

SSE3: Advanced Software Technologies for Knowledge Management

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Lecture 8: Topics

- Application domains
 - Counterterrorism
 - Paper 19 (CrimeFighter overview)
 - Paper 20 (CrimeFighter Assistant)
 - Other domains?
 - Programming
 - Learning
 - Innovation
 - ...

Counterterrorism Research Lab

- The ultimate goal of the CTR Lab is to develop software tools that can help prevent future terrorist attacks
- Knowledge about the structure and organization of terrorist networks is important for both terrorism investigation and the development of effective strategies to prevent terrorist attacks
- Research from various fields can play an important role in dealing with terrorist information

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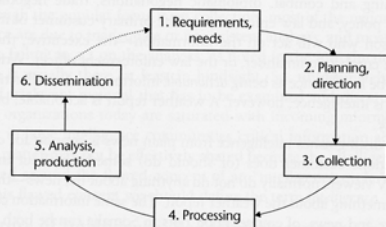
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3

The intelligence process

- Stakeholders
 - Collectors, (Processors), Analysts, Customers
- Intelligence is about reducing uncertainty in conflict
- It supports operations, and it is always concerned with a target

Figure 1-1 Traditional Intelligence Cycle



Note: The dotted line represents the transition from one cycle to the next, during which the customer reviews the analysis product and formulates new requirements and needs.

Figure 1-2 Target-Centric View of the Intelligence Process

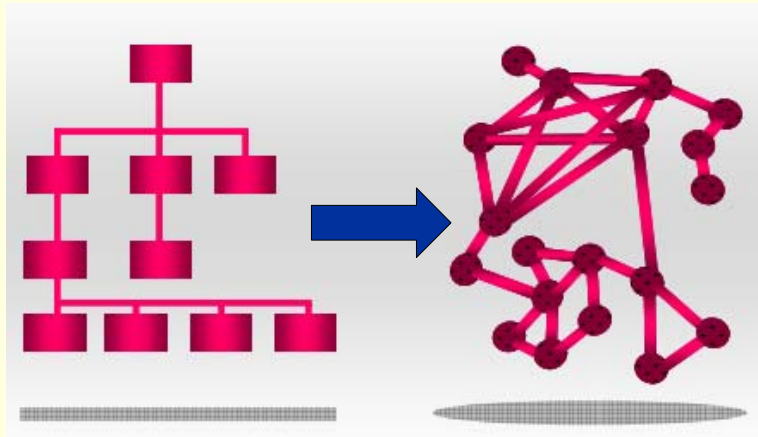


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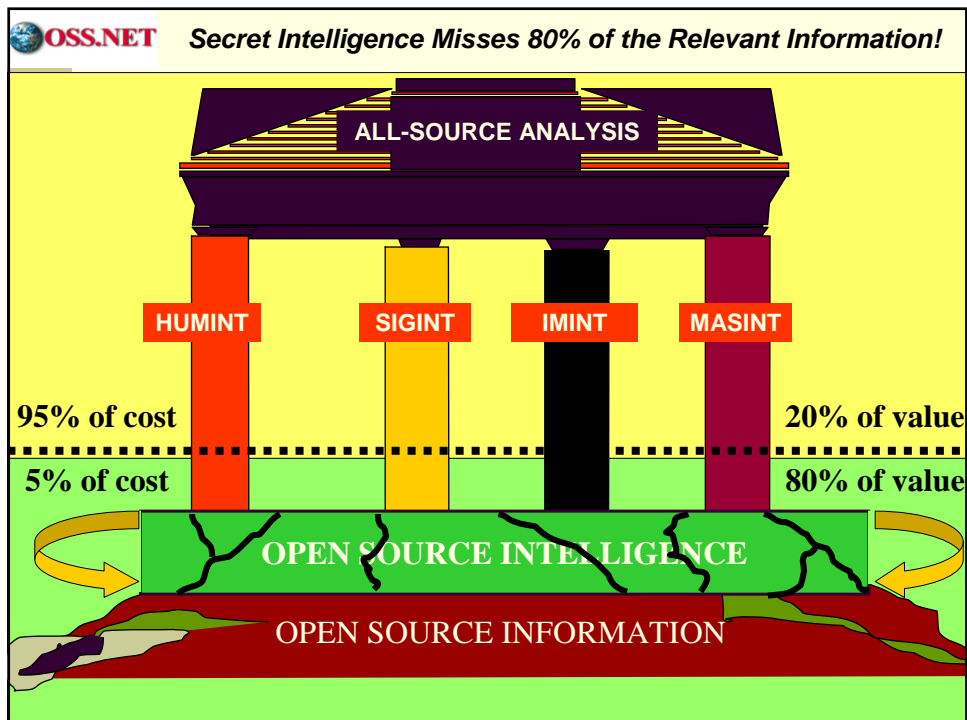
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Terrorist networks

