
# Information Assurance
# &
# Computer Security Incident Response
## Past, Present, Future

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# We heard about the worm on 11/2/88

Source: Spafford, Eugene H.,1988,"The Internet Worm Program: An Analysis," Purdue Technical Report CSD-TR-823, West Lafayette, IN: Purdue University

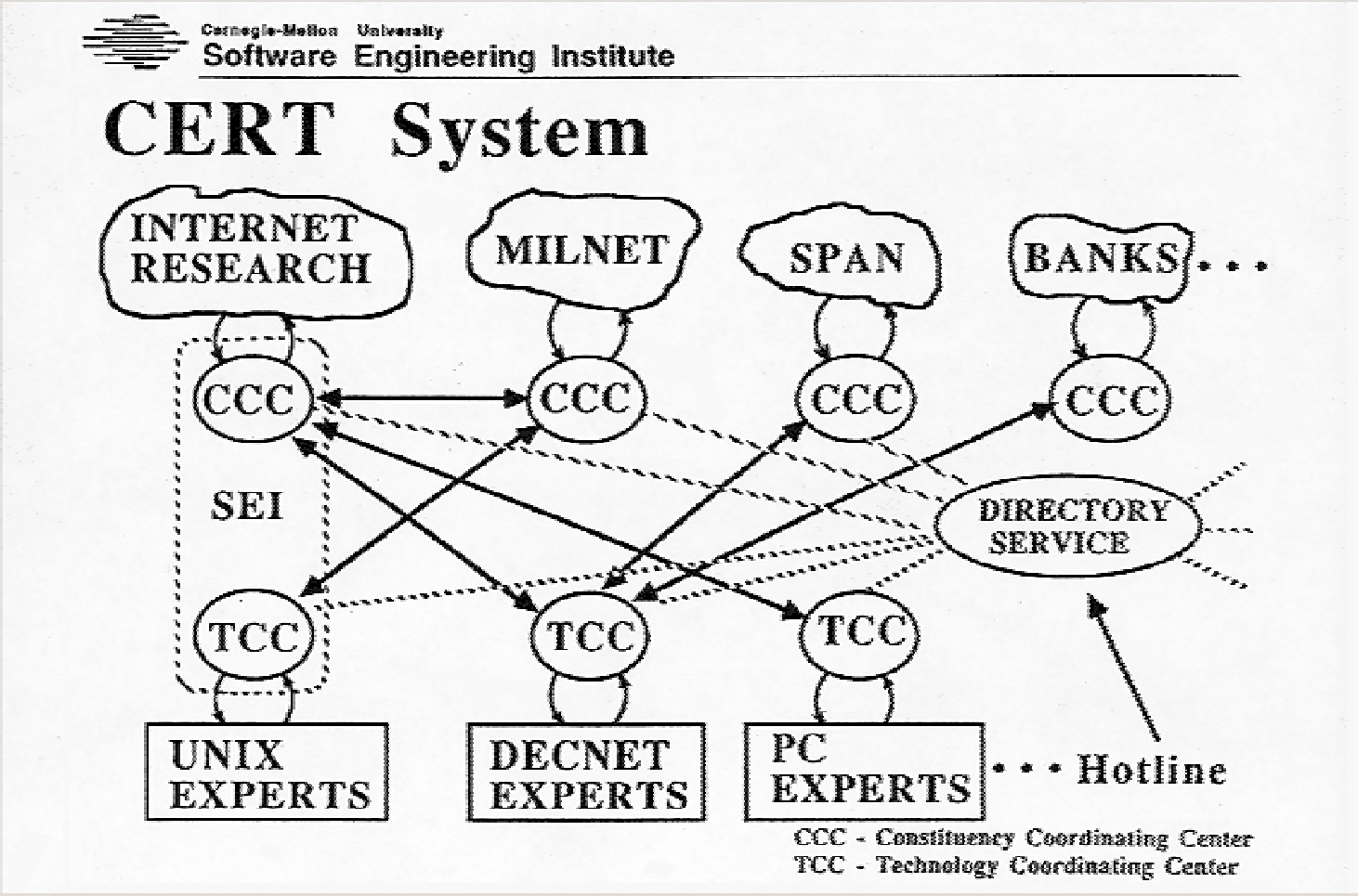
"On the evening of 2 November 1988, someone infected the Internet with a worm program. … This infection eventually spread to thousands of machines, and disrupted normal activities and Internet connectivity for many days."

# …it was the catalyst for the CERT/CC

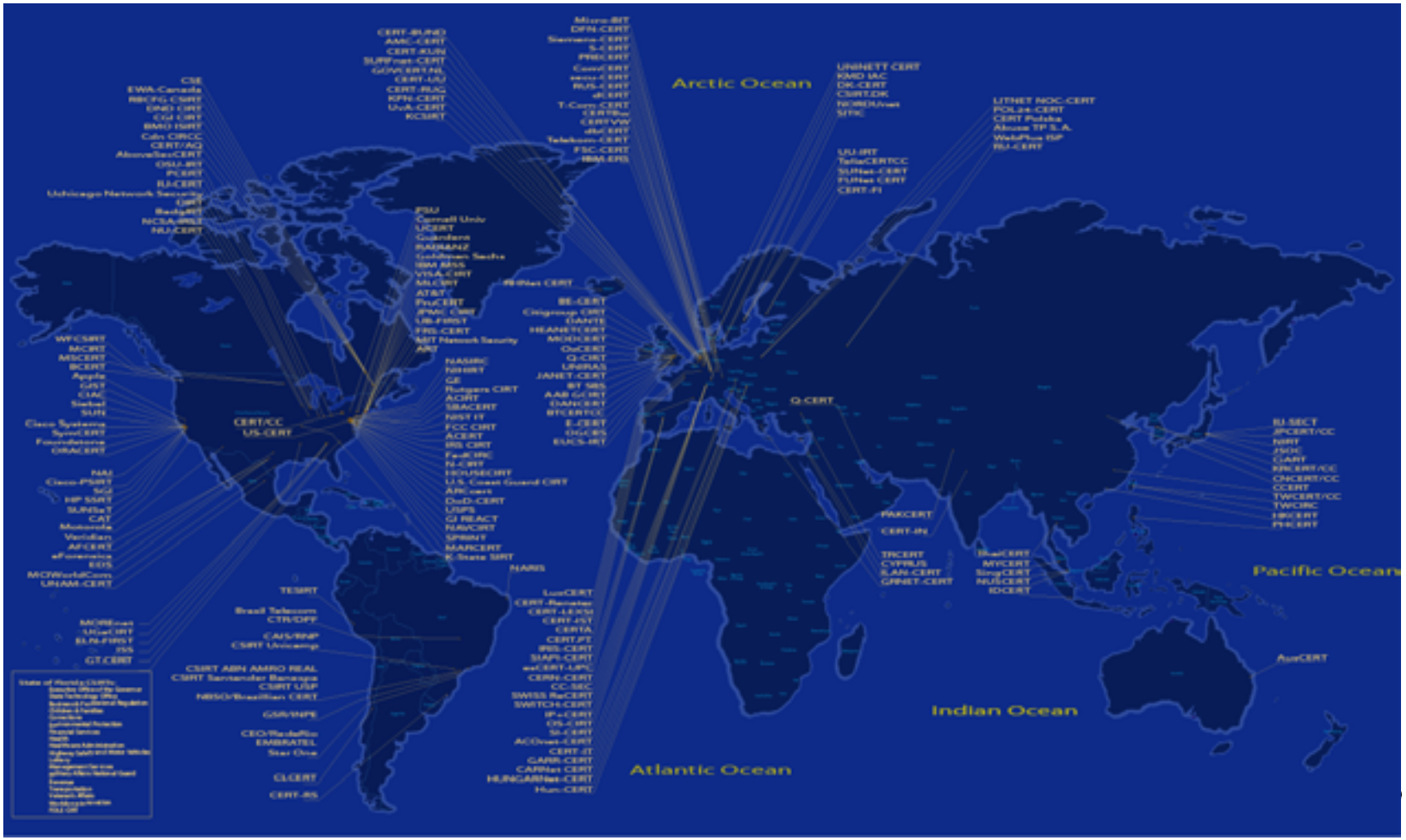
The SEI established, with DARPA sponsorship, The Computer Emergency Response Team Coordination Center in 1988.

