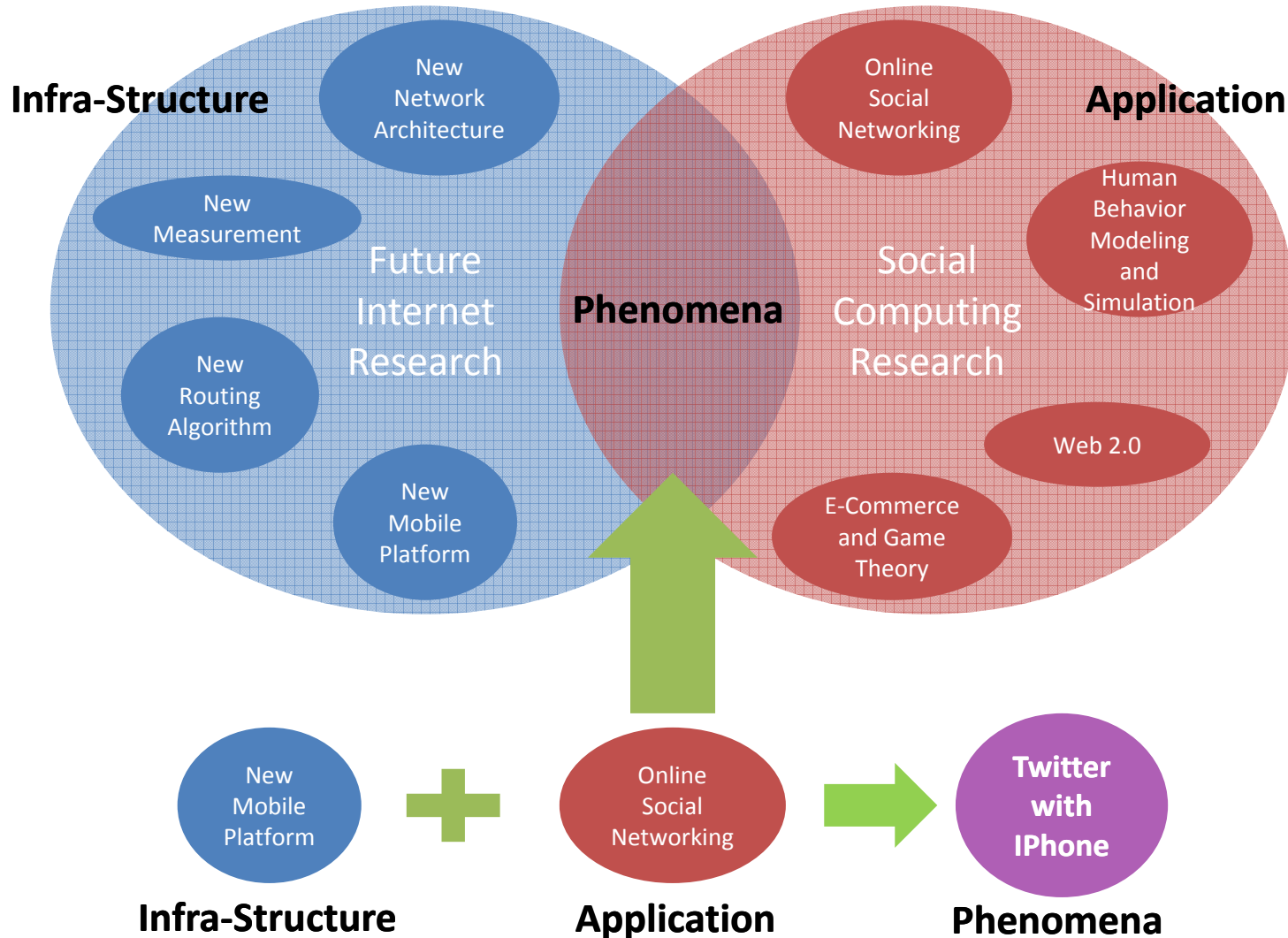


# Social Computing in Action: Tales of Social Computing in the Military and Intelligence Analyses

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Department of Electrical Engineering  
KAIST

# Future Internet and Social Computing



# Ancient Futures (오래된 미래)

- Why military and intelligence analysis?
  - Learning from others' history to estimate our future
  - The community used
    - Cutting-edge communication technology
    - Complicated applications on top of the communication



What can we learn from the experience of using complex applications and communication systems in military?

System-Oriented or Human-Oriented?

