SYMPOSIUM

Dynamic Network Analysis in Information Operations

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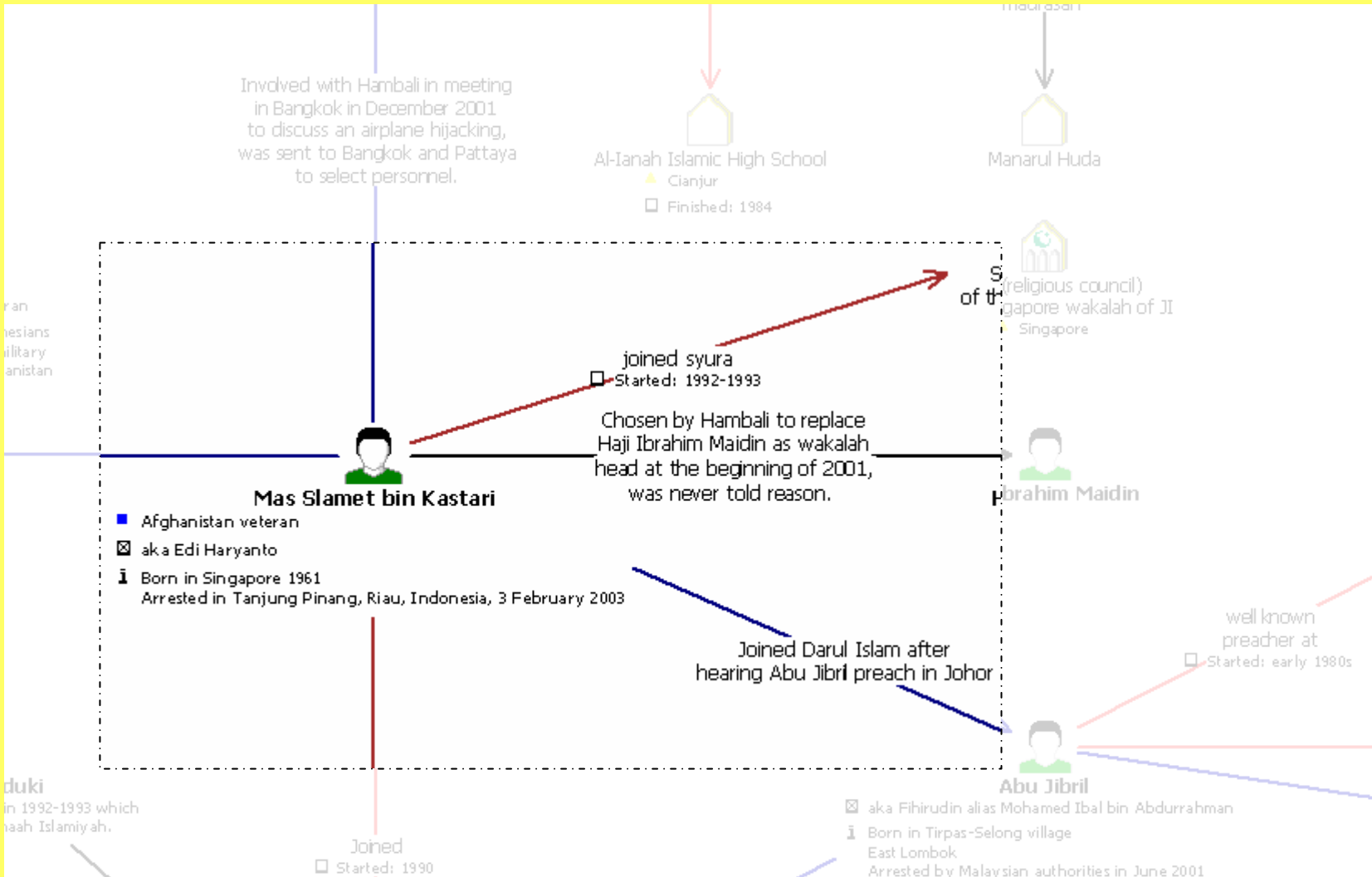
Problem

- PAO, MNC-1, Research & Monitoring Division collects, at some risk, local media.
- Require a way to conduct rapid analysis/ ‘actionable’ OSINT
- Goal is to:
  - Describe (quantitatively & qualitatively) current Atmospherics
  - Describe (quantitatively & qualitatively) Atmospherics trends
  - Identify target insertion points for friendly messages
  - Identify target insertion points for disinformation
  - Identify & describe AIF information network
- Approach: Develop a methodology that integrates Dynamic Network Analysis toolset

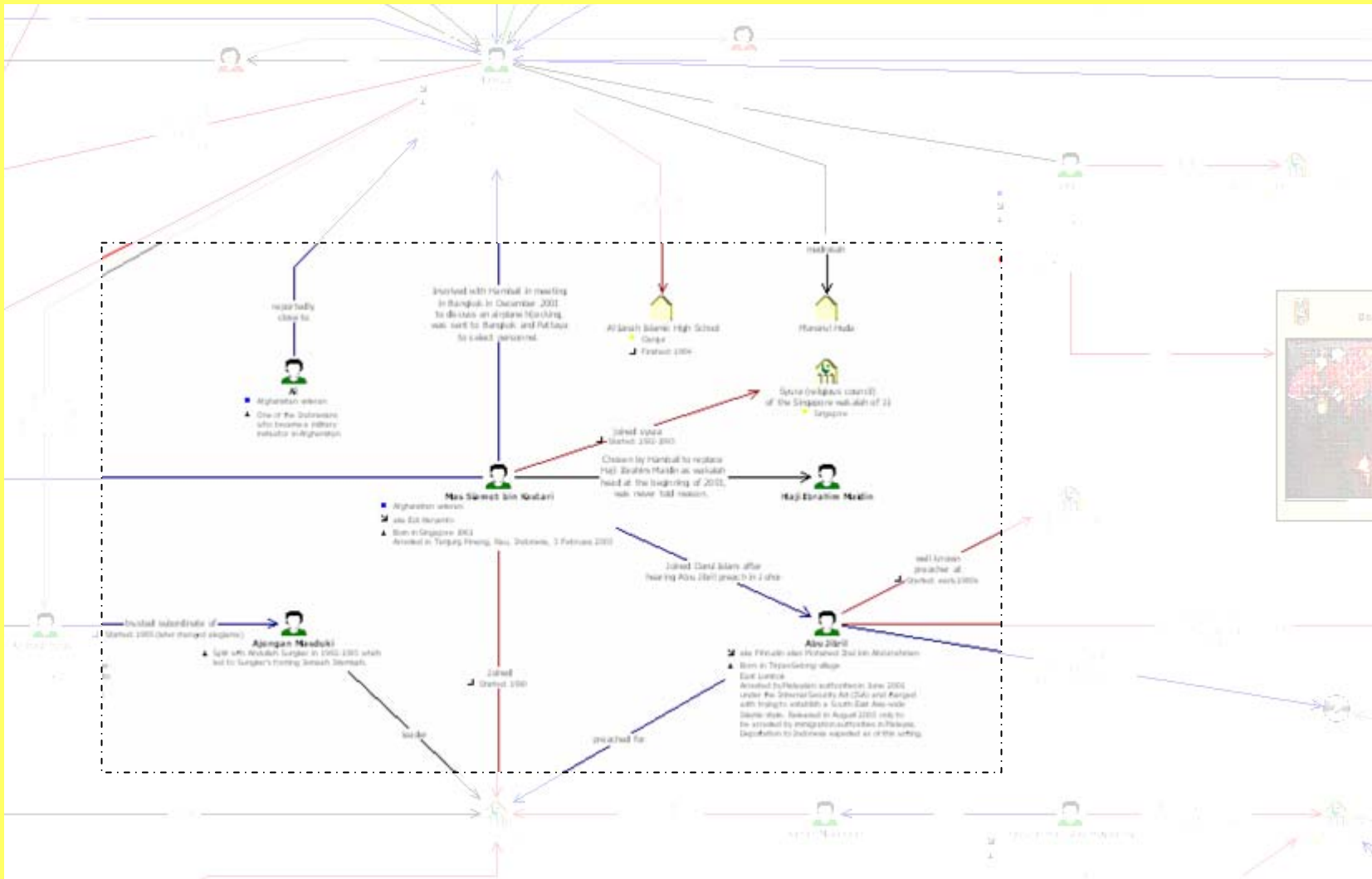
Agenda

- What is Link-Analysis
- What is Social Network Analysis
- What is Dynamic Network Analysis
- IO Example- Pre-Election Iraq

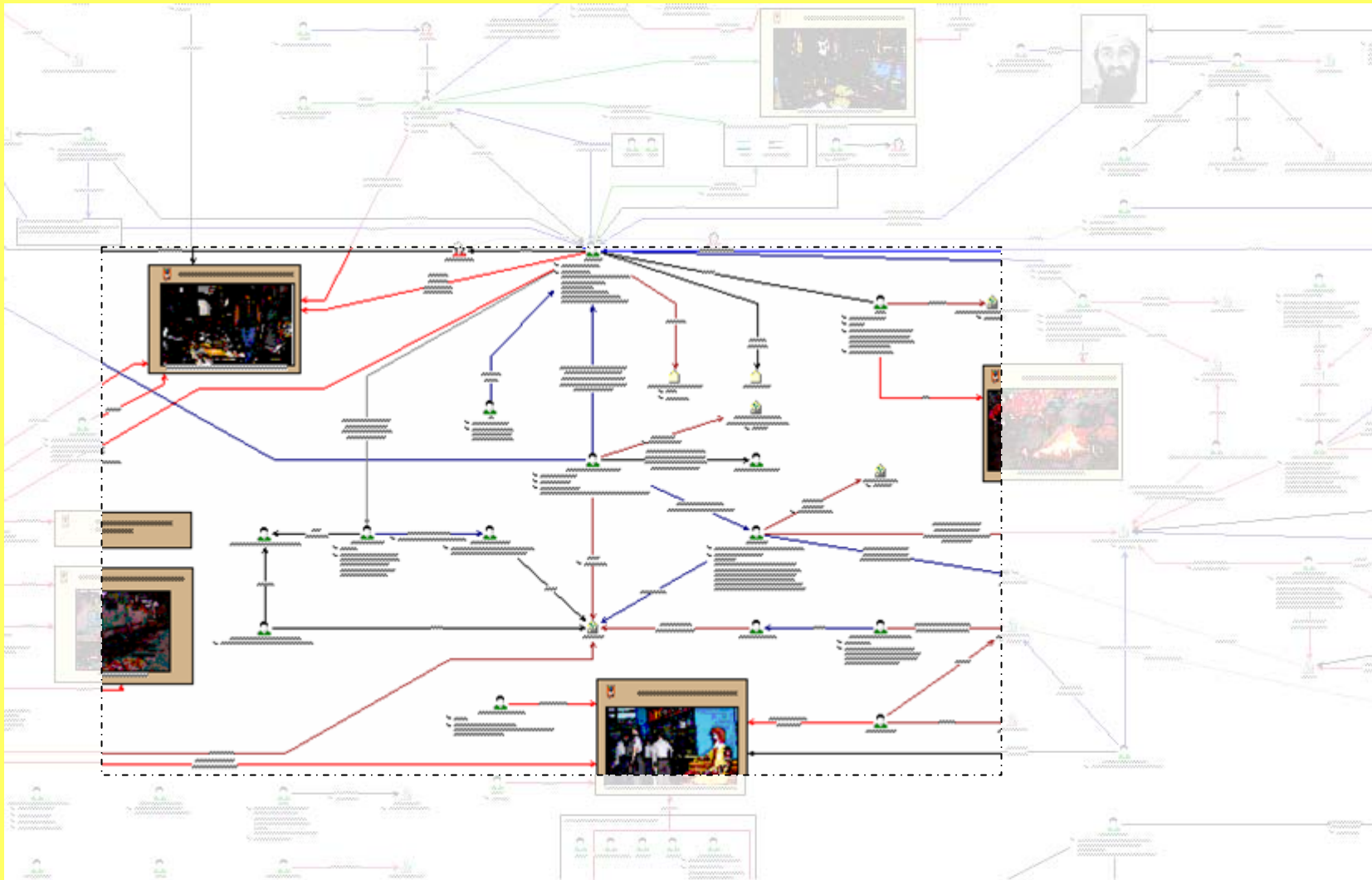
Link Analysis



Link Analysis



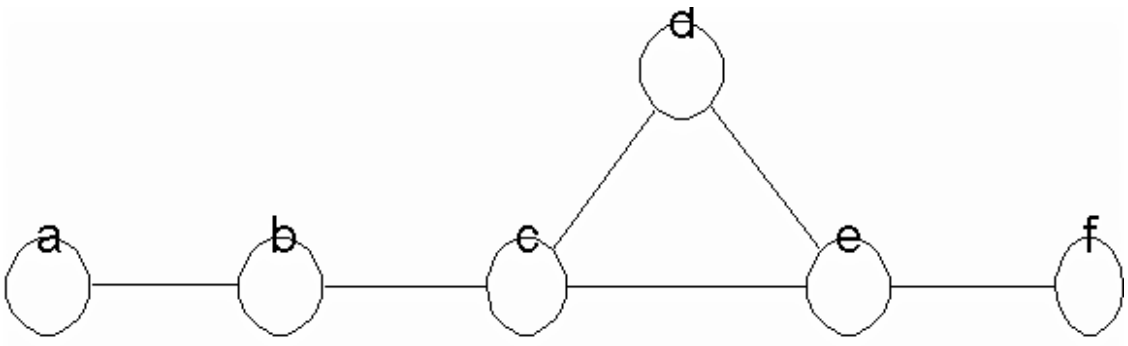
Link Analysis



Current Link Analysis Limitations

- Accounting for Normal Evolution
  - Without external manipulation, network is evolving
- Zoom Lens Effect
  - Can only consider local changes
  - Multiple micro and macro changes happening simultaneously
- Complex Rule Set
  - Changes to network rely on complex rule set
  - Rule set developed by experience
  - Time consuming to train
- Human Cognitive Limitations

