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Cisco live!

Managing an Enterprise WLAN with Cisco Prime Infrastructure

BRKEWN-2011

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Session Agenda

- Introducing Cisco Prime Infrastructure
- Installation and Initial Setup
- Planning and Deploying a Wireless Network
- Configuration Templates
- Maps
- Monitoring the Network
- Tools and Troubleshooting
- Reporting
- Advanced Topics

Session Objective

This session focuses on Cisco Prime Infrastructure (PI) as a deployment, management, and troubleshooting tool for Cisco Unified Wireless and wired (access) networks.

Attendees are required to have familiarity with basics of PI installation; topics covered in this session are, but not limited to: deployment options with PI (templates, auto-provisioning); operational insights, system dashboards, trends, alarms; drill-downs, cross-linked intuitive workflows to monitor client related information; enhanced reporting interface design and customisation abilities.

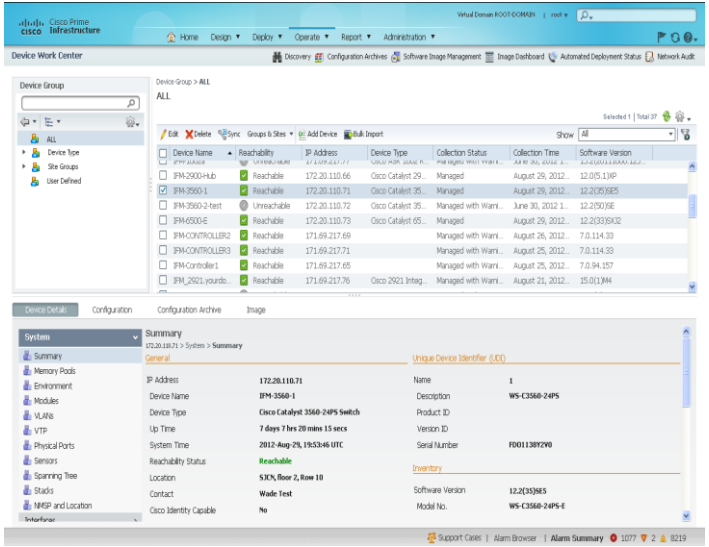
This session should be complemented with BRKEWN-2010 to get a complete overview of the advanced management and mobility services offered for a Cisco Wireless LAN.




Introducing Cisco Prime Infrastructure

Cisco Prime Infrastructure Overview

- Cisco Prime Infrastructure provides a single integrated solution for complete lifecycle management of Cisco routers, switches, and wireless devices, along with deep visibility into end-user experience and application performance
- Extends the functionality of Cisco WCS/NCS, provides complete lifecycle management of wired and wireless access networks
- Provides monitoring of endpoint security policy integration with Cisco Identity Services Engine (ISE)
- Upgrades/Migrations are available for existing customers of:
  - Prime Infrastructure 1.x [free upgrade to PI 2.0 with SASU contract]
  - Cisco Prime NCS 1.0 [free upgrade to PI 2.0 with SASU contract]
  - Cisco WCS*
  - CiscoWorks LMS 2.x/3.x
  - Cisco Prime LMS 4.x [free upgrade to PI 2.0 with SAS contract]
- Cisco Prime Infrastructure 2.0 also includes the software and licenses to use Cisco Prime LMS 4.2

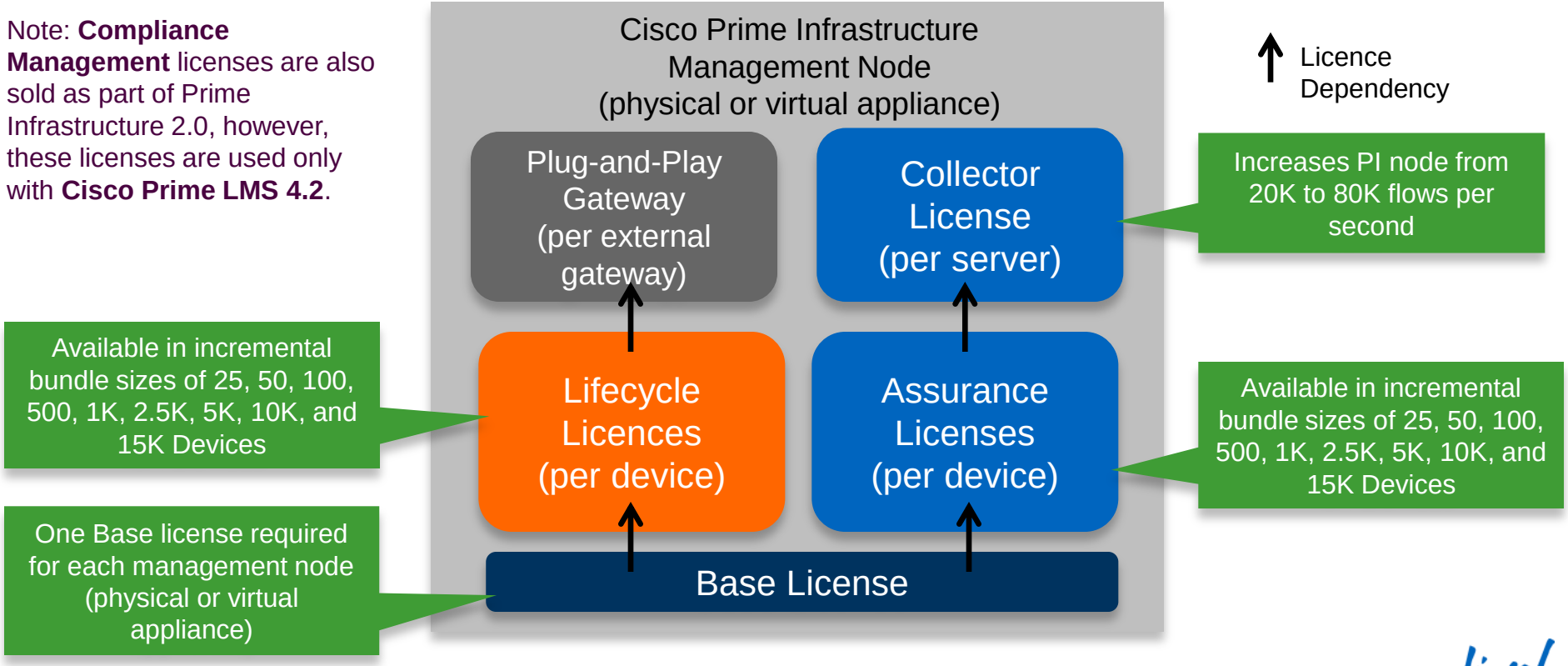


* For data migration requires doing an intermediate upgrade to NCS 1.1

Cisco Prime Infrastructure 2.0

License Model Overview

Note: **Compliance Management** licenses are also sold as part of Prime Infrastructure 2.0, however, these licenses are used only with **Cisco Prime LMS 4.2**.



Appliance Delivery Models

Physical Appliance

Application & Components

OS

Cisco Provided

Cisco-branded Hardware (1RU)

Virtual Appliance

Application & Components

OS

Cisco Provided

Customer Provided

Virtual Infrastructure

Prime Infrastructure 2.0
Virtual OVA Server Requirement and Mapping

Virtual Appliance Size	Virtual CPU	Memory (DRAM)	HDD Size	Throughput (Disk I/O)	Concurrent Users (Max)	API Clients
Express	4	12 GB	300 GB	200 MBps	5	2
Custom Express*	8	16 GB	600 GB	200 MBps	10	2
Standard	16	16 GB	900 GB	200 MBps	25	5
Pro	16	24 GB	1200 GB	200 MBps	25	5

- *Cisco UCS can be used as a virtual infrastructure deployment. i.e ESX/ESXi running on UCS*

Mapping of Pre-2.0 to 2.x OVA/Bundle/SKU	
Pre-2.0	**PI 2.0**
WCS 7.x	Standard or Physical
Physical	Standard or Physical
Small	Express
Medium	Express or Custom Express
Large	Standard <=16K Netflow
Extra Large	Pro

** Important Field Notice **

If you are using a Small or Med OVA from PI 1.2/1.3 and have not significantly added more devices or turned on new features, you can migrate to the Express OVA. All their current numbers of scale with PI 1.2/1.3 will carry forward to PI 2.0

*Custom Express is not available as a separate OVA download. You will need to download the Express OVA and customise it for Custom Express

https://supportforum.cisco.com/docs/DOC-37253

Prime Infrastructure 2.0
Physical Appliance and Mapping

Physical Appliance	Physical CPU	Memory	HDD Size	Throughput (Disk I/O)	Web Clients	API Clients
Cisco Prime Appliance	2 CPUs 8 Cores (16 Threads)	32 GB	900 GB (4x300GB RAID5)	200 MBps	25	5

- *In PI 2.0, the PI Physical Appliance maps to the Standard OVA (for scalability purposes)*
- *Physical Appliances are field upgradable*
- *Prime Infrastructure Appliance comes pre-installed with Prime Infrastructure 2.0*
- *Deploying Cisco Prime NCS Virtual Appliance on CiscoWorks Wireless LAN Solution Engine (WLSE) models 1130-19 or 1133 is **not** supported.*

** Important Field Notice **

If you are using PI Physical Appliance with PI 1.2/1.3 and have not significantly added more devices or turned on new features, they can migrate to PI 2.0 with the same number of APs or devices.

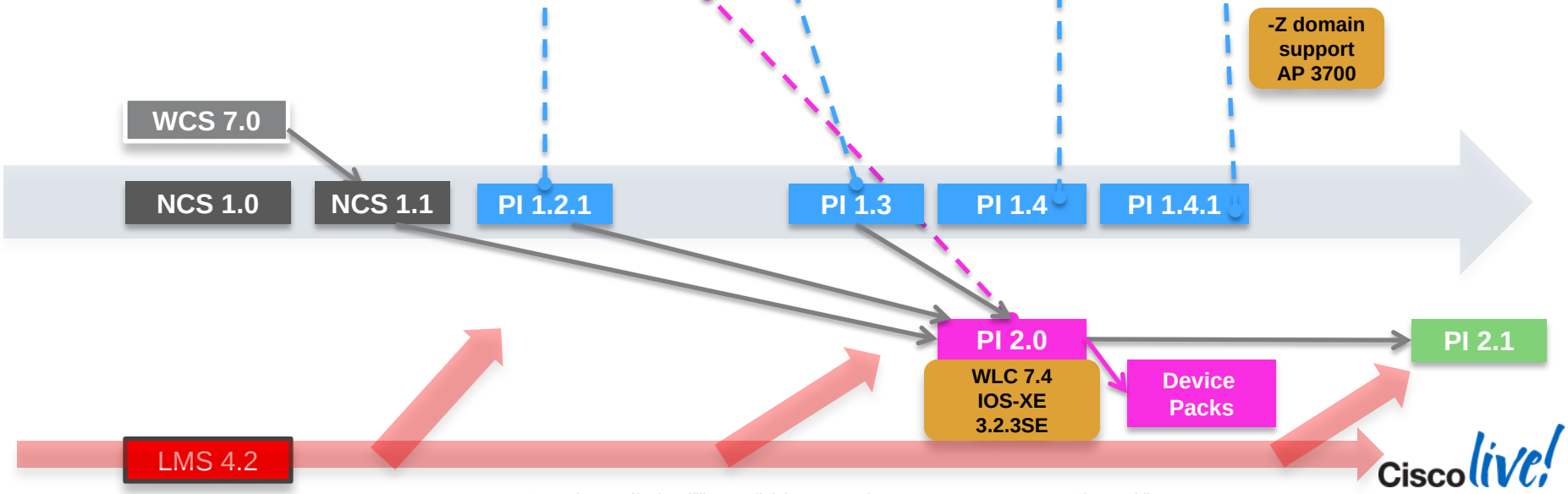
Prime Infrastructure 2.0 Scalability

Parameter		Express	Custom Express	Standard	Pro
Devices	Max Unified AP	300	2,500	5,000	20,000
	Max. Autonomous AP	300	500	3,000	3,000
	Max. Wired	300	1,000	6,000	13,000
	NAMs	5	5	500	1,000
Clients	Wired Clients	6,000	50,000	50,000	50,000
	Wireless Clients	4,000	30,000	75,000	200,000
	Changing Clients	1,000	5,000	25,000	40,000
Monitoring	Events Sustained Rate (events/s)	100	100	300	1,000
	Netflow Rate (flows/s)	3,000	3,000	16,000	80,000
	Max. Interfaces	12,000	50,000	250,000	350,000
	Max. NAM Data Polled	5	5	20	40
System	Max. Number Sites/Campus	200	500	2,500	2,500
	Max. Groups	50	100	150	150
	Max. Virtual Domains	100	500	1,000	1,000

Cisco Prime Infrastructure

AireOS Controller Release and IOS Release Alignment

	Jun 11	Feb 12	Aug 12	Dec 12	Feb 13	Oct 13	Dec 13	Mar 14	May 14
AireOS	WLC 7.0 MSE 7.0	WLC 7.2 MSE 7.2	WLC 7.3 MSE 7.3	WLC 7.4 MSE 7.4		WLC 7.5 MSE 7.5	WLC 7.6 MSE 7.6		WLC 8.0 MSE 8.0
IOS-XE				3.2.3SE		3.3.1SE		3.3.2SE	3.3.2SE



Software Upgrade Paths

From\To	WCS 7.0	NCS 1.0 (1.0.2.29)	NCS 1.1 (1.1.1.24)	PI 1.2.0 (1.2.0.103)	PI 1.2.1 (1.2.1.12)	PI 1.3 (1.3.0.20) PI-VA-1.3.0.20-size.ova	PI 1.4 PI-VA-1.4.0.45-size.ova	PI 1.4.1	PI 2.0 PI-VA-2.0.0.0.294-size.ova	PI 2.1	PI 2.2
WCS 7.0 (7.0.230.0)											
NCS 1.0 (1.0.2.29)					ncs_patch-1.0.2.29-upgrade-12						
NCS 1.1 (1.1.1.24)				ncs_patch-1.1.0.1114 ncs_patch-1.1.0.1116	ncs_1_1_1_24-Update.13.4	ncs_1_1_1_24-Update.13.4			ncs_1_1_1_24-Update.13.4		
PI 1.2.0 (1.2.0.103)					pi_1.2.1.12_update pi_1.2.1.12_patch_1	pi_1.2.1.12_update pi_1.2.1.12_patch_1 PI_1_2_1_12u-Update.1					
PI 1.2.1 (1.2.1.12)						PI_1_2_1_12-Update.1.0 PI_1_2_1_12u-Update.1			PI_1_2_1_12-Update.1.0		
PI 1.3 (1.3.0.20)									PI_1_3_0_20-Update.1.12		
PI 1.4								PI_1.4_0_45_Update_1-39			
PI 1.4.1											
PI 2.0									pi_dev_pack_update_2.0-13.ubf		
PI 2.1											




Installation and Initial Setup

Initial Setup

Setup script

- Guides network administration through set of questions for setting basic parameters
- Changes to set parameters can be made at a later time via CLI

Secondary server (High Availability) setup

- You will need to specify the Prime Infrastructure role (Primary or Secondary) during installation
- Server configured for Primary operation cannot be reconfigured for Secondary operation (or vice versa)
  - appliance needs to be re-installed and configured for Secondary operation
- Licensing based on (v)UDI (Unique Device Identifier) of Primary server

High-Availability - Components and Operation

- At the heart of the High-Availability design is the “Health Monitor” (HM) Process
- Health Monitor is sub-divided into the following sub-system:

Core HM - Configures, maintains state and starts/stops the HA configuration across Prime servers

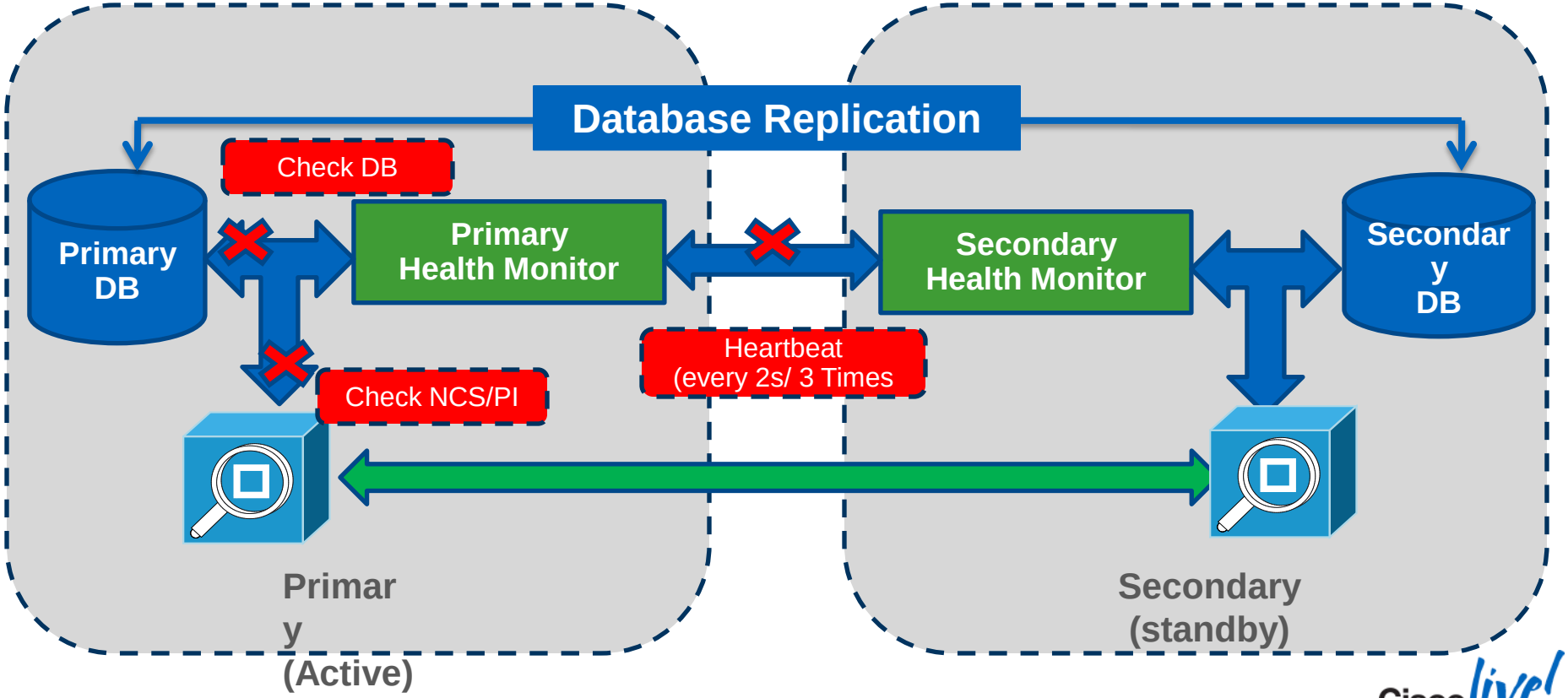
Heartbeat - Responsible for maintaining communication between the Primary and Secondary servers (over HTTPS, port 8082); timeout is set to 2s, with three re-tries

Application Monitor - Communicates with the Prime framework components on the primary server

DB Monitor - Configures database replication

File Sync - Identifies file changes, compression, and statistics maintenance

High-Availability - Components and Operation



Cisco Prime Infrastructure High Availability

- When an Primary Prime Server fails, the Secondary Prime Server takes over operations and continues to provide service.
- If the standby Prime doesn't receive 3 heartbeats (timeout 2 seconds) then either the Secondary Prime will become active (automatic failover or email will be sent to network admin. (manual failover)
- **Failover** (Primary to Secondary) can be **Automatic** or **Manual**
- **Failback** (Secondary to Primary) is always **manual**

High-Availability - Things to Consider

- Both the Primary and Secondary Prime servers should run the same software version
- Both the Primary and Secondary Prime servers should be the same size
- Email server and receiver must be configured (used for notifications)
- For communication between the Primary and Secondary, HM port (8082) must be allowed through firewall if in the path between Primary and Secondary servers
- **Failover** mode must be carefully selected (and remembered): **Manual vs. Automatic**
- Authentication key is created during the install, and is used by the Primary and Secondary Prime servers for communication (and also logging into the HM web page)
- HM available at: https://<ip.address>:HMport (example: https://10.10.10.20:8082)

High Availability Setup

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime

Home | Design | Deploy | Operate | Report | Administration | Workflows

System Settings | **High Availability**

- HA Status
- HA Configuration

HA Configuration

Administration > System Settings > High Availability > **HA Configuration**

Configuration

Configuration Mode **HA Not Configured**

General

Secondary Server

Authentication Key

Email Address rasrames@cisco.com

Failover Type Manual

Save

Administration:

- Admin Dashboard
- Logging
- Users, Roles & AAA
- Virtual Domains
- User Preferences
- Software Update
- Import Policy Update
- Jobs Dashboard
- Jobs Approval
- Health Rules
- System Settings
  - Data Sources
  - Appliance
  - Background Tasks
  - High Availability
  - System Audit
- Licenses
  - Assurance License Manager



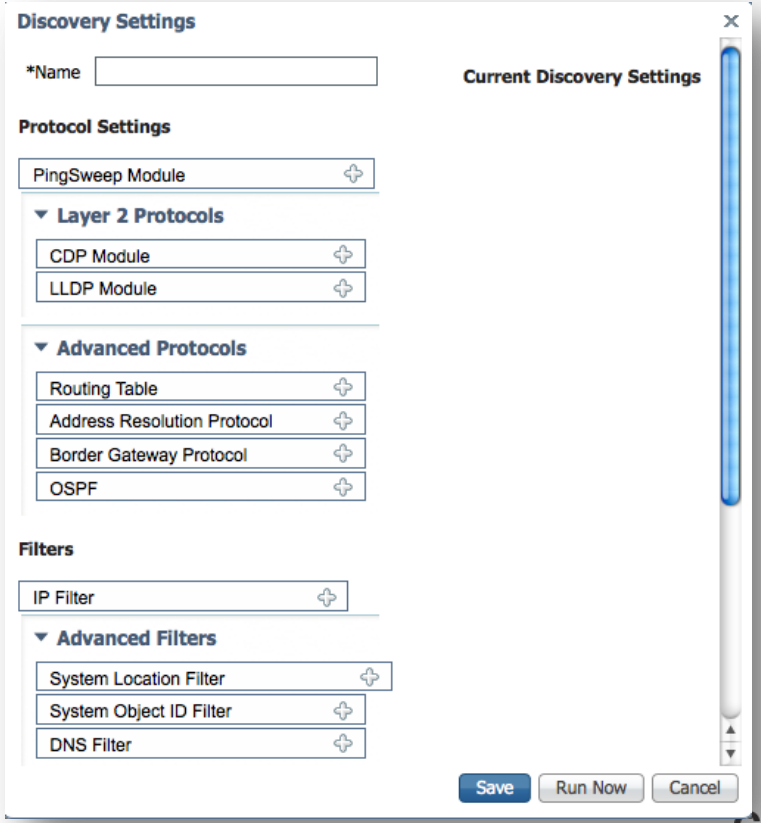

Planning and Deployment

Prime Infrastructure System Planning

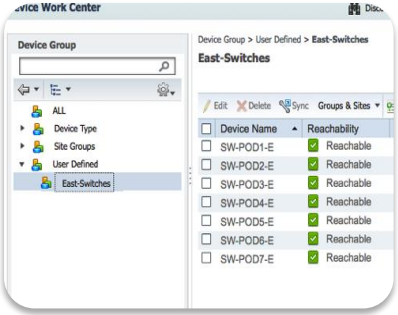
- Consideration of the initial layout of the management system is key and can make daily operations such as configuration changes, reporting and templates easier to administer
- Placing controllers and AP's in designated groups can make deployment changes or maintenances updates easier to manage and control
- Identifying RF or Security issues can be easier to locate and mitigate
- Increase in High Availability and reduction of critical network coverage response time