# **LESSONS LEARNED ABOUT NETWORK STRUCTURE DESIGN**

# A Story of Breakdown

- In 1988,
  - USS Vincennes (3<sup>rd</sup> aegis ship)
    - deployed to the Strait of Hormuz
    - shoot down a civilian airliner, Iran Air Flight 655
    - killed 290 civilians.
- USS Vincennes was
  - Taking charge of air defense
  - A new aegis cruiser with cutting-edge communication
- What happened?



Dotterway, K. A. (1992). *Systematic Analysis of Complex Dynamic Systems: The case of the USS Vincennes*. Unpublished master's thesis, Naval Postgraduate School, Monterey, CA.

# Complex Communication Systems and Users

Intra-Ship  
Communication



USS Vincennes



US Frigates

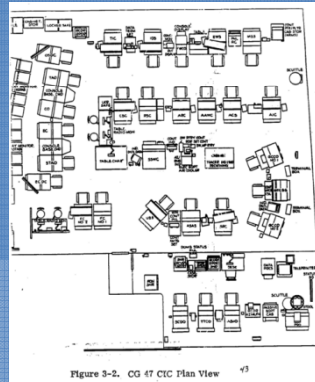
Navy Secured  
Communication



P-3 Orion



Complex Systems



Human Crews



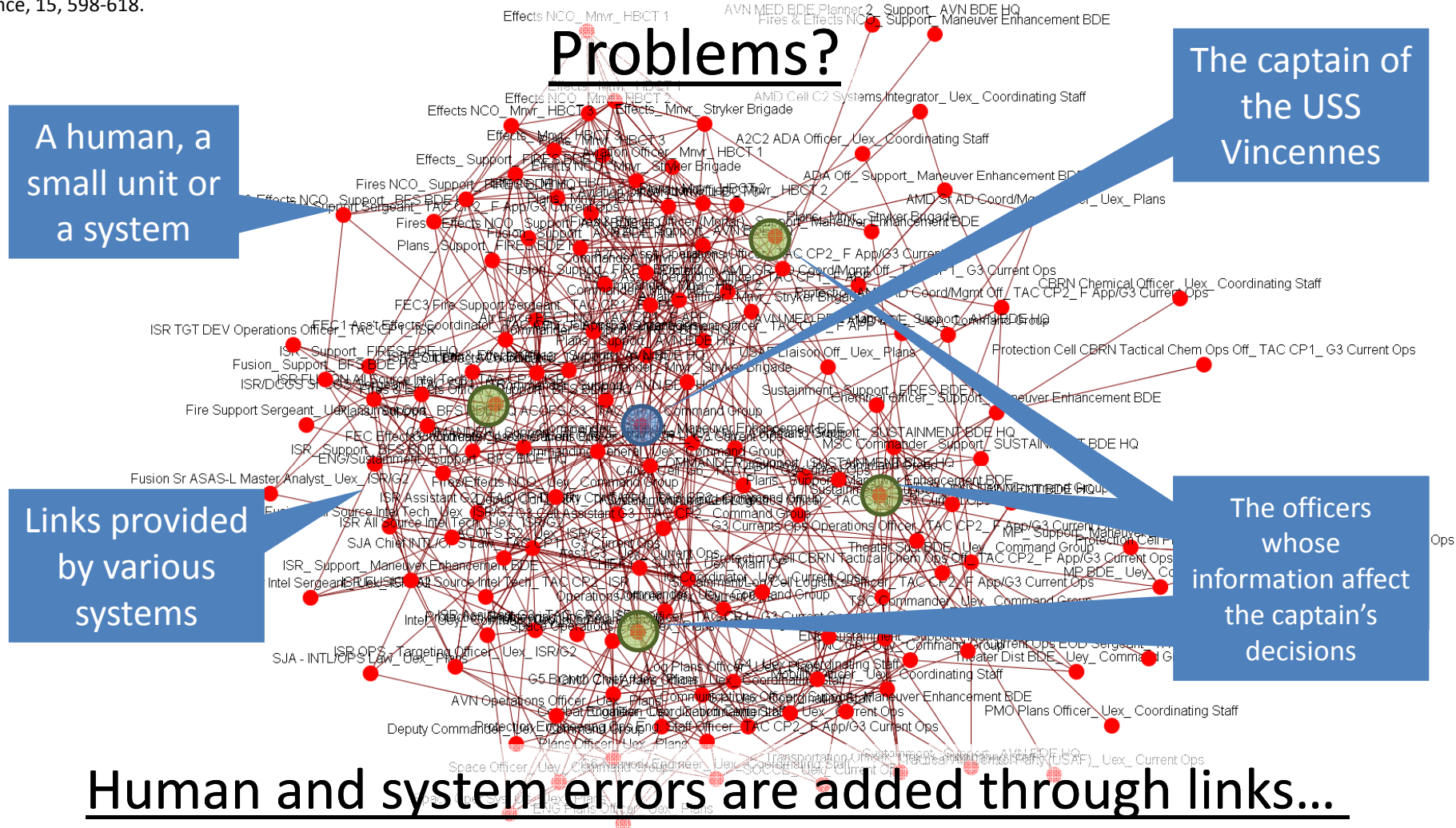
Omani Gunboat

Regional Radio Communication

# Reality, Not a Diagram

## Another View of the Communication Network

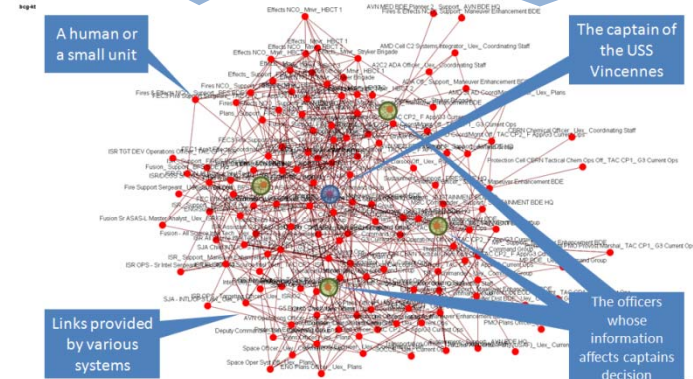
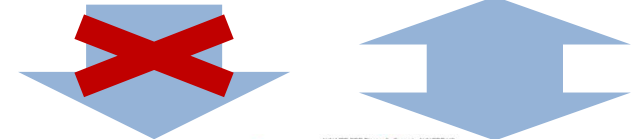
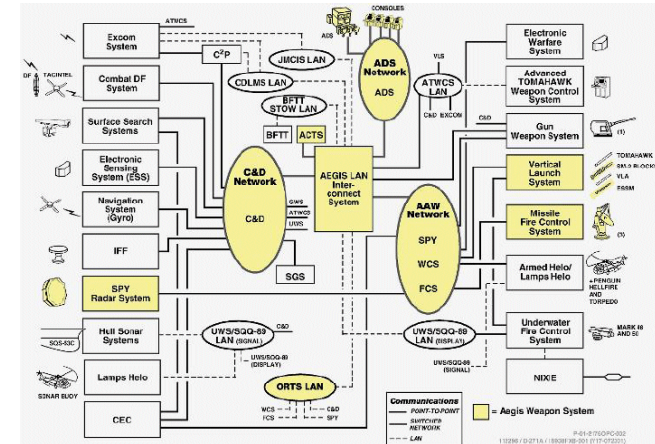
Lin, Z., Zhao, X., Ismail, K., & Carley, K. M. (2006). Organizational design and restructuring in response to crises: Lessons from computational modeling and real-world cases. *Organization Science*, 15, 598-618.



# Problems of System-Oriented Communication Network

- Military communication systems
  - Redundant
  - Time-Critical
  - Secured
  - **But, had been often system-oriented!**
- System-oriented?
  - Not optimized to human operators and their organizations
    - Human organizational structure
    - System communication structure