"The CERT/CC's mission is to respond to security emergencies on the Internet, serve as a focal point for reporting security vulnerabilities, serve as a model to help others establish incident response teams, and raise awareness of security issues."

# The early vision



# International cooperation speeds response to Internet security breaches.



# But there were ARPAnet attacks in 1986

Source: Stoll, Clifford, 1989, The cuckoo's egg: tracking a spy through a maze of computer espionage, New York, NY: Pocket Books

"The hacker's code name was "Hunter" – a mystery invader hiding inside a twisting electronic labyrinth, breaking into U.S. computer systems and stealing sensitive military and security information"

# Hackers were once a nuisance

Source: Time Magazine, December 12, 1994

Newsday technology writer & hacker critic found:

- Email box jammed with thousands of messages
- Phone reprogrammed to an out of state number where caller's heard an obscenity loaded recorded message

# Then it got more serious

Source: PBS website report on Phonemasters (1994 – 1995)

An international group attacked major companies: MCI WorldCom, Sprint, AT&T, and Equifax credit reporters.

- had phone numbers of celebrities (e.g. Madonna)
- Had access to FBI's national crime database.
- Gained information on phones tapped by FBI & DEA
- Created phone numbers for their own use

# … and profitable

Source: PBS web site report on Vladimir Levin (1994)

Russian hacker accessed Citibank computers and transferred $10M to his accounts using passwords and codes stolen from Citibank customers

- Citibank & FBI tracked Levin
- all but $400,000 recovered

# Software Blamed for Problems

Source: Business Week Cover Story, December 6, 1999

"Software Hell

Bugs, viruses, complexity

Is there any way out of this mess"

# DDOS attacks become a reality

Source: Seattle Post-Intelligencer Staff and News Services; February 9, 2000

Operations of major e-commerce & web sites seriously disrupted

- Amazon.com, eBay, CNN, others

# Links made with organized crime

Source: Ecommerce Times – March 9, 2001

FBI advises that Eastern European hacker groups stole information from e-commerce & online banking sites

- 40 firms in 20 states, lost over 1M credit card numbers
- credit card information sold to organized crime entities.
- the criminal groups usually try to sell security services to victim sites

# The relationships grow

Source: New York Times News Service, May 13, 2002

Eastern European Internet sites traffic in tens of thousands of stolen credit-card numbers weekly

- Claims financial loses of over $1B/year
- Cards prices at $.40 to $5.00/card – bulk rates for lots of hundreds or thousands
- Organized crime groups buying from black-hat hackers

# Spyware Targets Individuals

Source: The Register, Aug 30 2002

Spyware freely available

- Distributed via email
- Logs keystrokes and copies all email
- Sends recorded information to a specified email address

# Extortion

Source: U.S. Dept. of Justice Press Release - July 1 2003

- Oleg Zezev, a/k/a "Alex," a Kazakhstan citizen, sentenced to 51 months in prison following his conviction on extortion and computer hacking charges.
- Convicted of hacking into Bloomberg L.P.'s computer system; stealing confidential information and threatening public disclosure if $200,000 not paid.

# Bot Nets for Hire

Source: Technology Review - September 24, 2004

- Rent pirated computers for $100/hour
- Average rate in underground markets
- Used for sending SPAM, launching DDOS attacks, distributing Pornography, etc..

# Going “phishing”

## Definition

- Phishing: fraudulent email and websites used to lure recipients into divulging sensitive information such as credit card numbers, social security numbers, bank account numbers & PINs, etc.

## A rapidly growing problem

- Anti phishing working group (www.antiphishing.org)
  - Dec. 03 – reports increase 400% over holidays
  - Feb. 04 – reports increase 50% in January
  - March 04 – reports increase 60% in February
  - April 04 – reports increase 43% in March
  - May 04 – reports increase 180% in April
  - Jan 05 – 300% increase over May 04

# Identity theft flourishes -1

Chronicle, October 21, 2004 – reports on theft of Social Security numbers from UC Berkeley systems; 600,000 Californians effected

Associated Press, November 4, 2004 – reports a former University of Texas student indicted on hacking into UT's system and stealing Social Security numbers and other personal information from more than 37,000 students and employees.

# Identity theft flourishes -2

Los Angeles Times, November 4, 2004 – reports four computers stolen from Wells Fargo; lost Social Security numbers of customers

Computerworld, January 10, 2005 – reports hacker steals names, photos and Social Security numbers of more than 32,000 students and staff at George Mason University

# Identity theft flourishes -3

news.com, Feb 15, 2005 – reports ChoicePoint confirmed that criminals accessed its database of consumer records, potentially viewing the data of about 35,000 Californians;  at least one case of identity fraud.

