OpenNMS

A platform for managing next generation services

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  — Community
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- **OpenNMS Futures**
  — Newts NoSQL data store
  — Distributed Architecture

A Great Application…

- **OpenNMS**

  — Open Network Management System

  — OpenNMS is the world's
    - First Enterprise and Carrier Grade
      - Network and Infrastructure Management Platform
        - Developed under the Open Source Model.

- **Technology**
  — Written in Java
  — Packaged for
    - Windows, Linux and most Unix distributions
  — Proven resilience and scalability

- **Websites**
  — www.opennms.org
  — http://sourceforge.net/projects/opennms/
  — https://github.com/OpenNMS/

... Made by a great community

- **User community**
  - The active user community is probably around 10,000 people.
  - Support customers; 100+ globally

- **Developer Community**
  - We have 40+ developers with commit access

- **Assets**
  - Licence GPL
  - The IPR is owned by The OpenNMS Group, Inc.
  - OpenNMS Trademark owned by The OpenNMS Group

- **Governance**
  - The community is managed by The Order of the Green Polo. All active OGP members have a vote on the direction of the project.

- **Foundation**
  - The independent OpenNMS Europe Foundation has been created to represent the interests of the user community and run the user conferences
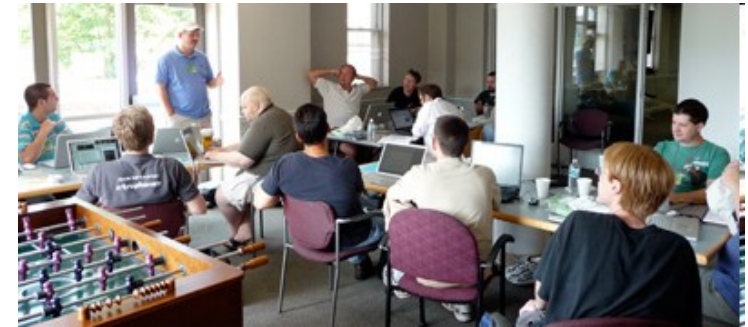
DEV-JAM Atlanta July 2008
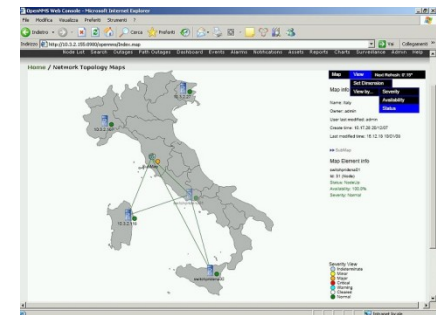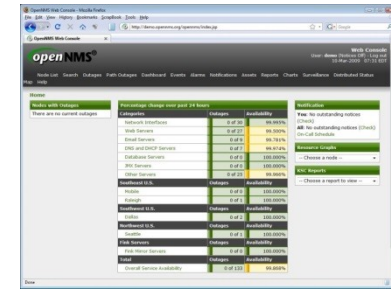

DEV-JAM Minneapolis June 2013

DEV-JAM Minneapolis June 2014

Capability Overview

OpenNMS Release 14

(Released Q3 2014)

