

# USING OPEN SOURCE SOFTWARE IN DAILY ISP OPERATIONS

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# Agenda



- Introduction
- ISP Operational Background
- ISP Operational Challenges
- Open-source Solution Components
- Summary

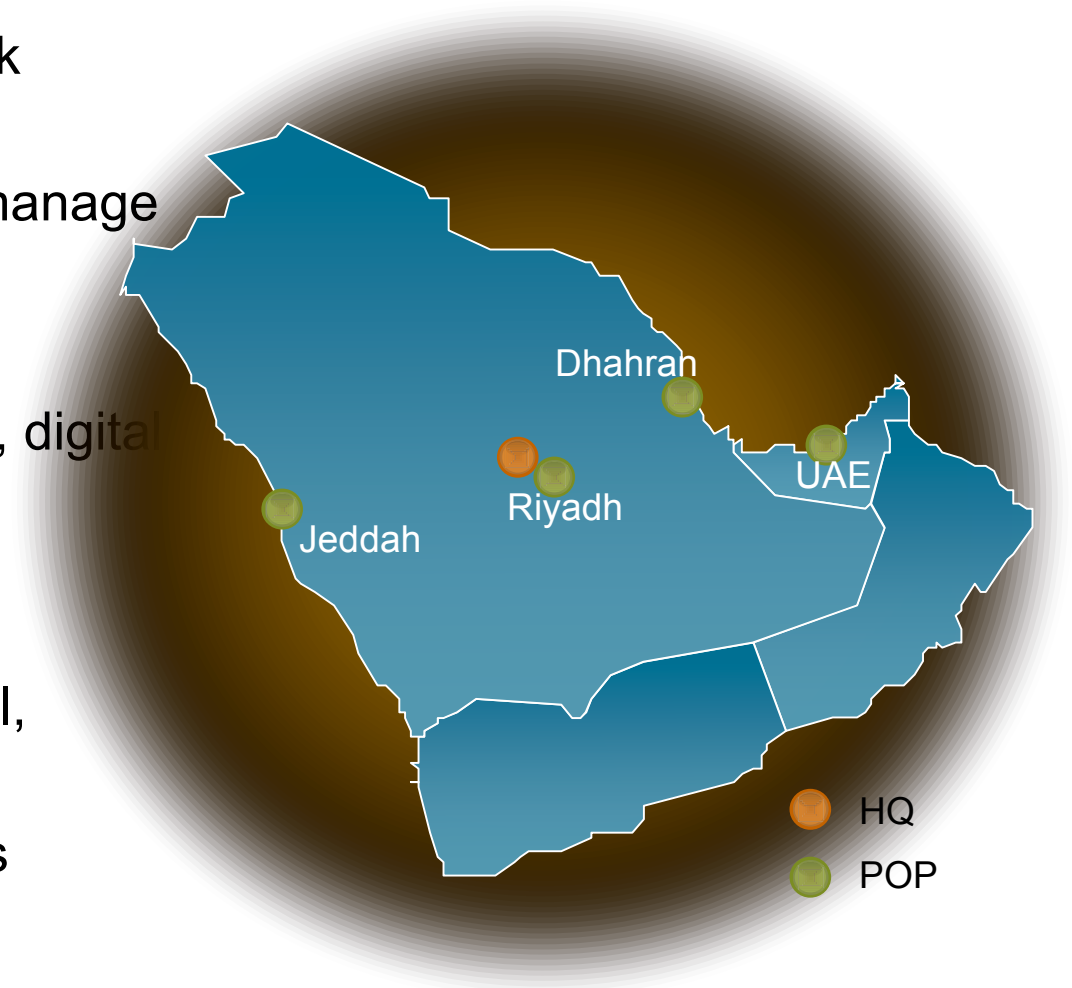
# Introduction



- This presentation reflects the various stages an ISP in Saudi Arabia went through to implement open-source software and tools for enhancing daily operations
- This includes implementing the following:
  - ▣ Network graphing tool
  - ▣ System and network monitoring
  - ▣ Customer relationship management

