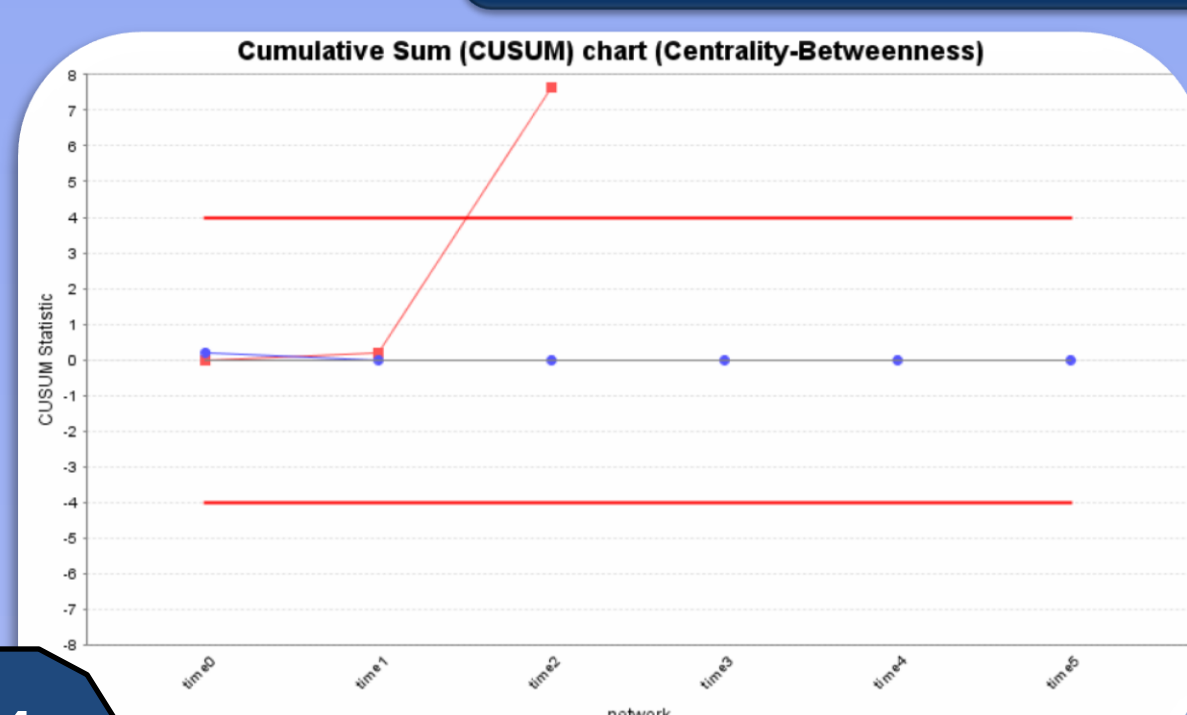
4
Time Period 3 Signals Change in Operations
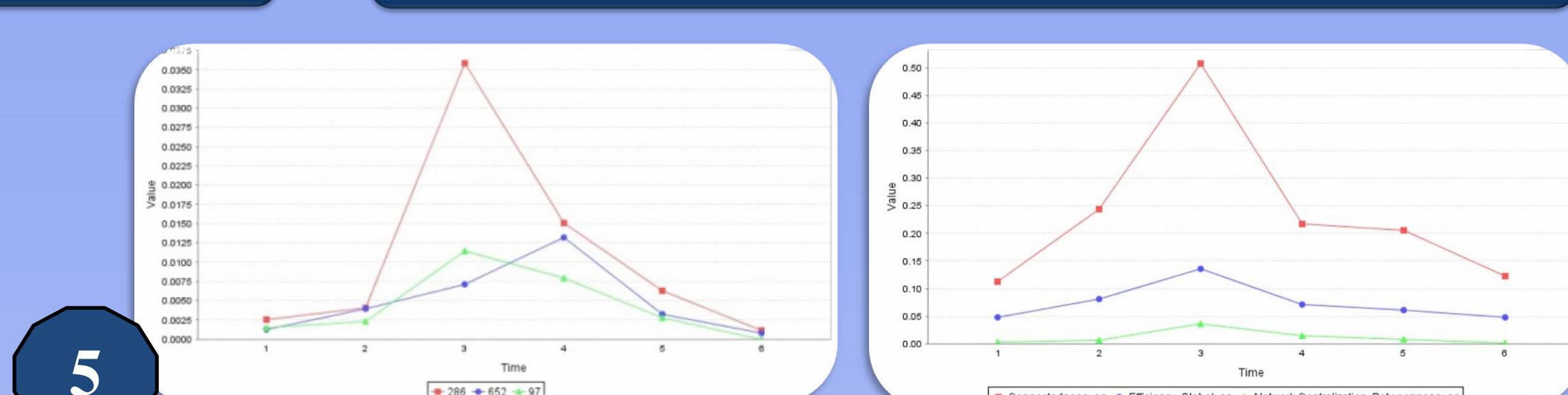
5
Time 3 May Be Operation and Time 4 Initial Surveillance