■ New structure of terrorist networks



5



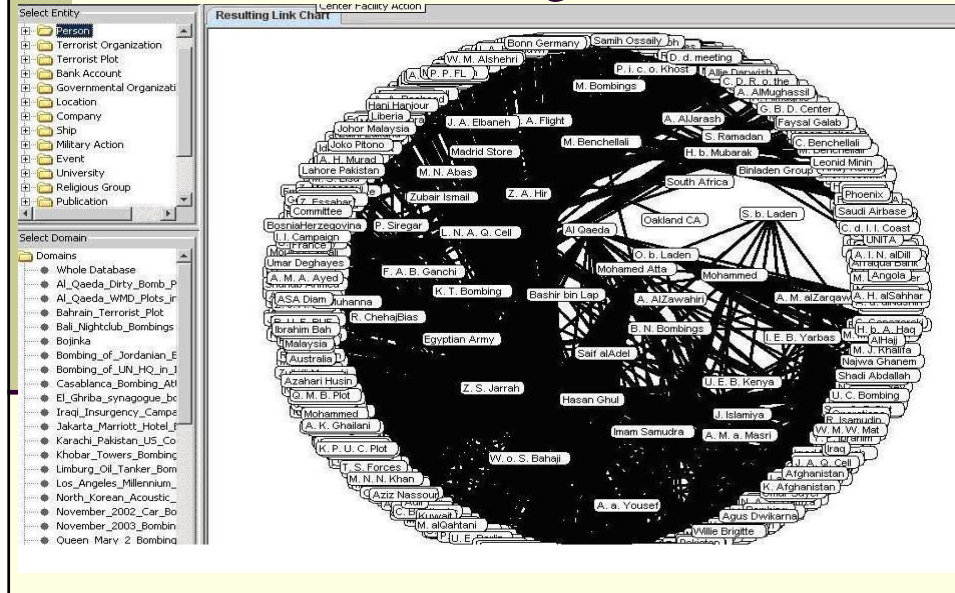
Open source intelligence

- Open Source Information (OSINF) is data which is available publicly – not necessarily free
- OSINF Collection is monitoring, selecting, retrieving, tagging, cataloging, visualizing & disseminating data
- Open Source Intelligence (OSINT) is proprietary intelligence recursively derived from OSINF
- OSINT is the result of expert analysis of OSINF

Models, algorithms and techniques

- | | |
|--|--|
| <ul style="list-style-type: none">■ Terrorism domain model<ul style="list-style-type: none">■ Graph■ Hypertext■ Social network■ ...■ Algorithms<ul style="list-style-type: none">■ Existing■ Adjusted■ Domain specific | <ul style="list-style-type: none">■ Techniques<ul style="list-style-type: none">■ Data mining (investigative data mining)■ Social network analysis (terrorist network analysis)■ Hypertext structuring■ Graph theory■ Visualization■ Web harvesting■ ... |
|--|--|

