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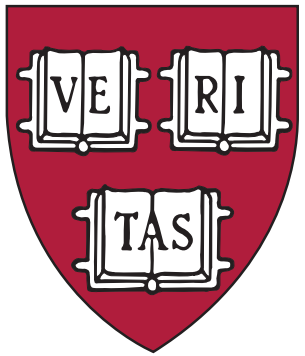

Information Technology

Integer - An Integrated Management System

March 28, 2014

Strategic Vision

Integer

Cross organization, technology and vendor tool for deployment, fault, configuration, accounting, performance and security management.

Strategic Objectives	Guiding Principles	Key Performance Indicators
❁ Create integrated and simplified deployment & operations environment ❁ Reduce total cost of operations ❁ Reduce failures ❁ Reduce MTTR ❁ Enable best operational practices ❁ Create actionable information ❁ Increase technical agility	❁ Integration of information ❁ Cross intra and inter Harvard collaboration ❁ Open source techniques, technologies and values ❁ Balance urgent needs consistent with long-term objectives ❁ Use and support open standards wherever feasible ❁ Actively balance flexibility, complexity and usability	❁ Shared actionable information ❁ Reduction in operational costs associated with management infrastructure(s) ❁ More responsive deployment of new and incremental resources ❁ Reduction of down time related to configuration errors and missing operational information

What is Integer?

- Covers areas of:
  - Fault
  - Configuration
  - Accounting
  - Performance
  - Security
- Key elements of the environment:
  - Servers
  - Network elements like routers, firewalls, load balancers, DNS system and other physical and virtual network elements.
  - Software from the virtualization layer to high-level web services
- Integrates systems and software into different views:
  - A key service like iSites or PIN
  - Infrastructure services like routing, DNS, or load balancing
  - Views of information based on role, such as high-level service view to details of how a server or router is functioning

Why Integer?

- Information gaps cause downtime:
  - Separate configuration systems/approaches
  - Absent/uncoordinated monitoring across environments
- Patchwork of non-integrated systems from multiple sources is not cost-effective:
  - Scripts
  - Existing open source solutions
  - Commercial software vendors
  - Equipment vendors
- New environments like AWS add complexity and more proprietary methods further fragmenting our view; more stove pipes

Deliverables

Release/Description	Simplification/Eliminated Systems*	Release to Test
Release 1 - Discovery - Delivery of overall architecture with an integrated function, layer 2/3 discovery and service element discovery with inventory reporting. Support for layer 1 elements.	SNMProwl	7/2014
Release 2 - Discovery and system enhancements - user ability to modify management object definitions, integration of additional data, addition of storage technology and virtualization environments at Harvard. First AWS discovery support.	cust.db, separate supporting spreadsheets for support agreements and other data	9/2014
Network Element Access Control Configuration - coordinated configuration of access across network elements/infrastructure.	Currently done by hand	5/2015
Full Network Element Configuration - addition of full network device configuration control.	NetMRI, RANCID	12/2015
Server configuration/integration with automation technologies. This includes automation of cloud and local server infrastructure configuration.	Many manual scripts, programs, poss. Maestro.	5/2016
Selected Application Configuration Control	Numerous manual scripts	10/2016
Refinement of Policy Controls, AWS enhancements and clean up	Manual scripts	3/2017
Integrated Fault and Performance Monitoring	Statseeker, Nagious, SNMPoll, MRTG	9/2017
Enhancements for Wireless support	Scripts	12/2017
*In addition to the systems and manual scripts retired, each release has potential to retire redundant Identity and Access Management System (e.g., duplicate LDAP repositories).		

Key Enablers

- Why the program will work - unique combination of:
  - Operations expertise.
  - Software engineering skills.
  - Domain experience.
  - Ability to collaborate in the open source community.
  - Ability to have a long-term view and commitment.

Results

- Ensures consistency throughout the environment - the lack of which has been the source of service outages
  - A single system where one instruction (such as permit TCP port 80 for a specific service) is translated to the service element specific commands, e.g., configure:
    - Host Firewalls
    - Firewalls
    - ACIs
    - Middleware
    - Other elements
- A single integrated set of data about our environment for better generation of actionable information.
- A single monitoring environment to view the entire technology stack.
- Reduces need for different groups to write one off tools that they must maintain.
- A common interface adjusted by role to all functions.