Campus Network Design Workshop

Network Documentation & Netdot

UNIVERSITY OF OREGON

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Documentation

- Have you ever asked, "*How do you keep track of it all?*"

Document!
Document!
Document!

Documentation

- Basic information you need such as keeping track of IP address assignments
- Who has spreadsheet of IP addresses?
- How do you update DNS? DHCP?
- Do you have to take action when a user needs to add a printer that needs DNS and a fixed IP?
- Maybe there is a better way….

Documentation

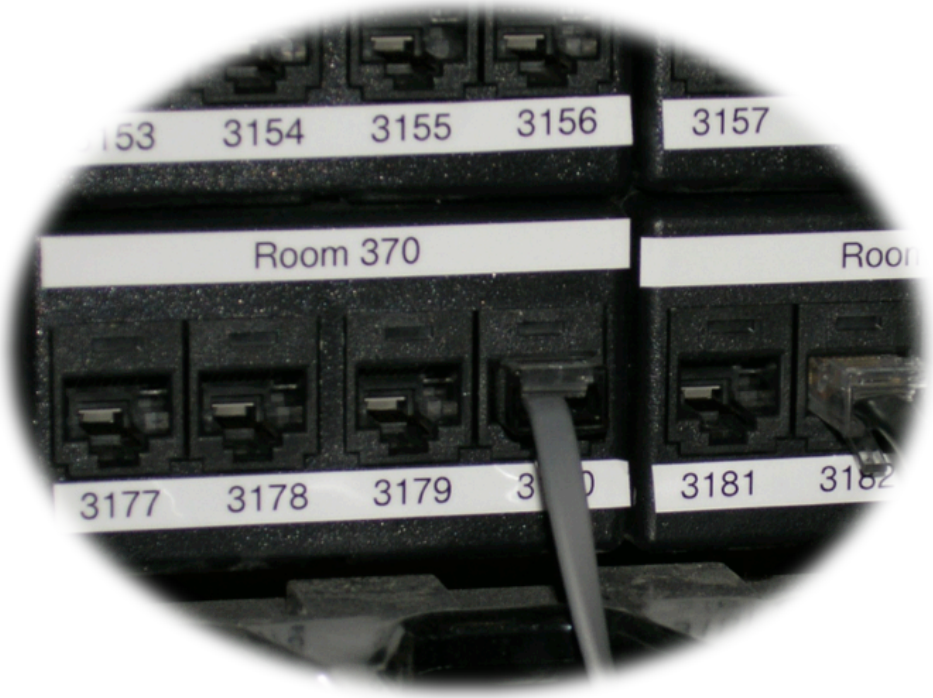
- Other basics, such as documenting your switches...
  - What is each port connected to?
  - Can be simple text file with one line for every port in a switch:
    - health-switch1, port 1, Room 29 – Director's office
    - health-switch1, port 2, Room 43 – Receptionist
    - health-switch1, port 3, Room 100 – Classroom
    - health-switch1, port 4, Room 105 – Professors Office
    - …..
    - health-switch1, port 25, uplink to health-backbone
  - This information might be available to your network staff, help desk staff, via a wiki, software interface, etc.
  - Remember to label your ports!

Documentation

- Maybe we can make some of the documentation processes automatic.
- Tools to help automate network documentation are something to consider.
  - You can write local scripts (programs) to do this.
  - Consider among several automated documentation systems for networks.
  - You'll probably end up using and doing both.

Documentation: Labelling

- Can be simple things



Problems with Documentation

- In most cases:
  - Lack of clear procedures and methods
  - Lack of structure
  - Lack of correlation
  - Lack of tools… or, too many tools
  - Lack of time and human resources

Requirements for a Tool

- Open standards based
- Generic and flexible
- That uses a relational database
- Automates tasks
- Exports configurations
- Web and command-line interfaces (CLI)
- Authentication and authorization
- Reports
- Open source code
- Application programming interface (API)

{net.} NETwork Documentation Tool

- Started in 2002. Required by the University of Oregon Network Services and NERO
  - http://www.nero.net
- Nothing equivalent available as Open Source
- Started as something much simpler
- Centralising and correlating information is critical:
  - Topology
  - Cable plant
  - IP and Mac addresses
  - DNS, DHCP, etc.

