Cybersecurity Innovation Forum

National Institute of Standards and Technology
Information Technology Laboratory
Computer Security Division
Security Testing, Validation, and Measurement

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ITL Organization Overview

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Abdella Battou

Computer Security
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Information Access
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Software and Systems
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Statistical Engineering
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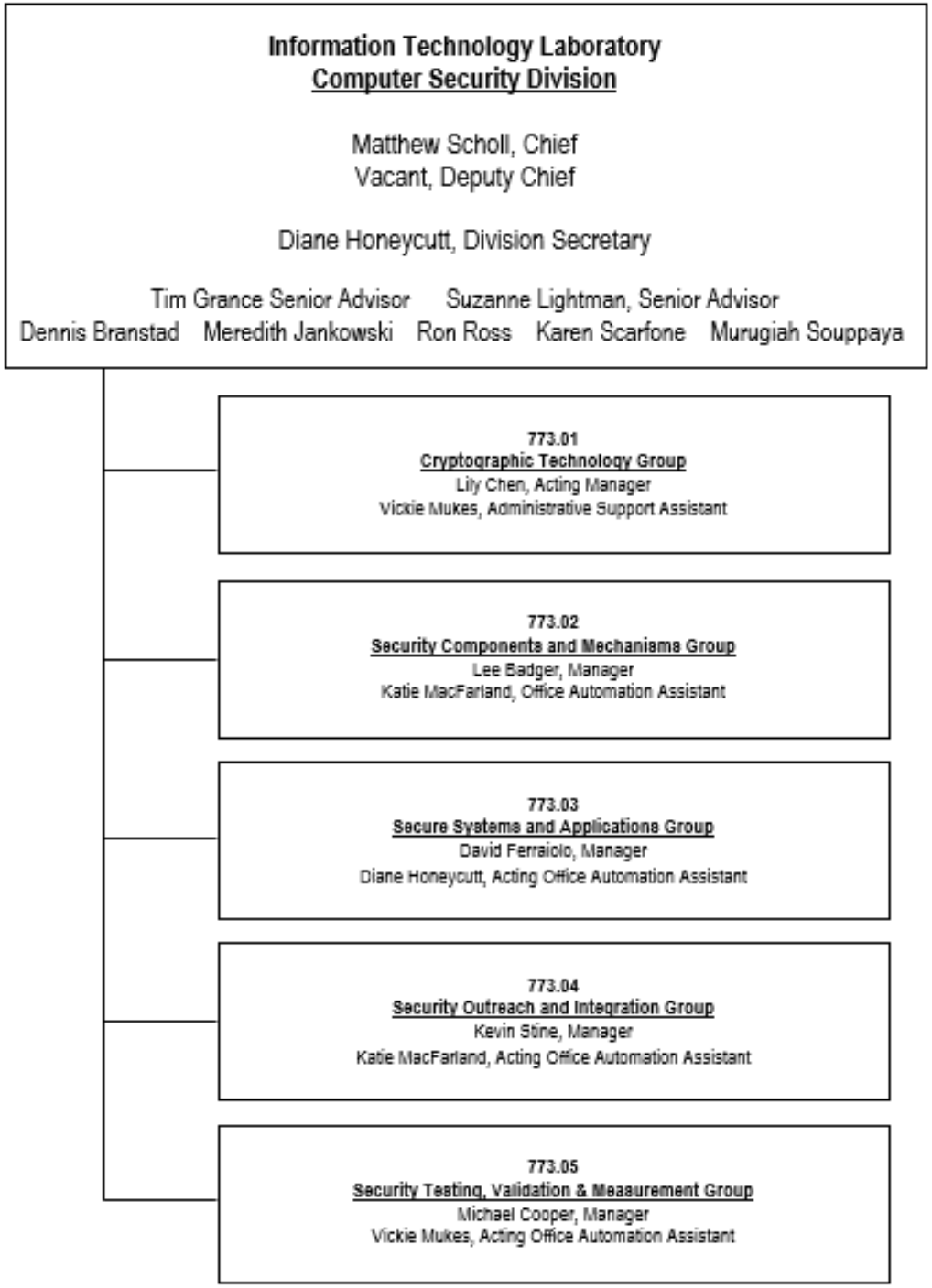
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Testing Group Mission

Advance information security testing, measurement science, and conformance.

STVM's testing-focused activities include validating cryptographic algorithm implementations, cryptographic modules, and Security Content Automation Protocol (SCAP)-compliant products; developing test suites and test methods; providing implementation guidance and technical support to industry forums; and conducting education, training, and outreach programs.

