Inherent Information Survivability

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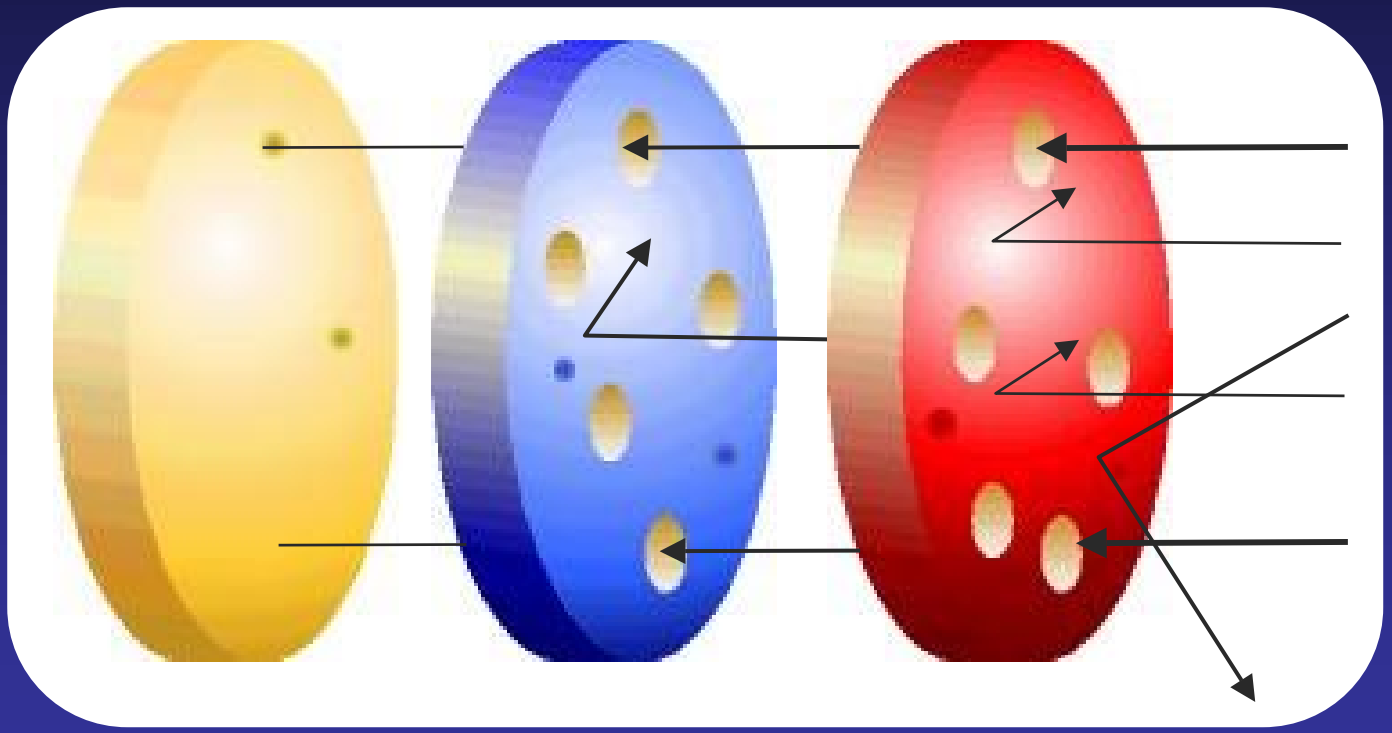
Layered Defense

Tolerate Detect Prevent



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DARPA Strategy

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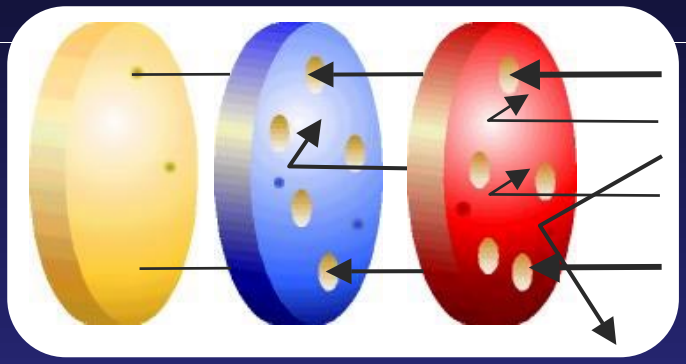
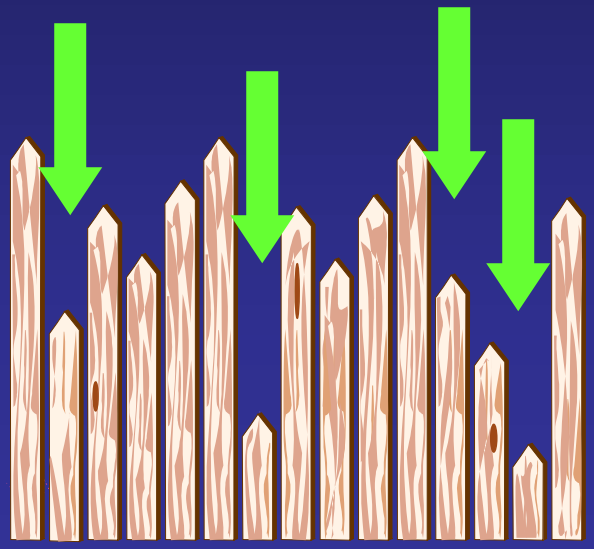
Address Critical Technology Gaps