{net.} Design Goals

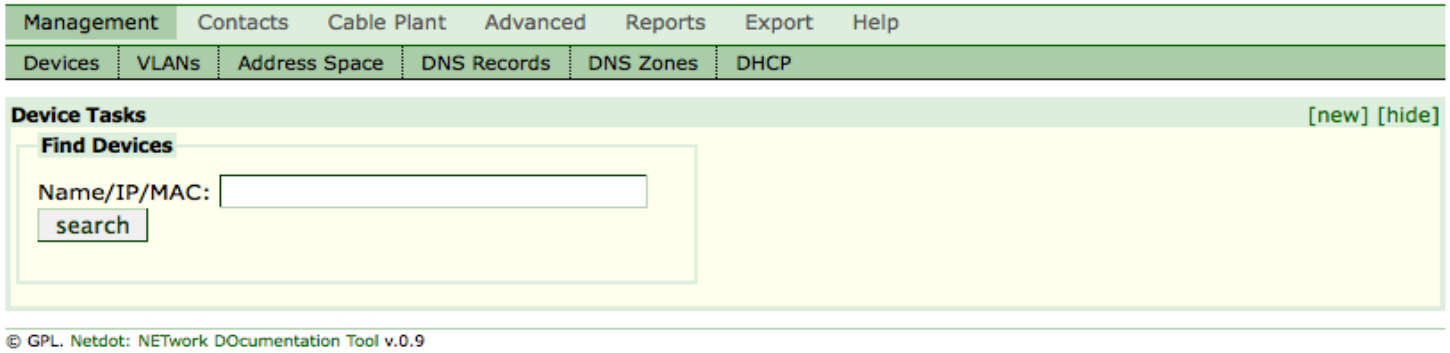
- Reutilize components (don't reinvent the wheel)
  - There are Open Source packages that help to resolve many Network Management problems.
- Must be able to use different databases
  - http://www.masonhq.com
  - MySQL, Postgres, etc.
- Use of Object Relations Mapper tools (ORM)
- Minimize the number of programming languages.
  - Perl and Javascript
- Simple graphical interface.

{net.} NETwork Documentation Tool

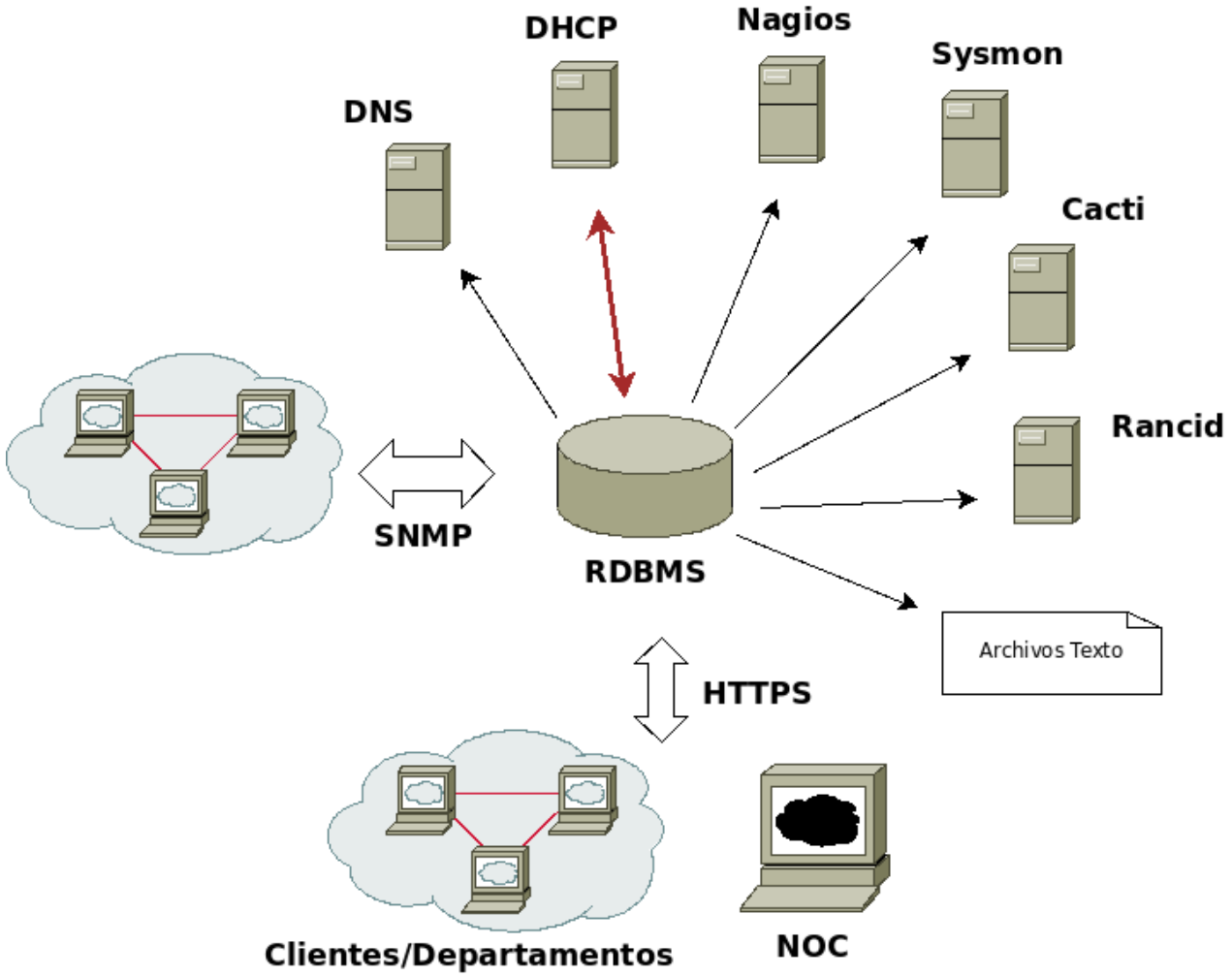
- Include functionality of other network documenation tools such as IPplan and Netdisco.
- Core functionality includes:
  - Discovery of network interfaces via SNMP
  - Layer 2 topology discovery and graphics using:
    - CDP/LLDP
    - Spanning Tree protocol
    - Switches forwarding tables
    - Router point-to-point subnets
  - IPv4 and IPv6 address management (IPAM)
    - Address space visualization
    - DNS and DHCP configuration management
    - IP and Mac address correlation