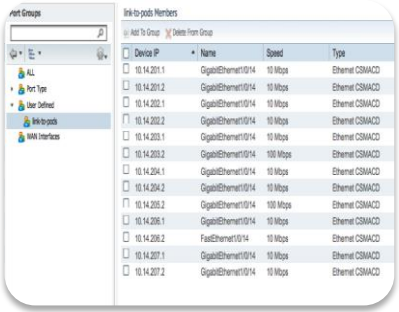
Populating Inventory

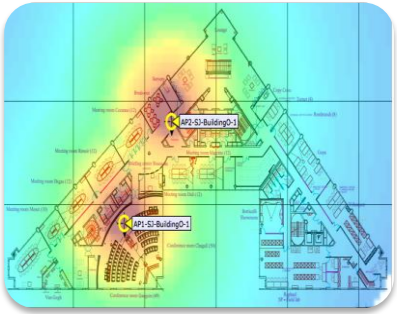
- Device Addition
  - Single addition
  - Bulk Add
  - Discovery
- Device Collection
  - Inventory
  - Configuration
- Device Monitoring
  - Performance
  - Fault

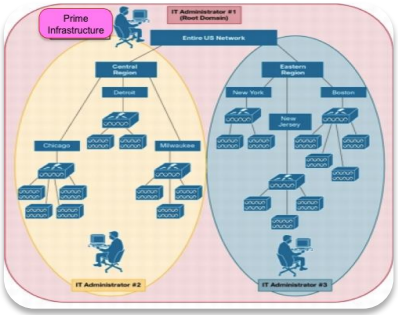


Grouping









Device Groups

- Predefined groups per device type
- Custom groups Static or dynamic
- For Configuration purpose

Port Groups

- Predefined groups per port type
- Custom groups static or dynamic
- For configuration or Monitoring purpose

Sites

- Grouping per physical location
- Hierarchy campus/building/floor
- For Location services or Assurance

Virtual Domains

- Grouping of sites/Controllers/AP/wired devices
- For Role Based Access Control

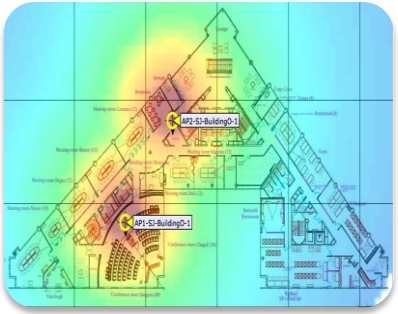
Site Grouping

- **Sites** can be organised into a hierarchy of Campuses and Buildings

- **Sites** allows for Devices, Traffic, End-users and Alarms/Events to be organised based on the physical structure of the network

- Users of Prime Infrastructure can be assigned to manage specific groups of **Sites**, called **Virtual Domains** based on their responsibilities

- The Monitoring Dashboards allows all the data collected by Prime Infrastructure / Prime Assurance to be viewed based on **Sites**



Creating Site Groups

Design > Site Map Design (or Operate > Maps)

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime | Search Menu/Prime Data

Home | Design | Deploy | Operate | Report | Administration | Workflows

Maps | Google Earth Maps

Maps Tree View

- Root Area
  - System Campus
  - Unassigned
  - Amsterdam Branch
  - Boxborough Branch
    - BXB1
    - System Campus
  - Dallas Branch
  - Denver Branch
  - India Branch
  - Japan Branch
  - London Branch
  - Los Angeles Branch
  - Management Apps
  - New York Branch
  - Paris Branch
  - RTP Branch
  - San Francisco Branch
  - San Jose Campus
  - San Jose Data Center

Site Maps Edit View

Operate>Site Maps

Show: Type All | Status All | Incomplete | Go

✓ -- Select a command -- | Go

- New Campus/Site
- New Building
- ----------
- Delete
- ----------
- Move Buildings
- Copy Maps
- ----------
- Properties
- Export Maps...
- Import Maps...
- ----------
- RF Calibration Models
- Location Presence
- Multi-Map Editor

Name	Type	Incomplete	Total APs	a/n Radios	b/g/n Radios	Critical	ients	Status
System Campus	Campus/Site		0	0	0	0		
Unassigned	Campus/Site		0	0	0	0		
Amsterdam Branch	Campus/Site		1	1	1	0		
Boxborough Branch	Campus/Site		0	0	0	0		
Dallas Branch	Campus/Site		0	0	0	0		
Denver Branch	Campus/Site		0	0	0	0		
India Branch	Campus/Site		0	0	0	0		
Japan Branch	Campus/Site		0	0	0	0		
London Branch	Campus/Site		0	0	0	0	0	
Los Angeles Branch	Campus/Site		0	0	0	0	0	
Management Apps	Campus/Site		0	0	0	0	0	
New York Branch	Campus/Site		0	0	0	0	0	
Paris Branch	Campus/Site		0	0	0	0	0	
RTP Branch	Campus/Site		0	0	0	0	0	
San Francisco Branch	Campus/Site		0	0	0	0	0	
San Jose Campus	Campus/Site		2	2	2	0	0	
San Jose Data Center	Campus/Site		0	0	0	0	0	

Workflow Status 0 0 0 | Support Cases | Alarm Browser | Alarm Summary 206 5 190

Creating Site Groups from Device Work Centre

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime | Search Menu/Prime Data

Home | Design | Deploy | Operate | Report | Administration | Workflows

Device Work Center

Discovery | Configuration Archives | Software Image Management | Image Dashboard | Plug and Play Status | Network Audit

Device Group

- ALL
- Device Type
- Site Groups
  - Amsterdam Br
  - Boxborough B
  - Dallas Branch
  - Denver Branch
  - East Sheen Branch
  - India Branch

Device Group > ALL

ALL

Name	Site Groups
Description	Site Groups
Type	Device
Group Type	Static
No. of Members	77 Total (0 Direct, 77 Children)
No. of SubGroups	34 Total (22 Direct, 12 Children)

Actions

Add Site Group

Selected 0 | Total 83

oups & Sites | Add Device | Bulk Import | Export Device | Show All

	ability	IP Address/DNS	Device Type	Admin Status	Inventory Collection Status	Last Successful Coll...	Software Type	Softwa
		10.0.252.4	Cisco Catalyst 3560E-24...	Managed	Completed	February 20, 2014 1...	IOS	12.2(5
		10.0.252.3	Cisco 3750 Stackable S...	Managed	Completed	February 20, 2014 1...	IOS	12.2(3
		192.168.152.1	Cisco 3945E Integrated ...	Managed	Completed	February 20, 2014 1...	IOS	15.1(4
		10.0.103.1	Cisco 3945 Integrated S...	Managed	Completed	February 20, 2014 1...	IOS	15.1(4
		10.0.255.42	Cisco 7206VXR Router	Managed	Completed	February 20, 2014 1...	IOS	12.2(1
7206-Core-2		10.0.255.52	Cisco 7206VXR Router	Managed	Completed	February 20, 2014 1...	IOS	12.2(2
AMS-2921-RBR		192.168.152.2	Cisco 2921 Integrated S...	Managed	Completed	February 20, 2014 1...	IOS	15.2(4

Building View

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime | Search Menu/Prime Data

Home | Design | Deploy | Operate | Report | Administration | Workflows

Maps Tree View

- Root Area
  - System Campus
  - Unassigned
  - Amsterdam Branch
  - Boxborough Branch
  - Dallas Branch
  - Denver Branch
  - East Sheen Branch
  - India Branch
  - Japan Branch
  - London Branch
  - Los Angeles Branch
  - Management Apps
  - New York Branch
  - Paris Branch
  - RTP Branch
  - San Francisco Branch
  - San Jose Campus
    - Building O
  - San Jose Data Center
  - Singapore Branch

Building View

Operate > Site Maps > San Jose Campus > **Building O**

✓ -- Select a command --
New Floor Area

Edit Building
Delete Building
Copy Building ...

Configure Interferer Notifications

Go

Floor	Map	Details			
2		Floor Area	2	Total APs	0
		Floor Index	2	a/n Radios	0
		Contact		b/g/n Radios	0
		Status	✓	Critical Radio Alarms	0
		a/n Clients	0	b/g/n Clients	0
		Wired Clients	0		
1		Floor Area	1	Total APs	2
		Floor Index	1	a/n Radios	2
		Contact		b/g/n Radios	2
		Status	⚠	Critical Radio Alarms	0
		a/n Clients	0	b/g/n Clients	0
		Wired Clients	0		

Workflow Status 0 0 0 | Support Cases | Alarm Browser | **Alarm Summary** 206 5 190

Adding Devices to Sites and Groups

Operate > Device Work Centre > Groups & Sites

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime | Search Menu/Prime Data

Home | Design | Deploy | Operate | Report | Administration | Workflows

Device Work Center

Discovery | Configuration Archives | Software Image Management | Image Dashboard | Plug and Play Status | Network Audit

Device Group

- ALL
- Device Type
  - Cisco Interfaces and Modules
  - Cisco UCS Series
  - Routers
  - Switches and Hubs
  - TelePresence
  - Third Party Device

Device Group > ALL

ALL

Selected 3 | Total 83

Edit | Delete | Sync | Groups & Sites | Add Device | Bulk Import | Export Device | Show All

Device Name	Reachability	IP Address/DNS	Device Type	Admin Status	Inventory Collection Status	Last Successful Coll...	Software Type	Softwa
3560-DC-1		10.0.252.4	Cisco Catalyst 3560E-24...	Managed	Completed	February 20, 2014 1...	IOS	12.2(5
3750-PHY-1		10.0.252.3	Cisco 3750 Stackable Sw...	Managed	Completed	February 20, 2014 1...	IOS	12.2(3
3945-East-1.cisco.com		192.168.152.1	Cisco 3945E Integrated	Managed	Completed	February 20, 2014 1...	IOS	15.1(4
3945-West-1		10.0.10		aged	Completed	February 20, 2014 1...	IOS	15.1(4
7206-Core-1		10.0.25		aged	Completed	February 20, 2014 1...	IOS	12.2(1
7206-Core-2		10.0.25				February 20, 2014 1...	IOS	12.2(2

Number of devices selected 3

Add To Group

Select Group

Save | Canc

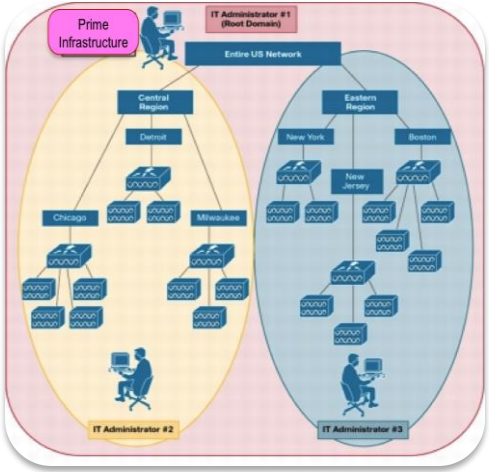
Group

- Site Groups
  - Amsterdam Branch
  - Boxborough Branch
  - Dallas Branch
  - Denver Branch
  - India Branch
  - Japan Branch

Workflow Status 0 0 0 | Support Cases | Alarm Browser | Alarm Summary 206 5 190

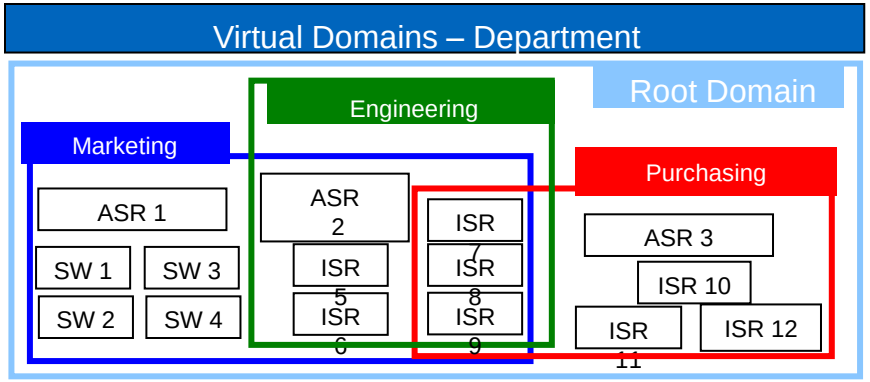
Virtual Domains

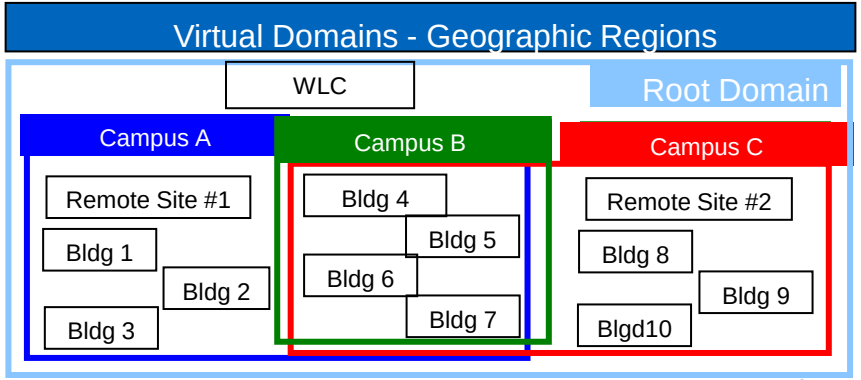
- Virtual Domains allow controlled access to a specific set of devices and/or sites
- Used to provide administrative control. User can be added and assigned predefined static roles.
- Besides complete access, you can give administrative access with differentiated privileges to certain user groups
- A user can add new virtual domain by navigating to **Administration > Virtual Domains**
- To add users, navigate to **Administration > User Roles & AAA**.



Virtual Domains

- Hierarchical Domains
  - Top (ROOT-DOMAIN) user has complete access to all domains
  - Selected users have access to individual domains
  - Standard Prime Infrastructure features for all domains
- Distributed Device Deployment
  - Dedicated Device per virtual domain
  - Configuration and monitoring of Device allowed at individual domain level
- Centralised Device Deployment
  - e.g Shared Controller across multiple virtual domains
  - Only monitoring views for particular domain; configuration of shared Controller at top most domain





Virtual Domains

What They Are (or do)	What They're Not (or don't do)
Quick way to partition PI objects	Not necessarily a complete replacement for RBAC (for example, via TACACS+)
Allows users to be mapped to separate virtual domains at the time of creation	If none specified, users are added to the **"ROOT-DOMAIN"** virtual domain by default
Separate Reports, Controllers, Access Points, Search, Templates, Config Groups, Alarms and other objects	Don't separate Google Earth Maps, Auto-Provisioning, MSEs, and Ethernet Switches
Objects may be assigned to multiple domains at the same time	Avoid changing configurations from multiple domains management simple
"**ROOT-DOMAIN**" domain is a superset of all sub-domains	Not all objects are available at the "root" level – objects such as Search and Reports are domain specific

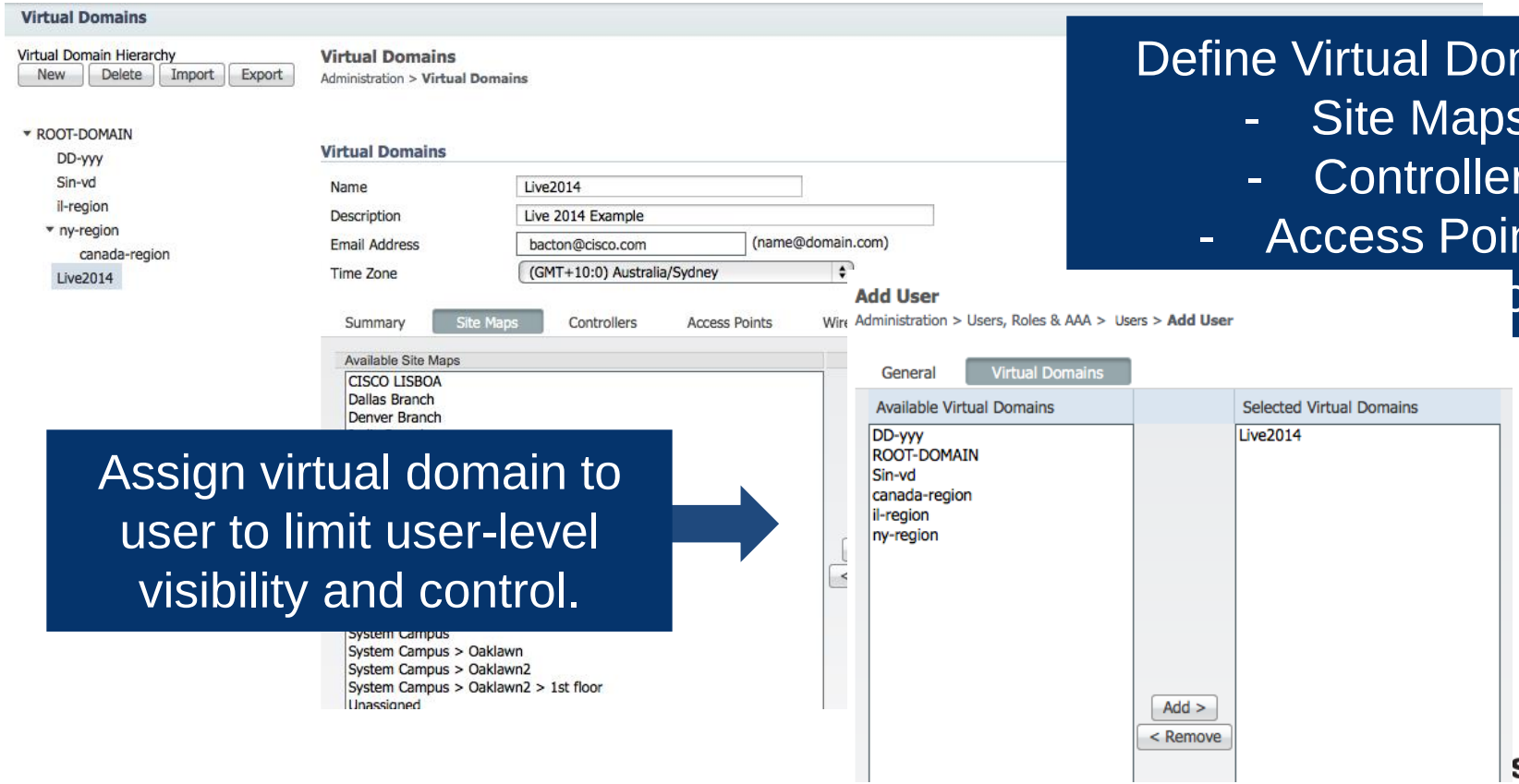
Effects of Partitioning

	Effects of Partitioning
Reports	Only visible in current virtual domain. Cannot view reports from subvirtual domain
Search	Only includes components assigned to virtual domain.
Alarms	Only ROOT-DOMAIN can enable Location Notifications, Location Servers
Templates	Only available to Virtual Domain unless it is applied to Controller
Config Groups	Can be viewed/modified by Parent Domain
Maps	All Buildings in Campus, All Floors associated with Building, All Access Points associated with that floor. **IF** floor directly assigned you lose some map based features
Access Points	When controller or map assigned, the associated access points are assigned too. IF you assign Access Points directly lose some controller based features
Controllers	Recomendation to assign controller to only One Virtual Domain
Email	Can be configured per-Virtual Domain.

Virtual Domains vs. Roles

Network Partitioning	Provides the capability for PI to be segmented by network elements (controllers, AP's, switches, maps)
Partitioning Granularity	Alarms, reports, searches, applied templates, config groups are virtual domain aware.
User-Level Control	Granular control of user/admin privilege level (defined in PI and RADIUS/TACACS).

Virtual Domain – Setup



Define Virtual Domains
- Site Maps
- Controller
- Access Points
- ces

Assign virtual domain to user to limit user-level visibility and control.

Virtual Domain – Roles: User Setup

Add User
Administration > Users, Roles & AAA > Users > **Add User**

General | Virtual Domains

Username: biggles
New Password: ••••••••
Confirm Password: ••••••••

Groups Assigned to this User

- [x] Admin
- [x] Config Managers
- [ ] Lobby Ambassador
- [ ] Monitor Lite
- [ ] North Bound API
- [ ] Root
- [x] Super Users
- [x] System Monitoring
- [ ] User Assistant

User accounts provides granular level of user access.

RADIUS Custom Attributes

```
NCS:virt
NCS:virt
NCS:virt
```

TACACS+ Custom Attributes

```
virtual-domain0=ROOT-DOMAIN
virtual-domain1=floor 1 APs
virtual-domain2=11B-AP1
```

Cisco ACS

Cisco PI

Add User
Administration > Users, Roles & AAA > Users > **Add User**

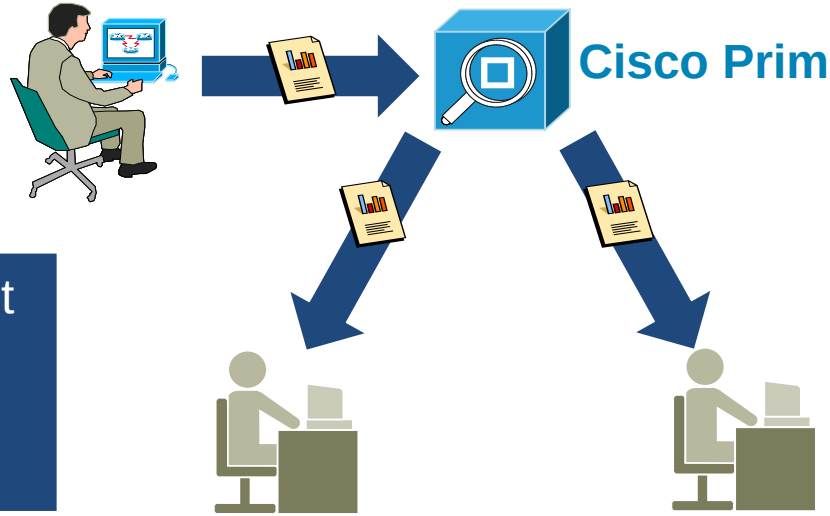
General | Virtual Domains

Available Virtual Domains		Selected Virtual Domains
DD-yyy ROOT-DOMAIN Sin-vd canada-region il-region ny-region	Add > < Remove	Live2014

Assign virtual domain to user to limit user-level visibility and control.