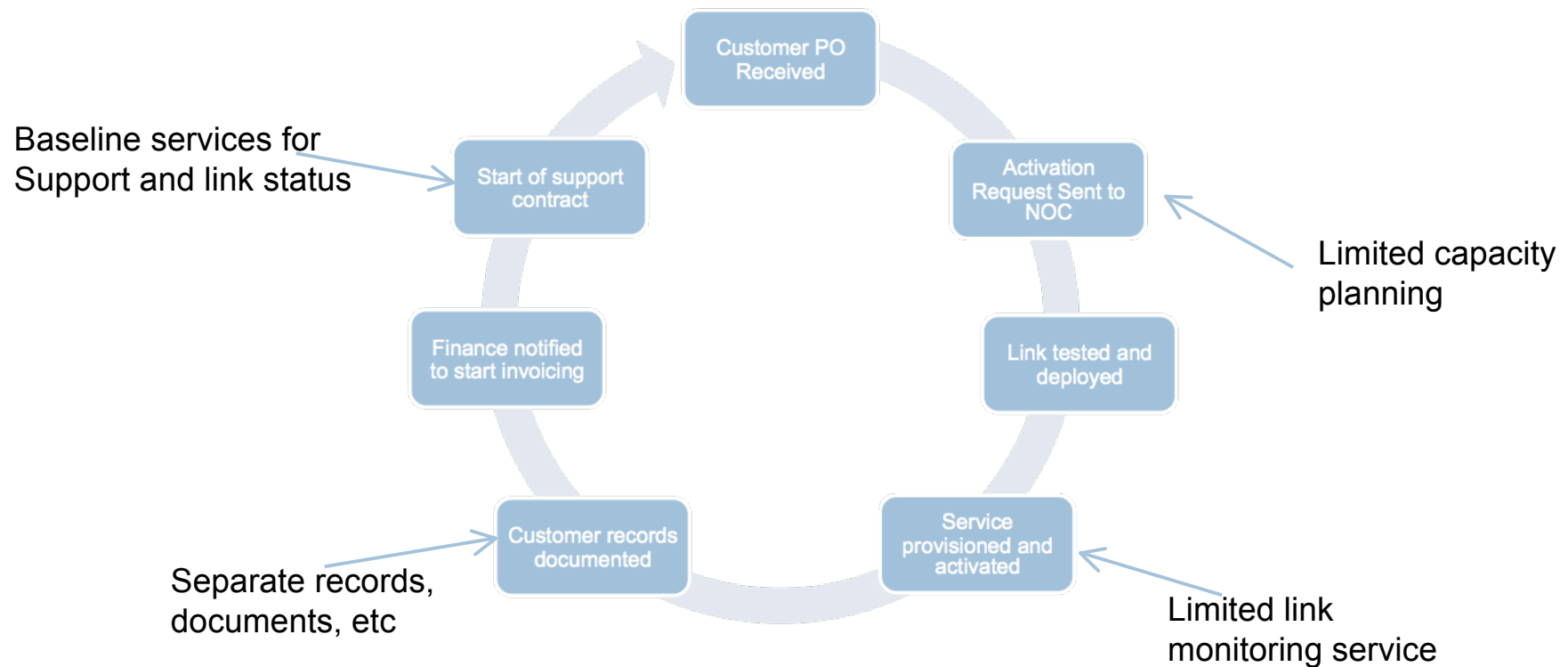
# ISP Operational Background

- 5 major POPs in the region
- ATM and IP-based network backbone
- 200+ network devices to manage
- 1000+ customer records
- Various last mile access solutions (Microwave links, digital LL, DSL, WiMax, etc.)
- A plethora of data center systems & applications to manage (web hosting, mail, DNS, LDAP, etc.)
- Multi-tiered support groups



# ISP Operational Background

- ISP operated based on the following high-level workflow for customer data/internet activation:



# ISP Operational Challenges

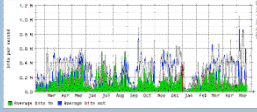
- Main challenges:
  - ▣ Limited ability to monitor system and network devices
  - ▣ Lack of monitoring, trending, historical graphs, logs, etc.
  - ▣ Little visibility into device health check
  - ▣ Lack of a central repository for customer records, such as:
    - service dates, activation requests, network diagrams and contact details
- As customer list grows, new tools for network operation & management are needed!
- *Modus Operandi* had to change from fire-fighting to planned service activation and proactive network monitoring and trending

# ISP Operational Challenges

## □ Tools used in the past:


**Network Graphing**

- MRTG
- Cricket




**Network Monitoring**

- WhatsUp
- HPOV NNM



**Customer Records**

- Excel sheets
- MS-Word docs
- MySQL DB



## □ Drawbacks:

- No roadmap
- Limited SW support
- Complex Scripting
- Bits & pieces solution

- Basic features (WUP)
- Incr. Cost for HPOV
- Infrequent updates


- Manual records
- Chaotic book keeping
- Inconsistent/seldom updated data
- No track of changes

# Proposed Solution Components

- Used alternatives:

Network Graphing

Cacti

The Cacti logo is a green, stylized saguaro cactus with two arms, set against a light blue background.


Network Monitoring

Nagios

The Nagios logo features the word "Nagios" in a bold, black, sans-serif font with a registered trademark symbol, set against a white background with a black border, all on a green background.

Customer Records

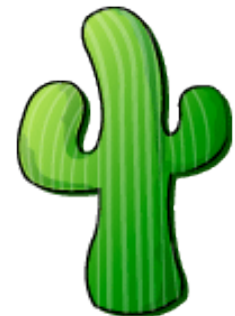
vTiger CRM

The vTiger logo consists of a purple paw print icon followed by the word "vtiger" in a white, lowercase, sans-serif font, set against a blue background.



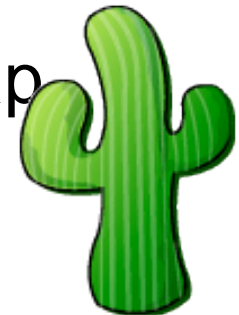
# Network Graphing: Cacti

- ❑ Open-source software for network graphing and monitoring
- ❑ Used to monitor traffic, CPU, temperature, etc. – any SNMP-based MIB
- ❑ Utilizes RRDTool for fast polling and graphing
- ❑ Runs on typical LAMP/WAMP environments
- ❑ Web-based administration, access and configuration
- ❑ Lively community support
- ❑ Multitude of network views, plug-ins, and device templates
- ❑ LDAP integration
- ❑ Site: <http://www.cacti.net>



