Information Alignment and Visualization for Cyber-Physical Network Operations Center Teams

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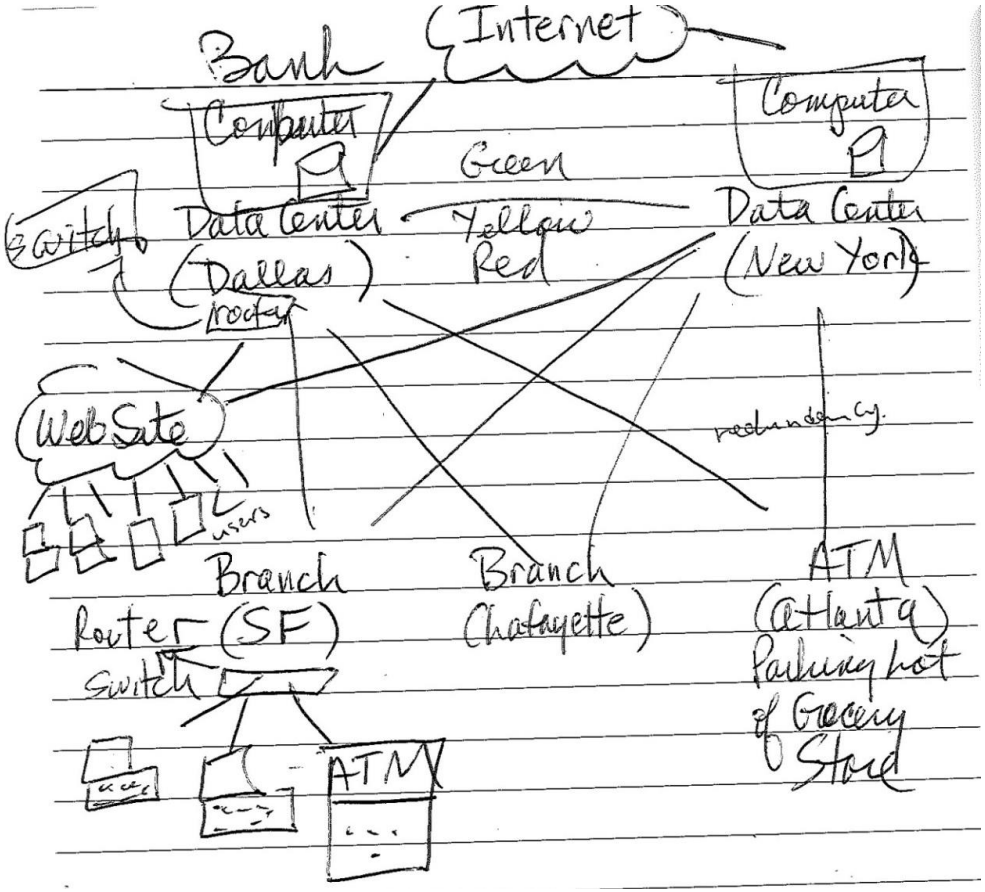
Introduction

Dedicated Teams to control and manage enterprise information systems and networks

Bank Network



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Human Factors Engineering Problem

Situation Awareness (SA) is the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future. (Endsley, 1988)

