Establishing an NG9-1-1 Certification Program Year 2

Meet the Panelists

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Texas A&M University System

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Chief Technology Officer
NENA: The 9-1-1 Association

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Asst Professor
College of Engineering
Texas A&M University

Why Certification?

Sridhar Kowdley, DHS S&T
Brian Tegtmeyer, DoT NHTSA
Brian Fontes, NENA
John Holloway, DoD DISA

Why Is Certification Important For NG9-1-1?

Brandon Abley, NENA

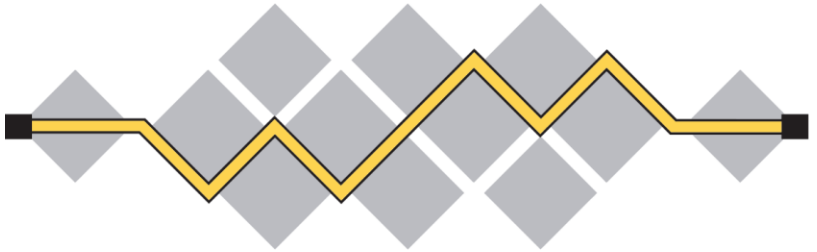
What is NG9-1-1?

- NG9-1-1 is built around SIP and IP (like modern VoIP services/5G)
- Provides standardized interfaces from emergency call and message services
- Processes all types of calls: voice, text, data, and multimedia information
- Acquires and integrates additional call data useful to call routing and handling
- Delivers calls, messages, and data to the appropriate entity based on the location of the caller and other policies
- Supports data, video, and other communications needs
- Interoperates with services and networks used by field responders
- Based on a suite of standards across standards development organizations, especially NENA

Key SDOs

NENA THE 9-1-1 ASSOCIATION

- Specifies NG core services, NG call handling, data formats, others
- i3, NG-PSAP/ECC, GIS, EIDO, NG-SEC



IETF®

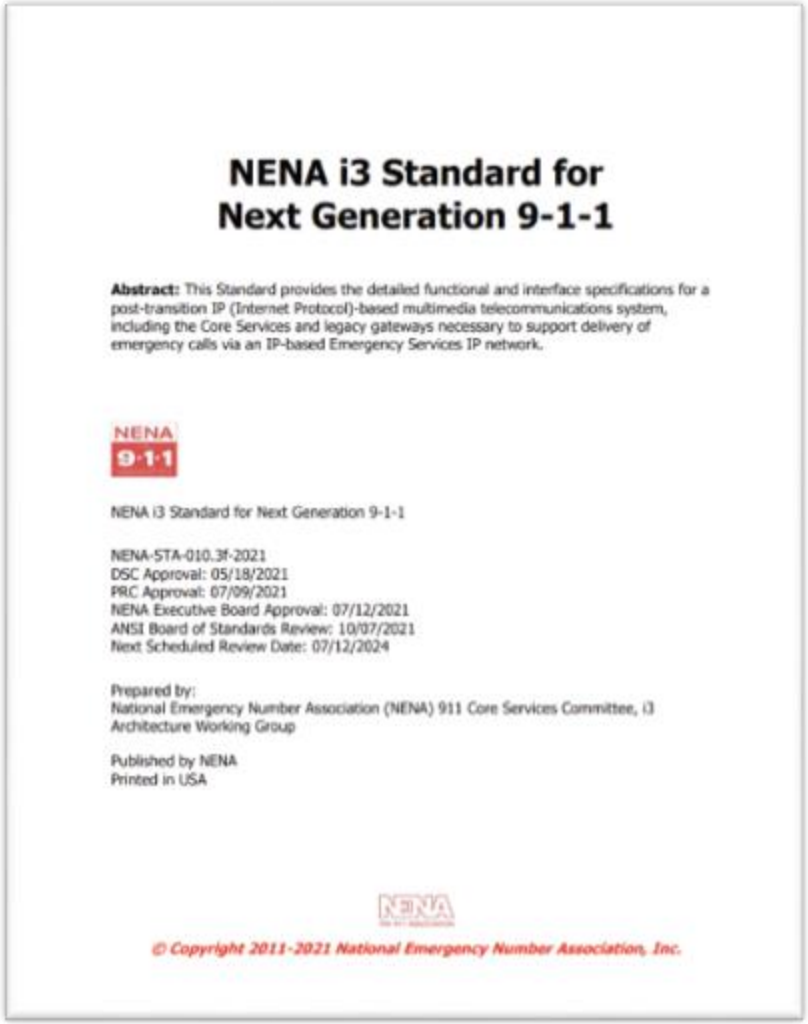
- Underlying IP technologies for emergency call handling
- PIDF-LO, LoST, AACN, registries

Key NG9-1-1 Standards this FY

- Security for Next Generation 9-1-1 Standard, an ANS-Candidate Document
- Virtual PSAP Management Standard, an ANS-Candidate Document
- Standard for 911/988 Interactions, an ANS-Candidate Document
- Civic Location Data Exchange Format (CLDXF) Canada
- Standard for the Conveyance of EIDOs in NG9-1-1 Version 2, an ANS-Candidate Document
- Standard for Communications Center/PSAP Daily Personnel Operations, an ANS-Candidate Document
- NG9-1-1 Operational Diversity and Redundancy Information Document
- Security Audit Checklist
- E9-1-1 Wireless Maintenance Call Routing & Testing Validation Standard
- Wireless E9-1-1 Overflow, Default and Diverse Routing Operational Standard
- Wireless Phase I & II Features and Functions Operational Information Document
- Wireless Phase I/II Planning and Implementation Checklist and Modules Document

NENA i3 Standard

- NG9-1-1 system architecture defined by NENA
- Functional Elements make up the set of software services, databases, network elements and interfaces needed to process multi-media emergency calls and data for NG9-1-1.
- i3 is the core services standard for NG9-1-1, and is the most important standard overall in the entire NG9-1-1 standards family
- i3 is not all of NG9-1-1 (e.g. NG-PSAP/ECC, EIDO, NG-SEC, GIS, etc)



NENA i3 Standard for Next Generation 9-1-1

Abstract: This Standard provides the detailed functional and interface specifications for a post-transition IP (Internet Protocol)-based multimedia telecommunications system, including the Core Services and legacy gateways necessary to support delivery of emergency calls via an IP-based Emergency Services IP network.

