AFRL Defensive IO Programs

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Information Assurance

- **Definition**
  - Information operations that defend the global information enterprise through employment of Protect, Detect, Assess and Respond capabilities. This is accomplished by ensuring availability, integrity, authentication, confidentiality, and non-repudiation (based on DODD S-3600.1 & AFDD 2-5).
- **Approach**
  - Develop technology for and transition technology to AF, DoD and National customers
  - Continuous capability improvement through experimentation with warfighter, spiral development, leverage of COTS, and technology transition, e.g., CAOC-X, JBI, etc...
- **Value to the Warfighter**
  - Accurate, trusted, reliable warfighter information
  - Survivable information systems and networks
  - Information superiority through assured information operations

Information Assurance
"A Short History"

- **Pre 1970's**
  - Encryption
- **1970's**
  - Computer Security R&D begins ("Test and Patch")
- **1980's**
  - Multilevel Security
  - Strong Security Based on Special-Purpose Systems
  - Risk Avoidance
  - "Orange Book" Evaluation Criteria
- **1990's**
  - Movement Towards COTS Software
  - Perfect Security Recognized as Unachievable
  - Risk Management
- **2000 & Beyond**
  - Trend toward Information Survivability
  - Situational Awareness
  - Intrusion Tolerance
  - Active Response

Information Assurance Today's Capability

Protect

- Encryption (VPN, Digital Signature, PKI, etc.)
- Firewalls/Guards/Boundary Controllers
- Passwords, Biometrics
- Trusted Operating Systems/Database Management Systems
- Physical Security (Stovepipes, Vaults, etc.)
- Vulnerability Scanners
- "Penetrate and Patch"

Detect

- Virus Scanners (Signature-Based)
- Intrusion-Detection (Signature-Based)
- Auditing