# A growing electronic crime infrastructure

Source: Baseline Mag, March 7, 2005

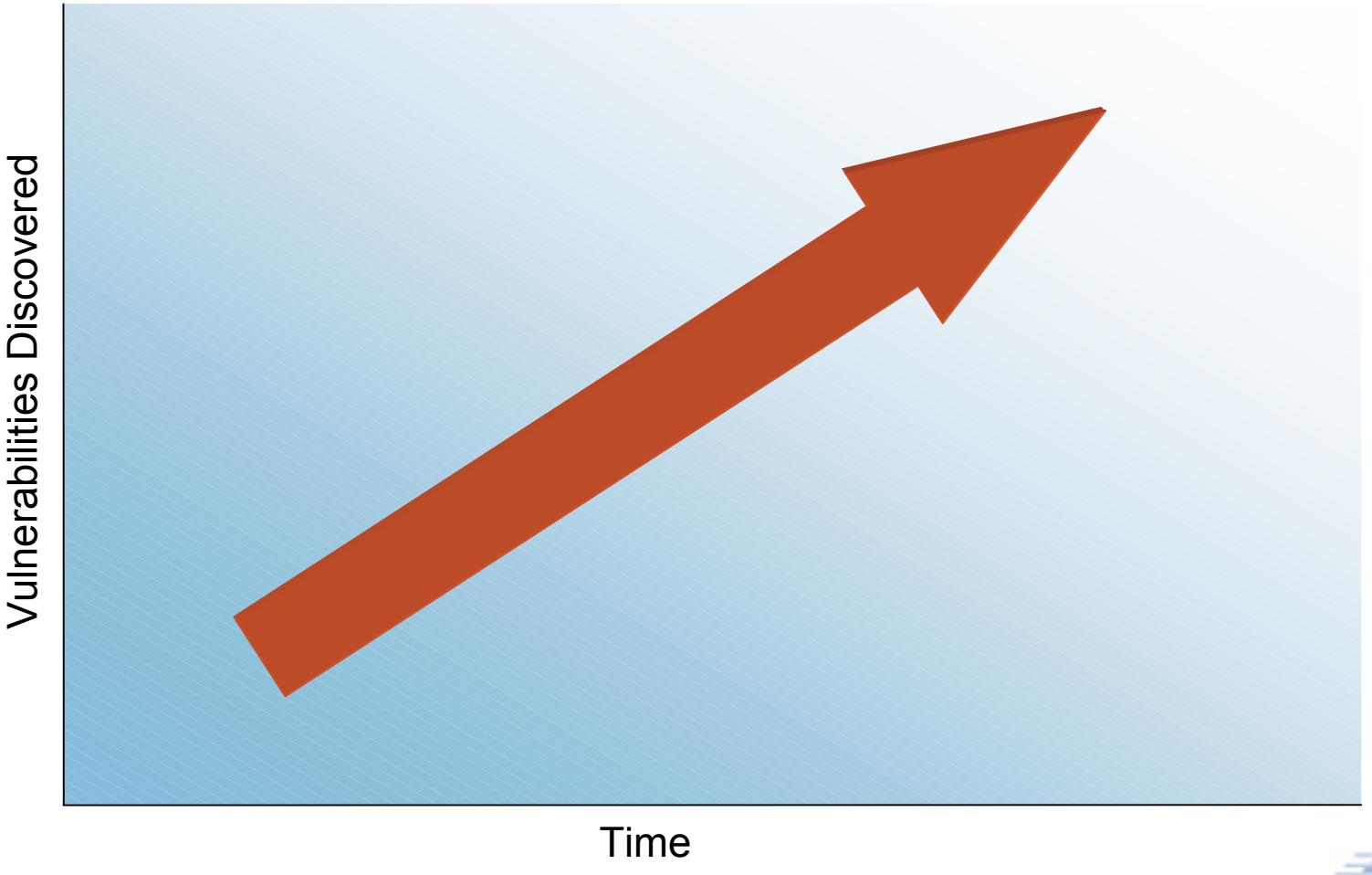
- Web mobs named carderplanet, stealthdivision, darkprofits and the shadowcrew
  - Buy and sell millions of credit card numbers, social security numbers and identification documents
  - Often for less than $10 each
  - Build sites and services to create more skilled, like-minded organizations.
- U.S. Secret Service said Shadowcrew had 4,000 members
  - Sold 1.5 million credit card numbers, 18 million e-mail account and other ID documents
  - Sold to highest bidders

# With links to terrorist activities

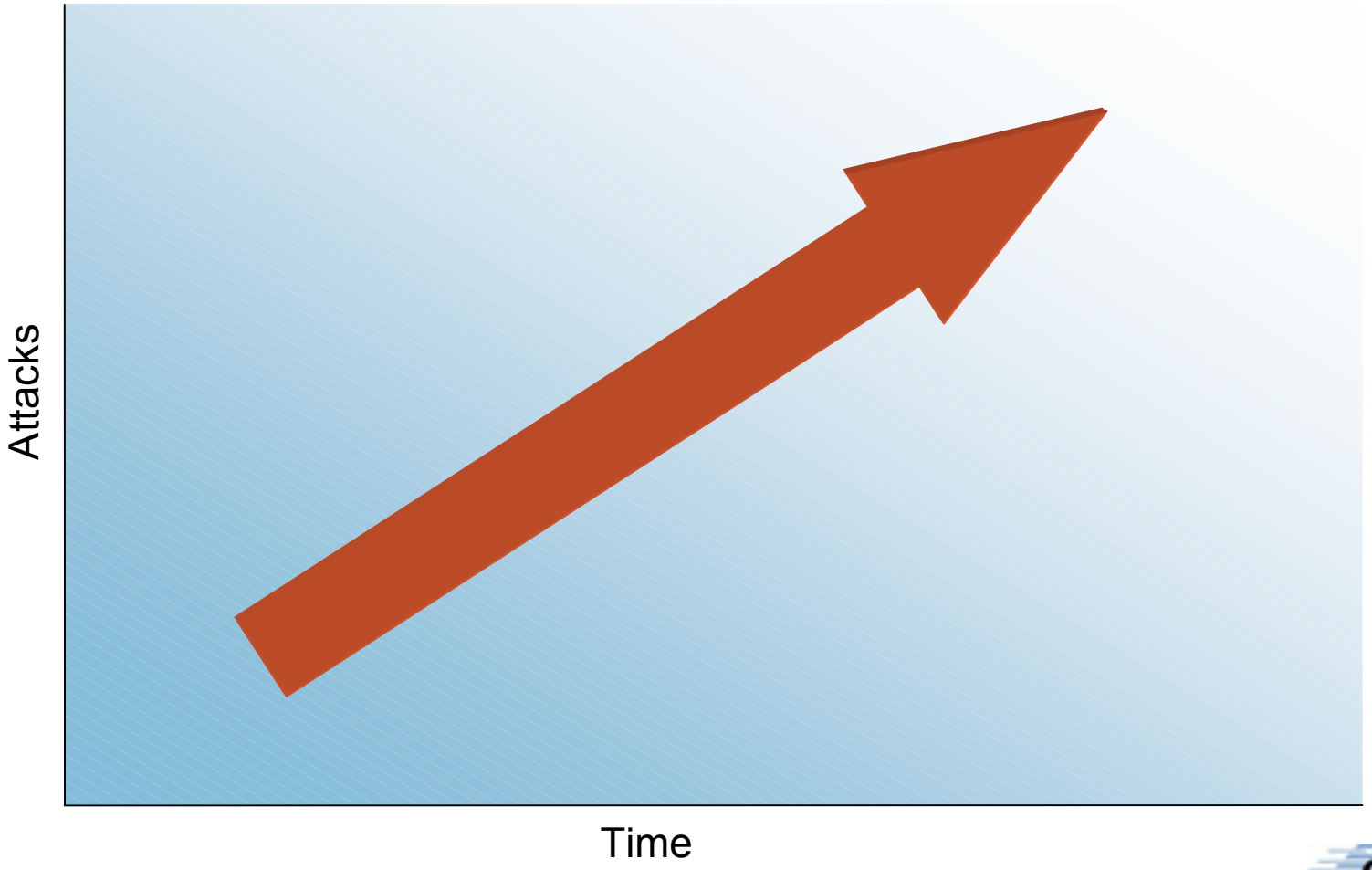
Source: Testimony of  Mr. Dennis Lormel, FBI; Senate Subcommittee on Technology, Terrorism and Government Information - July 9, 2002