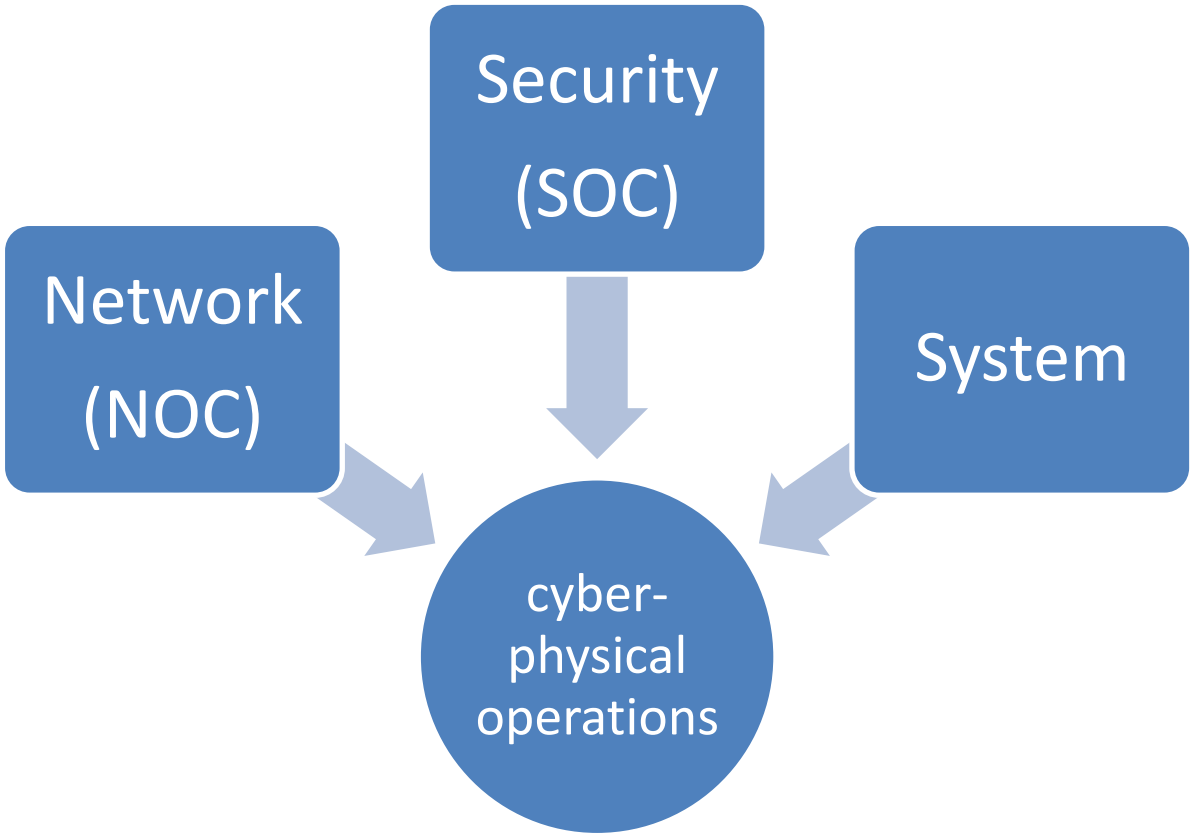
Levels of SA:

1. perception 2. comprehension
3. projection *4. resolution* (McGuinness & Foy, 2000)

Functional Requirements of SA in network Security

- information visualization (Onwubiko, 2009)

Cyber Physical Operations



Network Operation Centers (NOCs)

Network health and performance

1. Mediterranean (Jan 2008)
   Scuba Divers Fiber-Optic Cables cuts

2. United Airlines (Nov 2012)
   Computer system breakdown

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Security Operation Centers (SOCs)

Confidentiality, Integrity, and Availability

1. Multiple Retailer Credit Systems (2013-14)
   Target, Home Depot, Staples…

2. Yahoo Mail Accounts (Jan 2014)
   Breach of 273 million user accounts

Pilot Study

- Exploratory subjective data collection
- RSA Conference 2014
- Diversity (applications and functions)
- 10 to 30 years of IT working experience

Goal

Understand the goals, practice, challenges of analysts

Highlights

- NOC and SOC commonalities (Big data, Dynamic, Event driven, Collaboration)
- NOC and SOC integration/ separation

Case Study

Goal

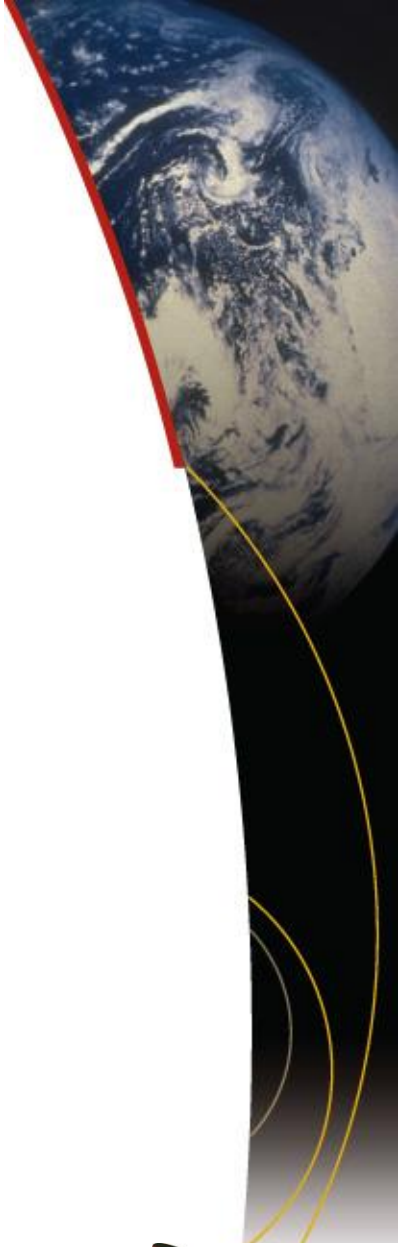
1. Analysts gaps in sense making
2. Visualization features to mitigate the gaps