• Assess

- Computer Forensics Tools (Media Imaging, Data Recovery, etc.)
- CERT's

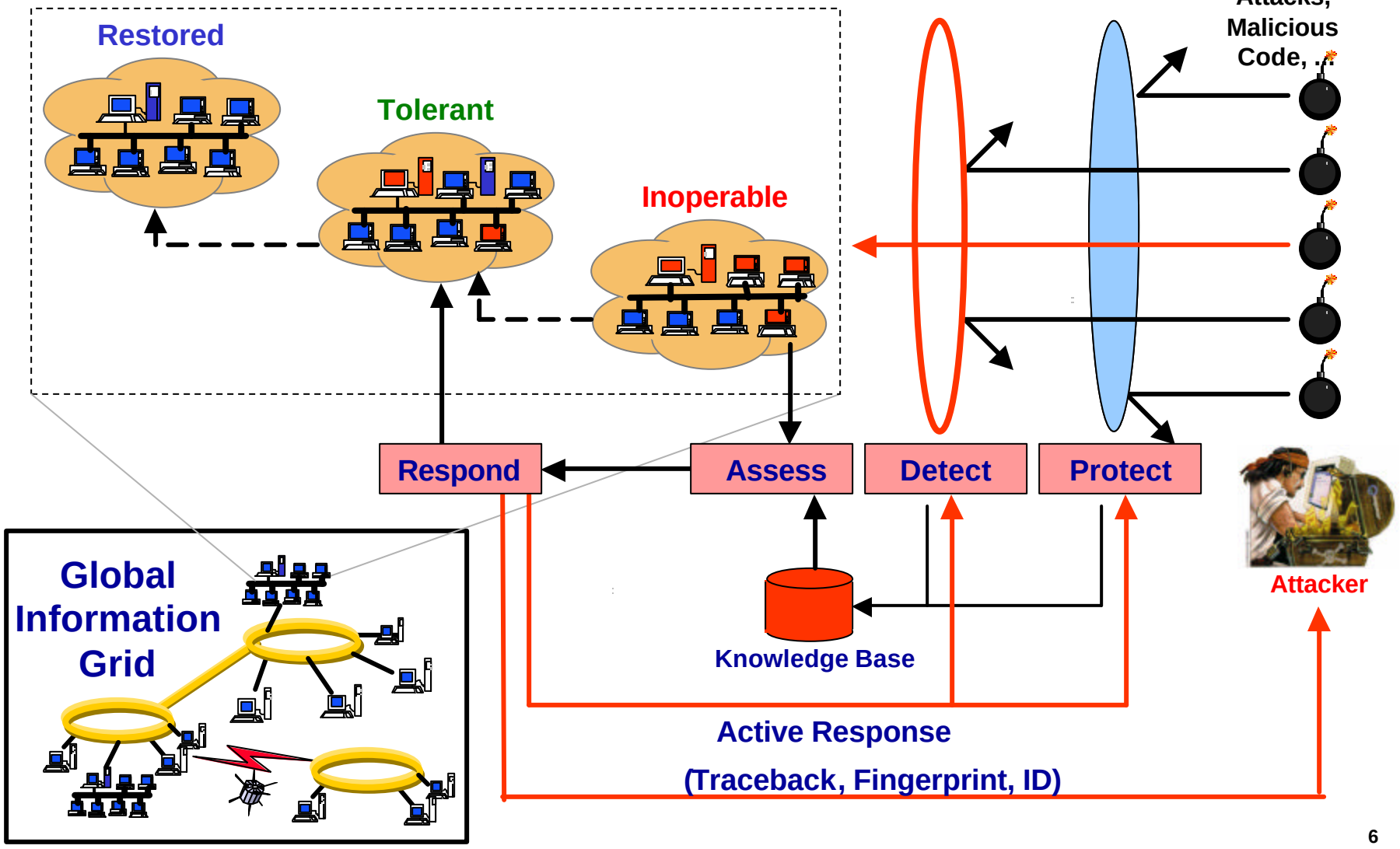
• Respond

- Physical Media Relocation
- Backups

Vision

- **Protect the GIE with a high degree of confidence**
  - Assured defense-in-depth against a wide variety of threats
  - Understand/manage risks and plan for protection
- **Detect information attacks**
  - Early warning using light weight cooperating sensors
  - Efficient, accurate data reduction, fusion, correlation
- **Assess information attacks**
  - Identify adversary, nature, timing, severity
  - Determine mission impact
  - Develop courses-of-action
- **Respond to a successful IW attack in an appropriate manner**
  - Graceful degradation, recovery, reconstitution
  - Feedback to improve protection and detection processes
  - Offensive Information Operations

Information Assurance Vision



National Scale INFOSEC Hard Problems

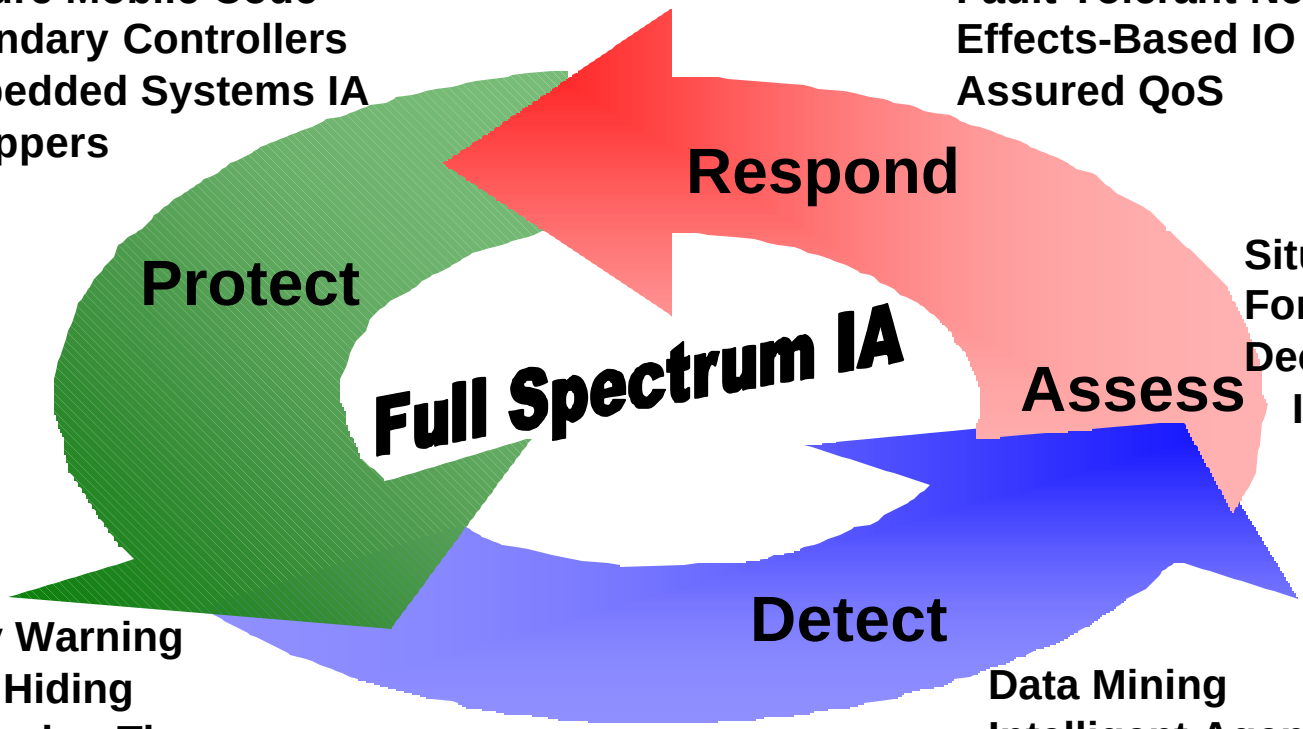
[By the INFOSEC Research Council]

