

Current Threat Environment

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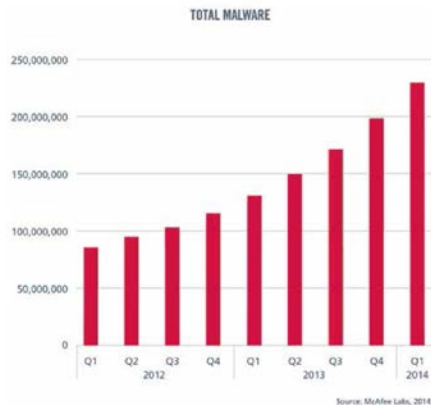
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Current Threat Environment

- Usual view of threat environment
- Looking backwards from today's threats
- Looking forwards to future threats
- The need for prevention is pressing

Usual view of threat environment



Sources: Poneman Institute, CNNMoney study, May 28, 2014; McAfee Quarterly Threat Report, June 2014; Wall Street Journal, Feb 26, 2014

retailcustomerexperience.com - 5_lessons_learned_from_recent_retail_data_breaches.pdf



Looking backwards from today's threats



92% of the 100,000 incidents from the last 10 years can be described by 9 basic patterns

- Insider misuse
- DOS attacks
- Cyber-espionage
- Crimeware
- Web app attacks
- Physical theft and loss
- Payment card skimmers
- Point-of-sale intrusions
- Miscellaneous errors





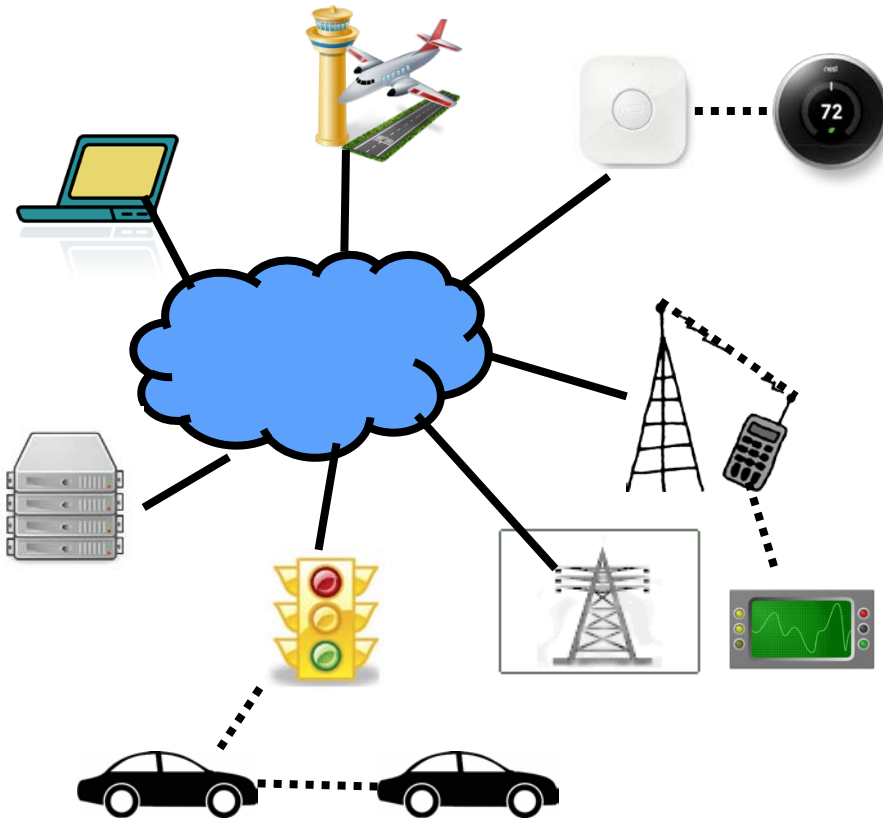
Looking forward to future threats



- Technology
- Evolving role of people in cyber security
- Learning from data: measurements, metrics, analysis



Cyber threats track evolution of technology



- Software is the new hardware
- Covering the next last mile
- Expanding endpoints