Virtual Domain – Reports

Admin creates report from ROOT-DOMAIN

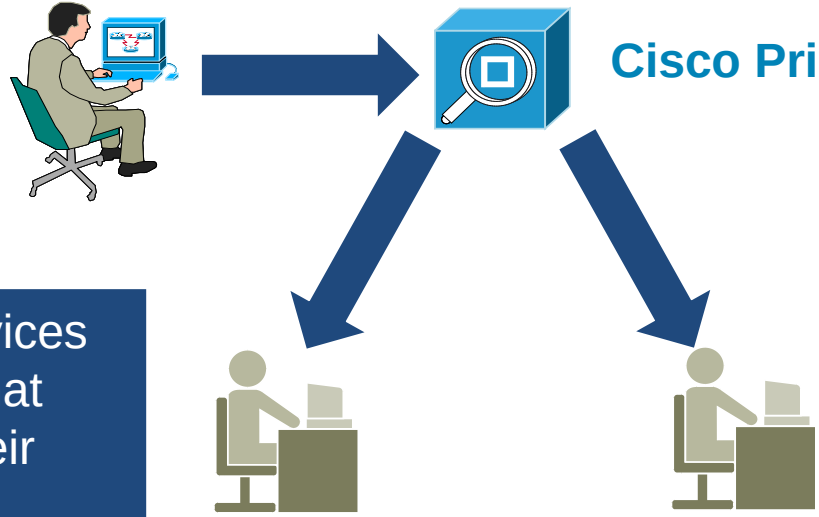


Users in all target virtual domains can see/execute report

- Use case: admin at headquarters creates reports for virtual domains
- Reports created in parent domain can be pushed to child domain

Virtual Domain – Network Elements

ROOT-DOMAIN user sees all network elements



User manages devices in virtual domain that are assigned to their username

- Use case: admin responsible for subset of network, i.e. devices in their domain
- Full control (super user) for all devices in their domain (config + monitoring)
- User should not have visibility into rest of the network

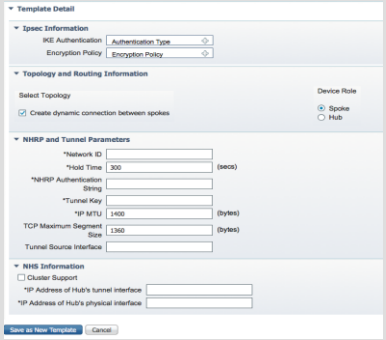



Configuration - Templates

Device Configuration with Templates

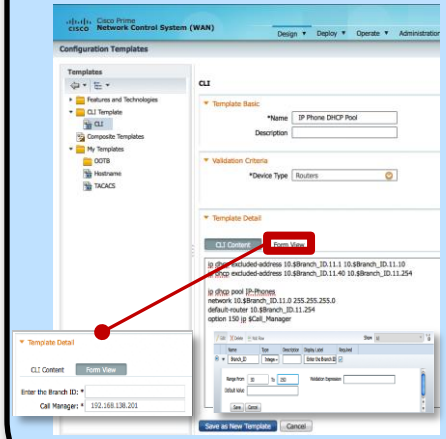
Feature Based

- Router (Security, Routing, AVC) and Wireless
- Intelligent template
- Understand current device configuration



CLI Based

- Pre-defined (System)
- User defined
- Parameters and more with Apache VTL scripting



Composite

Template of CLI Templates

- Management
- Routing
- Security
- QoS

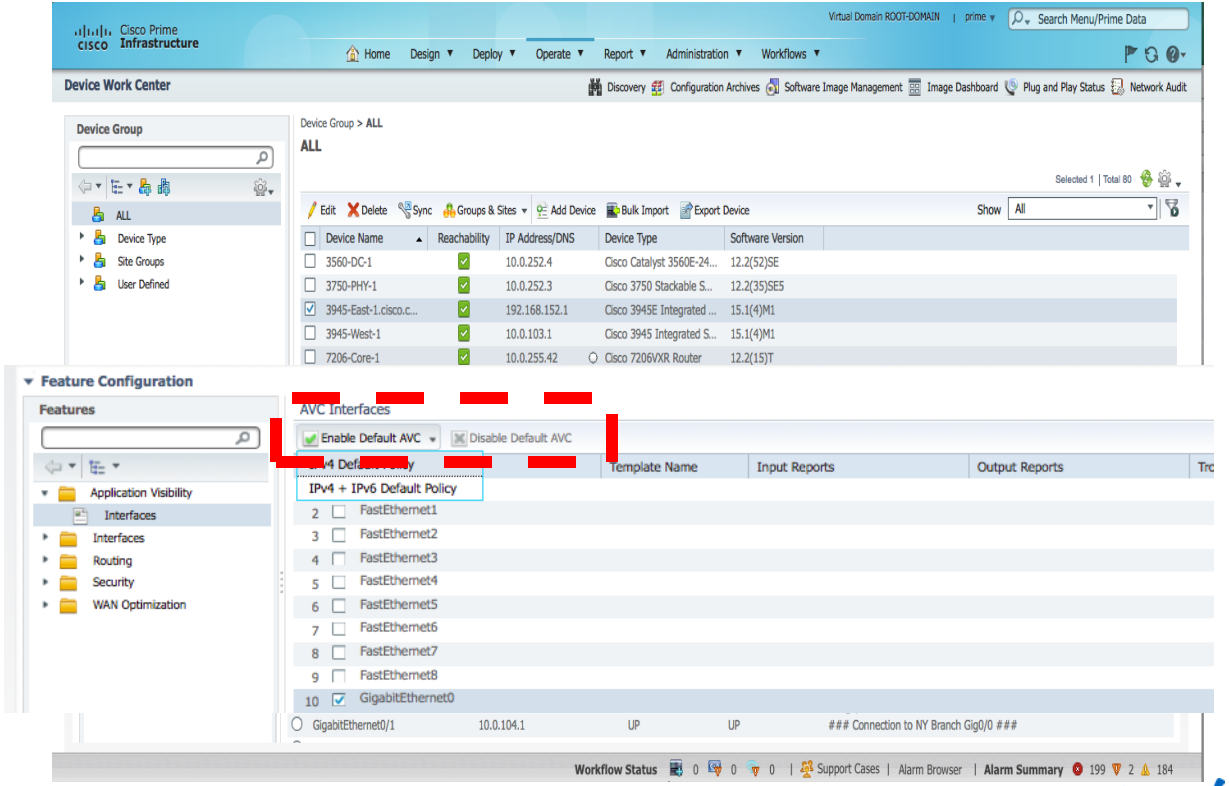
Configuration Group

- Devices
- Composite Template

Feature Based Template Deployment Modes

Configuration in Device Work Centre

- Per device configuration
- Understand current device configuration
- Allows Add/Edit/delete
- All configuration options are not always available (AVC)
- Very simple
- Very fast
- No job Created
- Immediate deployment

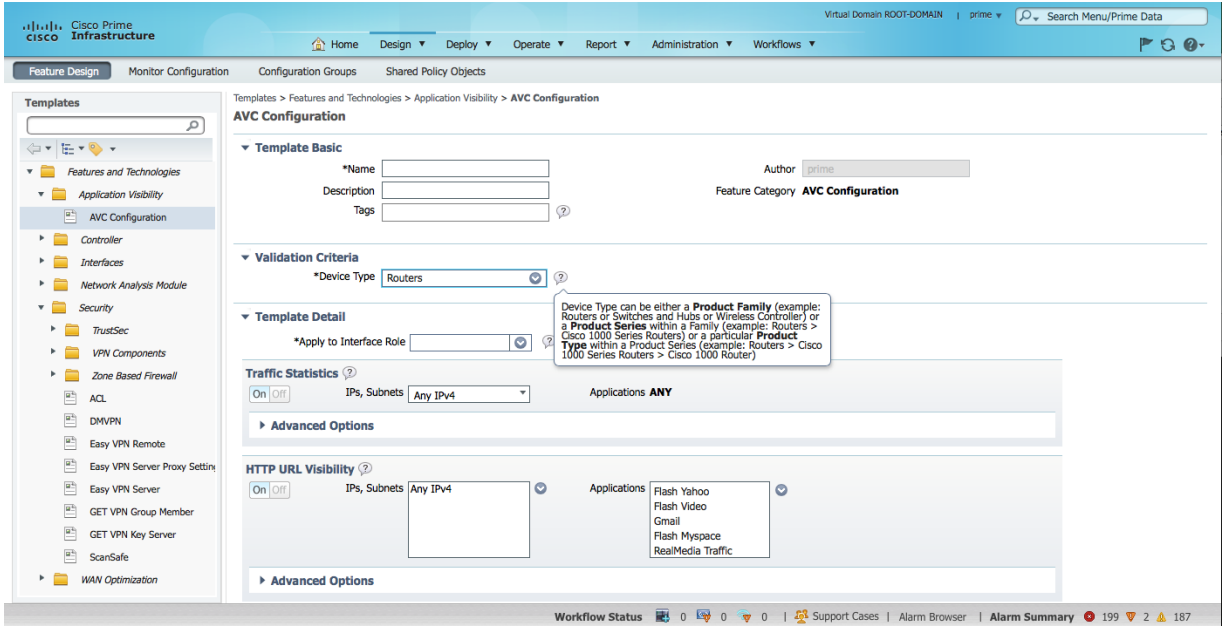


Feature Based Template Deployment Modes

Design/Deploy Lifecycle

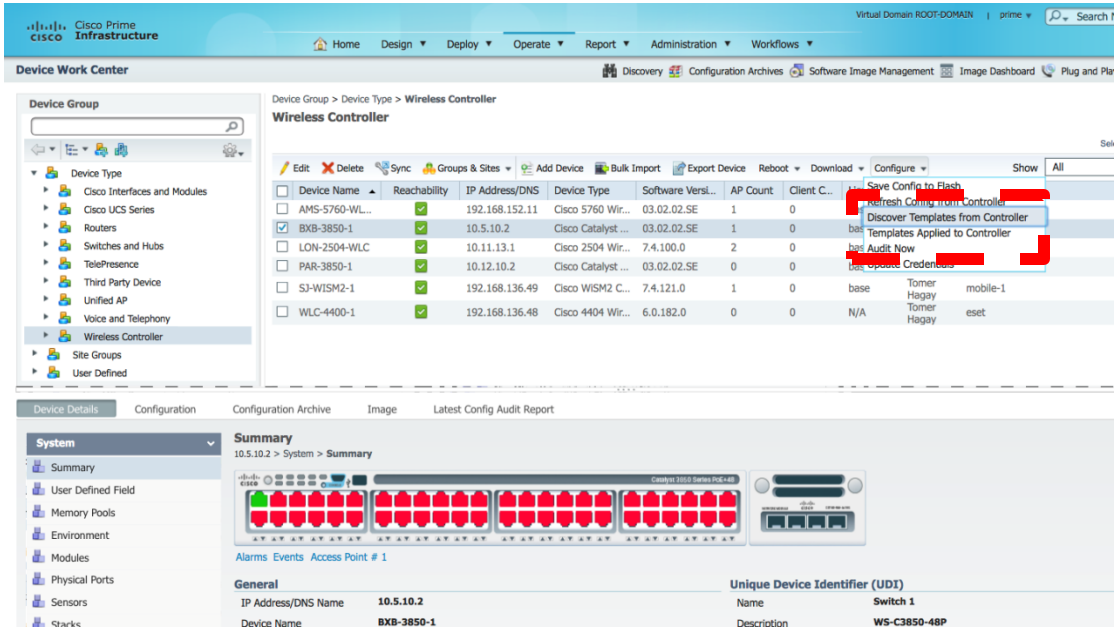
Design > (Configuration) Feature Design

- Works for deployment on multiple devices
- Allows full customisation of the template (design)
- Deployment job
- Immediate or scheduled

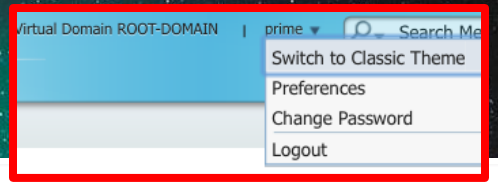


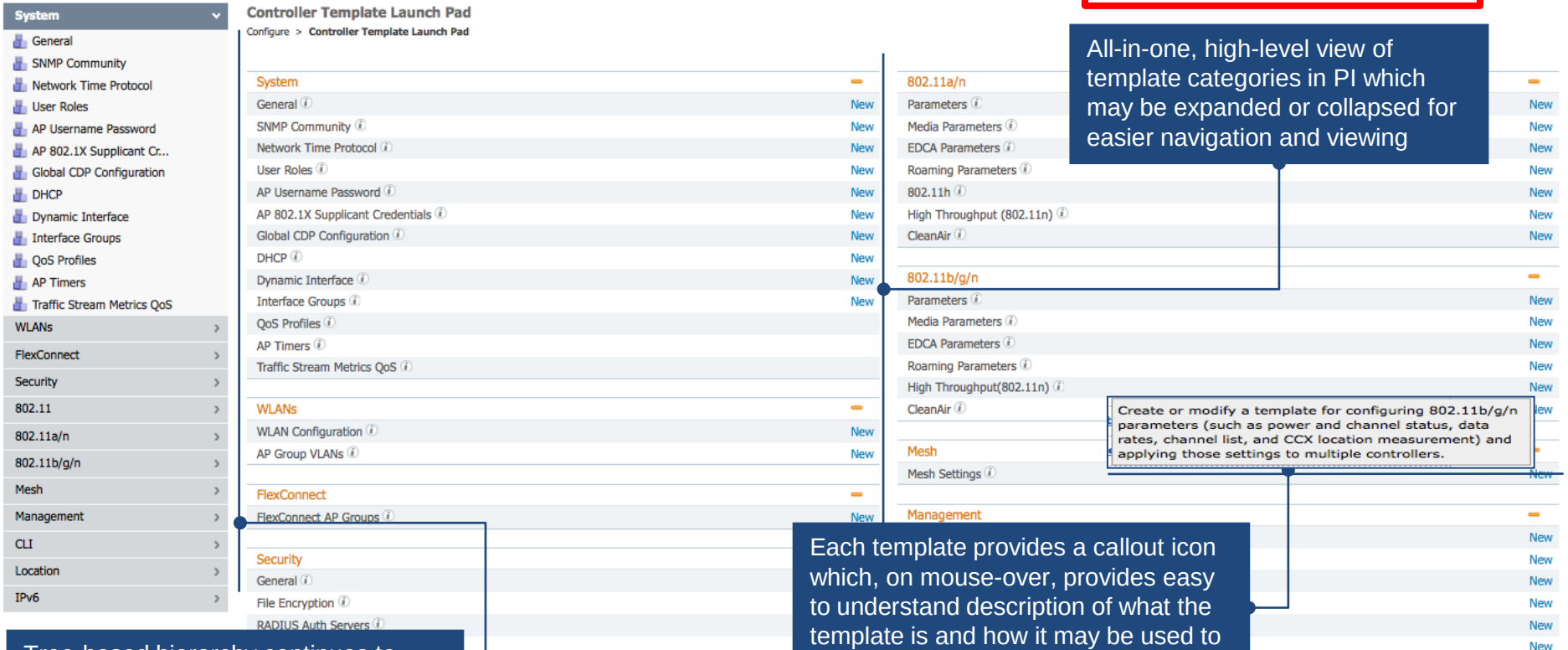
Templates: Discovery From Wireless Controller

- Templates are added to PI database when a WLC is first added to PI
- Template names can be changed to more meaningful names after discovery
- Additional configuration changes on the WLC may be pulled in to PI via the "Discover templates from controller" option



Controller Template LaunchPad
Classic Theme





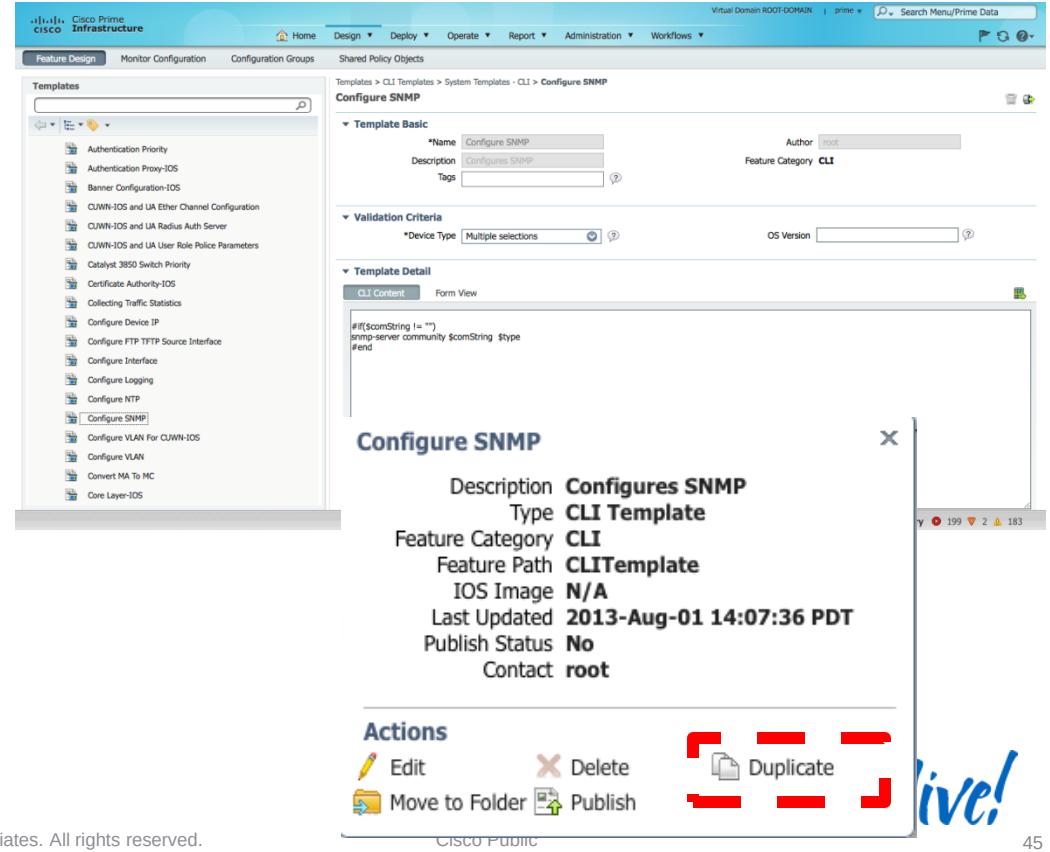
All-in-one, high-level view of template categories in PI which may be expanded or collapsed for easier navigation and viewing

Each template provides a callout icon which, on mouse-over, provides easy to understand description of what the template is and how it may be used to configure certain attribute(s).

Tree-based hierarchy continues to exist as left-hand navigation

CLI Based Templates

- Many Pre-Defined Systems Templates (e.g Flexible Netflow, Medianet, Performance Monitor, 802.1x …)
- User [skilled] defined CLI based templates
- It's possible to create NEW templates for specific needs or to adapt existing templates (Duplicate)
- Template language is VTL (Apache) see http://velocity.apache.org/
- Operator then uses the template forms to **Deploy** configuration



CLI Template Scripting

- Templates have validation criteria on hardware and software
- Simple Parameter Types: String, Integer, IPv4
- New Parameter Types: Drop-Down, Check-Box, Radio-Box, Multi-Line

- Database Variables
- Scripting Capabilities: Conditional Statement, Foreach Loop
- Interactive and Enable Mode

Composite Template

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime | Search Menu/Prime Data

Home | Design | Deploy | Operate | Report | Administration | Workflows

Feature Design | Monitor Configuration | Configuration Groups | Shared Policy Objects

Templates

- Features and Technologies
- CLI Templates
  - CLI
  - System Templates - CLI
- Composite Templates
  - Composite Templates
  - System Templates - Composite
    - 5760 WLC Basic Configuration
    - Catalyst 3850 Switch Basic Configuration as MC
    - Catalyst 3850 Switch Basic Configuration
- My Tags
- My Templates
  - Discovered Templates
  - Live2014
  - Lux template
  - Test2-Folder
  - 3945E-TestAVC
  - 8021X
  - AMEX-Demo

Templates > Composite Templates > System Templates - Composite > **Catalyst 3850 Switch Basic Configuration as MC**

Catalyst 3850 Switch Basic Configuration as MC

Template Basic

*Name: Catalyst 3850 Switch Basic Configi

Author: root

Description: This template is used to convert M

Feature Category: **Composite Template**

Tags:

Validation Criteria

Device Type: Cisco Catalyst 3850 Series ...

Template Detail

Selected 0 | Total 13

Delete | Move to | Add | Show: All

	Name	Group	Description	Feature Category	Device Type	IOS Version
1	Configure Device IP	CLI Templates/System...	Configure Device IP	CLITemplate	Switches and Hubs,Wi...	
2	Configure NTP	CLI Templates/System...	Configure NTP	CLITemplate	Switches and Hubs,Wi...	
3	Configure SNMP	CLI Templates/System...	Configures SNMP	CLITemplate	Switches and Hubs,Wi...	
4	Local Management User	CLI Templates/System...	Configure Local Mana...	CLITemplate	Switches and Hubs,Wi...	
5	CUWN-IOS and UA Radius Aut...	CLI Templates/System...	CUWN-IOS and UA Ra...	CLITemplate	Switches and Hubs/Cis...	
6	Configure Interface	CLI Templates/System...	Configure Interface	CLITemplate	Switches and Hubs,Wi...	

Save | Cancel | Publish | Deploy

Workflow Status 0 0 0 | Support Cases | Alarm Browser | Alarm Summary 199 2 175

Configuration Group Templates

Composite Templates with Selected Devices

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime ▾ Search Menu/Prime Data

Home | Design ▾ | Deploy ▾ | Operate ▾ | Report ▾ | Administration ▾ | Workflows ▾

Feature Design | Monitor Configuration | Configuration Groups | Shared Policy Objects

Configuration Group

- Configuration Group
- Configuration Group
  - 3850 Switch Priority
  - 3945s
  - Test1234
  - WGBH_Config_Group
  - new

Template Selection

Selected Templates — Selected 0 | Total 3

Delete | Move to | Add | Show All

		Name	Group	Description	Feature Category	Device Type	IOS Version
1	☐	CUWN-IOS and...	System Templates - CLI		CLITemplate	Switches and Hubs/Cis...	
2	☐	CUWN-IOS and...	System Templates - CLI	CUWN-IOS and UA Ra...	CLITemplate	Switches and Hubs/Cis...	
3	☐	CUWN-IOS and...	System Templates - CLI	Configure User Role P...	CLITemplate	Switches and Hubs/Cis...	

Device Selection

To enable device selection at least one template needs to be added to the 'Selected Templates' table
Add and select devices to save the configuration group for deployment.

Selected Devices — Selected 0 | Total 3

Delete | Add | Show All

		Name	Description	Type	IP Address	Vendor
1	☐	AMS-5760-WLC.cisco.com	AMS-5760-WLC.cisco.com	Wireless Controller	192.168.152.11	Cisco
2	☐	PAR-3850-1	PAR-3850-1	Switches and Hubs	10.12.10.2	Cisco
3	☐	BXB-3850-1	BXB-3850-1	Switches and Hubs	10.5.10.2	Cisco

Workflow Status 0 0 0 | Support Cases | Alarm Browser | Alarm Summary 199 2

Controller Config- Groups Overview

What Are Controller Config-Groups?

- An easy way to group controllers logically
- Provides a way to manage controllers with similar configurations
  - Extract templates from existing controller to provision
  - Schedule configuration sets
  - Cascade Reboot
- Manage Mobility Groups, DCA, and Configuration Auditing

When Are Controller Config-Groups Used?

- Group sites together for easier management for:
  - Mobility Groups
  - DCA and Regulatory Domain Settings
  - Schedule remote configuration changes
- Groups sites to ensure compliance with configuration policies

Controller Config- Groups

How To Setup

Design ▼ | Deploy ▼ | Operate ▼ | Report ▼ | Administration ▼

Configuration
- Feature Design
- Monitor Configuration
- Configuration Groups
- Shared Policy Objects
- Wireless Configuration
  - Lightweight AP Configuration Templates
  - Autonomous AP Configuration Templates
  - Switch Location Configuration Templates
  - Autonomous AP Migration Templates
  - Controller Configuration Groups
  - AP Profiles
- Custom SNMP Templa
- **Plug and Play Profi**

Management Tools
- Port Grouping
- Site Map Design
- Automatic Hierarchy Creation
- Endpoint-Site Association
- External Management Servers

Network Services

Mobility Services
- Mobility Services Engines
- Synchronize Services
- Synchronization History
- High Availability
- Context Aware Notifications

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime ▼ | Search Menu/Prime Data

Home | Design ▼ | Deploy ▼ | Operate ▼ | Report ▼ | Administration ▼ | Workflows ▼

Controller Config Groups

Design > Configuration > Wireless Configuration > **Controller Config Groups**

Group Name	Mobility Group Name	Controllers	Templates	Scheduled	Next Scheduled Run	Last Modified	Last Applied
Config	-	2	2	No	-	2013-Oct-02, 08:07:34 PDT	-
Test2	-	0	0	No	-	-	-
test	-	0	0	No	-	-	-
WGBH_demo	WGBH_controllers	2	3	No	-	2014-Feb-18, 13:19:36 PST	-

✓ -- Select a command --
- Add Config Group..
- Delete Config Groups
- ----------
- Download Software..
- Download IDS Signatures
- Download Customized WebAuth
- ----------
- Save Config to Flash
- Refresh Config from Controller

Add Config Group

Design > Configuration > Wireless Configuration > Controller Config Groups > **Add Config Group**

Add New Group

Group Name: Campus ABC

Templates:
- (●) Select and add later
- ( ) Copy applied templates from a controller

Save | Cancel

Add Config Group

Design > Configuration > Wireless Configuration > Controller Config Groups > **Add Config Group**

Add New Group

Group Name: Campus ABC

Templates:
- ( ) Select and add later
- (●) Copy applied templates from a controller

Select a controller to copy templates from:
- ( ) 192.168.152.11(AMS-5760-WLC.cisco.com)
- ( ) 10.5.10.2 (BXB-3850-1)
- ( ) 10.11.13.1 (LON-2504-WLC)
- ( ) 10.12.10.2 (PAR-3850-1)
- ( ) 192.168.136.49(SJ-WISM2-1)
- ( ) 192.168.136.48(WLC-4400-1)
- [✓] Add selected controller to this group.