Social Network Analysis

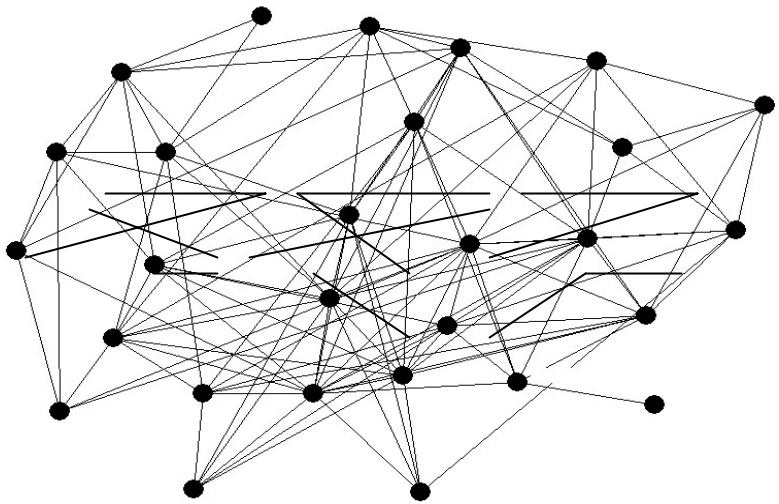


Select Measures

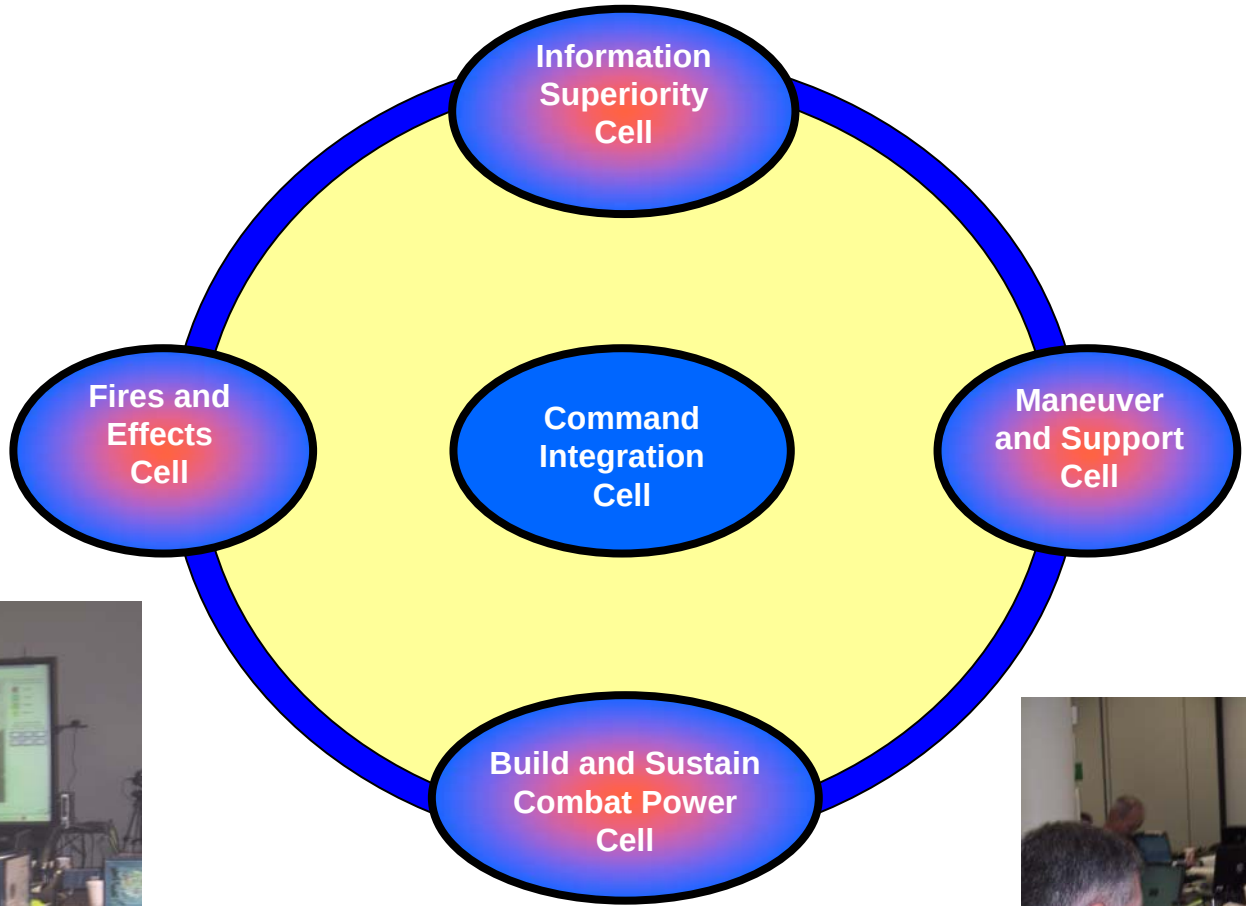
- Node Density
- Betweeness Centrality
- Cliques

Social Network Analysis

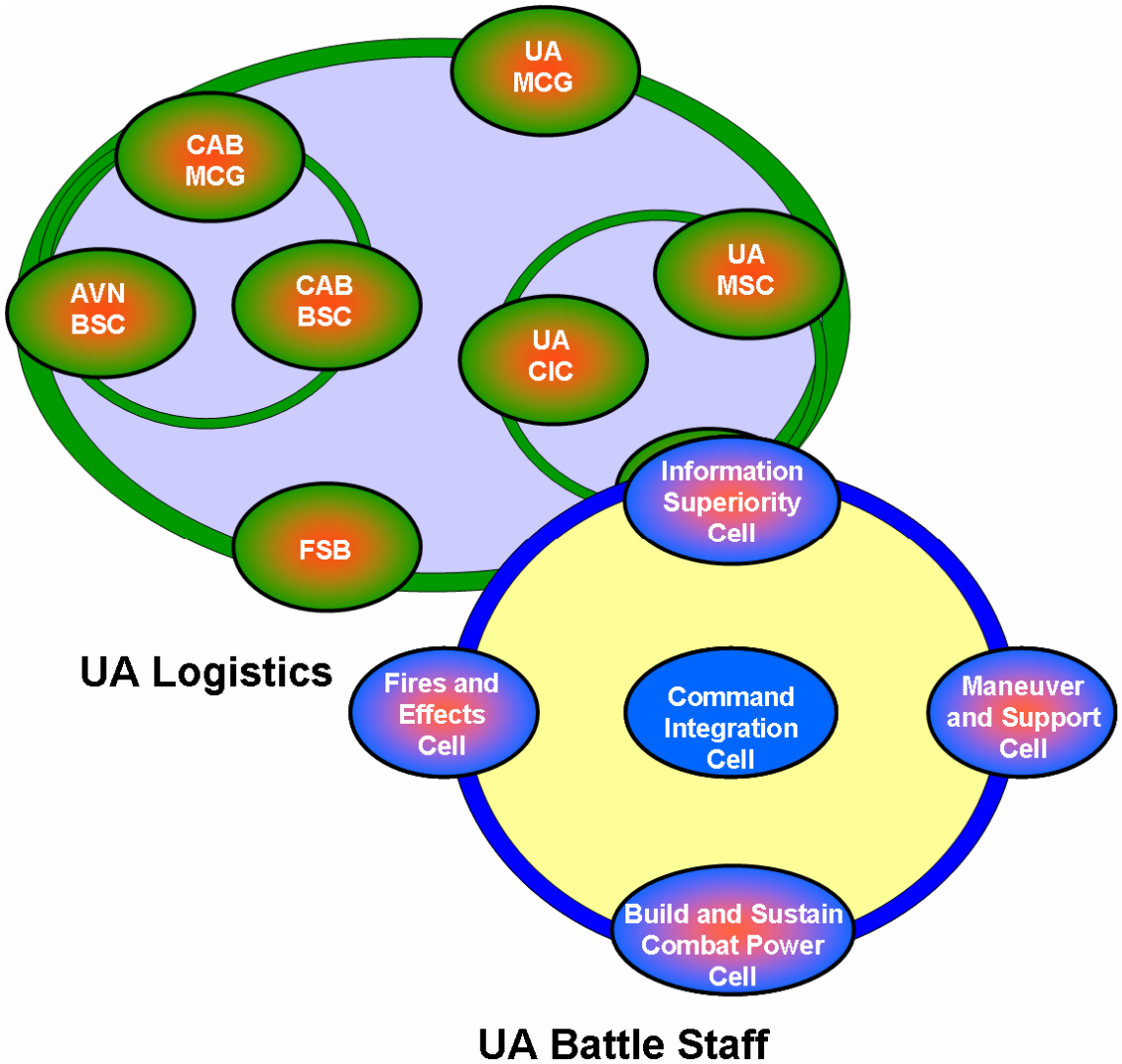
Network
Organization



Social Network Analysis--- BLUE C2 Example



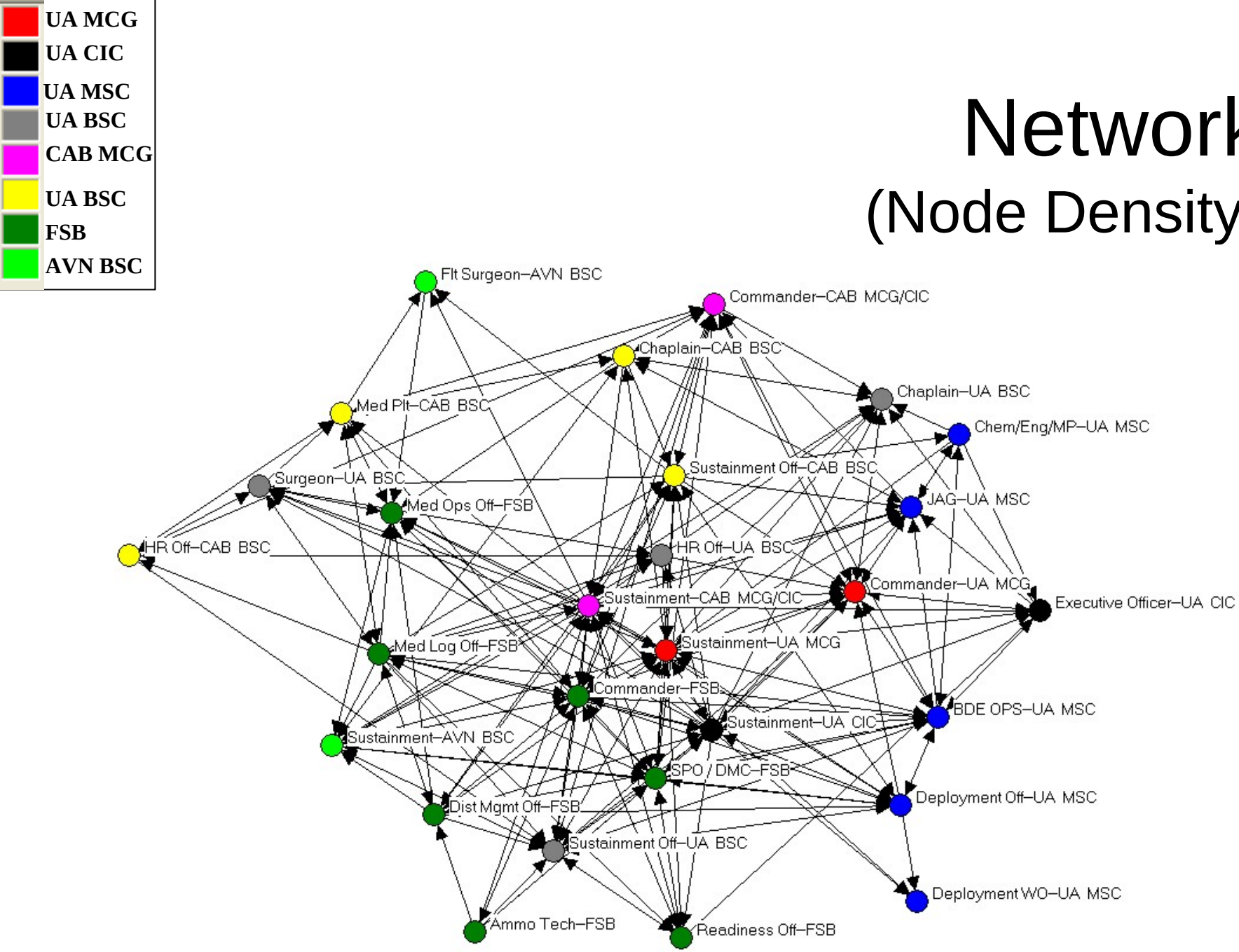
UA Logistics Experiment #1
CSSBL-Ft Lee, VA



CSSBL Collection

Session	Date	Activities	Remarks
1	January 27, 2004	Event 1 & 2	No MSL injects
2	January 27, 2004	Event 2	Recovery MSL
3	January 27, 2004	Event 3	MSL Injects & End of Day AAR
4	January 28, 2004	Event 4	No MSL injects
5	January 28, 2004	Event 5	Mass Casualty
6	January 28, 2004	Event 6	Resupply

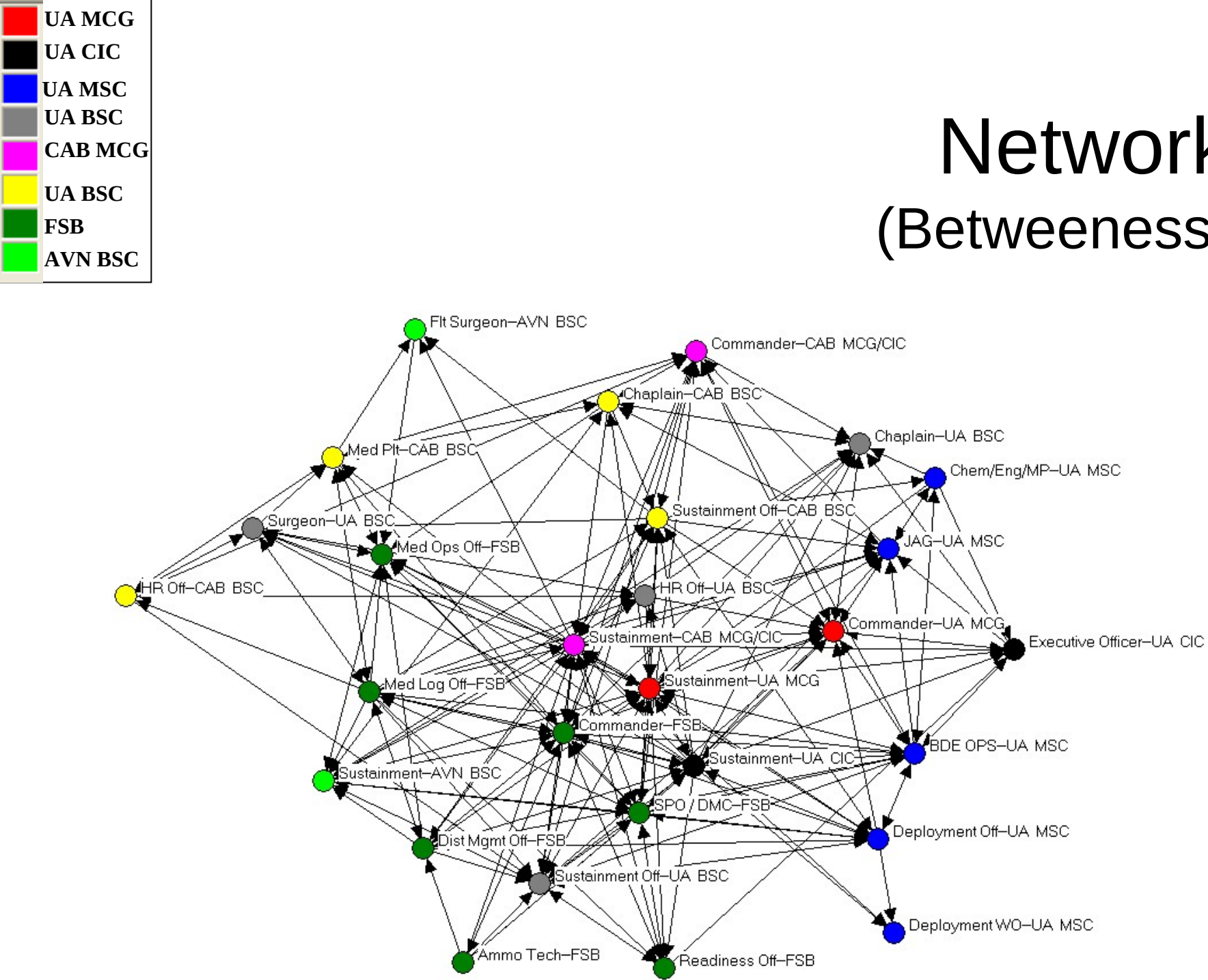
Network
(Node Density)



