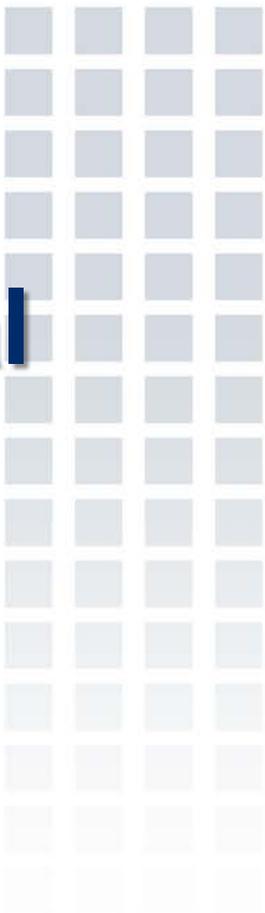


Visualization of multi-modal relationships in dynamic networks

Elisha Peterson

Sunbelt Social Networks Conference

March 15, 2012

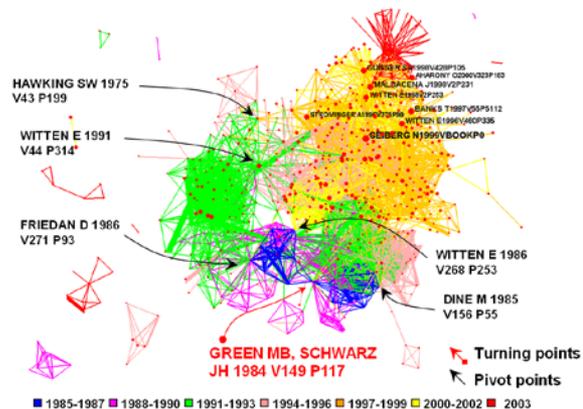
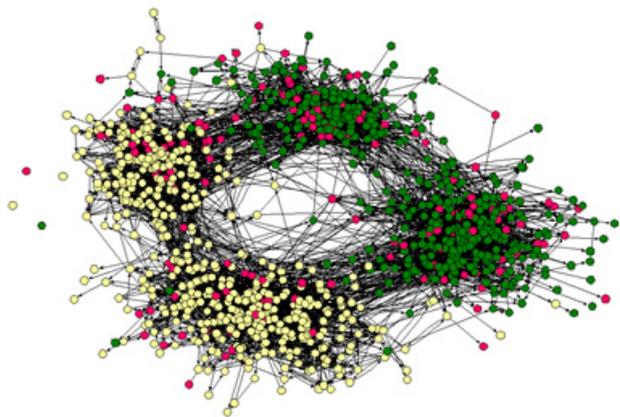


APL

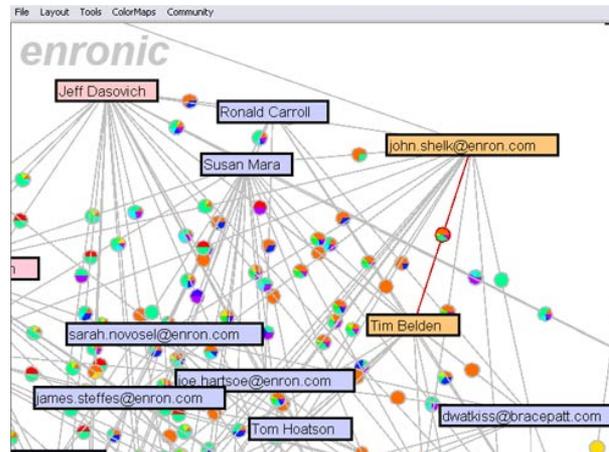
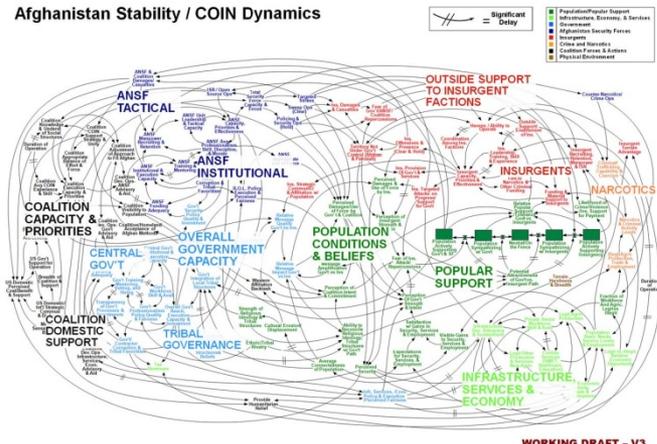
JOHNS HOPKINS UNIVERSITY
Applied Physics Laboratory