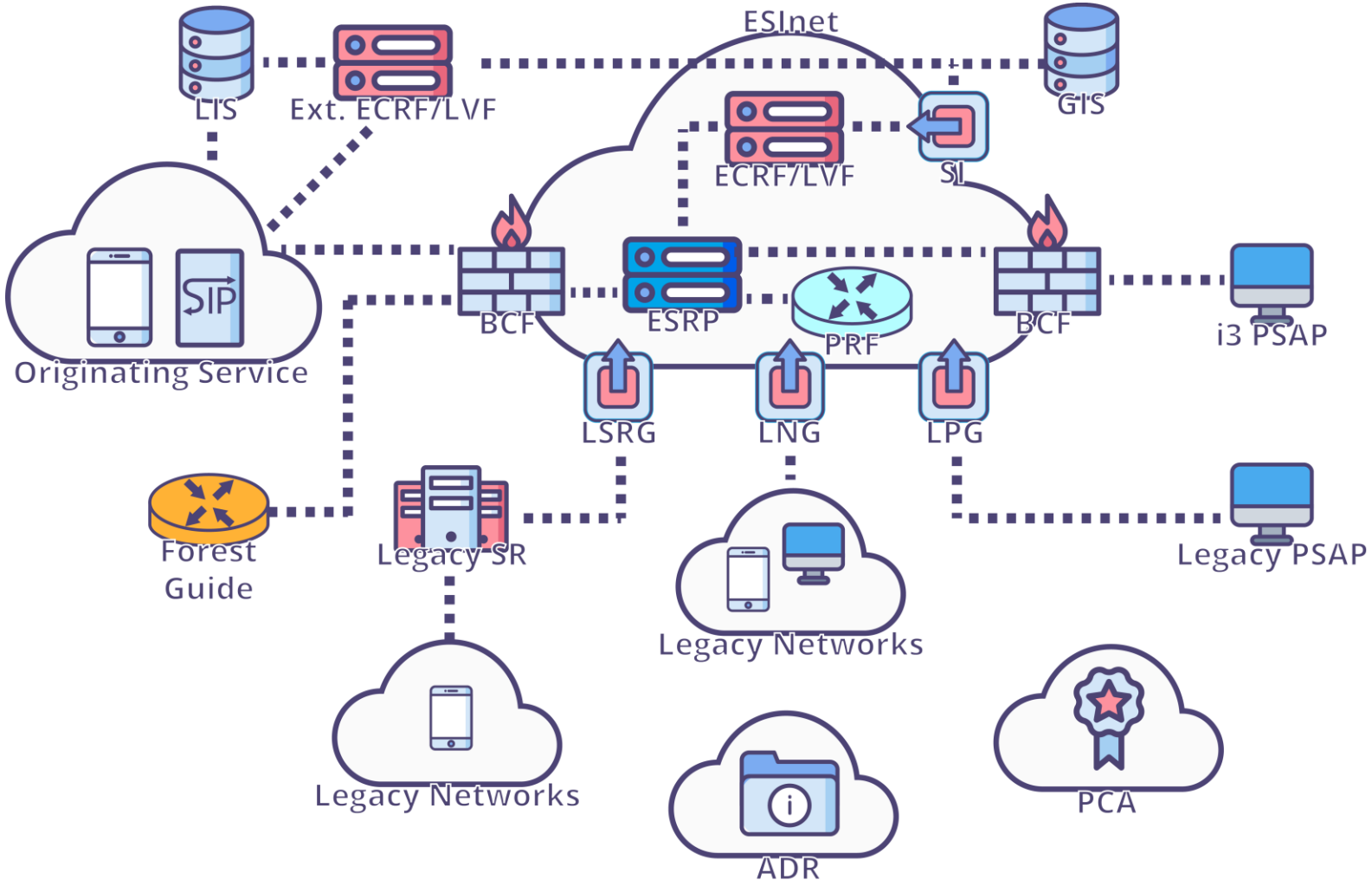
NENA i3 Standard for Next Generation 9-1-1

NENA-STA-010.3f-2021
DSC Approval: 05/18/2021
PRC Approval: 07/09/2021
NENA Executive Board Approval: 07/12/2021
ANSI Board of Standards Review: 10/07/2021
Next Scheduled Review Date: 07/12/2024

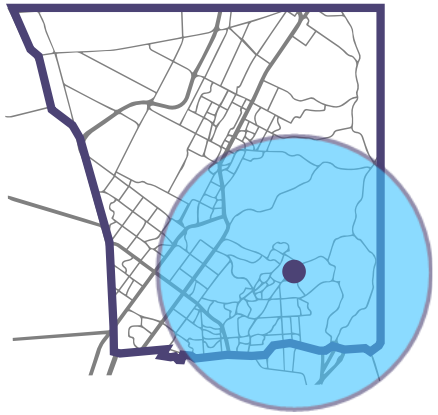
Prepared by:
National Emergency Number Association (NENA) 911 Core Services Committee, i3 Architecture Working Group

Published by NENA
Printed in USA

NG9-1-1 Simplified



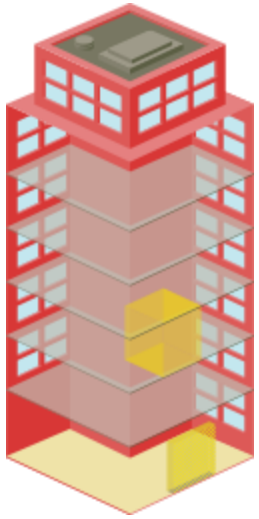
LoST and PIDF-LO



Geometry

X=38.80587
Y=-77.059400
Z= 20m

CNF=90%
UNC=20m
Z-UNC= 2.4m`

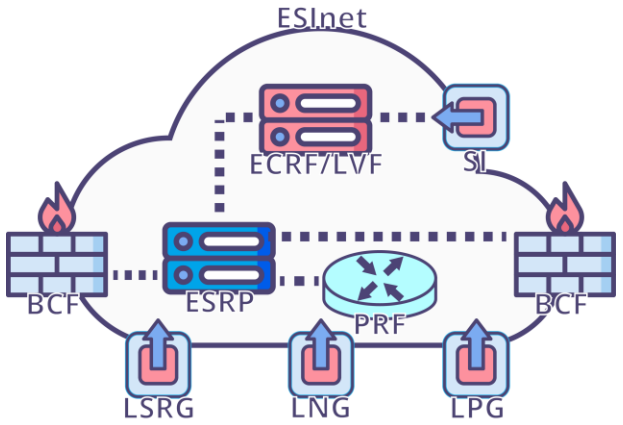


Civic Address

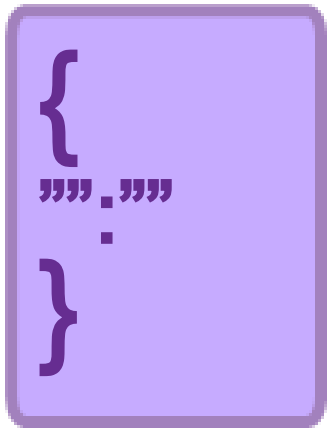
1700 Diagonal Rd
Alexandria, VA 22314

- Internet Standard2 (IETF)
- Location in NG9-1-1 is expressed in PIDF-LO and routed with LoST
- Can be expressed with geometry (a point) or a civic location (address)
- Location Uses WGS-84 reference ellipsoid (standard coordinate system)
- Shapes convey location +uncertainty
- Included in signaling information in the SIP header (by value or reference)

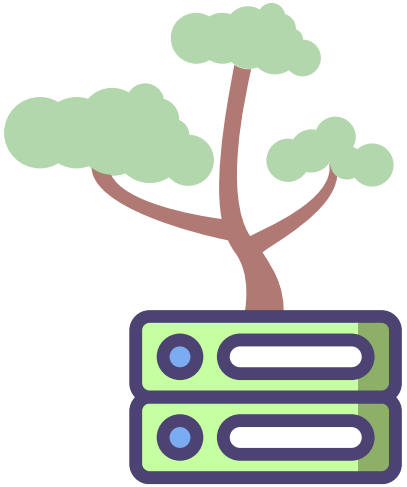
Interoperability



Standardization of Interfaces



EIDO



Forest Guide

PKI (“PCA”) and Identity

NENA i3 Standard

- NENA has THIRTEEN COMMITTEES and THIRTY-EIGHT WORKING GROUPS dedicated to developing the standards, information, and requirements documents
- NENA's success as a Standards Development Organization is attributed to the people who volunteer their time and expertise in our working groups.
- Anyone is qualified to join any of NENA's working groups and you do not need to be a NENA member to contribute. Find current calls for volunteers in your member newsletter or visit nena.org/volunteer to search for working groups seeking participants.