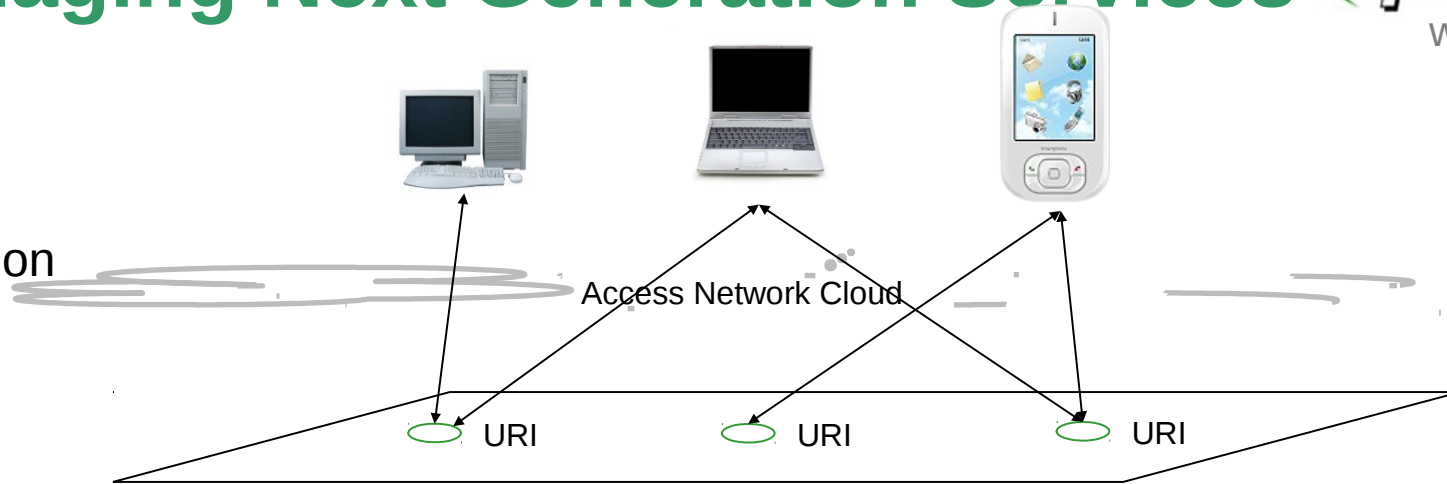# Managing Next Generation Services

Application Space
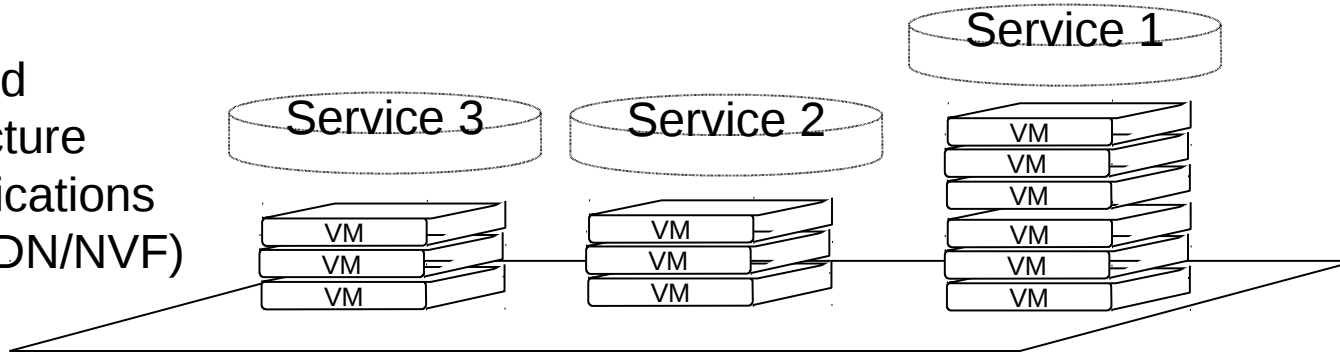
Access Network Cloud

URI   URI   URI

End user Services (Apps) are a mash-up of web services accessed through standard and proprietary protocols;
- HTTP, REST, SOAP, JSON, RSS,
- **Open Data / RDF etc.**
- **'Internet of things'**

Virtualised Infrastructure And applications (Cloud/SDN/NVF)