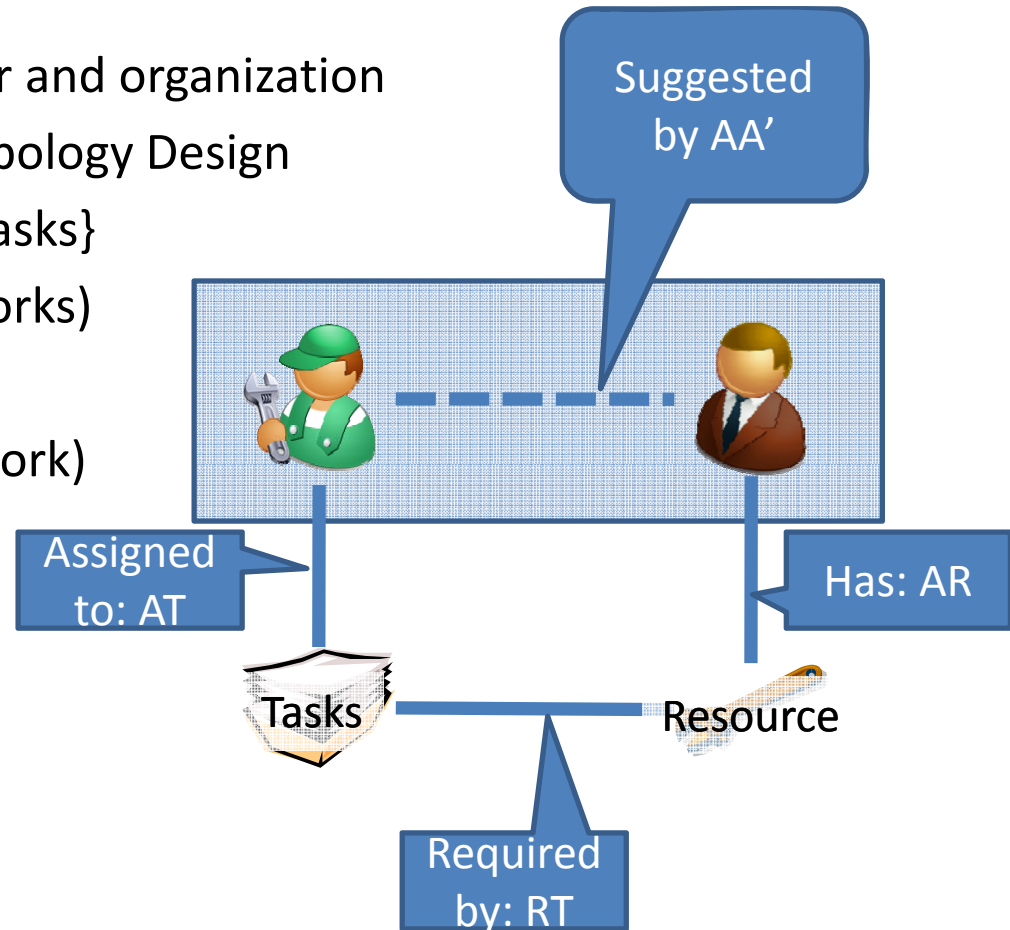
System Communication Network



Human Command and Control Structure

# Designing a Better Topology

- Need to understand human behavior and organization
- One example: Congruence Based Topology Design
  - $A=\{\text{Agents}\}$ ,  $R=\{\text{Resources}\}$ ,  $T=\{\text{Tasks}\}$
  - $AR=(\text{Resource distribution networks})$
  - $AT=(\text{Task assignment network})$
  - $RT=(\text{Resource requirement network})$
  - $AA' = AR \times RT \times AT^T$
  - Congruence:
    - I will talk to a person with a resource that I need to complete my task.



## Lessons Learned:

## Future Communication Network

## Design considering Human Relationships

Analyzing the contents as well...

# **LESSONS LEARNED ABOUT NETWORK AND CONTENT ANALYSIS**

# Proliferation of Internet Media

- Who are internet early adaptors?
  - Websites
  - E-Mail
  - YouTube
  - Social Networking Site
  - Frequent communication methods of terrorists



- Internet media has been
  - A place to broadcast propaganda
  - A place to broadcast bombing records
  - A place to train newbies
  - A place to communicate among members ← catch!



## Lieberman Calls for YouTube Terrorism Video Ban

Published by The Voice Editor May 20th, 2008 in Breaking News.