Only create the config group and then add controllers and templates at another time

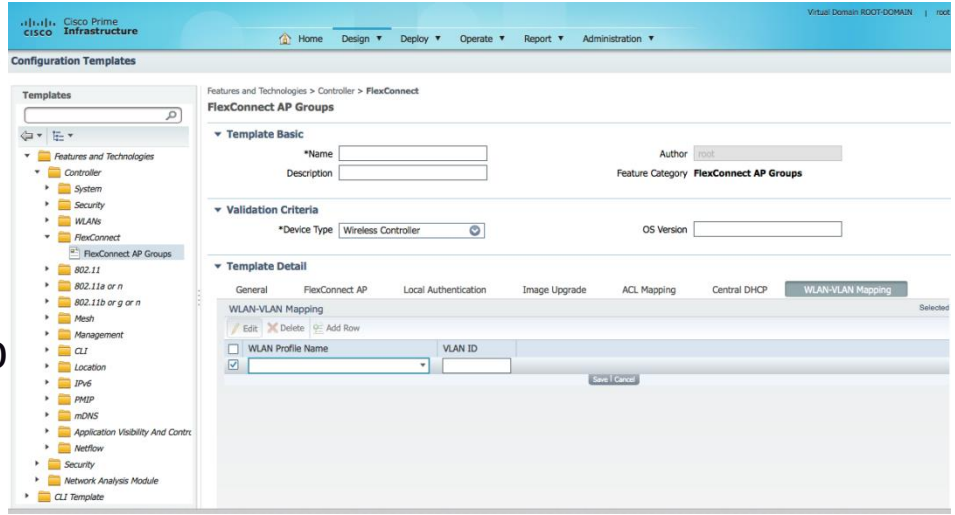
Copy templates from one of the controllers currently in PI and then apply them to controllers in this config group.

Controller Config-Groups: Things to Remember

- Template order is very important!
- Background audit is performed during network and controller audit
- Background audit and audit enforcement can only run when template-based audit is selected (under Administration—Settings)
- WLC(s) may be part of multiple configuration groups so be careful while setting mobility group names

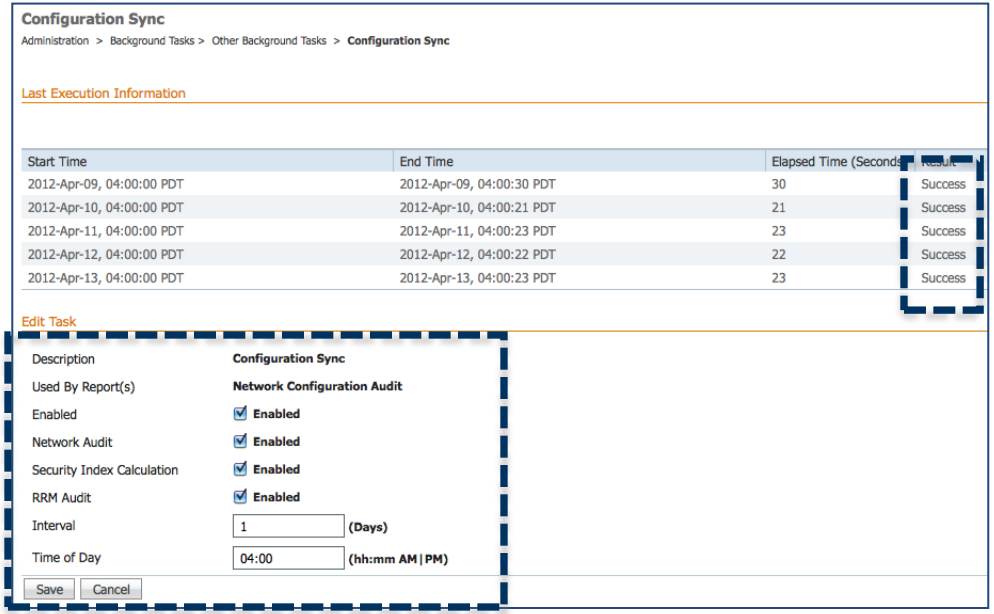
FlexConnect – WLAN to VLAN Mapping

- Prior to WLC 7.5 release, WLAN to VLAN mapping was done on per AP basis
- Made it difficult for the users to configure in the case of large number of access points deployed.
- WLC 7.5 release adds WLAN to VLAN mapping from the FlexConnect group
- Will push the WLAN to VLAN mapping to all AP's present in FlexConnect group
- Will not override the WLAN-VLAN mapping done on the AP.



Configuration - Auditing

Administration > Background Tasks > Other Background Tasks > Configuration Sync



- Automatic audits based on “configuration sync” background task.
- Specify frequency of audit

- Allows easy reconciliation in the event of a configuration mismatch
- Helps ensure WLCs comply with configuration policies

Quick Audit Summary and Reconciliation

Controllers
Configure > **Controllers**

-- Select a command -- Go

Entries **1** - **4** of **4**

IP Address	Controller Name	Type	Location	Software Version	Mobility Group Name	Reachability Status	Audit Status
171.71.122.80	WCS-Beta	5500		7.0.112.2	WNBU-TME	Reachable	Identical
171.71.128.157	sjc14-wl-wlc3	2500	SJC Bld 14 - FL 1/2	7.0.116.0	SJCwireless	Reachable	Mismatch
171.71.128.75	SJC 14 LWAPP1	5500	SJC Bld 14 - FL 1/2	7.0.116.0	SJCwireless	Reachable	Mismatch
171.71.128.78	SJC 14 LWAPP2	5500	SJC Bld 14 - FL 3/4	7.0.116.0	SJCwireless	Reachable	Identical

Entries **1** - **4** of **4**

Audit Summary

Restore or Maintain Config

Audit Result

Device name **sjc14-wl-wlc3**

Audit Time **Apr 14, 2012 12:02:06 AM**

Audit Status **Mismatch**

Total Enforcements for Config Groups with background audit enabled **0**

Failed Enforcements for Config Groups with background audit enabled **0**

Applied Template and Config Group Template Discrepancies

(Template Type)Template Name	Template Applied Via	Audit Status	Attribute	NCS Value	Controller Value
(WLAN Template) test	Independent Template	Not Present in Controller	-	-	-
(AP / MSE Authorization Templates) d8d385c122da	Independent Template	Mismatch	Key Hash	08df221b75f0153c4f4f72dac24434018ebfc62e	****

NCS Config Discrepancies

(Type)Configuration Name	Audit Status	Attribute	NCS Value	Controller Value
(Local Management User) alial	Not Present in NCS	-	-	-
(AP Groups VLANs) 171.71.128.157/default-group	Mismatch	Profile	test	-
(AP Groups VLANs) 171.71.128.157/default-group	Mismatch	Interface Mapping	management	-

Restore NCS Values to Controller | Refresh Config from Controller

Audit Settings

Audit Settings

- **Audit Mode**
  - Basic Audit: Perform an audit on current WLC configuration and compare it with the configuration in PI
  - Template-Based Audit: Perform an audit on current WLC configuration with respect to applied templates, config groups' background templates and then the configuration in PI
- **Audit On**
  - All Parameters: Audit on entire WLC configuration
  - Selected Parameters: Audit on selected parameters from the templates

Scheduled Image Download to Controller

Download Software to Controller

Configure > Controllers > **Download Software to Controller**

Some TFTP servers may not support files larger than 32 MB.

Controller IP Address	Current Software Version	Operation Status	Details
171.71.128.157	7.2.103.0	NOT_INITIATED	-

Download Type

Download Type: Now / Scheduled

Schedule

Download software to controller

Pre-download software APs

APs download the image and then reboot when the controller reboots.

FlexConnect AP Upgrade

Upgrade Image: Primary

Schedule Details

Task Name

Reboot Type: Manual / Automatic / Scheduled

Schedule

Download date/time: 04/14/2012 0 : 10

Reboot date/time: 04/14/2012 0 : 40

Current Server Time: 2012-Apr-14, 00:06:13 PDT

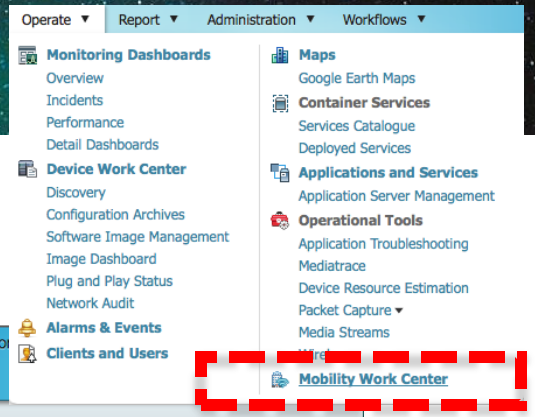
Notification (Optional)

To be notified on download completion,enter an email address.

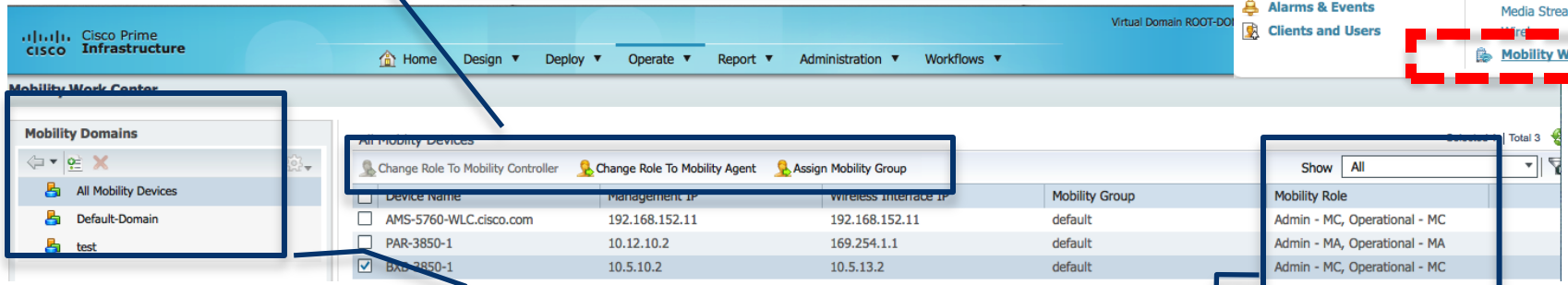
- Provides option to schedule software download (FTP/TFTP) to controllers.
- Task can be saved for future scheduling.
- Reboot can be scheduled at a future date/time.
- Email notification can be sent after completion of download.

Mobility Work Centre

Converged Access View



Device role can be changed to MO/MC/MA



Tree hierarchy displays mobility domain, SPG and device–level relationship

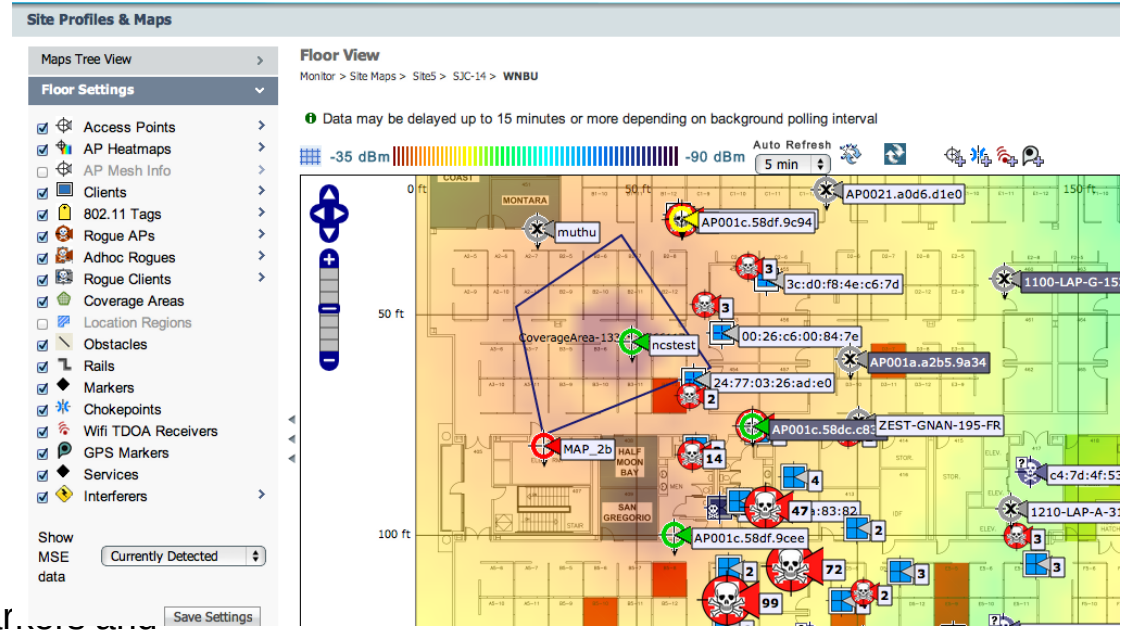
Lists NGWC devices and their role (MO, MC, MA). Operational: current role Admin: role after next reboot



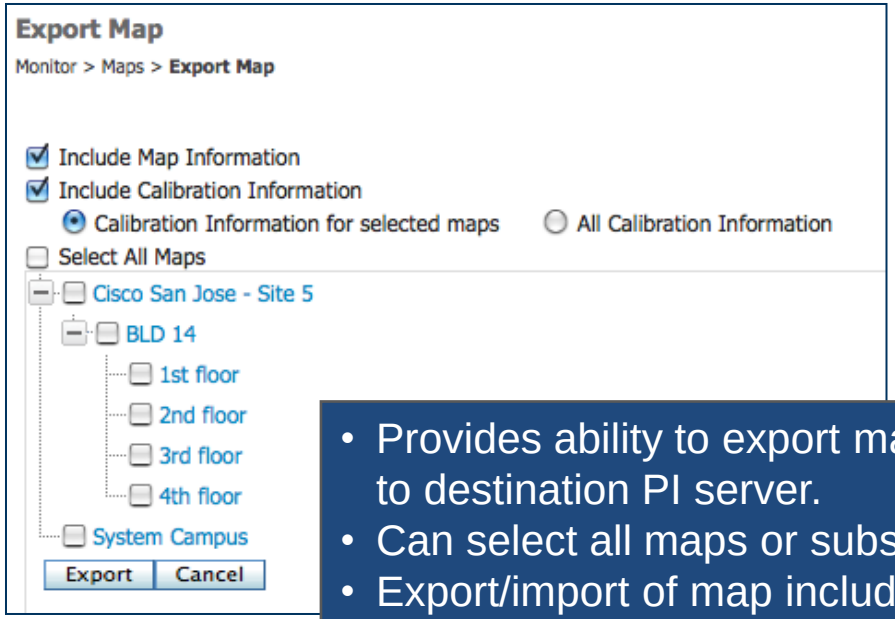

Configuration - Maps

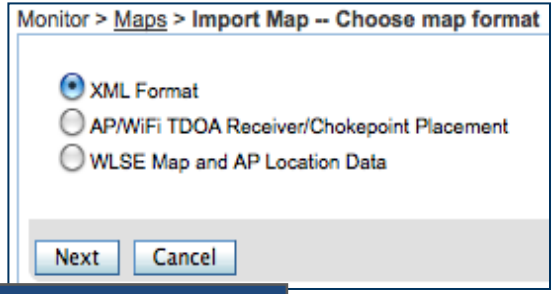
Configuration
Maps

- Track wireless clients and tags, and play location history across campus
- Track and mitigate rogue devices
- Display Chokepoints
- Display Mesh AP relationships
- Integrate outdoor wireless mesh with Google Earth
- Represent wireless coverage on campus, and plan for growth
- View Channel and Tx Power plans provisioned by RRM
- View AP and RF Profile at the floor level
- Provision and display coverage areas, markers and other objects and use them with location notifications
- Post-Deployment: VoWLAN and Location Readiness tools



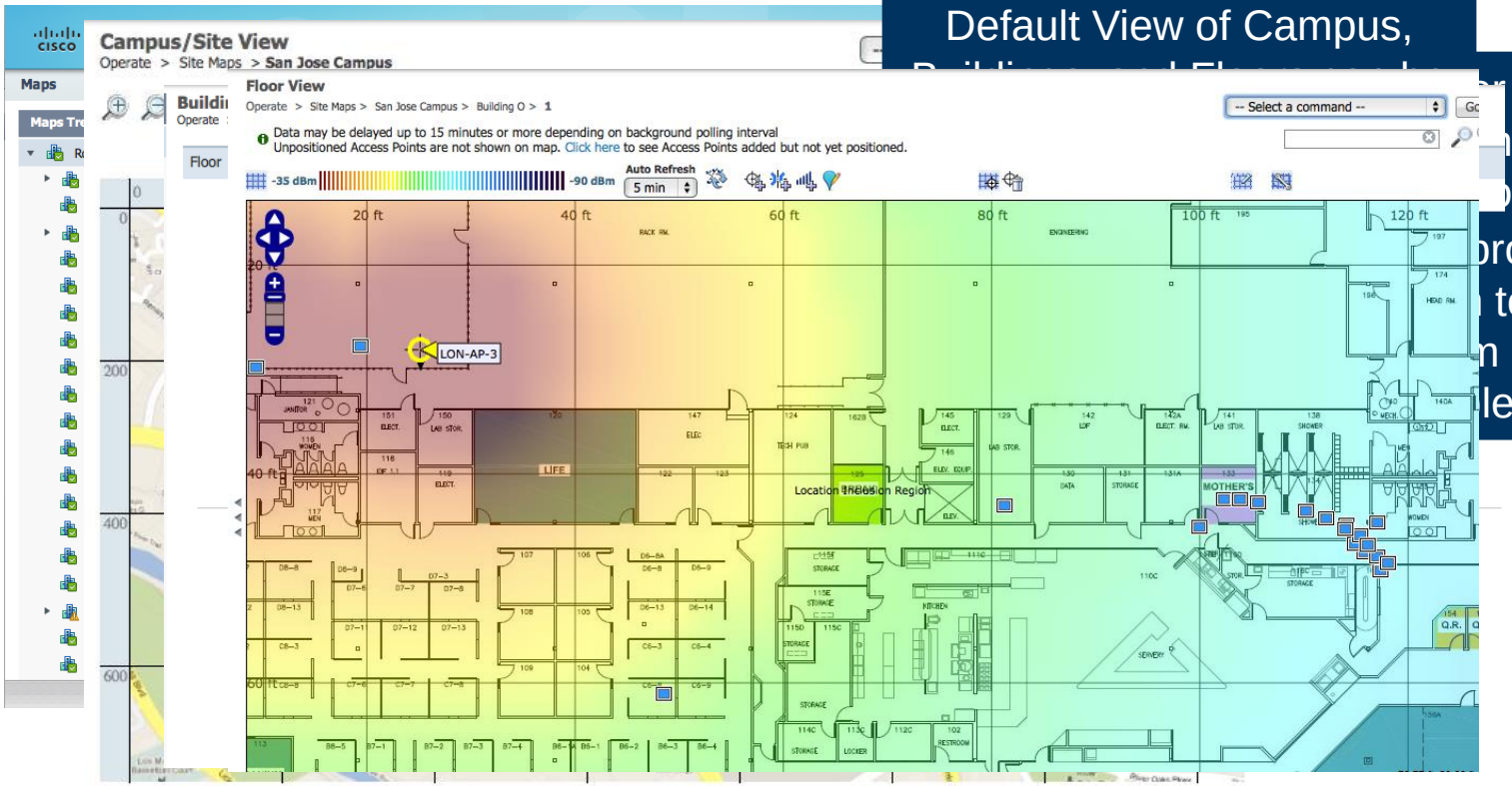
Map Export/Import





- Provides ability to export maps from source WCS/NCS to destination PI server.
- Can select all maps or subset.
- Export/import of map includes both map and AP's placed on MAP.
- Option to export calibration information.
- Exported via tar gzipped XML file.
- Import process ungzips/untars XML file automatically.

Maps Layout



Default View of Campus,

r Buildings are
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provides a
to floors'
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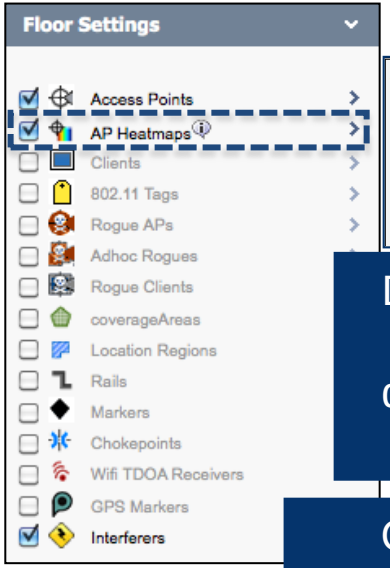
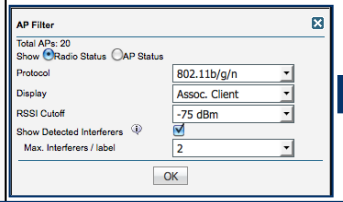
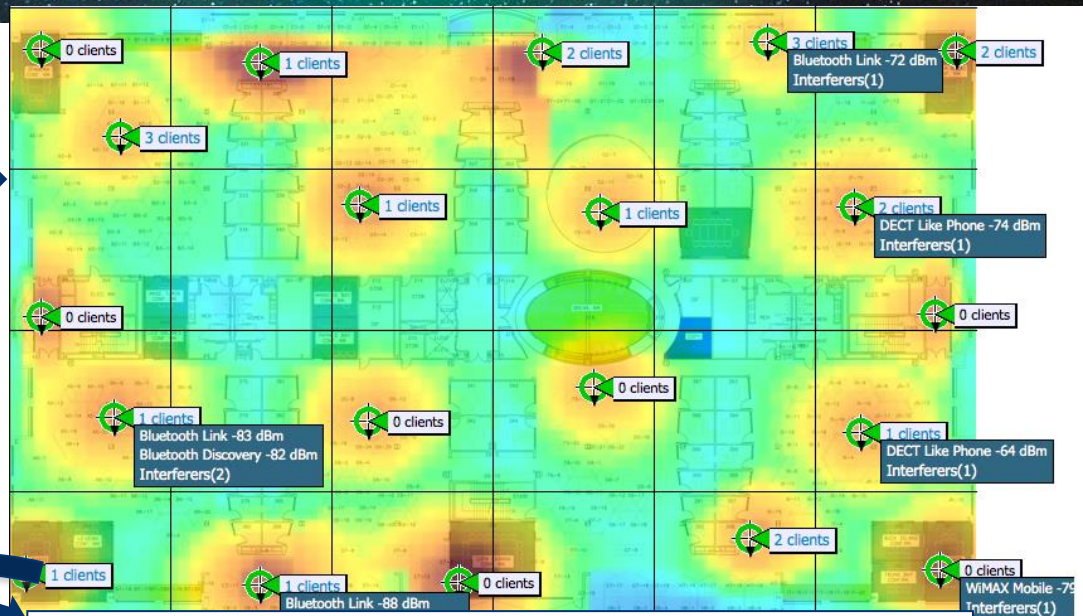
n summary
leshooting

Maps Layout – AP's and Clients

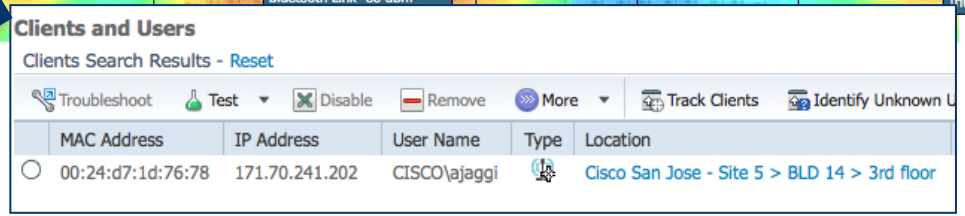




Display client count as AP label, and detected interferers per AP.



Client count is hyperlink that takes user to "Clients and Users" list page with filters list of clients connected to AP.



