Defense Advanced Research Projects Agency

Information Assurance and Survivability Operational Experimentation (OPX)

Phoenix Challenge 2002

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This briefing was presented during the Phoenix Challenge 2002 Conference and Warfighter Day.

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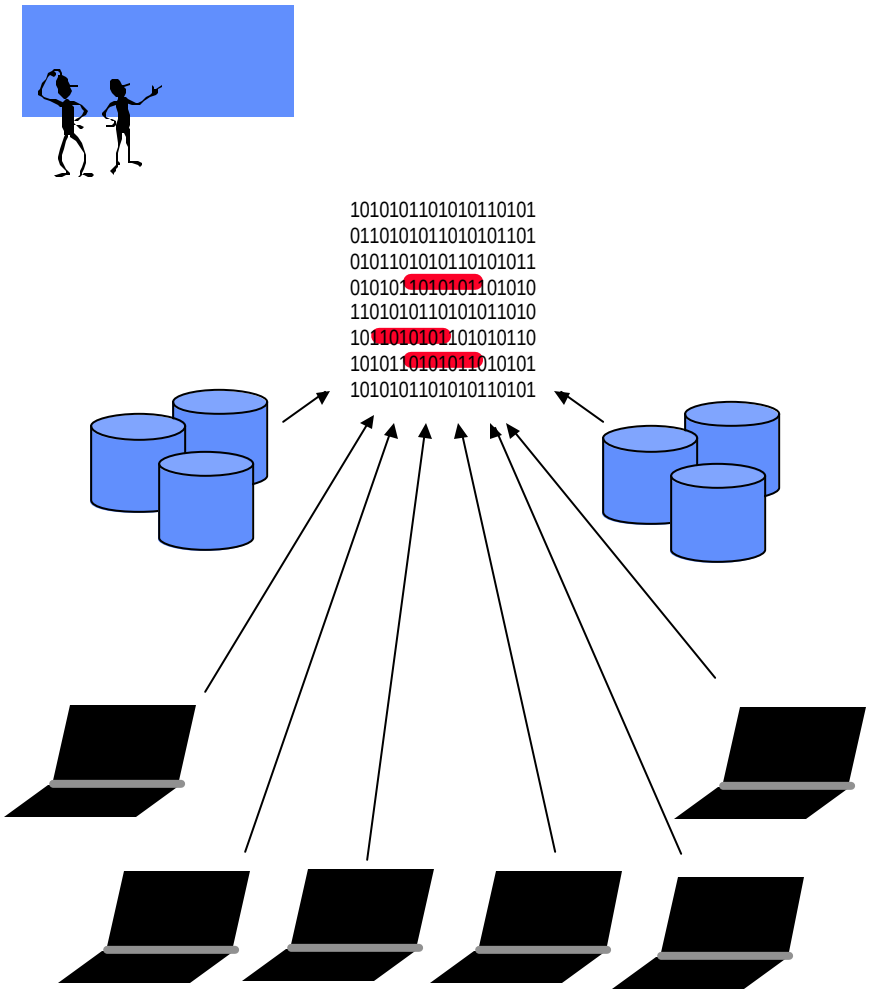
Vision