Network Science Center
West Point  

Relationships are Complex



Afghanistan Stability / COIN Dynamics

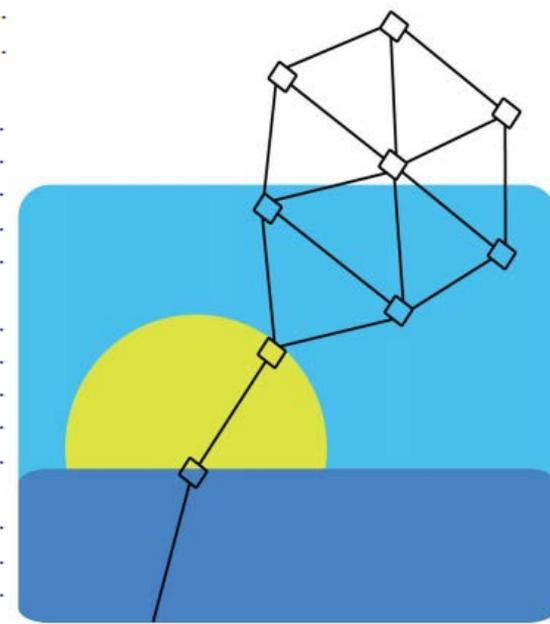


Relationships are Multi-Dimensional

YOUR MALE FRIENDS.

Darken the oval under the name if:

34. you went to his house in the last seven days.
- | | | |
|--------------------|-------|------|
| best male friend 1 | ..... | S34A |
| male friend 2 | ..... | S34B |
| male friend 3 | ..... | S34C |
| male friend 4 | ..... | S34D |
| male friend 5 | ..... | S34E |
35. you met him after school to hang out or go somewhere in the last seven days.
- | | | |
|--------------------|-------|------|
| best male friend 1 | ..... | S35A |
| male friend 2 | ..... | S35B |
| male friend 3 | ..... | S35C |
| male friend 4 | ..... |  |
| male friend 5 | ..... |  |
36. you spent time with him last weekend.
- | | | |
|--------------------|-------|--|
| best male friend 1 | ..... |  |
| male friend 2 | ..... |  |
| male friend 3 | ..... |  |
| male friend 4 | ..... |  |
| male friend 5 | ..... |  |
37. you talked with him about a problem in the last seven days.
- | | | |
|--------------------|-------|--|
| best male friend 1 | ..... |  |
| male friend 2 | ..... |  |
| male friend 3 | ..... |  |
| male friend 4 | ..... |  |
| male friend 5 | ..... |  |
38. you talked with him on the telephone in the last seven days.
- | | | |
|--------------------|-------|------|
| best male friend 1 | ..... |  |
| male friend 2 | ..... |  |
| male friend 3 | ..... |  |
| male friend 4 | ..... |  |
| male friend 5 | ..... | S38E |





(Roll over to learn more)