Automated Wired/Wireless
Client Discovery

jfields

Search Results

Your search 'jfields' matched following item(s). Please click on the 'View List'

Item Type	Item Count	Item List
Client	4	View List

Clients and Users

Clients Search Results - Reset

Selected 0 | Total 4

Troubleshoot | Test | Disable | Remove | More | Track Clients | Identify Unknown Users

MAC Address	IP Address	IP Type	User Name	Type	Vendor	Device Name	Location	VLAN	Status	Interface	Protocol	Association Time
00:21:5c:01:b8:6f	192.168.152.38	Dual-Stack	jfields		Intel	AMS-2504-WLC	Root Area	13	Associated	vlan 13	802.11n(...	2012-Aug-22, 1
00:26:b0:94:1b:6c	192.168.152.37	Dual-Stack	jfields		Apple	AMS-2504-WLC	Root Area	13	Associated	vlan 13	802.11g	2012-Aug-23, 0
dc:0e:a1:b9:22:58	192.168.152.27	IPv4	jfields		Compal	AMS-3750-SBR	Unknown	12	Disassociated	Fa1/0/6	802.3	2012-Aug-21, 1
cc:08:e0:2e:b6:32	192.168.152.36	IPv4	jfields		Apple	AMS-2504-WLC	Root Area	13	Disassociated	vlan 13	802.11n(...	2012-Aug-21, 1

Get to the user association history in couple of clicks !!!

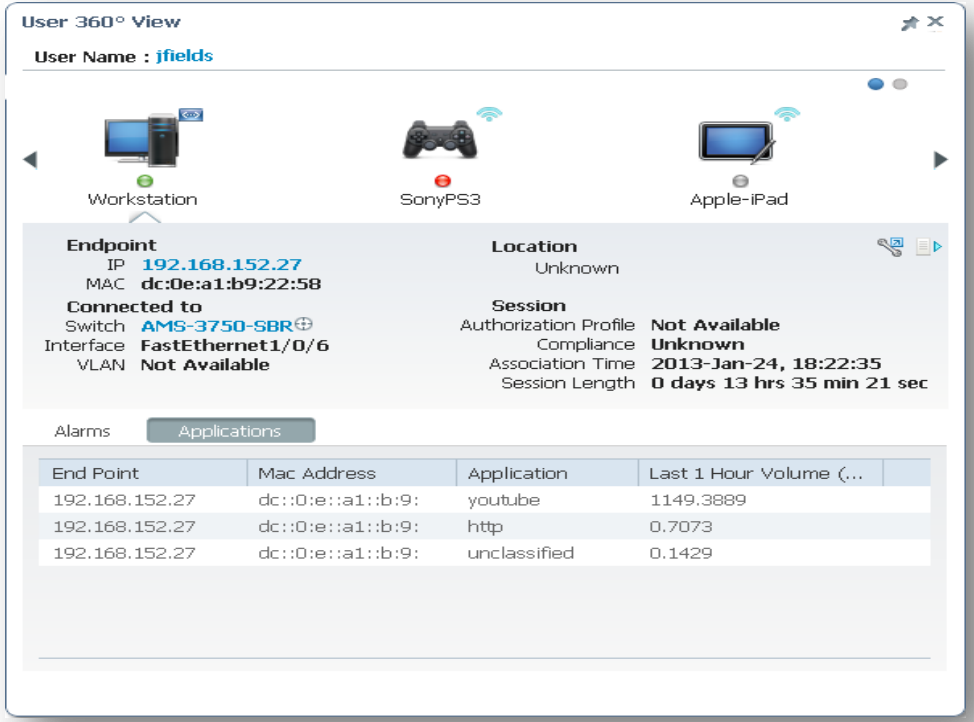
Association History

Association Time	Duration	User Name	IP Address	IP Addres...	AP Name	Controller Name	SSID
2012-Aug-23, 09:37:45 PDT	3 hrs 8 min 4 sec	jfields	192.168.152.37	Dual-Stack	NMTG-AP3500-2	AMS-2504-WLC	AMS-DOT1X
2012-Aug-22, 15:15:34 PDT	3 hrs 43 min 59 sec	jfields	192.168.152.37	IPv4	NMTG-AP3500-2	AMS-2504-WLC	AMS-DOT1X
2012-Aug-21, 14:38:21 PDT	17 hrs 21 min 22 sec	jfields	192.168.152.37	IPv4	NMTG-AP3500-2	AMS-2504-WLC	AMS-DOT1X
2012-Aug-20, 17:12:58 PDT	10 hrs 37 min 1 sec	jfields	192.168.152.37	IPv4	NMTG-AP3500-2	AMS-2504-WLC	AMS-DOT1X

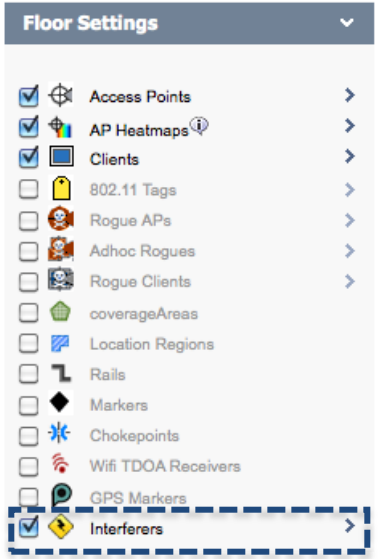
Achieve Operational Excellence

The 360 Experience

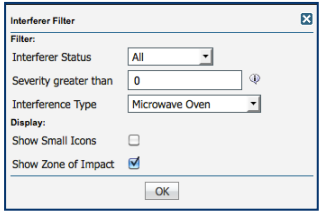
- **Simplified troubleshooting and remediation improves application, services and end user experience**
  - Brings together multiple sources of information for effective problem isolation
- **User 360 – quickly isolate and fix end-user or end-point issues** (response time, network access, configuration etc.)
- **Device 360 – identify and fix device related problems** (performance, faults, interface, modules)
- **Application 360 – identify and fix network issues related to app delivery** (app discovery, utilisation, user/device/site association)

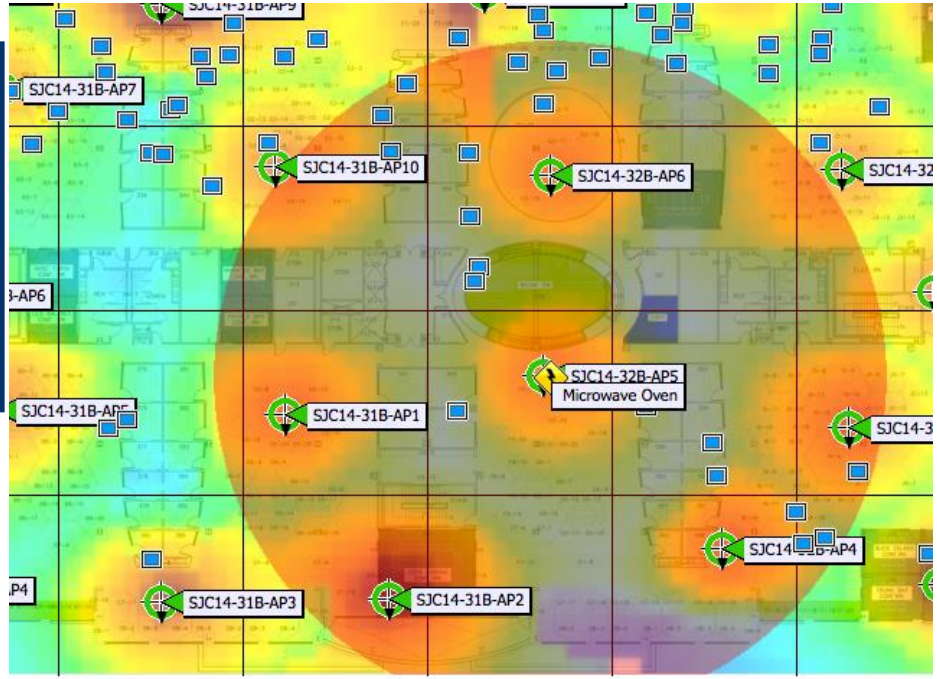


Maps Layout – CleanAir



Quickly filter on subset of interferers on floor.
Can specify other parameters: severity level, zone of impact.





Real-Time Heat Maps

- Based on AP-to-AP RSSI measurements
- Predictive (legacy) heat maps still supported
- Provides graphical view of RSSI based on set of nearest AP's vs. AP transmit power (predictive heat map)
- Configurable options for real-time heat maps:
  - Min. number of APs
  - Recompilation interval

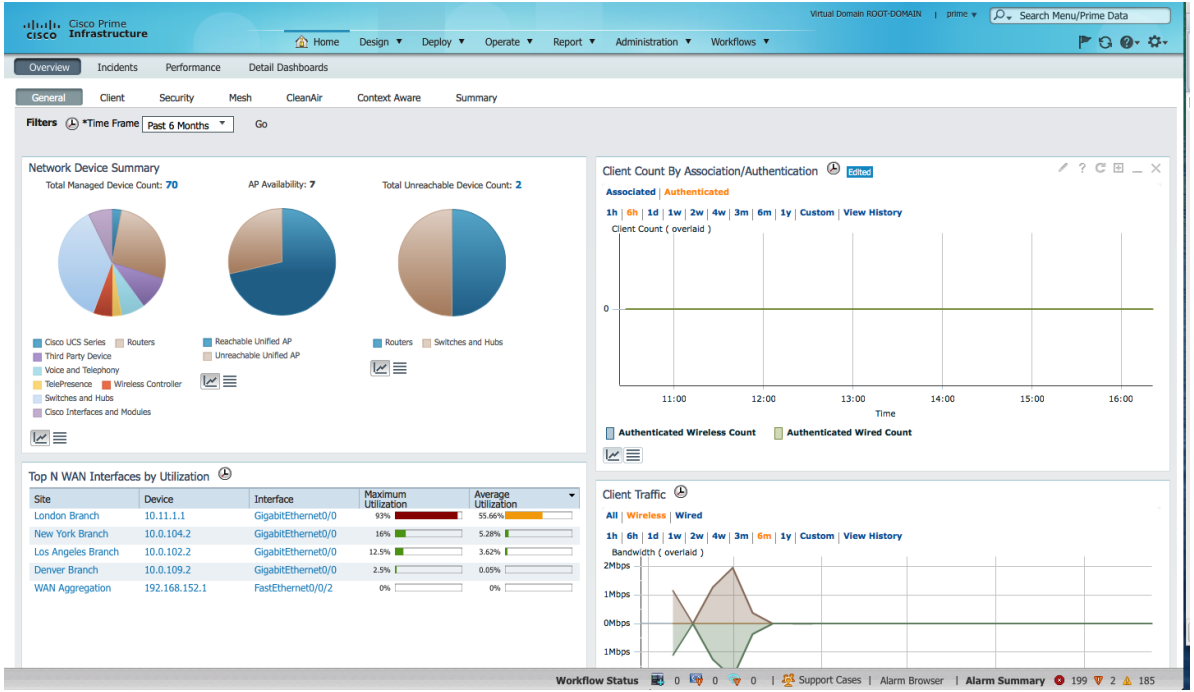
Provides list of neighbouring AP's and RSSI value that they "hear" the selected AP




Monitoring The Network

Monitoring — Dashboard Concepts

- Canned tabs of high-level system views
- Ability to add/remove tabs
- Ability to add/remove components within tabs
- Customise individual components
- Introduction of trending information at system level
- Quick drill-downs



Information Layout and Workflow Concepts

- Presents many intuitive ways to arrive at information
- Ability to drill-down to an individual client-level detail from dashboard
- Ability to drill-down with the help of "Quick Filters"
- Ability to sort on different attributes in client list pages
- Ability to perform and save intelligent searches
- Ability to customise list layout, items per page and content
- Perform advanced context-sensitive actions (such as launching a report from AP page) from page drop-downs

Dashboard Customisation

Dashlets

Cisco Prime Infrastructure

Virtual Domain ROOT-DOMAIN | prime

Search Menu/Prime Data

Home | Design | Deploy | Operate | Report | Administration | Workflows

Overview | Incidents | Performance | Detail Dashboards

General | Client | Security | Mesh | CleanAir | Context Aware | Summary

Filters *Time Frame Past 6 Months Go

Network Device Summary

Total Managed Device Count: 70 | AP Availability: 7 | Total Unreachable Device Count: 2

Cisco UCS Series, Routers, Third Party Device, Voice and Telephony, TelePresence, Wireless Controller, Switches and Hubs, Cisco Interfaces and Modules

Reachable Unified AP, Unreachable Unified AP

Routers, Switches and Hubs

Client Count By Association/Authentication Edited

Associated | Authenticated

11:00, 12:00, 13:00, 14:00

Time

Authenticated Wireless Count, Authenticated Wired Count

Coverage Area

Description

List coverage areas and details about each coverage area

Top N WAN Interfaces by Utilization

Site	Device	Interface	Maximum Utilization	Average Utilization
London Branch	10.11.1.1	GigabitEthernet0/0	93%	55.66%
New York Branch	10.0.104.2	GigabitEthernet0/0	16%	5.28%
Los Angeles Branch	10.0.102.2	GigabitEthernet0/0	12.5%	3.62%
Denver Branch	10.0.109.2	GigabitEthernet0/0	2.5%	0.05%
WAN Aggregation	192.168.152.1	FastEthernet0/0/2	0%	0%

Client Traffic

Add New Dashboard

Rename Dashboard

Add Dashlet(s)

General Dashlets

AP Join Taken Time Add

AP Uptime Add

CAPWAP Uptime Add

AP Uptime

Add

Device Uptime Add

GETVPN Network Stat... Add

Job Information Status Add

Most Recent AP Alarms Add

Network Device Sum... Add

Recent Alarms Add

Recent Coverage Holes Add

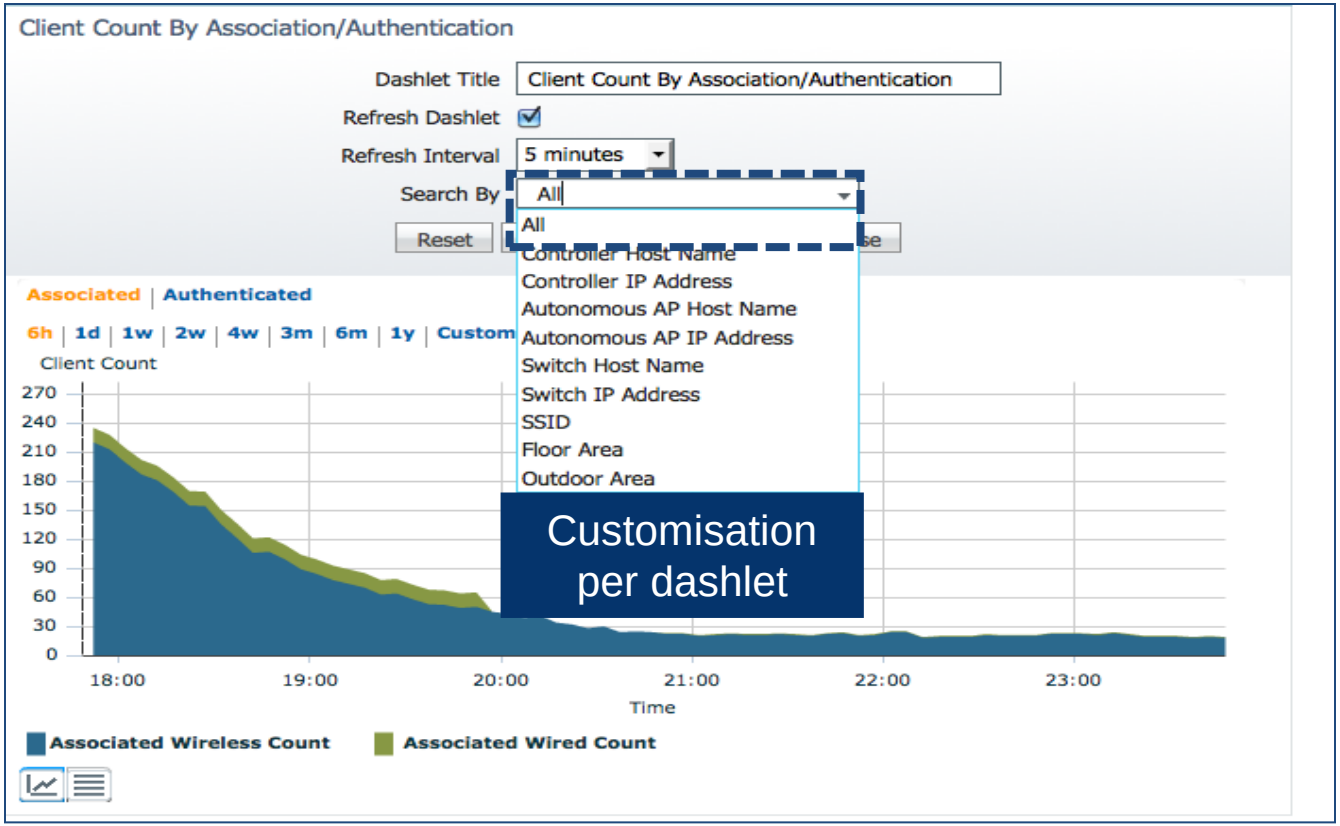
Layout Template

Manage Dashboards

Workflow Status 0 0 0 | Support Cases | Alarm Browser | Alarm Summary 199 2 186

"drag and drop" dashboard customisation

Dashlet Customisation



Finding Data – Search Capability

- PI and MSE represent a large data store
- PI provides Advanced Search capability
- Various filter criteria depending on search categories

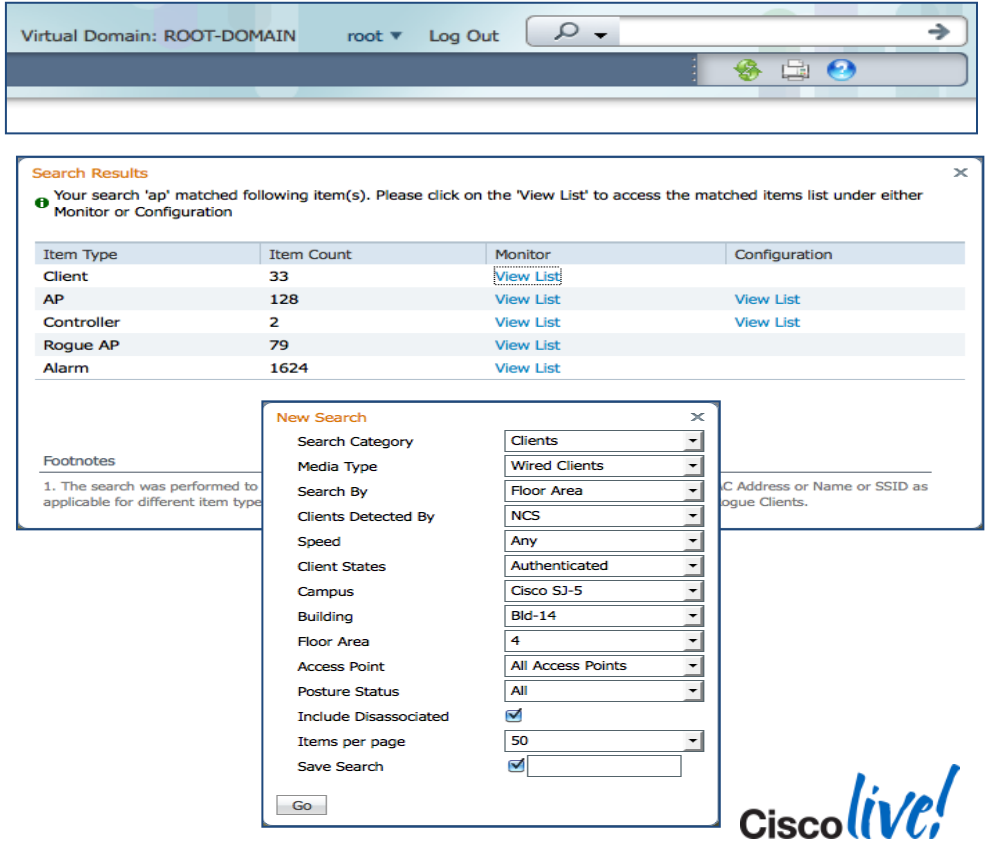
Basic Search	Searches for: clients, devices (AP's, controllers, switches), rogue (AP, ad hoc), alarms. Output is categorised.
Advanced Search	Multiple search categories and criteria (alarms, AP's, controller licenses, switches, clients, chokepoints, interferers, TDOA receivers, maps, rogue clients, shunned clients, RFID tags). Searches can be saved for future use.

Using Search

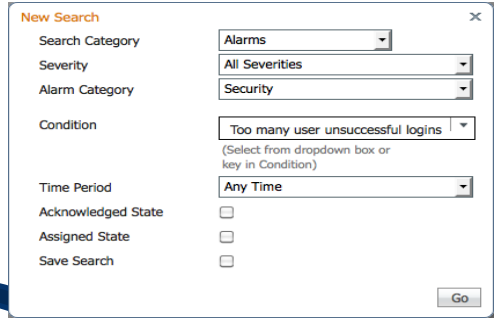
Global Search Capability

- Searches can be performed on partial input
- Search output provides configuration and monitor links based on device type found
- Search parameters include IP Address, Usernames, MAC Addresses, SSIDs ,Rogues and AP Names

Advanced searches can be saved for easy future reference and use



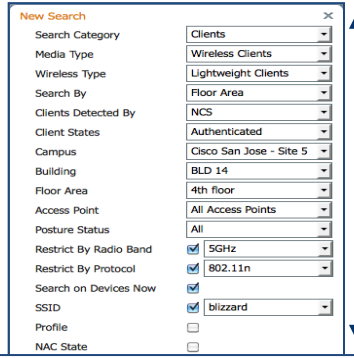
Finding Data – Security Alarms



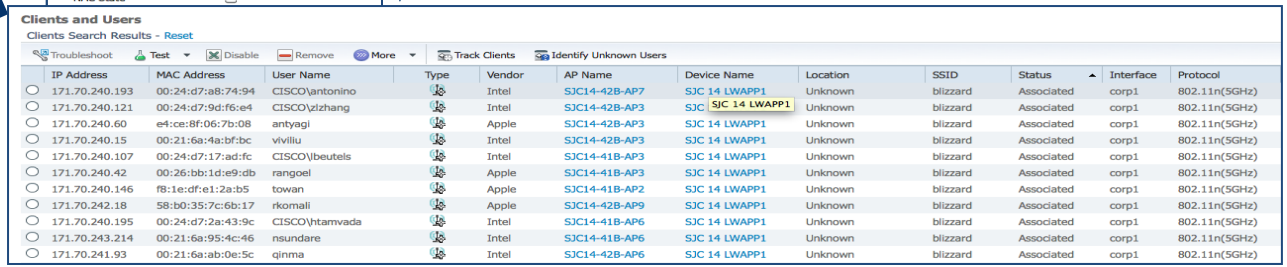
Customised search for specific alarm criteria

- Use case: admin wants to search for all security alarms “too many user unsuccessful logins”

Finding Data – Client Search



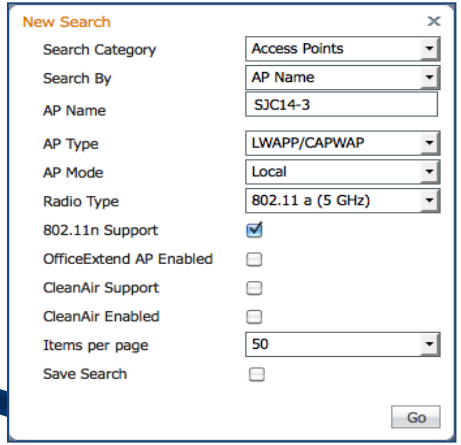
Customised search for specific client criteria