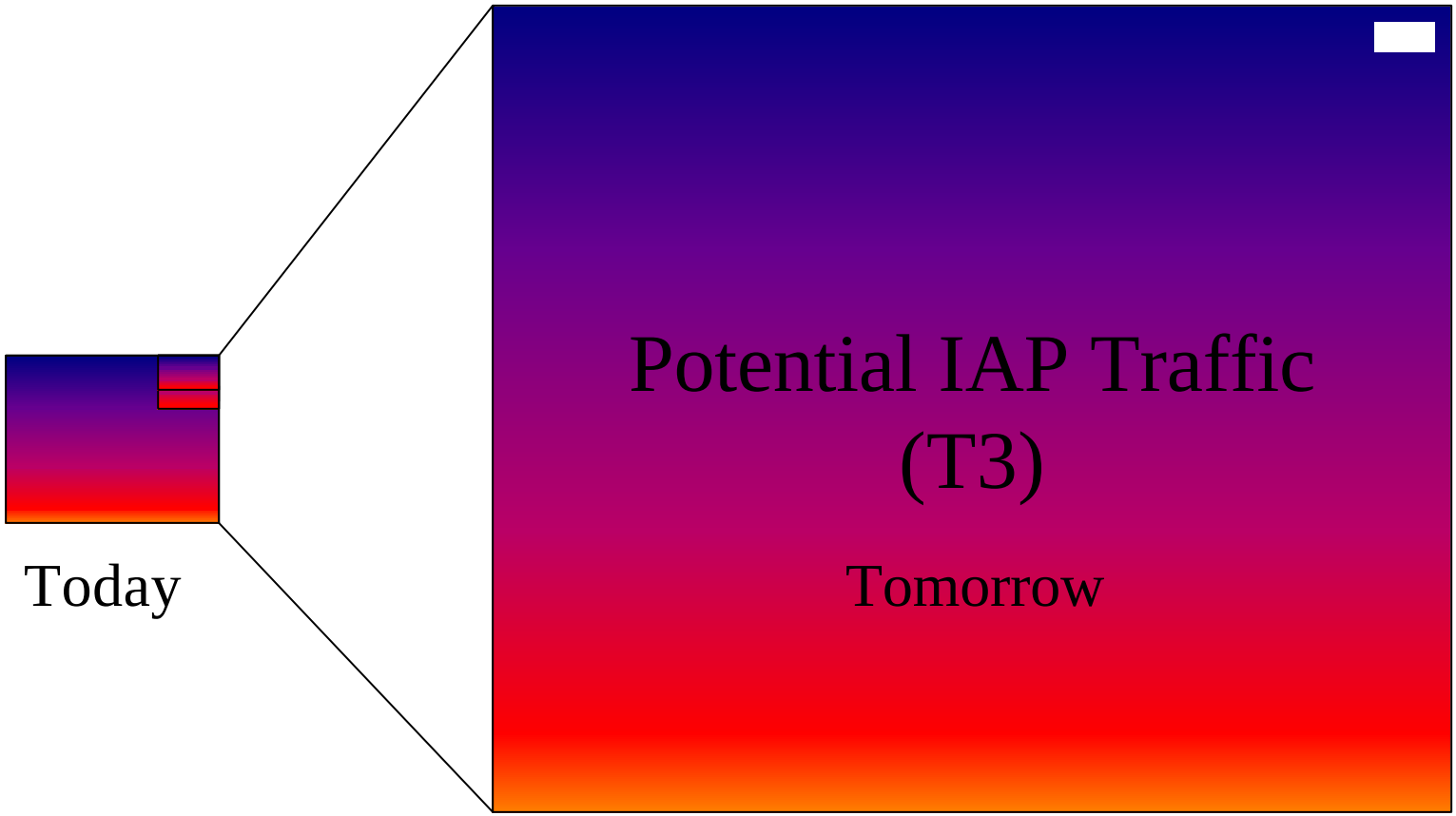
- New Capability:
  Situational Awareness
- Reduce Overload:
  Analyst Workbench
- Protect Centers of Gravity:
  Survivable Servers
- Pervasive Sensors:
  Hardened Clients

Strategy

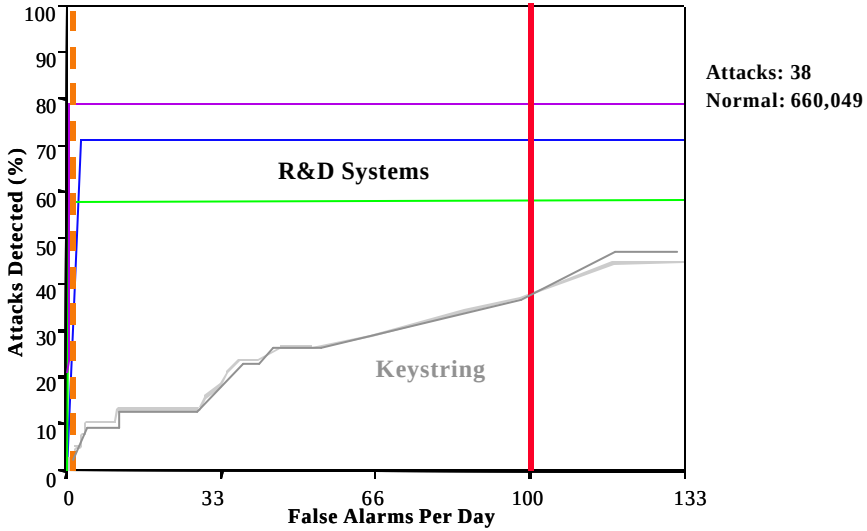
- **Objectives:**
  - Accelerate transition of effective technologies
  - Inform research agenda with operational experience
- **Key Experimentation Risks, Transition Metrics:**
  - Limited operational staff time
  - Impact on operational systems
- **Approach:**
  - Leverage mature research, well tested in lab
  - Field cautiously: walk before we run