Software is the new hardware

IT moving from specialized hardware to software, virtualized as

- Memory
- Storage
- Servers
- Switches
- Networks

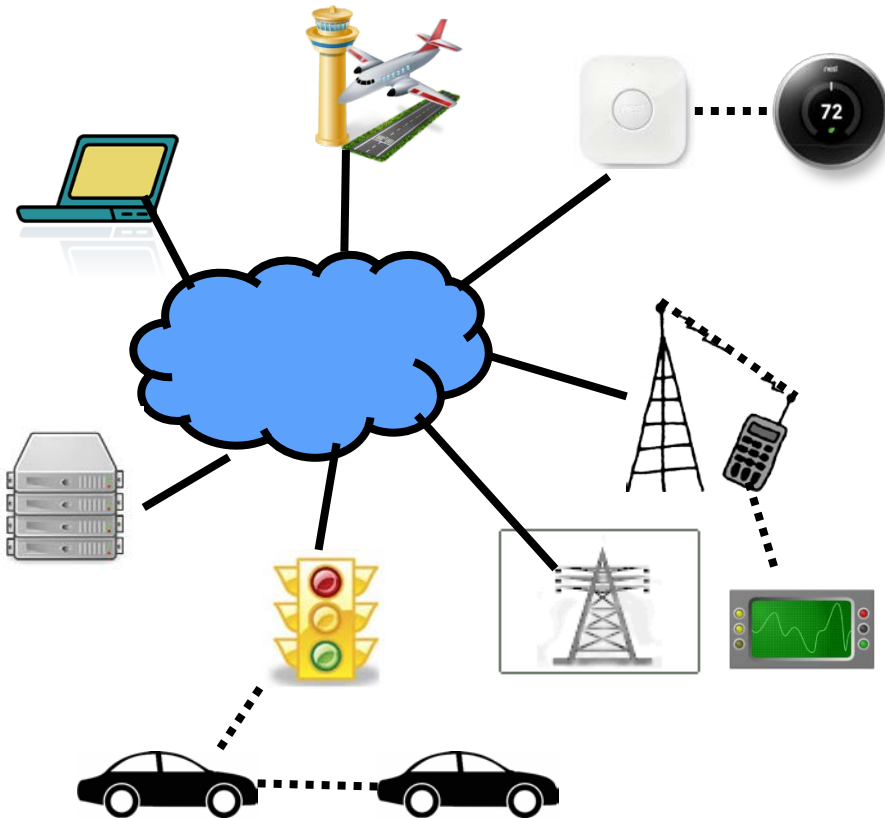
Cyber-physical systems (CPS) evolving to a computer with interesting peripherals

- Airplane function in software moved from 8% to 80% since 1960
- Software defined radios drive communication
- Television evolved to digital signal processors

- Hardware security needs software analogs
- New programming models need secure coding guidelines
- Guard against side channel attacks enabled by virtualization



Covering the next last mile – securing the border and end points



The last mile has expanded to

- Cellular
 - Main processor
 - Base band processor
 - Secure element (SIM)
- Industrial and home automation
 - SCADA
 - Bluetooth
 - Zigbee
- Automotive
 - Intravehicular: more than 50 networked processors
 - Vehicle to infrastructure (V2I): congestion management, emergency services, law enforcement
 - Vehicle to vehicle (V2): safety, efficiency
- Aviation
 - Fly by wire
 - Next Gen air traffic control
- Smart grid
- Embedded medical devices





Evolving role of people in cyber security

Analysts: Soaring need for cyber analysts

- Bureau of Labor Statistics projects information security analyst jobs to increase by 20% or more through 2018
- Need validated measurement and testing of needed skills, at individual and team level

Optimizing analyst effectiveness: Automation assists analysts

- What can be automated and what left to the analyst
- Trade off between training and application

Developers: Development becoming assembly over creation

- At least 75% of organizations rely on open source as the foundation of their applications
- Weak or absent security tracking in the software supply chain