Terrorism knowledge base



Destabilizing terrorist networks

- Destabilizing terrorist networks

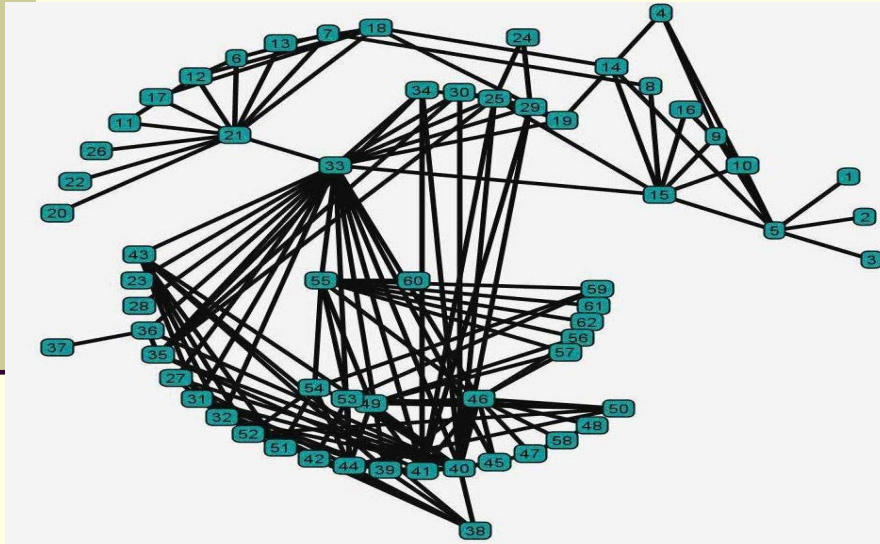
- How is the efficiency of a network affected by removing one or more nodes in a network?
- How many nodes in a network are dependent on one node?
- Is it possible to “calculate” the hierarchical structure of a terrorist network?

- Examples

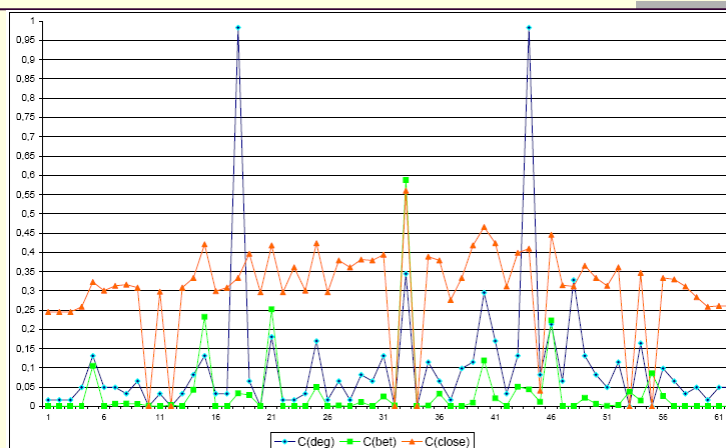
- 9/11 attack (2001)
- Bali night club bombing (2002)
- 7/7 London bombing (2005)



