Security/Information Assurance Measurements and Metrics

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Agenda

- Software estimation and measurement
  - Sizing estimation (SLOC, FP, Feature Point)
  - Cost and schedule estimation
  - Metrics and Measurements
- Cyber Impact
  - Attacks
  - Security/Privacy
- Cyber Security/Privacy/Information Assurance
  - Risk management standards
  - Metrics and measurements
  - Information assurance standards
- Verticals in need of cyber security/privacy

Software Estimation (Sizing, Cost and Schedule) and Measurements Phases

- Concept of Operation
- Requirement Specification
- Product Design Specification
- Detailed Design Specification
- Software Acceptance

Software Sizing Estimation Methodologies

- Source Lines-Of-Code (SLOC)
- Function Points (FP)
- Feature Points

Software Sizing Estimators

SLOC

- SLOC factors: Executable Instructions, Data Declarations
- Analog-based
- Language dependent
- Design-oriented
- Variations a function of languages
- Convertible to function points
- SLOC with a Predictive Model (COnstructive COst MOdel or COCOMO)

FP

- Core factors: Inputs, Outputs, Logic Files, Inquiries, Interfaces
- Specification-based
- Language independent
- User-oriented
- Variations a function of counting conventions
- Expandable to SLOC

Feature Points

- Derivative of FP for real time system software
- Core FP factors
- Add algorithm parameter

Cost and Schedule Estimation Methodologies

- Analogies
  - Subsystem, computer software configuration item (CSCI), computer software component (CSC), computer software unit (CSU)
- Expert (engineering) opinion
  - Personnel w/ experiential knowledge
- Parametric models
  - Cost drivers based on statistical formulas, Development and operational environments, SW characteristics
- Engineering build
  - Effort summation of detailed functional task breakouts (CSC and CSU)
- Cost performance report analysis
  - Requirements/design, code/unit test, integration/test
- Cost estimation relationship factors
  - Algebraic relationship

Software Metrics and Measurements

- Metrics
  - Monitor
  - Predict
  - Track
  - Understand
- Measurements
  - Quantifiable dimension, attribute, software program, product, process

Cyber World (1)

- Cyber space is a de-perimeterized, distributed data environment
- It is global, densely connected and dynamic
- Cloud computing As-A-Service (AAS) offerings to reduce TCO
  - Software or SAAS
  - Platform or PAAS
  - Infrastructure or IAAS
- Service Oriented Architecture (SOA)

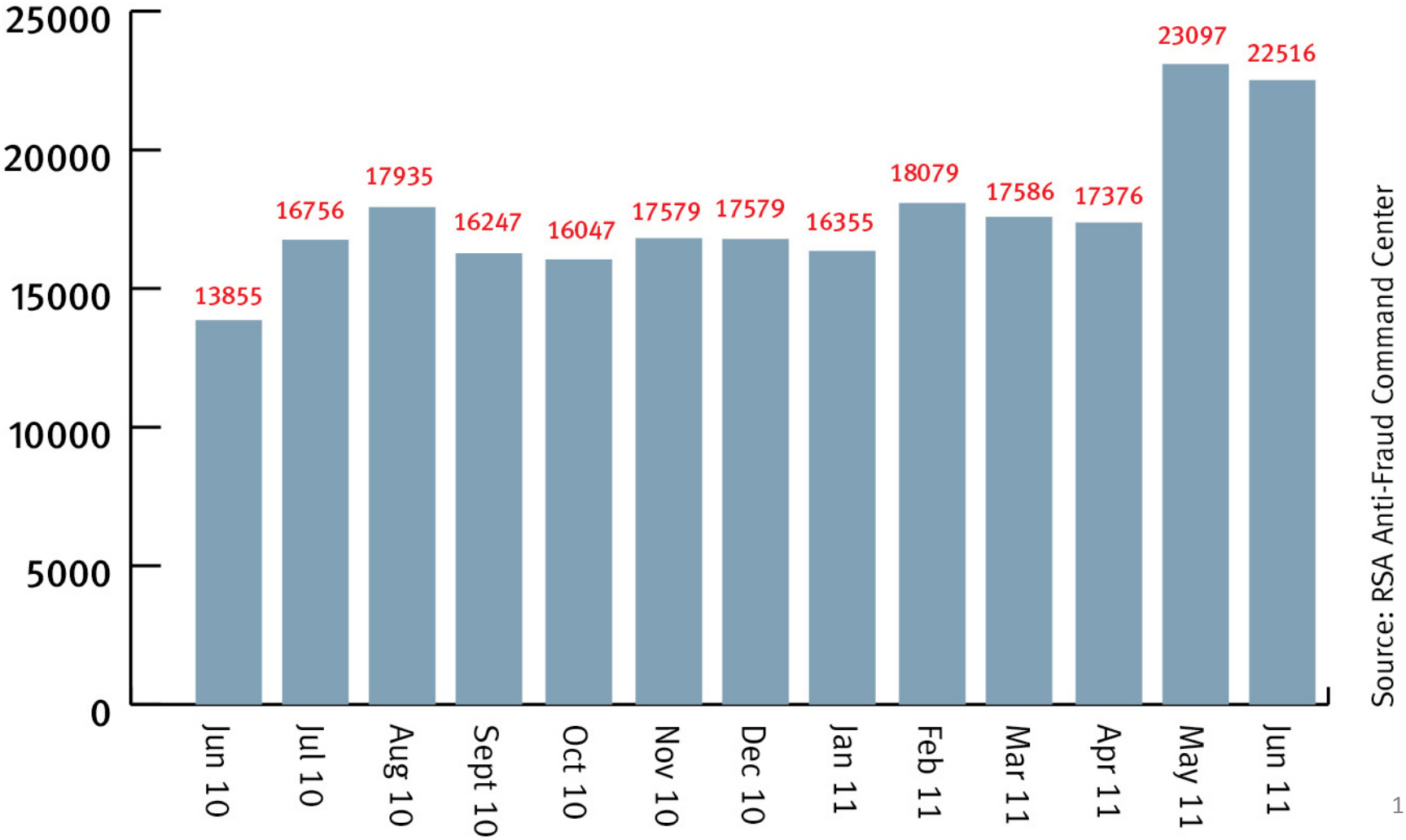
Cyber World (2)

