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Information Assurance & Survivability

Brian Witten

Information Systems Office

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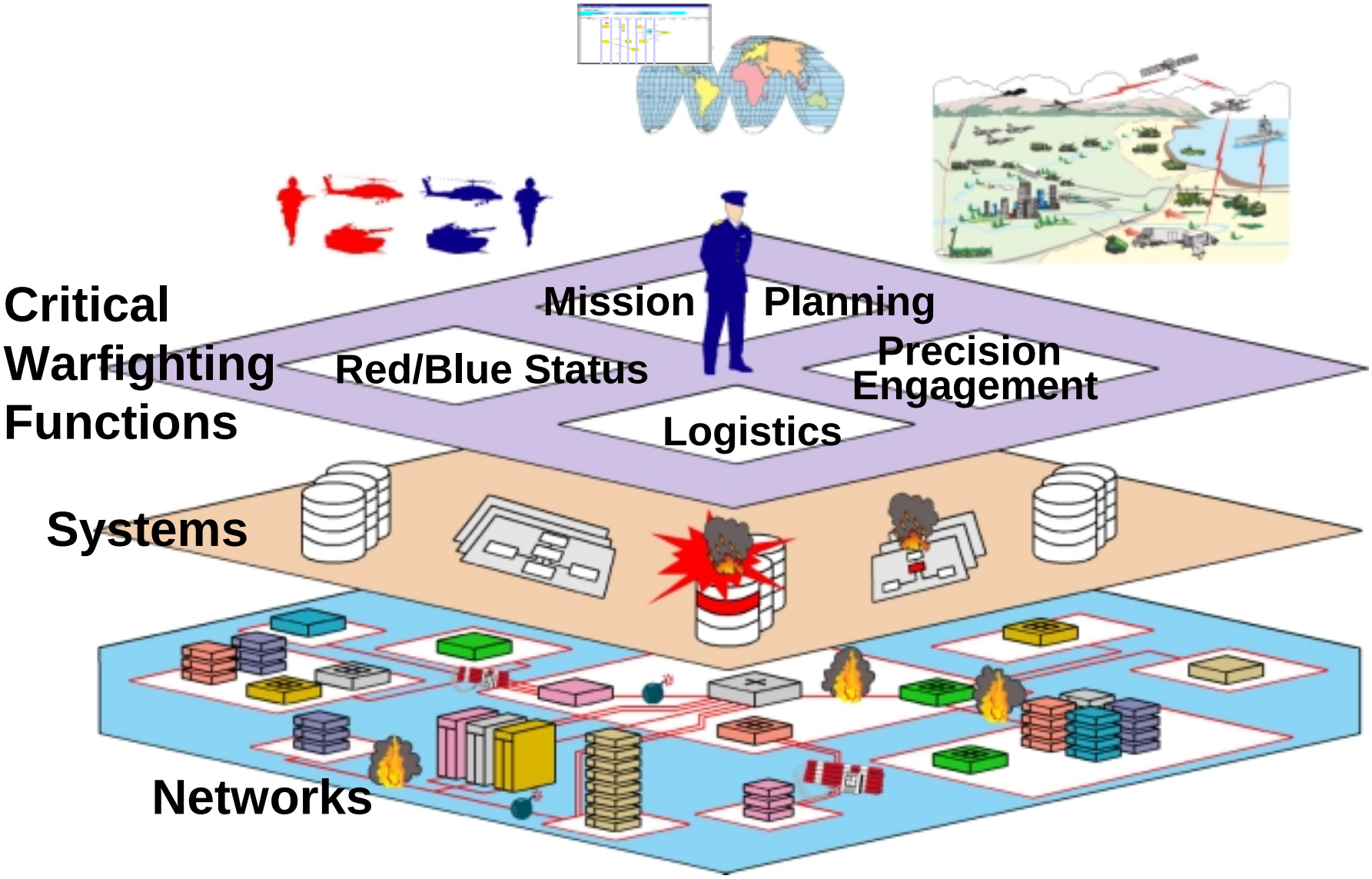
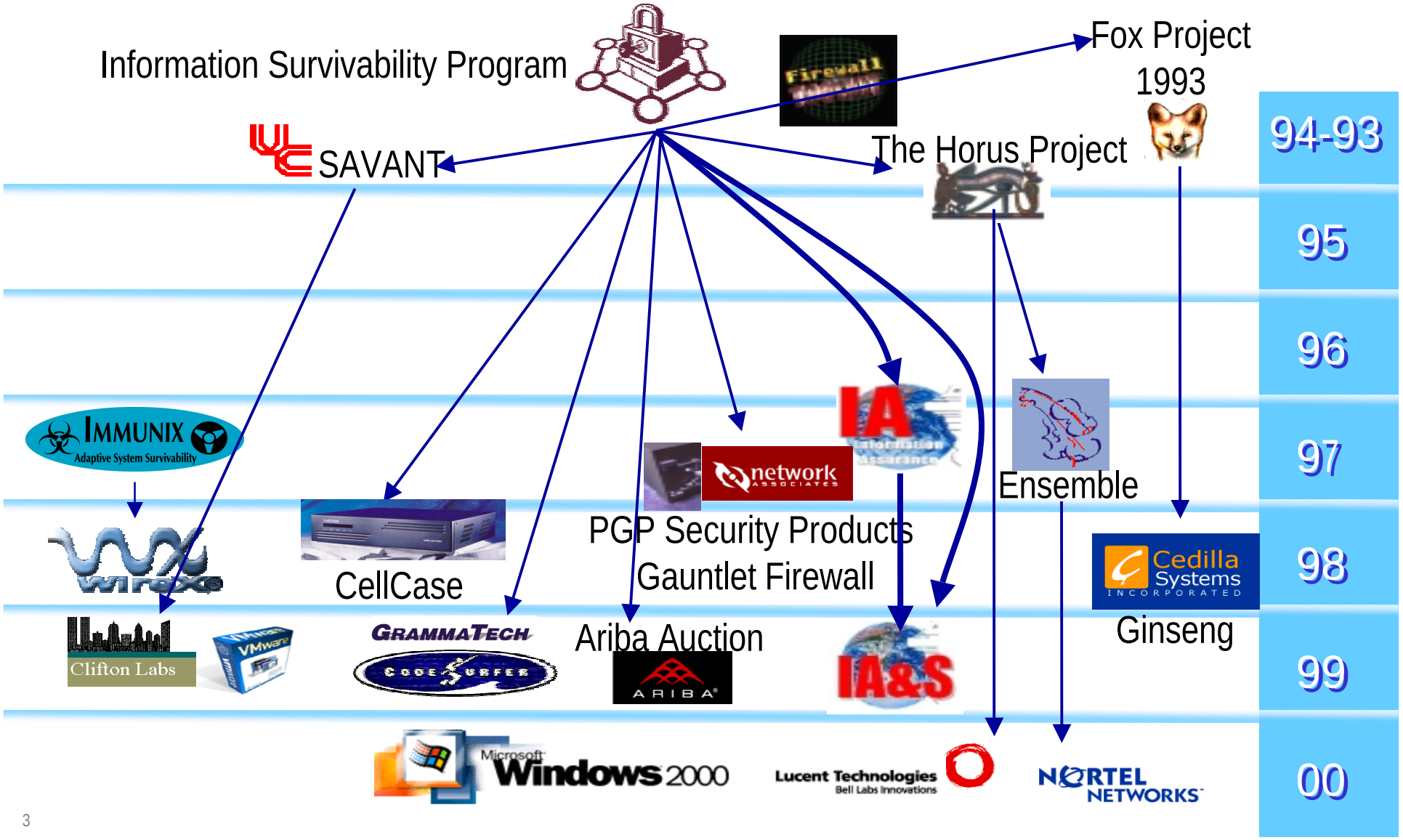
Can we trust the data we are fighting on?