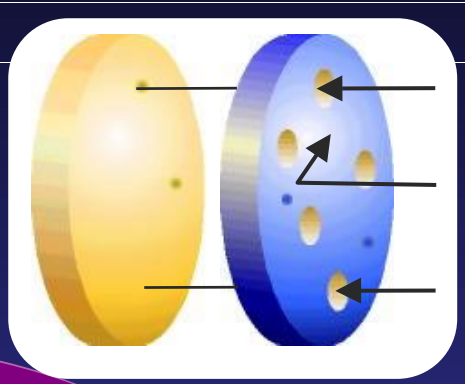
ISO

Integration for Balanced Protection

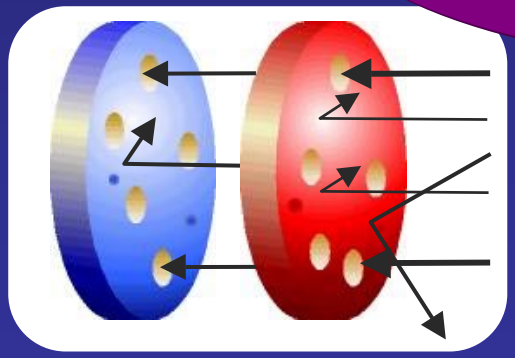


Roadmap

Inherent Survivability
1999-2003



ISO Info Assurance
1997-2000



Information Survivability
1995-1999

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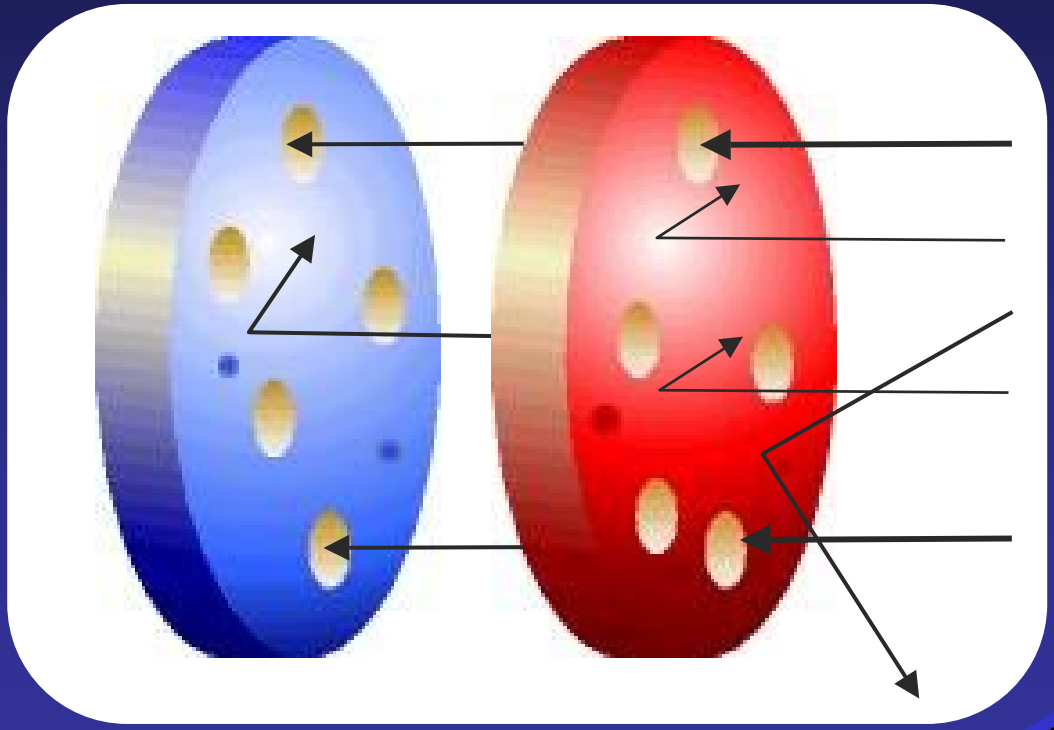
Accomplishments

Local Detection ***Strong Barriers***

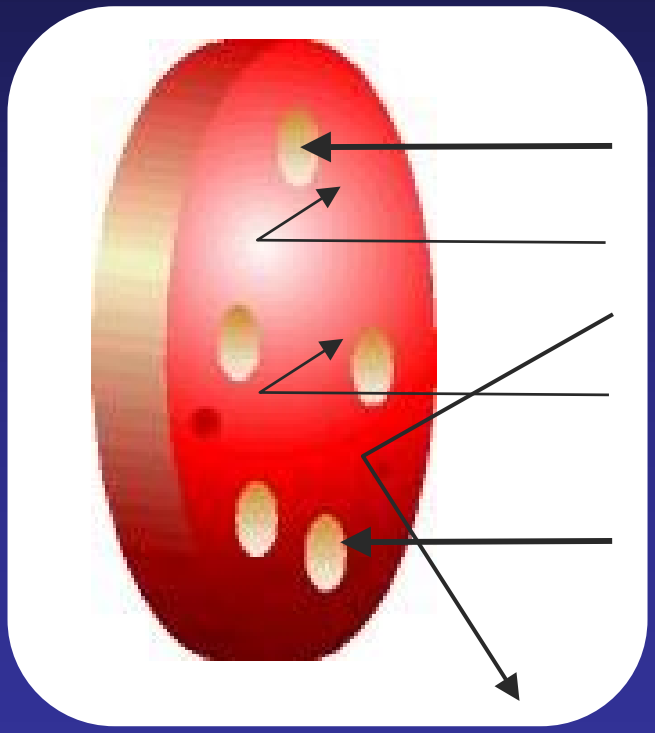
Information Survivability Program

1995-1999

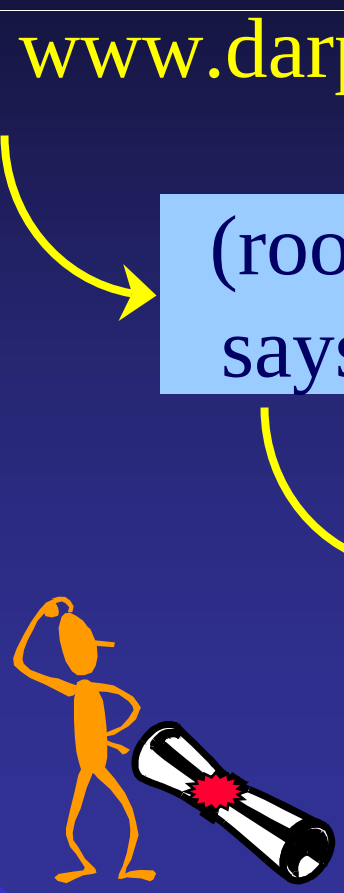


Strong Barriers

Develop strong barriers to penetration at all system levels



Network: DNS Security



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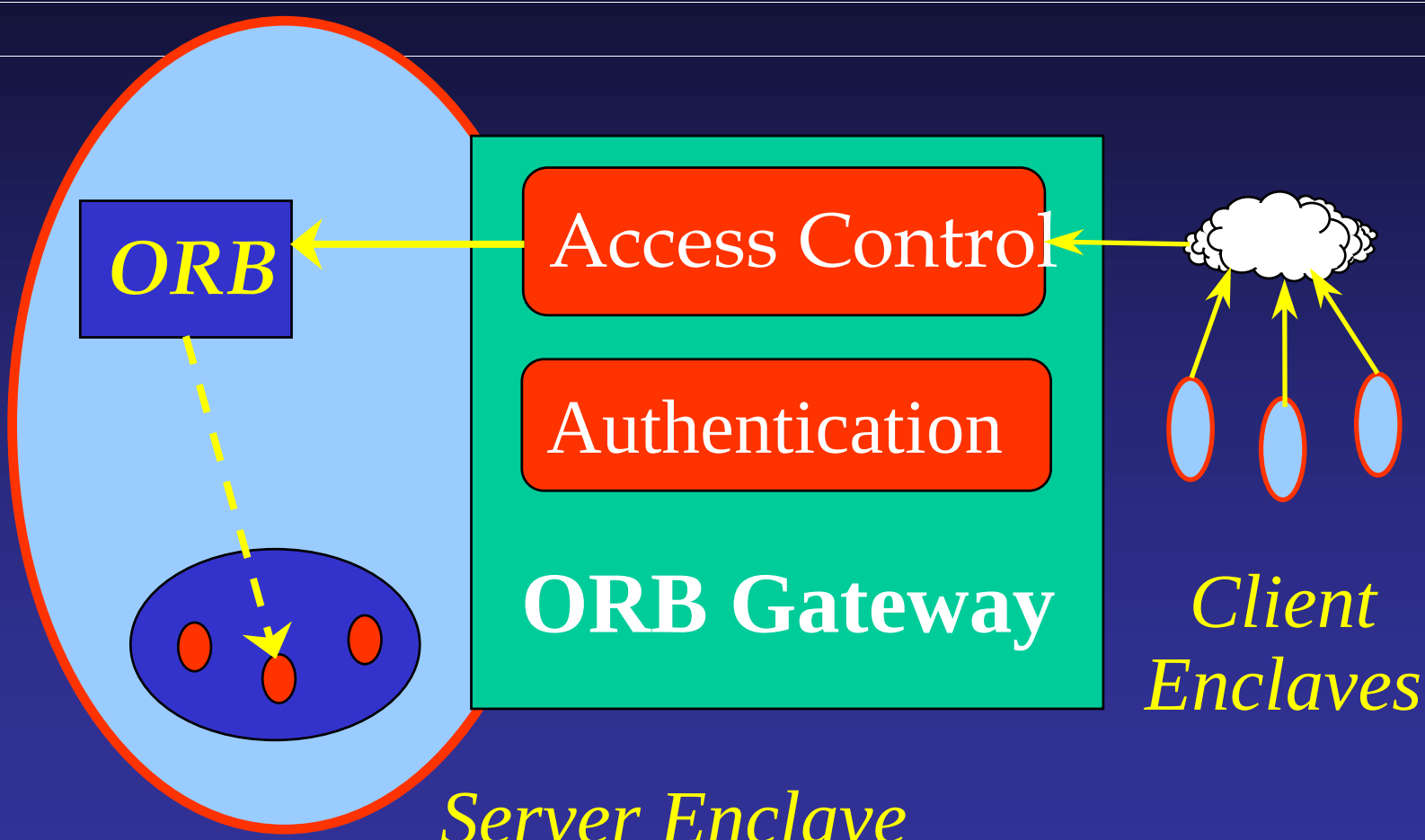
Middleware: CORBA