- Terrorists have used identity theft & Social Security Number fraud to obtain employment and access to secure locations.
- Also used by terrorists to obtain Driver's Licenses, bank and credit card accounts through which terrorism financing is facilitated.
- Terrorist cell in Spain used stolen credit cards in

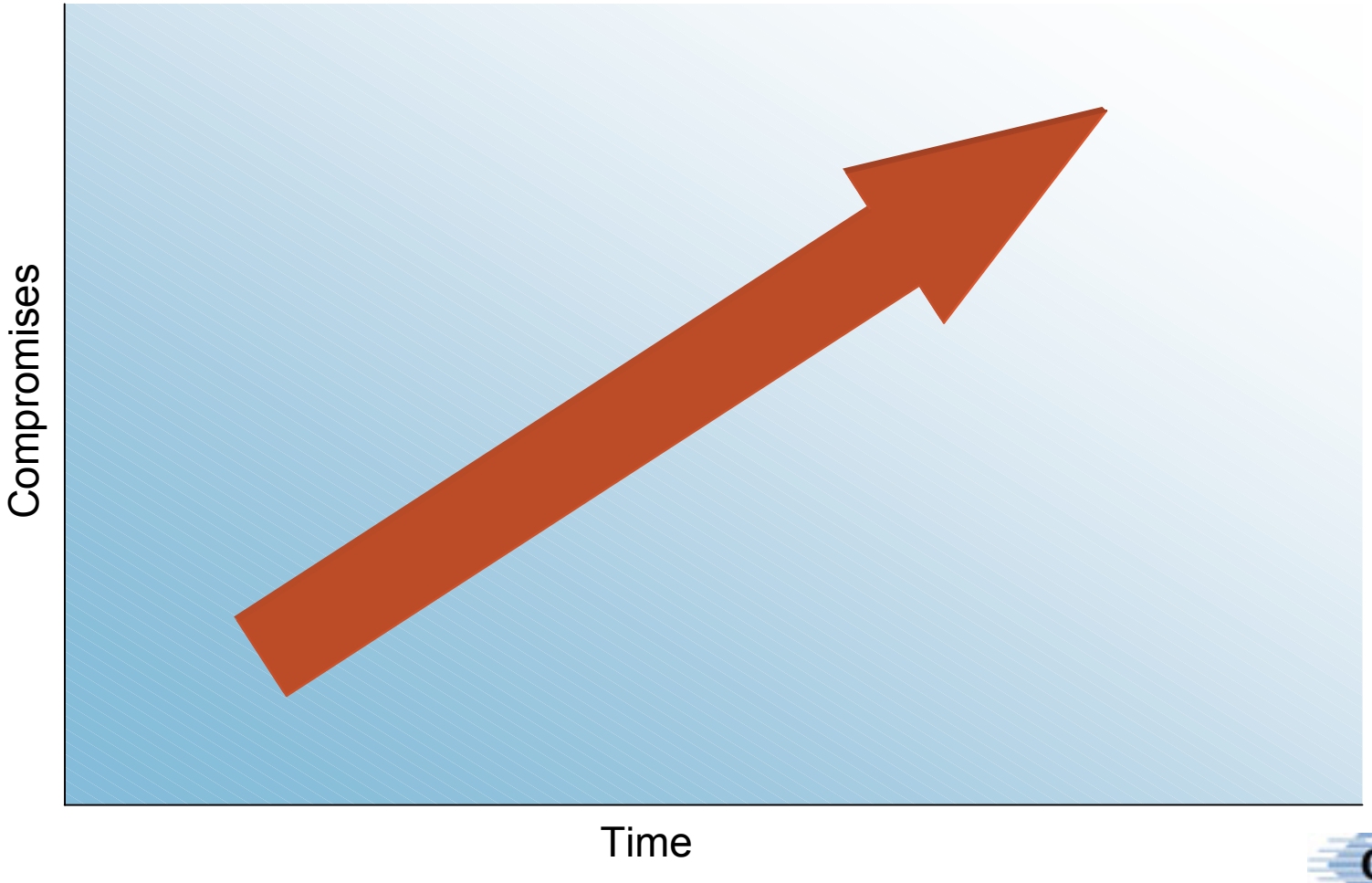
# Vulnerabilities



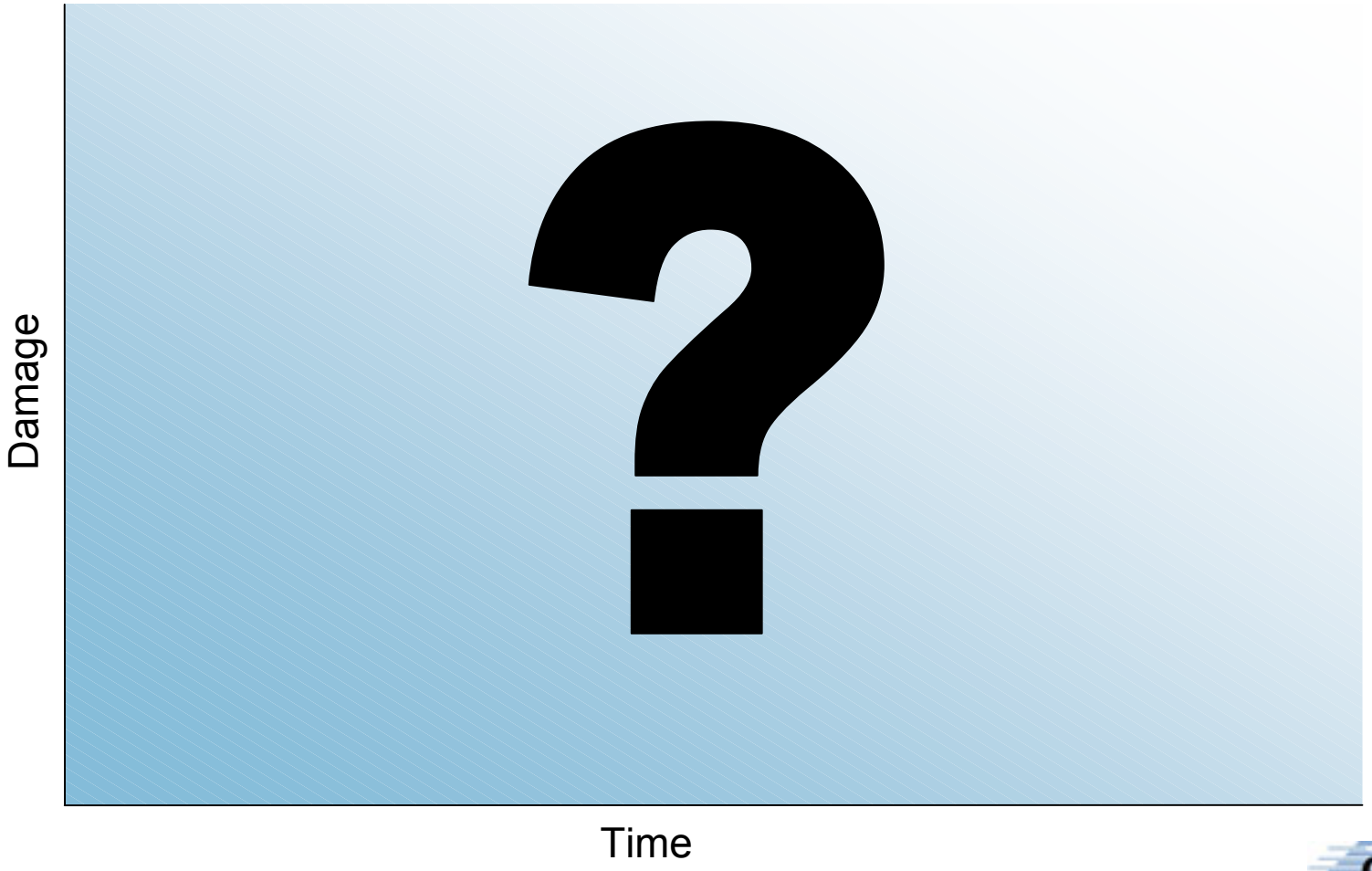
# Attacks



# Compromises



# Damage

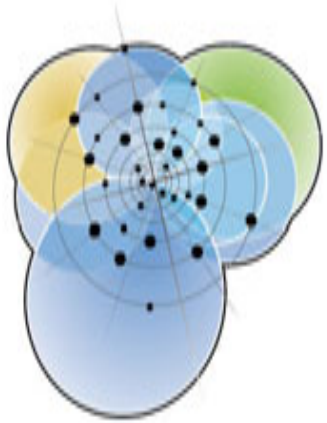


# What About the Future?

# A continuously changing problem – systems -1

Complex, continuously evolving, interdependent elements – ultra-large scale systems that go far beyond our current “system of systems”

- New design and implementation merge with updates and configuration changes
- Systems that must continuously deliver results while suffering attacks, accidents and failures
- Individual components becoming more secure (e.g. operating systems)



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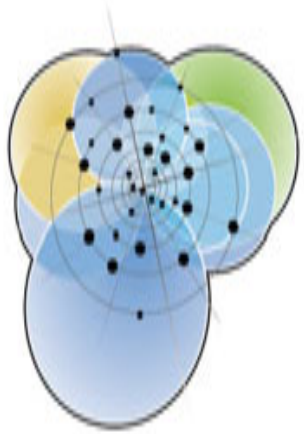
# A continuously changing problem – systems -2

- Network connected, embedded systems likely to be vulnerable
  - Firmware vulnerabilities become major problem
  - Current response & recovery practices won't scale up
- Continued growth in vulnerability caused by increased size & complexity
- Serious entertainment systems will be Internet connected & run serious operating systems with significant memory & disc
  - And you think botnets are a problem now!

# Continuously changing threats

More and more of the same plus new challenges

- Dramatic increase in “attacks for profit”