Node Density

Position	Network Size
Sustainment--CAB MCG/CIC	23
Sustainment--UA MCG	20
Sustainment--UA CIC	20
Commander--FSB	18
Med Log Off--FSB	16
Sustainment Off--UA BSC	15
Sustainment Off--CAB BSC	15
SPO / DMC--FSB	15
Commander--UA MCG	14
BDE OPS--UA MSC	13
Deployment Off--UA MSC	12
Commander--CAB MCG/CIC	12
Med Ops Off--FSB	12
Dist Mgmt Off--FSB	12
Sustainment--AVN BSC	12
JAG--UA MSC	11
Chaplain--UA BSC	10
Executive Officer--UA CIC	9
Surgeon--UA BSC	9
Chaplain--CAB BSC	9
Med Plt--CAB BSC	9
Readiness Off--FSB	8
HR Off--UA BSC	7
Chem/Eng/MP--UA MSC	6
HR Off--CAB BSC	6
Ammo Tech--FSB	6
Flt Surgeon--AVN BSC	4
Deployment WO--UA MSC	3

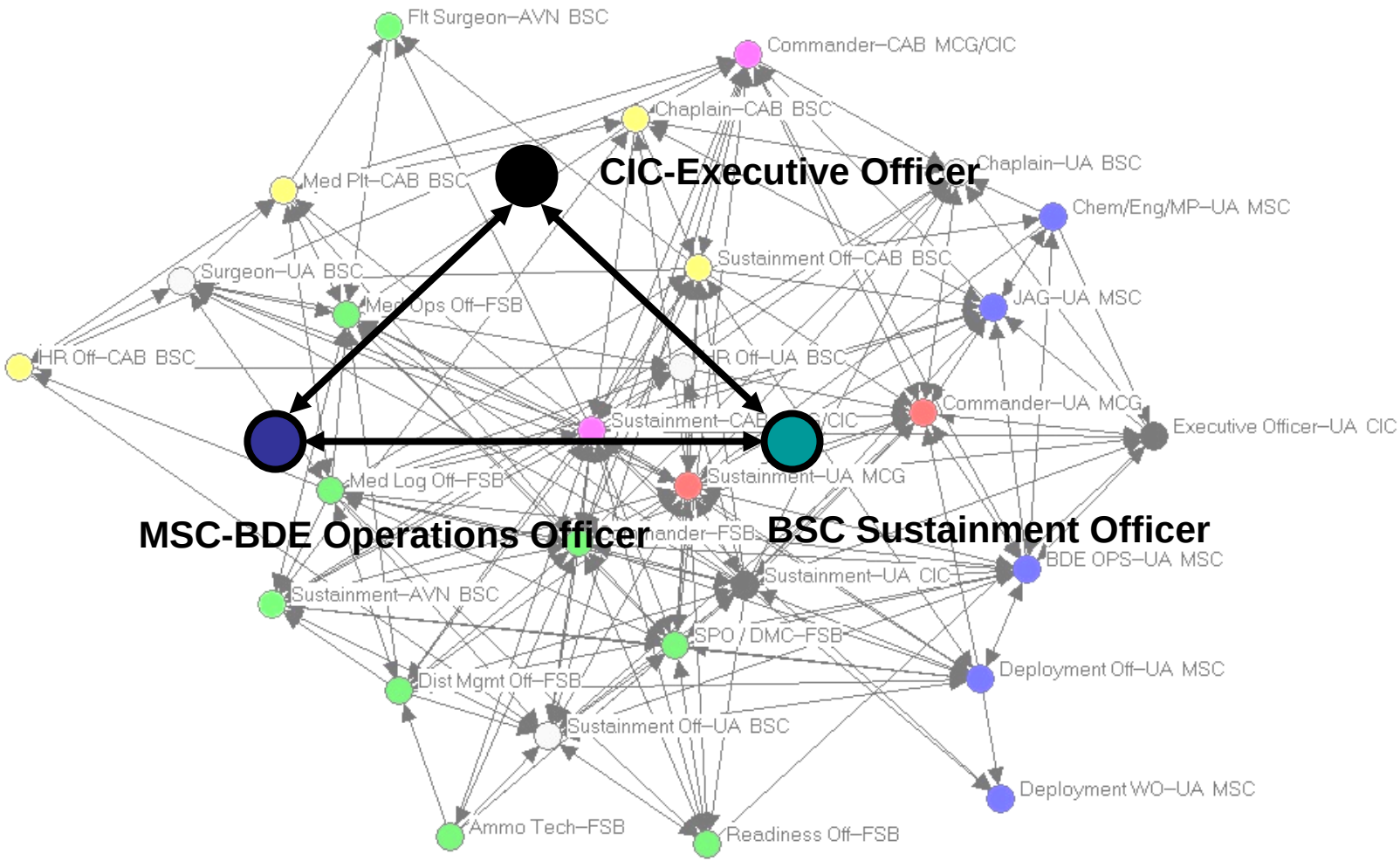
Network
(Betweeness)



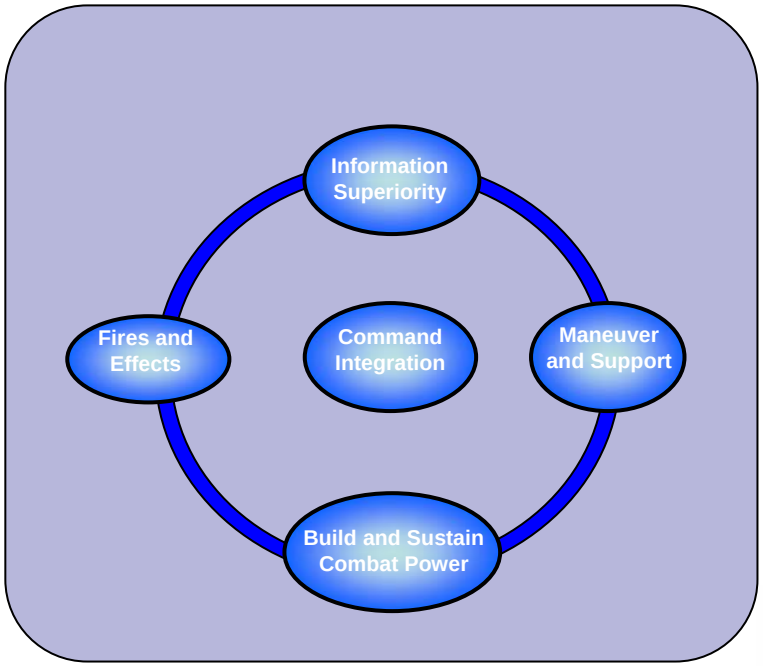
Betweeness Centrality

Position	Betweenness
Sustainment--UA MCG	71.188
Commander--FSB	69.466
Sustainment--CAB MCG/CIC	56.751
Sustainment--UA CIC	41.702
Sustainment--AVN BSC	37.57
Commander--CAB MCG/CIC	34.119
Med Plt--CAB BSC	33.327
Med Ops Off--FSB	31.011
Sustainment Off--UA BSC	27.002
Med Log Off--FSB	25.914
Commander--UA MCG	25.524
BDE OPS--UA MSC	24.921
Sustainment Off--CAB BSC	23.438
SPO / DMC--FSB	23.256
Chaplain--CAB BSC	19.262
Surgeon--UA BSC	16.768
JAG--UA MSC	11.268
Chaplain--UA BSC	7.878
Deployment Off--UA MSC	7.466
HR Off--UA BSC	6.748
Dist Mgmt Off--FSB	6.279
HR Off--CAB BSC	5.453
Executive Officer--UA CIC	3.897
Chem/Eng/MP--UA MSC	3.032
Readiness Off--FSB	1.337
Ammo Tech--FSB	0.258
Flt Surgeon--AVN BSC	0.167
Deployment WO--UA MSC	0

Cliques

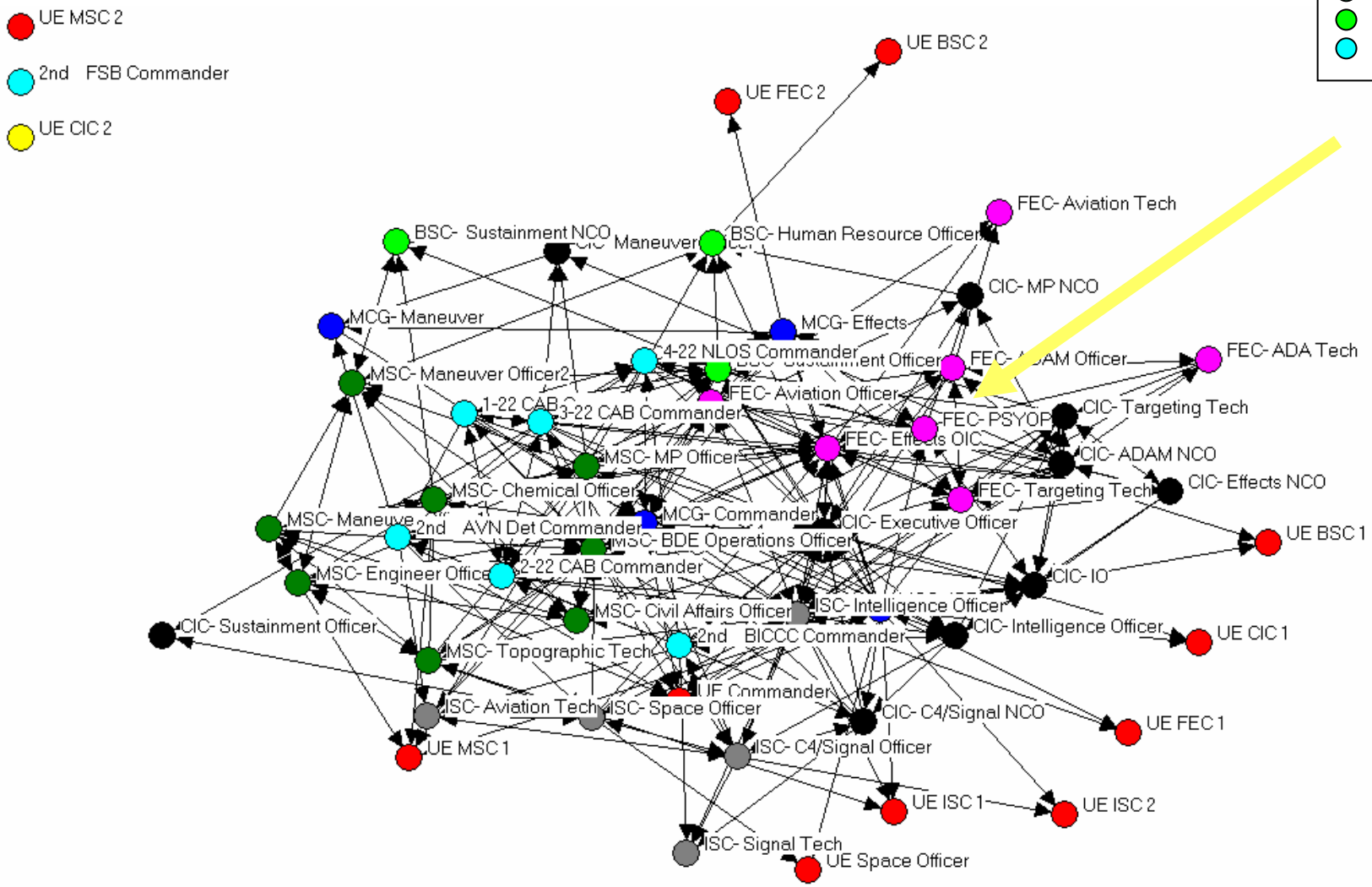

Flt Surgeon–AVN BSC
Commander–CAB MCG/CIC
Chaplain–CAB BSC
CIC-Executive Officer
Chaplain–UA BSC
Med Plt–CAB BSC
Chem/Eng/MP–UA MSC
Sustainment Off–CAB BSC
Surgeon–UA BSC
Med Ops Off–FSB
JAG–UA MSC
HR Off–CAB BSC
HR Off–UA BSC
Commander–UA MCG
Executive Officer–UA CIC
Sustainment–CAB
Sustainment–UA MCG
Med Log Off–FSB
MSC-BDE Operations Officer
BSC Sustainment Officer
BDE OPS–UA MSC
Sustainment–UA CIC
Sustainment–AVN BSC
SPO / DMC–FSB
Deployment Off–UA MSC
Dist Mgmt Off–FSB
Sustainment Off–UA BSC
Deployment WO–UA MSC
Ammo Tech–FSB
Readiness Off–FSB

UA Collection Plan



Session	Date	Activities	Remarks
1	27 September	Planning	Discarded (collection software crash)
2	27 September	Planning	
3	27 September	Planning	
4	27 September	Planning	
5	27 September	Planning	
6	29 September	Execution	
7	29 September	Execution	
8	30 September	Planning	
9	30 September	Planning	UE participant briefing conducted after session 9
10	30 September	Planning	
11	30 September	Planning	Discarded (40% of participants missing)
12	1 October	Execution	
13	1 October	Execution	Discarded (Simulation crash)
14	1 October	Execution	
15	1 October	Execution	
16	1 October	Execution	