NENA i3 Standard

- Volunteers
- Our volunteers are at the heart of every standard and best practice NENA publishes.
- Consensus-based collaboration creates the HOW and WHAT behind the WHY of our work.
- We currently have just over 2300 AMAZING volunteers.
- Find current calls for volunteers in your member newsletter or visit www.nena.org/volunteer

DHS NG9-1-1 Conformance & Interoperability Testing Program

Michael E Fox, Texas A&M

NG9-1-1 Testing Program: Phase 1

Main Objectives

- Engage stakeholders (Industry, SPs, 9-1-1 operators, first responders)
- Recommend program structure for compliance & interoperability testing

Key feedback from stakeholders: Low cost is critical; Anyone can test for free!

Open Source Testing

- Free!
- Use as often as needed
- Integrate into QA process
- Save time/resources
- Eliminate uncertainty & ambiguity
- Command line user interface
- Need SW dev skills
- Target: FE developers

Testing as a Service

- Same tests
- Adds …
- Cloud-based, scalable, accessible, web-based UI
- Reporting formatted for certification
- Affordable: subscription, pay per test models
- Target: integrators, customers

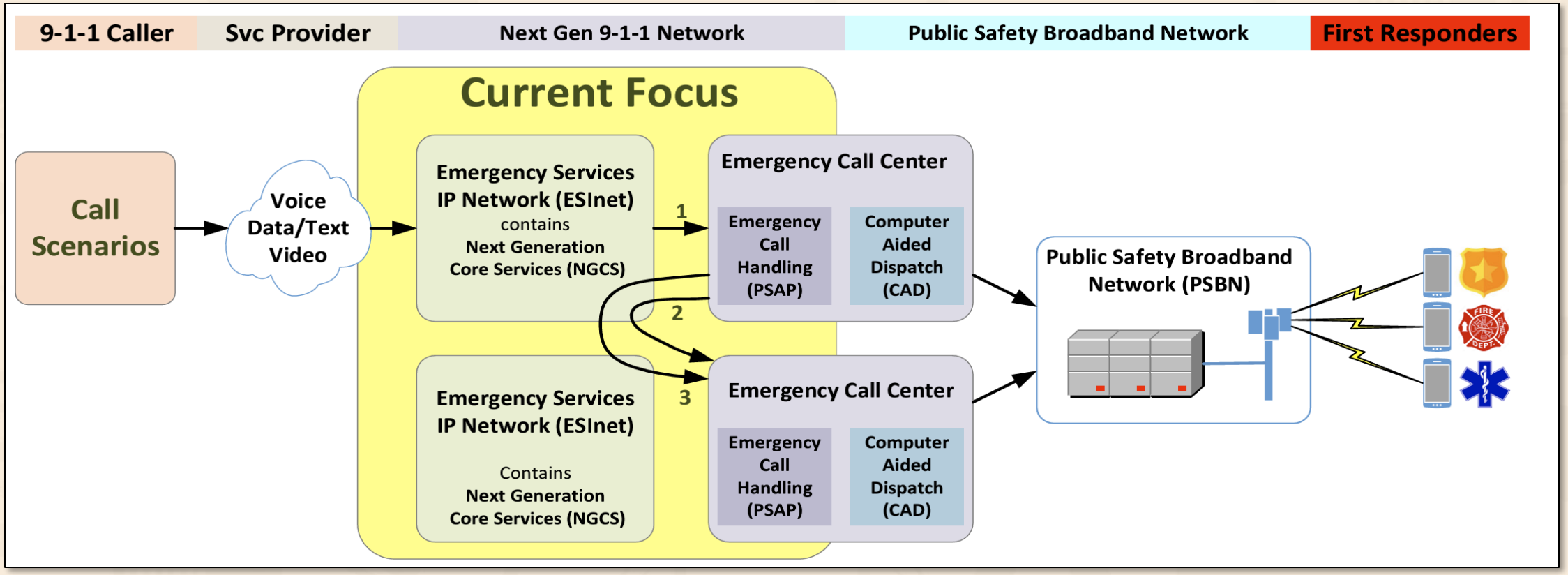
Accredited Lab Testing

- Same tests = No surprises
- Adds …
- Tests run by ISO 17025 accredited lab
- Consistent and dependable process
- Confidential results
- Digitally co-signed test report

- Vendor submits report to certifying body
- Certifying body verifies info, posts to their website
- Vendor products are eligible for purchase using federal grant funds

NG9-1-1 Testing Program: Phase 2 (2A & 2B)

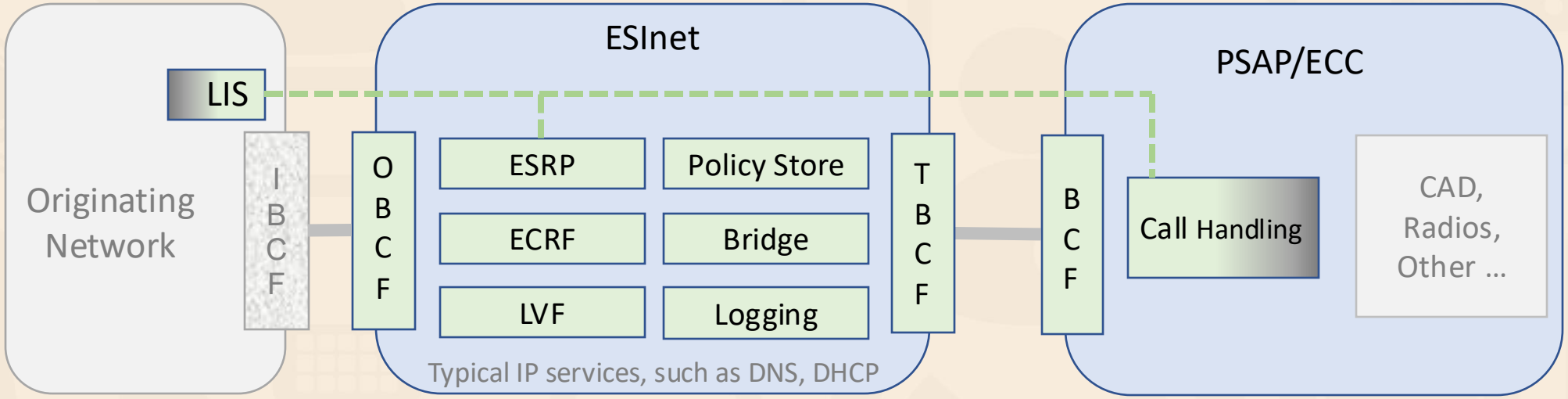
Main tasks: Build testbed; define end-to-end call scenarios, create certification report format, document costs, produce outreach video



Phase 3:
NG9-1-1 Testing System

Michael E Fox, Texas A&M

Conformance Test Scope



LIS = Location Information Server
ESInet = Emergency Services IP Network
BCF = Border Control Function
ESRP = Emergency Services Routing Proxy
ECRF = Emergency Call Routing Function
LVF = Location Validation Function
PSAP = Public Safety Answering Point