- Continued increases in computer/network facilitated crime – e.g. fraud, identity theft, pornography, pirated IP, extortion
- Shift of attack patterns – from OS to applications, new devices & protocols
- Stealthy, automated attacks aimed at individual companies/industries
- Increased instances of embedded malicious code
- Increase in technical mercenaries



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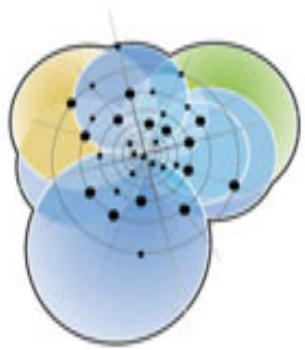
# Continuously changing security products and services -1

Key question: How will today's security solutions evolve, scale to meet new challenges?

- Increased dissatisfaction with effectiveness of perimeter security
- Growing dissatisfaction with Intrusion Detection Systems (limited effectiveness, inability to scale to ultra-large scale systems, weak support for retrospective analysis
- Growing dissatisfaction with anti-malware products



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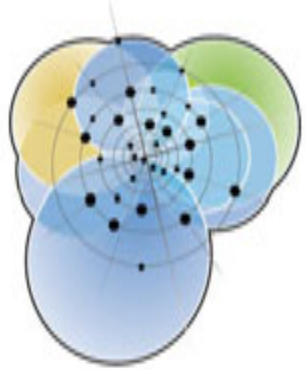
# Continuously changing security products and services -2

- Increased integration of system management & security tools (though with little improvement in effectiveness)
- Emergence of “application centric” security event detection systems
- More hardware to help solve problems – biometrics, encrypting discs, etc
- Increase in risk consulting on insider threats & compliance

# Continuously changing victims -1

Globalization and ubiquitous Internet connected systems are changing the fabric of government/business/citizen interactions. The emerging socio-technical ecosystem will bring new targets.