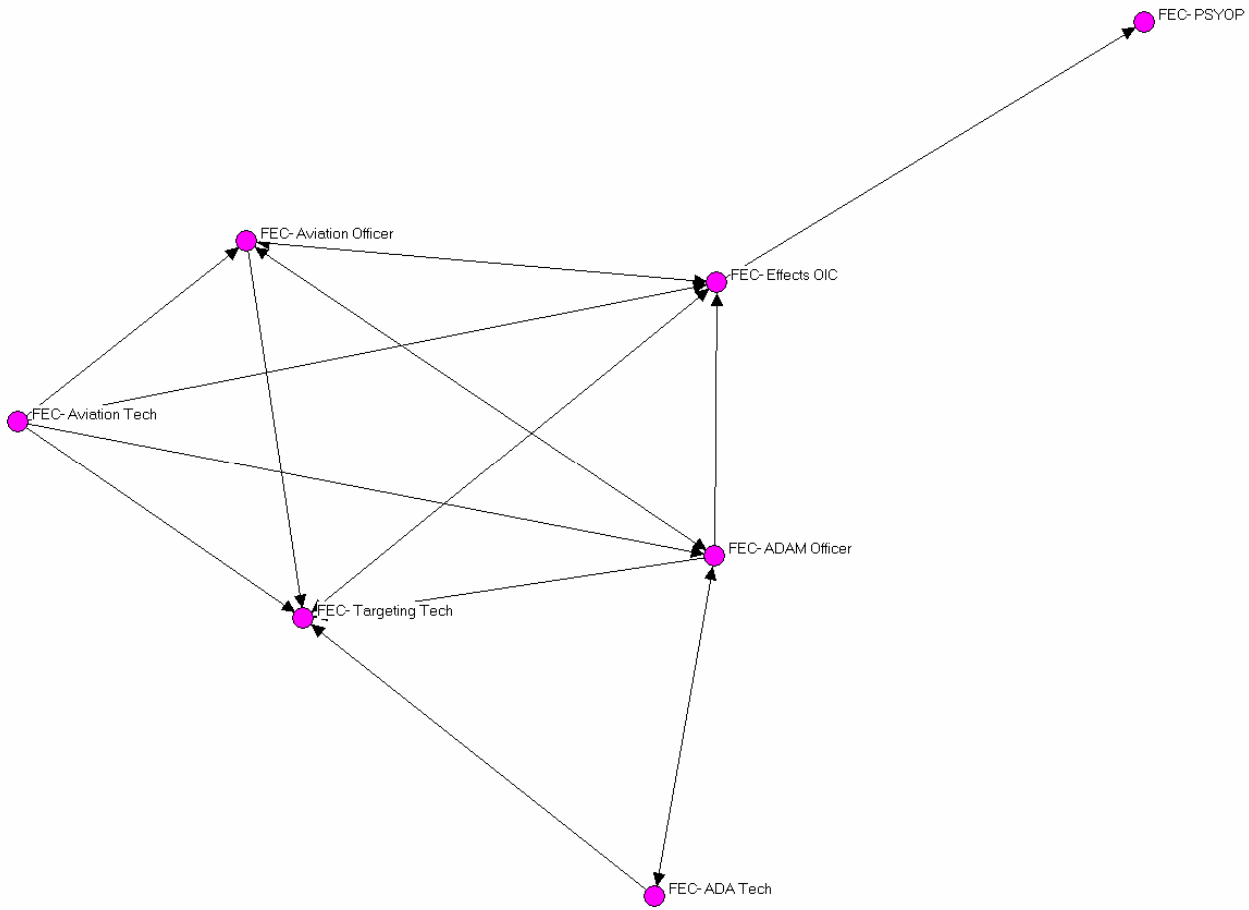
Planning 1-4 Total



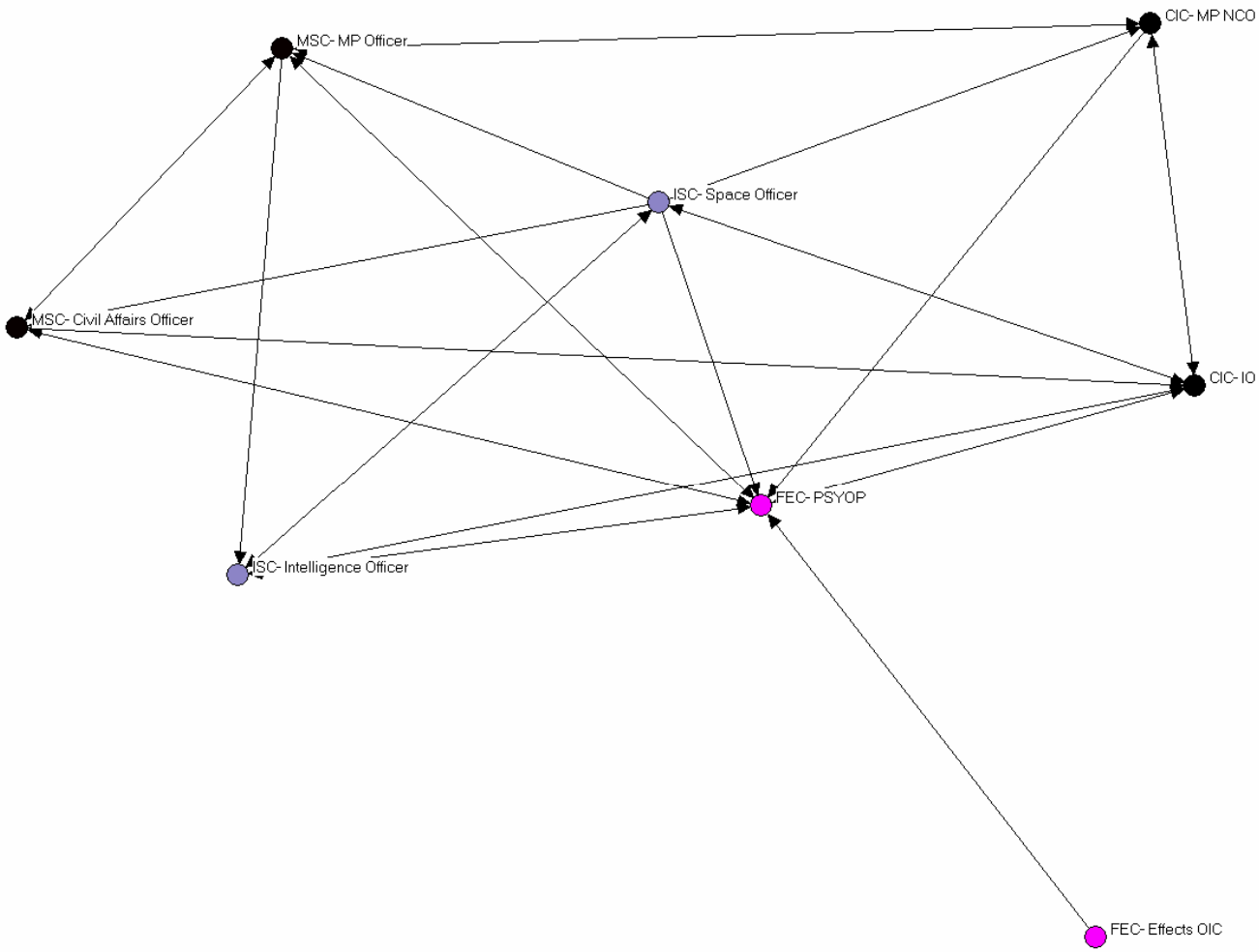
LEGEND

- UE
- MCG
- CIC
- ISC
- FEC
- MSC
- BSC
- BATTALION

FEC ID
Execution Day 4

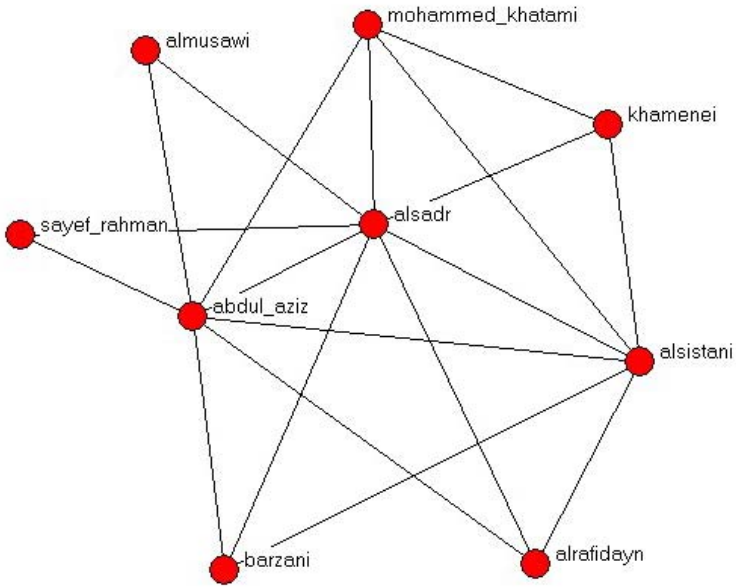


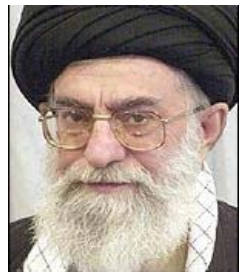
PSYOP EGO
Execution Day4 12-16



Social Network Analysis
Iraq Key Players (4 December)

Barzani





Khamenei

Social Network Analysis Limitations

Overly Macro?

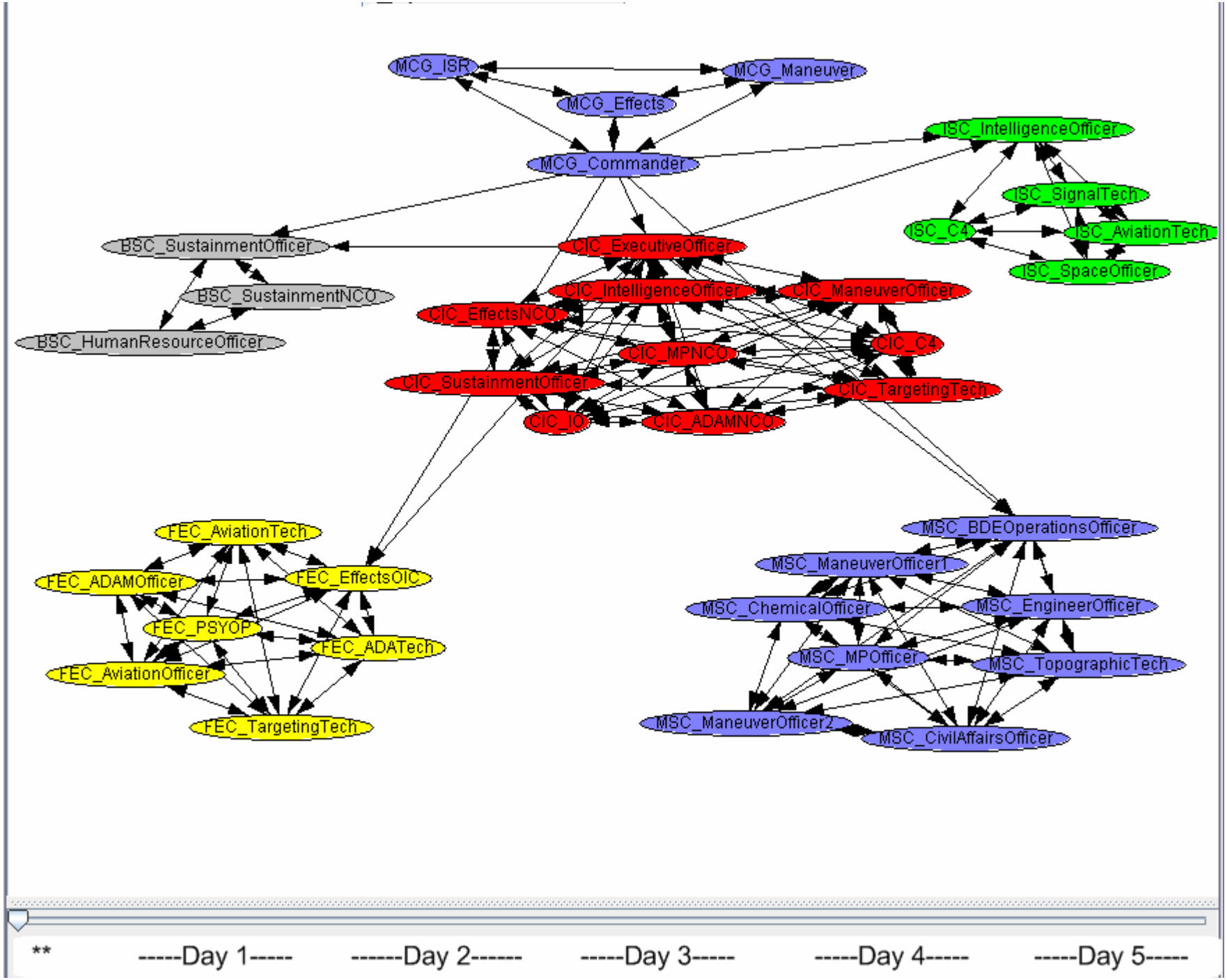
- ❑Doesn’t account for the what of relationships
- ❑Typically, cannot zoom in to a individual

❑People-People relationships are not enough

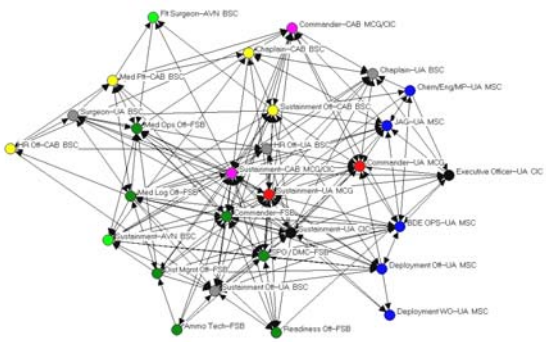
- ❑What resources do they have access to?
- ❑What organizations do they belong to?
- ❑What knowledge/training do they have