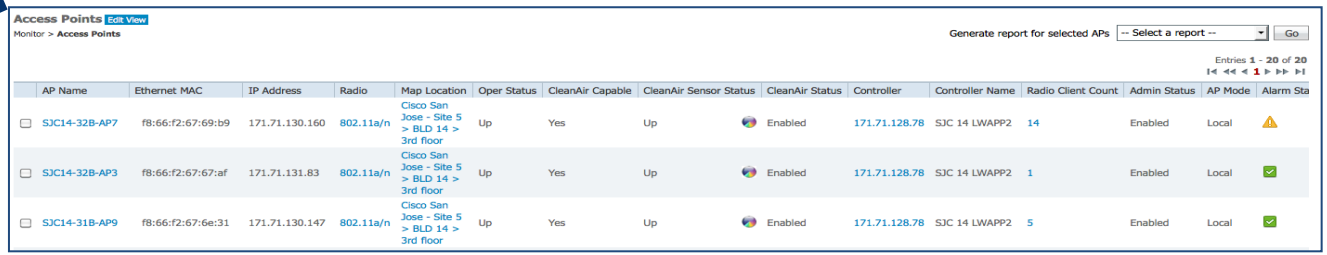
IP Address	MAC Address	User Name	Type	Vendor	AP Name	Device Name	Location	SSID	Status	Interface	Protocol
171.70.240.193	00:24:d7:a8:74:94	CISCO\antonino		Intel	SJC14-42B-AP7	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.240.121	00:24:d7:9d:f6:e4	CISCO\zlzhang		Intel	SJC14-42B-AP3	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.240.60	e4:ce:8f:06:7b:08	antyagi		Apple	SJC14-42B-AP3	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.240.15	00:21:6a:4a:bf:bc	viviliu		Intel	SJC14-42B-AP3	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.240.107	00:24:d7:17:ad:fc	CISCO\lbeutels		Intel	SJC14-41B-AP3	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.240.42	00:26:bb:1d:e9:db	rangoel		Apple	SJC14-41B-AP3	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.240.146	f8:1e:df:e1:2a:b5	towan		Apple	SJC14-41B-AP2	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.242.18	58:b0:35:7c:6b:17	rkomali		Apple	SJC14-42B-AP9	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.240.195	00:24:d7:2a:43:9c	CISCO\htamvada		Intel	SJC14-41B-AP6	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.243.214	00:21:6a:95:4c:46	nsundare		Intel	SJC14-41B-AP6	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)
171.70.241.93	00:21:6a:ab:0e:5c	qinma		Intel	SJC14-42B-AP6	SJC 14 LWAPP1	Unknown	blizzard	Associated	corp1	802.11n(5GHz)

- Use case: admin wants to search for all authenticated wireless clients (802.11n, 5 GHz) on 4th floor

Finding Data – AP Search

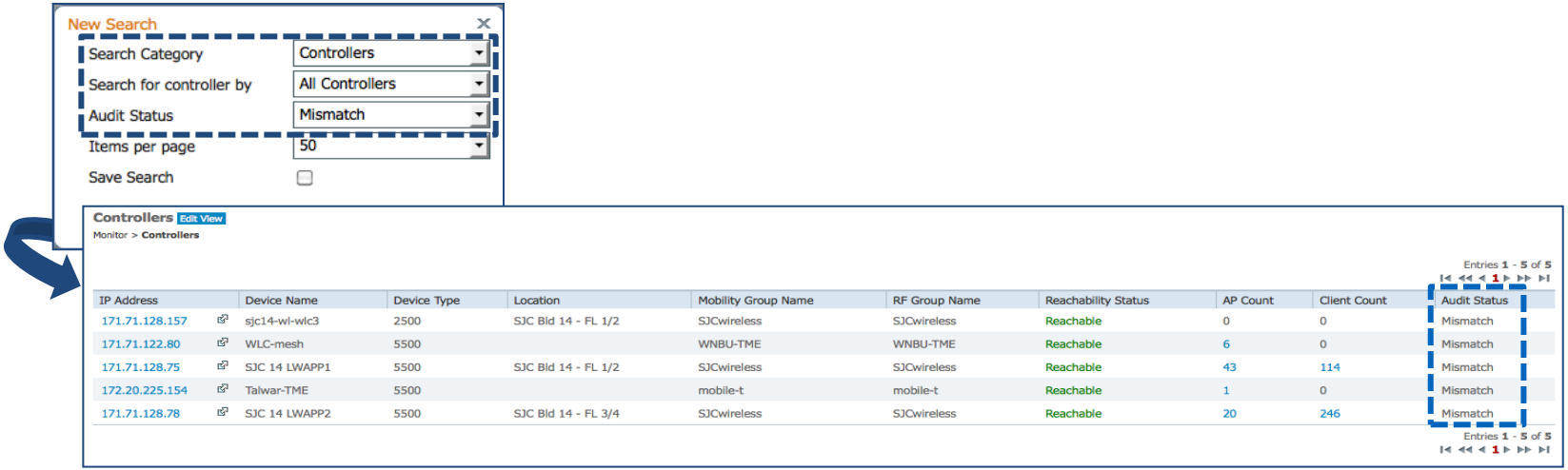


Customised search for specific AP criteria



- Use case: admin wants to search for CAPWAP, 802.11a (5 GHz) AP's by AP name (partial string search) that are operating in local mode

Finding Data – Controller Search

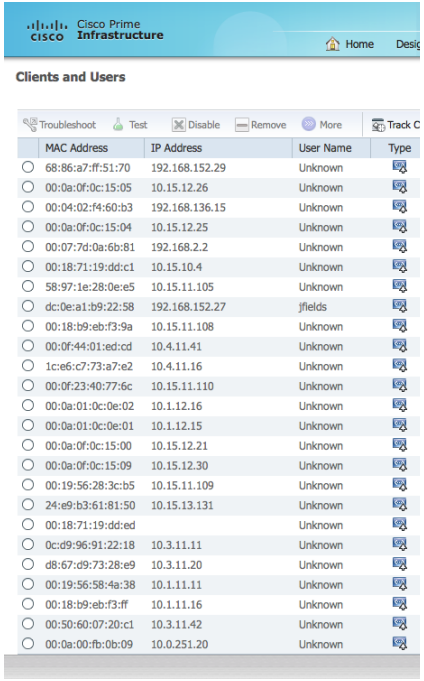


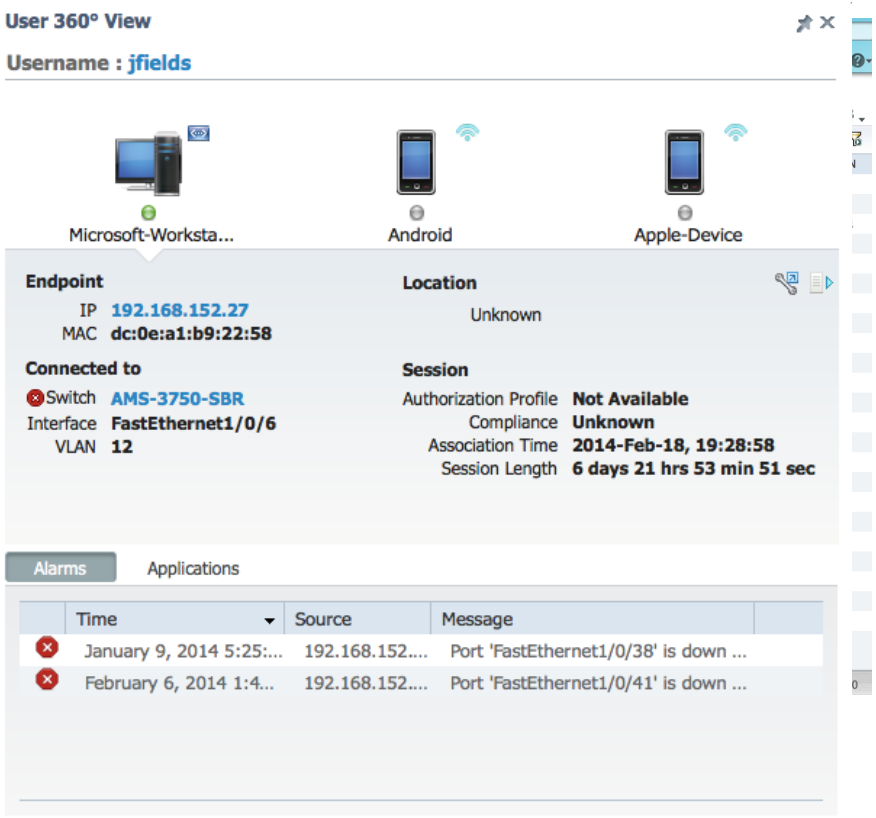
- Use case: admin wants to search for all controllers where config mismatch has occurred

Monitoring Clients and Users

Common Steps in a Troubleshooting Scenario:

- Lookup a client: MAC Address, Username, IP Address, Client type, Client state, From AP Details Page
- Where is the client now (and how is their RF profile)
- Where has this client been (Location playback, session and AP history)
- Active troubleshooting





Monitoring: Client Details - 1

Client dc:0e:a1:b9:22:58 (Refreshed :2014-Feb-18, 00:28:58 PST)

Note: None

Client Attributes

General

User Name	**jfields**
IP Address	**192.168.152.27**
MAC Address	**dc:0e:a1:b9:22:58**
Vendor	**Compal**
Endpoint Type	**Microsoft-Workstation**
Media Type	**Wired**
Hostname	**Data Not Available**
CDP Device ID	**Data Not Available**
Software Version	**Data Not Available**
Model	**Data Not Available**
UDI	**Data Not Available**

Session

Switch Name	AMS-3750-SBR
Switch IP Address	192.168.152.10
Interface	**FastEthernet1/0/6**
Wired Speed	**100Mbps**
VLAN ID	**12**
VLAN Name	**Campus_Data**
Status	**Associated**
On Network	**Yes**

Traffic

No

Security

Authenticating ISE	**Data Not Available**
Authentication Method	**802.1X**
Auth Status	**Authorization Succeeded**
Authorization Profile Name	**Data Not Available**
Posture Status	**Unknown**
TrustSec Security Group	**Data Not Available**
Audit Session ID	**C0A8980A00003B26EC9A555C**
Windows AD Domain	**Data Not Available**
EAP Type	**Unknown**

Basic Client Properties—can be expanded for further details

Session History

Association Time	Duration	User Name	IP Address	IP Address...	Hostname	Switch Name	Interface	VLAN ID	Traffic (MB)
2014-Jan-15, 21:06:15 PST	30 days 0 hrs 19 min 5 sec	jfields	192.168.152.27	IPv4	unknown	AMS-3750-SBR	FastEthernet1/0/6	12	0.0
2014-Feb-15, 00:01:15 PST	3 days 0 hrs 13 min 14 sec	jfields	192.168.152.27	IPv4	unknown	AMS-3750-SBR	FastEthernet1/0/6	12	0.0
2014-Feb-18, 00:28:58 PST	6 days 21 hrs 46 min 39 sec	jfields	192.168.152.27	IPv4	unknown	AMS-3750-SBR	FastEthernet1/0/6	12	0.0

Client Association, Session History and Roam Reason

Events

Event Type	Event Time	Description
No data available		

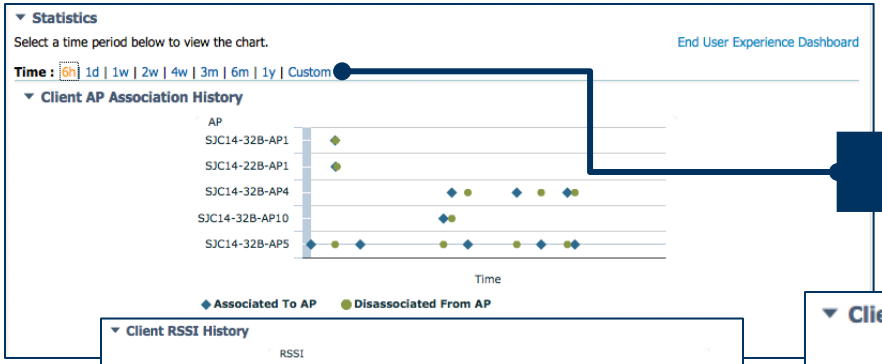
End User Experience Dashboard

Time : 6h | 1d | 1w | 2w | 4w | 3m | 6m | 1y | Custom

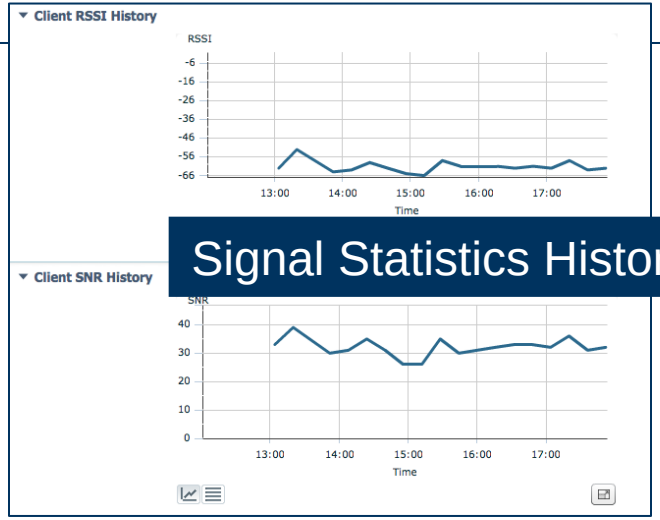
Bytes Sent and Received (Kbps)

Time	Send Rate	Receive Rate	Dropped Byt...	Dropped Byt...

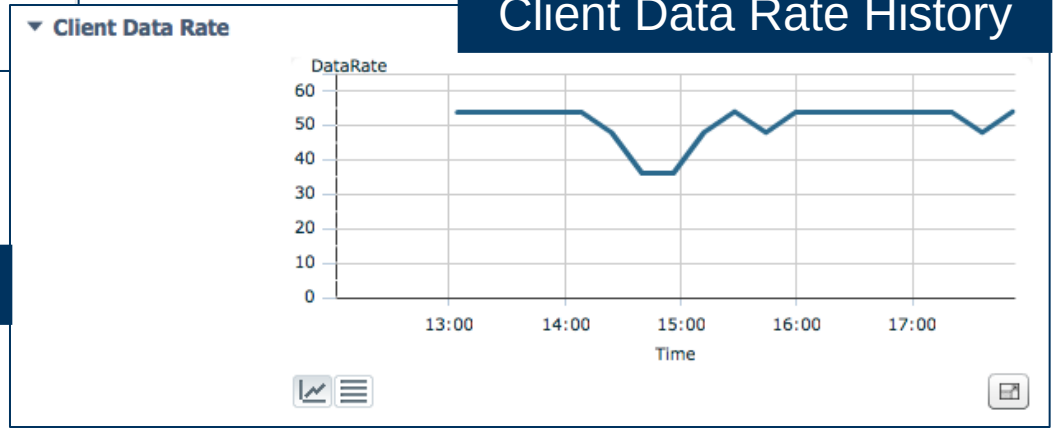
Monitoring: Client Details - 2



Client AP Association History



Signal Statistics History



Client Data Rate History

Sleeping Client

- Prior to WLC 7.5 release, client device connected to the WLC on web-auth enabled WLANs has to enter login credentials every time the client goes to sleep and wakes up.
- In WLC 7.5 release, client entry is cached for a configurable duration (up to 30 days / 720 hours)
- Sleeping interval is configured on a per WLAN basis
- When exceeding the user-idle timeout, client database entry is moved to a cache section of the database for the duration of the cache duration

New Controller Template

Configure > Controller Template Launch Pad > WLANs > WLAN Configuration > **New Controller Template**

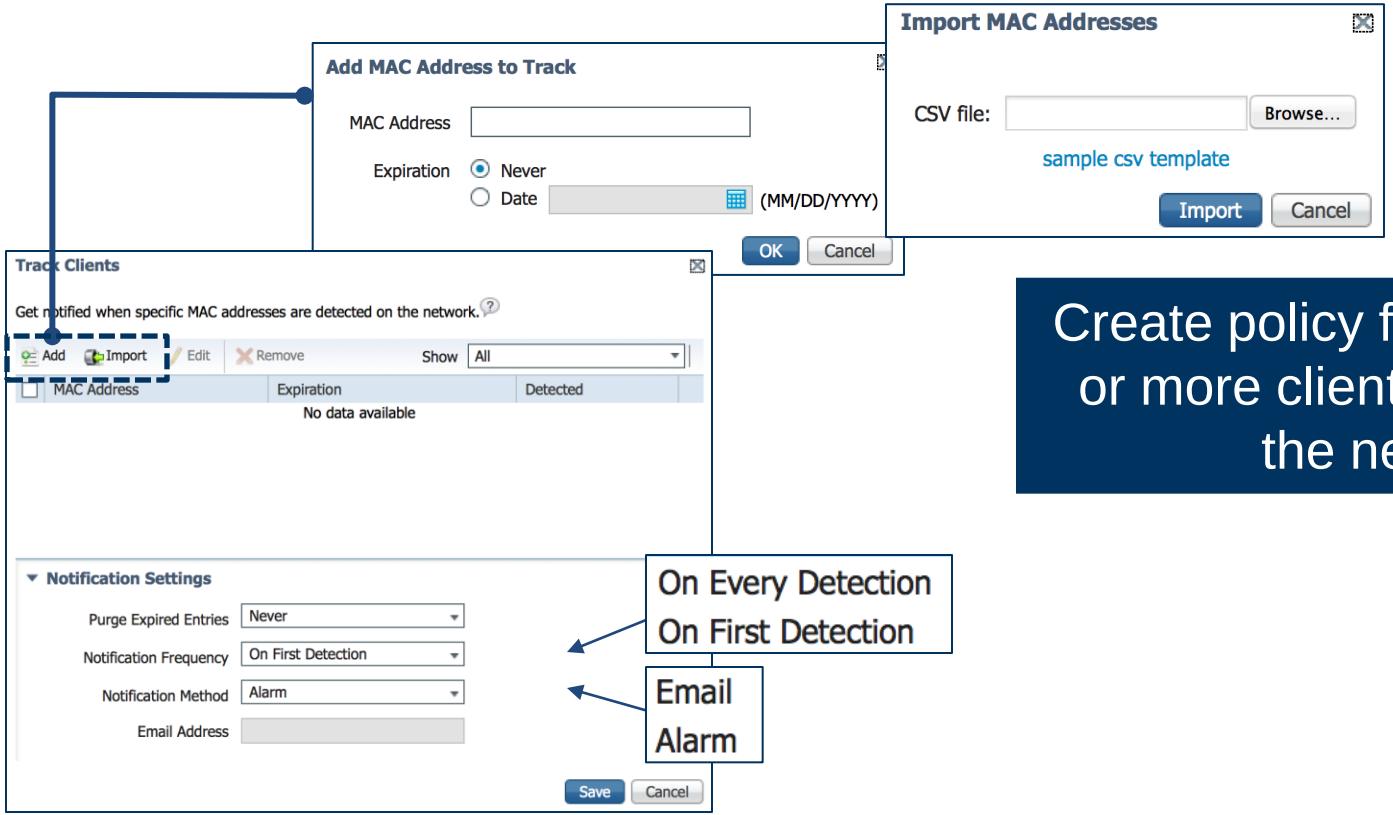
General | Security | QoS | Advanced | HotSpot | Policy Configuration

Layer 2 | Layer 3 | AAA Servers

Layer 3 Security	None
Web Policy	☑
	◉ Authentication
	○ Passthrough
	○ Conditional Web Redirect
	○ WebAuth on MAC Filter Failure
Preauthentication ACL	IPv4 none
	IPv6 none
	WebAuth none
Sleeping Client	☑ Enable
Sleeping Client Timeout	12 (hrs)
Global WebAuth Configuration	☐ Enable
Web Auth Type	Default Internal

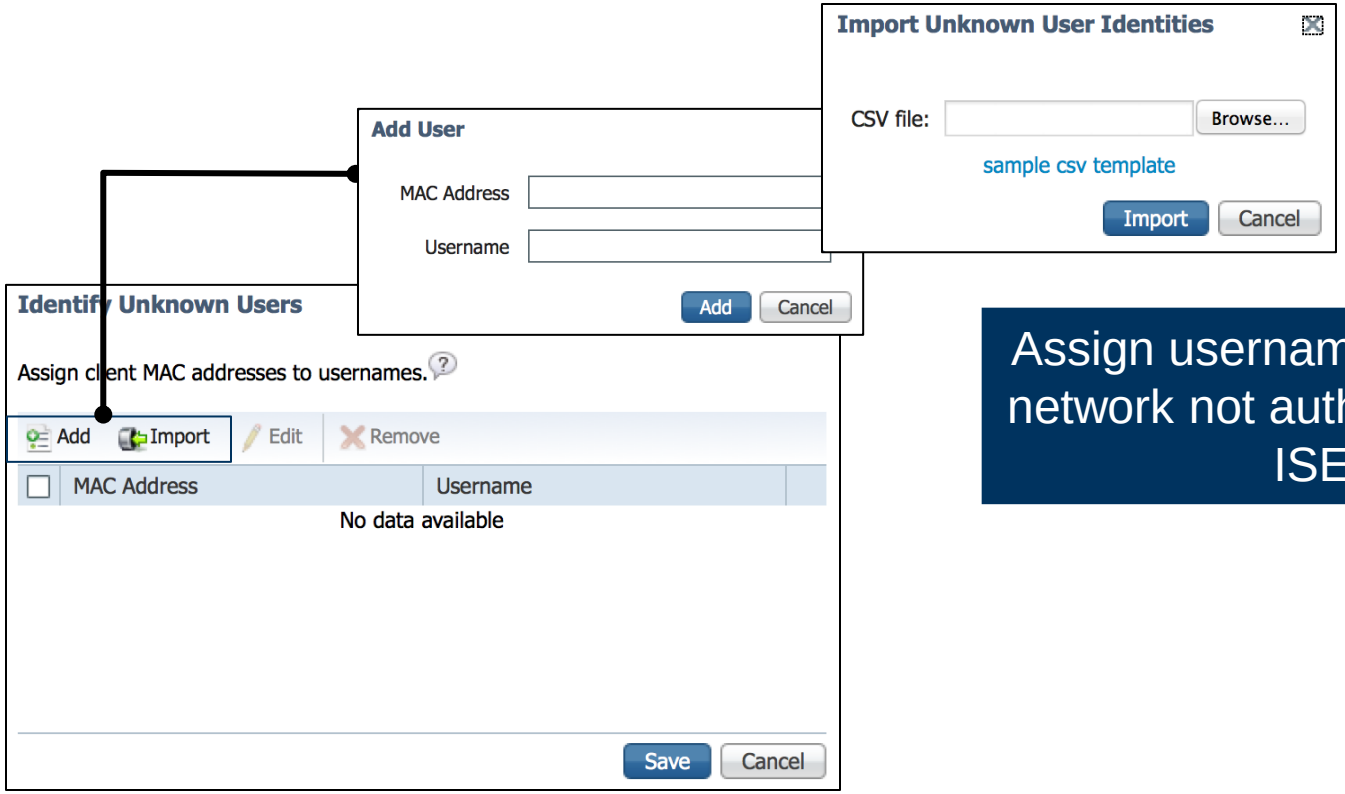
Enable sleeping client and timeout value in WLAN template

Track Clients



Create policy for tracking one or more clients detected on the network

Unknown Users



Assign username to client on network not authenticated via ISE.

IPv6 - Client Details

- IP Type – The type of client based on what IP addresses have been seen from the client. Possible options are IPv4, IPv6, or Dual-Stack which signifies a client with both IPv4 and IPv6 addresses.
- IPv6 Assignment Distribution - displays how the client acquired it IPv6 address. Possible assignment types are DHCPv6, SLAAC or Static, and Self Assigned.
- Global Unique – The most recent IPv6 global address used by the client. A mouse-over on the column reveals any additional IPv6 global unique addresses used by the client.
- Local Unique – The most recent IPv6 local unique address used by the client. Reveals any additional IPv6 global unique addresses used by the client.
- Link Local – The IPv6 address of the client which is self-assigned and used for communication before any other IPv6 address is assigned.
- IPv6 RA's Dropped – The number of router advertisements sent by the client and dropped at the access point. Can be used to track down clients that may be misconfigured or maliciously configured to act like an IPv6 router.