Adversaries: Culture role in cyber security

- Cultural influences on development and attack behavior





Learning from data: measurements, metrics, analysis

$$\frac{\partial}{\partial a} \ln f_{a, \sigma^2}(\xi_1) = \frac{(\xi_1 - a)}{\sigma^2} f_{a, \sigma^2}(\xi_1) = \frac{1}{\sqrt{2\pi\sigma}} \exp\left(-\frac{(\xi_1 - a)^2}{2\sigma^2}\right)$$
$$\int_{\mathbb{R}_n} T(x) \cdot \frac{\partial}{\partial \theta} f(x, \theta) dx = M\left(T(\xi) \cdot \frac{\partial}{\partial \theta} \ln L(\xi, \theta)\right) \int_{\mathbb{R}_n} \frac{\partial}{\partial \theta} T(x) f(x, \theta) dx$$
$$\int_{\mathbb{R}_n} T(x) \cdot \left(\frac{\partial}{\partial \theta} \ln L(x, \theta)\right) \cdot f(x, \theta) dx = \int_{\mathbb{R}_n} T(x) \cdot \left(\frac{\partial}{\partial \theta} \frac{f(x, \theta)}{f(x, \theta)}\right) \cdot f(x, \theta) dx$$
$$\frac{\partial}{\partial \theta} T(\xi) = \frac{\partial}{\partial \theta} \int_{\mathbb{R}_n} T(x) f(x, \theta) dx = \int_{\mathbb{R}_n} \frac{\partial}{\partial \theta} T(x) f(x, \theta) dx$$

Biggest challenges

- Determining leading indicators
- Reducing false positives

Need to extract information from data from across the software lifecycle

Applying techniques across disciplines including

- Metric and model definition
- Social and psychological experimentation
- Machine learning
- Statistical modeling

Applications to

- Real-time analysis
- Retrospective insight





An ounce of prevention is worth a pound of cure

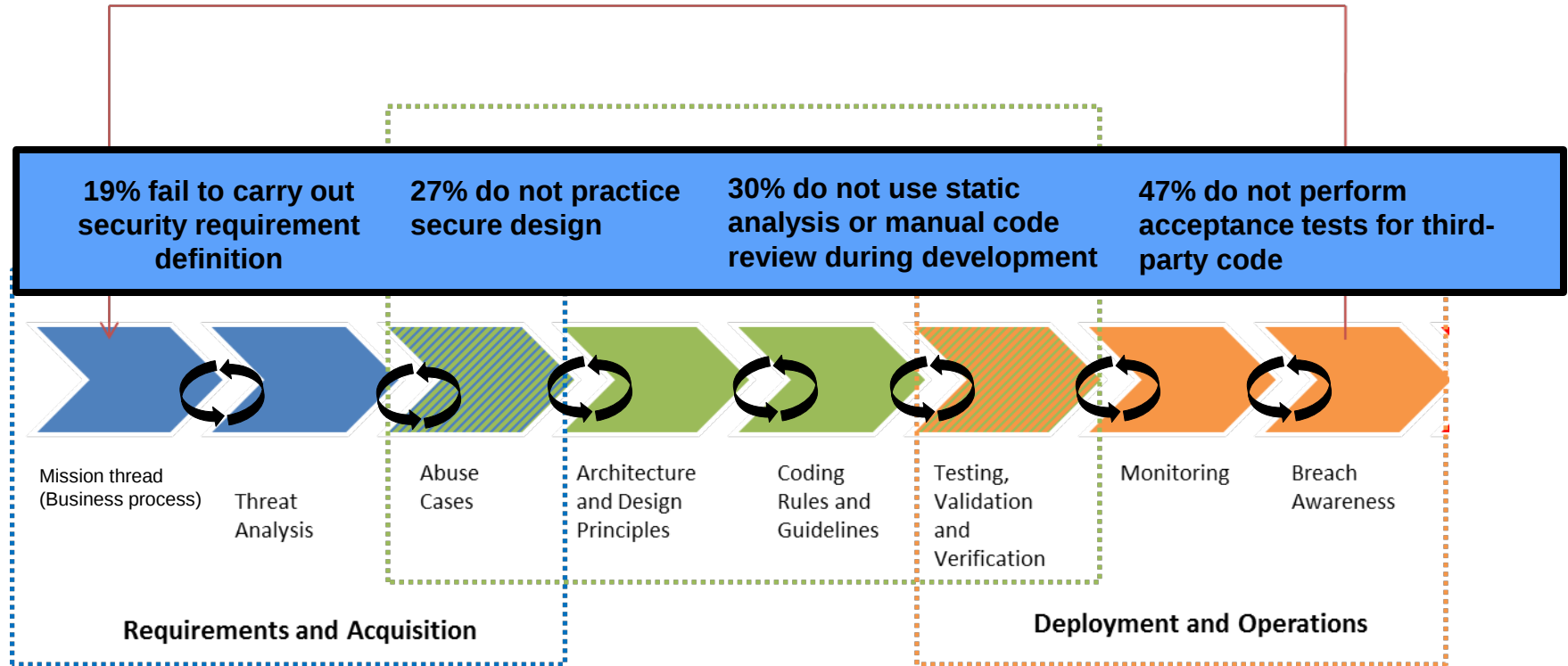
“We wouldn't have to spend so much time, money, and effort on network security if we didn't have such bad software security.”