- Increase in espionage as relationships change world-wide
- Increase in industrial espionage as developing countries become major players in world-wide markets
- Increase in attacks on citizens of countries with growing economies

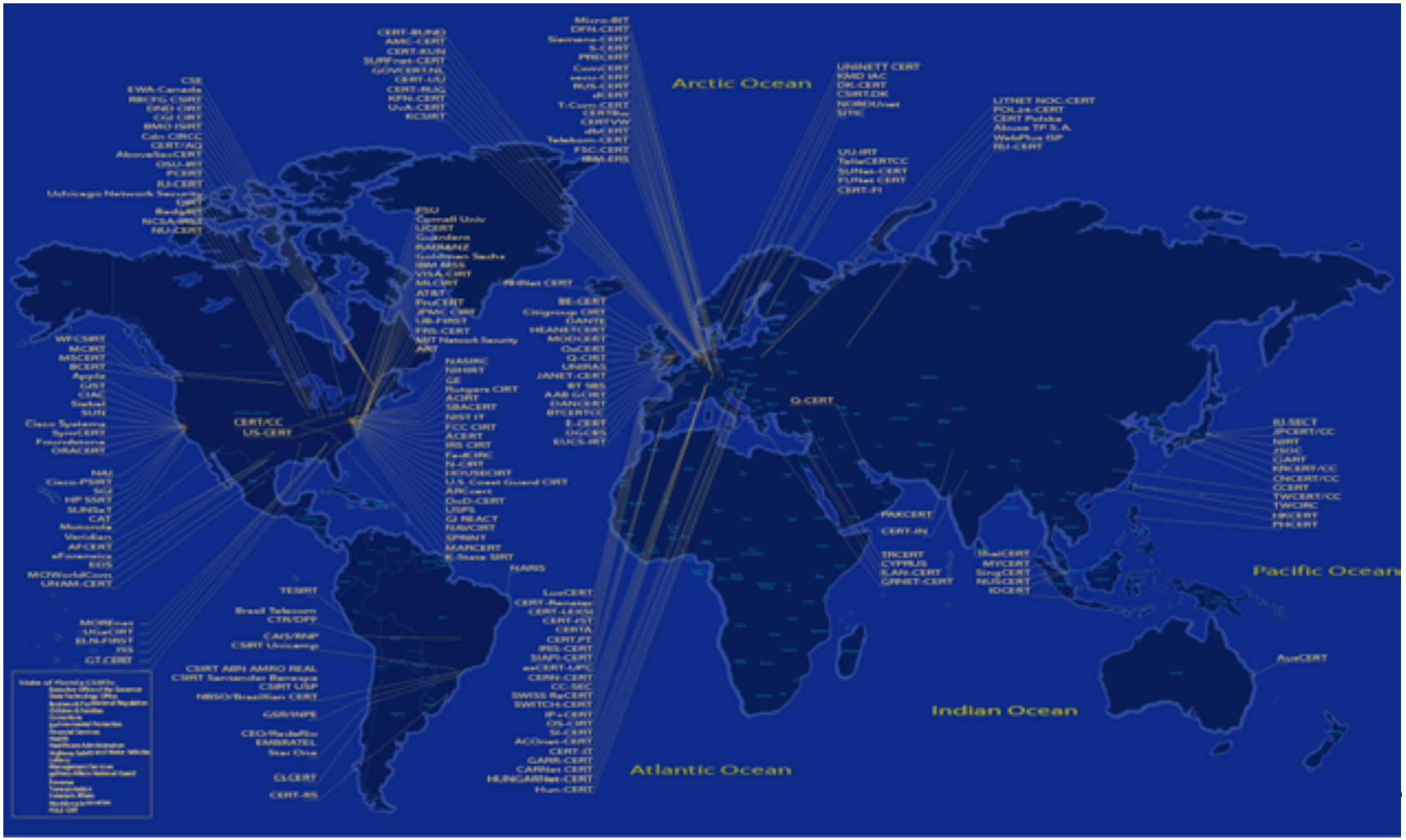


# Continuously changing victims -2

- As security in advanced agencies/companies improves, weaker links in contractor/supply chains will be attacked
- Likely to see at least one concentrated attack on a critical infrastructure (maybe a run-away experiment)

# What Can We Do?

# Recognize the power of FIRST



# Better Understanding

Analysis->Understanding->Informed Action->Improvement

- Today sharing is time consuming and expensive leading to islands of information and little shared understanding
  - FIRST members are in an excellent position to:
    - Work together and with standards groups like IETF on open standards for the capture, storage and transmission of security information and analysis results
    - Form sharing & analysis coalitions to improve understanding and disseminate knowledge
    - Establish global indications and warning systems with predictive capabilities
    - Define requirements for automated support for recognition, response, reconstitution & recovery

# Better Software

Low quality software continues as the root cause of most vulnerabilities/incidents

- Good software engineering process solves much of this problem
- Static source code analysis tools are increasingly effective
- Secure out-of-the-box configurations help too