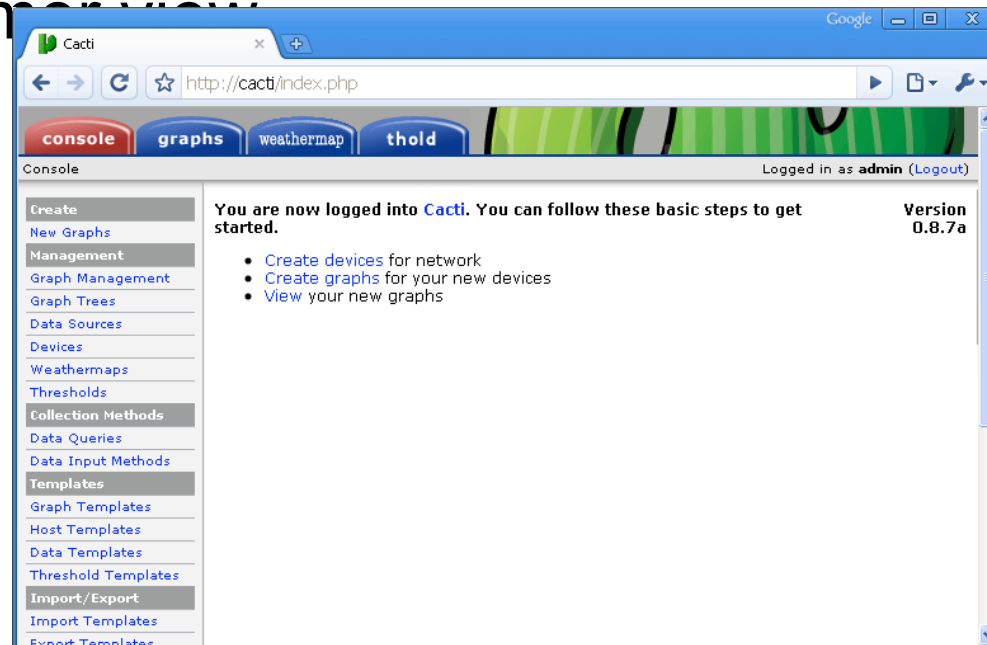
# Cacti Implementation

- Cacti was first implemented as a test server to monitor interface traffic on backbone network devices
- Installation was done first on Windows machine (using Cygwin) and moved later on to a Fedora system
- Required the installation of PHP, Apache, MySQL, Net-SNMP and RRDTool
- It was then rolled out to customers to check their link utilization
- More services were later added: weathermap, environmental threshold monitoring, syslog, LDAP integration, etc.



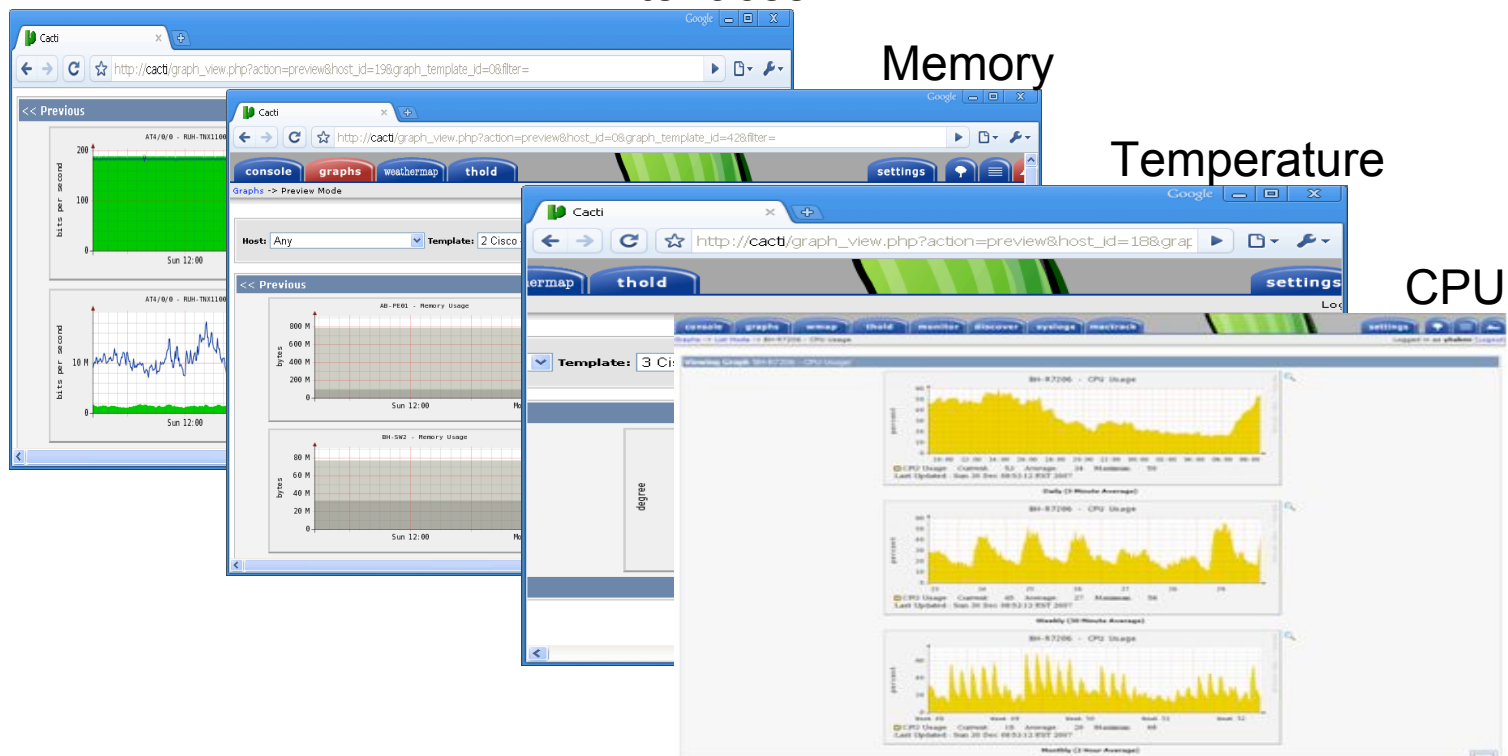
# Cacti Features

- Console view: very neat Layout:
  - ▣ Many templates available for download
  - ▣ Easily add and organize devices, discover interfaces and assign each interface to a custom view



