



C2 for Computer Networked Operations: Using Computational Experimentation

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- Rise of NCW & CNO
- Highly Dynamic Environments
- Asymmetric Threats
- DoD Grappling with C2 and Organization Issues
- Contingency Theory and Computational Modeling
- *Which Organizations Provide the Best CNO Performance within the NWC Environment?*

- Center for Edge POW-ER at NPS
 - Contingency Theory
 - Computational Modeling
- Campaign of Experimentation
 - Buettnner & Nissen 2004
 - Nissen 2005
 - Orr & Nissen 2006
 - Gateau, Looney, Leweling & Nissen 2007

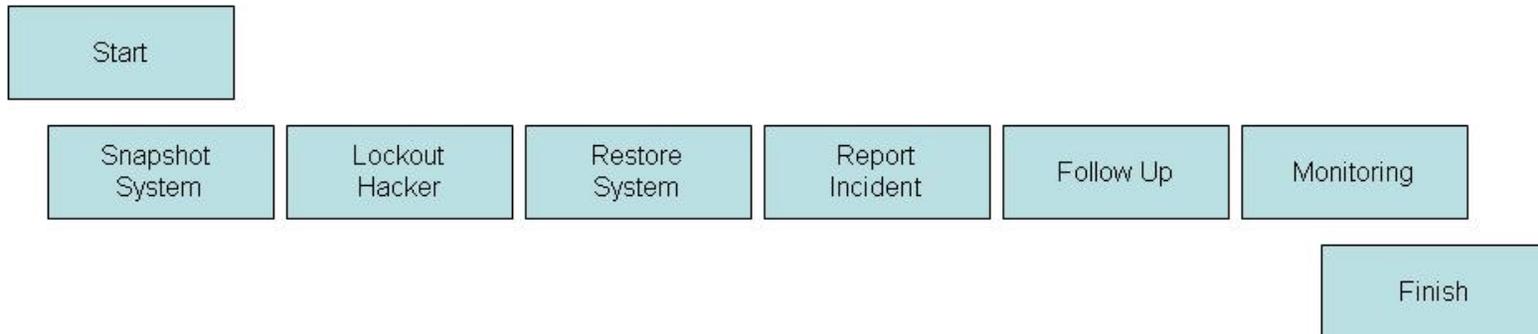
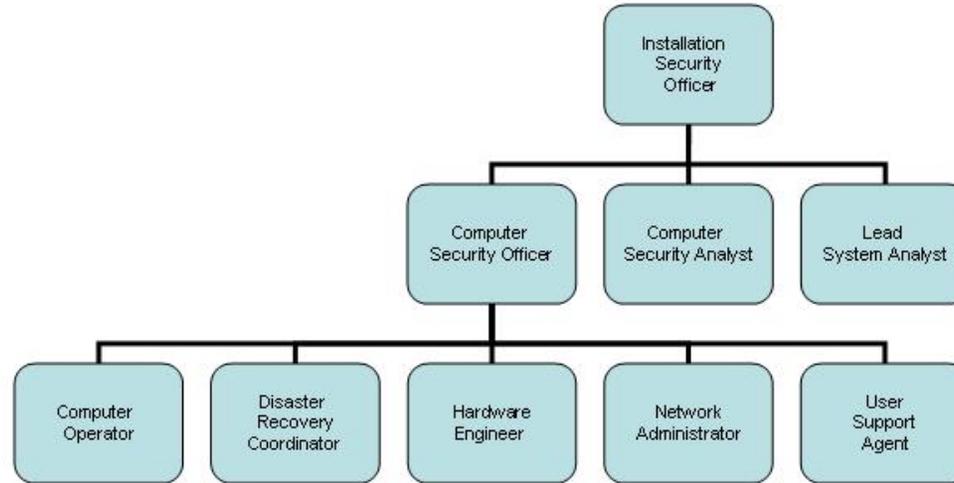