FIRST members can build the case for management attention

# Better Systems

Some problems are rooted in system architecture & design

- Viruses, spam, DDOS, spyware

Today's reactive solutions are reaching their limits of effectiveness

FIRST members should increase involvement in new technology development forums

- IETF, standards groups, vendor forums

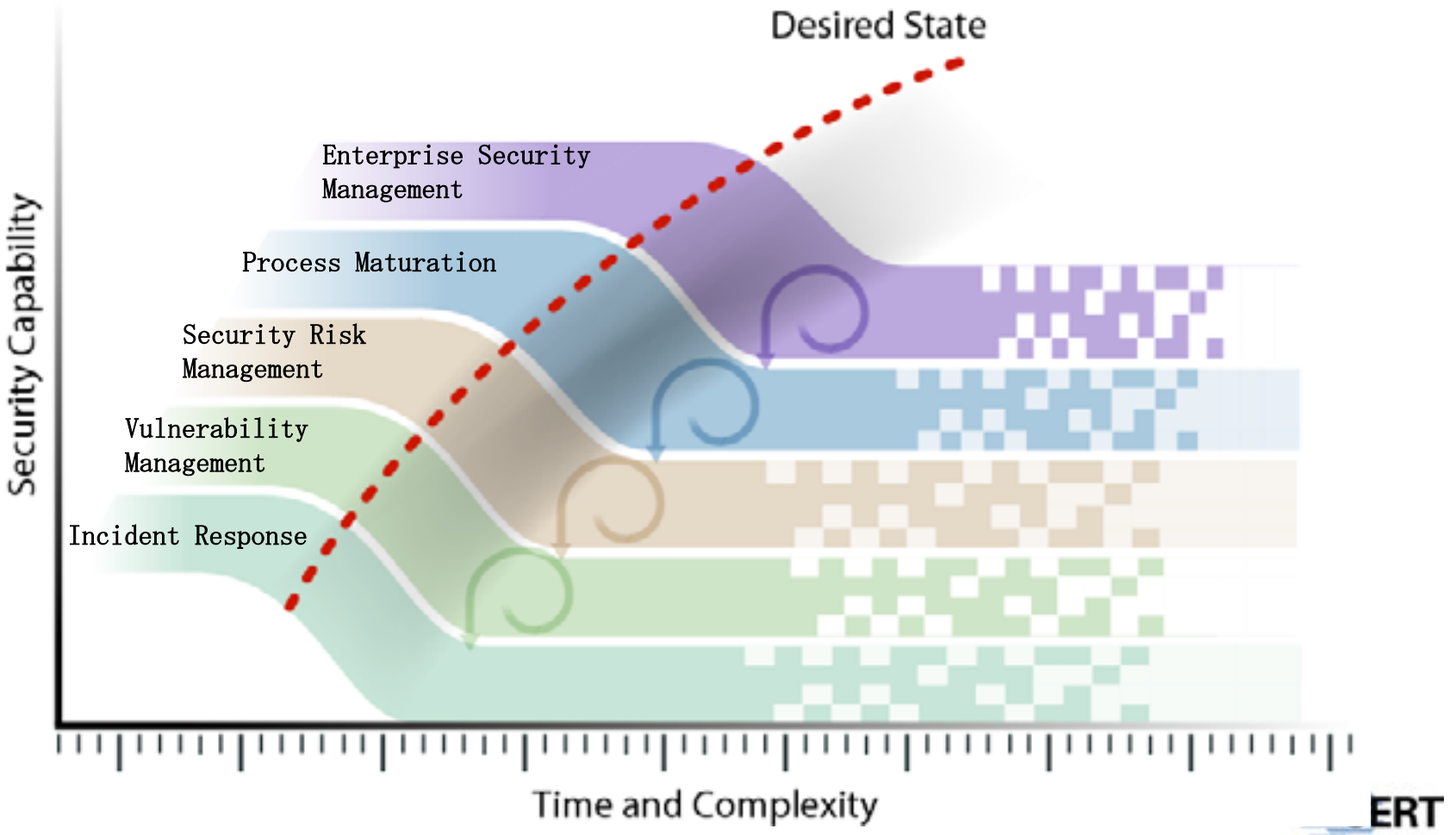
# Better Systems Management

We all know that some organizations are on top of security & others are clueless

We all need to promote security management practices that are:

- Supportive of an organization's mission & goals
- Focused on risk reduction rather than mere compliance
- Integrated with other key business practices
- Measured, reviewed & updated on a regular basis

# Evolving the Security Approach



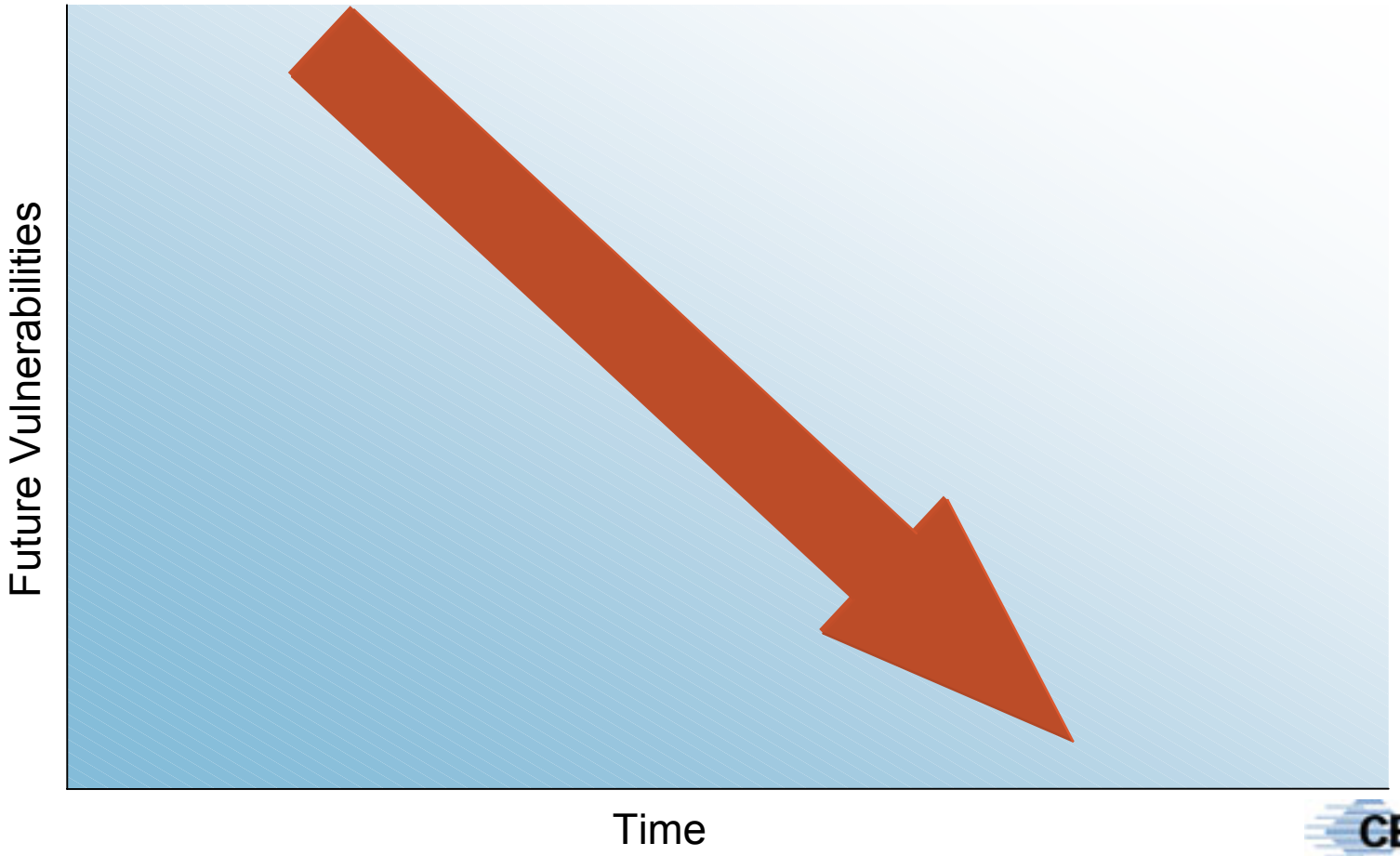
# Better People

Management practice dictates the “what”, but it’s the skills & abilities of the staff that determine the “how well”