Service 1

Service 3   Service 2

VM
VM
VM

VM   VM   VM
VM   VM   VM
VM   VM   VM

Services hosted in 'Cloud' designed to scale through addition of VM resources

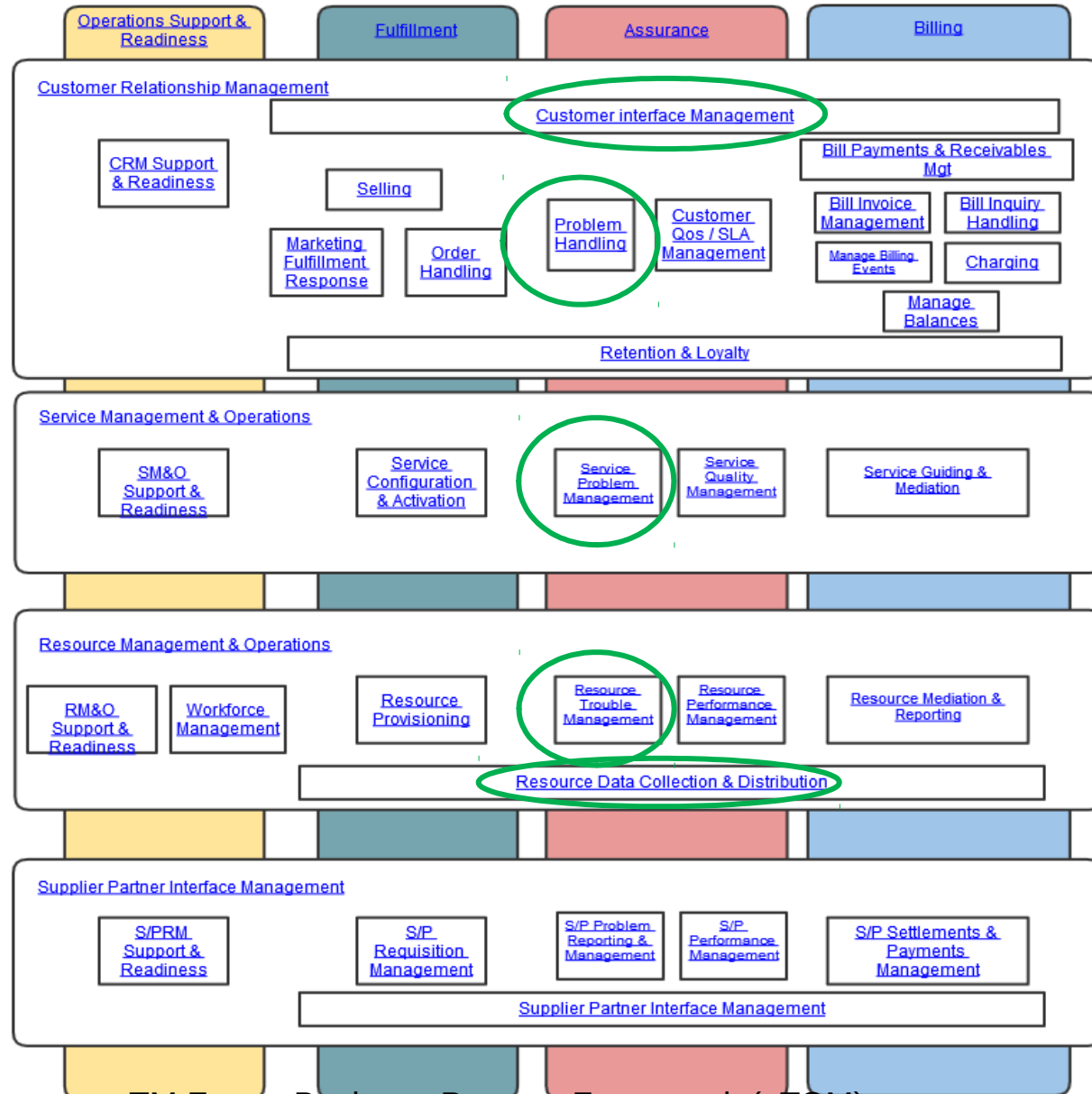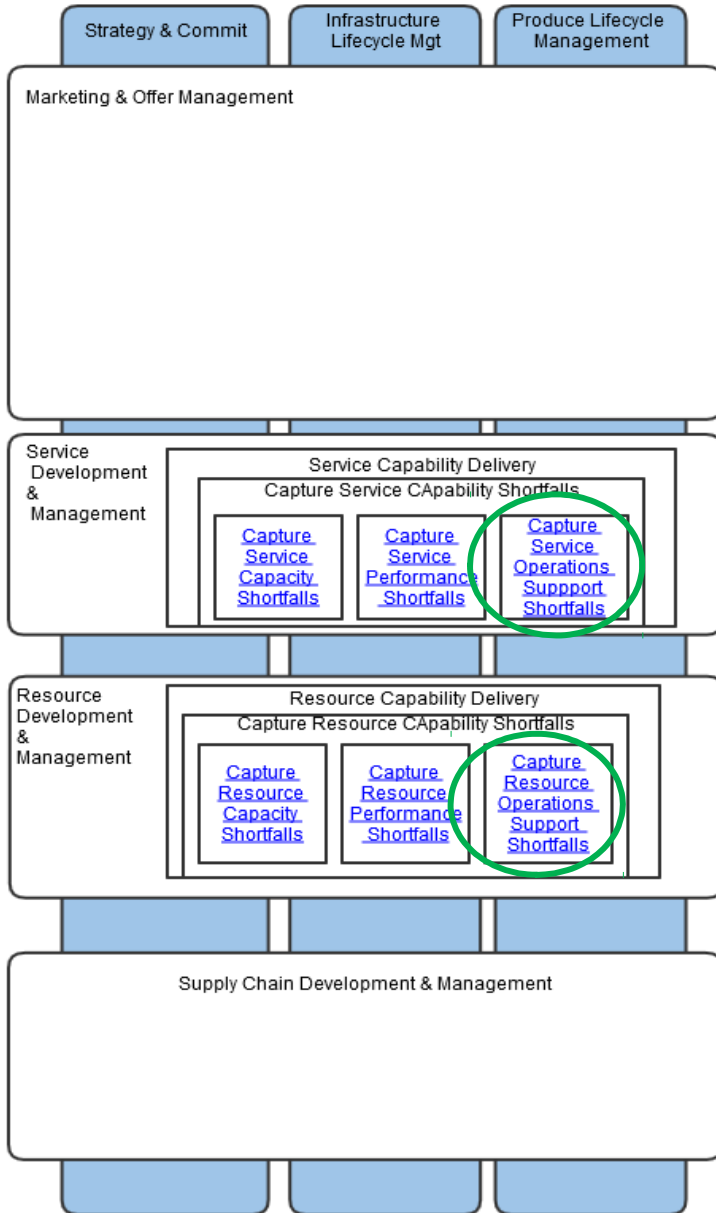**'cloud bursting'**
'cloud brokering'
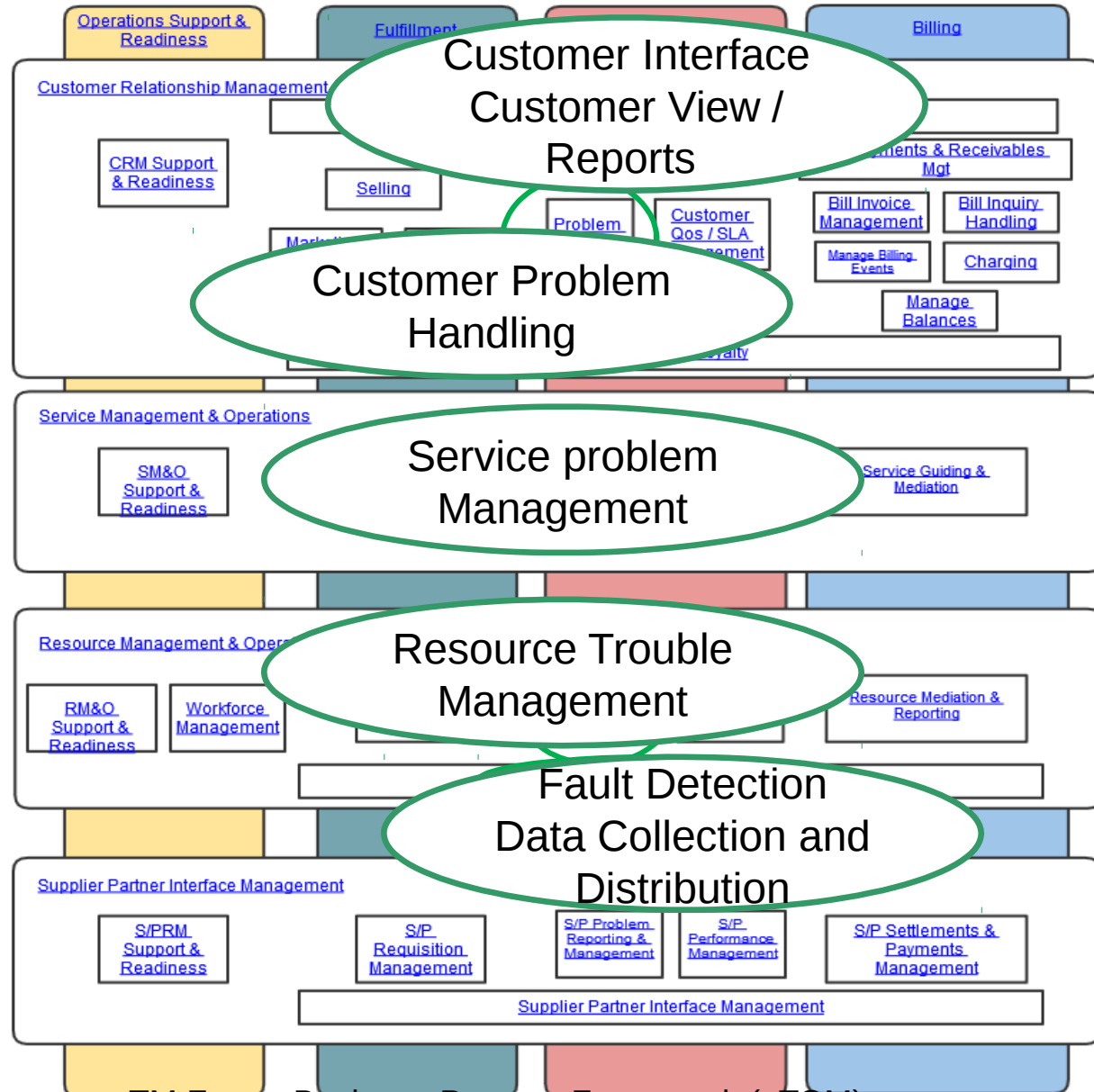
Physical Infrastructure