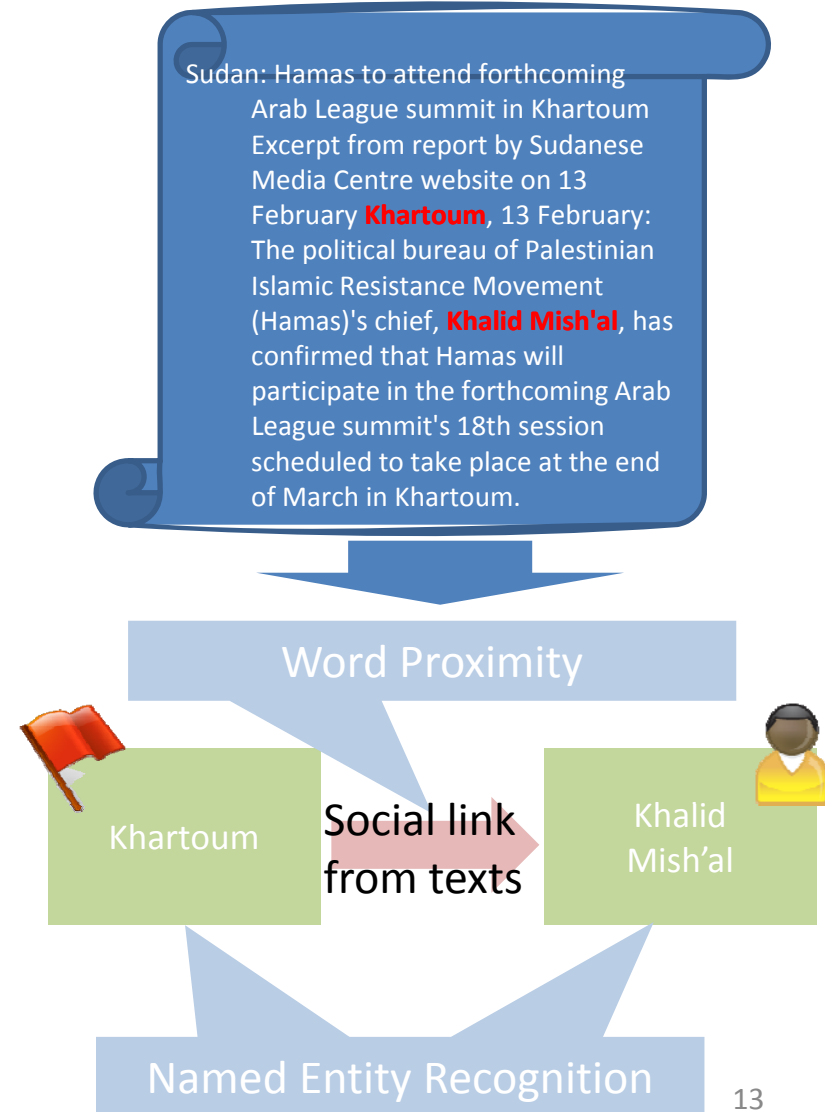
Tags: islamic extremists, lieberman youtube, senator joe lieberman, terrorism online jihad.

Homeland Security and Governmental Affairs Committee Chairman Joe Lieberman, ID-Conn., Monday called on Google to remove Internet video content produced by terrorist



# Fusion between Network and Content

- Used meta-data for social network building
  - Other than meta-data?
  - Content Analysis!
  - Initially, case analysts were interested, not network scientists...
- Used contents for
  - Natural Language Processing
  - Link Extraction (Information Retrieval)
  - **Enriching the built social network from meta-data**

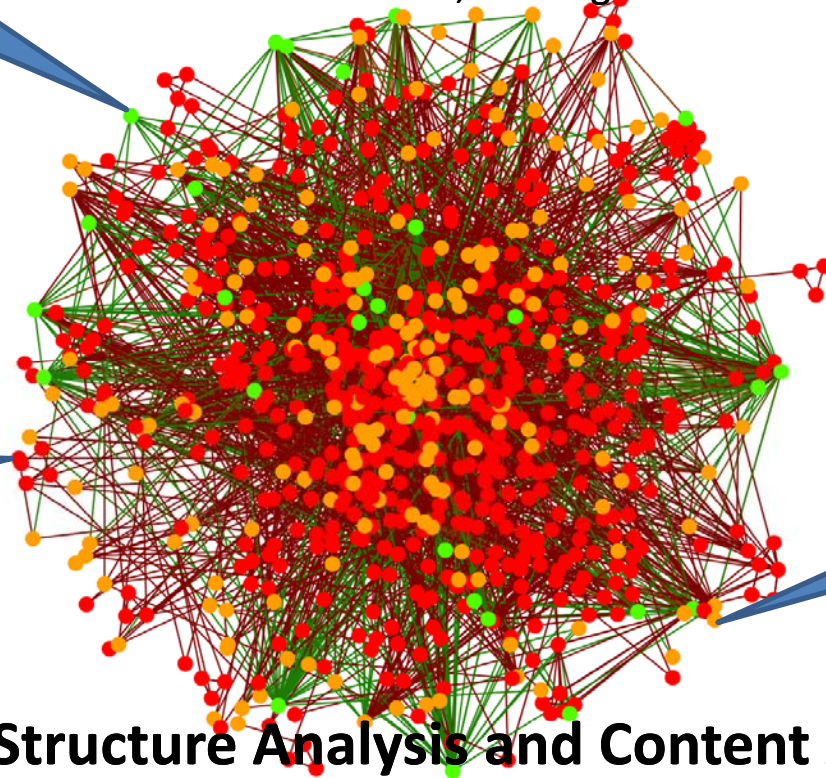


# Development of Meta-Network

Two Node Type  
(Agent and Event)  
Social and Event  
Network

- SNA + NLP → Enriched Social Networks = Meta-Network
- **Benefit:**
- Single type network: **Who** are talking to **whom**
- Meta-Network: **Who** are talking to **whom** about **what**  
→ New metrics, new algorithms...