Sc Self-Concept							Es Emotional States
Ee Emotional Energy	Pe Physical Energy					O Obliviousness	Rp Romantic Passion
Sp Sexual Passion	Ch Character	K Kindness	D Dominance	S Sociability	A Autonomy	Ad Adaptability	I Intellect
C Curiosity	H Humor	Ap Artistic Passion	Id Industriousness	Ap Appearance	Cs Communication Style	Am Anger Management	M Mood Management
Cr Conflict Resolution	T Traditionalism	Ab Ambition	Al Altruism	Fb Family Background	Fg Family Structure and Goals	E Education	



DEMO 1

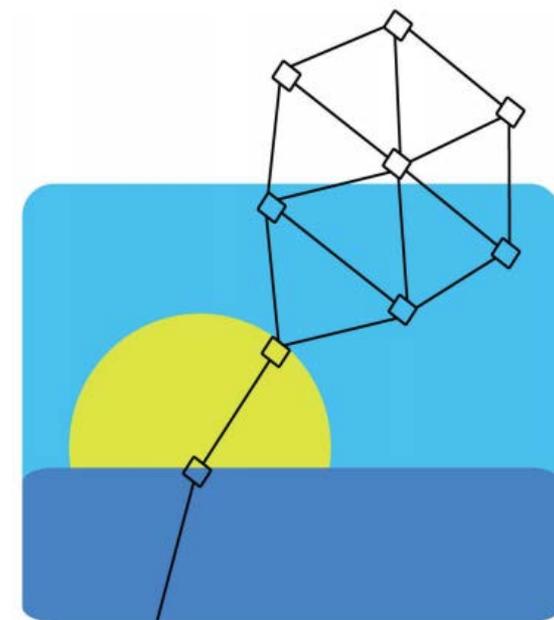
Event Data

- ***Source***
- ***Destination***

Basic node-link diagrams only convey this information

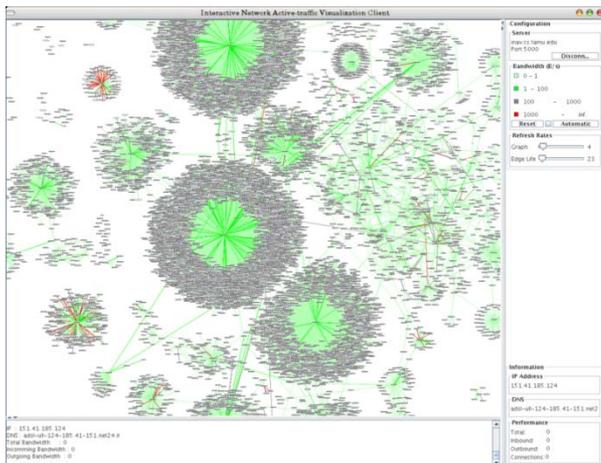
- ***Time***
- ***Category***

Some diagrams convey this information, but typically not in a scalable way.



Visualizing Multi-Modal Relationships

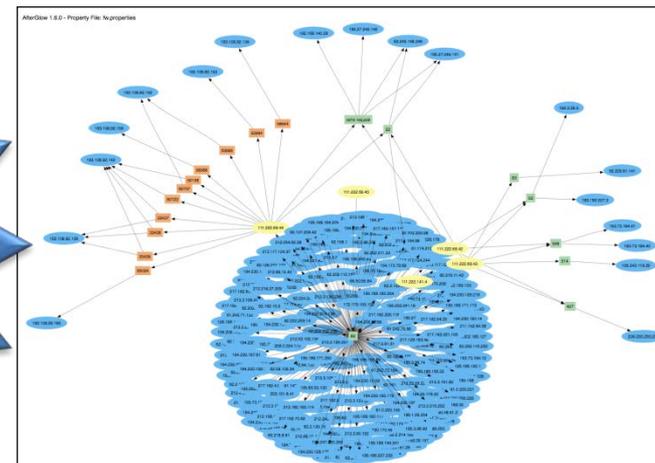
BIG PICTURE (NON-MODAL)
100s-1000s of Nodes/Edges



