Education

SMI-S: Building the Case for a Standard

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Abstract

- SMI-S: Building the Case for a Standard
  - This tutorial describes how the SMI-S standard benefits four primary players in storage management solutions – end users, vendors of storage products, application (such as SRM) vendors, and integrators. Standards-based solutions help end-users avoid vendor lock-in, provide choices in storage management applications, and eliminating the cost of vendor-specific agent infrastructures. Vendors of storage products benefit by gaining application support with little or no vendor-specific development costs. Application vendors and integrators benefit by gaining storage support with little or no vendor-specific development costs. This tutorial also looks at innovative solutions that can exploit a standards-based infrastructure such as SMI-S – for example, Management Frameworks.
  - This tutorial also talks bout the past and future evolution of SMI-S; how the standard started by providing basic storage networking management tasks, adding more functionality and increasing the scope to meet the requirements of end-users and storage vendors, and plans for the future.

Overview

- Qualities of a "good" standard?
  - Examples of good and not-so-good standards
- How this applies to SMI-S
  - How SMI-S measures up to these qualities
  - How SMI-S stakeholders benefit from the standard
  - How the evolution of SMI-S increases the benefits

What makes a “good” standard?

- Vendor Neutral
- Well documented
- Sustained, democratic governance
- Completeness, with room for extensibility
- Conformance tests
- No more complex than necessary
- Improves efficiency for stakeholders
- Provides a platform for innovation

Example of a "good" standard:
Intermodal Containerized Shipping

- Created in 1956, has revolutionized shipping
  - Improved logistics and reduced costs
- Standard sized containers: 20', 40' and 45'
- Transportable on ship, rail, truck, etc.
- Arbitrary contents, including modular offices and hospitals
- Standard size helps to optimize design for warehouses, ships, terminal ports, handlers, etc

Example of a sub-optimal standard: Master Boot Record disk partitions

- De facto standard – allows various PC platforms to coexist as different partitions of disk
- Essential functionality for x86 system bootstrap
- No written specification, no owning organization
  - Occasional collisions when different stakeholders decide to use same value or area for different purposes
- Limited long-term view
  - Every couple years, some other limit (32 meg limit, 2 gig limit, 8 gig limit, cylinder related limits, …) surfaces
  - In general, tough to use newer disks with older motherboards
  - Complete dead end at 32-bit block address limit (2 TB)
- Well-designed replacement (GPT) tied to languishing BIOS replacement (EFI)
  - Over-complexity hampering acceptance

Informal and Formal standards

- 'De Facto' Standards
  - Informal – defined by one vendor or organization without standards credibility
  - Often created to solve a short-term problem without necessarily looking at long-term issues
  - Tend to provide limited interoperability
  - Tend to reduce competition
- 'De Jure' Standards
  - Created/recognized by an authorized body
  - Intended to increase competition and interoperability

Standards Lifecycle

- Standards that "stick" often start as de facto (informal), then mature into de jure (official) standards
- Initial work serves as prototype – helps work out the kinks
- Stakeholders recognize that industry-wide and open participation strengthens the standard
- Also recognize a need for an organization to oversee evolution of the standard

Example: Secure Socket Layer

- The "S" (security) in HTTPS
- Originally developed by Netscape for e-commerce,
  - Publicly shared specification, but not a 'de jure' standard
  - Developed quickly, became obligatory for e-commerce
- At the time, difficult to imagine an internet without Netscape, but some folks wanted more rigor
- Took SSL to IETF to become a de jure standard (RFC)
  - Renamed as Transport Layer Security (TLS)
  - Improved documentation
  - Governance
  - Vendor Neutral
  - Innovation – SSL/TLS now integrated into many solutions

How SMI-S Measures up

- Look at the characteristics of a good standard (completeness, conformance tests, well documented, …) and see how SMI-S supports the goal
- In particular, look at the benefits to key stakeholders
  - Storage vendors
  - Application (e.g., SRM) developers
  - Integrators
  - End users

Vendor Neutral

- SMI-S published as an ANSI (US) and ISO (international) available to any vendor
- SMI-S developed in SNIA Technical Working Groups (TWGs)
  - TWGs open to any SNIA member
- Conformance tests open to any vendor

SMI-S Documentation

- Each release first developed as a SNIA specification, selected releases submitted to ANSI, then ISO
- Documentation workload shared by volunteer authors supported by TWGs
- Managing this scope of documentation (SMI-S 1.1 has 1474 pages) has been challenging
  - Learning from ANSI, ISO, and peers (T10, T11)
  - SMI-S 1.2 broken into 9 separate books (aligned with topics/TWGs)
  - Content Author Guide for style, tool usage
  - Professional editors pull together the entire collection, help with standardization tasks