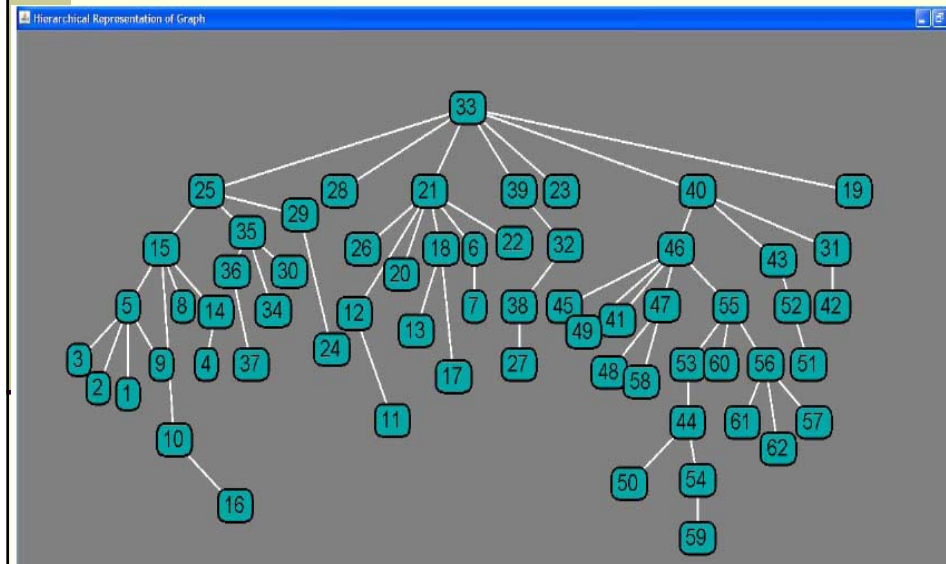
Case 1: 9/11 network



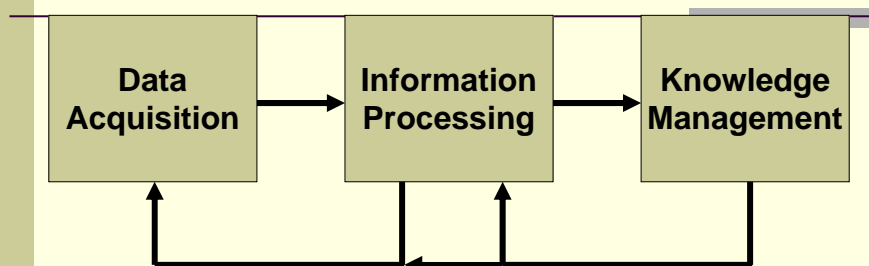
Case 1: 9/11 network



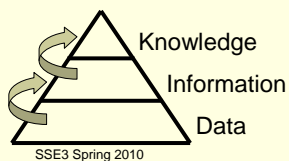
Case 1: 9/11 network



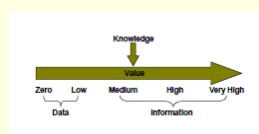
KM for intelligence analysis



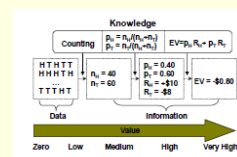
Intelligence analyst



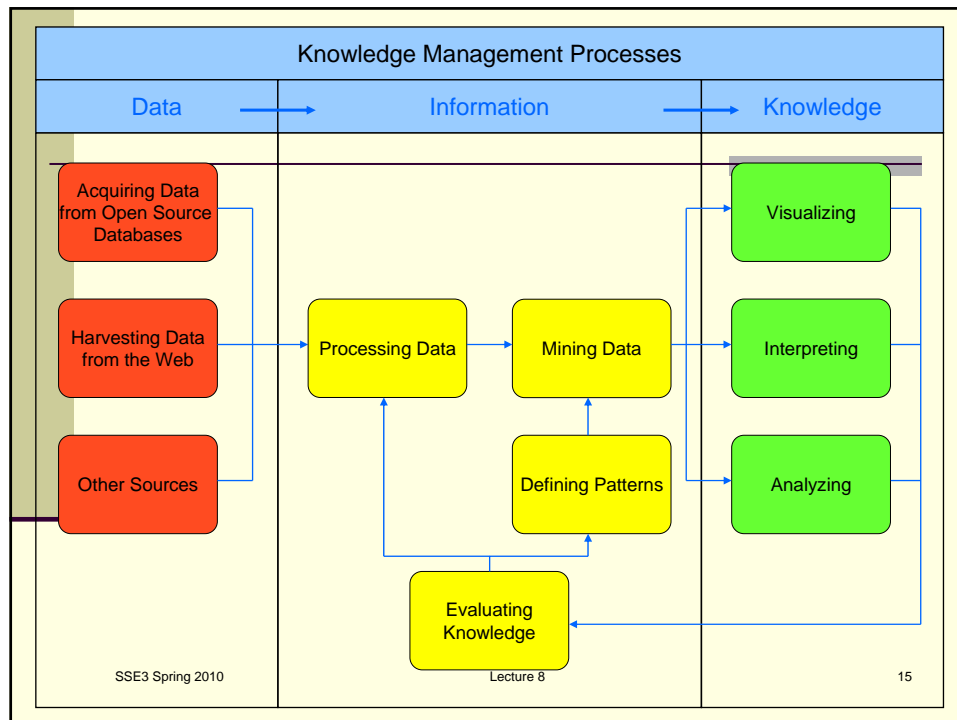
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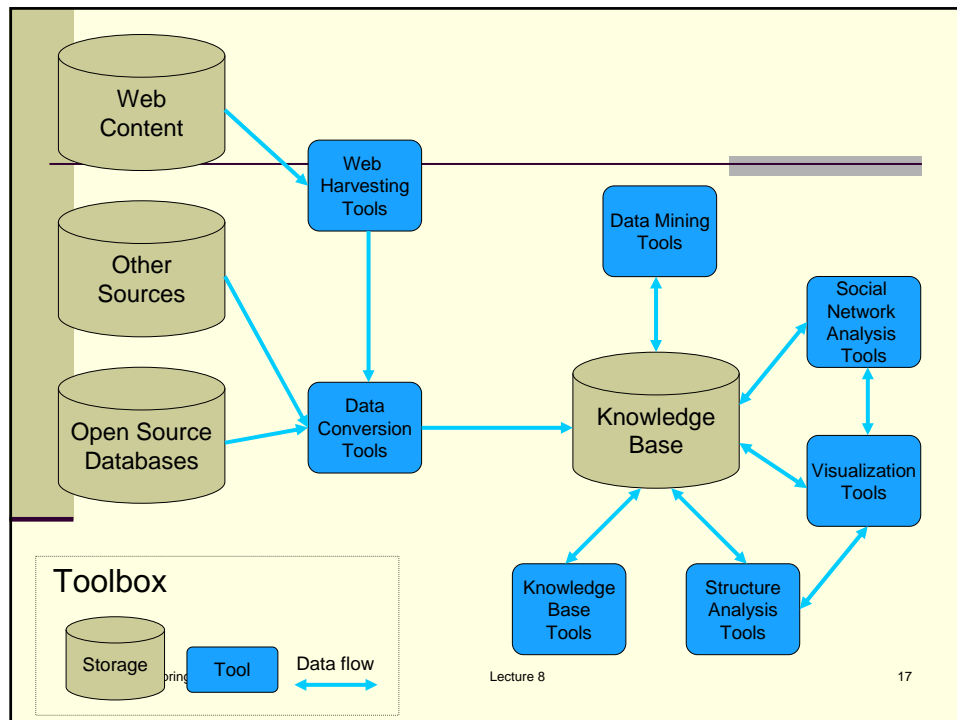


14



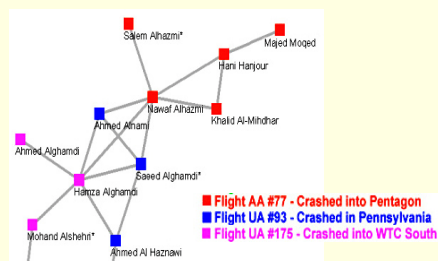
CrimeFighter

- A toolbox for counterterrorism
 - Semi-automatic tools that need to be configured by the intelligence analysts to perform the dedicated task. After configuration, the tool will automatically perform the dedicated task
 - Manual tools that support the intelligence analysts in performing specific tasks by providing dedicated features that enhance the work efficiency when performing manual intelligence analysis work



CrimeFighter Assistant

- Problem addressed
 - Terrorism domain models most often focus on nodes
 - There is a lack of tools and techniques for link analysis
 - Links are treated as second class entities



Destabilizing terrorist networks

- Carley et al. (2001) has proposed a criteria for evaluation if a terrorist network has been destabilized:
 - The rate of information flow through the network has been seriously reduced, possibly to zero
 - This can be examined by calculating the efficiency of the network
 - This can be accomplished by removing nodes or links
 - The network, as a decision making body, can no longer reach consensus, or takes much longer to do so
 - Evaluating of this criterion would require dynamic analysis of the information flow

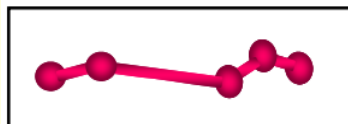
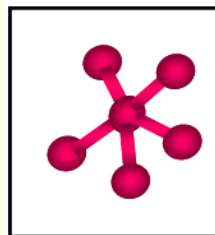
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21