{net.} NETwork Documentation Tool

- Functionality cont.
  - Cable plants (sites, fibre, copper, network racks, circuits)
  - Contacts (departments, providers, vendors, etc.)
  - Exports for tools like Nagios, Sysmon, RANCID, Cacti, etc.
    - For example, automate Cacti configuration
    - I.E., how to automate node creation in Cacti
  - User access-level: admin, operator, user
  - Ability to draw pretty pictures of your network.



Drives Configuration of Other Tools



Network Devices

- Can be added via SNMP (preferred) or manually
- Automatic updates via SNMP
- Manufacturer, model, software version, name and domain, dates
- Maintenance contracts, out of band access, SNMP version and community
- Interfaces, VLANs, IP addresses, BGP peers
  - ARP tables (routers), forwarding tables (switches)
- Topology
- Images, comments, change history

{net.} Topology

- {net.} uses many sources of topological information:
  - CDP and LLDP protocols
  - Analyse switch forwarding tables
  - Spanning Tree protocol
  - Point-to-point networks
- Uses this information to draw network diagrams showing exactly how things are connected together.

Topology: Example

Netdot can dynamically draw the topology of a network or a segment of a network.

IP Space: Addresses and Blocks

- Hierarchical (drill-down) and graphical representation
- Support for IPv4 and IPv6
- Classification in:
  - Block
    - Container
    - Subnet
    - Reserved
  - Address
    - Static
    - Dynamic
    - Reserved

Visualisation of IP Address Space

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IP Space: Addresses and Blocks

- Subnets are discovered from router interfaces
- From ARP tables we can know:
  - Addresses in use in each subnet
  - Mapping of IP to MAC
- Information added for blocks (or subnets)
  - Group that uses the block
  - Group that administers the block
  - Percent utilization of addresses (subnet)
  - Percent utilization of sub-divisions (containers)
- Information added for addresses
  - First and and last time seen
  - interface and device
  - Services to monitor with Nagios (HTTP, DNS, SSH, DHCP, Radius, LDAP, etc.)

IP Address Management

- This IP address database is used to generate
  - DNS configuration
  - DHCP configuration
- End users or departmental IT staff can be granted access to allow them to add/delete/ update their own entries
  - This means NO work on your part when they need to add printer, etc.