The Analyst's Challenge

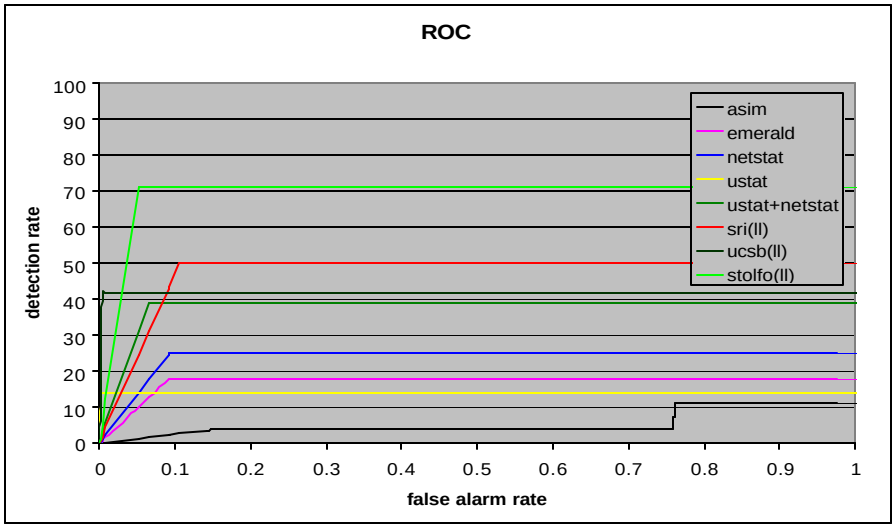
Impact of Transition to T3 volume at Internet Access Points



Intrusion Detection in the Lab



Attacks: 38
Normal: 660,049



DARPA 1998 Results (MIT/LL and AFRL)

- **Operational sensors:**
  - Hundreds of false alarms per attack
  - Actually miss most attacks
- **Research sensors:**
  - Dramatically reduce false alarm rates
  - Substantially improve detection coverage

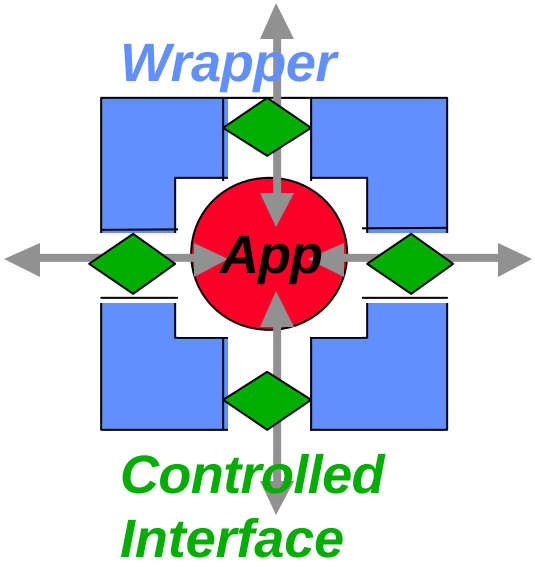
Analyst Workbench

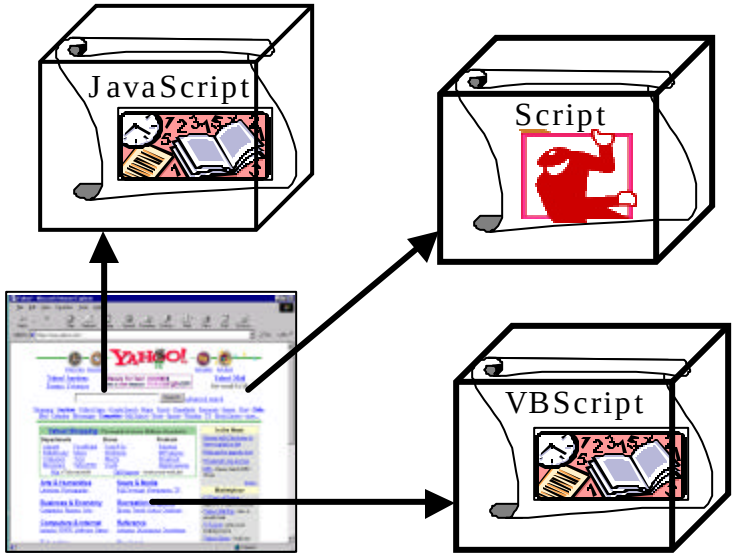
- Analysts currently overwhelmed
  - Flood of data, high false alarm, low detection rates
  - Not… real time, decision quality, always actionable
- DARPA Algorithms
  - Over a dozen lab tested real time algorithms
  - Data mining, anomaly, self organizing, expert systems
- Execution: September 2001 – September 2002