Single Node  
Type (Agent)  
Social Network



Multiple Node Type  
(Agent, Event and  
Location)  
Meta-Network

**Lessons Learned:  
Merging Network Structure Analysis and Content Analysis  
for Future Internet Structure Studies**

The Blog community as a new frontline...

# **RECENT RESEARCH ABOUT INTERNET AND BLOGS**

# Blogs and Real World Events

**서명 성공** 통합민주당에 촉구합니다.  
미최고기 졸속협상 무효화 특별법 제정 촉구

coolee

현재 서명인원 **156,451** 명  
서명목표 **136,000** 명 | 목표 달성하였습니다

100% 달성  
발의 08.04.30 | 마감 08.05.07

**관련이미지**

현 정부는 미국최고기 협상을 졸속으로 합의하며 국민의 건강과 생명권에 매우 중대한 위협을 가하고 있습니다. 이에 미국최고기 협상에 대한 농림부 고시를 무효화 하는 특별법 제정을 급히 촉구합니다.

PD수청에 따르면 협상안은 농림부 고시로 막으려면 특별법으로 가능하다고 합니다.  
-서명목표 136,000명-통합민주당 현역의원 136명\*천명입니다.  
-잠자고 있는 국회의원을 깨우시다!  
목표달성! 여러분의 힘입니다. 현 임시국회에서 특별법제정에 열쇠는 다수당인 민주당에 있습니다. 잠깐 시간 내시어 민주당 게시판(제목위 피란 글씨-통합민주당 클릭)에... 더보기

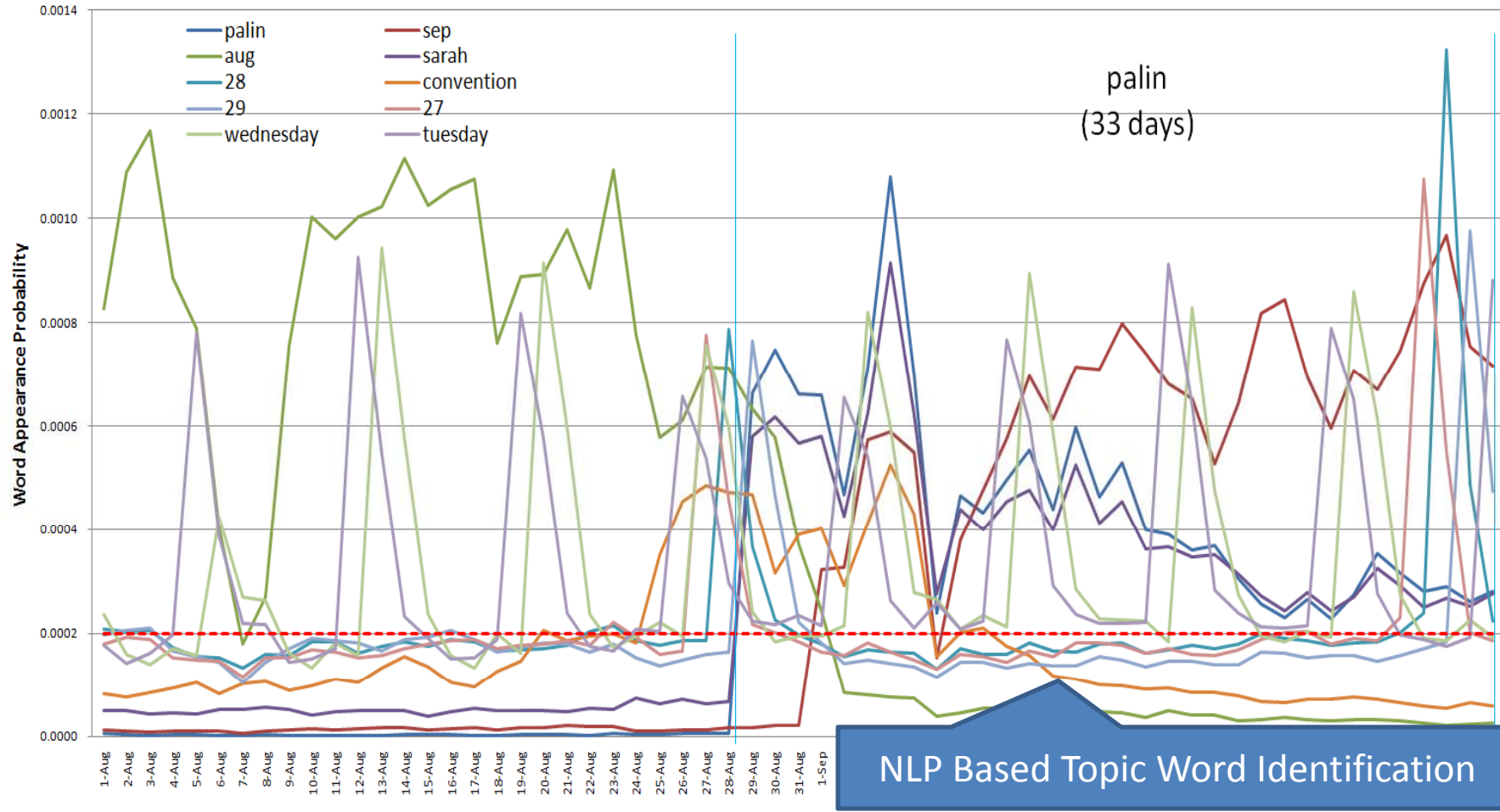
언론사에 제보하기 | 주소 복사 (4398) | 청원 퍼가기 | 카페 만들기 | 검색소 만들기