Building a case for a standard…

SMI-S Documentation

- With each release, documentation improves
  - Authors learn more about writing standards
    - Reading ISO style guide, incorporating suggestions
  - Addressing comments from ANSI/ISO reviewers
  - SNIA Review process improving
  - More reliance on professional editor to clean-up text and formating
  - Tool improvements – portion of each profile generated from machine-readable XML files
    - Verifies that programmable names are valid
    - Same files used by CTP – help eliminate inadvertant off-by-one differences between spec and tests

SMI-S Governance

- SNIA defines policies for TWGs and technical architectures (like SMI-S)
  - IP Policy
  - Vendor Neutrality
- SMI Technical Steering Group (TSG) oversees SMI TWGs
- Storage Management Initiative (SMI) formed 2006
  - Formed as SNIA "initiative"
  - Subsumed SMF and other SMI-S related non-technical entities
  - SMI Governing Board (and committees)
    - Schedules, budget, marketing, run plugfests

SMI-S Completeness, extensibility

- Early versions focused on basics (discovery, minimal provisioning) of commonly deployed SAN devices
  - Initial goals defined in 'functionality ladder' from Bluefin
  - All documented in SMI-S 1.0
- Later versions filling in gaps
  - Advanced and newer functionality (e.g., Thin Provisioning)
  - Optimization (e.g., bulk retrieval of common info from arrays)
  - Additional devices (e.g., Host Hardware RAID controllers)

SMI-S Extensibility

- CIM Common Information Model has served well in allowing us to add more devices, functionality
- SMI paving the way for vendor extensions
  - External to the standard, but format common with standard profiles
  - Created by vendors, then shared
  - Serve as incubators for new spec functionality
  - SMI-S 1.4.0 draft contains rules for keeping extensions compatible with existing profiles

SMI-S Conformance Tests

- CTP tests created for SMI-S 1.0 and extended with each follow-on release
  - Infrastructure tests
    - Independent of storage
    - Tests interoperability of the transport
  - Read-only test of information
    - Are mandatory elements provided?
    - Formatted as expected?
  - Active management tests
    - E.g., Create LUNs or Zones

Conformance Tests

- Over 500 SMI-S provider and client products have been tested through the Conformance Testing Program (CTP) for SMI-S 1.0/1.1
- CTP provider test development for SMI-S 1.2 wrapping up
  - Vendor testing starting
  - Large investment in updates to help "raise the bar" in CTP testing