IPv6 Client Details

Client e8:06:88:51:5c:56 (Refreshed :2013-Apr-15, 17:39:05 PDT)

Client Attributes

General

User Name	**ekudey**
IP Address	**171.70.243.137**
MAC Address	**e8:06:88:51:5c:56**
Vendor	**Apple**
Endpoint Type	**Unknown**
Client Type	**Regular**
Media Type	**Lightweigh**
Mobility Status	**Local**
Hostname	**dhcp-171-70-243-137.cisco.c**
E2E	**Not Supported**
802.11u Capable	**No**
Power Save	**ON**
CCX	**Not Supported**

Client IPv6 Addresses

IP Address	Scope	Assignment
fe80::ea06:88ff:fe51:5c56	Link Local	Self Assigned

Link local address derived from MAC address.

Monitoring
Device Work Centre

Cisco Prime Infrastructure

Home | Design | Deploy | Operate | Report

Device Work Center

Device Group

- ALL
- Device Type
  - Cisco Interfaces and Modules
  - Cisco UCS Series
  - Routers
  - Switches and Hubs
    - Cisco Catalyst 2960 Series Switches

Device Group > **ALL**

ALL

Edit | Delete | Sync | Groups & Sites | Add Device

Device Name	Reachability	IP Address/DNS
3750-PHY-1		10.0.252.3
3945-East-1.cisco.com		192.168.152.1
3945-West-1		10.0.103.1
7206-Core-1		10.0.255.42
7206-Core-2		10.0.255.52

Device Details | Configuration | Configuration Archive | Image

System

- Summary
- User Defined Field
- Memory Pools
- Environment
- Modules
- Physical Ports

Interfaces

Summary

192.168.152.1 > System > **Summary**

General

IP Address/DNS Name	**192.168.152.1**
Device Name	**3945-East-1.cisco.com**
Device Type	**Cisco 3945E Integrated Services Router G2**
Up Time	**28 days 9 hrs 51 mins 21 secs**
Reachability Status	**Reachable**
Location	
Contact	**nmtg**
Cisco Identity Capable	**No**
Location Capable	**No**

Inventory

Software Version	**15.1(4)M1**
Model No.	**CISCO3945-CHASSIS**

Device 360° Views

3945-East-1.cisco.com

192.168.152.1 — Cisco 3945E Integrated Services Router G2

WAN Aggregation

up for 28 days 9 hrs 51 mins 25 secs

OS Type	**IOS**
OS Version	**15.1(4)M1**
Last Config Change	**November 1, 2013 2:15:47 PM PDT**
Last Inventory Collection	**February 24, 2014 10:02:59 PM PST**

CPU Utilization: **11.00%** ▼-1.00%

Low	High	Average
10.00%	12.00%	11.00%

Memory Utilization: **14.00%** 0.00%

Low	High	Average
14.00%	14.00%	14.00%

I/O

Alarms | Modules | Interfaces | Neighbors

Op. Status	Admin S...	Interface	Top 3 Applications
		Backplane-GigabitEthernet0/4	Not Available
		GigabitEthernet0/0	Not Available
		GigabitEthernet0/1	Not Available
		GigabitEthernet0/2	Not Available
		GigabitEthernet0/3	Not Available
		GigabitEthernet4/0	Not Available

Workflow Status 0 0 0 | Support Cases | Alarm Browser | **Alarm Summary** 197 2 187

VLAN Information

VLANs

10.5.10.2 > Layer 2 > **VLANs**

VLAN ID	VLAN Name	
15	3850-MGMT	Ethernet
10	data	Ethernet
12	Data	Ethernet
1	default	Ethernet
1002	fddi-default	FDDI
1004	fddinet-default	FDDI Network Entity Title
11	Phns	Ethernet
1003	token-ring-default	Other
1005	trnet-default	Other
100	VLAN0100	Ethernet
20	voice	Ethernet

Per VLAN details – all VLANs configured per switch.

Spanning Tree – Details/Monitoring

Per VLAN configured parameters: single pane of glass view of all VLANs configured on switch

Spanning Tree Details

10.5.10.2 > Layer 2 > Spanning Tree > **VLAN0001**

VLAN ID	Root Path Cost	Designated Root	Bridge Priority	Root Bridge Priority	Max Age (sec)	Hello Interval (sec)	Forward Delay (sec)
1	4	00:1b:0c:02:ab:80	32769	32769	20	2	15

Per VLAN status: operational details for troubleshooting

VLAN Interfaces

Monitor > Switches > 172.20.224.54 > Interfaces > **VLAN Interfaces**

Port Name	VLAN ID	Operational Status	Admin Status	Port Type	Maximum Speed (Mbps)	MTU
Vlan1	1			Propvirtual	1000	1500
Vlan10	10			Propvirtual	1000	1500
[illegible]	[illegible]			[illegible]	[illegible]	[illegible]

Monitoring - Alarms and Events

What Are Events?

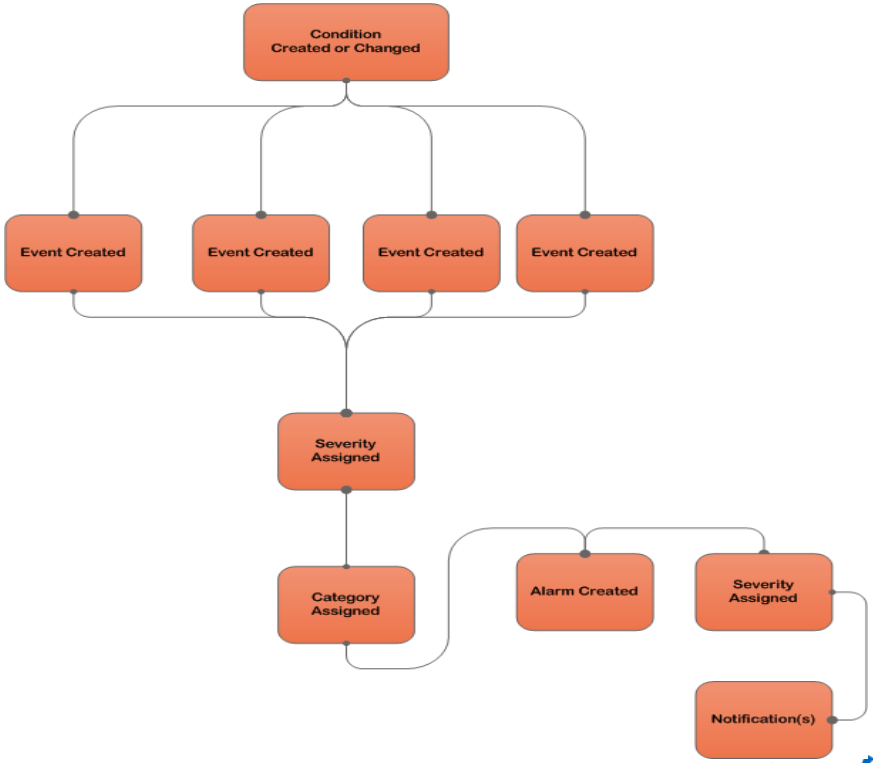
- An occurrence of a condition (or change in condition) in the network managed by PI
- Not necessarily generated for every condition but could be a result of a pattern or threshold match by the WLC
- Events may not be useful in their raw form (unless troubleshooting, for example) and usually need further processing

What Are Alarms?

- Correlated events result in alarms (PI allows looking up event history for alarms)
- Both Alarms and Events are categorised by severities
  - Critical
  - Major
  - Minor
  - Warning
  - Informational

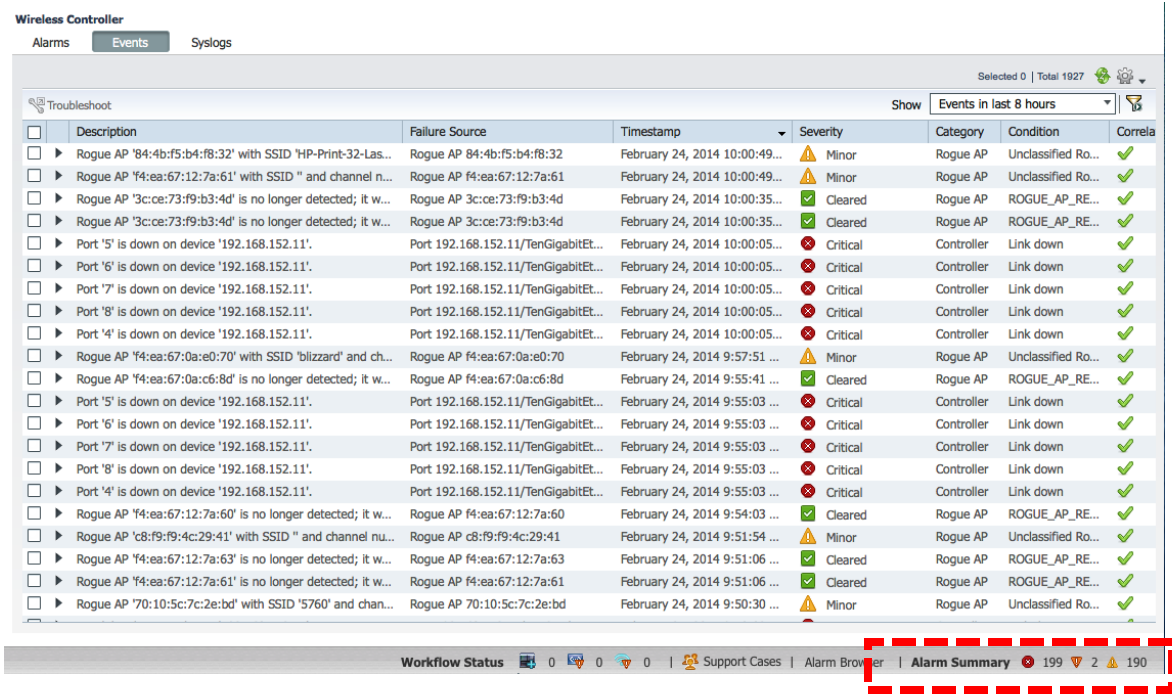
Notifications, Alarms and Events

- A notification is triggered when a fault occurs in the network.
- An event is created, based on the notification.
- An alarm is created after checking if there is no active alarm corresponding to this event.
- Events can be trap, syslog or threshold violation
- Conventional actions are available :
  - Filter
  - Clear
  - Acknowledge
  - Annotate
- Troubleshooting tools are available :
  - ping, traceroute
  - show commands



PI - Alarms and Events

- Single page view of alarms and events for wired and wireless
- Persistent alarm summary and browser
- Quick and Advanced Filtering
- Advanced search capabilities



Alarms – Layout and Search

Alarms sorted by Categories and Severities are hyperlinked to allow quick drill-down

On-demand refresh and view customisation

Persistent Alarm Summary toolbar. Expands to display alarm categories.

Alarm Summary

	Critical	Major	Minor
Alarm Summary	311	1164	964
AP	11	0	12
Controller	24	1	0
Coverage Hole	0	0	0
Mesh Links	0	19	12
Mobility Service	1	0	3
NCS	0	1	6
Performance	0	0	57
Rogue AP	0	1143	866
Security	275	0	8

Alarm Browser

Alarm Summary 311 1164 964

Alarm Browser

Expandable view for each alarm for details

Provides filtered view of alarms for wired and wireless

Selected 0 | Total 3665

Change Status | Assign | Annotation | Delete | Email Notification | Troubleshoot | Show: All

Severity	Message	Status	Failure Source	Timestamp	Owner	Category	Condition
Minor	Rogue AP '00:27:0d:08:7a:8e' wit...	Not Acknowledg...	Rogue AP 00:27:0d:08:7a:8e	April 15, 2013 10:49:06 PM PDT	japitche	Rogue AP	Unclassified Rog
Critical	IDS 'Deauth flood' Signature attac...	Not Acknowledg...	WLAN Controller sjc14-wl-wlc1/17...	April 15, 2013 11:33:20 PM PDT	japitche	Security	Signature attack
Major	Rogue AP 'c4:7d:4f:53:38:60' with...	Not Acknowledg...	Rogue AP c4:7d:4f:53:38:60	April 15, 2013 10:51:09 PM PDT	japitche	Rogue AP	Malicious Rogue
Critical	IDS 'NULL probe resp 2' Signature...	Not Acknowledg...	WLAN Controller sjc14-wl-wlc1/17...	April 15, 2013 2:22:56 PM PDT	japitche	Security	Signature attack

- Quick Filter
- Advanced Filter
- All
- Manage Preset Filters
- Assigned to Me
- Unassigned Alarms
- Alarms in last 5 minutes
- Alarms in last 15 minutes
- Alarms in last 30 minutes
- Alarms in last hour
- Alarms in last 8 hours
- Alarms in last 24 hours
- Alarms in last 7 days
- Cleared Alarms

General Info

Signature Name	**NULL probe resp 2**
Signature Type	**Standard**
Reported From	**WLAN Controller sjc14-wl-wlc1/171.71.128.75**
Attack active at	**1 AP(s)**
Observer MAC List	**c4:0a:cb:88:80:30,64:d9:89:42:26:60,64:d9:89:42:45:b0,64:d9:89:42:4b:b0,64:d9:89:42:44:50,64:d9:89:42:41:d0**
Owner	**japitche**
Acknowledged	**false**
Category	**Security**
Created	**April 1, 2012 3:40:22 AM PDT**
Modified	**April 15, 2013 2:22:56 PM PDT**
Severity	**Critical**
Previous Severity	**Critical**

Messages

IDS 'NULL probe resp 2' Signature attack cleare 'SJC14-31B-AP5' protocol '802.11b/g' on Contro The Signature description is 'NULL Probe Respo - Controller Name: sjc14-wl-wlc1This Signature detected by 1 APs.

Annotations

Message	Posted By	Date/Time
Reviewed and not thr...	japitche	March 8, 2013 9:02:...
Alarm assigned	japitche	March 8, 2013 9:02:...

Description

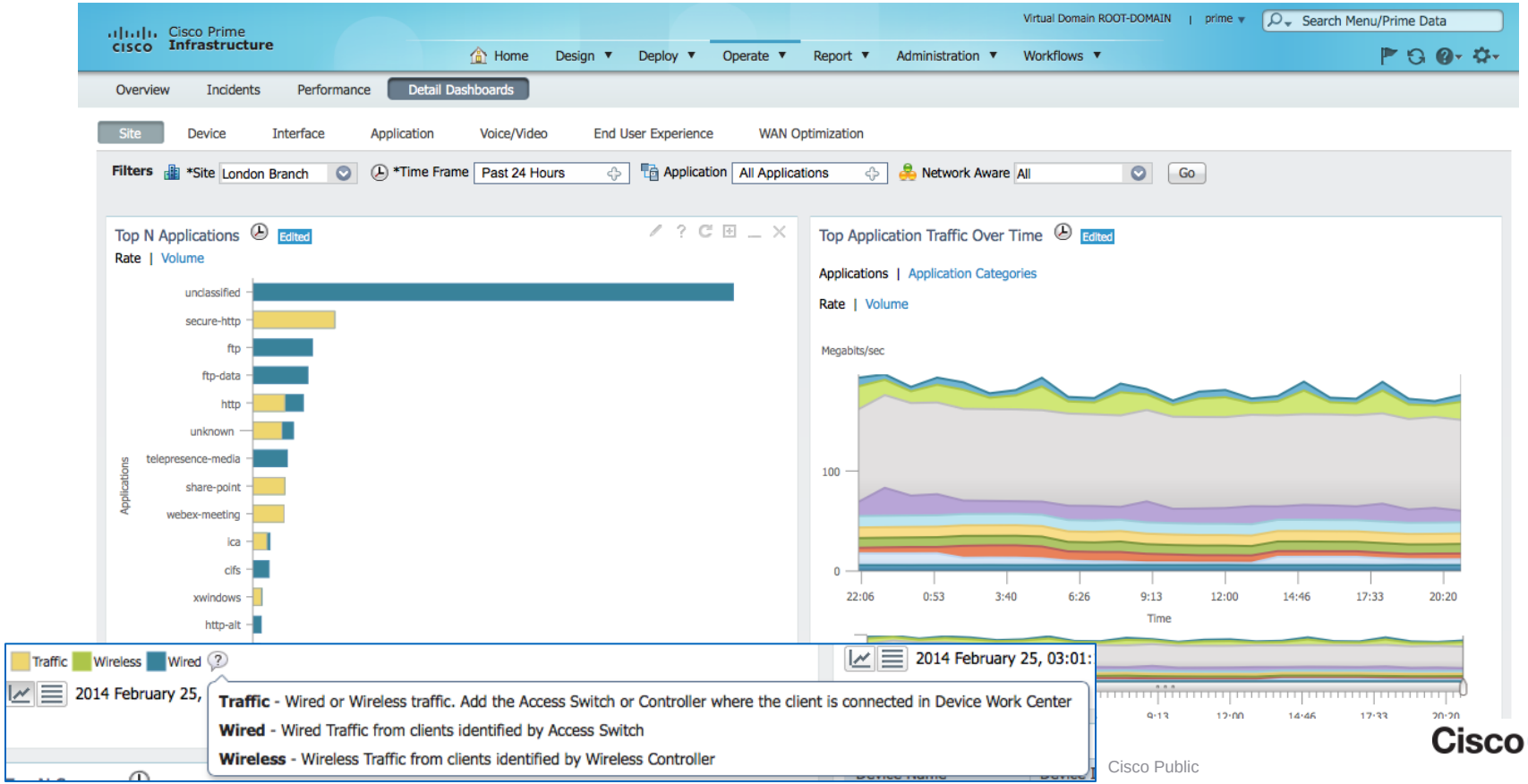
NULL Probe Response - No SSID element

Application Visibility and Control (AVC)

- AVC on a controller can classify and take action on 1039 different applications
- Two Actions, either DROP or MARK, are possible on any classified application
- A maximum of 16 AVC profiles can be created on a WLC
- Each AVC Profile can be configured with a maximum of 32 rules
- Same AVC profile can be mapped to multiple WLANs. However, one WLAN can only have one AVC Profile
- AVC is supported on WLANs configured for central switching only
- Any application, which is not supported or recognised by the AVC engine on WLC, is captured under the bucket of UNCLASSIFIED traffic

Application Visibility and Control

Assurance Licence



AVC – Wireless LAN Controller GUI

WLANs > Application Statistics

Aggregate | Upstream | Downstream

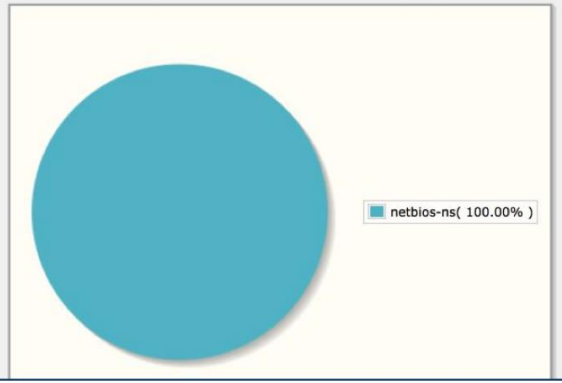
Application Last 90 Secs Stats

App Name	Packet Count	Byte Count	Average Packet Size	Usage(%)
netbios-ns	9	450 B	50	100.00

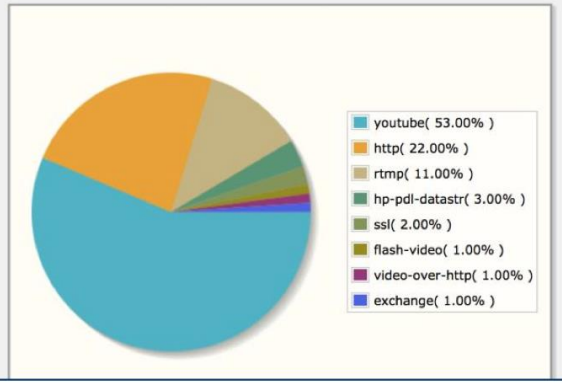
Application Cumulative Stats

App Name	Packet Count	Byte Count	Usage(%)
youtube	424116	466.72 MB	53.00
http	194901	200.47 MB	22.00
rtmp	93800	100.90 MB	11.00
hp-pdl-datastr	36834	33.65 MB	3.00
ssl	37721	23.06 MB	2.00
flash-video	14007	15.33 MB	1.00
video-over-http	13864	14.66 MB	1.00
exchange	14884	13.23 MB	1.00
google-services	6071	3.53 MB	0.00
sip	4347	2.16 MB	0.00

Application Last 90 Secs Usage(%)



Application Cumulative Usage(%)

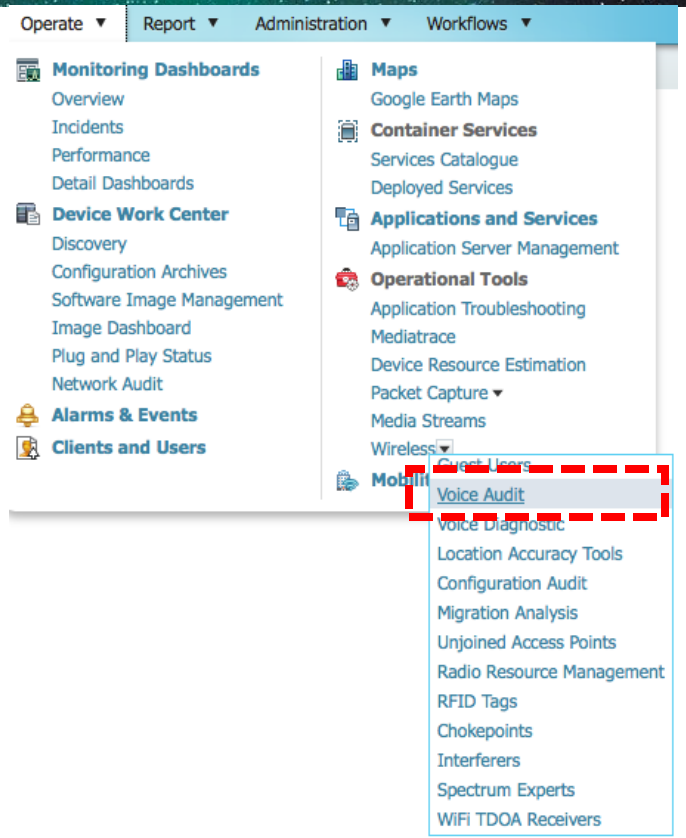




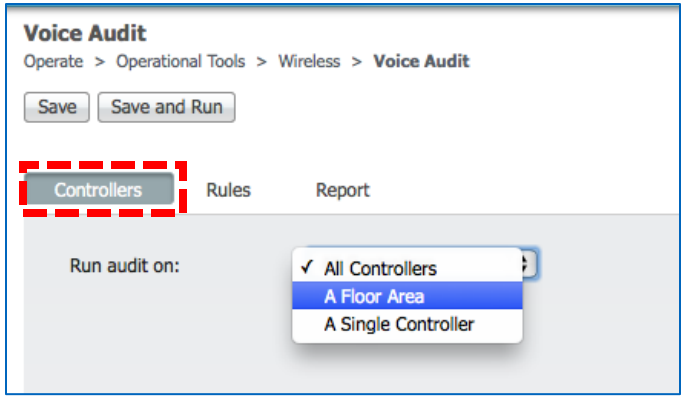

Operational Tools

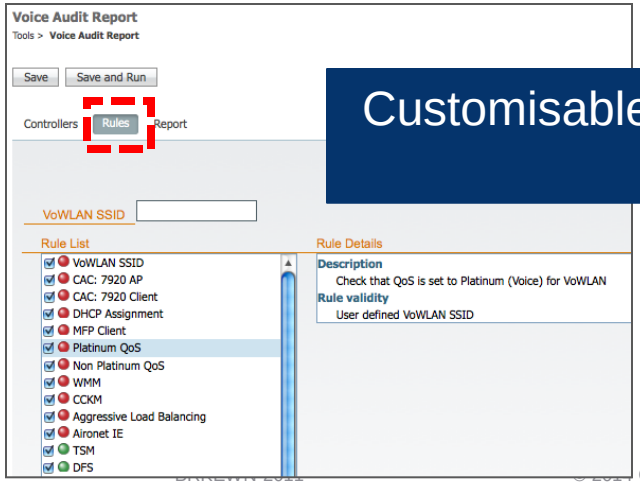
Operational Tools - Voice Audit Tool

- Allows auditing current **network configuration** from a VoWLAN deployment perspective
- Use default rules and thresholds based on Cisco best practices
- Ability to customise the rules to match your network and requirements
- Provides a simple report with a list of configuration gaps