Cabling

- Inter-building cabling (backbone)
  - Buildings and network racks where cabling starts and stops.
  - Type of fiber, length, quantity of fibers
- Fibers
  - Interconnections (splicing) and fiber segments
  - Measurements, tests, interfaces, circuits
  - Status

Cabling

- Intra-building cabling (interior cabling)
  - Network rack where it begins
    - Level
      - Building
  - Interface (port) where it is connected
  - Outlet where it terminates (id)
    - Office number or room
      - Level
        - » Building

Cabling

- Physical data
  - Dimensions, number and types of panels, type of ventilation, number of copper pairs, number of racks, etc.
- Cabling that terminates in each network rack
  - Fiber and twisted pair
- Photos

Other Documentation

- Branch offices or branch campuses
- Customers
- Departments
- Manufacturers
- Peer (BGP)
- Telecommunications and Internet Service Providers
- Vendors

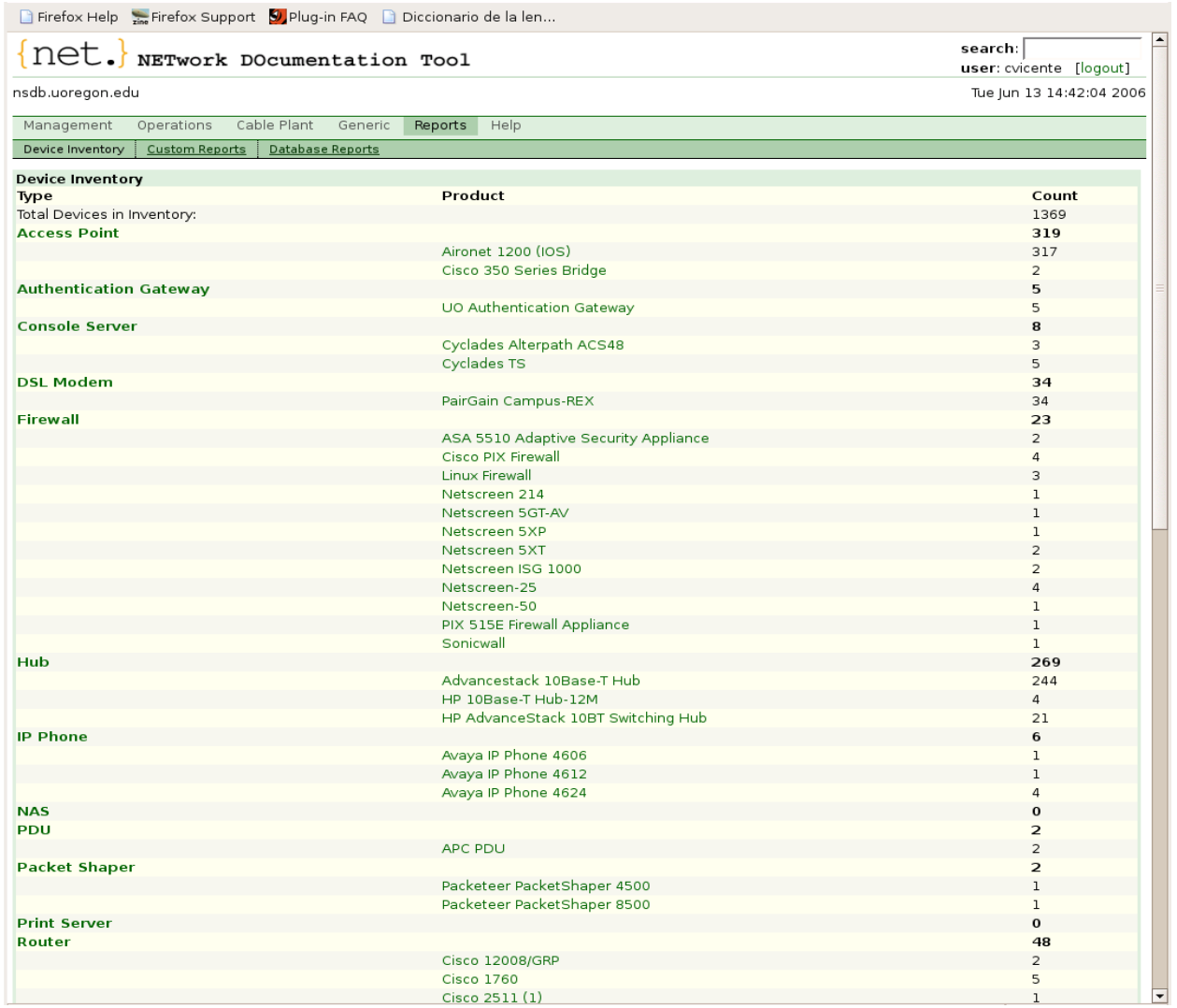
Contacts

- Based in individuals and roles (Person & Contact)
  - Information by individual
    - Contact data
      - Locations, position, telephone, e-mail, beeper
    - Roles
      - Administrative contact, technical, etc.
      - Notification schedule and levels
    - Contact lists
      - Assigned to different resources
        - » Devices, subnets, cabling, etc.

Reports

- Devices
  - By category and by product
  - Out-of-date firmware
  - Duplex mismatches
- Most used MAC codes (Manufacturers)
- From the database
  - SQL table utilization reports

Inventory & Devices



Firefox Help | Firefox Support | Plug-in FAQ | Diccionario de la len...

{net.} NETwork DOcumentation Tool

search:
user: cvicente [logout]

nsdb.uoregon.edu

Tue Jun 13 14:42:04 2006

Management | Operations | Cable Plant | Generic | Reports | Help

Device Inventory | Custom Reports | Database Reports

Device Inventory

Type	Product	Count
Total Devices in Inventory:		1369
Access Point		**319**
	Aironet 1200 (IOS)	317