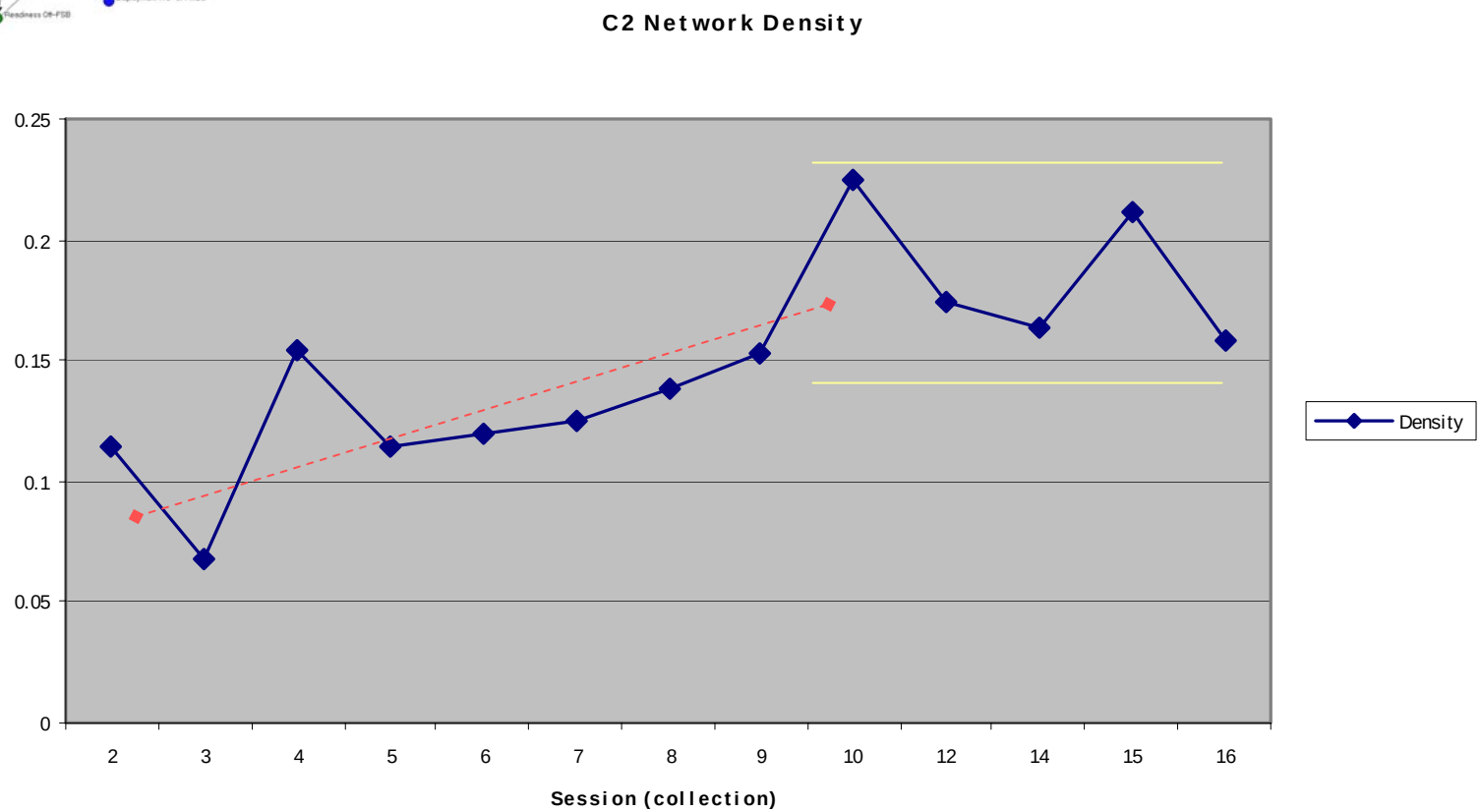
❑NOT Dynamic

Dynamic Network Analysis


MCG_ISR
MCG_Maneuver
MCG_Effects
MCG_Commander
ISC_IntelligenceOfficer
ISC_SignalTech
ISC_C4
ISC_AviationTech
ISC_SpaceOfficer
BSC_SustainmentOfficer
BSC_SustainmentNCO
BSC_HumanResourceOfficer
CIC_ExecutiveOfficer
CIC_IntelligenceOfficer
CIC_ManeuverOfficer
CIC_EffectsNCO
CIC_C4
CIC_MPNCO
CIC_SustainmentOfficer
CIC_TargetingTech
CIC_IO
CIC_ADAMNCO
FEC_AviationTech
FEC_ADAMOfficer
FEC_EffectsOIC
FEC_PSYOP
FEC_ADATech
FEC_AviationOfficer
FEC_TargetingTech
MSC_BDEOperationsOfficer
MSC_ManeuverOfficer1
MSC_ChemicalOfficer
MSC_EngineerOfficer
MSC_MPOfficer
MSC_TopographicTech
MSC_ManeuverOfficer2
MSC_CivilAffairsOfficer
**
-----Day 1-----
------Day 2------
-----Day 3-----
-----Day 4-----
-----Day 5-----

Dynamic Network Analysis- Trends & Behavior





Dynamic Network Analysis

	People / Agents	Knowledge / Resources	Tasks / Events	Group/ Organizations
People / Agents	Social Network	Knowledge Network	Assignment Network	Membership Network
Knowledge / Resources		Information Network / Substitutes	Needs Network	Core Capabilities
Tasks / Events			Precedence Ordering	Institutional Relation
Group/ Organizations				Inter-organizational Network

Problem

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- Approach: Develop a methodology that integrates Dynamic Network Analysis toolset (www.casos.cs.cmu.edu)

OSINT Collection Process (abstracted)

Example .txt

Excerpt from interview with Iraqi Foreign Minister Hoshyar Zebari by Jihan al-Husayni in Cairo; date not given; published by London-based newspaper Al-Sharq al-Awsat on 18 January; subheadings inserted editorially

Iraqi Foreign Minister Hoshyar Zebari has stressed that the Iraqi elections constitute a decisive turning point in the country's history. He said the Sunnis are opposed to the principle of elections as they seek to take a leading, commanding and unique role in **Iraq**. He added that they should accept partnership through Iraqi unity and accord because the age of Saddam is over and with it the notion of one group's hegemony and the marginalization of other groups. He pointed out that the disagreements between Iraqi President Ghazi al-Yawar and Prime Minister Iyad Allawi have not reached the level of a split and noted that their cause was the distribution of powers.

He went on to say in an interview with Al-Sharq al-Awsat that reports of Iranian ambitions and schemes to establish a Shi'i crescent that extends from Tehran to Beirut through Baghdad and Damascus are exaggerated and misplaced fears. He added: "We have not heard of such a policy or of the existence of a plan to unite the Shi'is" in these countries.

Election turnout

Al-Husayni Do you not think that the failure to have everyone participate in the elections will cast doubts on their legitimacy and credibility?

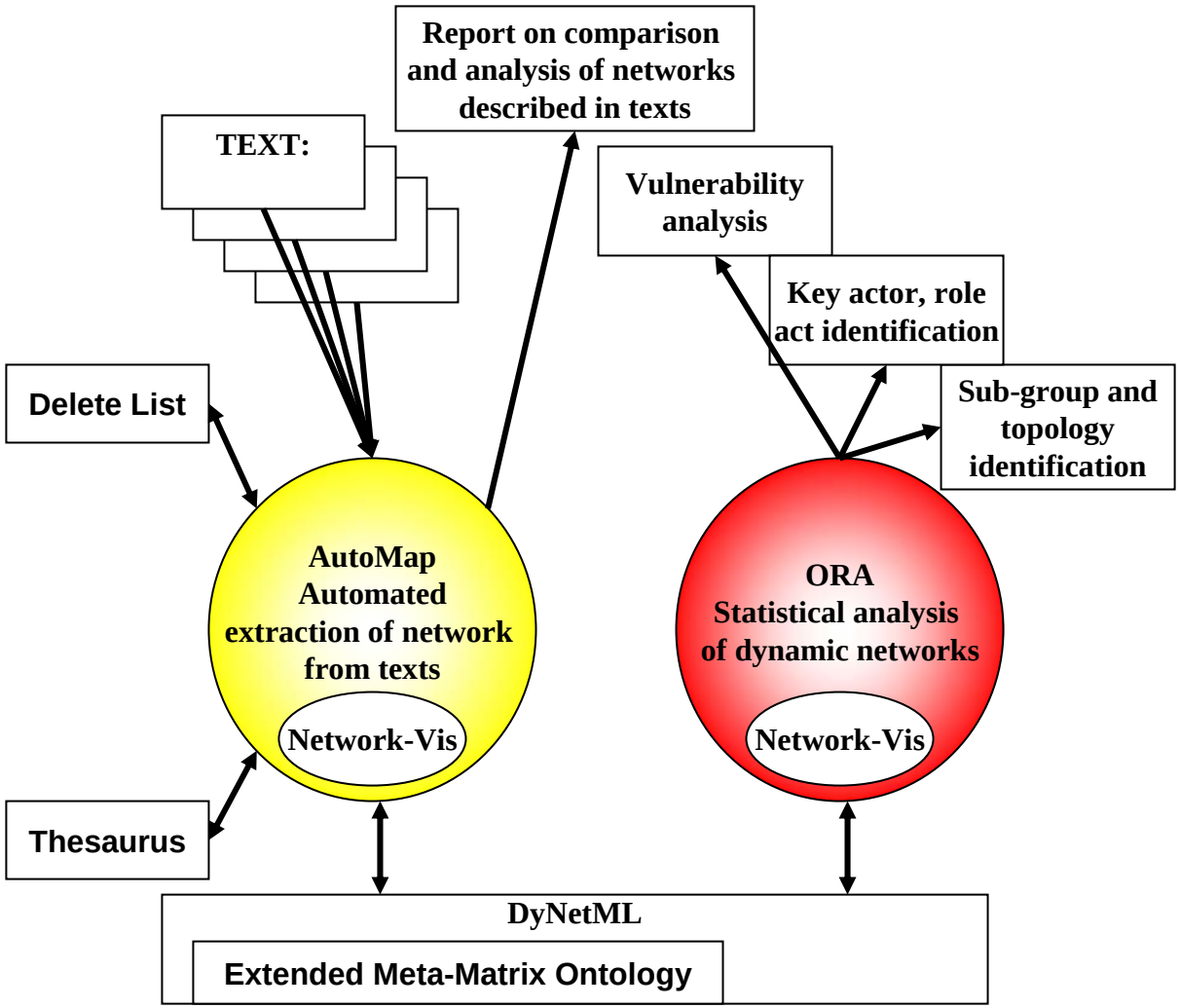
Zebari The elections should be comprehensive so that they are held in all of **Iraq's** 18 governorates. I believe that there will be a good participation by the people and that the participation must exceed 50 per cent. I am expecting the turnout of Iraqi voters to be between 70 and 80 per cent. We all saw the Palestinian elections. The turnout was 44 per cent and yet they were called transparent and legitimate.

Sunni position

Al-Husayni But the Sunnis are going to boycott the elections?

Zebari This is an inaccurate suggestion. It is my belief that the Sunnis are hostages in the hand of the armed groups and are being threatened and blackmailed. Still, the Sunnis will participate. They will be the losers if they

Dynamic Network Analysis-Software



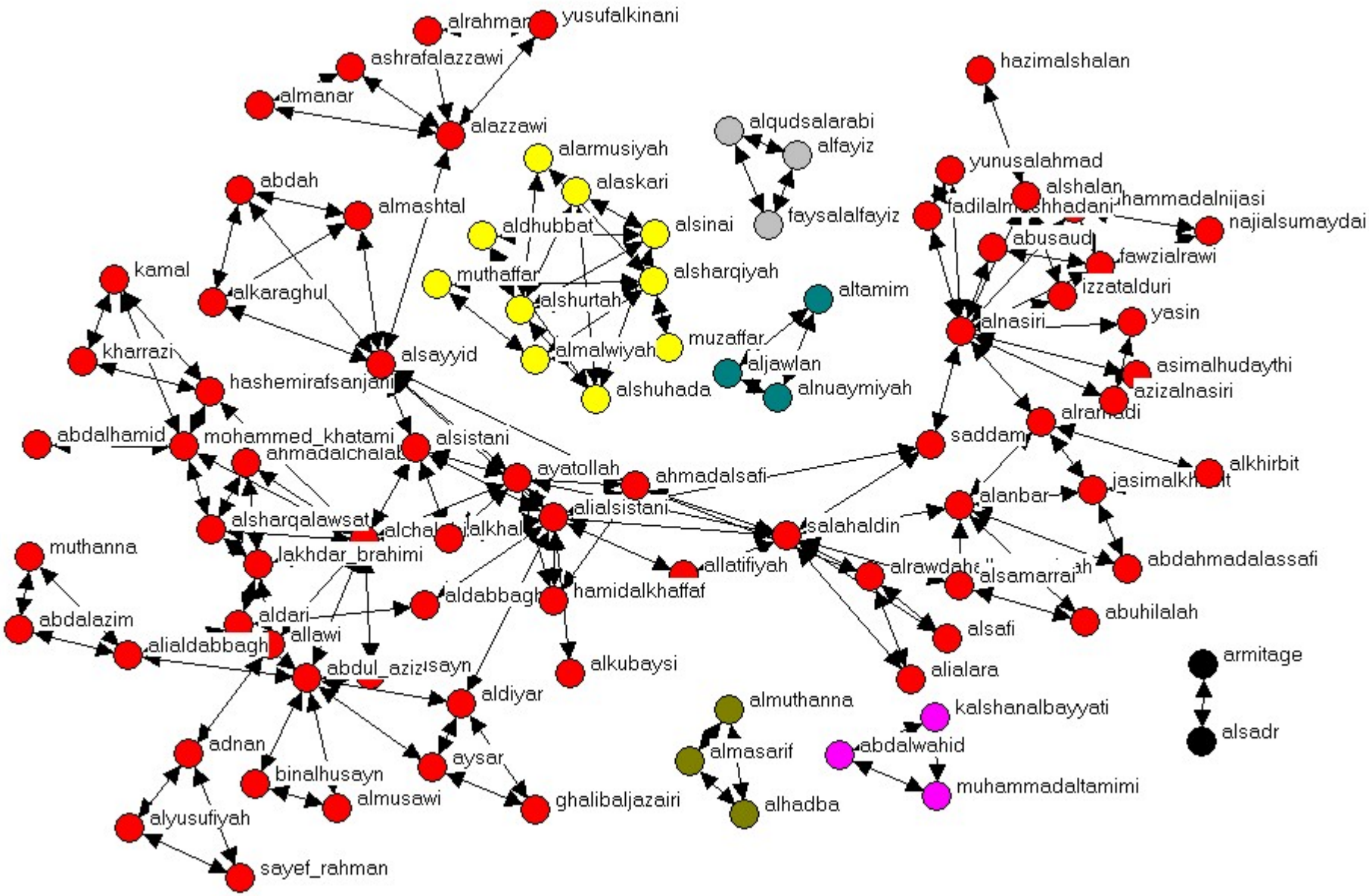
Initial Dataset

- OSINT collected 19-25 Nov 2004 in Baghdad.
- 386k file, 152 pages of text, 1664 paragraphs, 48308 wordcount
- 6min computer processing time, 40 min human analysis.