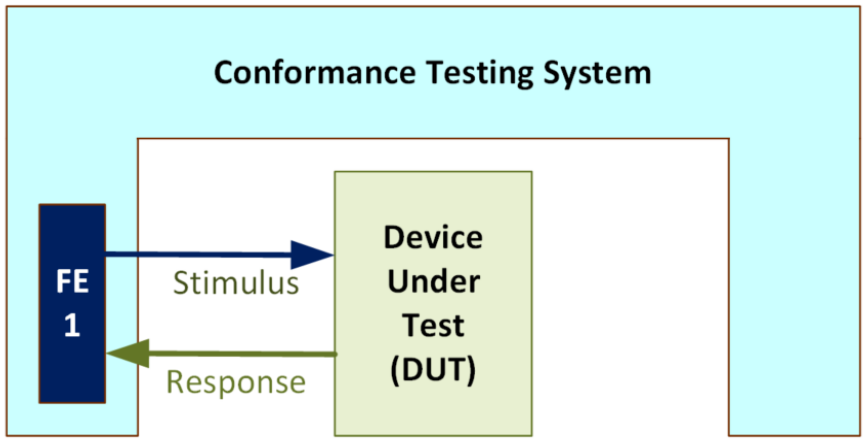
In Scope for current TAMU project

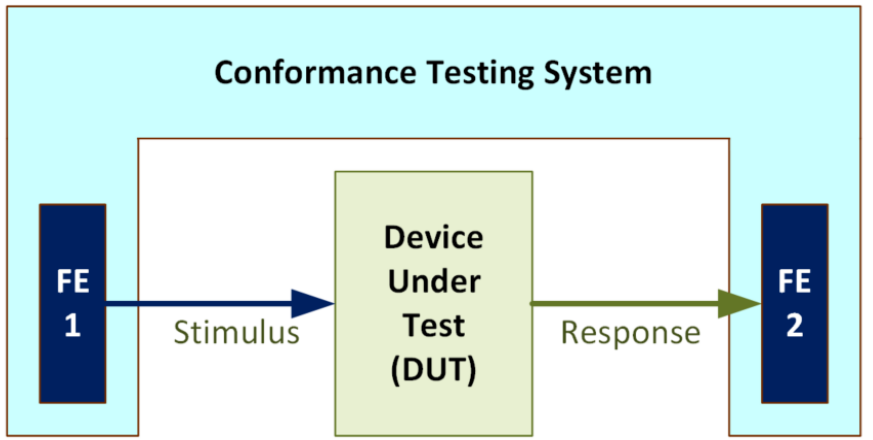
Out of Scope (for current TAMU project)

Out of Scope (for current TAMU project);
In Scope (Interoperability Task Force/Technical Committee)

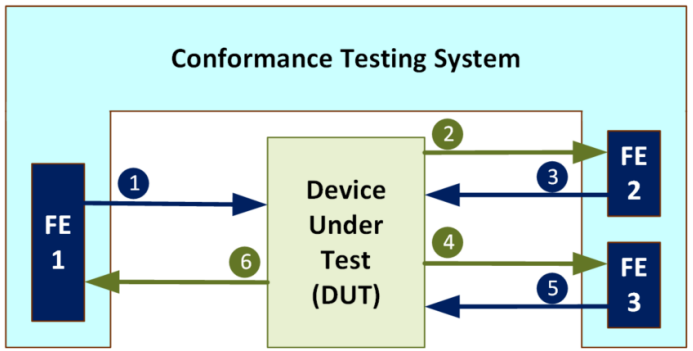
Conformance Testing: "Basic" vs. "Advanced"

Basic Conformance



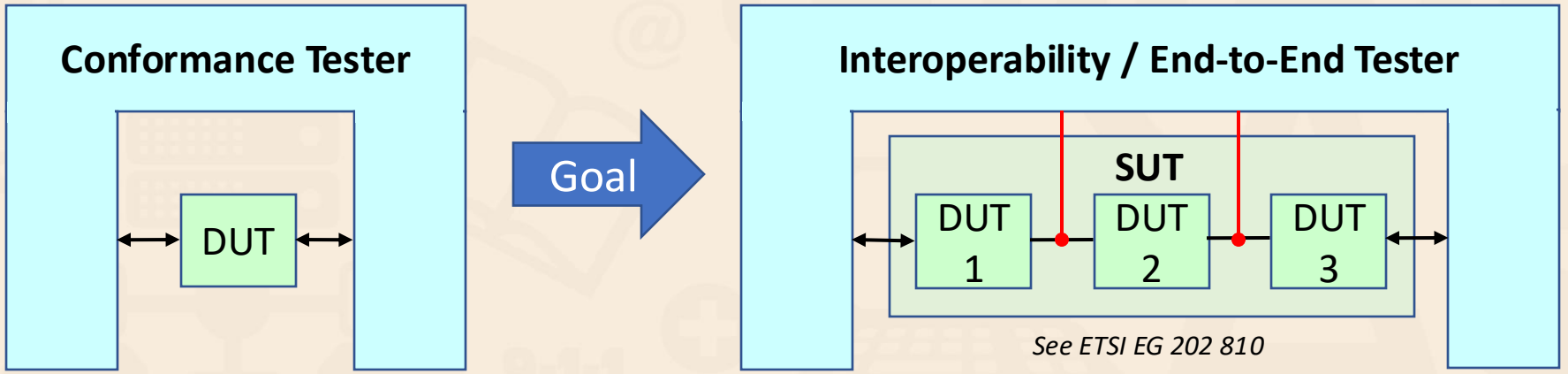


"Advanced" Conformance:

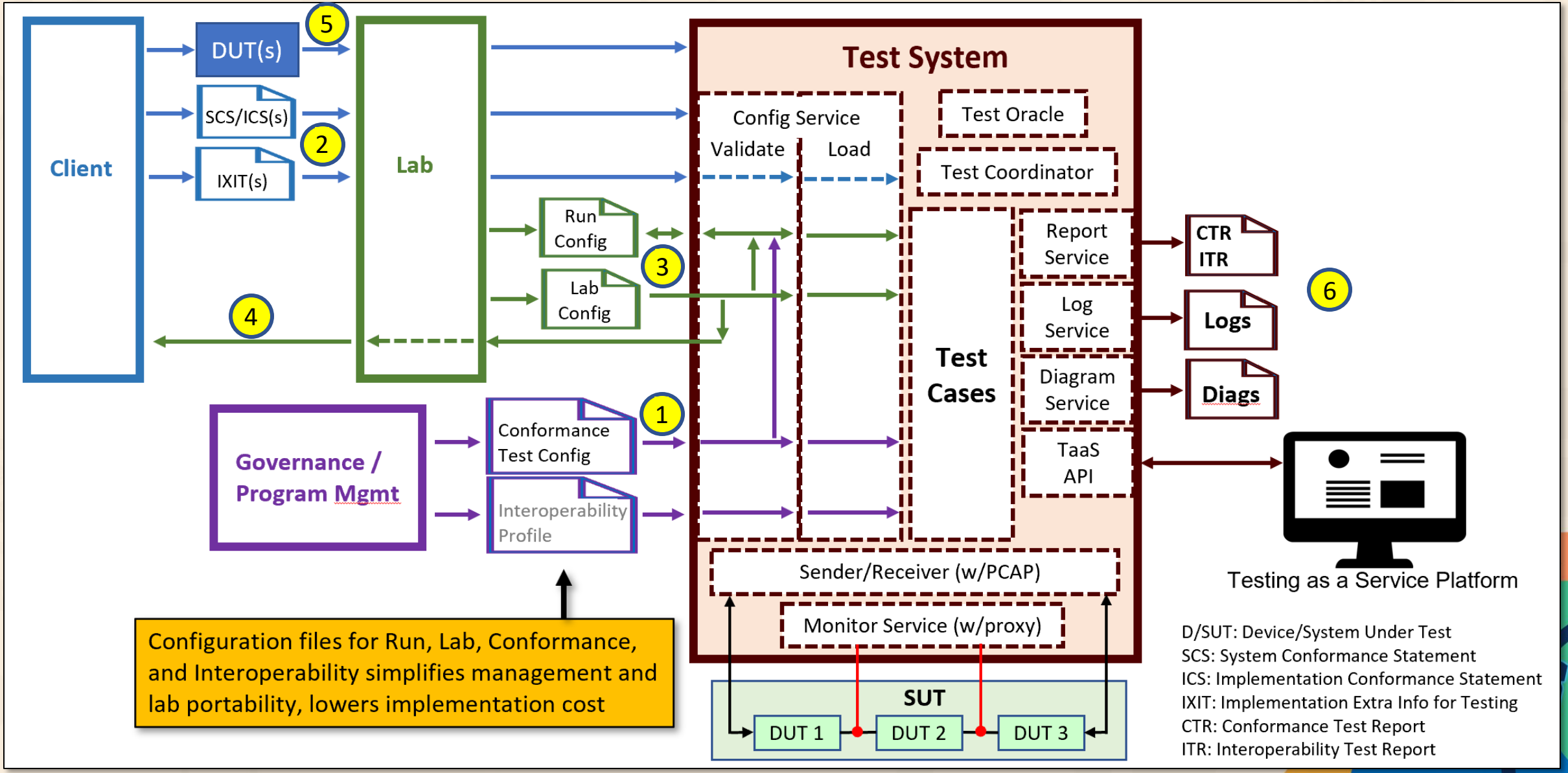


Conformance *AND* E2E Interoperability Testing

- Automated conformance testing is well understood.
- But end-to-end interoperability is the ultimate goal.
- Manual interoperability & E2E testing is time consuming and expensive.
  - Just one of the end-to-end test scenarios has over 30 variations, each with over 350 steps!
- ETSI EG 202 810 provides a model for automated interoperability test
  - Our objective: make it cost-effective and flexible (configurable) for developers and ISO labs



High-Level Test System Architecture & Workflow

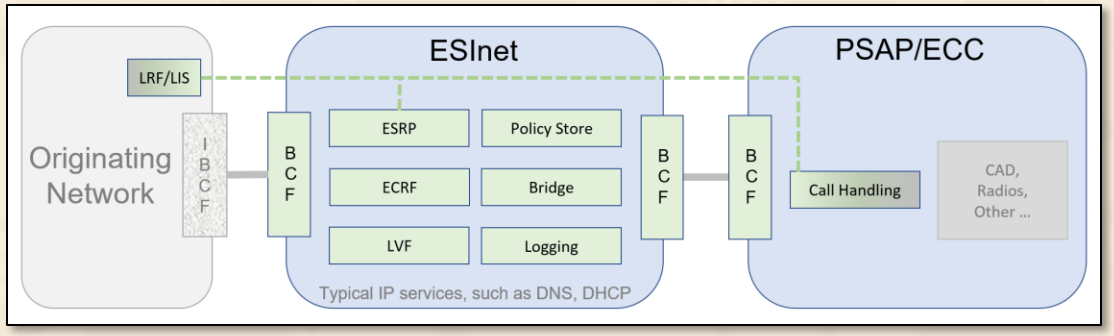


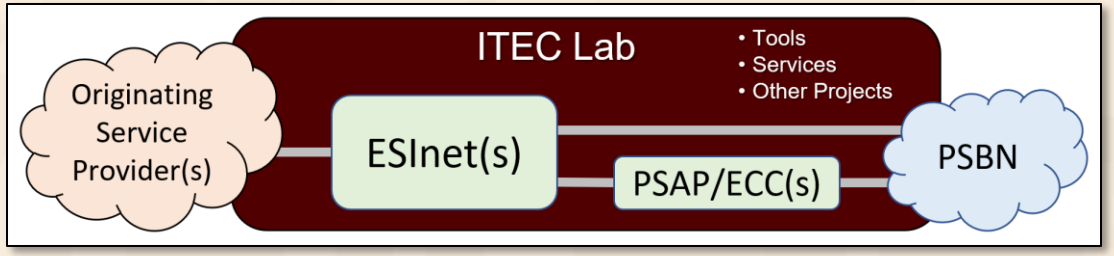
Phase 3: Cybersecurity

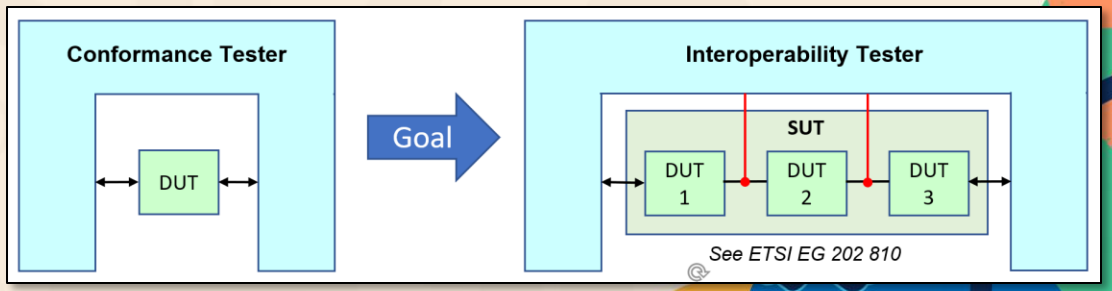
Dr. Eman Hammad, Texas A&M

Risk Assessments

- Functional Elements
  - FEs as part of the test lab; involves risk scenarios based on NG9-1-1 objectives and FE functionality.
  - Focus: system, network, and application security
  - Share practical recommendations for risk reduction
- ITEC Testbed
  - The NG9-1-1 testbed itself, including tools and services
  - External interfaces, including remote access and cloud
  - Isolation of the NG9-1-1 testbed from other projects currently operating at ITEC
- Open-source Test Engine
  - The test engine itself, including application and software supply chain security

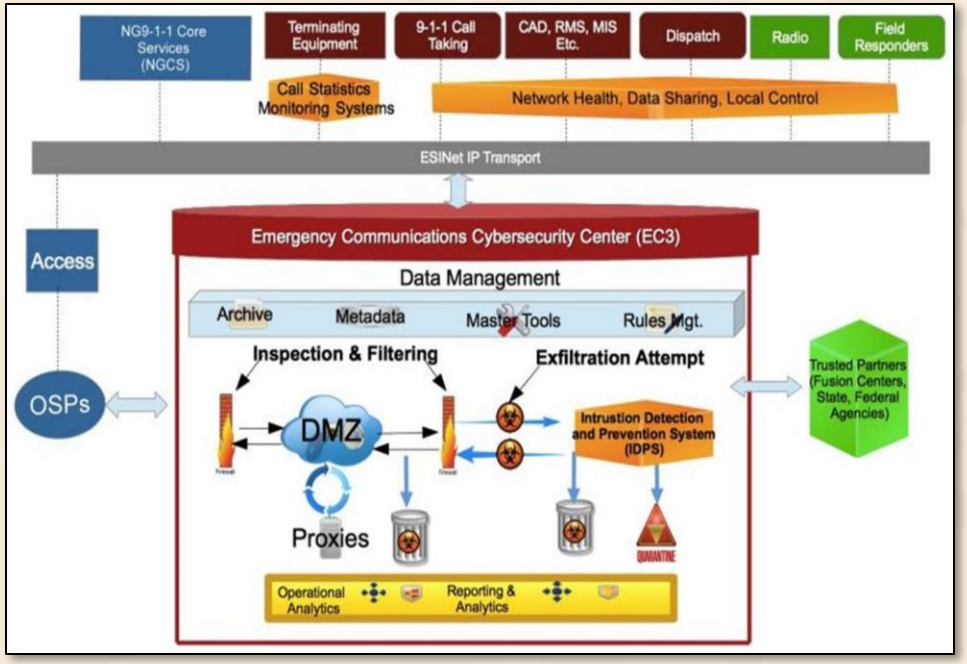






Recommendations

- EC3 (Emergency Communications Cybersecurity Center)
  - Uses existing test lab components to configure a simple Proof of Concept EC3
  - Develop example scenarios and examine EC3 abilities to collect/enrich/analyze/share data, integrate third party security solutions such as IDS, etc.
  - Develop practical recommendations on establishing an EC3 test bed with foundational capabilities
- NG9-1-1 to PSBN Interconnection
  - Uses existing 4G/5G systems at ITEC and PSBN connections to assess cybersecurity implications of NENA-STA-031.1-2021
    - “NENA Standard for Interconnecting Emergency Services IP Networks and Public Safety Broadband Networks”
  - Develop recommendations based on findings for interconnectivity.