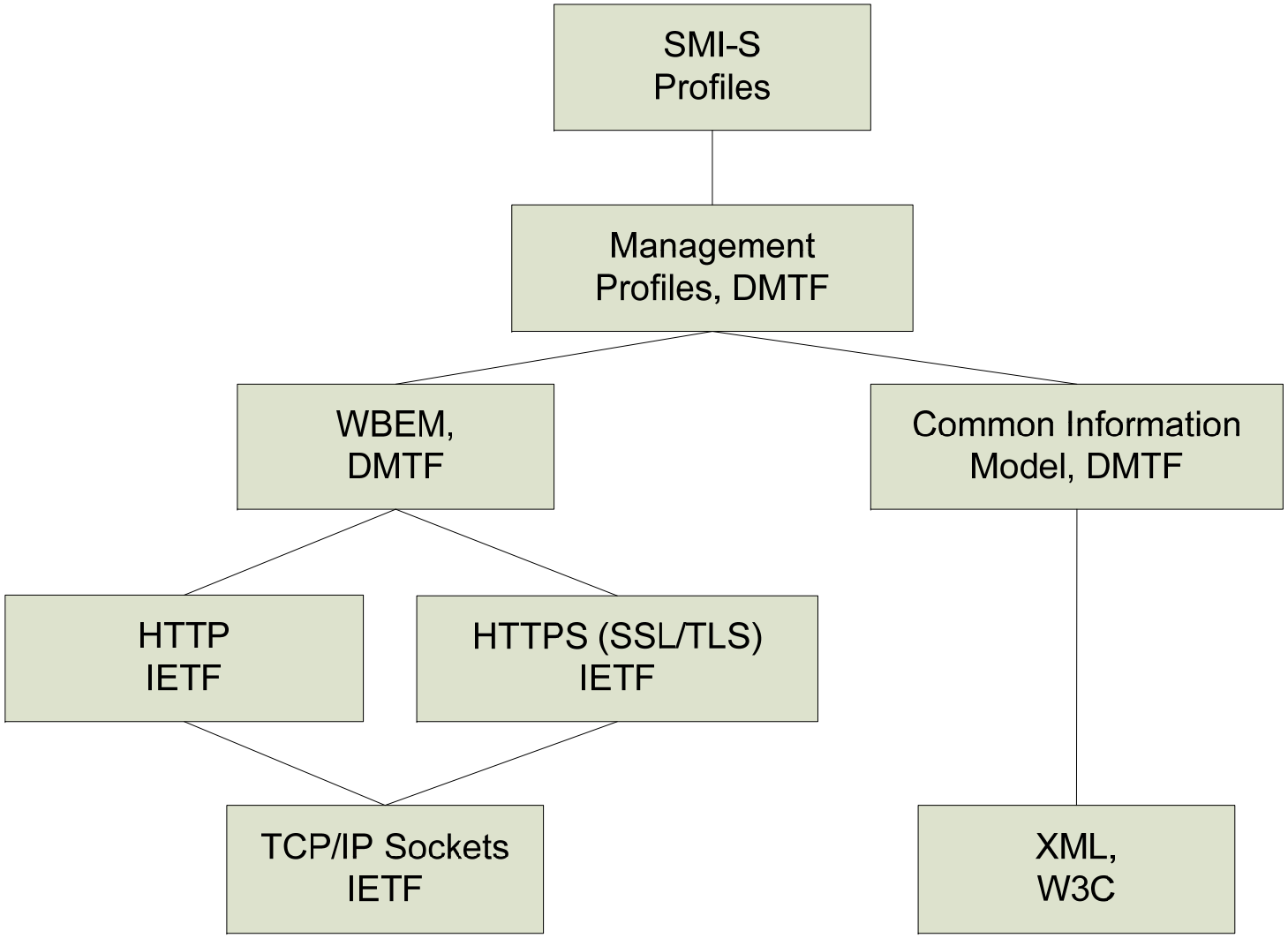
No more complex than necessary

- Cross-references are the mantra for standards like SMI-S
  - Build on and refer to other standards rather than re-inventing
  - SMI-S builds on standards from T10 (SCSI) T11 (FC), T10 (ATA), IETF (iSCSI, networking, security), DMTF (management), and other organizations
    - 39 standards referenced in SMI-S 1.2 Architecture book – these are standards with global relevance to SMI-S
    - Individual books reference other standards
- The result is that the bulk of SMI-S is about storage management

SMI relationship to other standards

- Peer relationships
  - SMI-S defines management standards for devices with datapath standards defined elsewhere (SCSI, FC, …)
  - SMI-S emphasizes use of names standardized elsewhere
    - Help end users correlate info from SMI-S and non-SMI-S applications
- Layering - building on standards
  - SMI-S builds on network-facing management standards from DMTF
    - SMI-S focuses on storage
    - SMI-S indirectly builds on network standards from IETF, XML from W3C
    - See next slide
  - SMI-S defines some profiles based on standard APIs (e.g., HBA API)
- Filling Gaps
  - SMI-S utilizes standards (e.g., SLP) to cover functionality not addressed elsewhere

SMI-S Building on other standards



Managing Complexity

- Early SMI-S focused on storage functionality incorporated in the standard
- Recent activities focused on production-readiness
  - How to install multiple-vendor SMI-S solutions
  - Trying to avoid adding additional complexity to SMI-S
  - Finding other vehicles
    - Provider portal
    - Best practices papers

SMI-S efficiency for stakeholders

- SMI-S benefits to storage vendors
  - Encourages development of third-party storage management applications
    - Offer customers multiple applications
  - Minimize need to develop or maintain in-house management infrastructure
- SMI-S benefits to application vendors
  - Single infrastructure/transport common to multiple vendors and device types

SMI-S efficiency for stakeholders

- SMI-S benefits to integrators
  - Common management platform for many vendors and devices
    - Minimize investment in multiple, proprietary infrastructures
  - Tools, trouble-shooting techniques, … common to multiple vendors and products
- SMI-S benefits to end users
  - Minimize vendor lock-in
  - Share benefits to integrators
  - Platform for innovation – future products

SMI-S: platform for innovation

- SMI-S developed with a goal of enabling innovation
  - Imagine other standards layered over SMI-S
    - For example, SNIA Management Frameworks
  - Exploit commonality across profiles
    - SMI-S Common Recipes show how an application might compose a SAN-wide topology using results from many SMI-S profiles
- Potential for Automation
  - Recovery when events are reported
  - Preventative maintenance
    - Monitor capacity growth and expand a LUN off-hours