Hardened Client

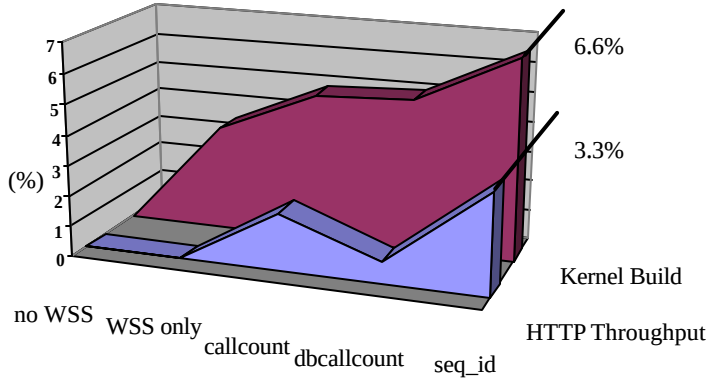
- MARFORPAC Challenge
  - Classic SIPR/NIPR PC problem
  - Compounded by TAD laptop theft
  - Insider threat and unknown viruses
- Proposed Technology
  - Safe e-mail “wrappers” and encrypting file system
  - Autonomic Distributed Firewall
  - PGP Disk & Disk Eraser

Operating System Wrappers





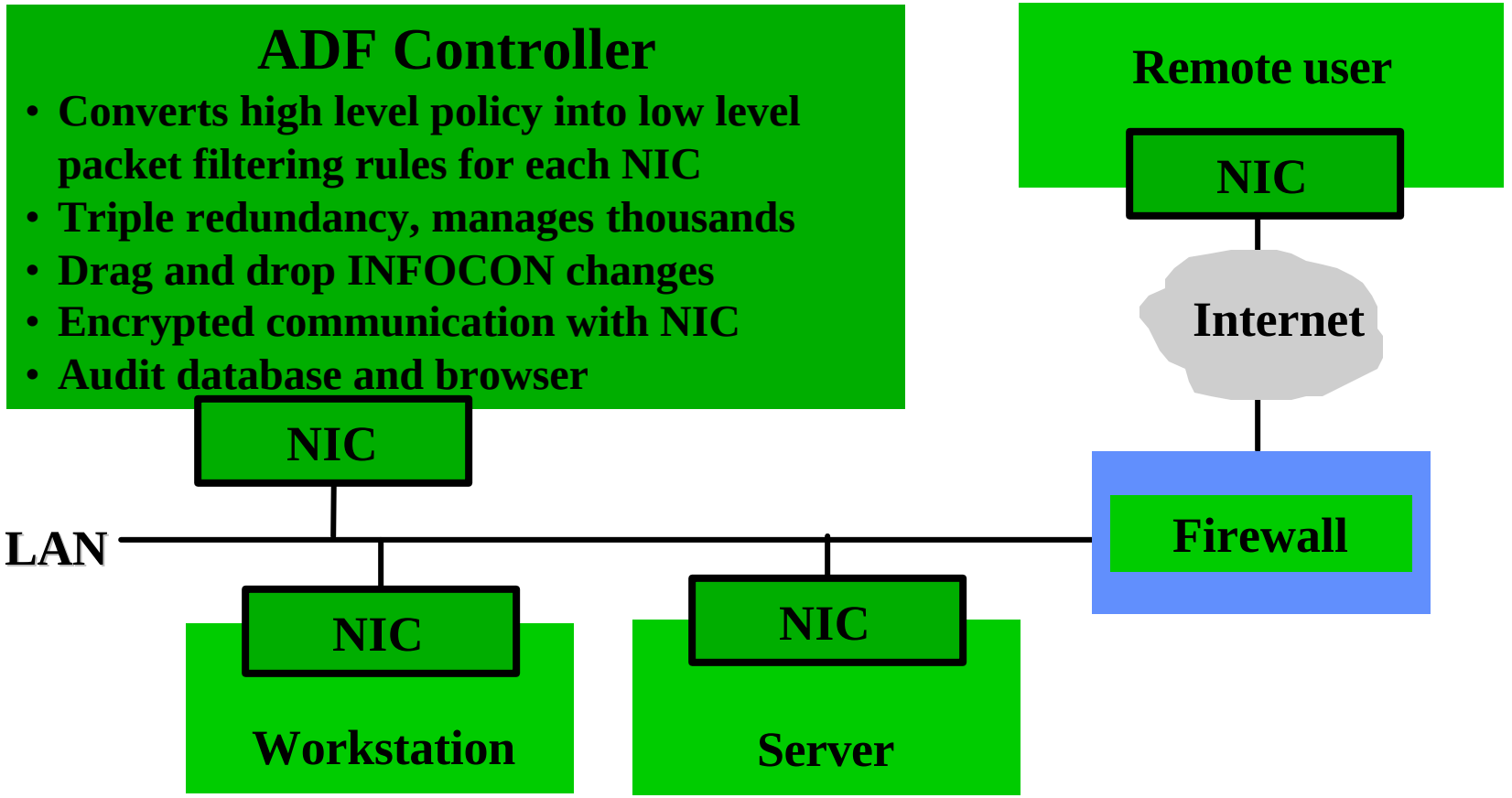
- Trap and stop unknown viruses
- Enable safer use of mobile code
- Performance impact: Low
- Availability: Solaris, Linux, NT, Win2K