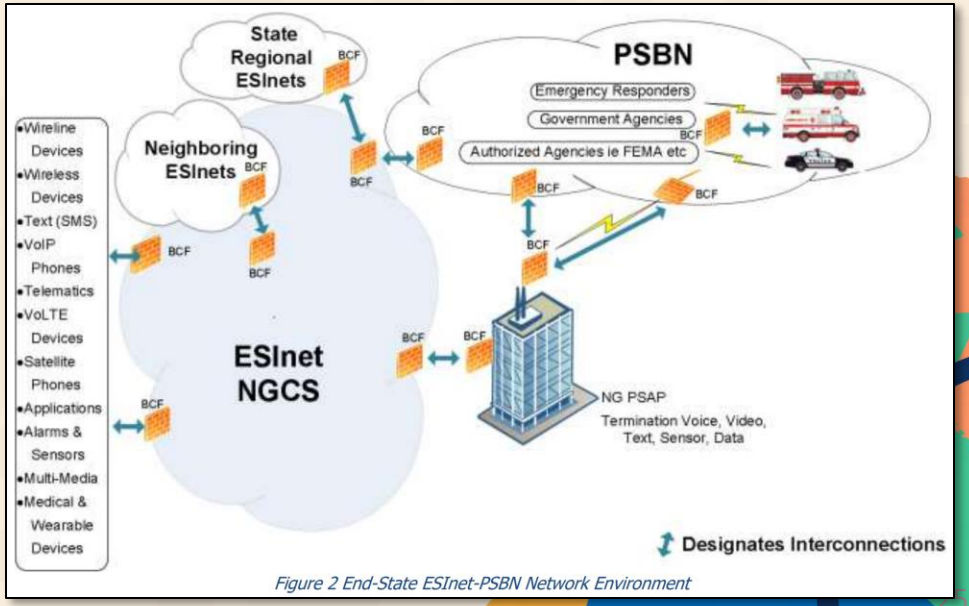


Figure 2 End-State ESInet-PSBN Network Environment

Phase 3:
ISO Accredited Lab

AJ Renold, Texas A&M

Why ISO Accreditation?

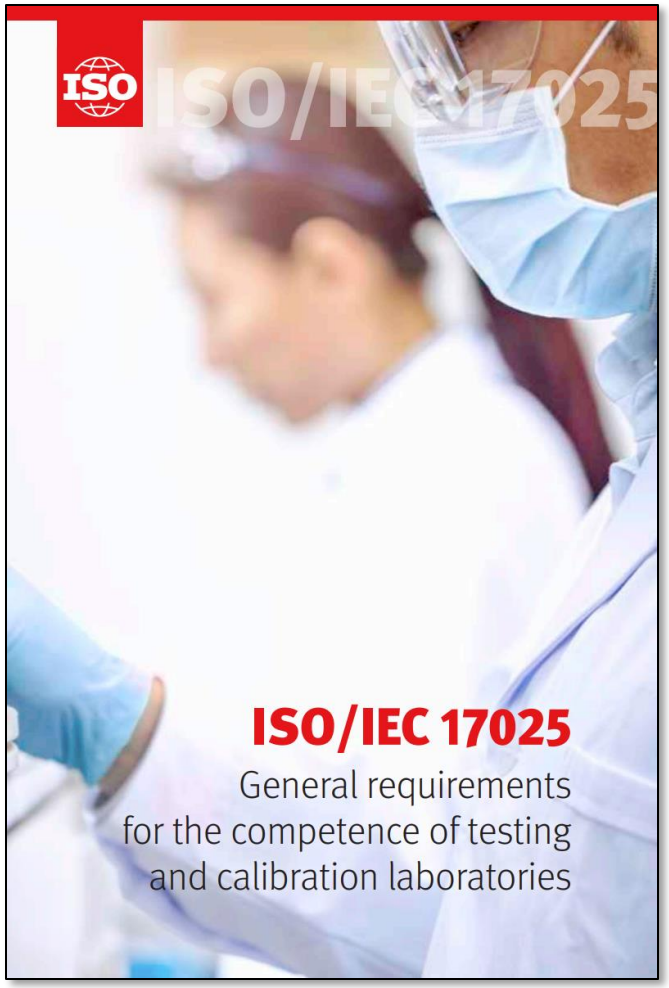
Validating components with an accredited lab before deployment reduces time, cost, and risk for PSAPs (integration errors/system downtime)

Specifically

ISO 17025 is an international standard that specifies requirements for laboratory

- Competence
- Impartiality
- Consistent operations.

ISO 17025 ensures results are credible, recognized, and trustworthy.



Major Steps in ISO Accreditation

Research

A2LA ISO Standards, Existing Standards, existing testing protocols (P25), ISO lab interviews, existing organizational policies/procedures

Develop

Draft policies, SOPs, training material, CAP report format, document management system, personnel roles, etc.

Validate

A2LA alignment, TAMU technical team, DHS, NG911 Interoperability Taskforce, conference presentations (Yay, NENA!)

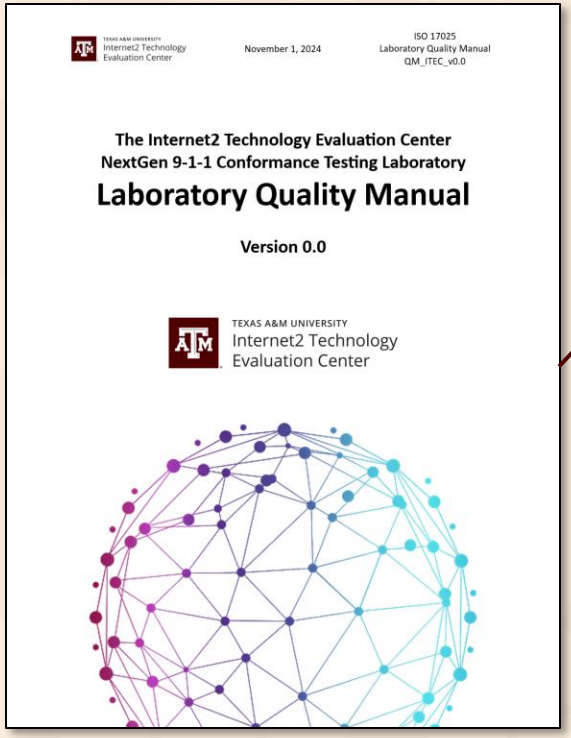
Document

Development process, cost (staff time, resources, accreditation, etc.), test methods, staff qualifications, filing conventions, policies, SOPs