Secrecy

- Dedicated for covert networks
 - Lindelauf et al. (2009)
- Terrorist networks aim for a high level of secrecy when designing networks
- Definition
 - Node exposure probability
 - Network exposure probability



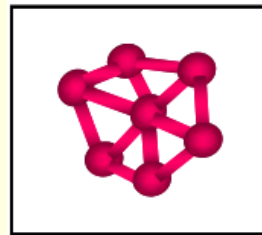
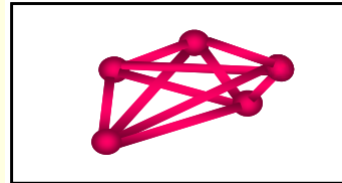
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22

Efficiency

- How efficiently nodes exchange information
 - Lindelauf et al. (2009)
- Terrorist networks aim for a sufficient level of efficiency
- By definition information is moving via the shortest path
 - An alternative could be random paths



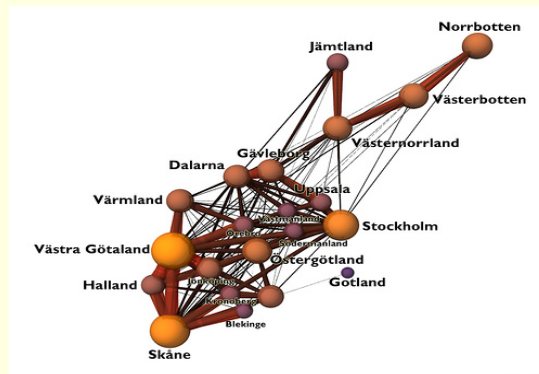
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23

Link importance

- Novel measure for ranking link importance in terrorist network structure
- Inspired by transportation networks - Jenelius et al. (2006)



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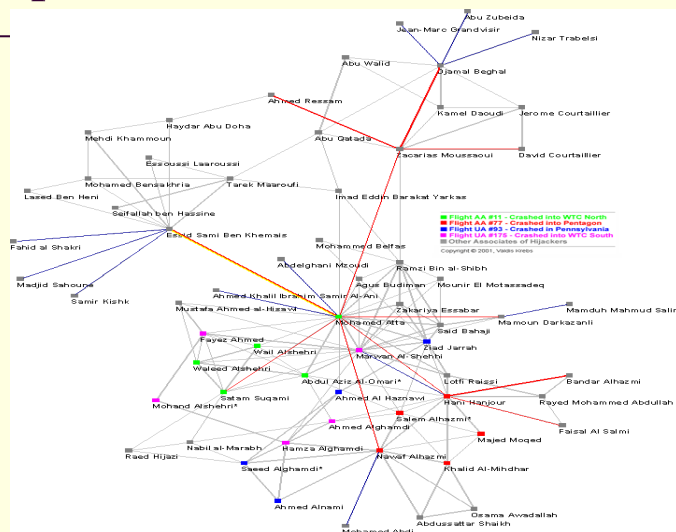
Anders Sundberg 2010

24

Link importance

- From transportation networks to terrorist networks
 - Travel demand becomes edge betweenness
 - Performance becomes tradeoff between network secrecy and efficiency as defined by Lindelauf et al. (2009)
- What happens to the overall performance (efficiency, secrecy) when a particular link is taken out?
 - The defines link importance in terrorist networks
- Link importance identifies the information “backbone” of a network

Important links in 9/11 network



CrimeFighter Assistant

- Domain specific terrorist network analysis tool providing support for analysts in determining terrorist network destabilization strategies
- Features
 - Terrorist network analysis measures
 - Terrorist network visualization
 - Ability to import network and export data
 - Using database storage model adjusted to terrorism domain model