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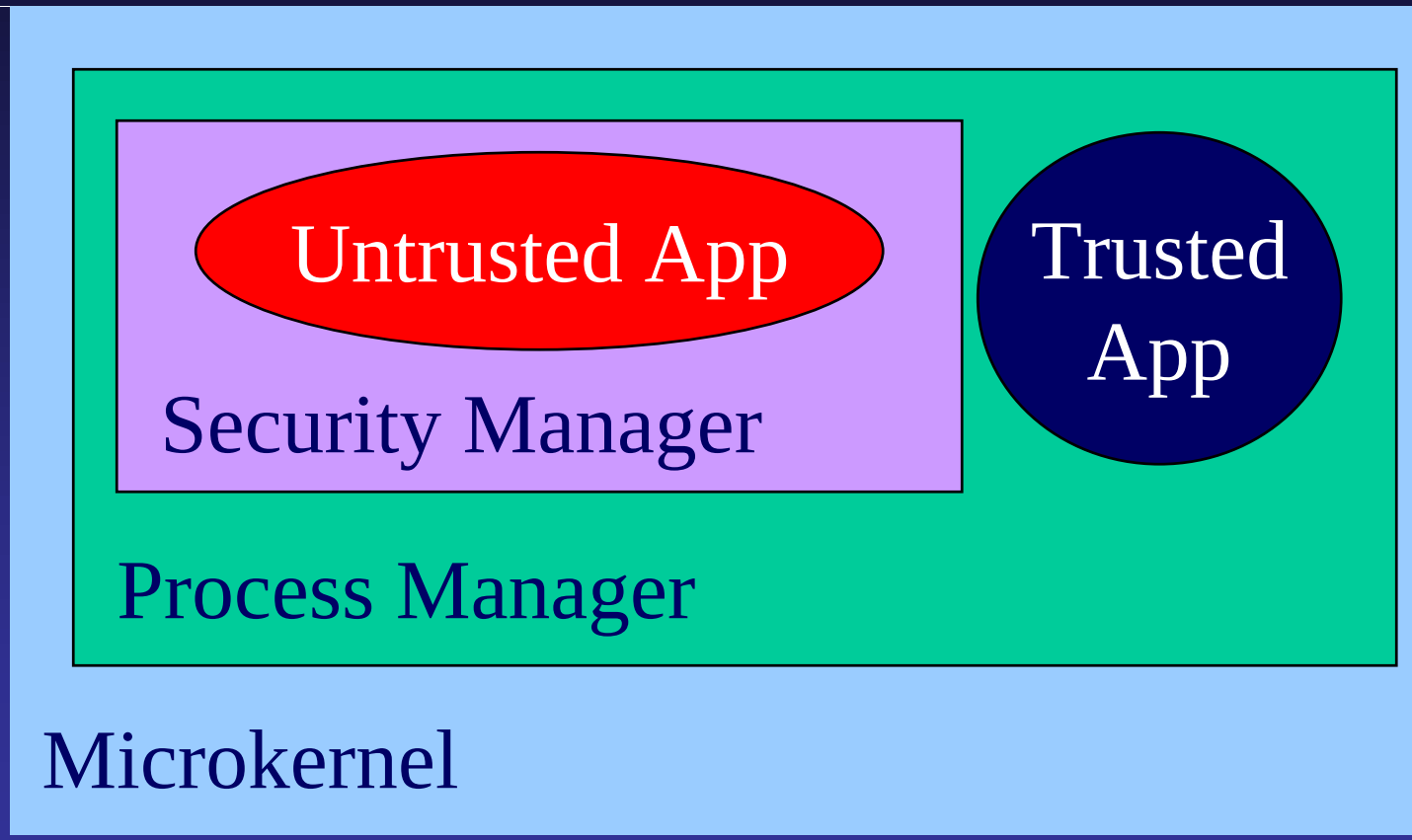
OS:Nested Processes



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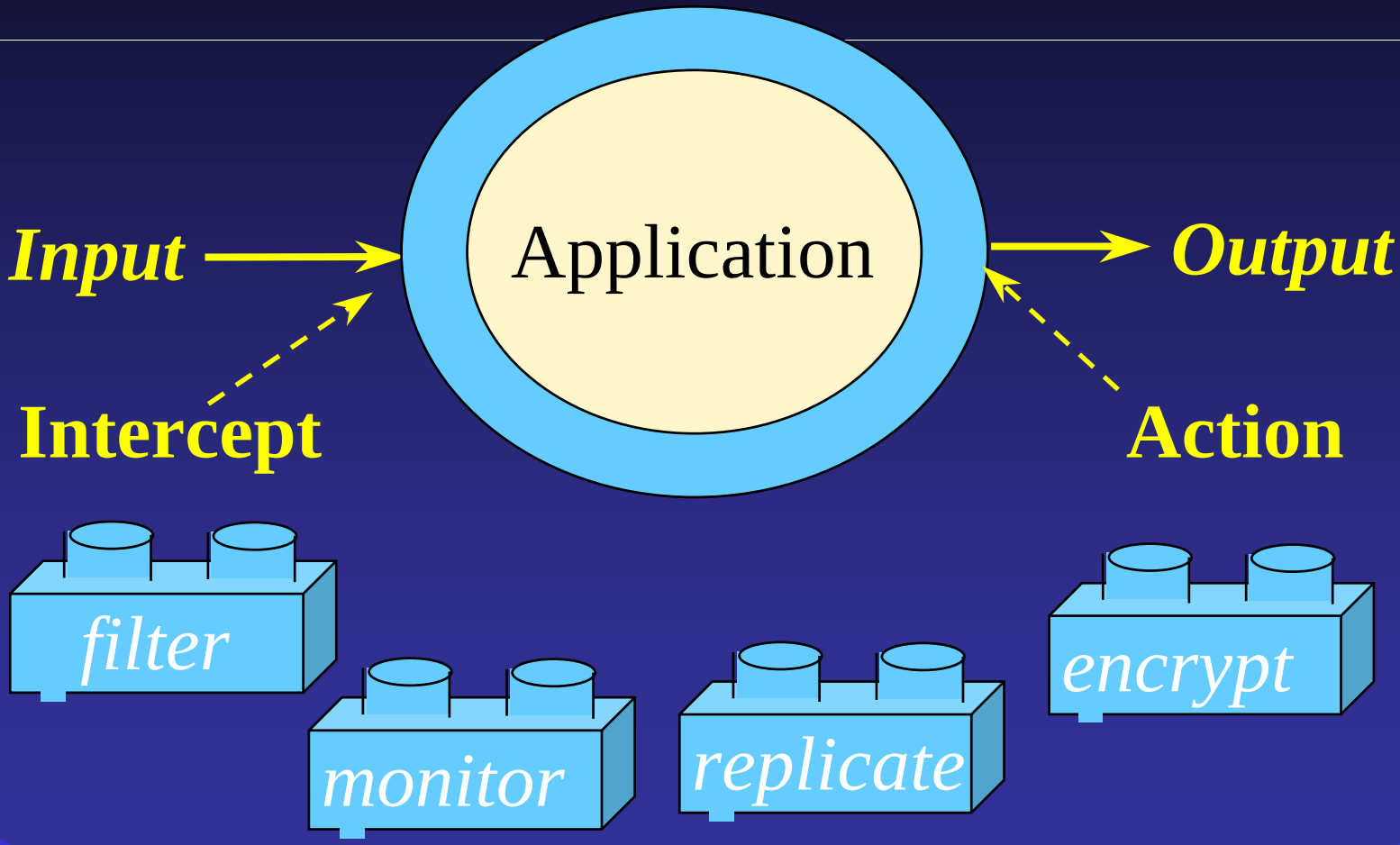
Application:Wrappers