Scalability

Balance
Scalability
& Detail

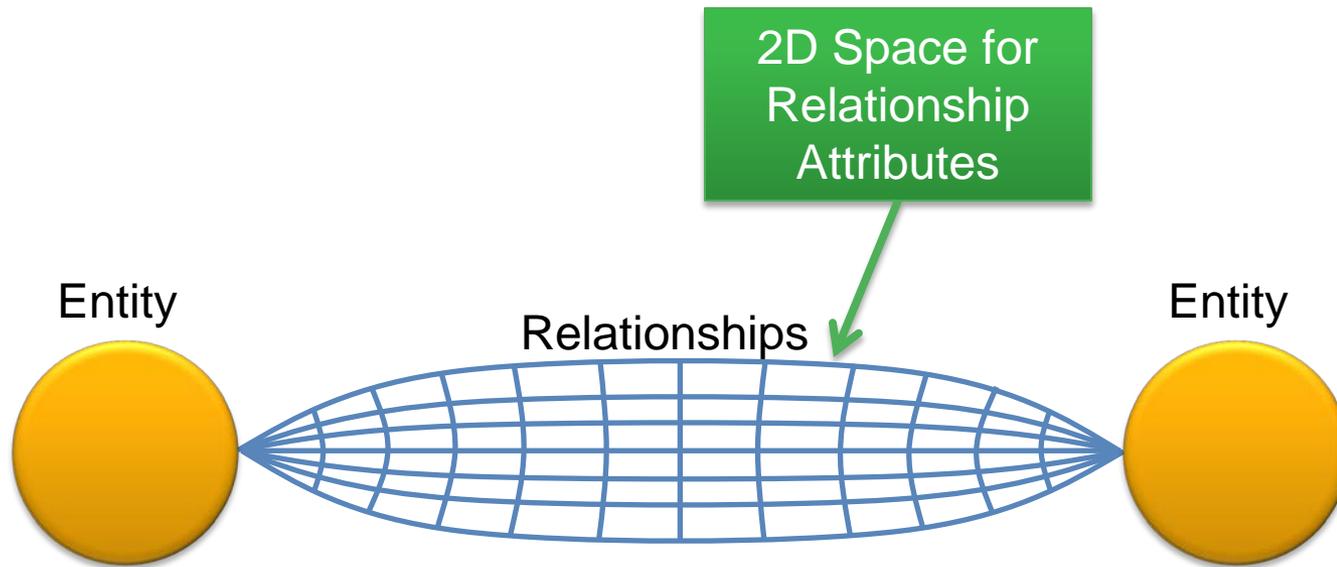
DETAILS (MODAL)
10s-100s of Node/Edges



Detail

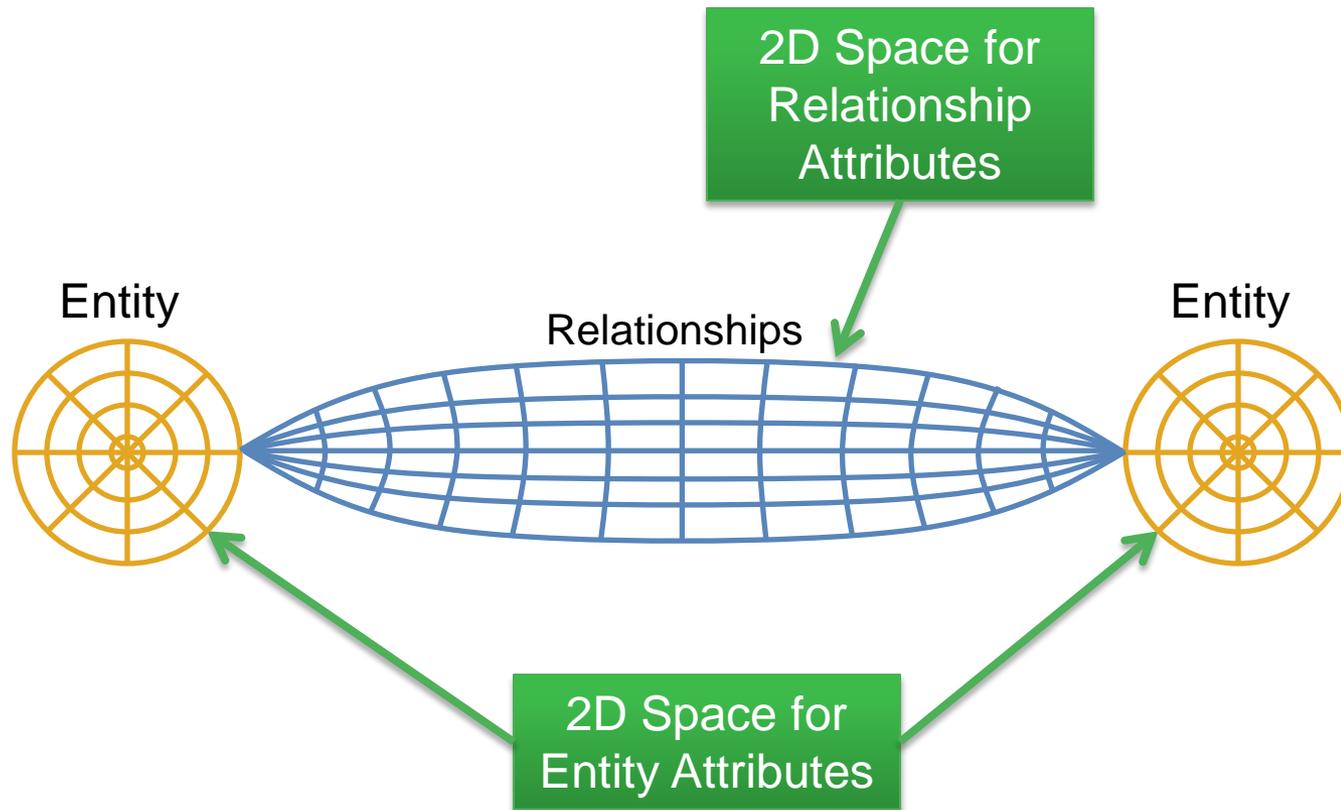