**Networks of users and posts on the internet inducing a real-world event**

- Fusion between Content Analysis and Network Analysis
  - Natural Language Processing (NLP) for Content Analysis
  - Social Network Analysis (SNA) for Network Analysis
  - A better analysis framework for Future Internet contents and structure analyses

# Topic Word Identification on Blogs

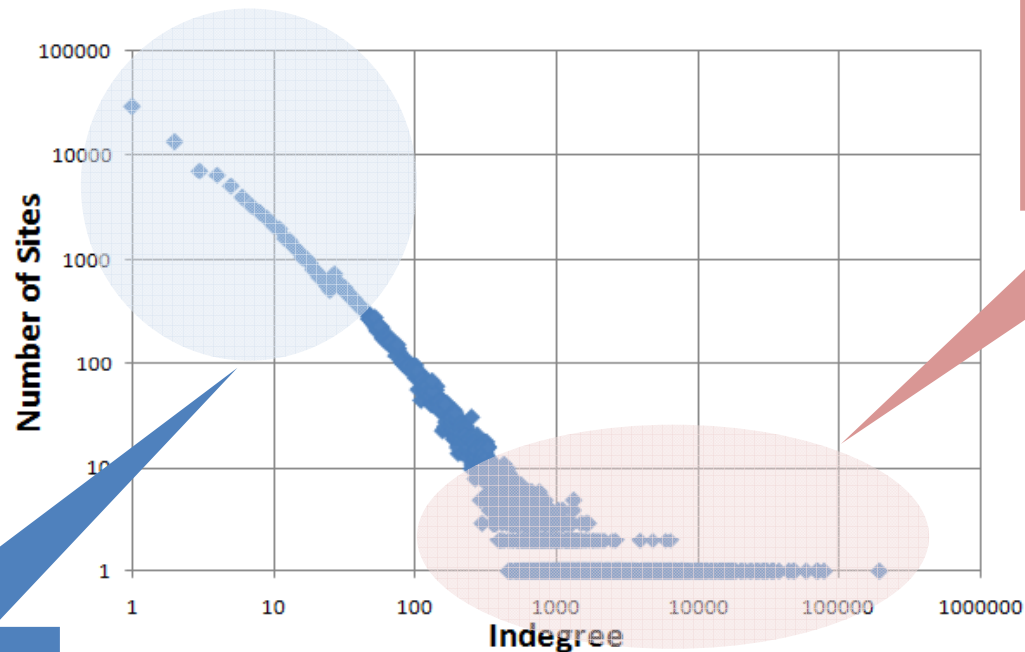


NLP Based Topic Word Identification

Topic Word Identification from Un-filtered Blog Corpus

# Simple Blog Network Analysis

- Social Network Analysis for Natural Language Processing
  - Why possible?
    - Because Internet Media
    - We have links and contents