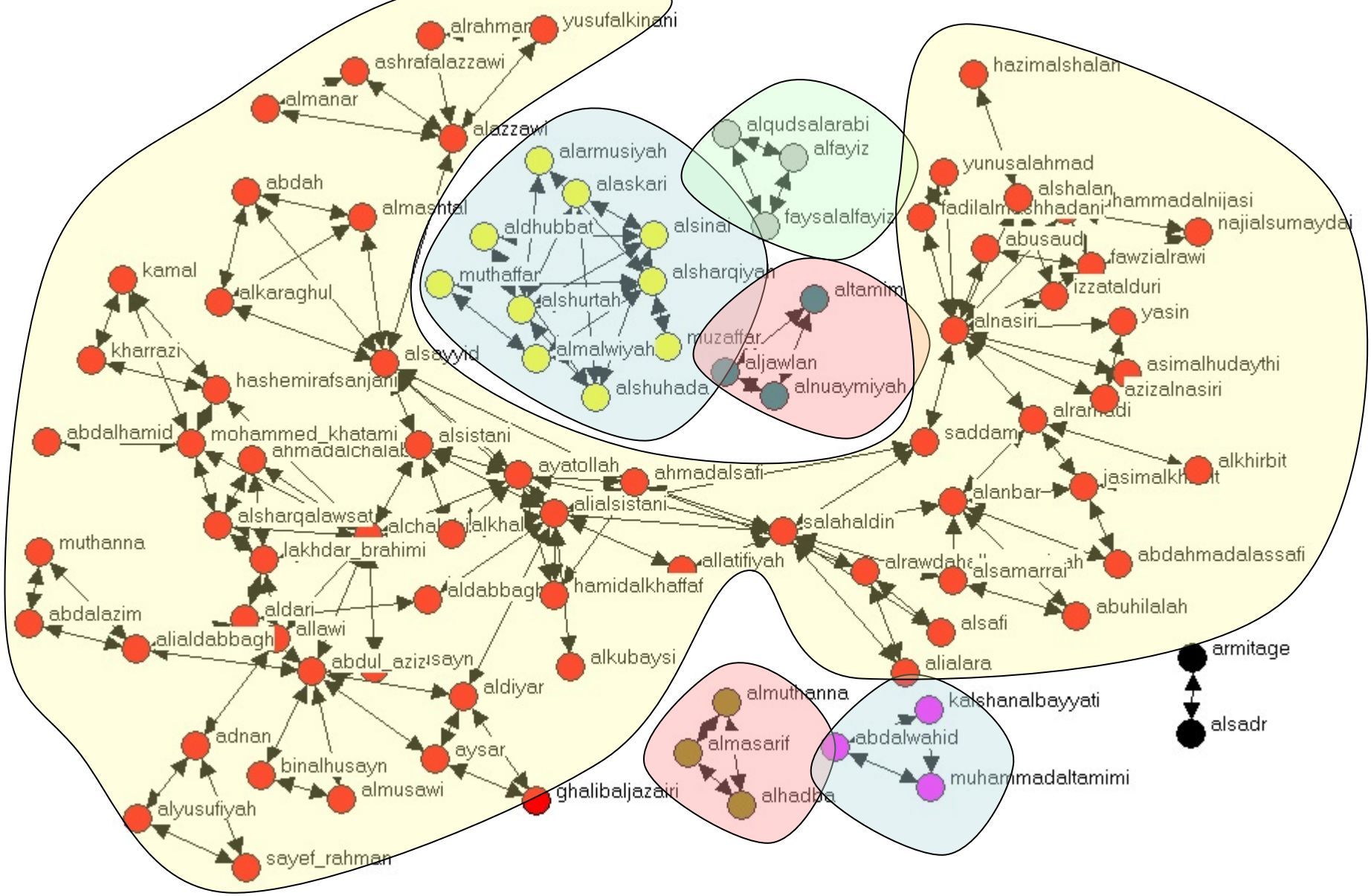
DNA-Implemented Meta-Matrix

Person	**Location**	**Organizations**	**Actions**
alialsistani	*Karbala, Baghdad, Al Najaf*	*governorate, Shiite, Iraq*	*against, bitter, asserted, boycott*
alialara	*Karbala, Iraq*		
bremer	*kurdistan, Kirkuk*	*administration*	*arabized*
altahrir	*baqubah, Iraq*	*Iraq*	
alhakim	*Iraq*	*Sunni, Iraq*	*added, assassinated*
abdalrahmanaluh	*amman, jordan*	*Jordan, commission*	
alchalabi	*iraq*	*i_n_s, assembly, Iraq, Iran*	*appointed, attacked, authorized*
khan_ansari	*jawawla, iran*	*Iran, British*	
abdul_aziz	*karbala, jordan*	*consulate, commission*	*buried, agree, asserted, came*

Dynamic Network (Agent Entities)
Extracted From: 19-25 NOV 2004 OSINT



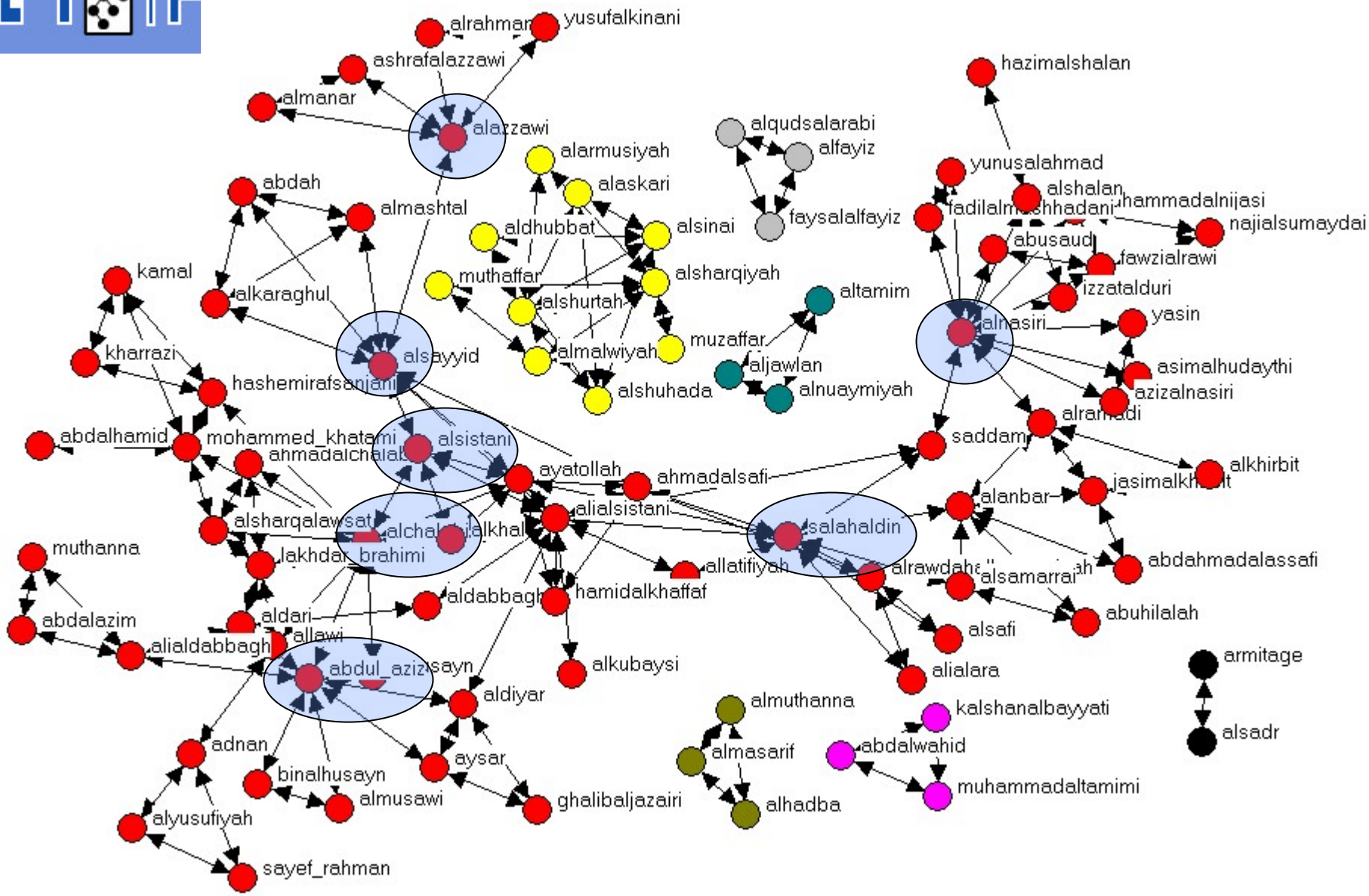
Groupings
Extracted From: 19-25 Nov 2004 OSINT



Key Individuals

Centrality-Betweenness	Centrality-Eigenvector	Centrality-Total Degree	Clique Count	Cognitive Demand	Exclusivity-Knowledge
alialsistani	aldustur	alialsistani	alialsistani	abuhilalah	alfayiz
alchalabi	alialsistani	salahaldin	salahaldin	alialsistani	alshuhada
alnasiri	alkinani	alnasiri	alchalabi	alazzawi	alsharqiyah
salahaldin	alialara	alchalabi	alnasiri		muwaffak
					alrubayii

High Payoff Linking Agents
Extracted From: 8-10 Jan 2005 OSINT

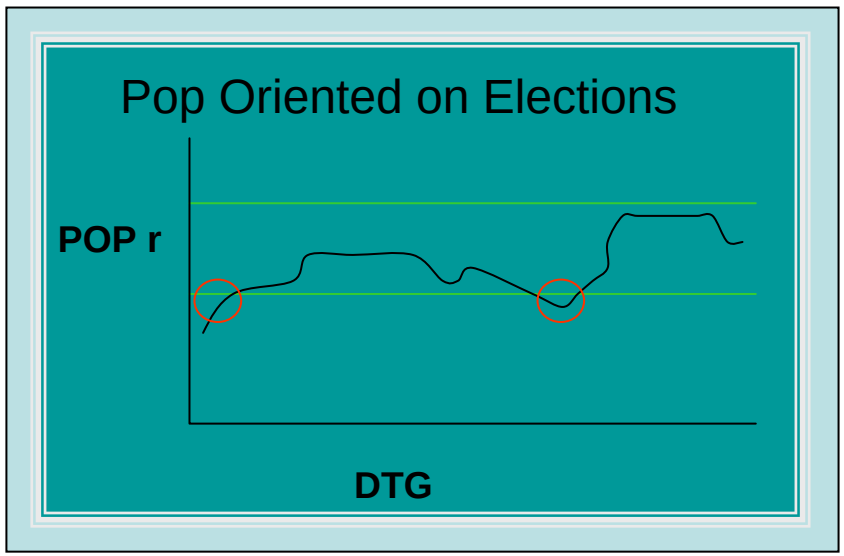


Key Organizations in the News 19-25 Nov 2004 (OSINT)

	KEY ORGANIZATIONS
1	government
2	governorate
3	army
4	jemaah_islamiyah
5	u_n

DNA-Trends

- No trends with a single data set.
- However, by comparing data week after week, we can develop key leader, organization, network density, etc trends.

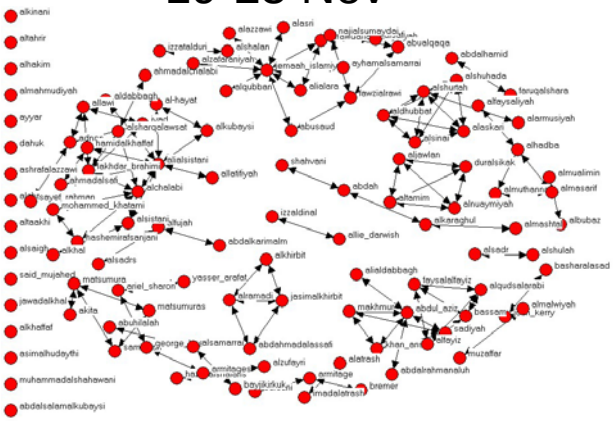


DNA-Extended Collection

Time Period	Inclusive Dates
1	19-25 Nov
2	25-30 Nov
3	3-10 Dec
4	10-17 Dec
5	17-24 Dec