	Cisco 350 Series Bridge	2
Authentication Gateway		**5**
	UO Authentication Gateway	5
Console Server		**8**
	Cyclades Alterpath ACS48	3
	Cyclades TS	5
DSL Modem		**34**
	PairGain Campus-REX	34
Firewall		**23**
	ASA 5510 Adaptive Security Appliance	2
	Cisco PIX Firewall	4
	Linux Firewall	3
	Netscreen 214	1
	Netscreen 5GT-AV	1
	Netscreen 5XP	1
	Netscreen 5XT	2
	Netscreen ISG 1000	2
	Netscreen-25	4
	Netscreen-50	1
	PIX 515E Firewall Appliance	1
	Sonicwall	1
Hub		**269**
	Advancestack 10Base-T Hub	244
	HP 10Base-T Hub-12M	4
	HP AdvanceStack 10BT Switching Hub	21
IP Phone		**6**
	Avaya IP Phone 4606	1
	Avaya IP Phone 4612	1
	Avaya IP Phone 4624	4
NAS		**0**
PDU		**2**
	APC PDU	2
Packet Shaper		**2**
	Packeteer PacketShaper 4500	1
	Packeteer PacketShaper 8500	1
Print Server		**0**
Router		**48**
	Cisco 12008/GRP	2
	Cisco 1760	5
	Cisco 2511 (1)	1

Configuration Exports

- Information contained within Netdot enables automatic generation of configurations for software packages.
  - Monitoring devices and services
    - Nagios, Sysmon
  - Monitoring configurations
    - RANCID
  - Traffic analysis
    - Cacti
  - Services
    - DNS (Bind)
    - DHCP

Exporting Configuration

- **Recommendation:**
  - Netdot updates Subversion or CVS
  - Puppet (replaces Cfengine) distributes configurations, restarts services, etc.

Other Tools

- There are other tools that do parts of what netdot does
- None provide all of netdot functionality
- Tools tend to focus on on aspect of what netdot does

IP Plan

- Does TCP/IP address management
- From the IPplan web page:

> "IPplan is a free (GPL), web based, multilingual, TCP IP address management (IPAM) software and tracking tool written in php 4, simplifying the administration of your IP address space. IPplan goes beyond TCPIP address management including DNS administration, configuration file management, circuit management (customizable via templates) and storing of hardware information (customizable via templates)."