- Intrusion/Misuse Detection & Response
- Foreign & Mobile Code
- Controlled Sharing of Sensitive Information
- Application Security
- Denial-of-Service
- Communications Security
- Security Management Infrastructure
- Security in Mobile Environments
- Security Engineering Methodologies
- Influencing Vendors

Technical Approach

High Assurance
RF Protect
Secure Mobile Code
Boundary Controllers
Embedded Systems IA
Wrappers

Intrusion Tolerance
Active Response
Fault Tolerant Networks
Effects-Based IO
Assured QoS



Situation Awareness
Forensics
Decision Support &
IO Planning

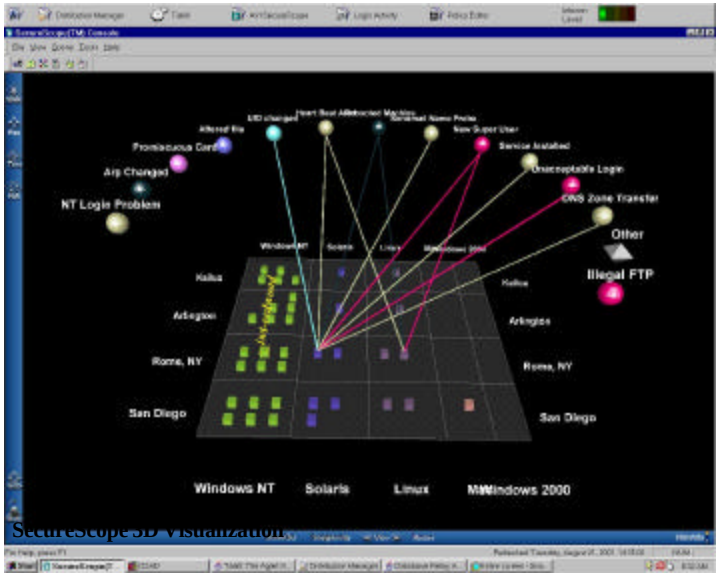
Early Warning
Data Hiding
Sovereign Time

Data Mining
Intelligent Agents
Auto Intrusion Detection Env
AF Enterprise Defense
Wireless Intrusion Detection

Success Stories

- DAIWatch
- CYBERWOLF
- Wireless Information Assurance
- Steganography
- Air Force Enterprise Defense (AFED)

Distributed Agents for Information Warfare Operational Transition (DAIWatch)



SecureScope 3D Visualization

Objective: Enhance level of Information Assurance by utilizing breakthroughs in software agent and fusion technologies that provide revolutionary flexibility, extensibility, and reliability

Approach:

- Agent Technology via Java Aglets
- Dynamic distribution of multiple host sensors
- Integrated multi-dimension graphical analysis