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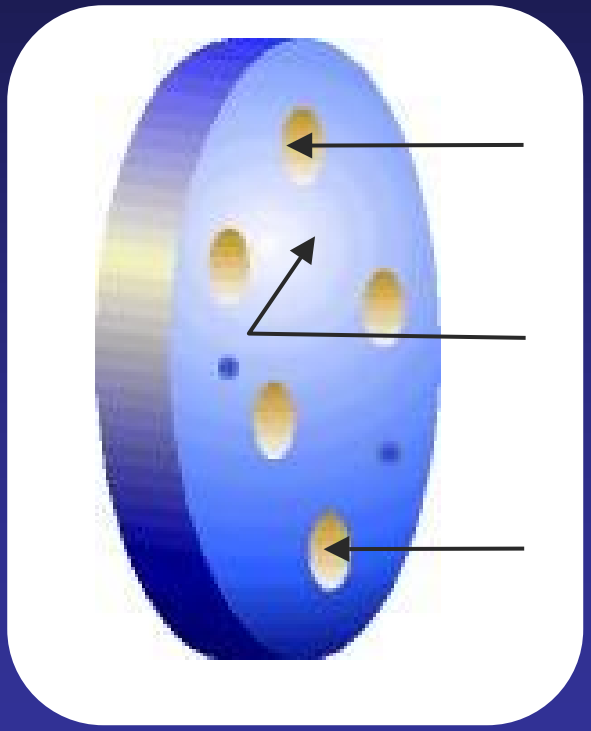
Local Intrusion Detection

Detect attacks locally with high confidence and low false alarm rate

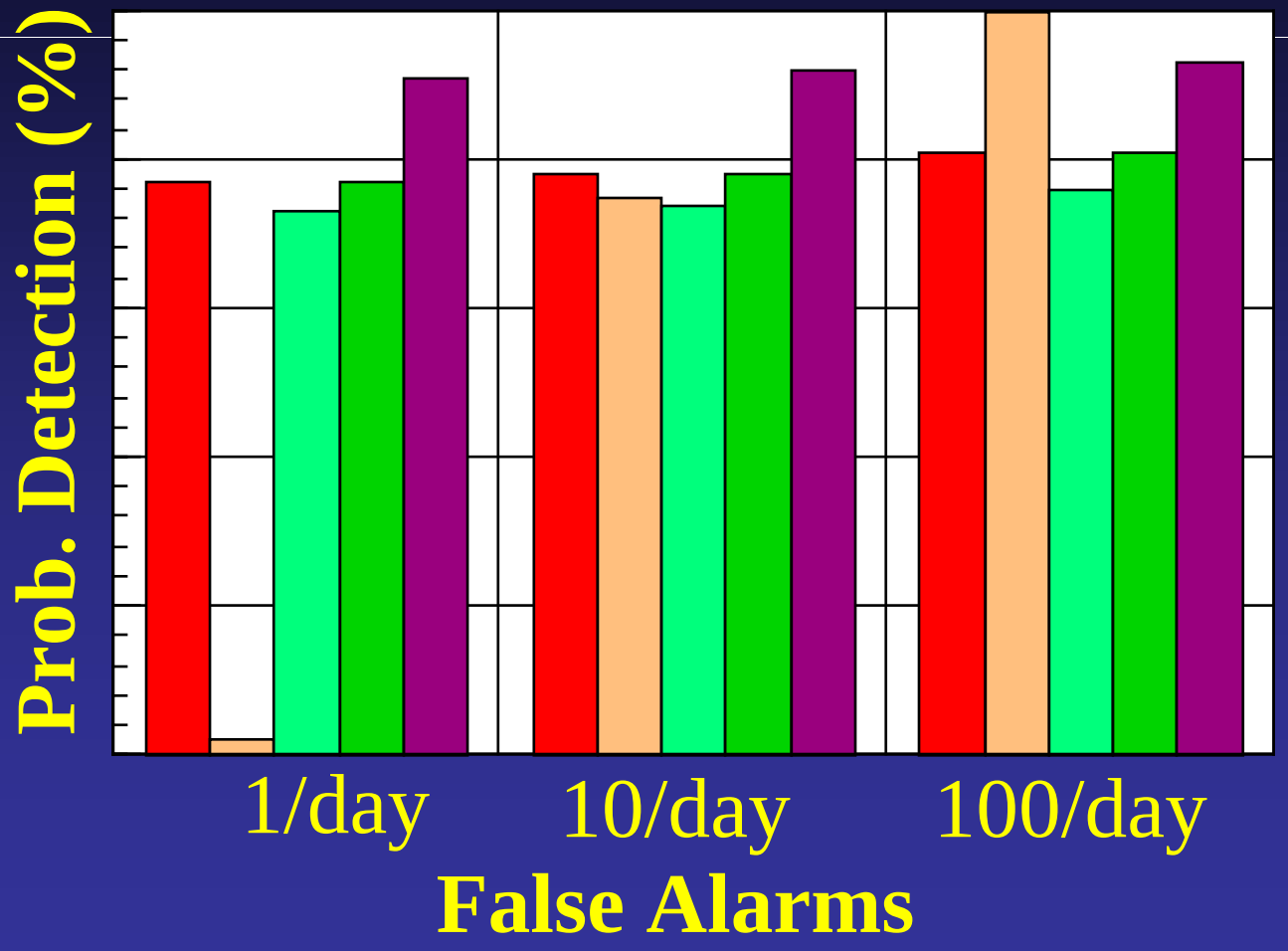


Intrusion Detection

- State-of-the-Practice
  - Pattern matching on known attacks
- Program focus
  - Statistical Anomaly Detection
  - Model-Based Profiles