The Main Idea

Provide 2D space for entity/relationship attributes



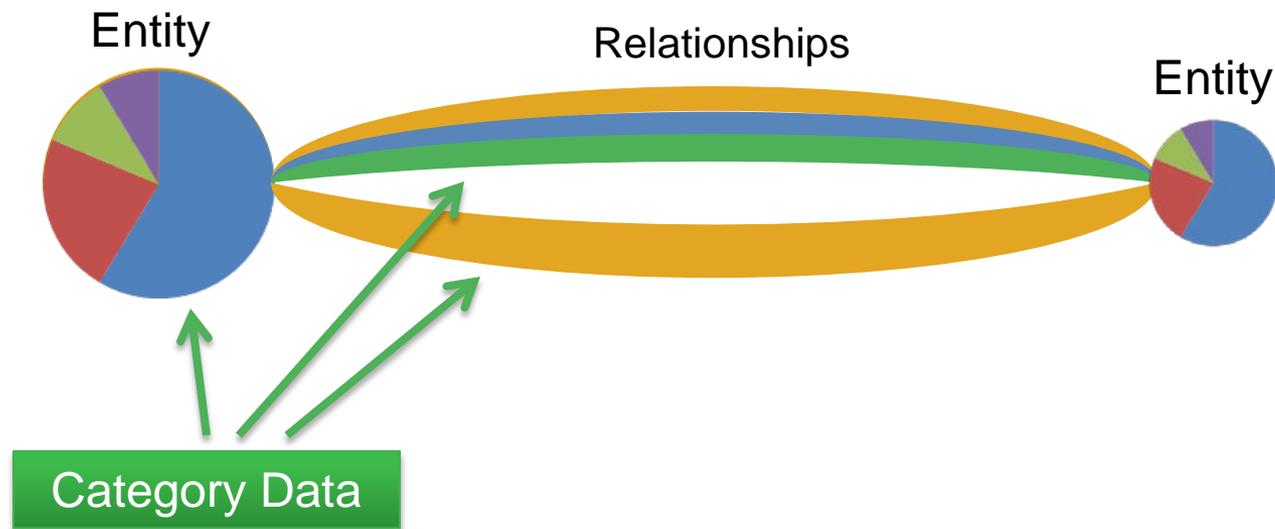
The Main Idea

Provide 2D space for entity/relationship attributes