Grounded CNO Model

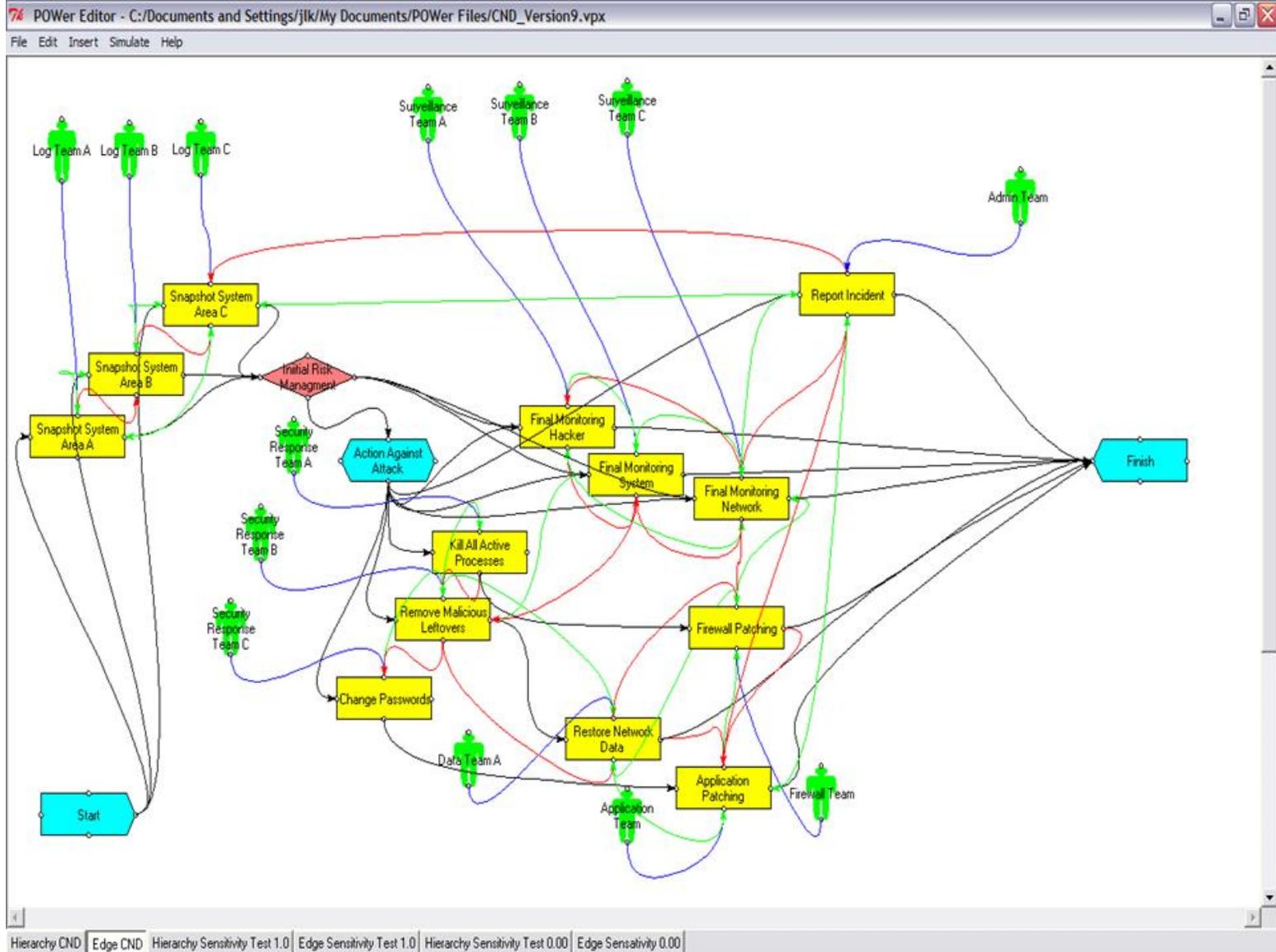
- CNO
 - Attack (CNA)
 - Exploit (CNE)
 - Defend (CND) *This is our focus!*
- Generalized Model
 - Similar Approach by Military and Industry
 - ◇University of California San Francisco Medical Center
 - ◇NPS Information Technology
 - ◇Subject Matter Experts