Developers: Network Associates, Teknowledge, Cigital, Telcordia

Autonomic Distributed Firewall

- Firewall on Network Interface Card (NIC)
- Hardware based cryptographic accelerator
- Trustworthy control of untrustworthy OS



Made by Secure Computing and 3Com

Research performed under DARPA sponsorship

Hardened Client Timeline

- MARFORPAC Limited Objective Experiment
  - Apply safe e-mail wrappers and encrypting file system
  - MARFORPAC approved internal experiment charter
  - Execution: Late CY2001, RSO&I 02, UFL 02
- Fleet Battle Experiment India (C3F)
  - Execution: Jun 2001 – Autonomic Distributed Firewall (PCI)
- Fleet Battle Experiment Juliet Goals (PACFLT)
  - Complete application of diverse wrappers
  - Autonomic Distributed Firewall (PCMCIA)

Survivable Server

- **Motivating factors:**
  - High-value and commonly targeted center of gravity
  - Need Intrusion Tolerant Systems:

    Ability to confidently execute mission while under attack
  - Reactive defense not adequate
- **Possible technologies:**
  - PASIS: Perpetually Available Survivable Information System

    Leverage fragmentation, redundancy, and scattering
  - SELinux, Immunix, Emerald, NetTop Vmware, Wrappers
- **Execution: 2002**

Situational Awareness

- **Am I under attack ?**
- **What is the nature of the attack ?**
  - Class, mechanism, and source
- **What is mission impact ?**
  - Urgency, damage assessment and control, initial response
- **When did attack start ?**
  - More detailed damage assessment. What have I done wrong ?
- **Who is attacking?**
  - What are they trying to do? What is their next step ?
- **What can I do about it ?**
  - Course of action analysis, collateral damage risk, reversibility

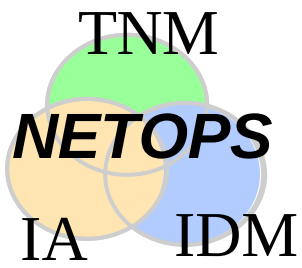
Theater C4I Coordination Center PACOM TCCC