The Main Idea

Provide 2D space for entity/relationship attributes



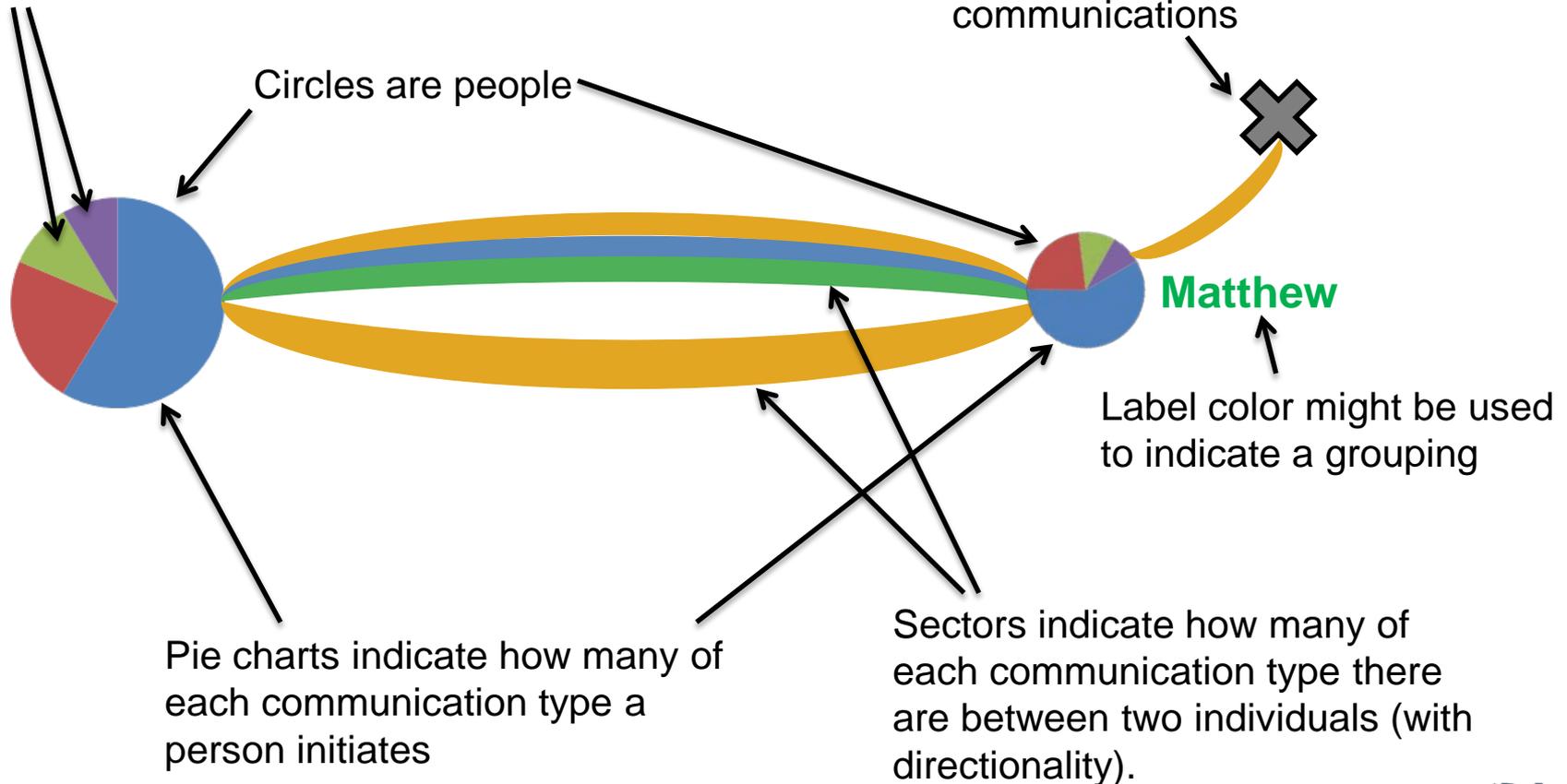
Concrete Example

Modes of Communication