Turns out to be major new outlet blogs

Turns out to be Personal Blogs

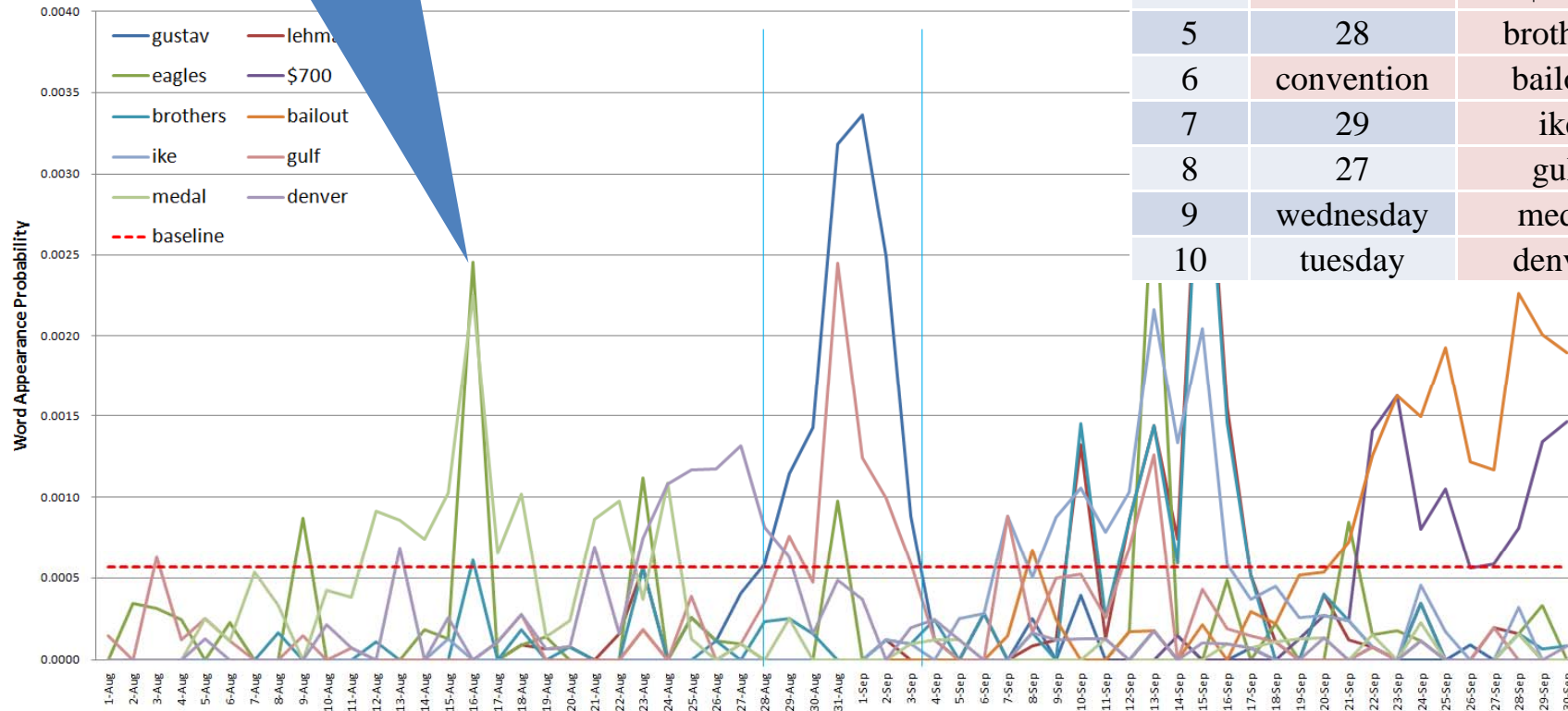
Blog In-Degree Distribution as Filtering Method

# Better Blog Topic Trend Analysis

Topic word identification from News outlets: Social Network Analysis Filtering

Much better topic identification results

IIM Rank	OLD RESULT	New Result
1	palin	gustav
2	sep	lehman
3	aug	eagles
4	sarah	\$700
5	28	brothers
6	convention	bailout
7	29	ike
8	27	gulf
9	wednesday	medal
10	tuesday	denver



Topic Word Identification from Filtered Blog Corpus

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# Lessons Learned

- Future Internet and Social Computing
  - Infra-structure Research
  - Application Research
  - Phenomena Research
- Lessons Learned...
  - Social Analysis
    - Human components
  - Content Analysis
    - Contents flowing through the network
- Current movement
  - Fusion between Social Network Analysis and Contents Analysis