Programs in STVM

- CAVP – Cryptographic Algorithm Validation Program
- CMVP – Cryptographic Module Validation Program
- SCAP – Security Content Automation Protocol Validation Program
- PIV – Personal Identity Verification Validation Program

- NVD – National Vulnerability Database
- NCP – National Checklist Program
- USGCB – US Government Configuration Baseline
- Metrics Research – shared with the math division

Testing Programs: CAVP

- Tests each individual algorithm implementation against the associated standard.
- Test tool – Crypto Algorithm Validation System (CAVS)

Testing Programs: CMVP

- Vendors of cryptographic modules use independent, accredited Cryptographic and Security Testing (CST) laboratories to test their modules.
- CST laboratories use the Derived Test Requirements (DTR), Implementation Guidance (IG) and applicable CMVP programmatic guidance to test cryptographic modules against FIPS 140-2.
- NIST's Computer Security Division (CSD) and CSEC jointly serve as the Validation Authorities for the program, validating the test results and issuing certificates.

Testing Group Functional Areas

- Research - Apostol Vassilev
  - Applied research of best security testing methodologies
  - Development of US and International Security Testing standards
  - Outreach to industry and academia
- Operations – Melanie Cook
  - Program Management – Contract management, Communications, etc
  - Validation Services – test report assignment and review
  - Quality Assurance – lab audits, quality metrics, artifacts, processes
  - Education – on standards, processes, tools
- Development – Gini Khalsa
  - Test tool development
  - Automation of Testing Processes

System Security Technology Stack

- Enterprise – all IT systems within an organization
- System – a suite of applications, products, and networks grouped logically
- Network – interconnected set of set of applications or products
- Application / Product – hardware or software crypto implementation that can be procured
- Protocol – i.e. TLS
- Scheme – i.e. key agreement scheme
- Module – container for protection of crypto algorithm implementations
- Algorithm – based on NIST SP or FIPS
- Component – testable parts of an algorithm

System Security Testing Coverage

	Hardware	Software	Hybrid	Virtual	Mobile
System					
Application					
Protocol					
Scheme					
Module					
Algorithm					
Component					

Security Testing Timeline

- Need to engage developers earlier in the lifecycle
- Need to give credit for development practices that provide assurance
- Need to provide automated verification tools for later in the lifecycle

Design – Development – Testing – Integration - Release – Installation – Operation – Retirement

Commercial Product Lifecycle

Testing Programs

- Defined roughly around technology layers, from the bottom up
- Integration of testing processes between layers/programs is difficult
  - Need research into integration testing processes at each layer into next higher layer
- Need research into root-of-trust assurances at the lowest layer to provide foundation for higher layers
  - What artifacts and evidence can be produced by hardware vendors to make supply chain assurances
- Need research into best-of-class test methodologies applicable to all programs/layers and aimed at improving the depth of testing without additional overhead to the programs
- Need research into applied technologies that could benefit the testing programs by eliminating difficult to measure/test aspects
  - Use SCAP capabilities to enable automated tests that can verify the assurances

Testing Coverage

- New technologies/embodiments create new challenges to testing that have not been fully studied
- Need to create a strong assurance case at the lowest level of the technology stack
- Need to automate testing workflow to drive down costs to vendors
- Need to interface with other testing regimes to input/output testing data
  - NIAP at application and system level
  - FISMA at system and enterprise level
- Need to develop testing tools that make integration testing at each layer easy for developers and labs
- Need to develop test methodologies and corresponding tools that automate and improve the depth of testing at each layer

ISO/IEC 19790

- Federal Register Notice – published August 12, 2015 with a 45-day comment period
  - Encourage comments from labs, vendors and other interested parties
- Comment review – 4 – 6 weeks – end of November
- US Standards necessary to support the ISO
  - FIPS 140-3 wrapper to point to ISO and to SP
  - SP 800-175D Management Manual
  - NISTIR 8019 Implementation Guidance

ISO Standard Impacts and considerations

- Pay to use standard
- Give the vendor the choice as to which validating authorities receive test data
- NIST/CSE Agreement
  - Need to change language that prohibits the sharing of test data to allow if authorized by the vendor.
- We will develop our public facing web application to support interactions between multiple validating authorities

NIST / NIAP relationship

- Working on reestablishing the Inter-agency agreement
- Technology stack – Nist responsible for lower layers, NIAP the upper
- Adoption of OS Protection Profile
- FIPS points to EAL2 which no longer exists

Miscellaneous topics

- Validation time limits – 5 years to match CRADA
- Tiered validation approach (Vendor affirmed; Lab tested; CMVP validated)
- Allow interpretation of the standard to support best security practices