Bruce Schneier in Viega and McGraw,
“Building Secure Software,” 2001



The need for prevention is pressing

Sustainment



More than 81% do not coordinate their security practices in various stages of the development life cycle.

Source: Forrester Consulting, "State of Application Security," January 2011



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Security by default





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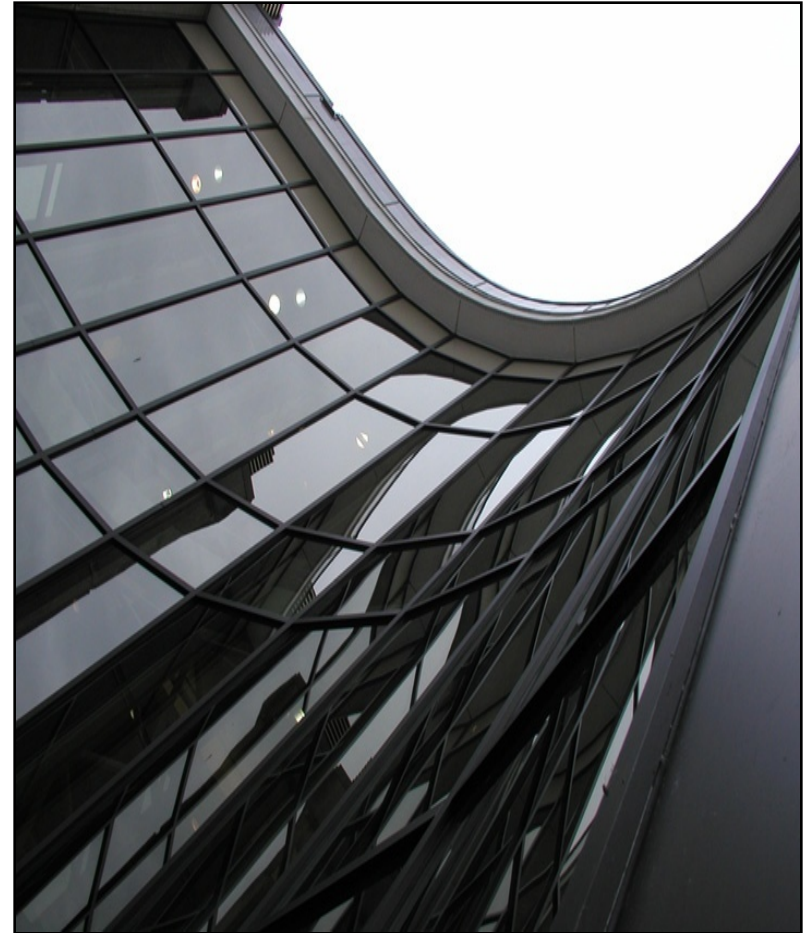
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Web Resources (CERT/SEI)

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