Layout

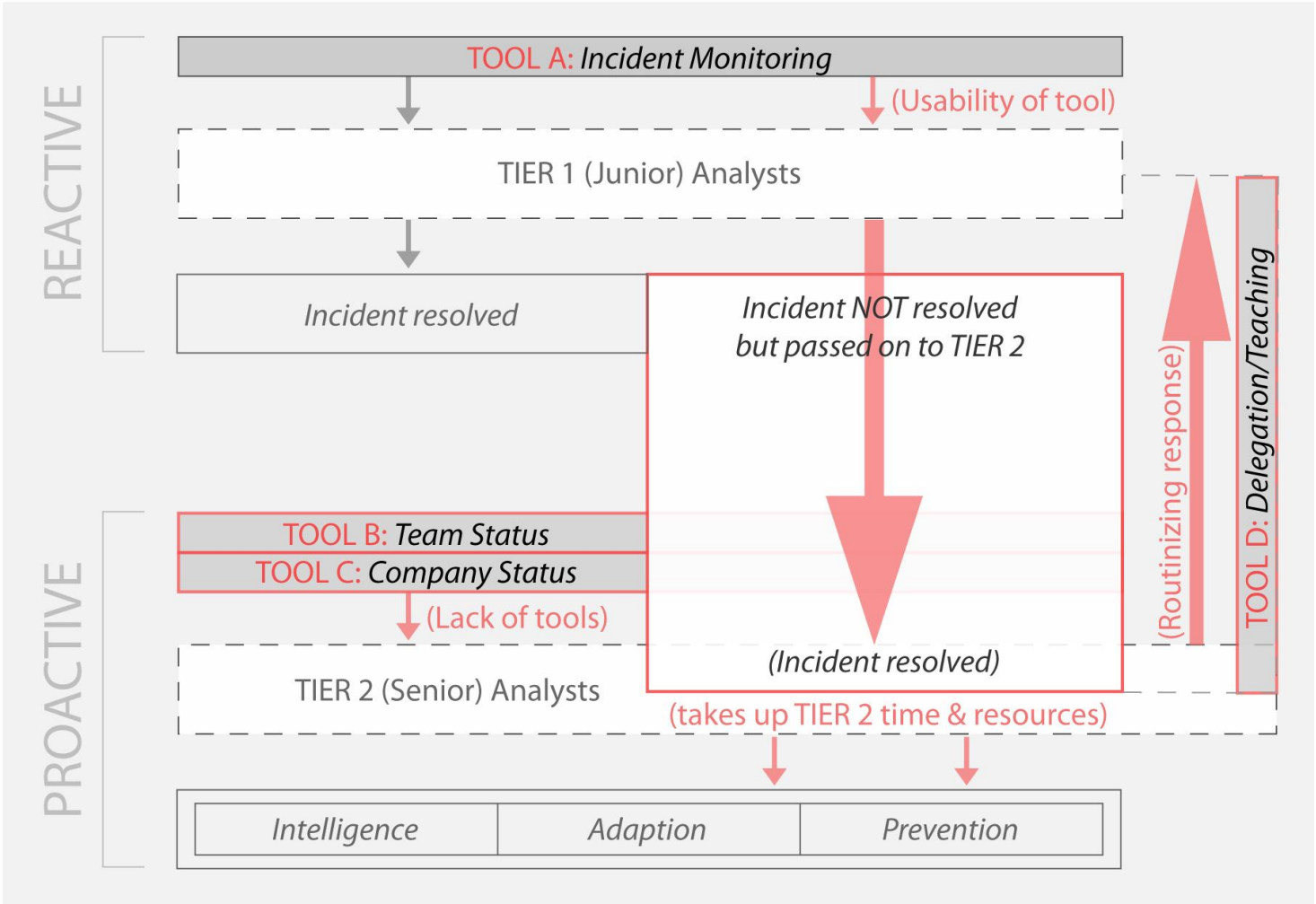
- SOC of a manufacturing enterprise
- attending team meetings
- job shadowing
- Six in depth interviews (one junior analyst, three Senior analysts , team lead, SOC manager)