History of Innovations

IS Conference Proceedings - http://schafercorp-ballston.com/discex




Long Road Ahead
Auto Forensics
Cyber Strategy
Autonomic Response
Course of Action Projection
Insider Attacks
Intrusion Assessment
IA Sensors
Adaptive Survivable Network Infrastructures
Adaptive Survivable Architectures
?
?
Malicious Code
Cyber Sensor Exploitation
Intrusion Detection
Protective Mechanisms
Crypto
Dynamic Policy
Situational Understanding
Composable Trust
Policy
Physical Security
Dynamic Coalition
Modeling/ Simulation
Lifecycle Attacks
Formalized Design & Assessment
Multi-Level Security
?

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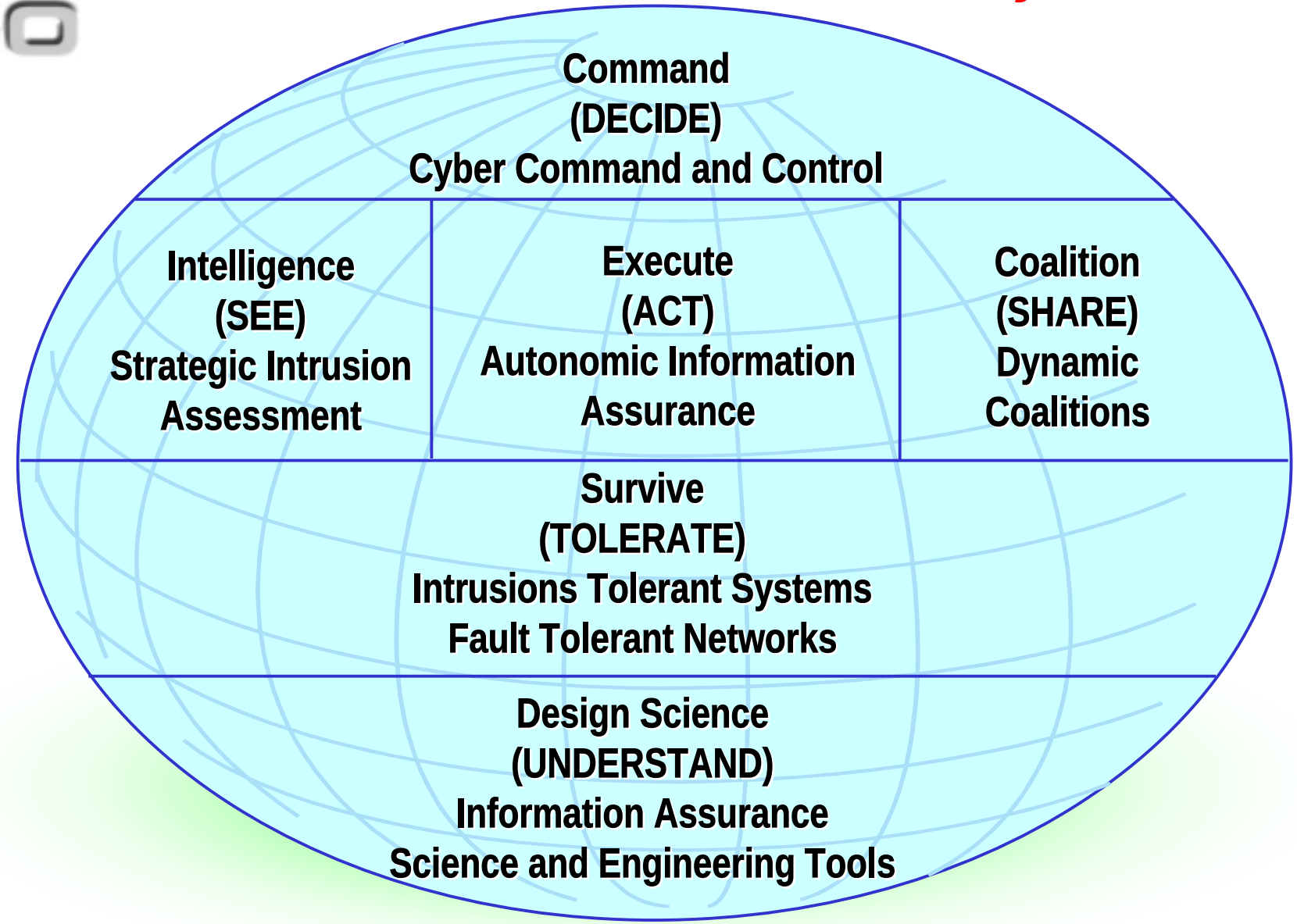
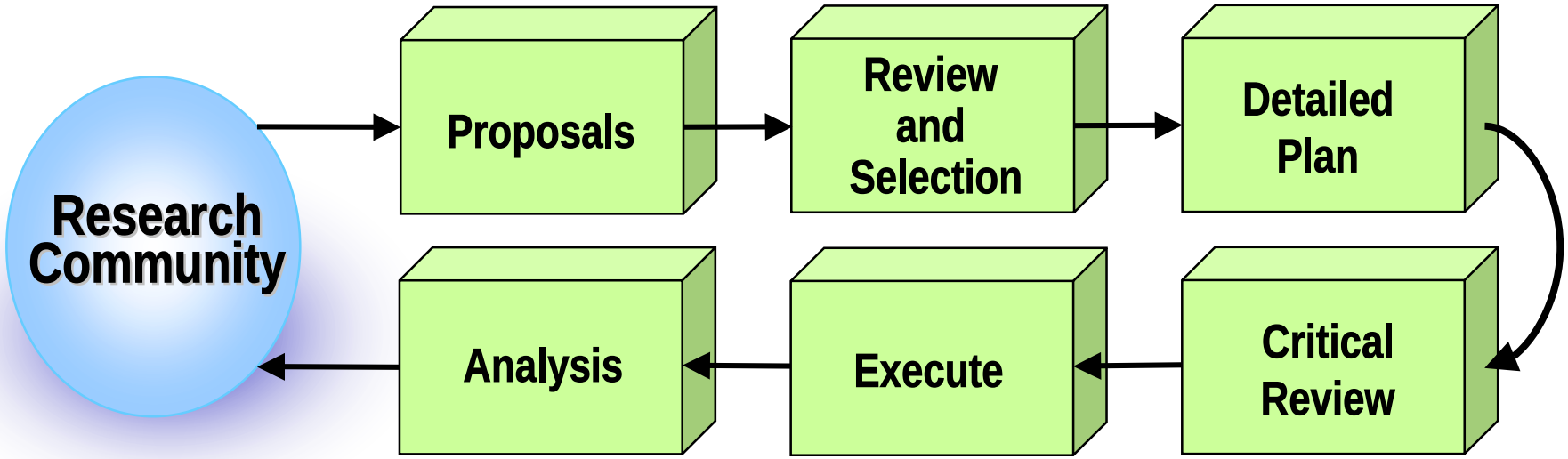
Objectives