- Not friendly: Trojan, worms, viruses, malware, botnets… => DDoS, identity theft, phishing/pharming, fraud, …
- Communications Security (COMSEC) => Information Security (INFOSEC)
  - Security, privacy, and information assurance
  - Self protecting data objects
  - User-centric
  - Fine grained access control
- Arbitrate assets with risks (i.e., threats, exploits, vulnerabilities)
- Preserve privacy to address liabilities
- Who is involved? (DHS, DoD, NSA, DoE labs, ENISA, MITRE, Verizon Business, ….

Web Browser

- Web browser is a security critical component in the ICT environment. It is the channel for:
  - Information sharing, banking, social networking, shopping, payments, cloud services, critical infrastructure…..
- Target for cyber attacks [Symantec]
  - Web-based attack increased by 93% from 2009 to 2010
  - 40 million attacks for September 2010

Phishing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May 11
Jun 11
Source: RSA Anti-Fraud Command Center

Security/Privacy Requirements

Security

- Confidentiality
- Integrity
- Availability
- Non-repudiation
- Identity management
- Authorization, Authentication and Accountability (AAA)

Privacy

- Notice
- Consent
- Minimization
- Control
- Access
- Retention
- Secondary use
- sharing

Security/Privacy Considerations within the Software Development Life Cycle (SDLC)

- Like project, quality and risk issues, security/privacy related issues can cause the project to fail
- To ensure success, security/privacy must be the default (built-in not bolted on) and implemented across the entire SDLC
- Security/privacy must be adaptive and preferably are concurrent with implementation of the formalized programs

Risk Management Standards and Guidelines

- NIST SP 800-3--Risk Management Guide for Information Technology Systems
- NIST SP 800-37 Rev 1—Guide for Risk Management Framework to Federal Information Systems: A Security Life Cycle approach
- NIST SP 800-39—DRAFT Integrated Enterprise-Wide Risk Management: Organization, Mission, and Information System View
- NIST SP 800-53 Rev 3--Recommended Security Controls for Federal Information Systems and Organizations
- NIST SP 800-53A Rev 1--Guide for Assessing the Security Controls in Federal Information Systems and Organizations, Building Effective Security Assessment Plans
- NIST SP 800-64--Security Considerations in the System Development Life Cycle
- NIST SP 800-13--DRAFT Information Security Continuous Monitoring for Federal Information Systems and Organizations
- ISO
- ENISA
- …

Security/Privacy Metrics and Measurements

- Measurements are single-point-in-views of specific discrete factor, generated by counting
- Metrics are derived by comparing to a pre-determined baseline two or more measurements taken over time, generated from analysis
- Security/privacy attributes are not mutually commensurable
- Security/privacy are often measured in terms of Information Assurance (IA)
- IA controls: Technical, operational and management

Information Assurance (IA) Standards and Guidelines

- NIST SP 800-55 Rev 1—Guide to Performance Measures for Information Security (SP 800-55 and SP 800-80)
- ISO/IEC 15408—IT-Security Techniques-Evaluation Criteria for Information Security
- ISO/IEC 15939—Systems and Software Engineering-Measurement Process
- ISO/IEC 21827—IT-System Security Engineering-Capability Maturity Model-SSE-CMM
- ISO/IEC 27001—IT-Security Techniques, Information Security Management Systems-Requirements
- ISO/IEC 27004—IT-Security Techniques, Information Security Management Systems-Measurements
- ISA 99.03.01 and 99.03.02
- FIPS 140 Evaluation
- …

Verticals in Need of Cyber Security/Privacy

- Financial
  - Mobile payments, web-based transactions

  PCI-DSS, FFIEC
- Healthcare
  - Electronic Health Record (EHR), Health Information Exchange (HIE)

  HIPAA, HITECH
- Smart Grid
  - Information sharing among domains/stakeholders

THANK YOU

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