- Lots of screenshots:
  - http://iptrack.sourceforge.net/doku.php?id=screenshots

NetDisco

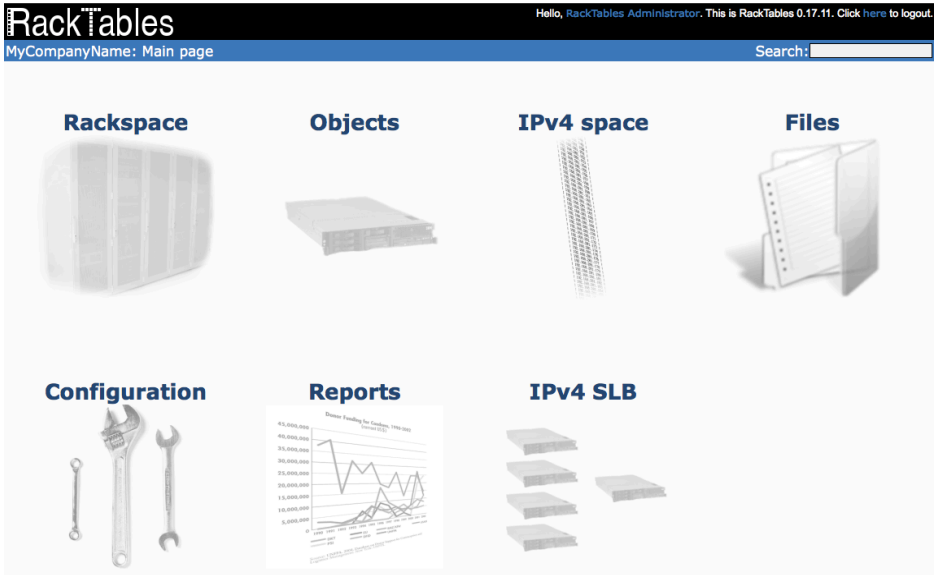
- Monitors IP address and Ethernet address Usage
- Launched 2003
  - v1.33 released June 2015
- Some popular uses of Netdisco:
  - **Locate** a machine on the network by MAC or IP and show the switch port it lives at.
  - **Turn Off** a switch port while leaving an audit trail. Admins log why a port was shut down.
  - **Inventory** your network hardware by model, vendor, switch-card, firmware and operating system.
  - **Report** IP address & switch port usage: historical & current.
  - **Pretty pictures** of your network.

RackTables

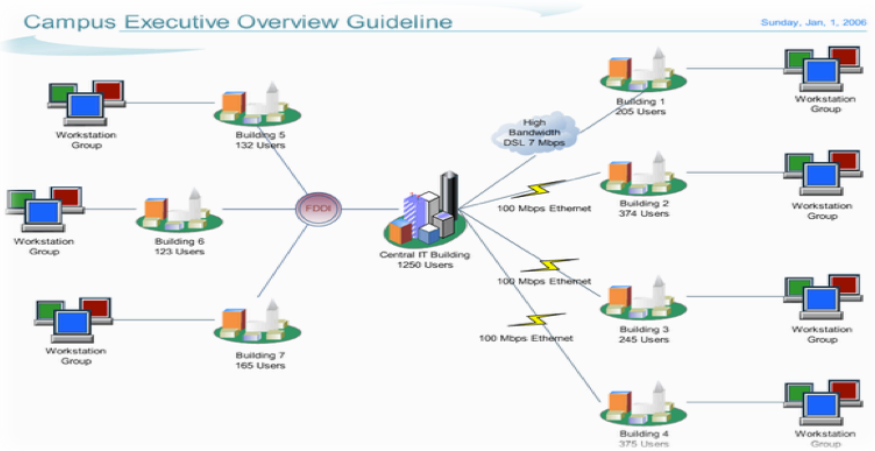
- Keeps track of assets
- Web site: http://racktables.org/

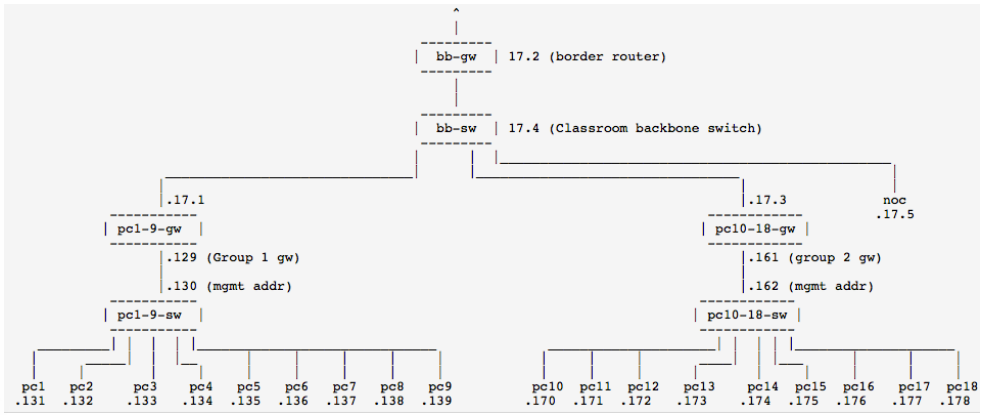
"Racktables is a nifty and robust solution for datacenter and server room asset management. It helps document hardware assets, network addresses, space in racks, networks configuration and much much more!"