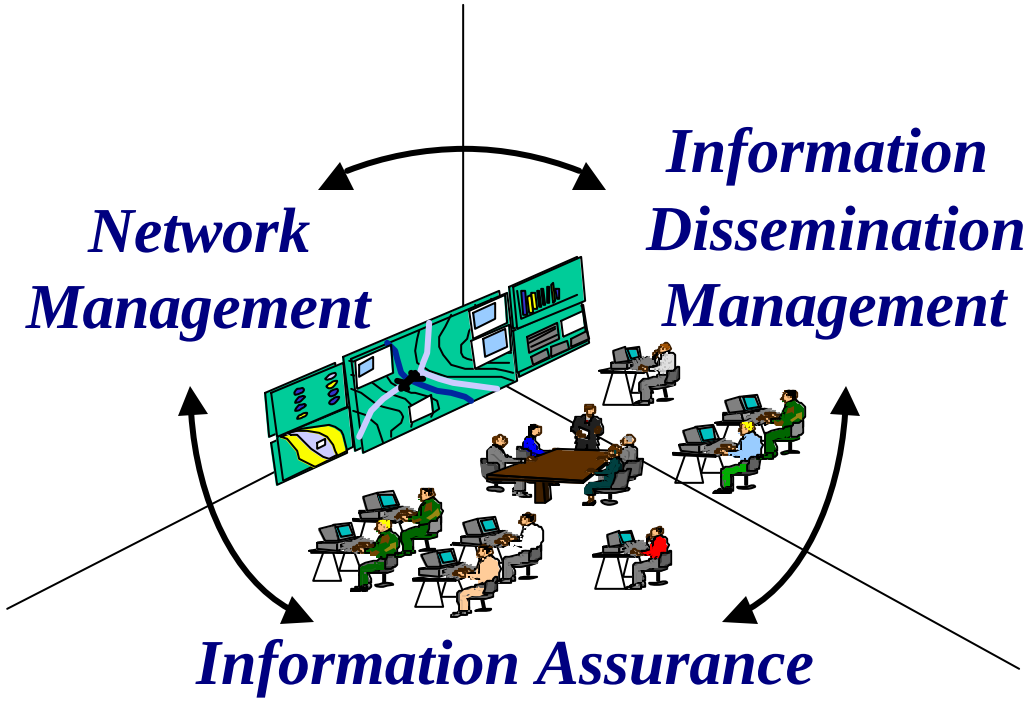
Need

- ***Theater Wide***
- ***Real Time***
- ***Decision Quality***
- ***Actionable Information***