ISO Documentation

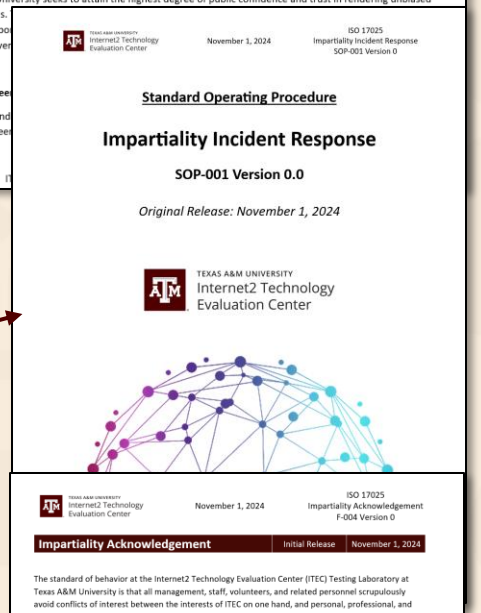
Quality Manual

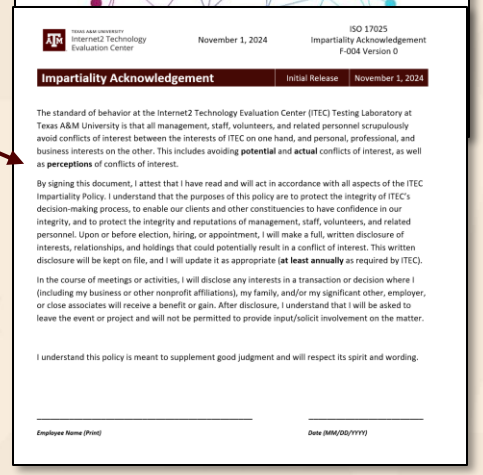
- Primary guide; 50 pgs
- ISO 17025-aligned sections
- Guides use of policies, SOPs, other docs



3 Policies

- Impartiality
- Confidentiality
- Quality





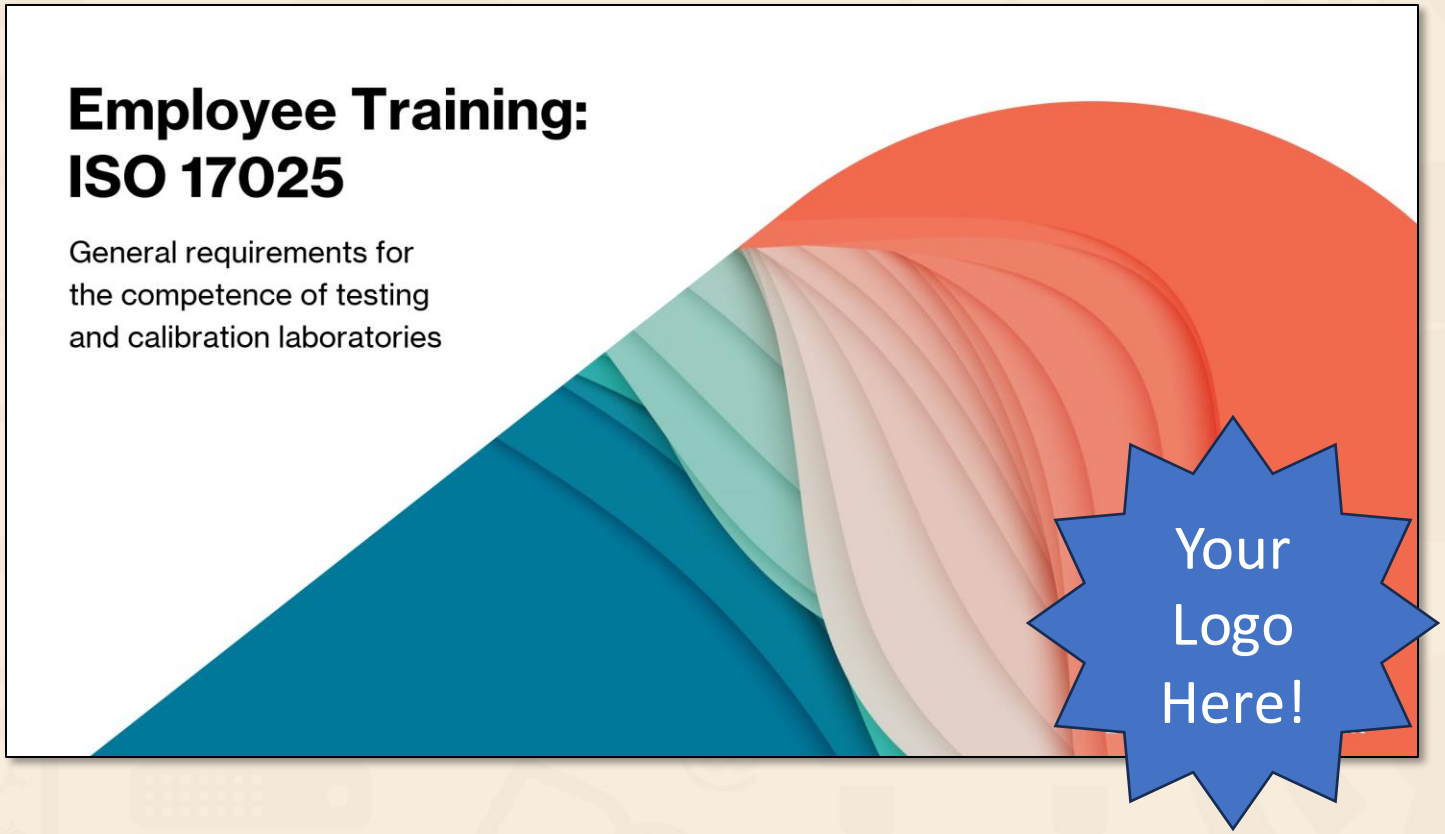
37 Other Documents

15 Forms
7 Records/Logs
15 Miscellaneous
(checklists, job descriptions, …)

19 Standard Operating Procedures

1. Impartiality Incident Response
2. Document Control and Management
3. Corrective and Preventive Actions
4. Training for Laboratory Personnel
5. Laboratory Complaint Handling
6. Purchase and Receipt of Supplies and Services
7. Control of Non-conforming Tests
8. Review of Requests, Quotes, and Contracts
9. Identification and Control of Lab Records
10. Handling of Test Items
11. Maintenance of Lab Equipment
12. Quality System Suitability Testing
13. Accreditation Symbol Control
14. Laboratory Audits
15. Laboratory Management Reviews
16. Managing Confidentiality
17. Personnel Life Cycle
18. Monitoring Validity
19. How to Perform Tests

ISO Training



Training Topics

- Lesson 1 – Introduction to ISO 17025
- Lesson 2 – Scope
- Lesson 3 – Terms and Definitions
- Lesson 4 – General Requirements
- Lesson 5 – Structural Requirements
- Lesson 6 – Resource Requirements*
- Lesson 7 – Process Requirements*
- Lesson 8 – Management System Requirements*

Impact of ISO Accreditation on NG 9-1-1 Readiness

Promotes Standardization	Universal Framework	Drives Consistency	Ensures Compatability
Accelerates Innovation	Removes Barriers	Scalable Solutions	Increased technology adoption
Supports Collaboration	Fostering Partnerships	Knowledge Sharing	Practical Implementation
Cost Effective Solutions	Lowering Barriers	Shared Resource	Lower Cost for Industry and Agencies
Builds Trust and Credibility	Globally Recognized Standards	Strengthening Ecosystem Confidence	Funding for NG911

