Network Monitoring, Management and Automation

Network Documentation

and

Netdot

npNOG 5

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

Document, Document, Document!



Documentation

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:
 - switch1, port 1, Room 29 Director's office
 - switch1, port 2, Room 43 Receptionist
 - switch1, port 3, Room 100 Classroom

o ...

- switch1, port 25, uplink to 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 (Contd.)

Maybe this process should be automatic. Tools to help automate network documentation are something to consider.

- You can write local scripts (programs) to do this.
- Consider among several automated documenation systems for networks.
- You'll probably end up using and doing both.

Documentation: Labelling

Nice...:)





Problems With Documentation

In most cases:

- Lack of clear procedures and methods
- Dispersion
- 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
- Ccentralizing 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.
- Independent of the RDBMS using abstraction (http://www.masonhq.com)
 - MySQL, Postgres, etc.
- Use of Object Relations Mapper tools (ORM)
- Minimize the number of programming languages.
 Perl and Javascript
- Low impact graphical interface.

{net.} Functionality

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 managment
 - IP and Mac address correlation

{net.} Functionality (Contd.)

- Cable plants (sites, fibre, copper, closes, 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.

Managen	nent	Со	ontacts	Cable Plant	Adv	vanced	Repo	orts	Export	Help	
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{net.} 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), redirection tables (switches)
- Topology
- Images, comments, change history

{net.} Topology

{net.} uses many sources of topological
information:

- CDP and LLDP protocols
- Analyze redirection tables
- Spanning Tree protocol
- Point-to-point networks

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

{net.} 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

{net.} Visualisation of IP Address Space

Address Space Tasks

[new] [tree] [show]

[*]: 100.68.0.0/16 : 100.68.1.0/24 [refresh] [edit] [range] [delete]																	
Child	ren	Sites	Zon	es	DHCP	Acc	ess Ri	ghts	Attrib	outes	Com	ments	Au	dit	All		
		Ac	dress	: 100	.68.1	0/24	Owner: npNOG [edit]										
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Description: Group 1 Internal-								Netmask: 255 255 0									
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{net.} IP Space: Blocks & Addresses

- 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,

npNOG5 DHCP, Radius, LDAP, etc.)

{net.} Cabling

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

{net.} Cabling (Contd.)

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

{net.} Cabling (Contd..)

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

{net.} Closet Photo



{net.} Entities

- Branch
- Customer
- Department
- Manufacturer
- Peer (BGP)
- Provider
- Vendor

{net.} 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.

{net.} 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

{net.} Inventory & Devices

Management Contacts Cable Plant Advanced Reports Export Help Devices Assets IP MAC Addresses Topology Graph Polling Stats Database Reports Device Inventory By Type Go Count Type Model Count Count Total Devices in Inventory: 4 Access Point 0 Console Server 0 Firewall 0 Hub 0 IP Phone 0 Module 0 Ceneric Net-SIMP Agent 2 Server 2 7206VXR 0 Switch 0 Unknown 0 Wireless Bridge 0	{net.} NETwork DOcum	entatio	on Too	sea 1 use	arch: [er: admin	[logout]
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{net.} Configuration Exports

Information contained within Netdot enables automatic generation of configurations for software packages.

- Monitoring devices and servces
 - Nagios, Sysmon
- Monitoring configurations
 - RANCID
- Traffic analysis
 - Cacti
- Services
 - DNS (Bind)
 - DHCP

{net.} Exporting Configuration

Recommendation:

- Netdot updates VCS (Git, Subversion, etc)
- Config mgmt system (Puppet, Chef, etc) distributes configurations, restarts services, etc.

{net.} Alternatives

- IPplan (http://iptrack.sourceforge.net/)
- NetDisco (http://netdisco.org/)
- RackTables (https://www.racktables.org/)

Documentation: Diagrams



Diagramming Software

- Windows
 - Visio: http://office.microsoft.com/en-us/visio/
 - 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
- Web based
 - Google Docs drawings
 - Gliffy: https://www.gliffy.com/
 - o draw: https://www.draw.io/

References

{net.} NETwork DOcumentation Tool https://github.com/cvicente/Netdot/