Grounded CND Organization



Edge POW-ER Model

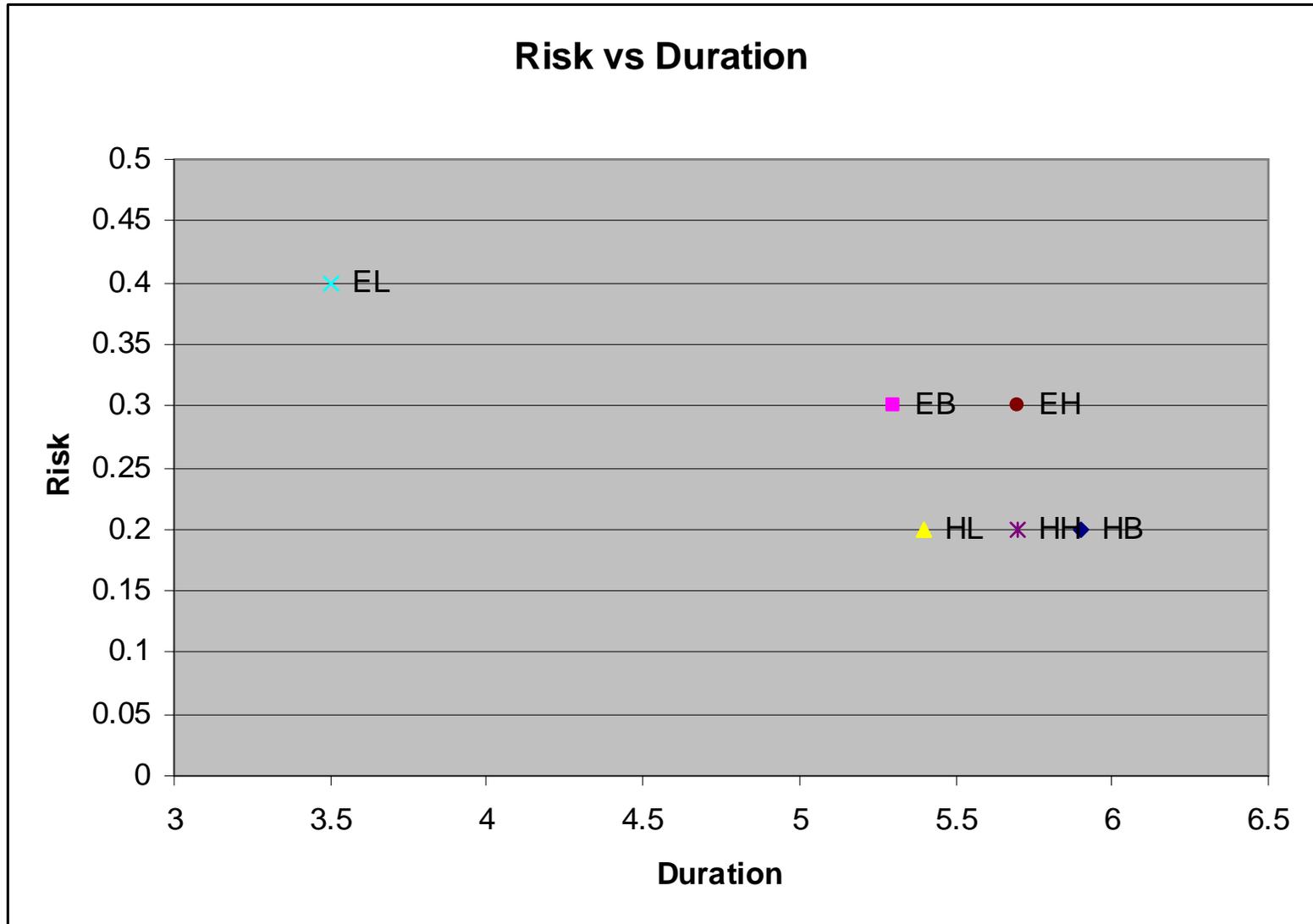




Simulated Performance

Scenario	Duration	Direct Work	Rework	Coordination	Wait Time	Meetings	Project Risk
Hierarchy Baseline	5.9	14.2	1.3	3.3	0.2	12.0	0.2
Edge Baseline	5.3	14.6	1.8	4.7	0	0	0.3
Hierarchy Low Threat	5.1	10.0	0.9	3.1	1.4	12.0	0.2
Edge Low Threat	3.5	9.2	0.8	1.4	0	0	0.4
Hierarchy High Threat	5.7	15.0	1.4	3.4	0.2	12.0	0.2
Edge High Threat	5.7	15.2	2.1	5.1	0	0	0.3

Risk vs. Duration Plot





Organizational Fit Matrix

Focus	\	Context:	Low Threat	High Threat
Speed			Edge	Either form
Risk			Hierarchy	Hierarchy

- Which Organizations Provide the Best CNO Performance within the NWC Environment?
- Predominate Hierarchy vs. Novel Edge CND
- Balance Trade-offs
 - Risk
 - Speed
 - Threat Level Sensitivity



Limitations and Future Research

- Computational Modeling Vice “Real World”
- Validation in “Live” CNO Environment
- Organizational Consultant (OrgCon)
 - Fit and Misfit
 - Operational Environment

Questions and Comments