97, liaison
waypoint
652
286 in Adelphi w/many others
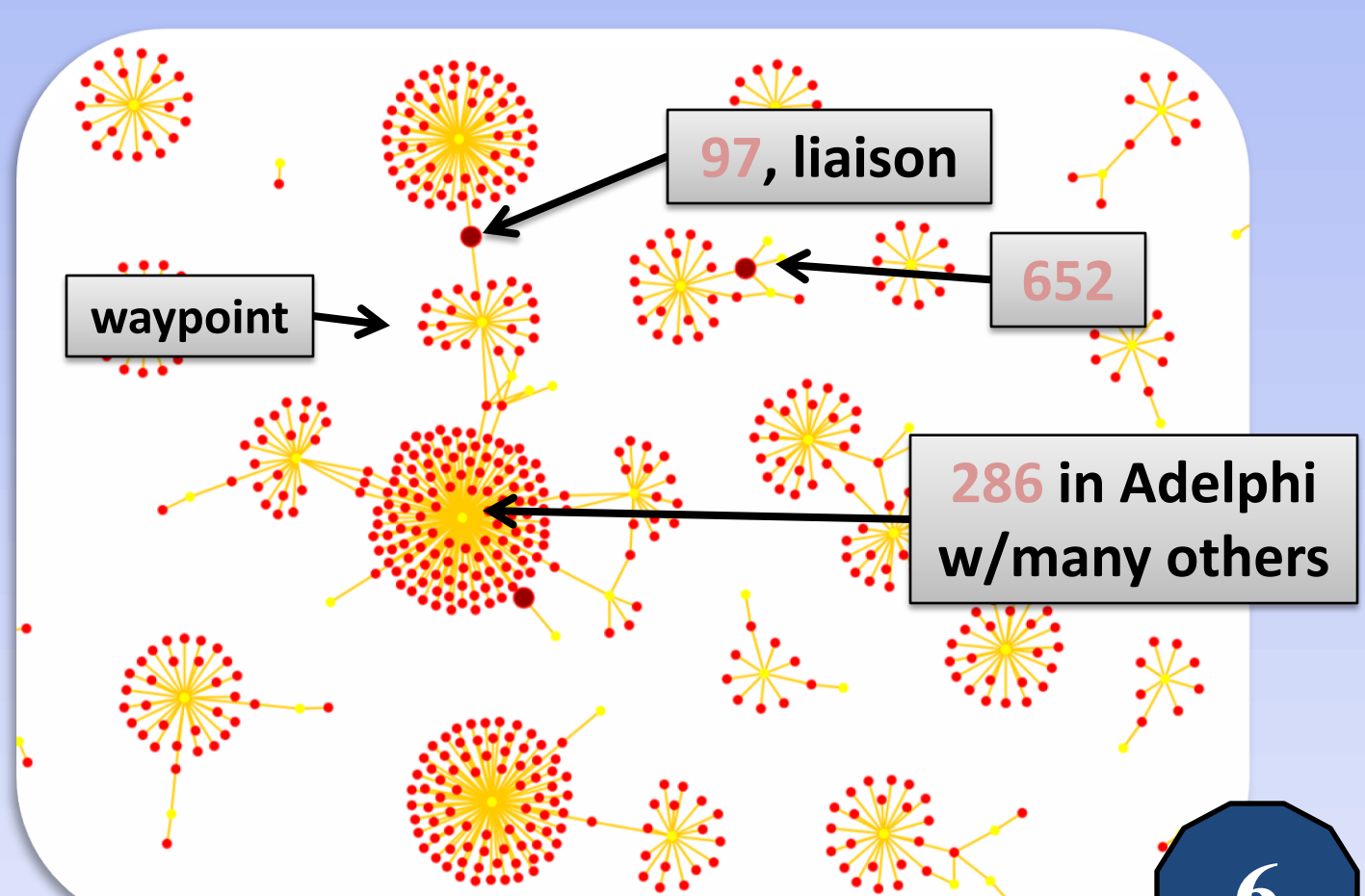
6
Bad Guys by Region Shows Convergence