Approach: Scientific Experimentation



Grand Hypotheses:

- Layered Defense
- Dynamic Defense
- Assurance Methodology
- Automated Response
- Automated Decision Support

Types of Experiments:

- Field Experiments
- Red Team Lab Exercise
- Laboratory Experiments
- Interdisciplinary White-Boarding
- Component Specific Testing

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Contact

Autonomic Information Assurance…… **Brian Witten**
Dynamic response bwitten@darpa.mil

Cyber Command & Control……. **Catherine McCollum**
Human directed strategy cmccollum@darpa.mil

Dynamic Coalitions…….. **Doug Maughan**
Coalition policy mechanisms dmaughan@darpa.mil

Fault Tolerant Networks……. **Doug Maughan**
Tolerant mechanisms dmaughan@darpa.mil

IA Science & Engineering Tools……. **Michael Skroch**
Design tools & models mskroch@darpa.mil

Information Assurance…… **Michael Skroch**
Composable trust mskroch@darpa.mil

Intrusion Tolerant Systems…….. **Jay Lala**
Tolerant systems jlala@darpa.mil

Strategic Intrusion Assessment…….. **Catherine McCollum**
Attack recognition & correlation cmccollum@darpa.mil

Cyber Sensor Grid……. Catherine McCollum

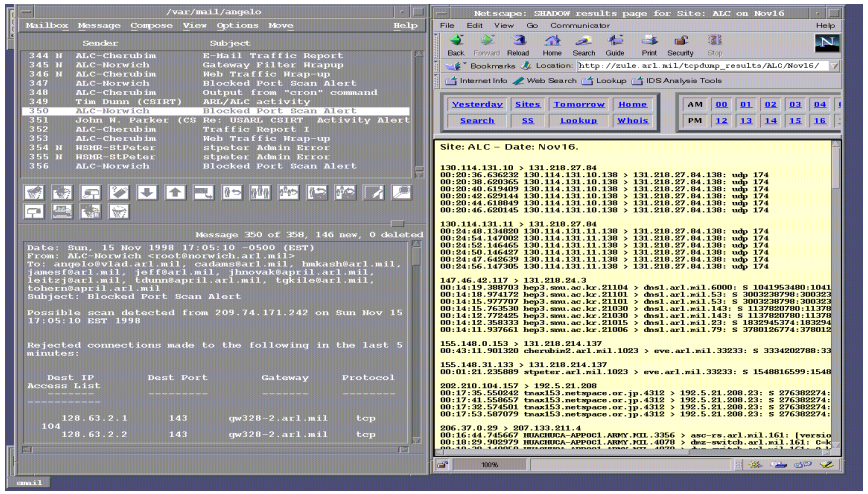
Malicious Code Mitigation…….. Michael Skroch

Reliable Mobile Agents…….. Brian Witten

Secure Operating Systems…….. Doug Maughan

Security of High Speed Networks…… Doug Maughan

New Focus: Cyber Sensor Grid



Sniffer data

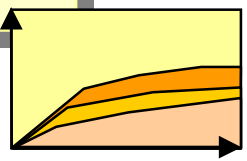
```
% ls -l

header,79,2,fork(2),,Sun Oct 03 21:57:43 1999, + 510000000 msec
argument,0,0x1b7,child PID
subject,aheberle,aheberle,staff,aheberle,staff,408,407,24 6 han
return,success,0

header,107,2,execve(2),,Sun Oct 03 21:57:43 1999, + 510000000 msec
path,/usr/bin/ls
attribute,100555,bin,bin,26738688,427674,0
subject,aheberle,aheberle,staff,aheberle,staff,439,407,24 6 han
return,success,0
   •
   •
   •
header,121,2,lstat(2),,Sun Oct 03 21:57:43 1999, + 510000000 msec
path,/export/home/aheberle/foo
attribute,100000,aheberle,staff,26738688,139738,0
subject,aheberle,aheberle,staff,aheberle,staff,439,407,24 6 han
return,success,0
```