Underlying physical infrastructure
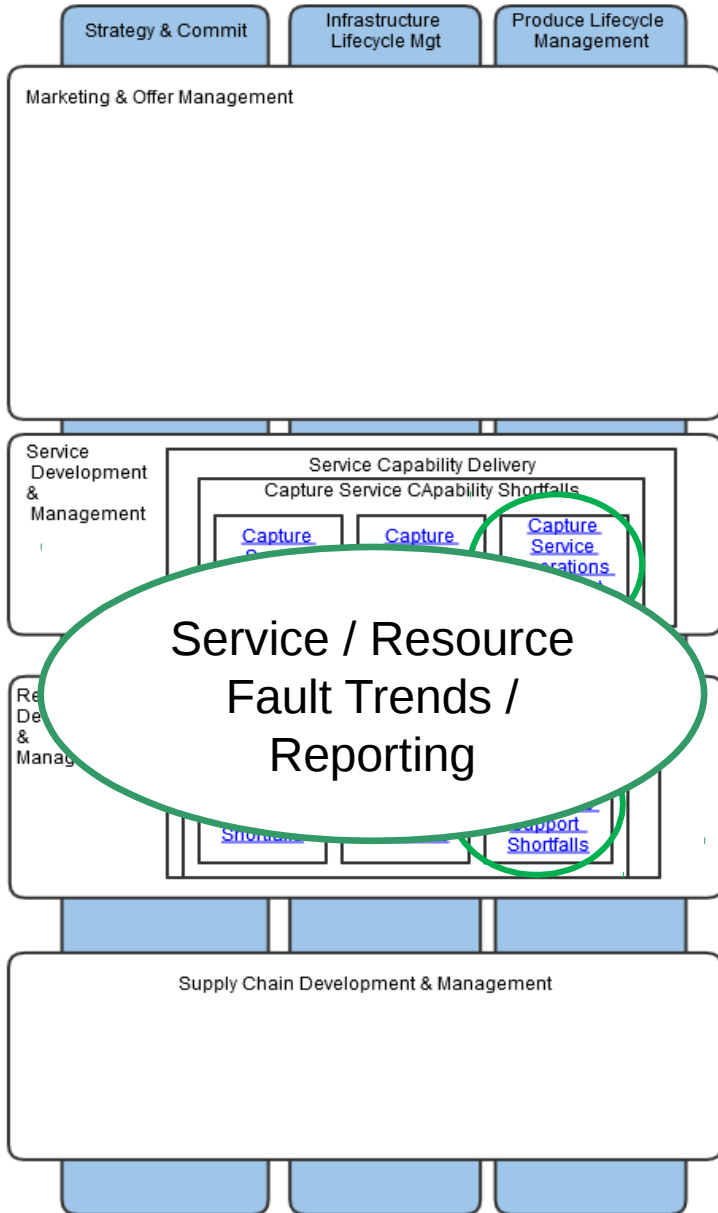- Commodity hardware
- Geographical Diversity
- Rapid Churn
- Network Connectivity