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27

CrimeFighter Assistant

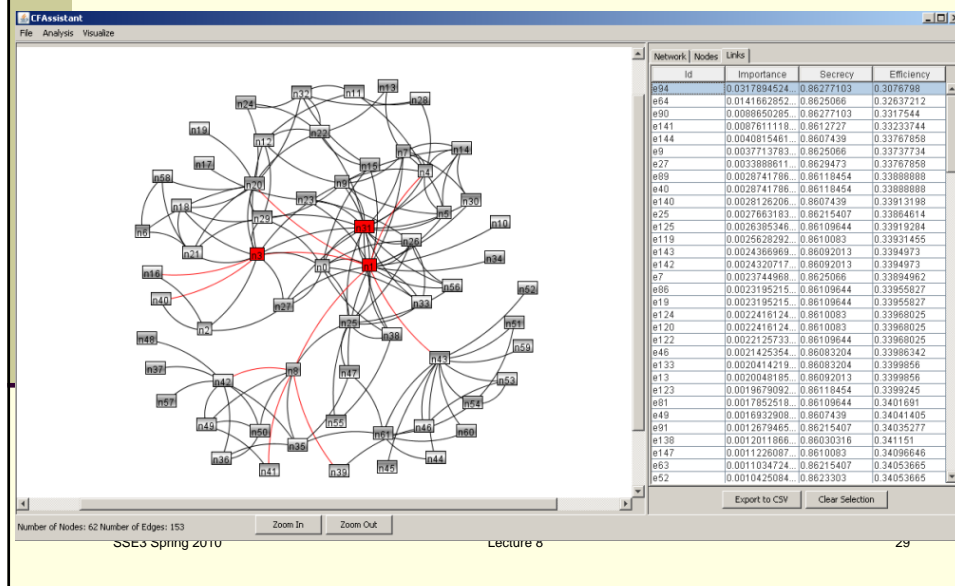
- Tool providing measures for analysis of
 - Network
 - Secrecy, Efficiency, Performance, Density, Diameter
 - Nodes
 - Closeness, Betweenness, Degree, Eigenvector, PRI
 - Links
 - Betweenness, Importance

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28

Network analysis using CF Assistant



CSCW / Hypertext?

- Did any CSCW concepts and techniques come into play?
- Did any hypertext concepts and mechanisms come into play?

CSCW / Hypertext?

- Hypertext
 - Structure is first class

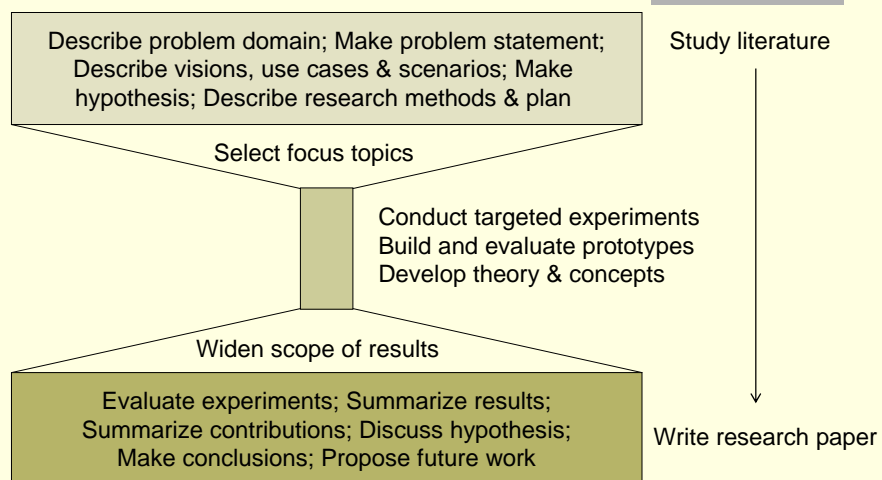
Application domains

- Health care
 - 3 papers
- Planning
 - 2 papers
- Counterterrorism
 - 2 papers
- Other domains?
 - Programming
 - Learning
 - Innovation
 - ...

Previous Master projects

- Ulrik (2007-2008)
 - CSR tool
- Rasmus (2007-2008)
 - ASAP
- Jolanta (2009-2010)
 - CrimeFighter Assistant
- ...

A Model for a Master's Project



Master project ideas

- May 7 event (I will not be there)
- Ideas from various domains
 - Counterterrorism
 - Planning
 - Health care
 - ...
- Come talk to me if you are interested
 - During project hours or
 - Email to set up an appointment