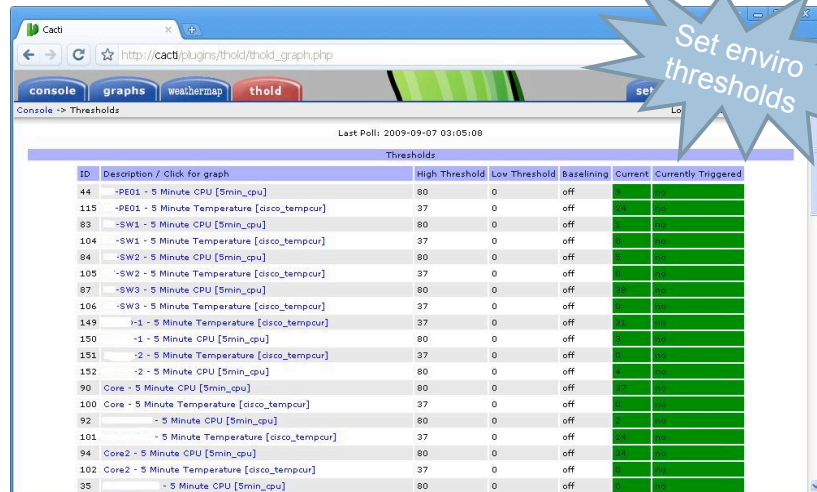
# Cacti Features

- Graphical view of collected data:
  - Interfaces, CPU, Temperature, memory, desk space, QoS policies, etc.



# Sample Cacti Integrations

## Threshold

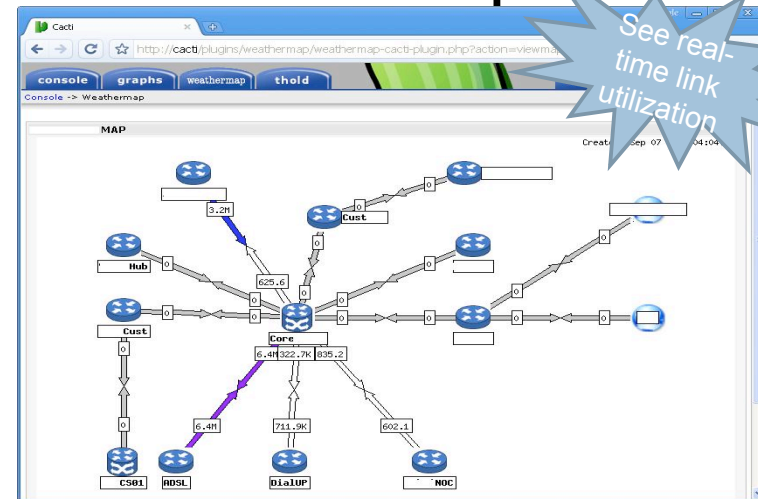


A screenshot of the Cacti web interface showing the 'Thresholds' page. The page has a navigation bar with 'console', 'graphs', 'weathermap', and 'thold' tabs. Below the navigation bar, there is a table with columns: ID, Description / Click for graph, High Threshold, Low Threshold, Baseline, Current, and Currently Triggered. The table contains 35 rows of threshold configurations for various devices like PE01, SW1, SW2, SW3, Core, and Core2, monitoring metrics such as CPU usage and temperature.

ID	Description / Click for graph	High Threshold	Low Threshold	Baseline	Current	Currently Triggered
44	-PE01 - 5 Minute CPU [5min_cpu]	80	0	off	off	
115	-PE01 - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
83	-SW1 - 5 Minute CPU [5min_cpu]	80	0	off	off	
104	-SW1 - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
84	-SW2 - 5 Minute CPU [5min_cpu]	80	0	off	off	
105	-SW2 - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
87	-SW3 - 5 Minute CPU [5min_cpu]	80	0	off	off	
106	-SW3 - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
149	-1 - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
150	-1 - 5 Minute CPU [5min_cpu]	80	0	off	off	
151	-2 - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
152	-2 - 5 Minute CPU [5min_cpu]	80	0	off	off	
90	Core - 5 Minute CPU [5min_cpu]	80	0	off	off	
100	Core - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
92	-5 Minute CPU [5min_cpu]	80	0	off	off	
101	-5 Minute Temperature [cisco_tempour]	37	0	off	off	
94	Core2 - 5 Minute CPU [5min_cpu]	80	0	off	off	
102	Core2 - 5 Minute Temperature [cisco_tempour]	37	0	off	off	
35	-5 Minute CPU [5min_cpu]	80	0	off	off	

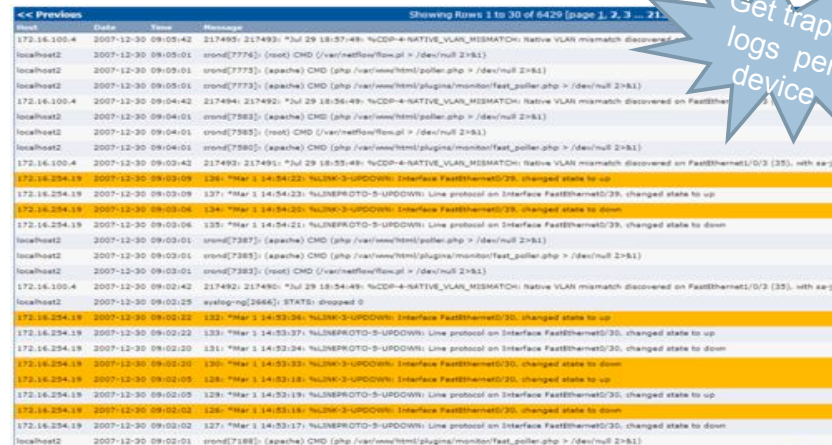
Set enviro thresholds

## Weathermap



See real-time link utilization

## Haloe Syslog



A screenshot of the Haloe Syslog page showing a list of log messages. The page has a navigation bar with '<< Previous' and 'Showing Rows 1 to 30 of 6429 (page 1, 2, 3 ... 21)'. The log messages are displayed in a table with columns: Host, Date, Time, and Message. The messages include system events like 'syslog-ng[2662]: STATE: dropped 0' and network protocol status changes like 'NLSNPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/30, changed state to up'.