Detect Previously Unknown Attacks

Sample Results



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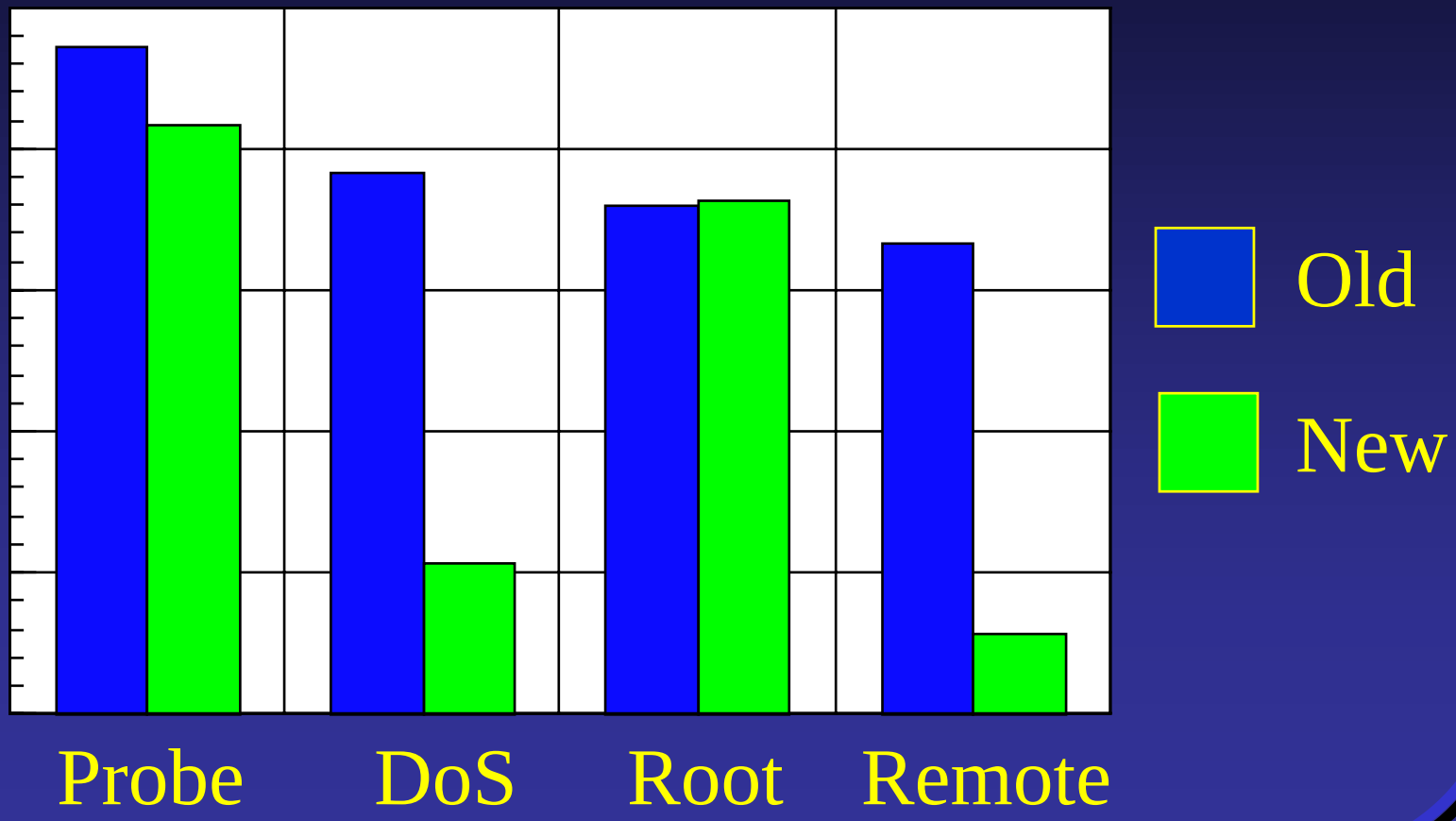
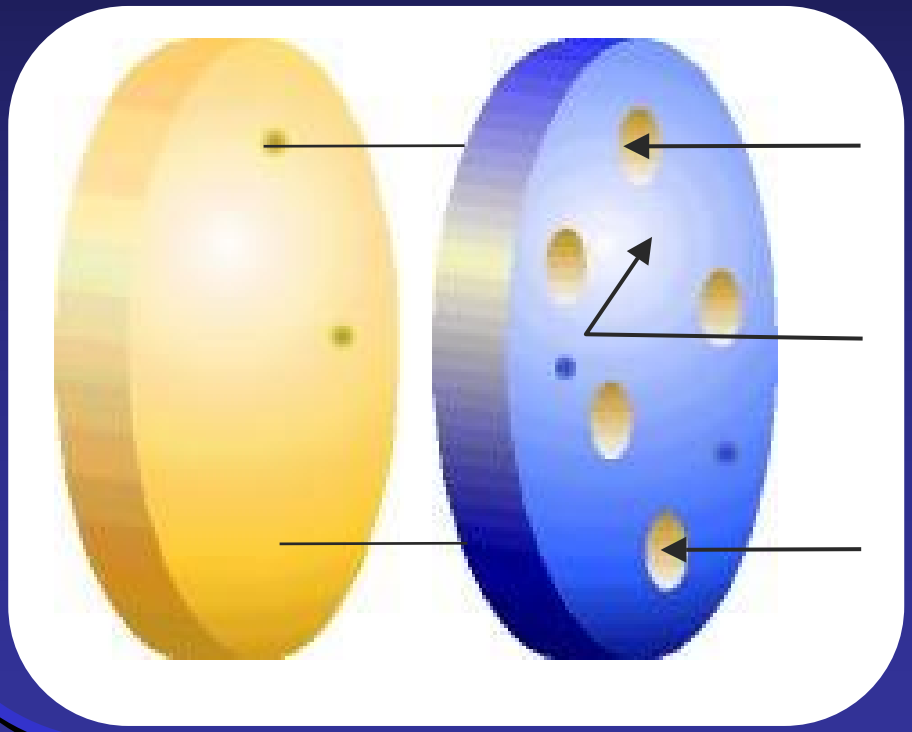
Old vs New Attacks