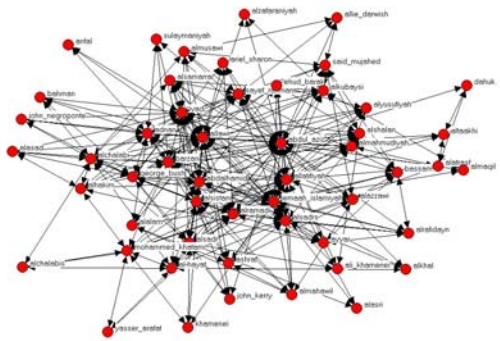
Agents In the Iraqi Media

19-25 Nov



149 agents
.0455

25-30 Nov

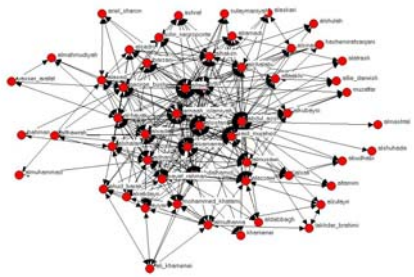


53 agents
.2126

3-10 Dec

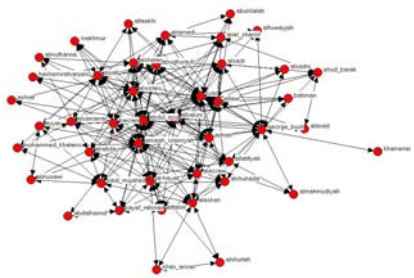
43 agents
.227

10-17 Dec



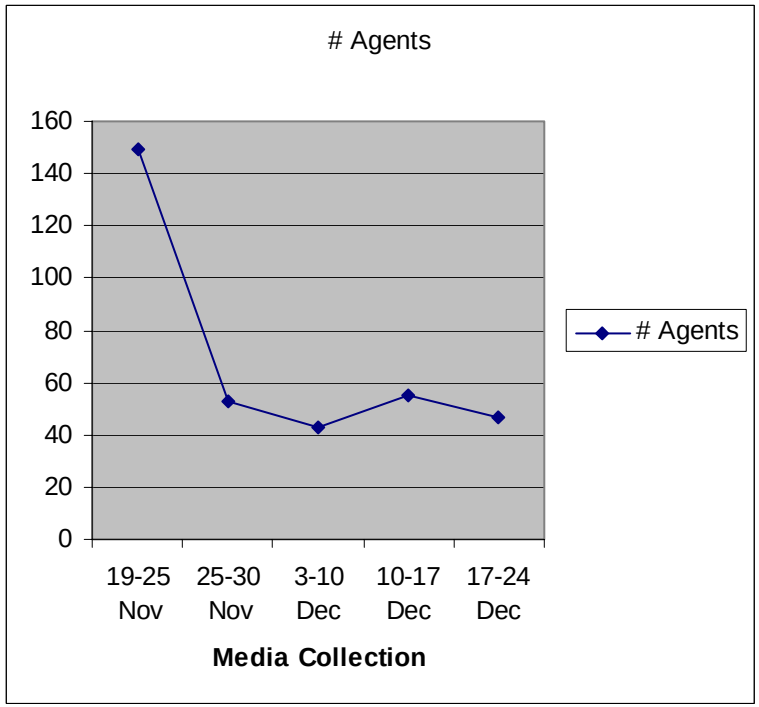
55 agents
.2101

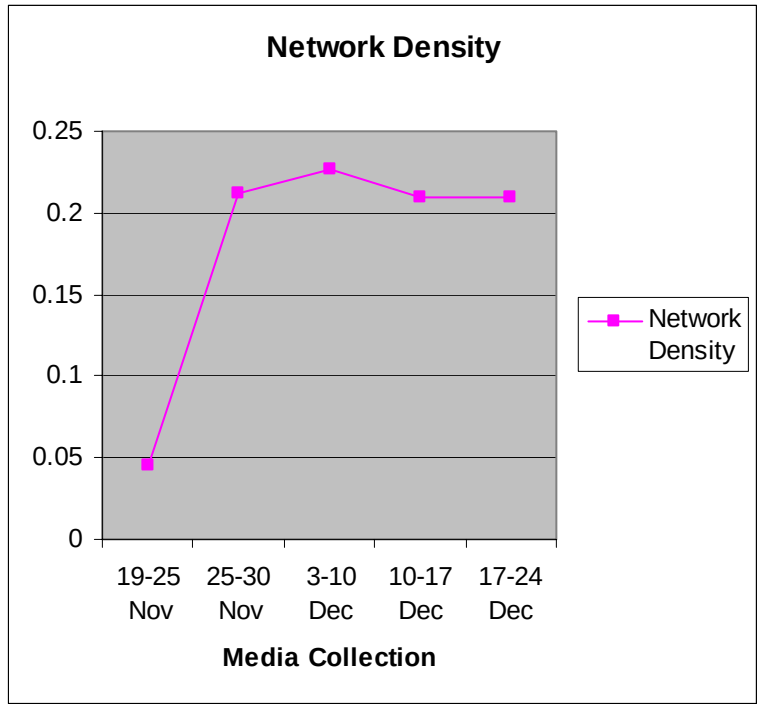
17-24 Dec



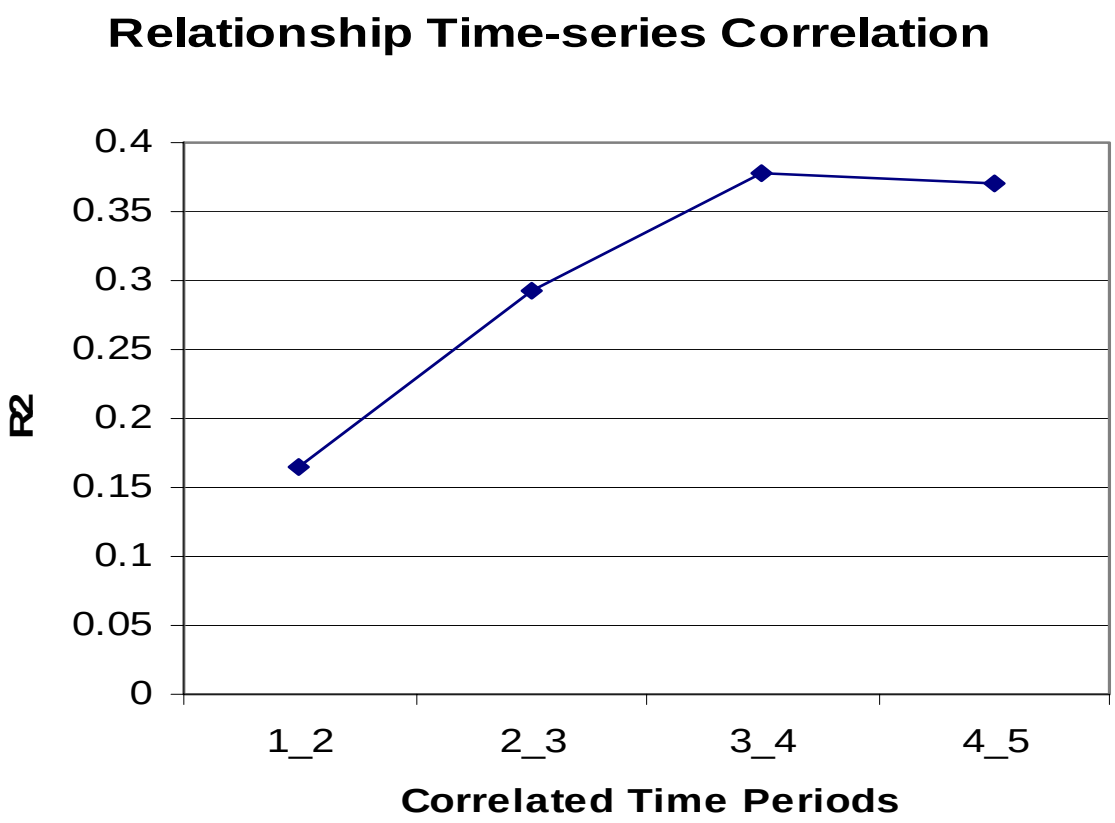
47 agents
.21

DNA-
Time-based Analysis



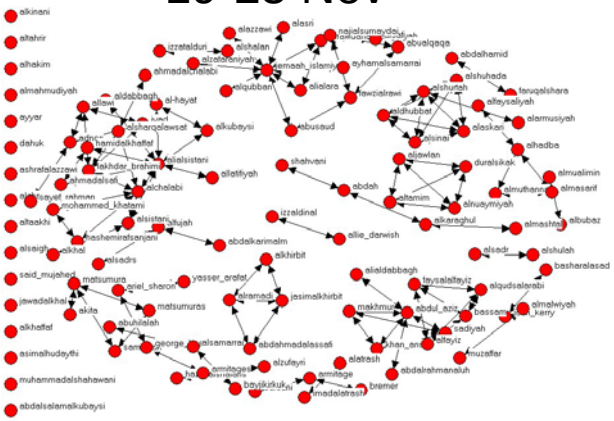


DNA-Organizational Stabilization



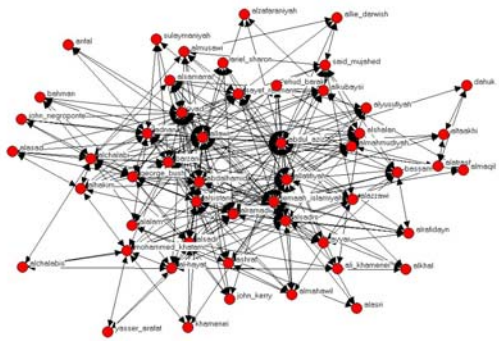
Agents In the Iraqi Media

19-25 Nov



149 agents
.0455

25-30 Nov



53 agents
.2126

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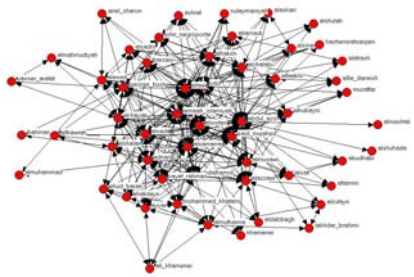
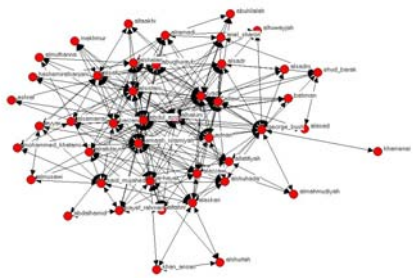
43 agents
.227

10-17 Dec



55 agents
.2101

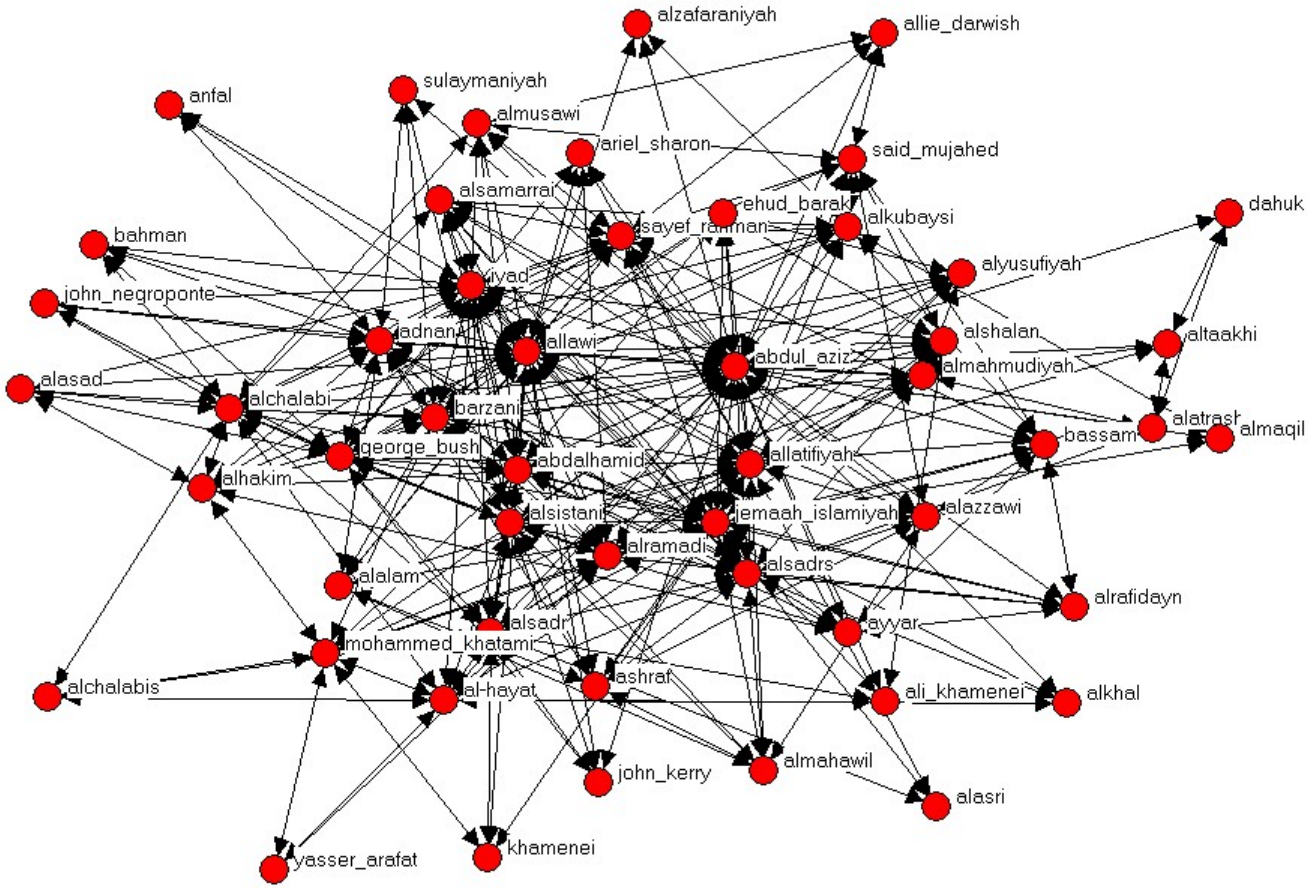
17-24 Dec



47 agents
.21

25-30 Nov

53 agents
.2126

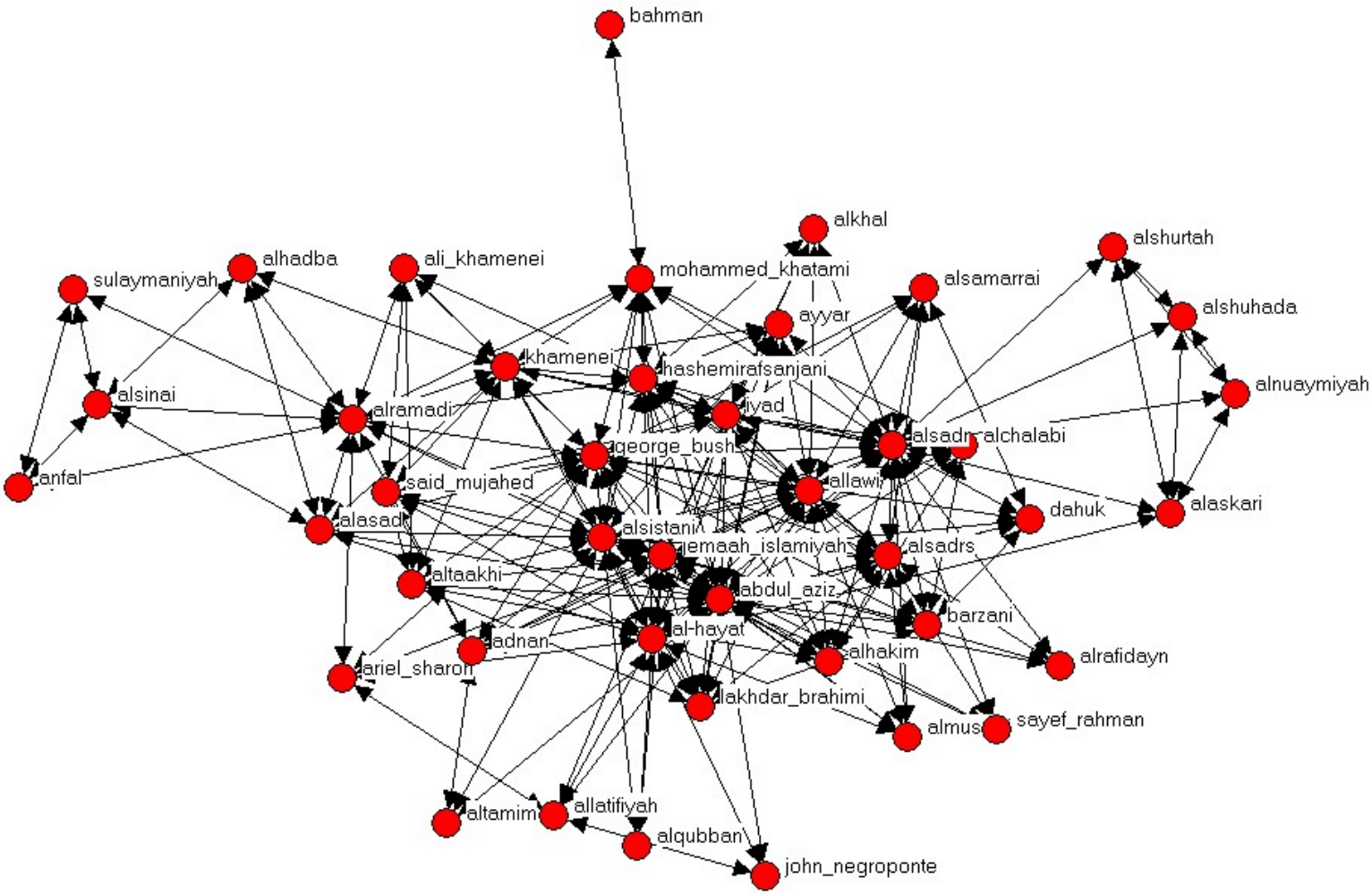


Key Actors

	Centrality-Betweenness	Centrality-Eigenvector	Centrality-Total Degree	Clique Count	Cognitive Demand
1	abdul_aziz	abdul_aziz	abdul_aziz	abdul_aziz	abdul_aziz
2	jemaah_islamiyah	allawi	allawi	allawi	allawi
3	allawi	barzani	jemaah_islamiyah	jemaah_islamiyah	jemaah_islamiyah
4	allatifiyah	jemaah_islamiyah	iyad	iyad	iyad
5	adnan	iyad	barzani	allatifiyah	barzani