on Adelphi at Time 3
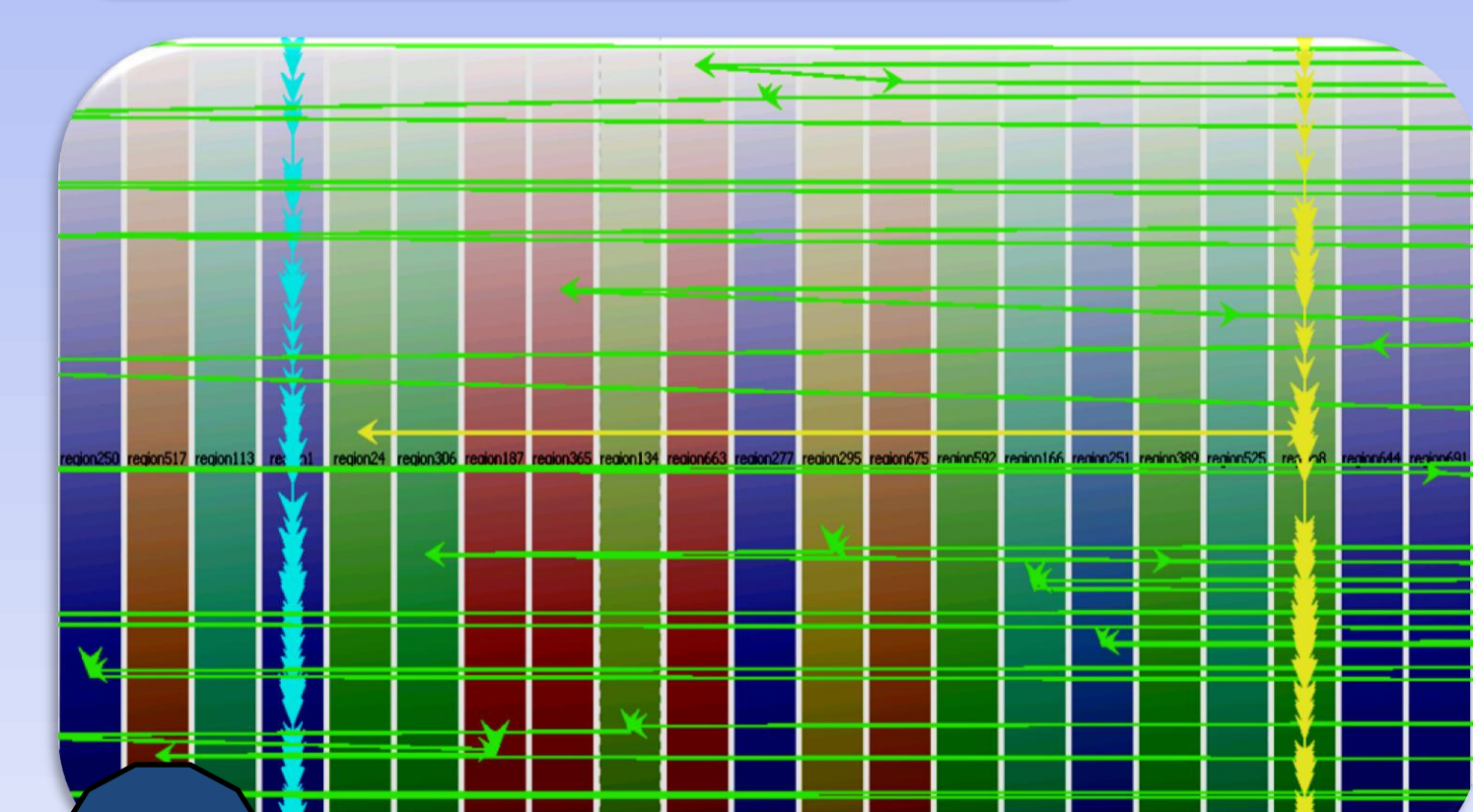
7
Time 4: All active; 652 running; Never same place same time.