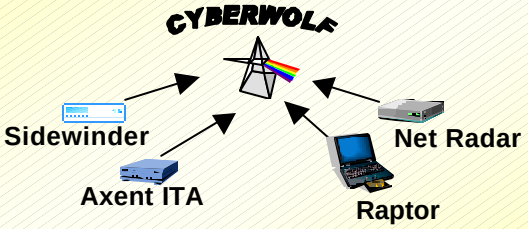
DAIWatch Revolution

- Finds the most sophisticated attackers
- Reduces security administration
- Adjusts to risk and minimizes overhead
- Not vulnerable to compromise

Technology Transition

- Phase III SBIR
- AFIWC – agreements to integrate DAIWatch with CIDDS
- JBC – DAIWatch selected for operational demonstration (focused on ability to transport functions and data across SIPRnet)
- Beta Test Program with a commercial investment company

CYBERWOLF



Problem: Network Defenders cannot process thousands of low level events in real time.

Objective: Enhance network defense by automatically correlating network management events with Intrusion Detection System (IDS) events to provide accurate situational information

Approach:

- Place lightweight device experts on all network assets
- Device experts adaptable to specific installations operational security policy
- Remotely manage geographically separate installations in a 24/7 mode

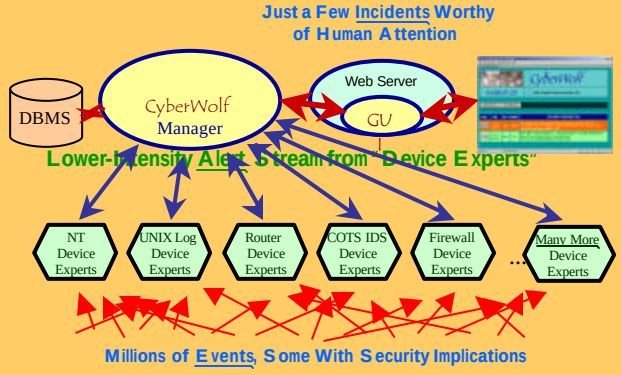
Technical Challenges

- Distribute event processing between enterprise and device
- Design and implement device experts for all types of network assets
- Encapsulate Net defenders knowledge into Rule structure
- Reduce 1000's of net events to a few highly reliable incidents

Status

- Cyberwolf correlating events from AFRL RRS NOC
- Cyberwolf commercialization effort fully underway with several potential customers
- Correlation capability from Cyberwolf is being channeled into AFED program
- Rule set currently exceeding 2000 entries
- Cyberwolf under evaluation for use by several large corp. and a Canadian bank for network enterprise protection

CyberWolf Architecture

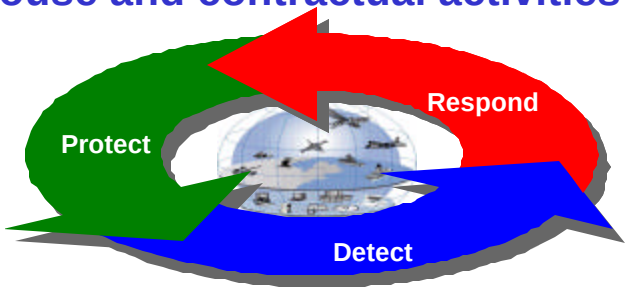


Tech Transitions

Federal Emergency Management Agency
Naval Sea Systems Command
Air Force Research Lab
Joint Battle Center
Land Information Warfare Activity

AFRL Wireless IA Program

Objective: ***Enhance and extend*** **IA for wireless through synergistic in-house and contractual activities**