Host	Date	Time	Message
172.16.100-4	2007-12-30	09:05:42	217493: 217493: *Jul 29 18:57:49: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/23 (35), with neighbor 172.16.100-4 (35).
localhost2	2007-12-30	09:05:01	syslogd[7774]: (root) CMD (/var/netflow/flow.pl > /dev/null 2>&1)
localhost2	2007-12-30	09:05:01	syslogd[7773]: (apache) CMD (php /var/www/html/plugins/monitor/fast_poller.php > /dev/null 2>&1)
172.16.100-4	2007-12-30	09:04:42	217494: 217492: *Jul 29 18:56:49: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/23 (35), with neighbor 172.16.100-4 (35).
localhost2	2007-12-30	09:04:01	syslogd[7585]: (root) CMD (/var/netflow/flow.pl > /dev/null 2>&1)
localhost2	2007-12-30	09:04:01	syslogd[7583]: (apache) CMD (php /var/www/html/plugins/monitor/fast_poller.php > /dev/null 2>&1)
172.16.100-4	2007-12-30	09:03:42	217492: 217491: *Jul 29 18:55:49: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/23 (35), with neighbor 172.16.100-4 (35).
172.16.234.19	2007-12-30	09:03:09	127: *Mar 3 14:53:29: NLSNPROTO-S-UPDOWN: Interface FastEthernet0/30, changed state to up
172.16.234.19	2007-12-30	09:03:08	128: *Mar 3 14:53:29: NLSNPROTO-S-UPDOWN: Interface FastEthernet0/30, changed state to down
172.16.234.19	2007-12-30	09:03:06	125: *Mar 3 14:54:21: NLSNPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/30, changed state to down
localhost2	2007-12-30	09:03:01	syslogd[7387]: (apache) CMD (php /var/www/html/plugins/monitor/fast_poller.php > /dev/null 2>&1)
localhost2	2007-12-30	09:03:01	syslogd[7385]: (apache) CMD (php /var/www/html/plugins/monitor/fast_poller.php > /dev/null 2>&1)
localhost2	2007-12-30	09:03:01	syslogd[7383]: (root) CMD (/var/netflow/flow.pl > /dev/null 2>&1)
172.16.100-4	2007-12-30	09:02:42	217492: 217490: *Jul 29 18:54:49: %CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/23 (35), with neighbor 172.16.100-4 (35).
localhost2	2007-12-30	09:02:29	syslog-ng[2662]: STATE: dropped 0
172.16.234.19	2007-12-30	09:02:11	122: *Mar 3 14:53:24: NLSNPROTO-S-UPDOWN: Interface FastEthernet0/30, changed state to up
172.16.234.19	2007-12-30	09:02:22	123: *Mar 3 14:53:37: NLSNPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/30, changed state to up
172.16.234.19	2007-12-30	09:02:20	121: *Mar 3 14:53:24: NLSNPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/30, changed state to down
172.16.234.19	2007-12-30	09:02:20	120: *Mar 3 14:53:33: NLSNPROTO-S-UPDOWN: Interface FastEthernet0/30, changed state to down
172.16.234.19	2007-12-30	09:02:05	128: *Mar 3 14:53:18: NLSNPROTO-S-UPDOWN: Interface FastEthernet0/30, changed state to up
172.16.234.19	2007-12-30	09:02:05	129: *Mar 3 14:53:19: NLSNPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/30, changed state to up
172.16.234.19	2007-12-30	09:02:02	124: *Mar 3 14:53:18: NLSNPROTO-S-UPDOWN: Interface FastEthernet0/30, changed state to down
172.16.234.19	2007-12-30	09:02:02	127: *Mar 3 14:53:17: NLSNPROTO-S-UPDOWN: Line protocol on Interface FastEthernet0/30, changed state to down
localhost2	2007-12-30	09:02:01	syslogd[7188]: (apache) CMD (php /var/www/html/plugins/monitor/fast_poller.php > /dev/null 2>&1)

Get traps, logs per device

## Other Notable Integrations :

- Link to SMS gateway for notifications
- Device auto-discovery
- Ntop
- MAC tracking

# Cacti Demo



- For a Live CD demo of Cacti implementation, you can try:
  - CactiEZ
  - <http://cactiez.cactiusers.org>