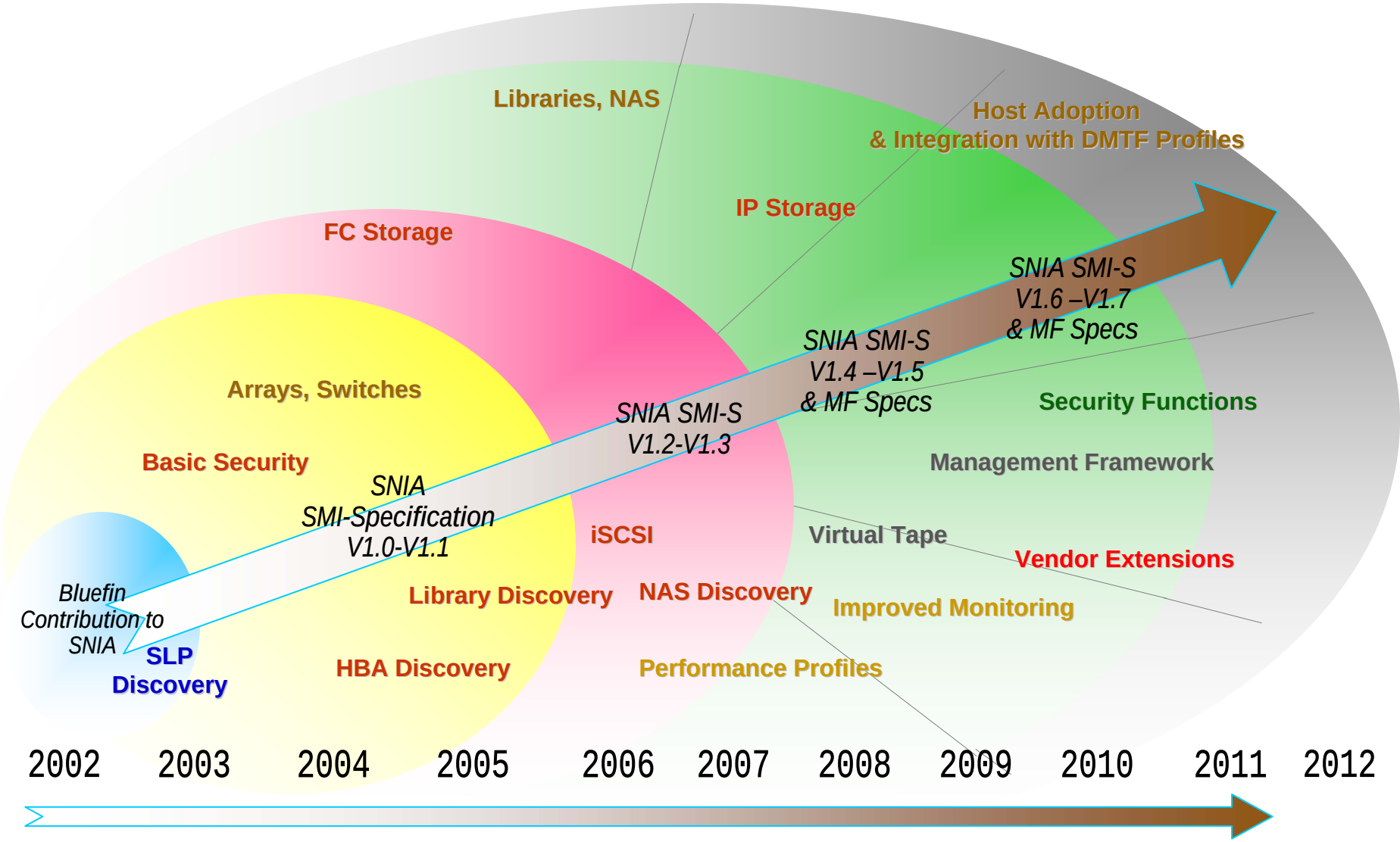
SMI-S Roadmap

- The process for defining a new SMI-S release
  - Marketing input from stakeholders (SMI vendors, End Users, Symposia BOF sessions, unfinished work items)
  - TSG architects determine how this input relates to emerging technical work, prioritize
  - TWG members volunteer for much of the work
  - TWG and SMI Governing Board recruit volunteers to address other requirements
  - TWGs scope work items, then develop content
- SMI creates schedule (approximately one year between releases)