43 agents
.227

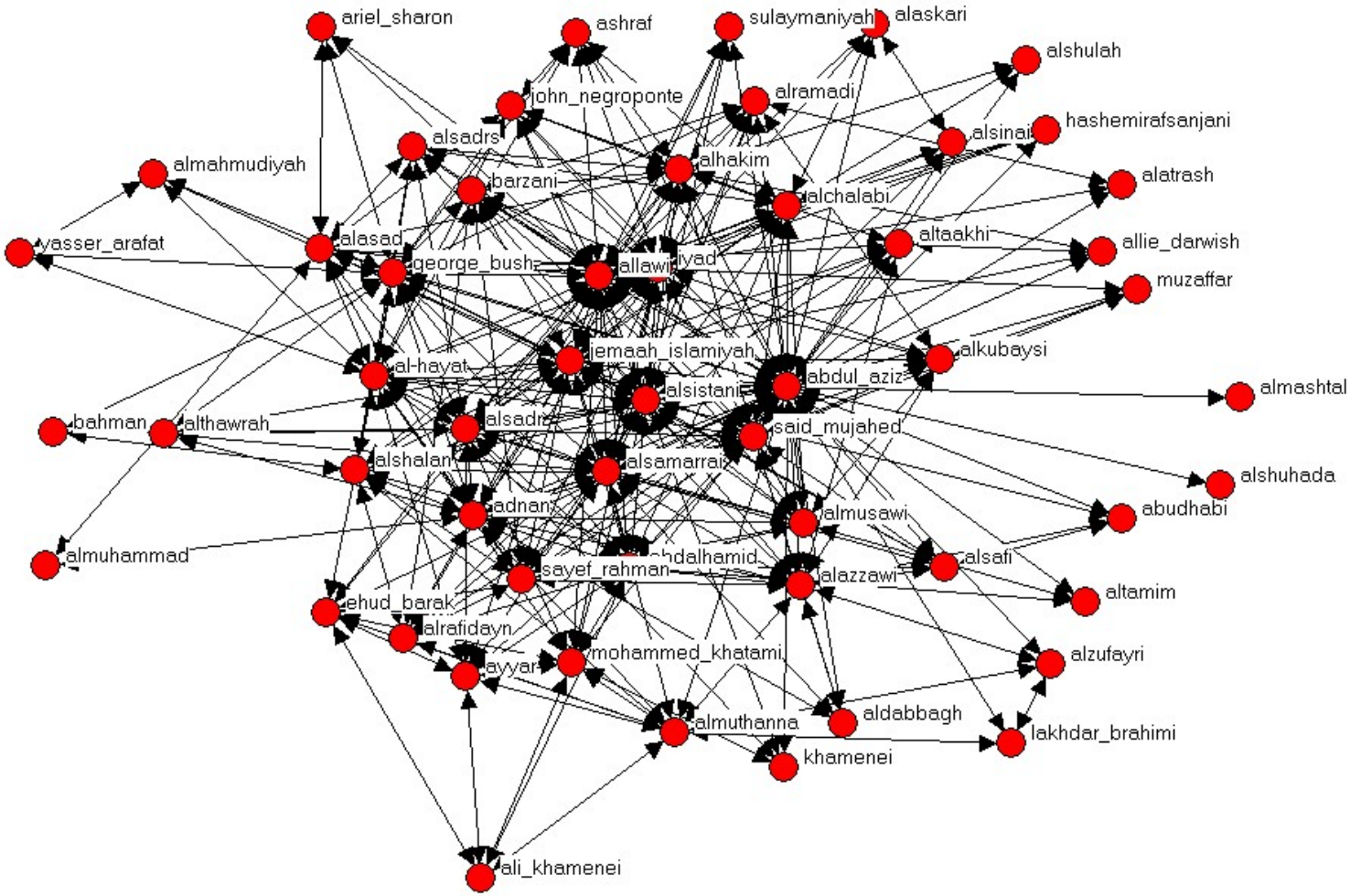
3-10 Dec



Key Actors

	Centrality-Betweenness	Centrality-Eigenvector	Centrality-Total Degree	Clique Count
1	alsadr	alsadr	abdul_aziz	abdul_aziz
2	alramadi	alsistani	alsadr	alsistani
3	abdul_aziz	al-hayat	alsistani	alsadr
4	jemaah_islamiyah	abdul_aziz	al-hayat	jemaah_islamiyah
5	alsistani	mohammed_khatami	jemaah_islamiyah	george_bush

10-17 Dec

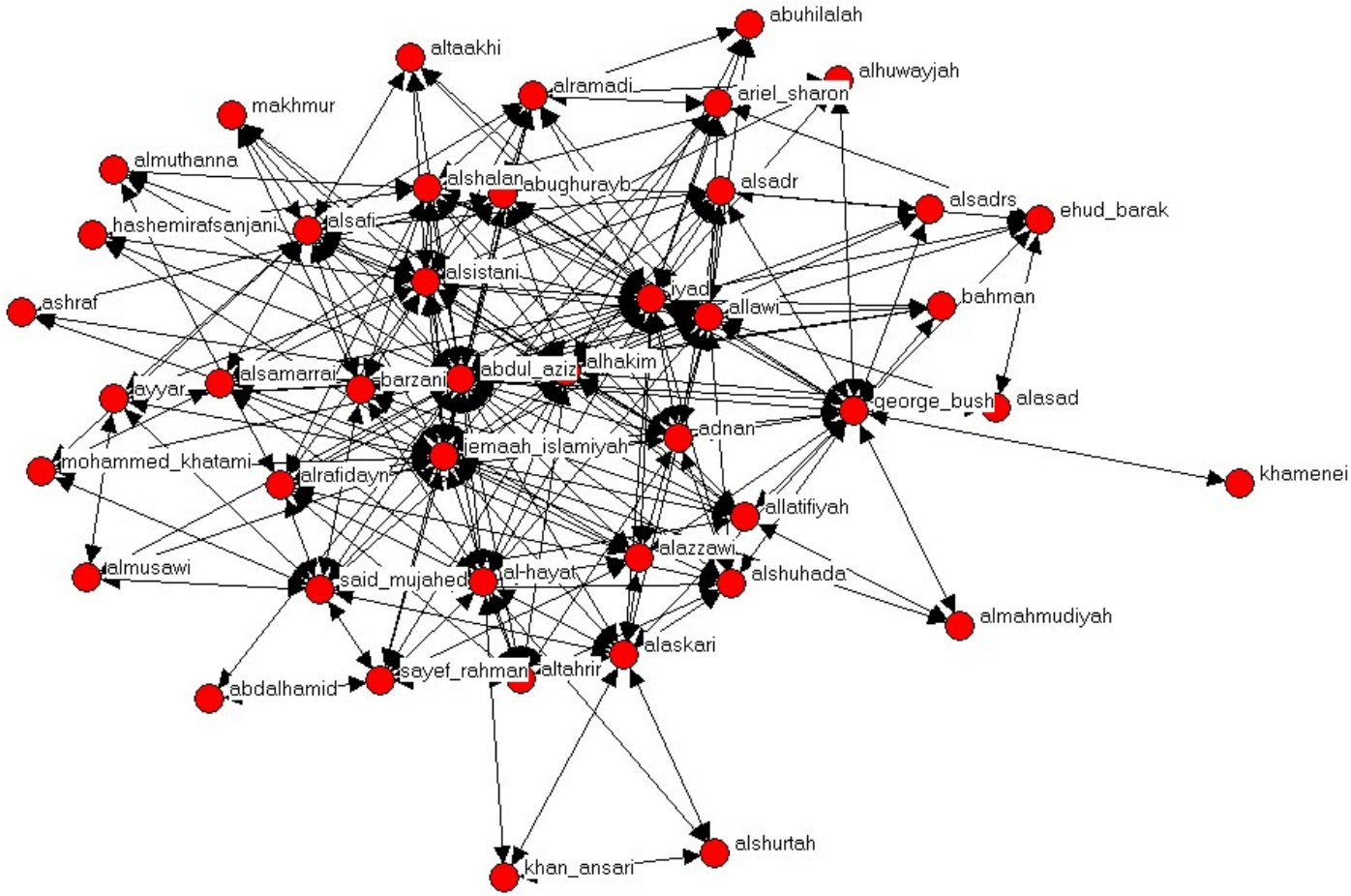

ariel_sharon
ashraf
sulaymaniyah
alaskari
alshulah
alramadi
john_negroponte
hashemirafsanjani
alsadrs
alsinai
almahmudiyah
alhakim
alatrash
barzani
alchalabi
yasser_arafat
alasad
altaakhi
allie_darwish
george_bush
allawi
iyad
muzaffar
alkubaysi
al-hayat
jemaah_islamiyah
abdul_aziz
alsistani
almashtal
bahman
althawrah
alsadr
said_mujahed
alshalan
alsamarrai
alshuhada
adnan
almusawi
abudhabi
almuhammad
alsafi
sayef_rahman
alazzawi
ehud_barak
altamim
alrafidayn
mohammed_khatami
alzufayri
ayyar
aldabbagh
almuthanna
lakhdar_brahimi
khamenei
ali_khamenei

Key Actors

	Centrality-Betweenness	Centrality-Eigenvector	Centrality-Total Degree	Clique Count
1	abdul_aziz	abdul_aziz	abdul_aziz	abdul_aziz
2	allawi	allawi	allawi	allawi
3	george_bush	jemaah_islamiyah	jemaah_islamiyah	jemaah_islamiyah
4	iyad	iyad	iyad	alsistani
5	alsistani	alsadr	alsistani	iyad

17-24 Dec

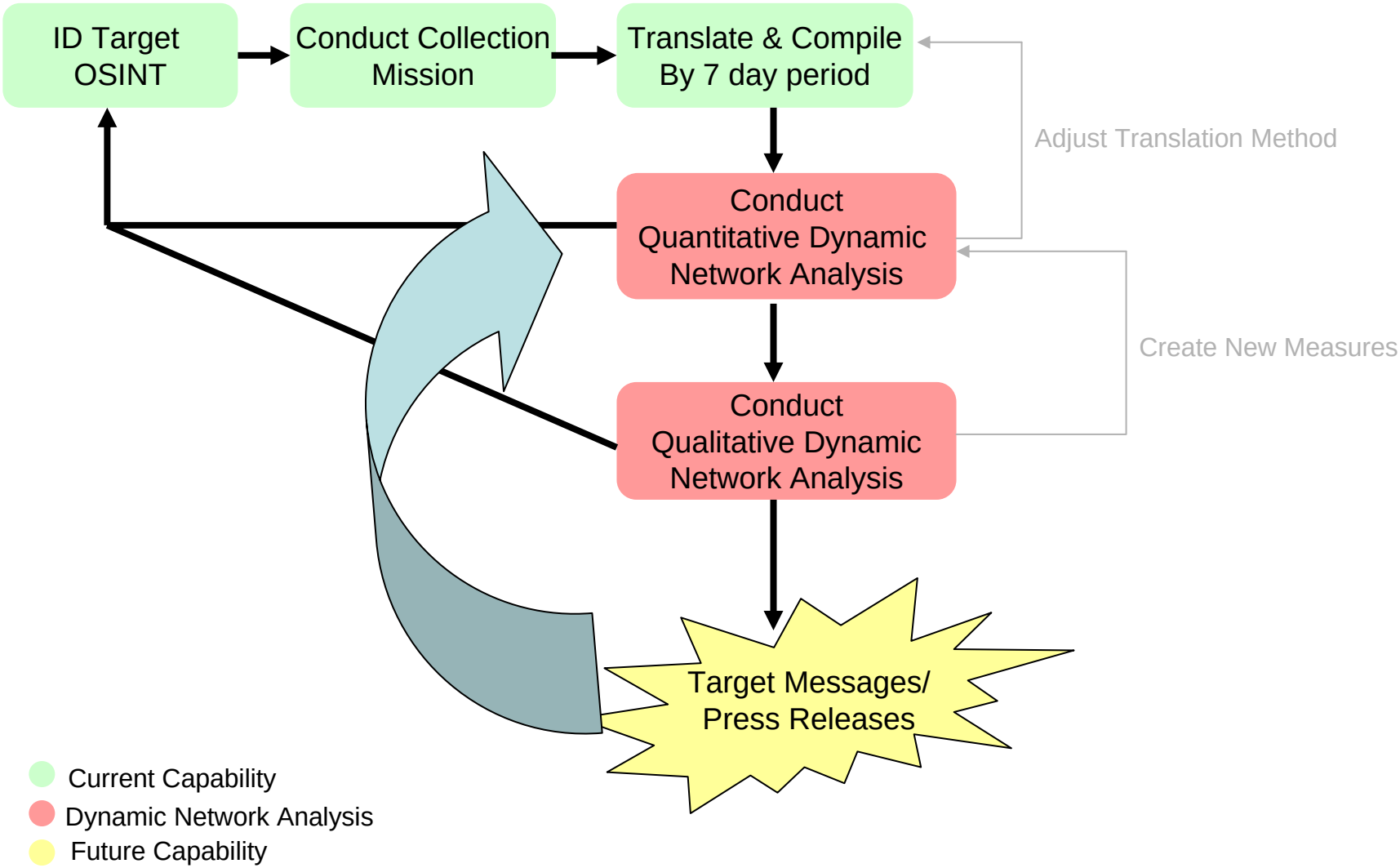
47 agents
.21



Key Actors

	Centrality-Betweenness	Centrality-Eigenvector	Centrality-Total Degree	Clique Count
	AA	AA	AA	AA
1	abdul_aziz	alhakim	abdul_aziz	abdul_aziz
2	jemaah_islamiyah	abdul_aziz	allawi	allawi
3	george_bush	allawi	alhakim	alsistani
4	alaskari	iyad	iyad	jemaah_islamiyah
5	iyad	alshalan	alsistani	iyad

Proposed MNC-1, PAO Implementation Approach



DNA-
Key Points

- Reduce Time from Data to Information
- Required 5-8 Hours Initialization Time
- 20-40min a Day to Maintain
- Prompted ‘Smart’ Questions
- IO needs ability to do own Homework

- ‘Almost’ ready for Prime Time
- Not there- Not happening!
- Arabic-English Translation Time is now the Issue

SYMPOSIUM

Dynamic Network Analysis in Information Operations

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