Core Network Cloud

OpenNMS Problem Handling touch points

openNMS UK

TM Forum Business Process Framework (eTOM)

OpenNMS Problem Handling touch points

TM Forum Business Process Framework (eTOM)

OpenNMS Performance touch points

openNMS UK

TM Forum Business Process Framework (eTOM)
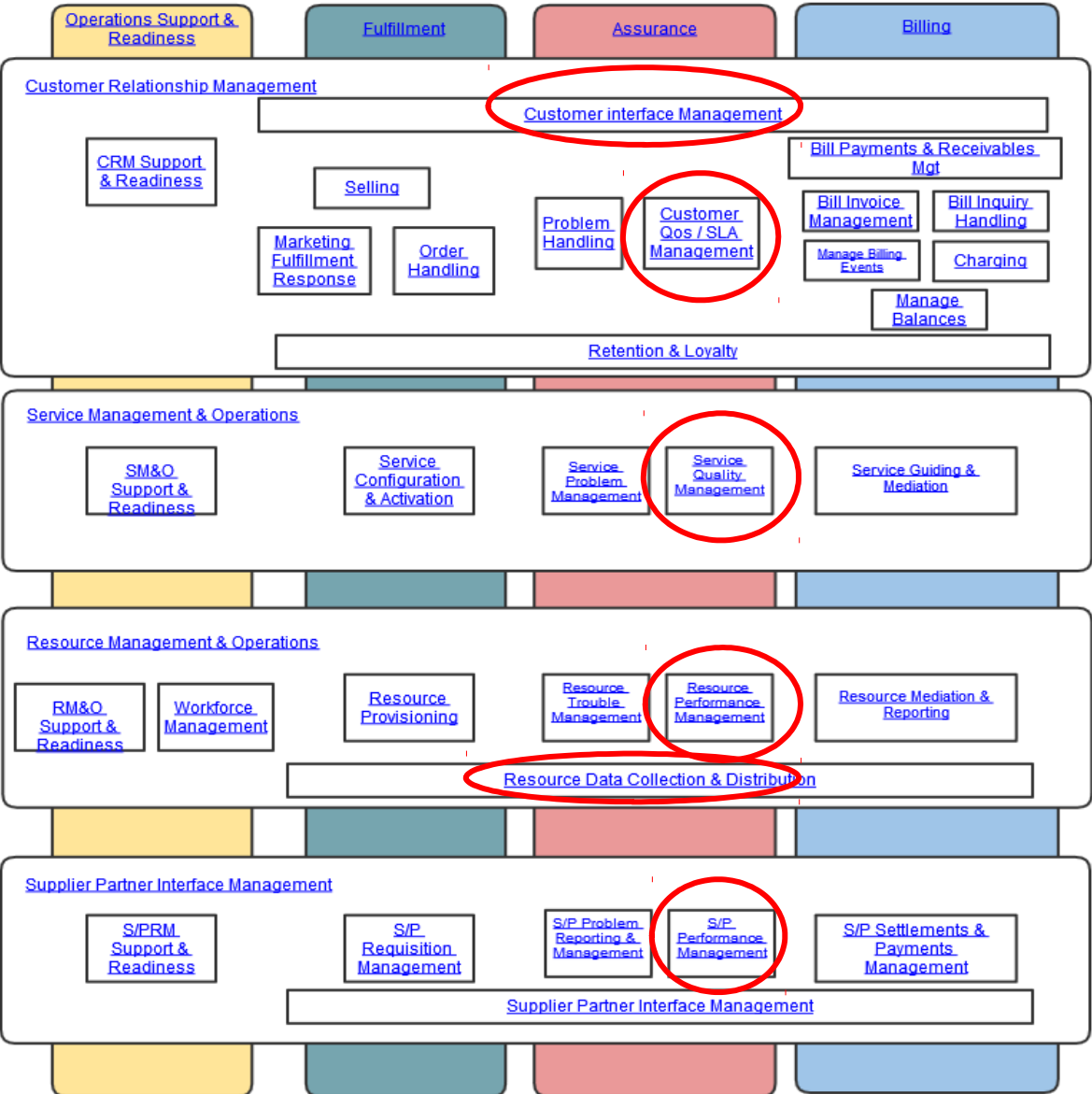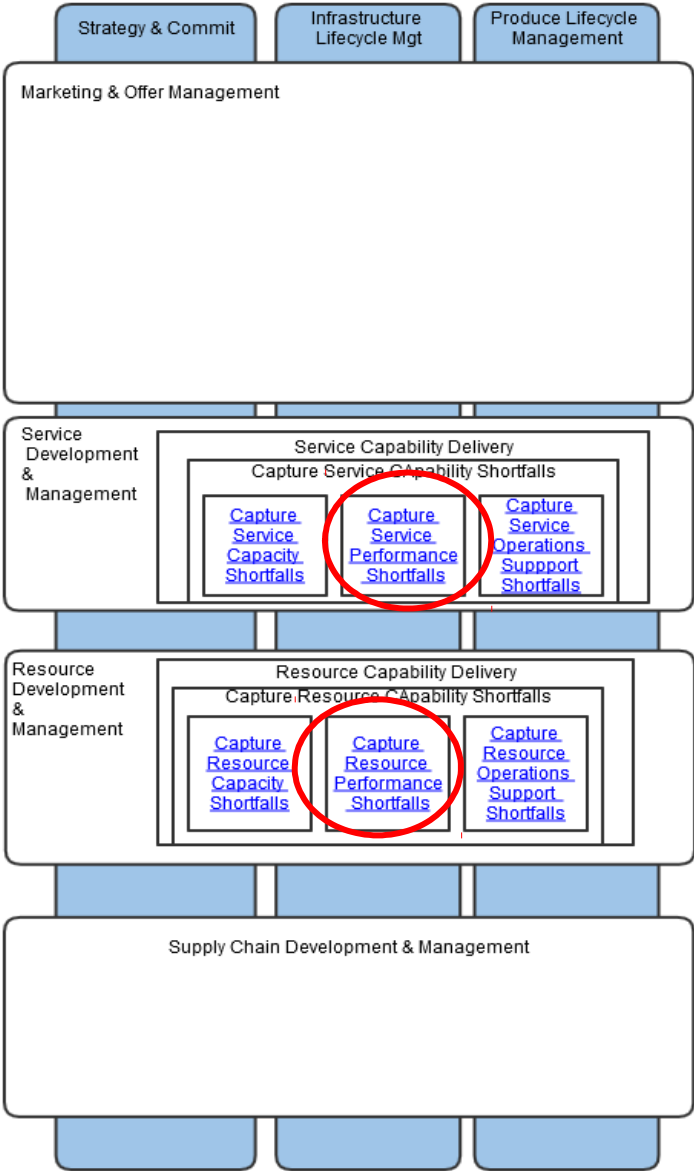
OpenNMS Performance touch points
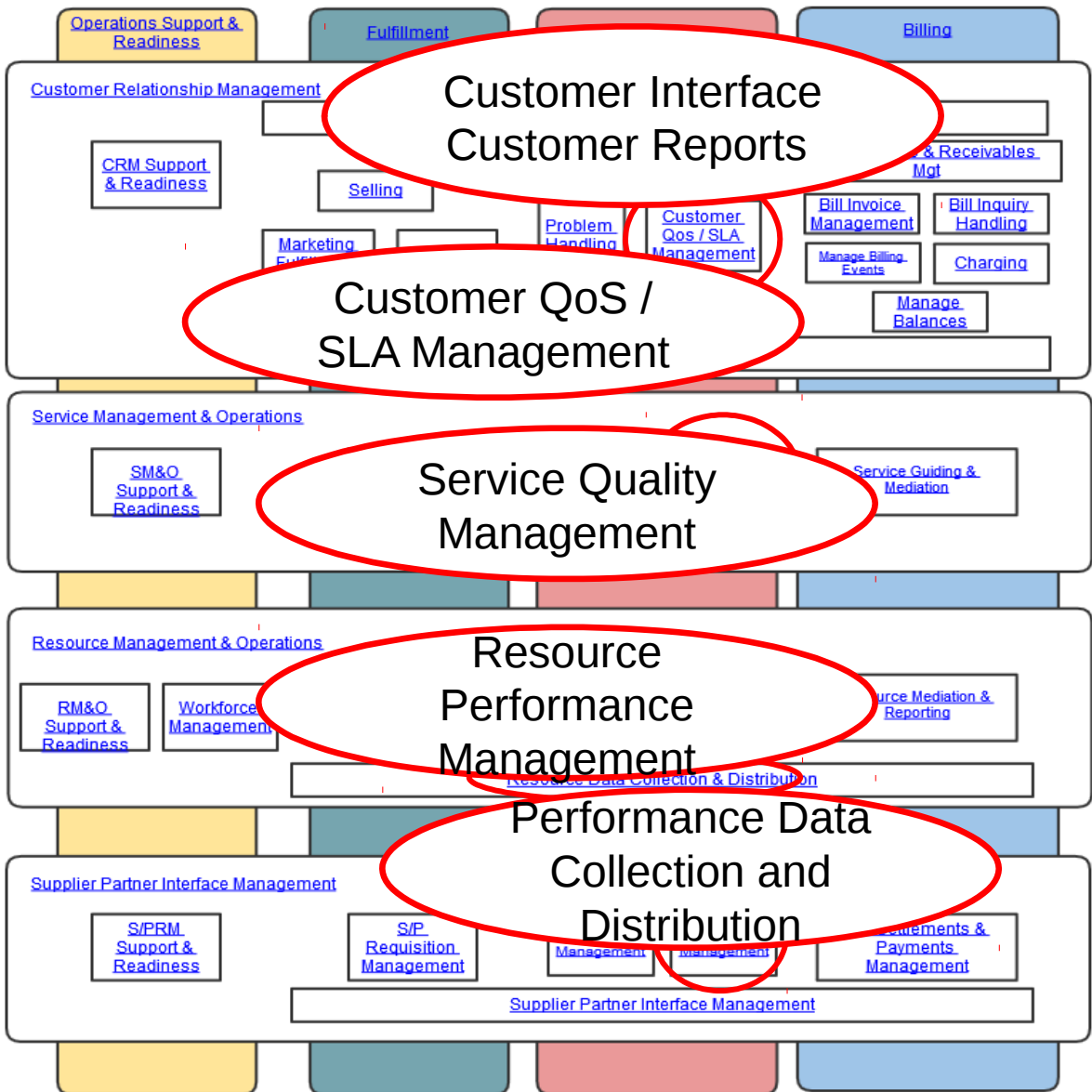
TM Forum Business Process Framework (eTOM)