NENA 2025 Long Beach

Challenges and Lessons Learned

Complexity of Interoperability

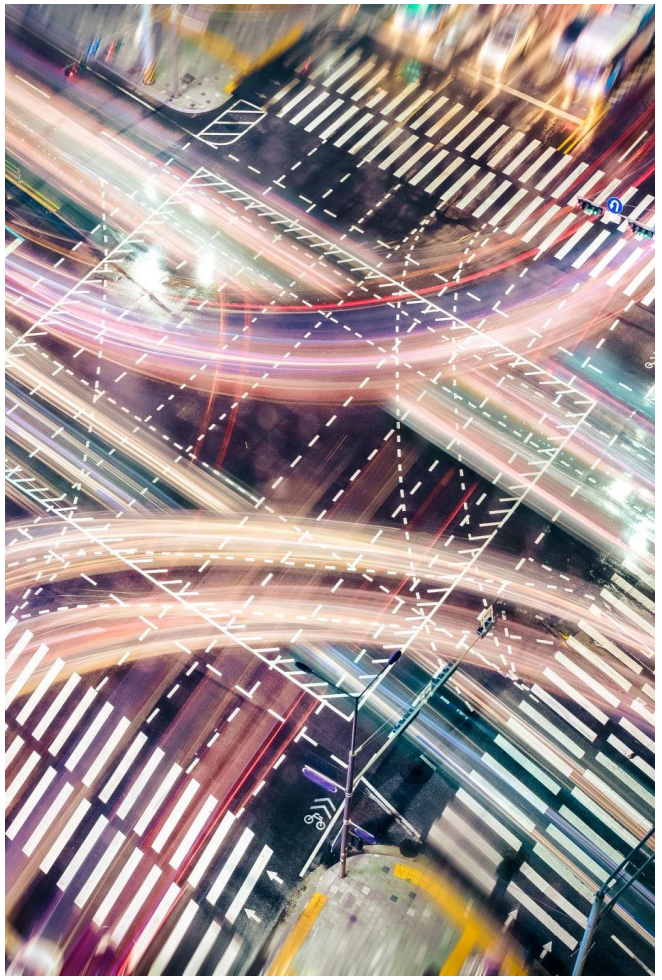
Defining the scope of testing (FEs) and components of lab/org to be accredited

Evolving Technology

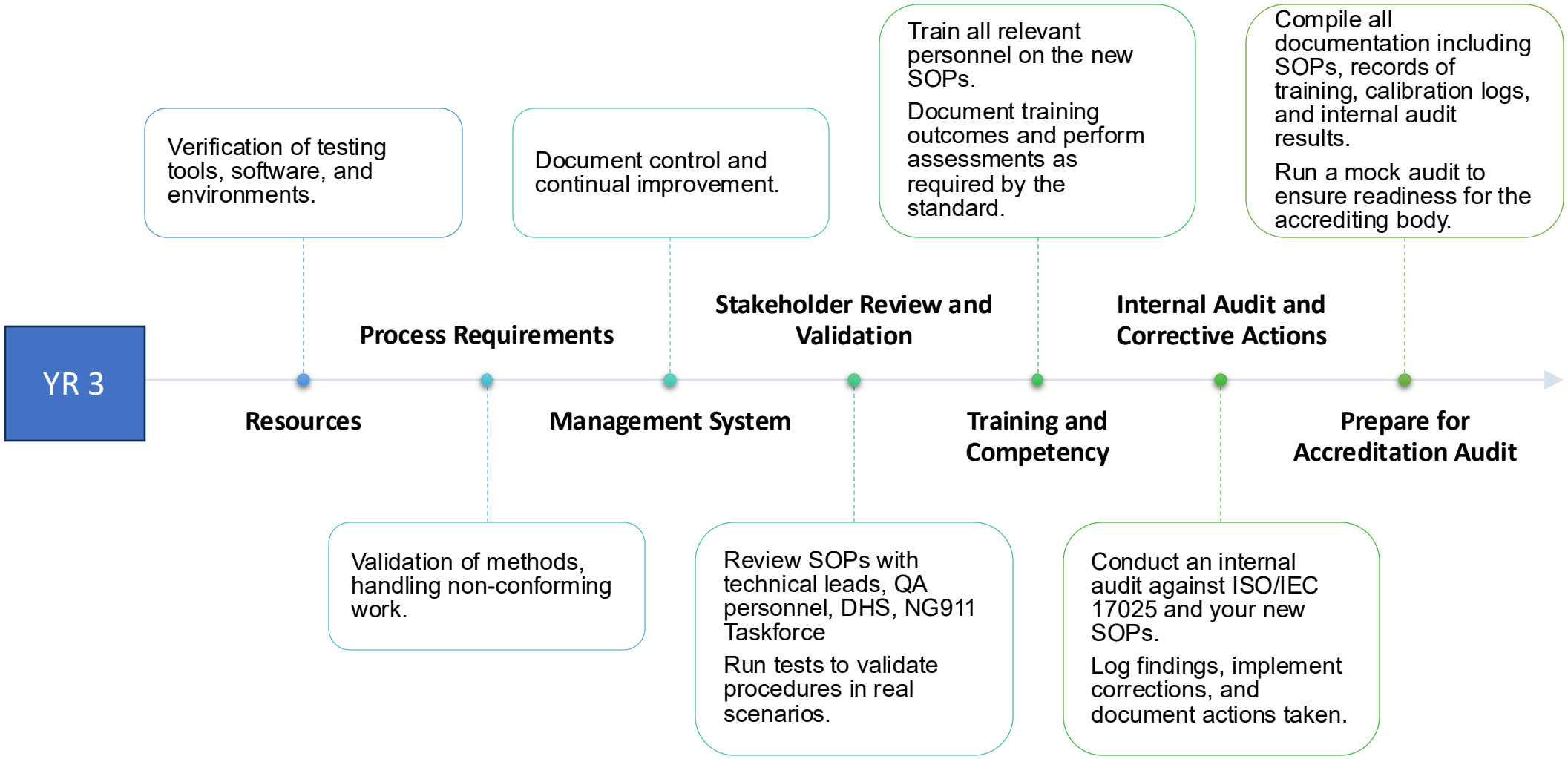
Flexibility, strong documentation, simplicity and frequent internal audits with technical staff and administrative teams is critical.

Repeatability

Creating an open-source guide that can be used by other labs.



Next Steps-FE Testing



Sounds Great!
When? And How Much?

When Do We Get It?

April 2025

Basic tests complete for all FEs

https://github.com/tamu-edu/ng911-dev

(untested and lacking documentation)

Sept 2025

ISO 17025 accredited lab ready

Vendors: Have your products tested by an ISO-accredited lab; distribute the digitally signed test reports to your sales prospects as a differentiator

9-1-1 implementors: Ask your vendors to see their ISO Lab test report!

NOW!!!

July 2025

Basic tests validated and ready for use

Vendors: Use in your own lab; submit bug reports; submit code fixes; …

9-1-1 implementors: ask your vendors if they have tested their products!

All: all vendors are welcome; more vendors = better interoperabilit

Next

Next: We're moving on to advanced tests!

How Much Does It Cost?

Source Code

- Free! Anyone can download from public GitHub.
- Development of the initial basic and advanced tests are funded by DHS.

ISO Lab Testing

- Free conformance testing until Feb 2027!
- Development and operation of an accredited lab Source Code is funded by DHS.

Testing as a Service

- Nominal fee for use.
- Pricing model is in development

Thank You!

Questions?