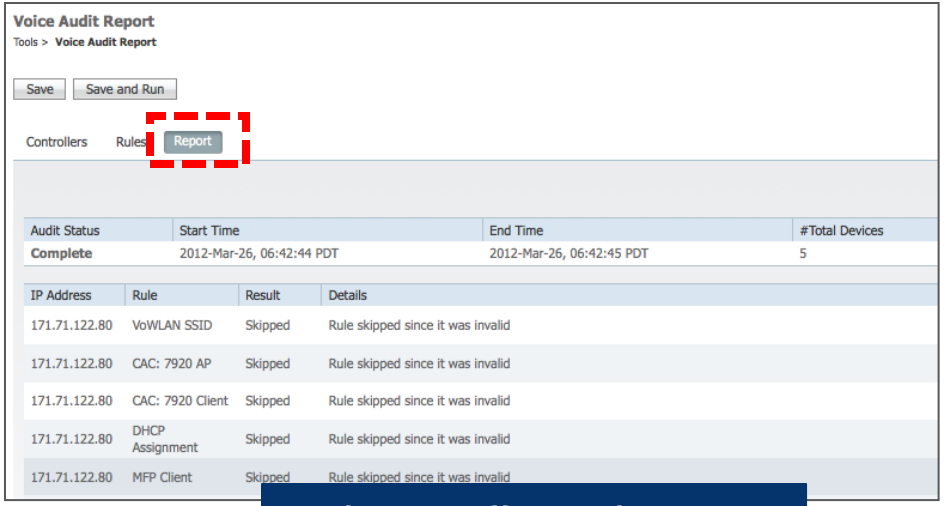


Voice Audit - Example





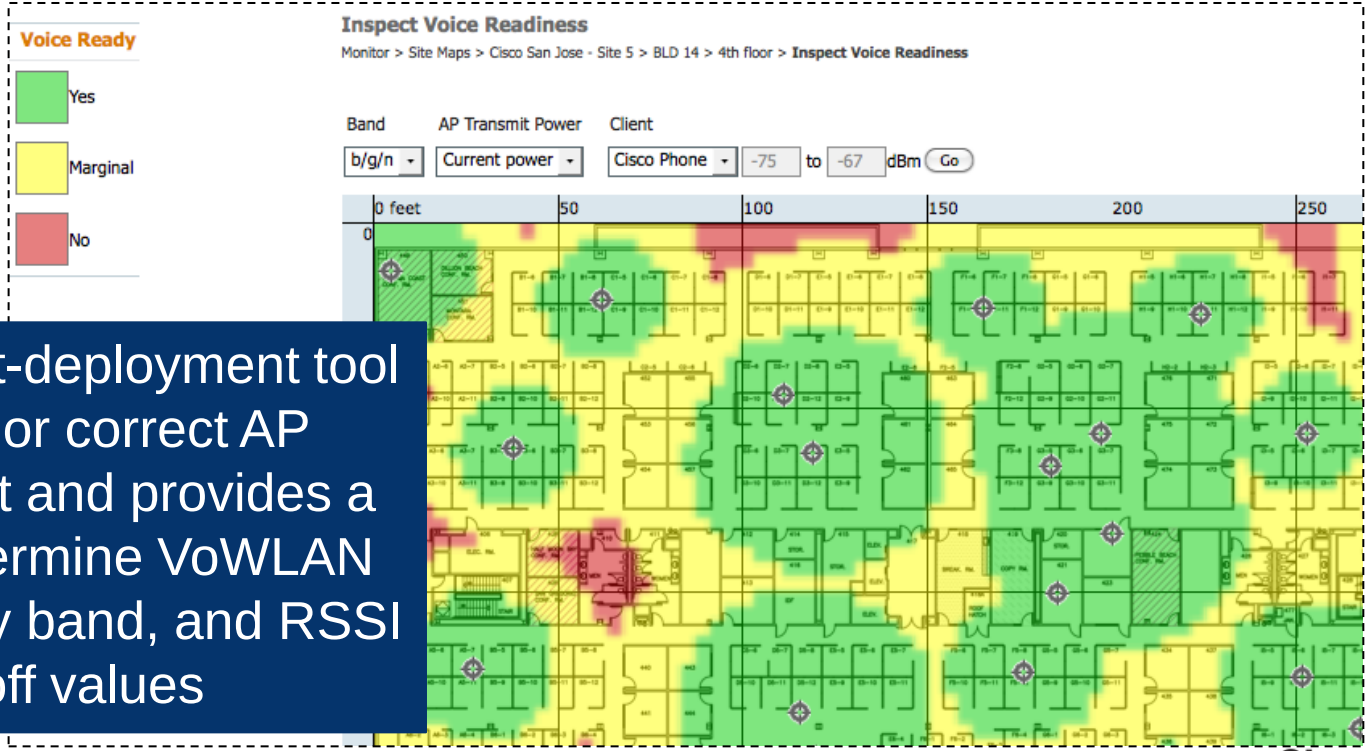
Customisable Rules



Voice Audit Tool Report

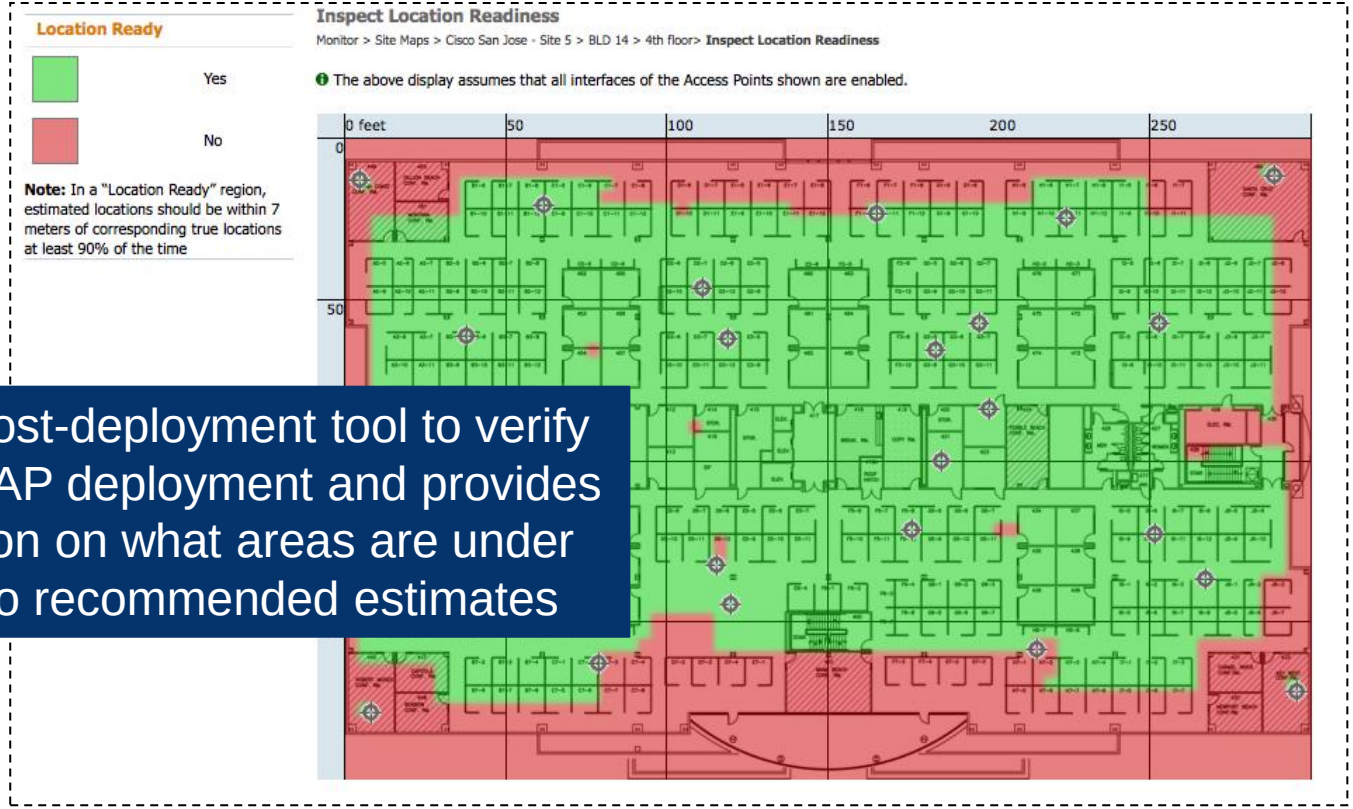
Voice Readiness Tool - Example

Launch from Floor View in Maps



Simple, post-deployment tool to verify or correct AP deployment and provides a way to determine VoWLAN readiness by band, and RSSI cutoff values

Location Readiness - Example



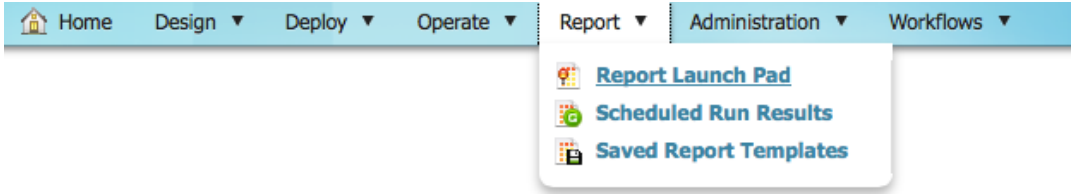
Simple, post-deployment tool to verify or correct AP deployment and provides information on what areas are under the Cisco recommended estimates




Reporting

Reporting

- Report LaunchPad
- Report Customisations
  - Multi-Level Filtering
  - Customising Report Output
  - Multi-Level Sorting in Report Output
- Report Scheduling
- PI + ISE Reporting



Report LaunchPad

Report LaunchPad – Easy Drill-Down

Cisco Prime Infrastructure

Home | Design | Deploy | Operate | Report | Administration

Autonomous AP
- Autonomous AP Memory and C...
- Autonomous AP Summary
- Autonomous AP Tx Power and...
- Autonomous AP Uptime
- Autonomous AP Utilization
- Busiest Autonomous APs

CleanAir
Client
Compliance
Custom NetFlow
Device
Guest
MSE Analytics
Mesh
Network Summary
Performance
Raw NetFlow
Security

Report Launch Pad
Report > Report Launch Pad

Autonomous AP
- Autonomous AP Memory and CPU Utilization — New
- Autonomous AP Summary — New
- Autonomous AP Tx Power and Channel — New
- Autonomous AP Uptime — New
- Autonomous AP Utilization — New
- Busiest Autonomous APs — New

Identity Service Engine (open in a new window)
- Endpoint Authentication Summary — New
- Endpoint Profiler Summary — New
- Posture Detail Assessment — New
- Top N Endpoint Authentications — New
- Top N User Authentications — New
- User Authentication Summary — New

CleanAir
- Air Quality vs Time — New
- Security Risk Interferers — New
- Worst Air Quality APs — New
- Worst Interferers — New

MSE Anal
- Client Locat
- Client Locat

Client
- Busiest Clients
- CCX Client Statistics
- Client Count
- Client Sessions
- Client Summary
- Client Traffic
- Client Traffic Stream Metrics
- Dormant Clients — New
- Mobility Client Summary — New

Busiest Clients
Reports > Report Launch Pad > Client > Busiest Clients

Report Title	Report Type	Scheduled
Ian Client Report	Busiest Clients	Disabled
haidertest	Busiest Clients	Disabled
kukku	Busiest Clients	Disabled
leksan rappari	Busiest Clients	Disabled
tonparke_Busiest_Client	Busiest Clients	Disabled

New | Enable Schedule | Disable Schedule | Delete

Mesh
- Alternate Parent — New

Easily navigate to created/scheduled reports
Modify/run existing reports

Report Customisation

Busiest Clients : Ian Client Report

Reports > Report Launch Pad > Client > Busiest Clients > **Busiest Clients Report Details**

Run | Save | Run and Save | Save and Export | Save and Email | Cancel | Delete

Settings

Report Title: **Ian Client Report**

Report By: Floor Area

Report Criteria: Cisco San Jose - Site 5 > BLD 14 > 1st floor [Edit]

Connection Protocol: All Clients

Reporting Period: Last 7 Days

From 00 : 00

To 00 : 00

Show: Up to 50 records

(Enter a number between 5 and 50, or leave blank to show all records.)

Customize Report: Customize — Customize the data for this report

Schedule

Scheduling: Enable

Export Format: CSV

Create Custom Report

Custom Report Name: Busiest Clients

Available data fields

- Global Unique
- Unique Local
- Link Local
- On Device
- Bytes Sent (MB)
- Bytes Received (MB)
- Packets Sent
- Packets Received

Data field sorting

Sort by	Throughput	Ascending	Descending
Then by	Utilization (%)	Ascending	Descending
Then by	Bytes Received (MB)	Ascending	Descending
Then by	Bytes Sent (MB)	Ascending	Descending

* Only reports in tabular format can be sorted.
* Only fields that can be sorted appear in the selection menus.

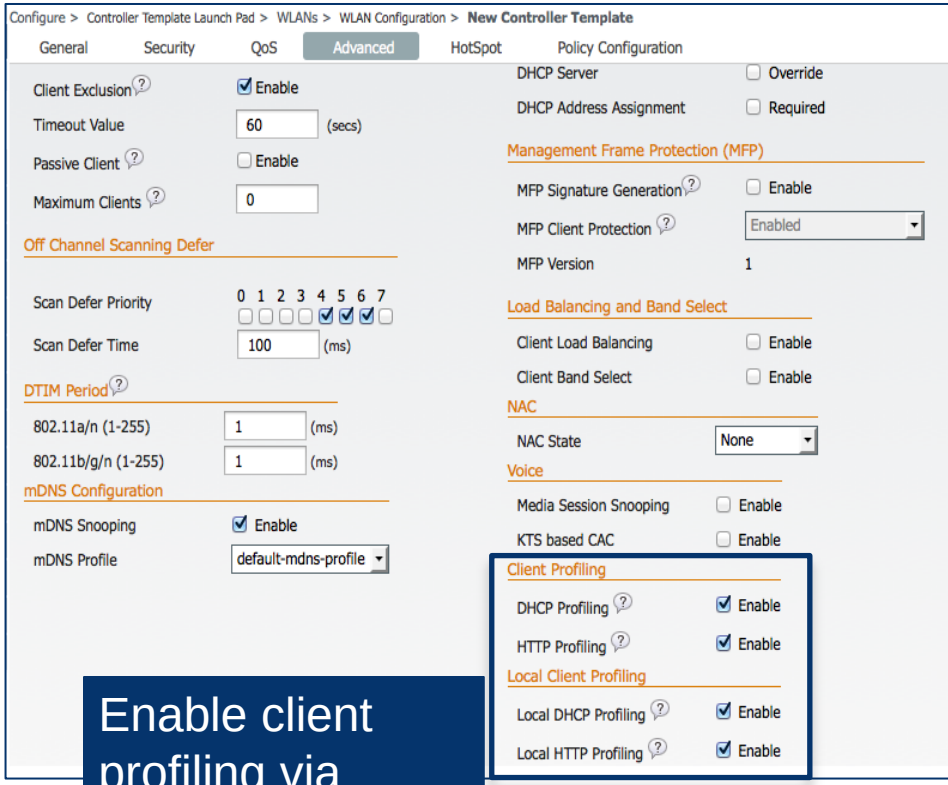
After clicking Apply, click Save on the Report Details page to save the custom report settings. Apply | Reset | Cancel

Run report immediately or schedule to be run one-time only or periodically. Save report in user-specified destination, or mailed to one or more recipients.

Customise reports: select data most relevant for each report.

Client Profiling

- PI 1.4 + WLC 7.5 Client Profiling
  - Client profiling **without** ISE
  - WLC profiling of devices based on HTTP/DHCP to identify endpoint devices
  - Configure device-based policies and enforce per user or per device policy on the network
  - WLC also displays statistics based on per user or per device end points and policies applicable per device.
- Profiling based on
  - device Type (iPad iPhone, Android, etc.), user name/password, EAP method, time of day (when end point is allowed on the network), etc.



Enable client profiling via WLAN template

Define rule for profiling device

Create action for device category

New Controller Template

Configure > Controller Template Launch Pad > WLANs > Policy Configuration > **New Controller Template**

Policy Name: policy-1

Rules

Policy Role:

EAP Type: Eap-tls

Device Type:

Actions

VLAN: 0

ACL: None

QOS: None

Session Timeout: 1800

Sleeping Client Timeout: 12

Save | Cancel

Device Type selector

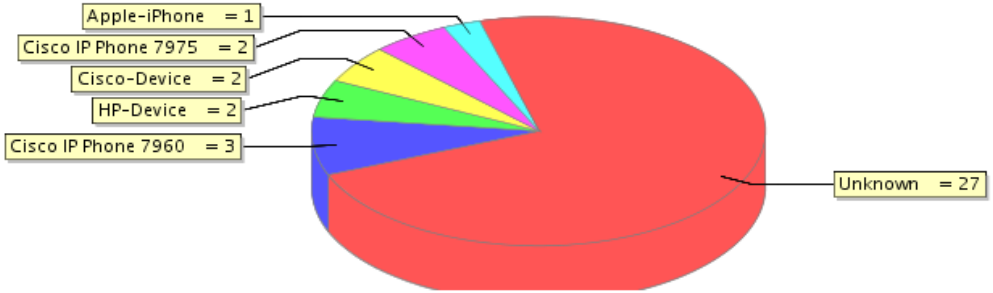
- Vista-Workstation
- Windows7-Workstation
- Windows8-Workstation
- WindowsXP-Workstation
- Xandros-Workstation
- CentOS-Workstation
- Debian-Workstation

Clear Selections | OK | Cancel

Client Summary Report - Endpoint Type

Endpoint Type	Number of Sessions	Number of Clients	Session Time (Hours)	Traffic (MB)	% of Sessions	% of Clients	% of Session Time	% of Traffic
Unknown	29	27	3.0	5107.8	74.36	72.97	74.07	66.98
Cisco IP Phone 7960	3	3	0.05	861.3	7.69	8.11	1.23	11.29
HP-Device	2	2	0.45	1647.05	5.13	5.41	11.11	21.6
Cisco-Device	2	2	0.38	9.72	5.13	5.41	9.47	0.13
Cisco IP Phone 7975	2	2	0.0	0.0	5.13	5.41	0.0	0.0
Apple-iPhone	1	1	0.17	0.0	2.56	2.7	4.12	0.0

Clients by Endpoint Type



ISE Reports in PI

ISE reports cross-launched from within PI (single sign-on)

Report Launch Pad

Reports > **Report Launch Pad**

Autonomous AP	
Autonomous AP Cpu/Memory Utilization	New
Autonomous AP Summary	New
Autonomous AP Tx Power and Channel	New
Autonomous AP Up Time	New
Autonomous AP Utilization	New
Busiest Autonomous APs	New

CleanAir	
Air Quality vs Time	New
Security Risk Interferers	New
Worst Air Quality APs	New
Worst Interferers	New

Client	
Busiest Clients	New
Client Count	New
Client Sessions	New
Client Summary	New
Client Traffic	New
Client Traffic Stream Metrics	New
Posture Status Count	New

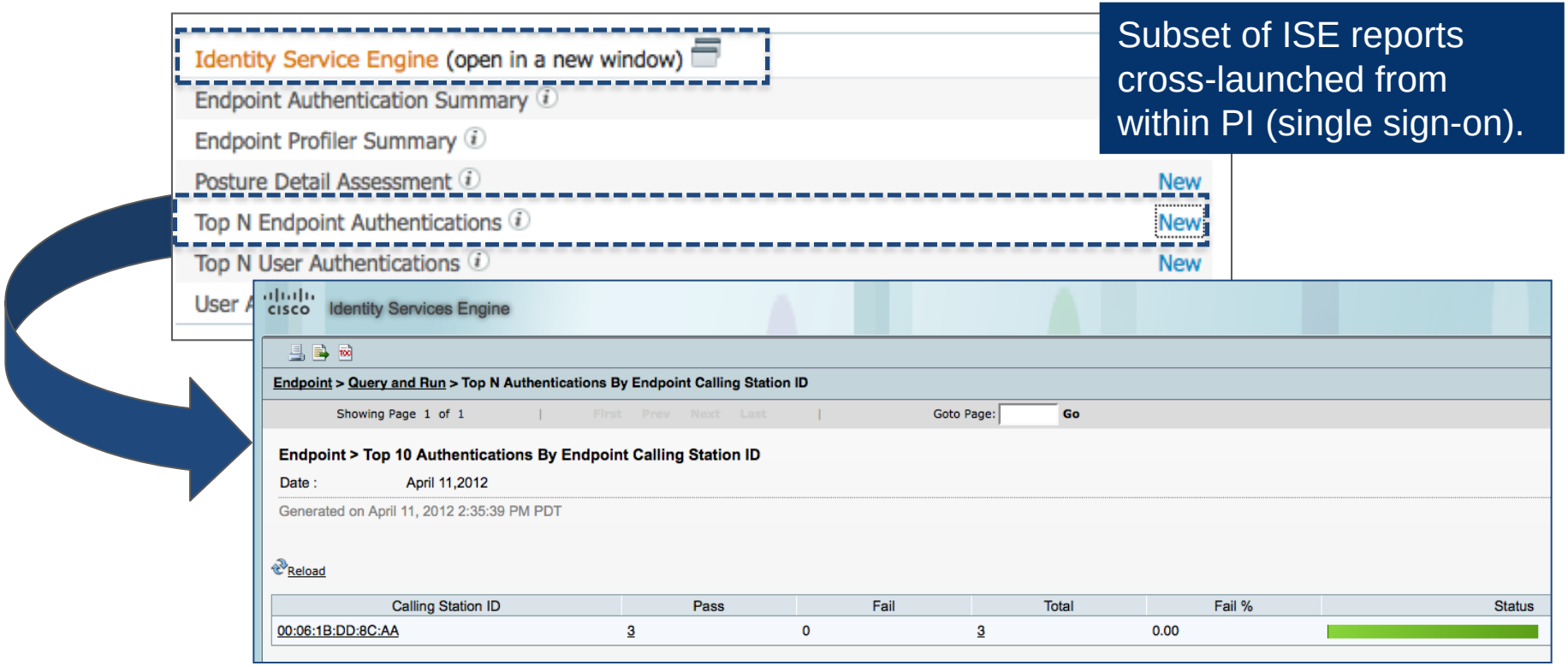
Guest	
Guest Accounts Status	
Guest Association	New
Guest Count	New
Guest User Sessions	New
WCS Guest Operations	New

Identity Service Engine (open in a new window)	
Endpoint Authentication Summary	New
Endpoint Profiler Summary	New
Posture Detail Assessment	New
Top N Endpoint Authentications	New
Top N User Authentications	New
User Authentication Summary	New

Mesh	
Alternate Parent	New
Link Stats	New
Nodes	New
Packet Stats	New
Stranded APs	New
Worst Node Hops	New

PI + ISE Reports

Subset of ISE reports cross-launched from within PI (single sign-on).



Key Takeaways

- PI provides full lifecycle management for wired/wireless infrastructure and endpoints
- Wired/wireless access – infrastructure and endpoints – need to be managed together
- PI builds on the features/functionality of WCS/NCS and adds wired management
- Provides license and data migration from WCS/NCS to PI

Final Thoughts

- Get hands-on experience with the Walk-in Labs located in World of Solutions,
- Come see demos of many key solutions and products in the main Cisco booth
- Visit www.ciscoLive365.com after the event for updated PDFs, on-demand session videos, networking, and more!
- Follow Cisco Live! using social media:
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  - Twitter: https://twitter.com/#!/CiscoLive
  - LinkedIn Group: http://linkd.in/CiscoLI

Maths Quiz

- Can you find a number, under 3000, which
- When divided by 2 leaves a remainder of 1;
- When divided by 3, a remainder of 2;
- When divided by 4, a remainder of 3;
- When divided by 5 a remainder of 4;
- When divided by 6 a remainder of 5;
- When divided by 7 a remainder of 6;
- When divided by 8 a remainder of 7;
- When divided by 9 a remainder of 8;
- When divided by 10 a remainder of 9?




Q & A

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