Process ID 0x1b7 = 439

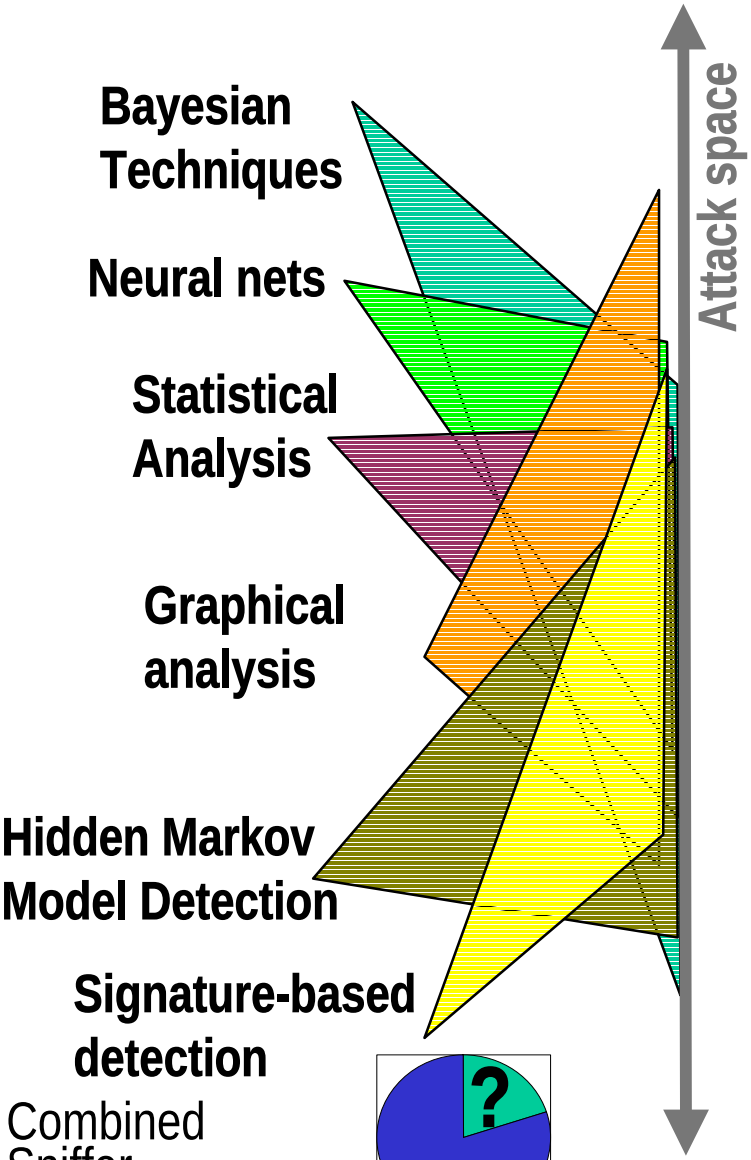
Execute `ls`

Stat `foo`

Audit data



Combined Sniffer Audit



New Focus: Malicious Code Mitigation

Complicating factors:
- More COTS
- Increasing use and reliance on systems
- Increasing connectivity

Strategy:
- Detect & Expunge "On the Fly"
- New Architectural Concepts
- Address Policy Language Lag

New Focus: Reliable Mobile Agents

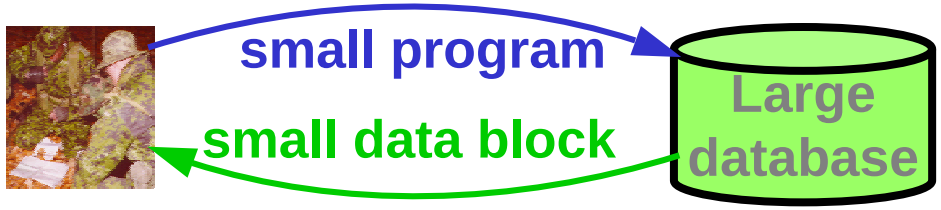
Mobile Agents are:

Programs that can migrate from machine to machine under their own control.

Code mobility…

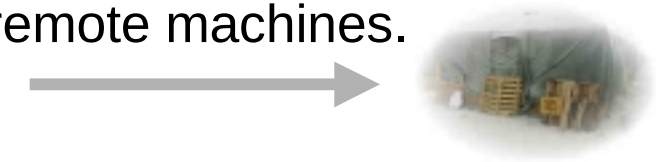
Functionally enhances:

1. **Efficiency**



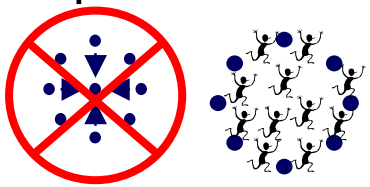
2. **Disconnected operations**
   (e.g.. wireless networks)

3. **Flexibility**
   Install new functionality on remote machines.



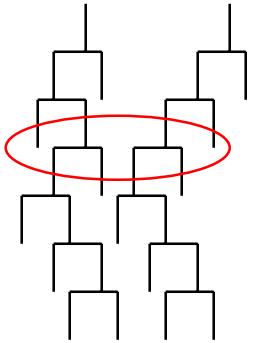
Presents Survivability Opportunities:

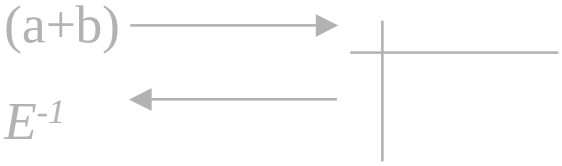
1. **Availability**
   No central failure point.



2. **Integrity**
   Fluidly reinforce execution traces.

3. **Confidentiality**
   Code fragmentation.
   Mobile cryptography.





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Conclusions:

- **National Level Problem**
- **DARPA "high-risk"/ "high-reward" focus**

New Focus Areas:

- **Cyber Sensor Grid**
- **Malicious Code Mitigation**
- **Reliable Mobile Agents**

Proven Success:

- **ARPANET**
- **Firewall Toolkit**

Waiting Gold:

- **Secure Domain Name Service**
- **Internet Protocol Security (IPSEC)**
- **Secure Border Gateway Protocol**
- **Next Generation Intrusion Detection**

More to Come:

- **Denying Denial-of-Service**
- **Self-Healing Systems**
- **Proof Carrying Code**
- **Trace Back**
- **Dynamic Defense**
- **Metrics & Science Based Design**

IA&S Information – www.darpa.mil