SMI-S Roadmap

- Where are we now
  - SMI-S 1.1.1 in ANSI and ISO standardization processes
  - SMI-S 1.2 completed early 2008 – released as SNIA Architecture but not being submitted to ANSI/ISO
  - SMI-S 1.3
    - content complete
    - reviews/errata in progress
    - CTP development in progress
  - SMI-S 1.4 and Management Frameworks
    - Content being developed
- The following slide shows the SMI-S roadmap past and planned future

Technical Roadmap



Storage Management Initiative

Ecosystem Road Map – The journey continues

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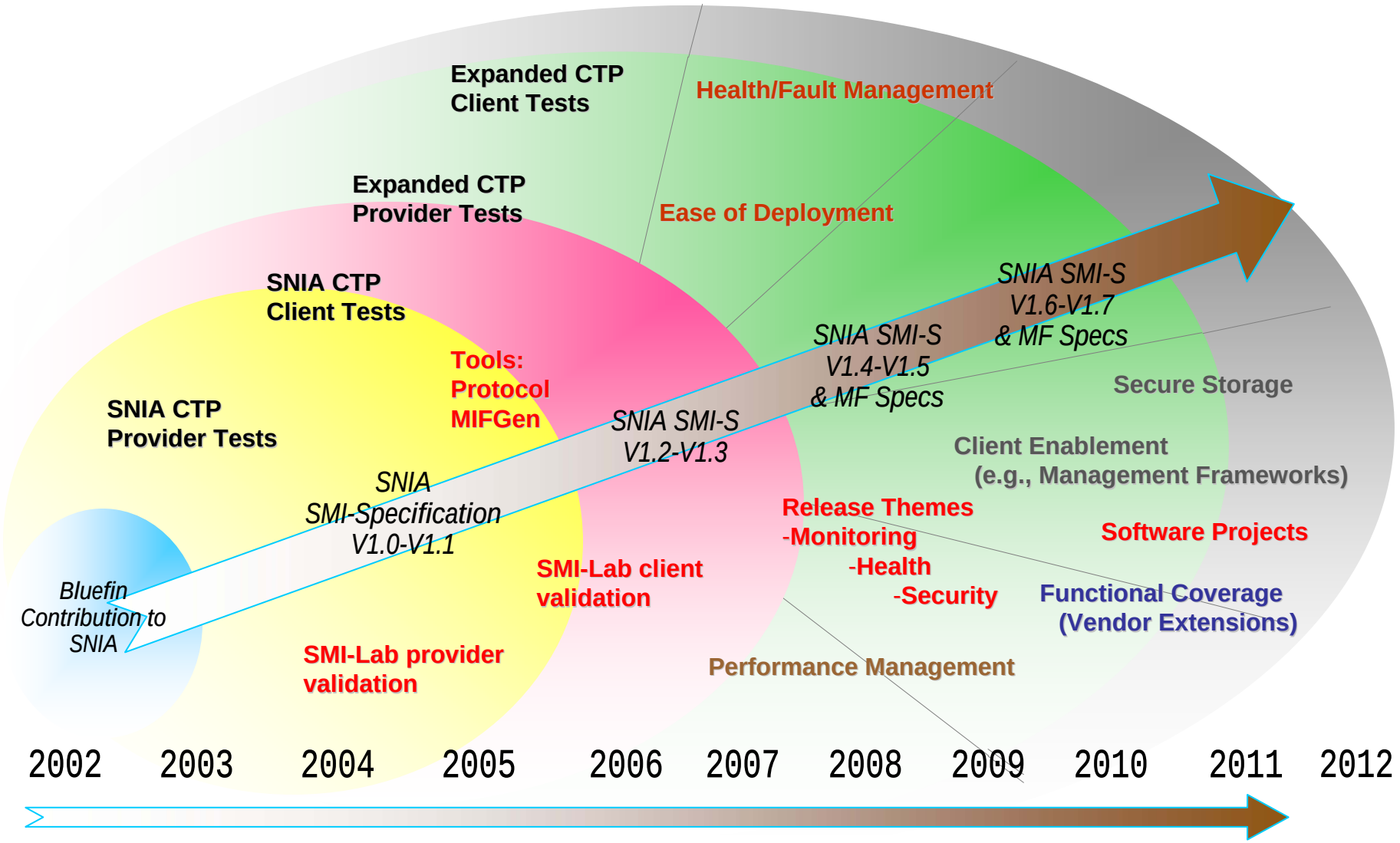

Q&A / Feedback

- Please send any questions or comments on this presentation to SNIA: trackvirtualization@snia.org

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- SNIA Education Committee

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