New Directions

Intrusion Tolerance

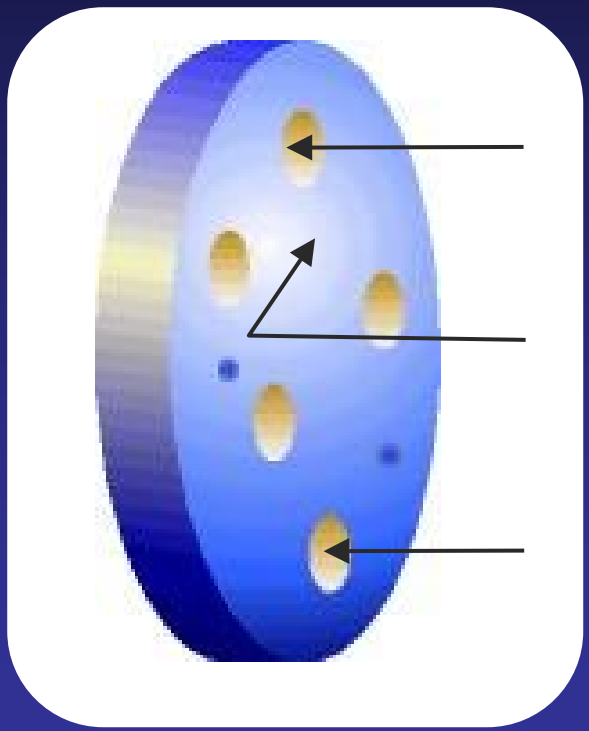
Global Detection



Inherent Survivability Program

1999-2003

Global Detection



Distinguish events of elevated significance from those of only local interest

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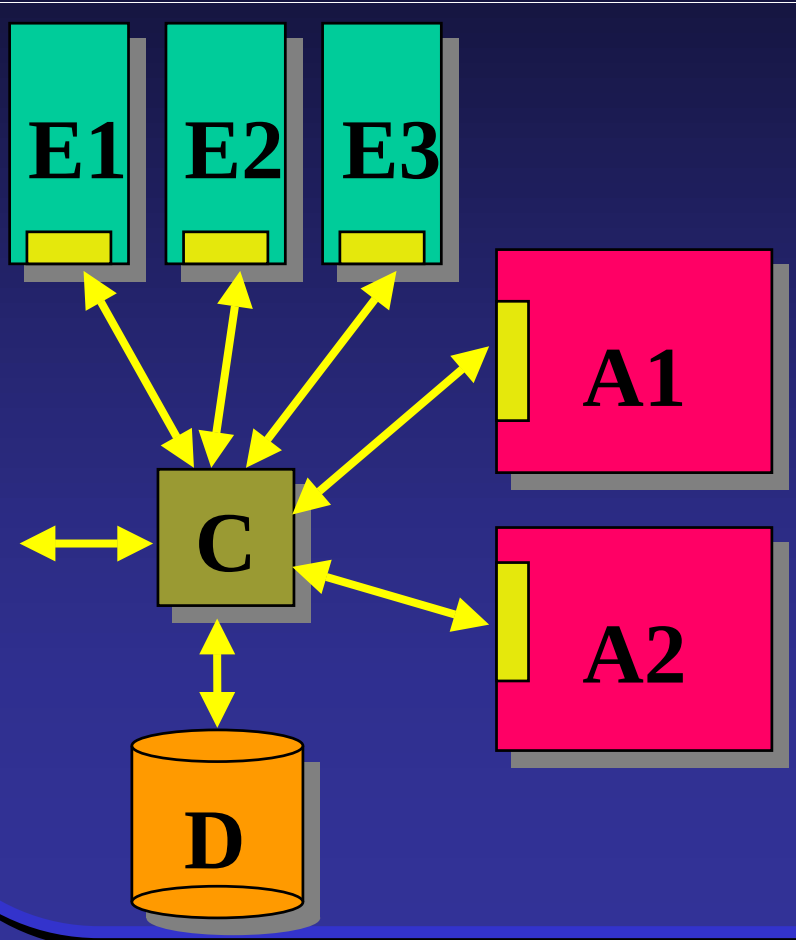
Common Intrusion Detection Framework



E Event Generator
A Event Analyzer
D Event Database
C Controller

Standard API

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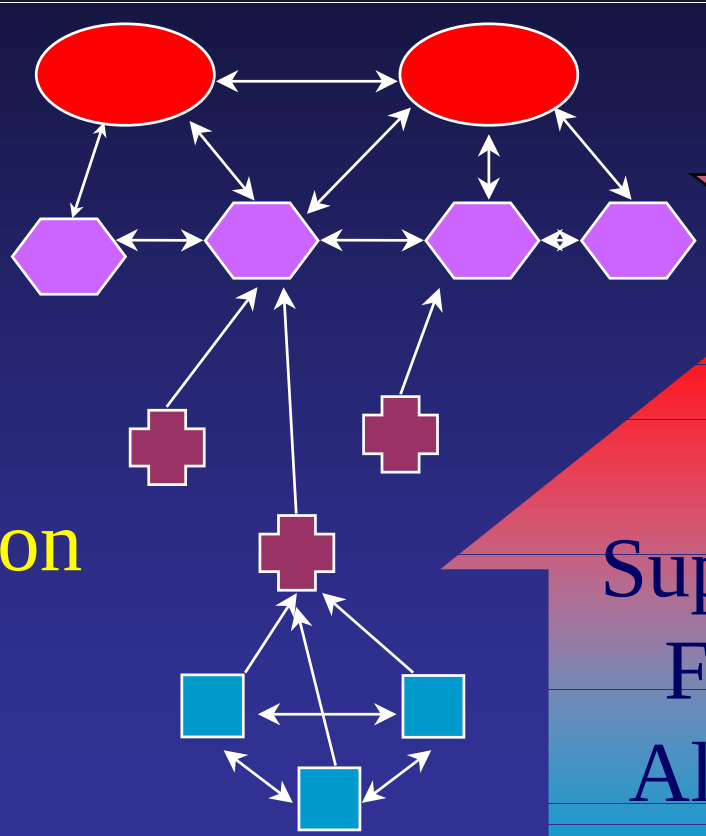
Intrusion Assessment

National

DoD

Organization

Local



Global Context

Suppress False Alarms

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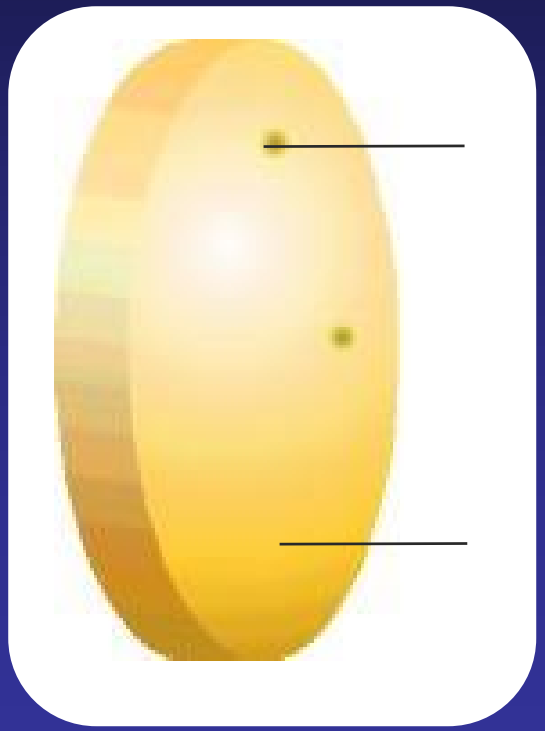
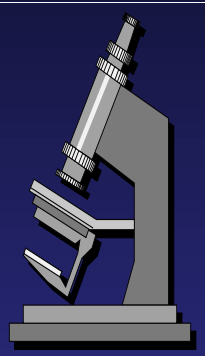
Intrusion Tolerant Systems



Maximize ability to continue critical operations following partial compromise

Data Integrity Marks



Wrapper:

- Verifies Marks
- Adds New One

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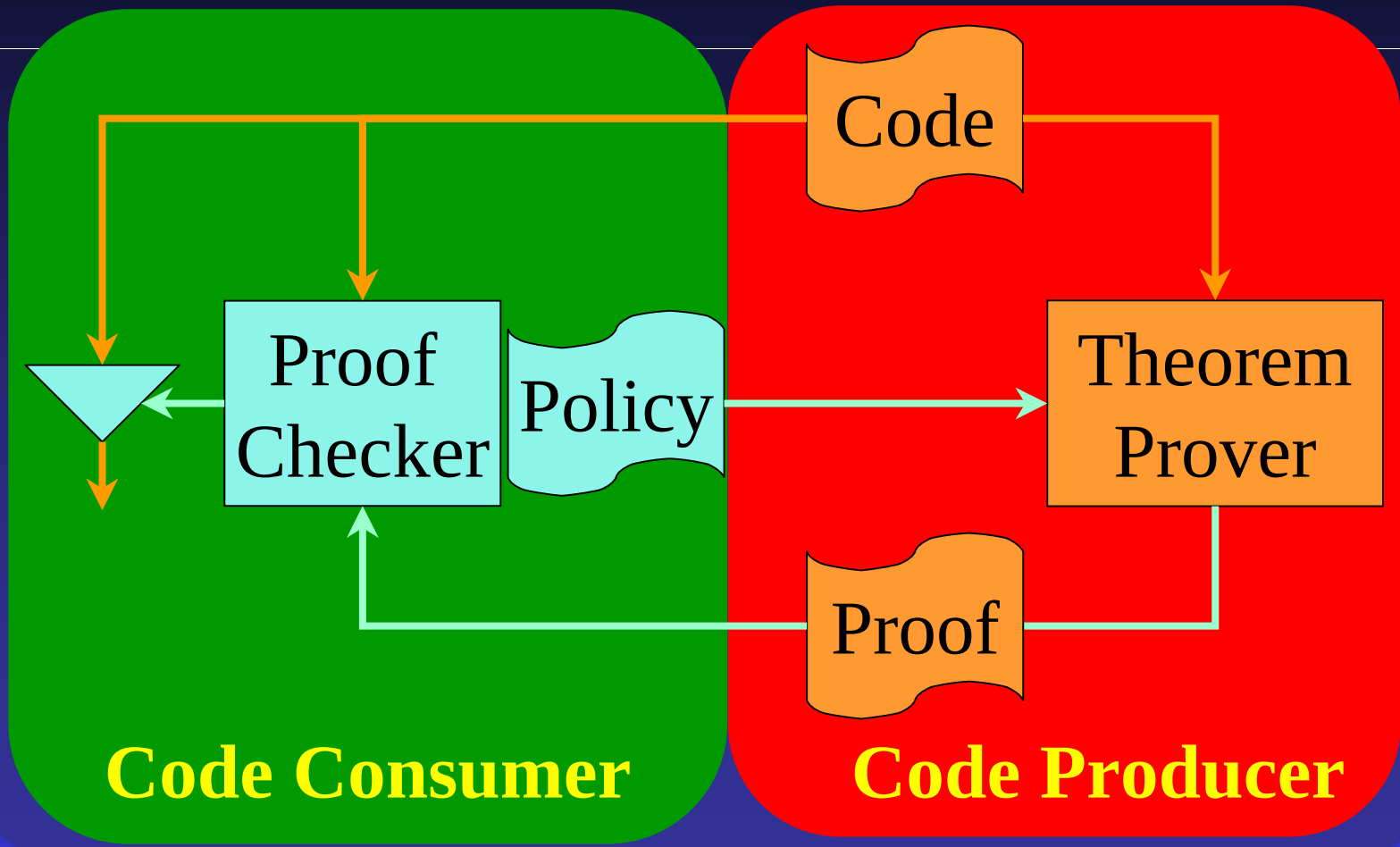
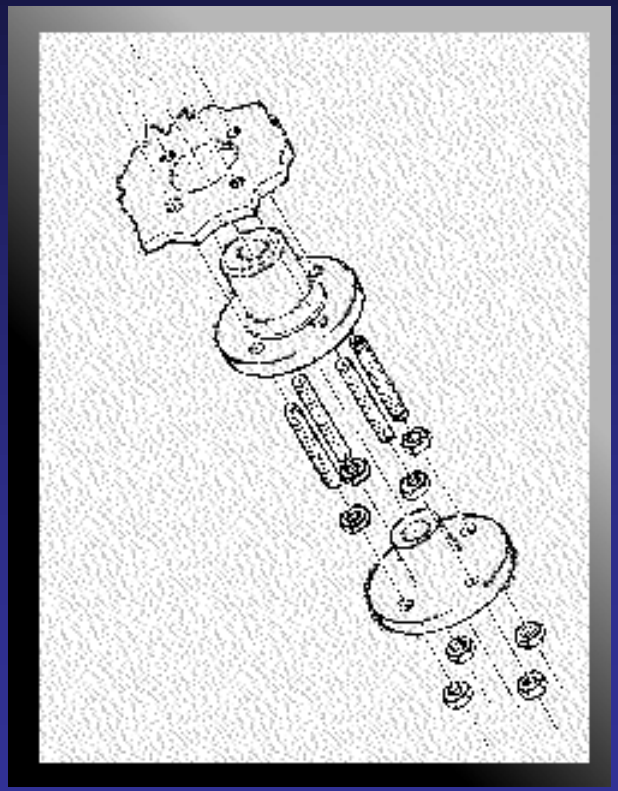
Proof Carrying Code



Tolerant Software

Analogy to Mechanical Parts



Tolerate:

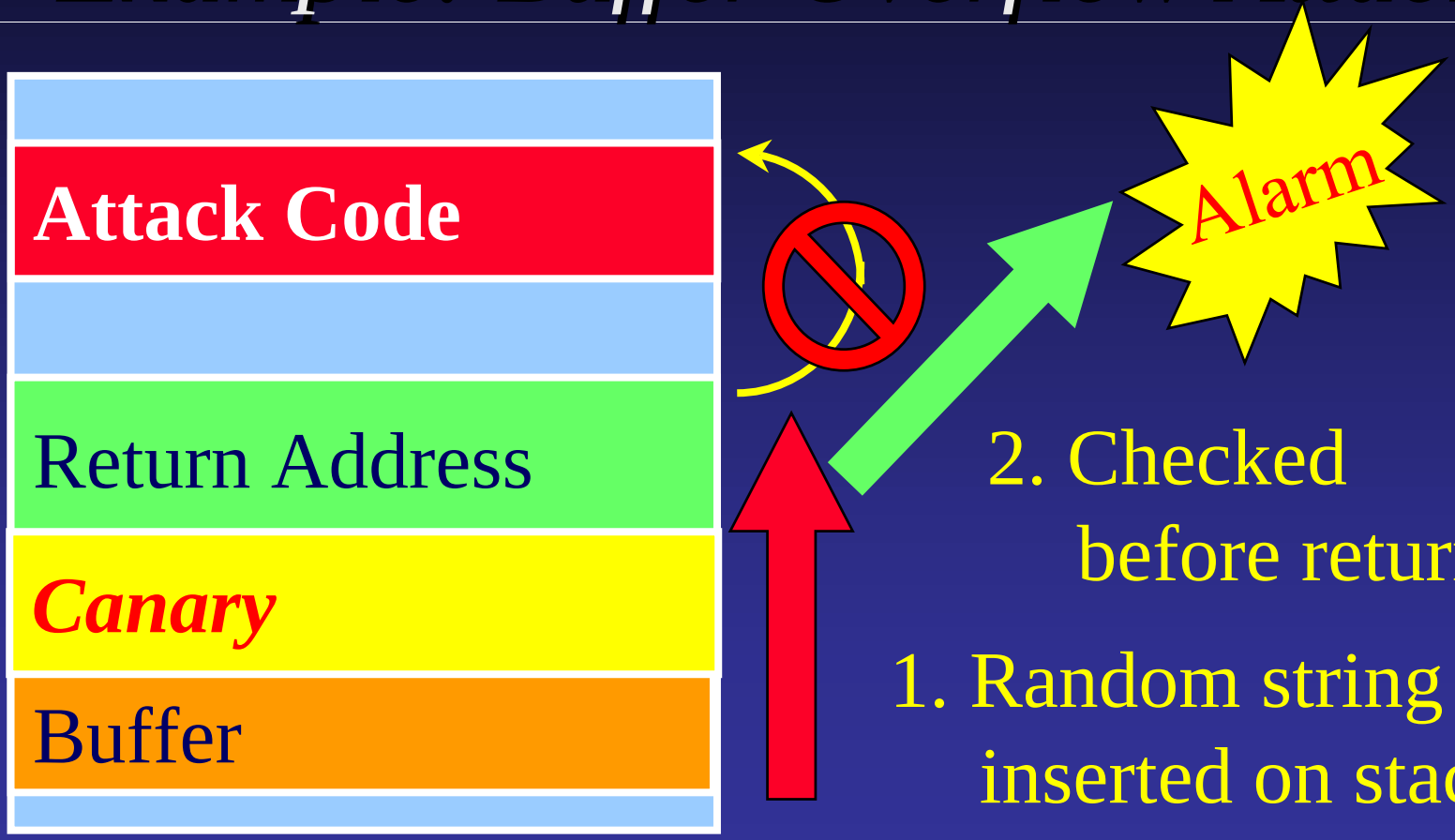
- Imprecision
- Completeness
- Latency

Ideas

- Active interfaces
- Probabilistic methods

Artificial Diversity

Example: Buffer Overflow Attack



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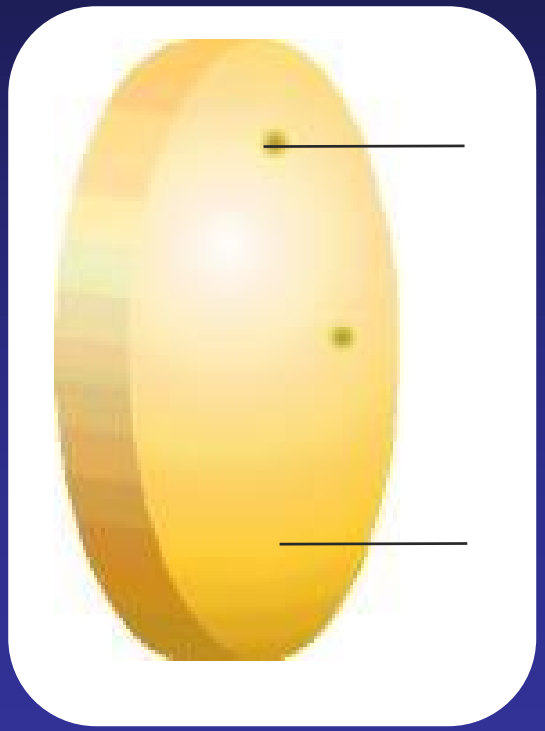
Intrusion Tolerant Networks



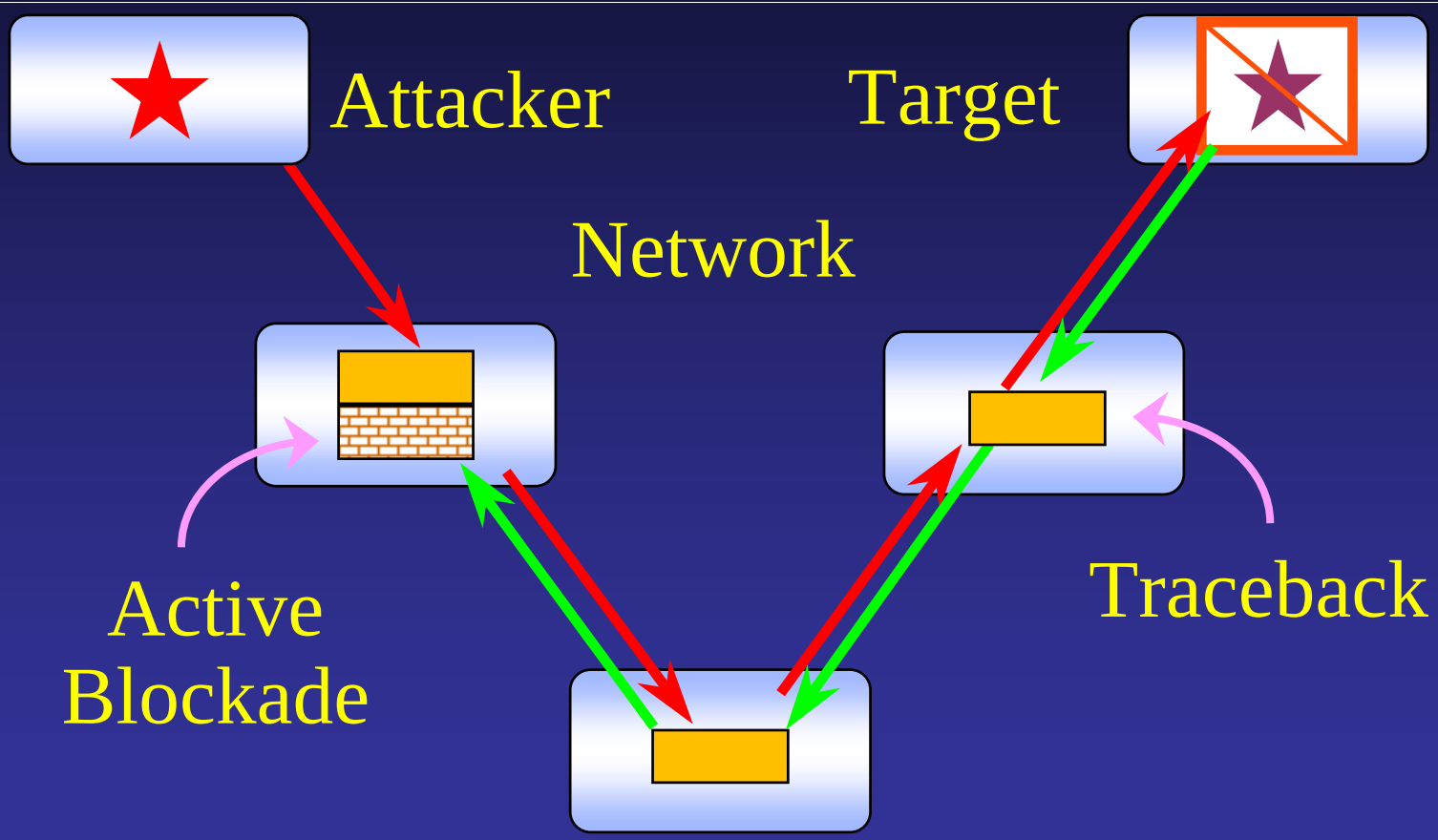
Maximize residual capacity of network infrastructure following partial compromise

Denying Denial-of-Service

Constrain attacker's resource consumption

- Market-Based Allocation
- Progress-Based Protocols

Active Net Response



Layered Defense

Tolerate **Detect** **Prevent**