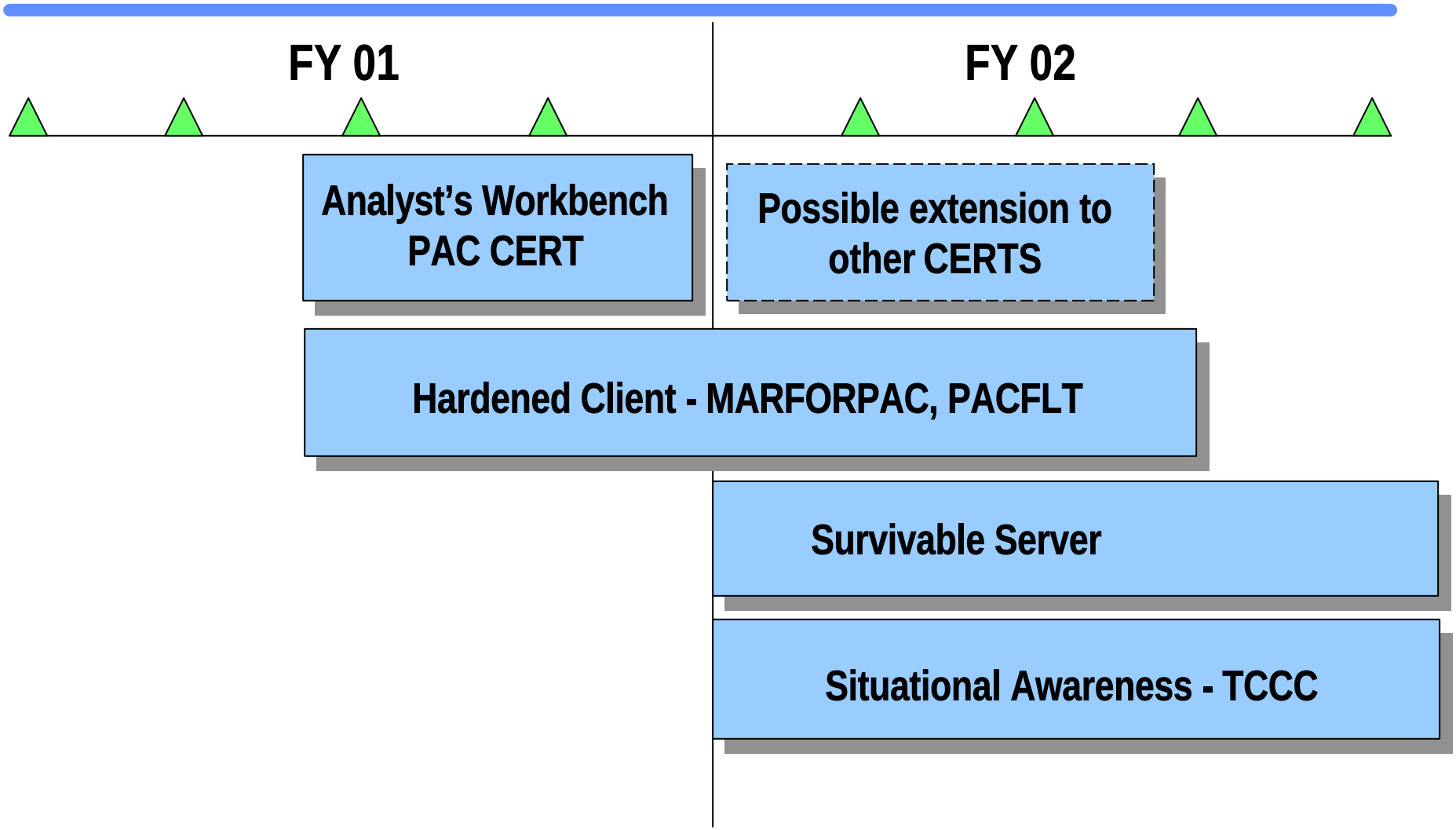
Strategy

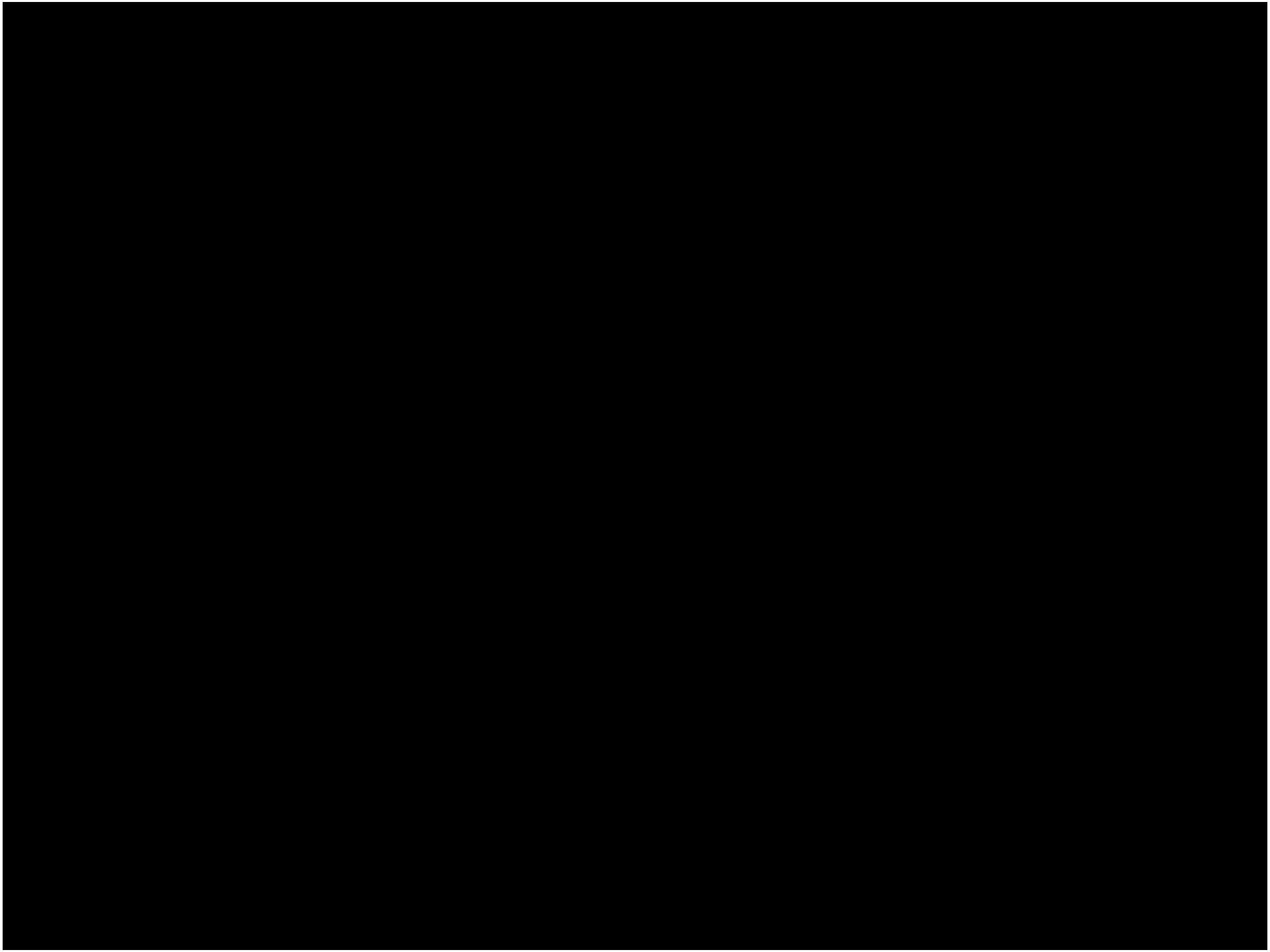
- **Leverage Cyber Panel emerging research**