Identified Gaps

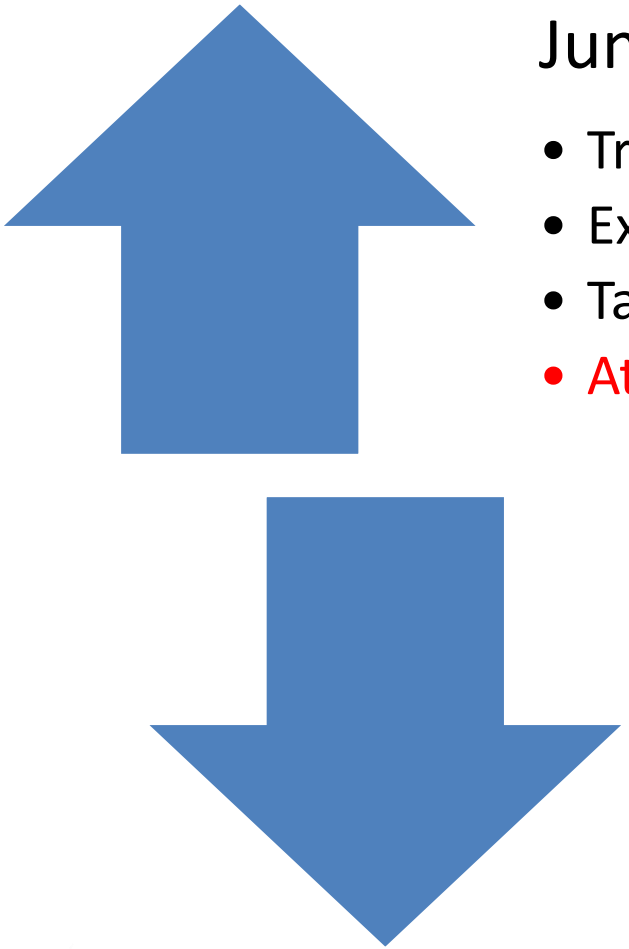
1. Information Alignment and team SA
2. Knowledge Referencing
3. Performance Management



1. Information Alignment



2. Knowledge Referencing



Junior Analysts

- Training
- Expertise Development
- Task Escalation
- Attrition

Senior Analysts

- Investigation
- Innovation
- Non-Routine Events
- Interruptions

2. Knowledge Referencing

Benefits

- Spreading expertise
- Awareness of team activity
- Integration from rare to frequent