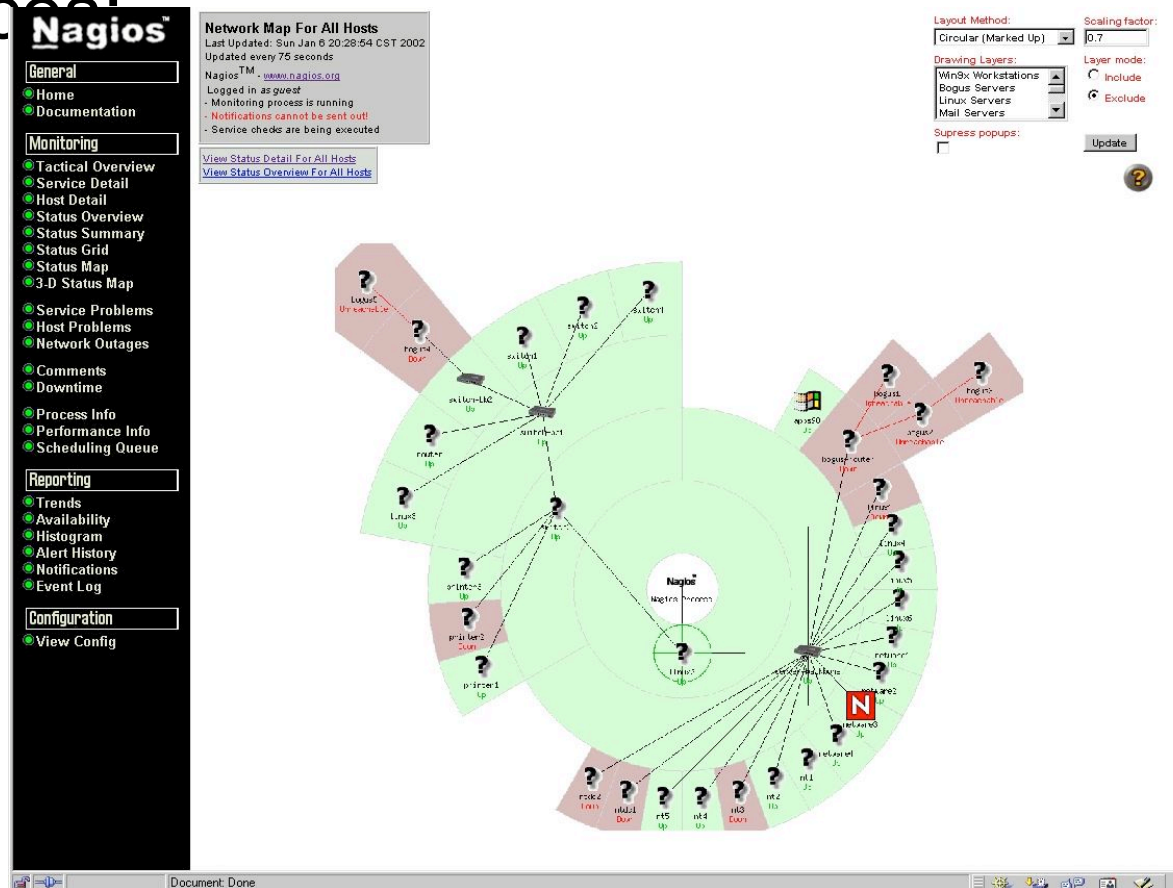
# Network Monitoring - Nagios

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- Nagios is one of the most trusted tools for gaining a high-level view on the operation of your system and network devices
- Main features:
  - ▣ Monitoring of device availability and associated services
  - ▣ Relies on an agent for probing host services
  - ▣ Provides detailed reporting and status view
  - ▣ Provides trending details
  - ▣ Ability to drill-down all the way to a certain service
- Nagios installation is a bit involved – runs on a LAMP environment

# Nagios – Map View

- Nagios provides a topology view of the devices



\*Simulated



# Nagios – Device View

- Fully customizable with a powerful backend polling tool
- Provides full details on each device
- ▣ Ability to drill down for service per device
- ▣ Notifications via e-mail and SMS

**Nagios**

**General**

- Home
- Documentation

**Monitoring**

- Tactical Overview
- Service Detail
- Host Detail
- Hostgroup Overview
- Hostgroup Summary
- Hostgroup Grid
- Servicegroup Overview
- Servicegroup Summary
- Servicegroup Grid
- Status Map
- 3-D Status Map
- Service Problems
- Host Problems
- Network Outages

**Current Network Status**  
 Last Updated: Tue Jan 22 11:33:32 EST 2008  
 Updated every 90 seconds  
 Nagios® - [www.nagios.org](http://www.nagios.org)  
 Logged in as yhakmi

[View History For all hosts](#)  
[View Notifications For All Hosts](#)  
[View Host Status Detail For All Hosts](#)

**Host Status Totals**

Up	Down	Unreachable	Pending
2	0	0	0

[All Problems](#) [All Types](#)

0	2
---	---

**Service Status Totals**

OK	Warning	Unknown	Critical	Pending
6	0	0	0	0

[All Problems](#) [All Types](#)

0	6
---	---

**Service Status Details For All Hosts**

Host	Service	Status	Last Check	Duration	Attempt	Status Information
<a href="#">VSAT-Hub</a>	<a href="#">PING</a>	OK	01-14-2008 00:58:04	8d 22h 30m 28s	1/4	PING OK - Packet loss = 0%, RTA = 5.34 ms
<a href="#">localhost</a>	<a href="#">Current Load</a>	OK	01-22-2008 11:31:38	0d 10h 26m 54s	1/4	OK - load average: 0.99, 0.91, 0.89
	<a href="#">Current Users</a>	OK	01-22-2008 11:30:18	46d 10h 29m 3s	1/4	USERS OK - 0 users currently logged in
	<a href="#">PING</a>	OK	12-27-2007 00:55:49	85d 11h 27m 44s	1/4	PING OK - Packet loss = 0%, RTA = 0.12 ms
	<a href="#">Root Partition</a>	OK	01-22-2008 11:30:18	40d 10h 28m 48s	1/4	DISK OK - free space: / 14337 MB (80%):
	<a href="#">Total Processes</a>	OK	01-22-2008 11:30:19	320d 11h 29m 57s	1/4	PROCS OK: 70 processes