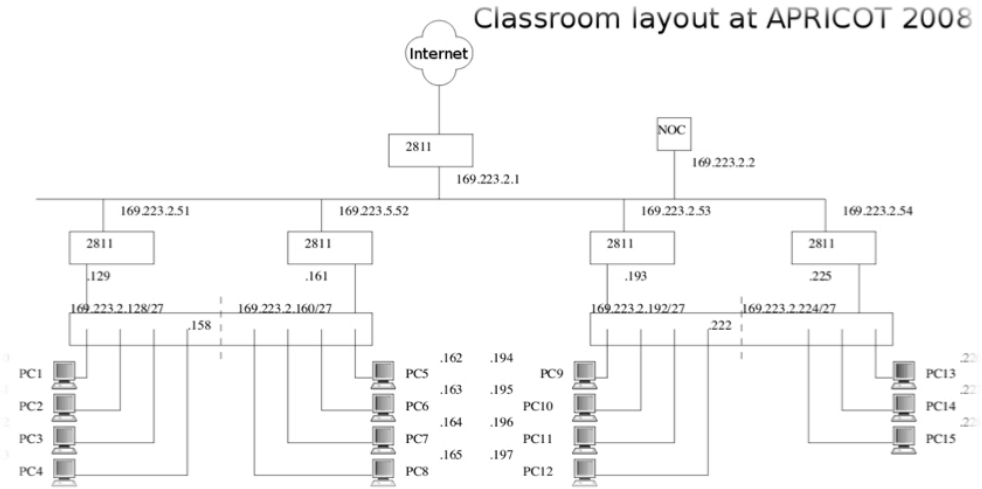
There is a demo system:
http://racktables.org/demo.php



Documentation: Diagrams







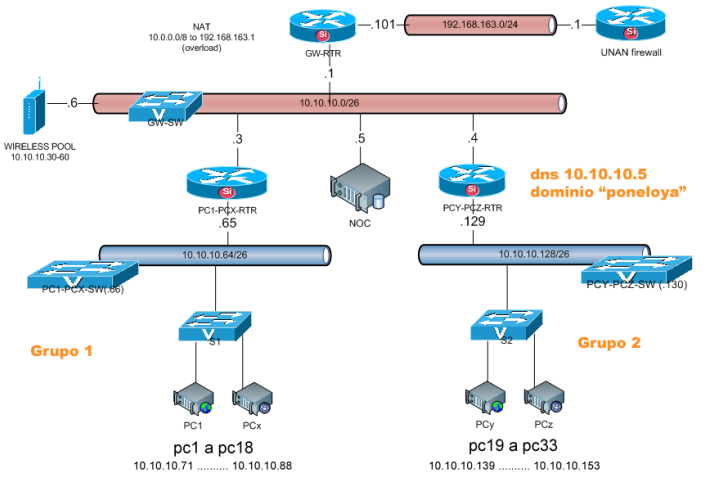


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Diagram Drawing Software

- **Windows**
  - Visio:
    - https://products.office.com/en-us/Visio/flowchart-software
  - Ezdraw: http://www.edrawsoft.com/
- **Mac**
  - Omnigraffle: https://www.omnigroup.com/omnigraffle
- **Open Source**
  - LibreOffice Draw
  - Pencil: http://pencil.evolus.vn/
  - Dia: http://live.gnome.org/Dia
  - ASCII: http://www.ascii-art.org/

Diagram Drawing Software

- Web based
  - Google Docs drawings
  - Gliffy: https://www.gliffy.com/
  - Be aware there is a charge for storage or team sharing features
- Icons
  - Cisco icons:
    - http://www.cisco.com/web/about/ac50/ac47/2.html
  - For LibreOffice:
    - http://www.vrt.com.au/downloads/vrt-network-equipment
  - Nagios Exchange: http://www.nagiosexchange.org/

{net.} Demo

- We will now give a short demonstration of a running copy of Netdot

- Netdot can be found at:
  - http://netdot.uoregon.edu/

Questions?

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