Color indicates type of communication

Circles are people

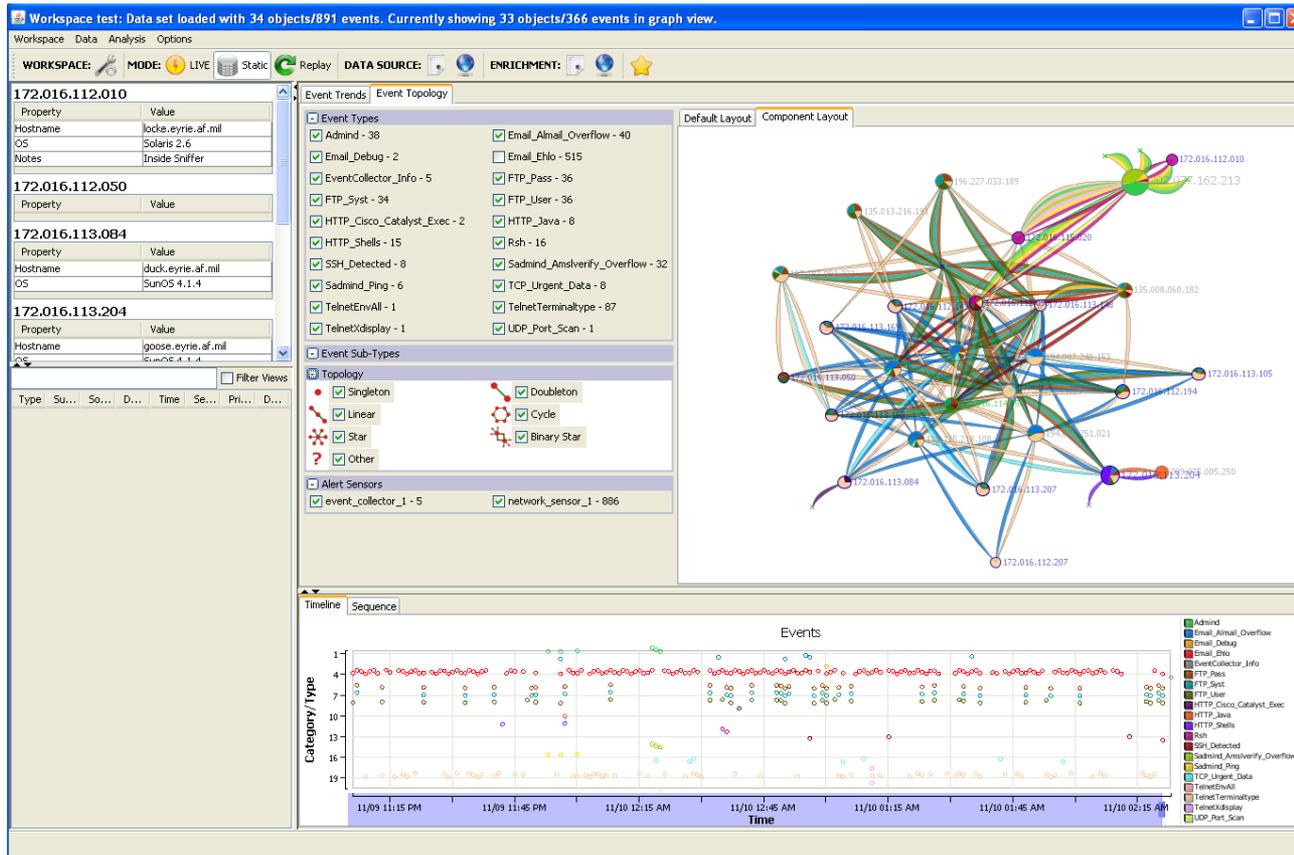
X's are people that do not initiate any communications