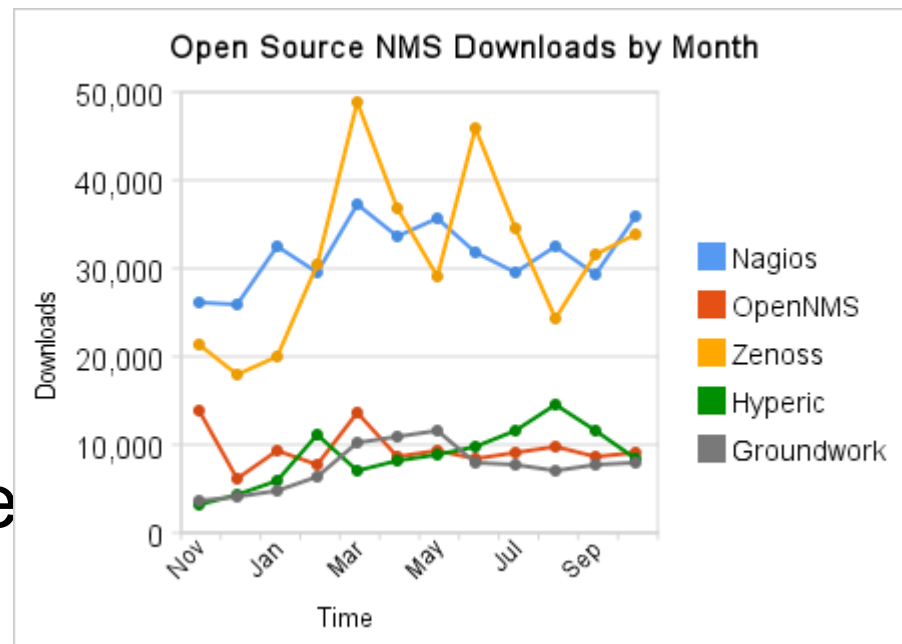
# Nagios Utilization



- Nagios is now used to monitor backbone network devices and plotted on the map view
- Certain servers with running services are also polled from Nagios for availability
- Reporting is introduced to draft histograms of trends and provide a list of critical notifications
- Right now, device settings are stored in a single text file (plan to introduce hierarchy for better scalability)

# Nagios - Comparisons

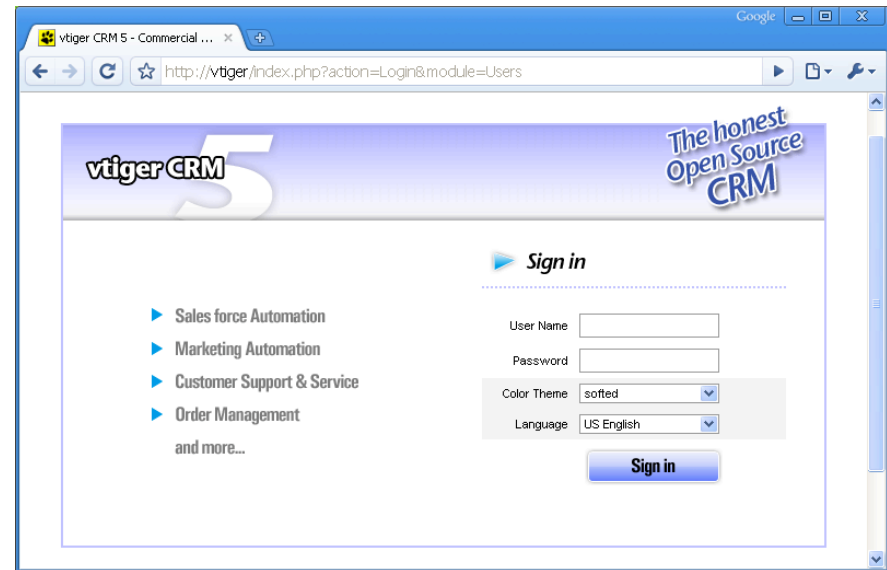
- Nagios is one of many other solutions in the market
- Most notable NMS packages:
  - Zenoss
  - OpenNMS
  - Hyperic
  - GroundWork
- Very robust apps
- Right software is the one that better fits your requirements



Source: openxtra.co.uk (2007)

# Customer Relationship Management

- vTiger is an open-source CRM (<http://vtiger.com>)
- A fork of SugarCRM
- Runs on a typical LAMP/WAMP environment
- For ISP ops, vTiger provides these features:
  - Customer and link



- Activities logs
- Change history

# vTiger Benefits



- Central repository for storing customer details
- Customer proposals and contact information from sales is inserted into the system
- Network operation team then utilized this data to initiate deployment cycle
- Once link is activated, network drawings, link details and service start/end dates are populated
- Integrated with LDAP; all record changes are logged

# vTiger Interface

Account Name  
et number

## Account details:

- Contact info
- Creation date
- Account type

## Customer info:

- Full account name
- Provided services
- Circuit name and details
- Service start and end dates

The screenshot shows the vTiger Accounts module interface. The browser address bar displays the URL: `http://vtiger/index.php?action=DetailView&module=Accounts&record=126&activity_mode=Events&viewname=0&parentt...`

The main content area is titled "[ 126 ] - Account Information" and includes a sub-section "Account Information" with buttons for "Edit", "Send Mail", "Duplicate", and "Delete".

The "Account Information" table contains the following data:

Account Information			
Account Name	[REDACTED]	Phone	
Website	[REDACTED]	Fax	
Other Phone		Member Of	
Email		Other Email	
Type	Customer	Email Opt Out	no
Assigned To User	admin	Created Time	15-12-2005 16:58:58
Modified Time	29-10-2008 09:05:34		

The "Custom Information" table contains the following data:

Custom Information			
Full Account Name	[REDACTED] Hospital	Account Details	
Account Number		STC Circuit Number	
Bandwidth	1.0 Mbps	Bandwidth Details	1+1 Mbps vci #: 400, #2: 356
Connection Type	Frame Relay	Connection Details	2x 1Mbps STC FR link + 2Mbps VSAT (128kbps VSAT download)
Internet Service	yes	Video Conferencing	yes
Systems Solutions	yes	VPN	no
Other Services 1		Other Services 2	
Transition IPs	172.16.200.100	Additional IPs	
Start of Service	13-02-2006	End of Service	13-02-2006
Interface	Customer Router 2: ATM1.0.356	Router	ATM2.0.400

On the right side, there is an "Actions" section with "Add Event" and "Add To Do" buttons, and a "TAG CLOUD" widget with a "Tag it" button.