97 holed-up here with others
652 alone, on the run
286 alone, little movement
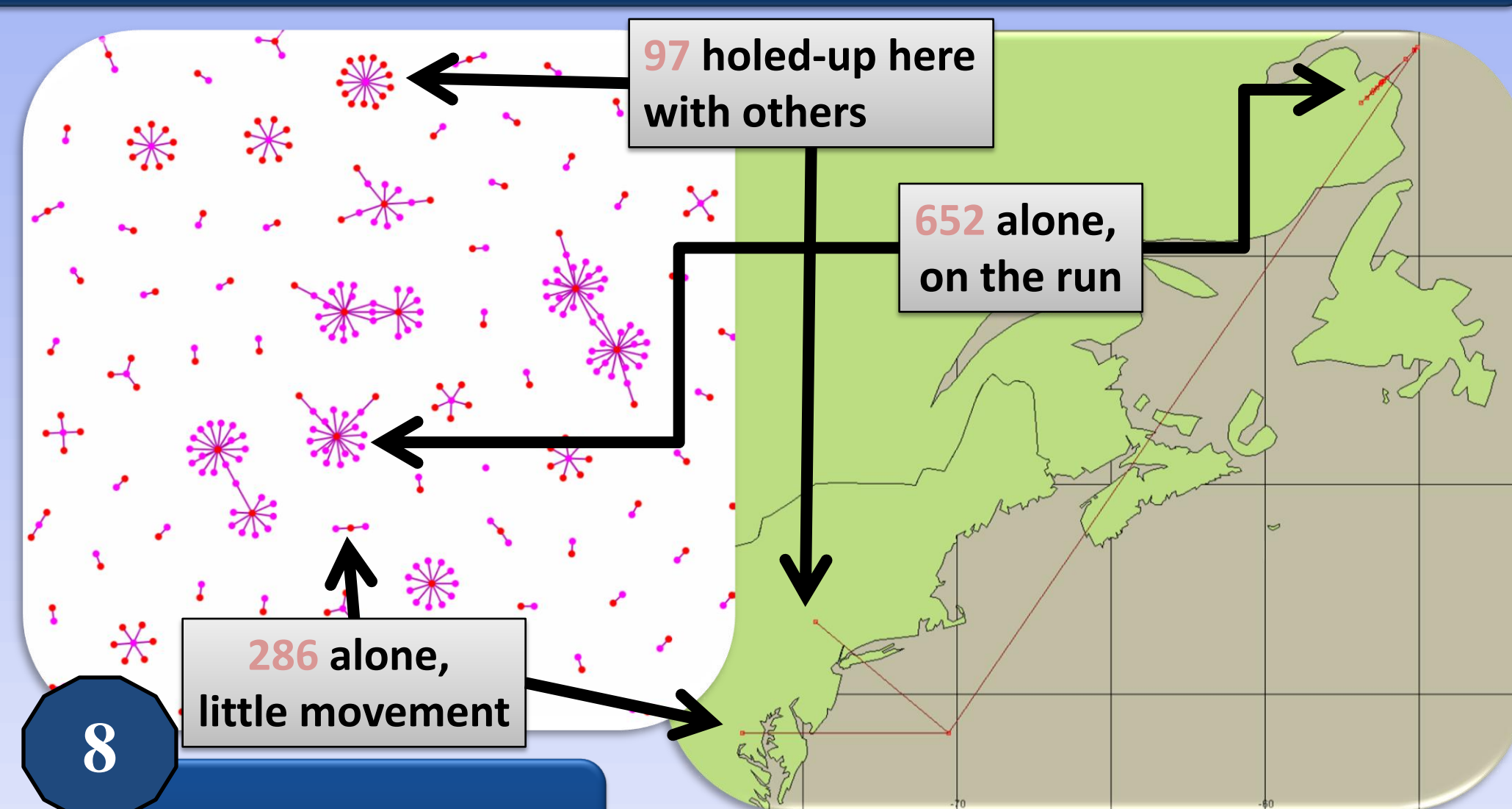
8 By Time 6:

COA 1: Go after Dispersed Bad Guys

COA 2: Scour Adelphi for IED/Bomb etc

Future Directions
Low-hanging Fruit: Automate pre-processing for ORA input
Intermediate Range: Build & Automate Tactical Insight Report
Long Range: Real-time DNA of Evolving Battlefield

Conclusion:
ORA can support tactical operations

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