DEMO 2

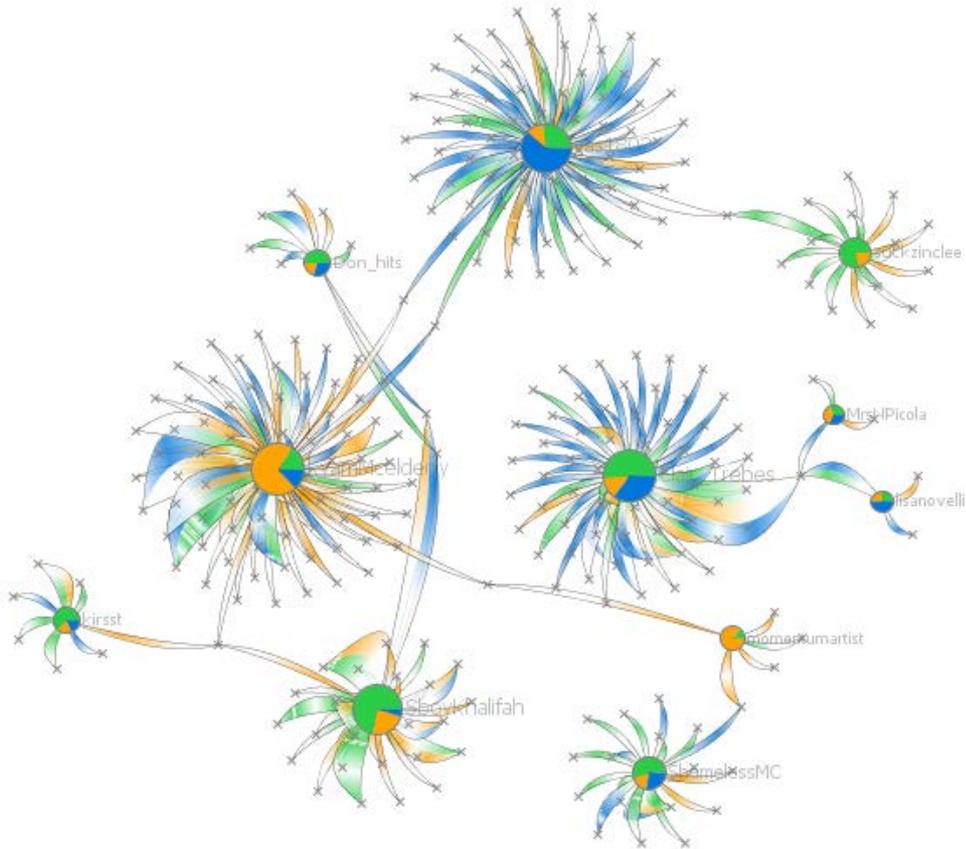
Example: Cyber Data



DataSource: IDS data set available at <http://www.ll.mit.edu/mission/communications/ist/corpora/ideval/data/index.html>

Example: Twitter Data

- *Public Twitter data set by retweet, categorized by type*



Summary

- *When your data contains complex relationships, don't be satisfied with basic node-link diagrams!*
- *Node-link diagrams can be generalized by expanding nodes & edges into 2-dimensional areas.*
- *“Crescent edge” approach is highly scalable and can depict complex relationships for 1000s of nodes and edges.*

QUESTIONS?