# vTiger Interface

## Customer Contacts

- Can be imported or exported

## Account History

- Trouble tickets
- Activities that took place
- Attachments: network diagram

The screenshot displays the vTiger interface for account management. It features several sections: 'Contacts' with a table of customer information, 'Activities' showing no included items, 'Trouble Tickets' with a table of open and closed tickets, and 'Attachments' showing a network diagram attachment. The interface includes navigation buttons like 'Add Contact', 'Add Ticket', 'Add Note', and 'Add Attachment'.

Last Name	First Name	Title	Account Name	Email	Office Phone	Assigned To	Action
Afdhal	Afdhal	IT				admin	edit   del
Alvan	Alvan	IT Staff			2982	admin	edit   del

Ticket ID	Subject	Related To	Status	Priority	Assigned To	Action
344	Cannot use Mubasher Stock Market tool	Afdhal Afdhal	Closed	Low		edit   del
663	Cannot connect to ADSL line		Closed	Normal	admin	edit   del

Created	Title	Description	Attachments	Type	Action
16-10-2007	[VPN]	VPN	DSL-VPN.vsd	Attachments	del

# vTiger Demo



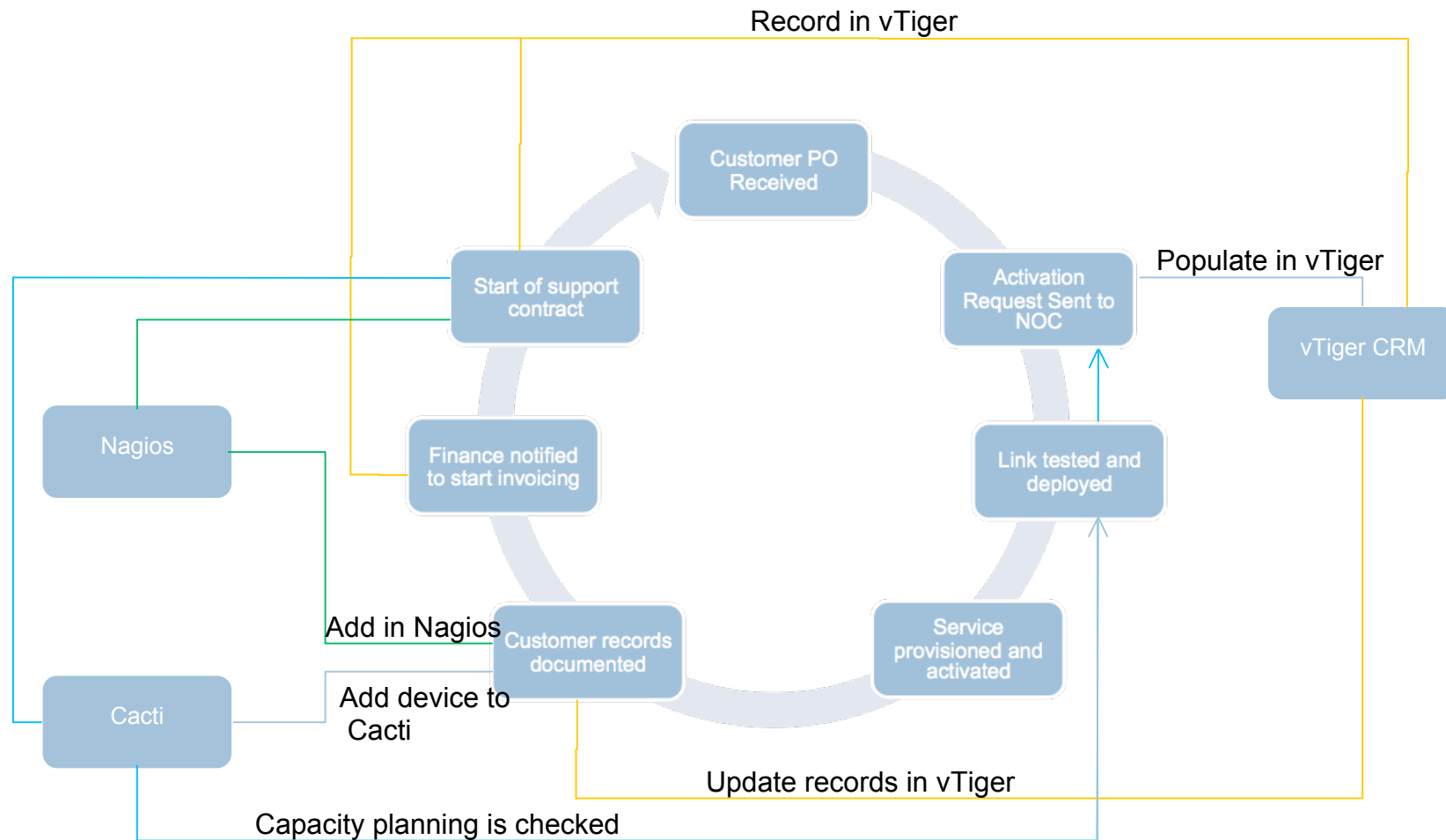
- Windows and Linux-based bundles are available online at [www.vtiger.com](http://www.vtiger.com):
- Live Demo of vTiger 5.0 (2-minute tour):

[CLICK HERE](#)



# Summary

## □ Workflow re-visited:



# Summary



- Conclusion
  - ▣ With Cacti, Nagios and vTiger, the ISP daily operation was streamlined
  - ▣ Provided complete visibility into the network
  - ▣ Shortened the troubleshooting time as information became readily available
  - ▣ Comprehensive monitoring of network utilization and environmental variables for devices
- Take away message:
  - ▣ Open-source software is robust, scalable and business-ready today

# Questions

- Questions, comments or suggestions?