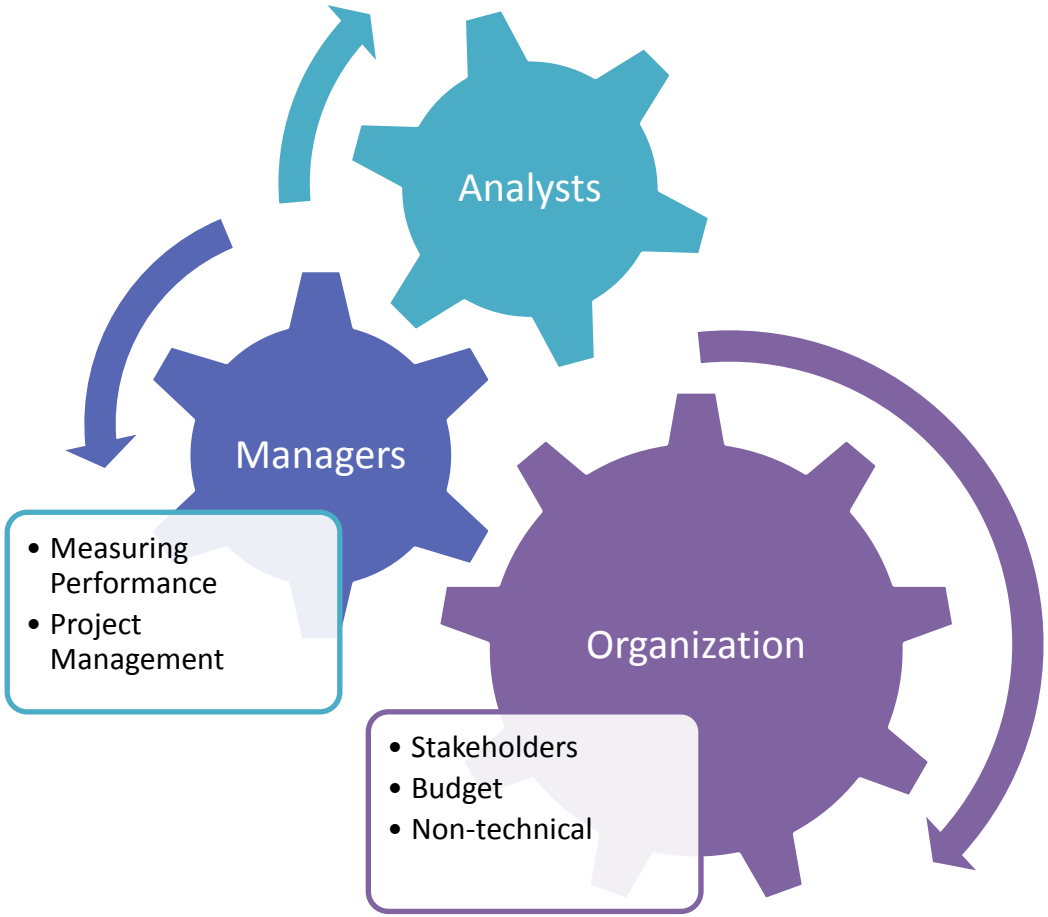
Costs

- Interruptions degrade senior analyst performance

  Interruption affects productivity and reduces the quality of final outputs (Foroughi et al., 2014)

- No time to formalize
- Lack of formulation degrade junior analyst contribution

3. Performance Management



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Projected Outputs

Tool 1: Information Alignment and Team Situation Awareness

- Added features in existing tools
- Improved team SA, responsiveness

Tool 2: Management of Team Performance

- New tools to quantify operational performance
- Improve communication with non-technical personnel

Tool 3: Operational Knowledge Referencing and System Teaching

- Delegate tasks to junior analysts – Knowledge Capture
- System automation

Outstanding Tasks

- More in depth **Case Studies** (RSA operations, IU NOC/SOC groups, Purdue ITAP)
  - Junior/ Senior Analyst
  - Goal Directed **Task Analysis** (GDTA)
  - SA requirements for NOC/SOC leads
  - Task Capture for defining and delegating routine tasks from leads to analysts
- **Prototyping** & **Usability Testing**

Our Critical Recognition

Lack of information alignment, situation awareness or team performance status in a NOC/SOC **is**, *per se*, **a SOC/NOC vulnerability**

1. tier **1** analyst performance is bounded by **usability of incident monitoring tools**

2. tier **2** analyst performance is bounded by limits in **delegating** to tier 1 and **lack of status/ context tools**

QUESTIONS?

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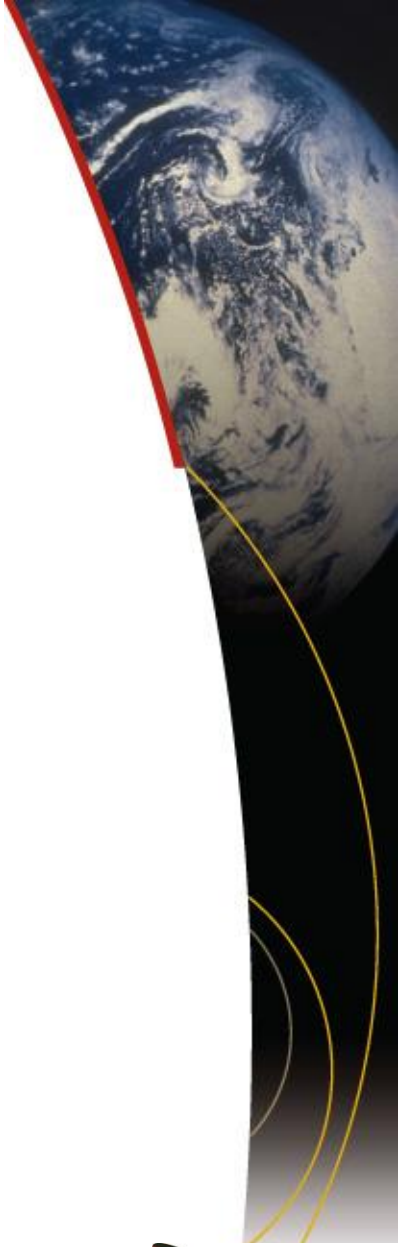

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