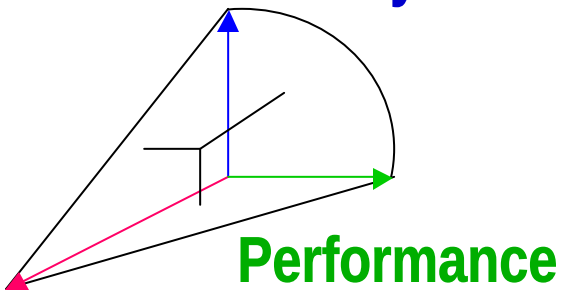


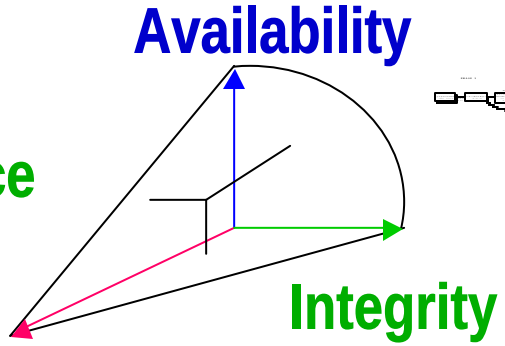
Summary


FY 01
FY 02
Analyst's Workbench
PAC CERT
Possible extension to
other CERTS
Hardened Client - MARFORPAC, PACFLT
Survivable Server
Situational Awareness - TCCC

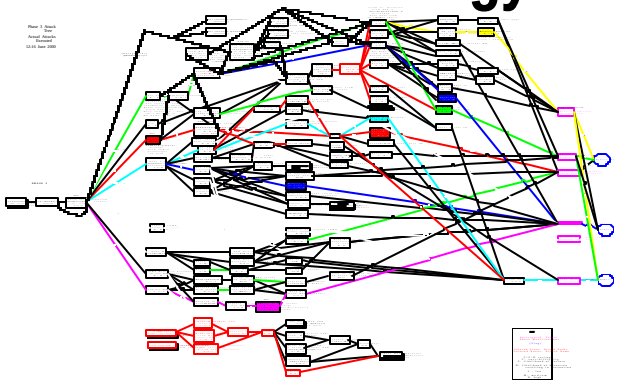


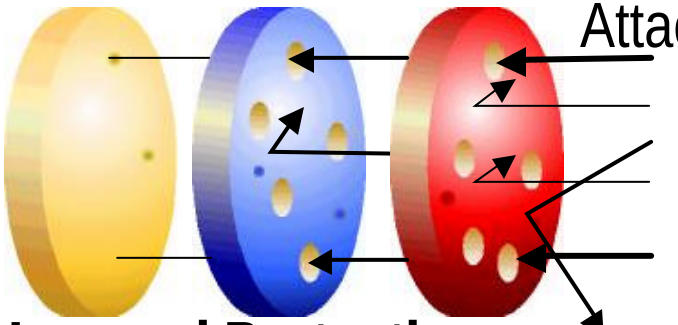
Context



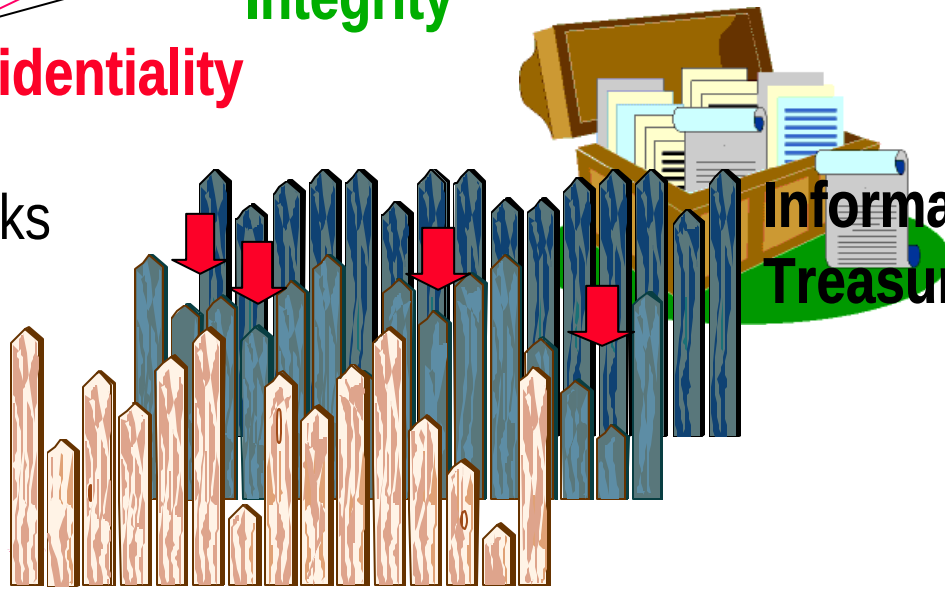


Methodology





Layered Protection
Dynamic Defense



Risk-Balanced Optimizing Strategy