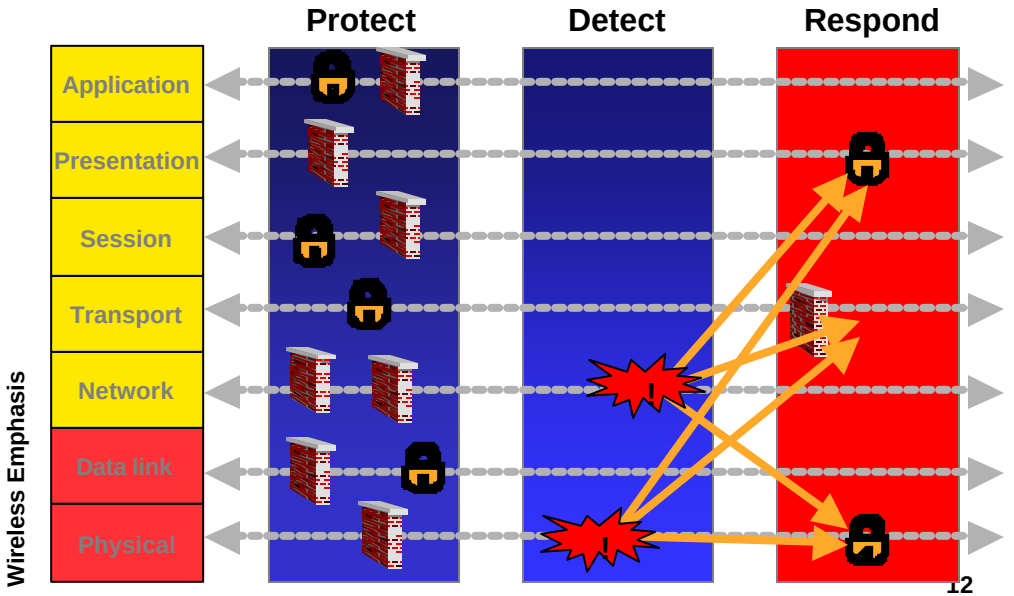
Current Projects:

- Wireless Intrusion Detection & Distributed Boundary Control
- Combined Access Point/Firewall/VPN/Intrusion Sensor Device
- Wireless & Mobile Authentication/Key Revocation
- Adaptive RF Wireless Nodes
- Software Defined Radio for Wireless Information Assurance
- Intrusion Detection Agents for Handheld Devices
- Automated Wireless LAN Compliance Monitoring Techniques
- AF Wireless Security Architecture Development
- DOD Overarching Wireless Policy Development

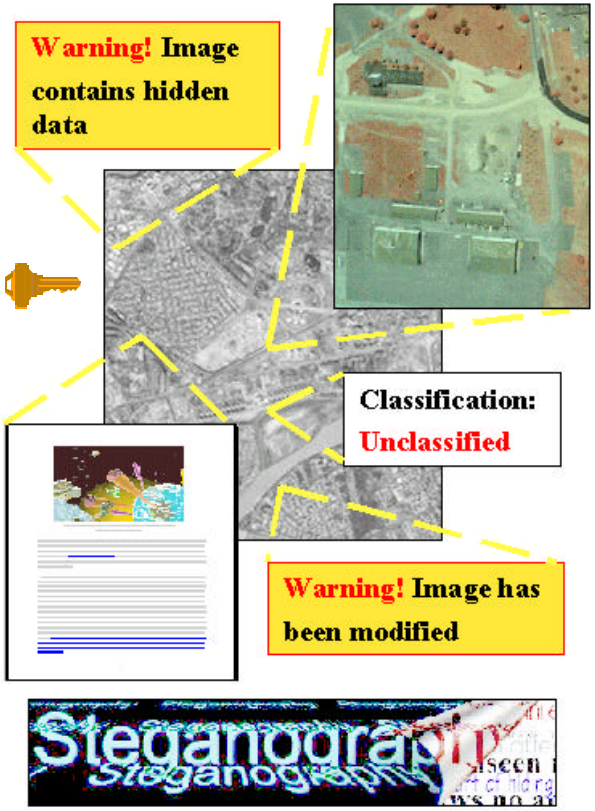
Accomplishments:

- Developed site survey and compliance monitoring techniques
- Created wireless architecture adopted by AF
- Developed and demonstrated wireless intrusion detection and policy violation detection techniques
- Provided key inputs to DOD overarching policy
- Assessed netstumbler.com threat in the context of AF base locations

Wireless IA Problem Space:



Smart Digital Data

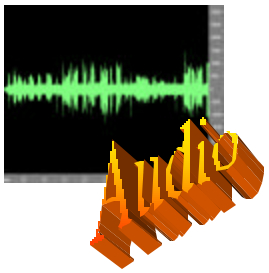


Data Hiding/Embedding

Steganography

Watermarking

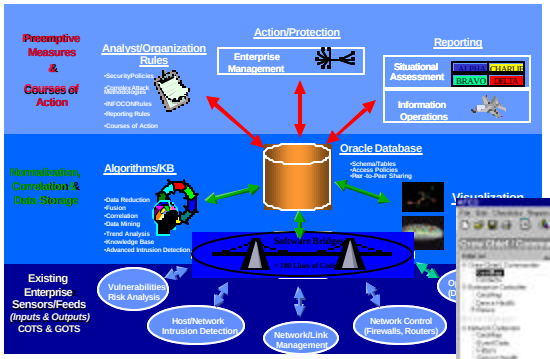
Steganalysis



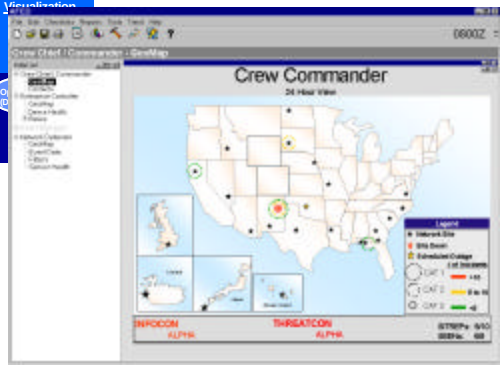
Technology Area Payoff

- Information Assurance
  - •data & source authentication
  - •tamper detection & data recovery
  - •automatic data dissemination through guards; classification & license marking
  - •detection & identification of adversary steganographic activity & extraction of hidden data
  - •tracing sources of data leaks
  - •minimize data loss (corrupt data pointers; invalid data headers)
- Information Enhancement
  - •embedded auxiliary information (images, documents, overlays, audio, links, etc.)
  - •multi-level data release to coalition forces; key-based access
  - •covert communication
  - •maximize throughput of communication channels

Air Force Enterprise Defense (AFED)



Infrastructure



Interface

Objectives

- Provide a Defense-in-Depth capability that integrates existing event information:
  - Policy Enforcement; Change/Configuration Management; Threat & Vulnerability Assessment with Countermeasure recommendations; Intrusion Detection; Network Management
- Fuse Information Assurance (IA) and Network Management data into a Common Enterprise Picture
- Provide a consistent visual environment for information portrayal

Approach

- Spiral tech exploration, development, validation, and feedback process
  - Automated Reporting for Containment and IO Targeting
  - Mission Situational Assessment
  - Automated Courses of Action

Transition Agents: ESC/DIGC, ESC/DIW
End Users: MAJCOM NOSCs, AFNOSC, CAOC-x

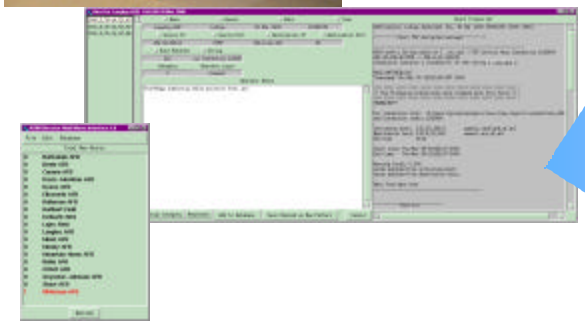
Payoffs

- Integrates existing enterprise sensors and provides enhanced Information Assurance and Enterprise Defense capabilities in support of the AF Protect-Detect-React/Restore model.
- Assists in the automated detection and reporting of information attacks, containment and restoration of compromised systems, and planning/protection of enterprise assets.
- Supports entire NOSC mission by cross-sharing of data among NOSC crew

Air Force Enterprise Defense

Moving from Data-Centric to Mission-Centric Operations

State of the Practice (NOSC Interface)



AF Enterprise Defense (AFRL Prototype)

Vision

- **"NOSC-in-a-box"—one application integrates all NOSC tools**
- **One application addresses needs of entire NOSC crew**

Summary

- **The AFRL/IF program includes all aspects of the IA problem**
  - **Protect**
  - **Detect**
  - **Assess**
  - **Respond**
- **Addressing the hard IA problems**
  - **Leading edge technology**
- **Addressing technology at all levels**
  - **Basic Research**
  - **Exploratory Development**
  - **Advanced Development**