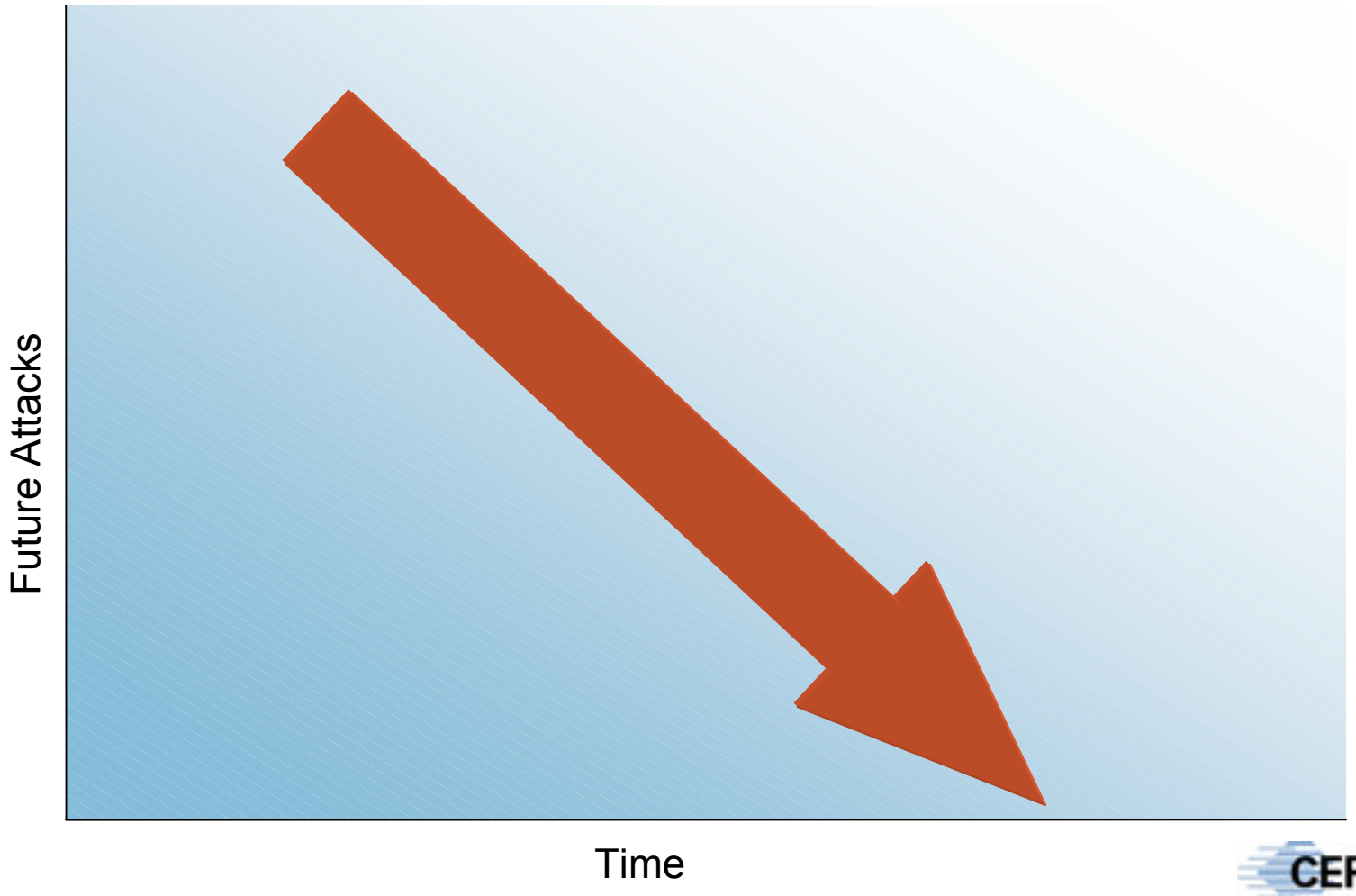
Support & promote the development of performance & training standards such as DoD 8530 & 8570.

Encourage your management to invest in the training & skills building needed to stay on top of a constantly changing problem

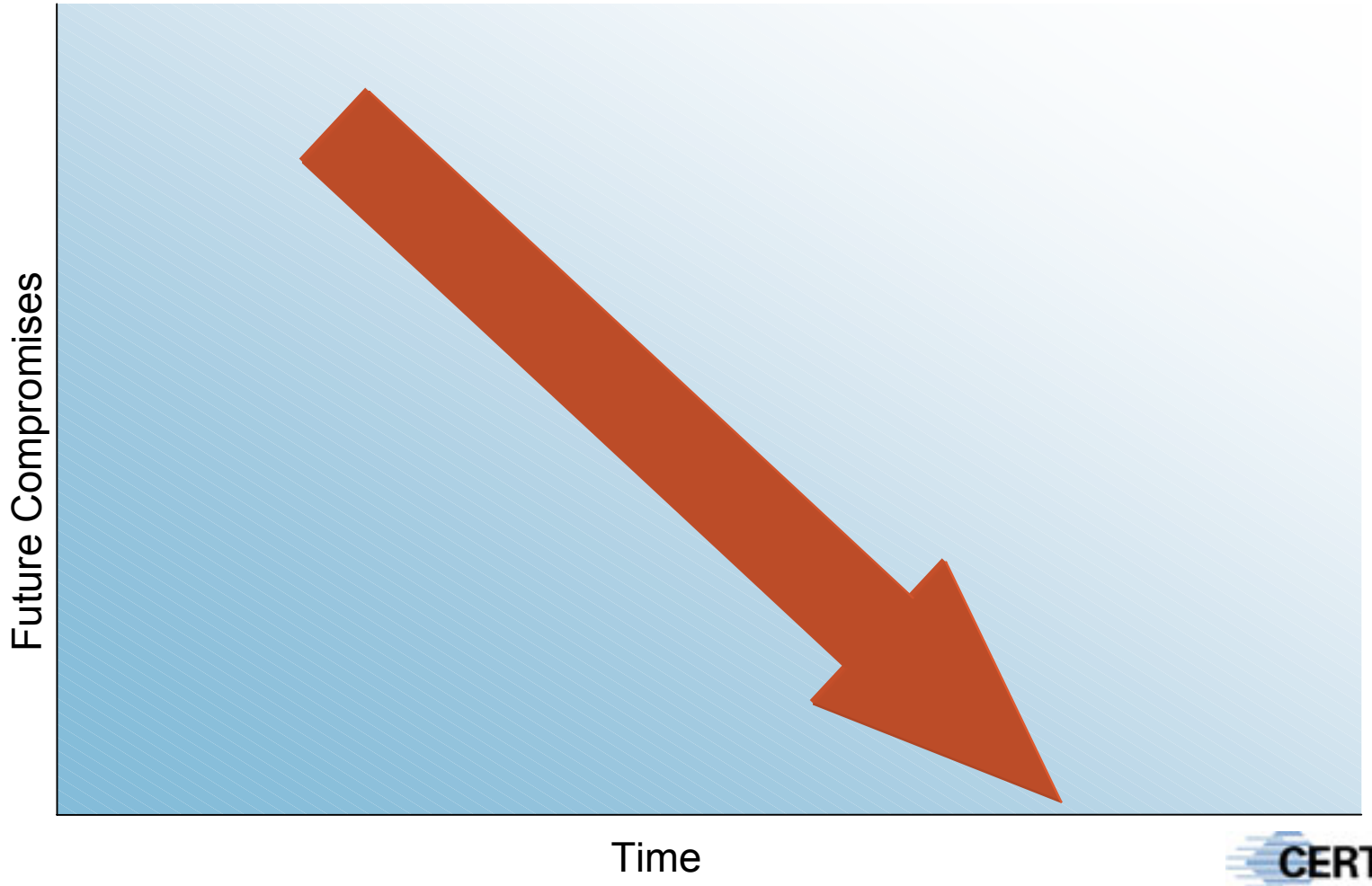
# Goal for Future Vulnerabilities



# Goal for Future Attacks



# Goal for Future Compromises



# Goal for Future Damage