Resource Data Collection at All Layers
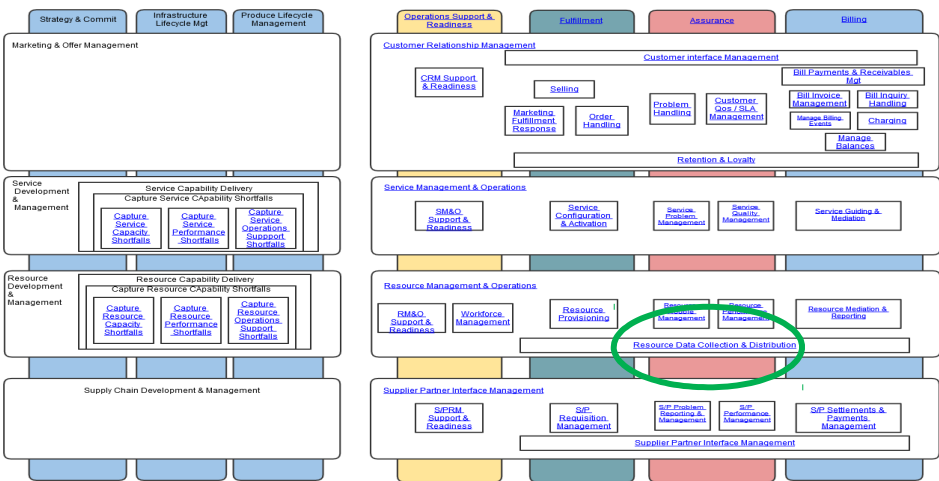
- **Remote Pollers**
  - Remotely monitor services from multiple locations
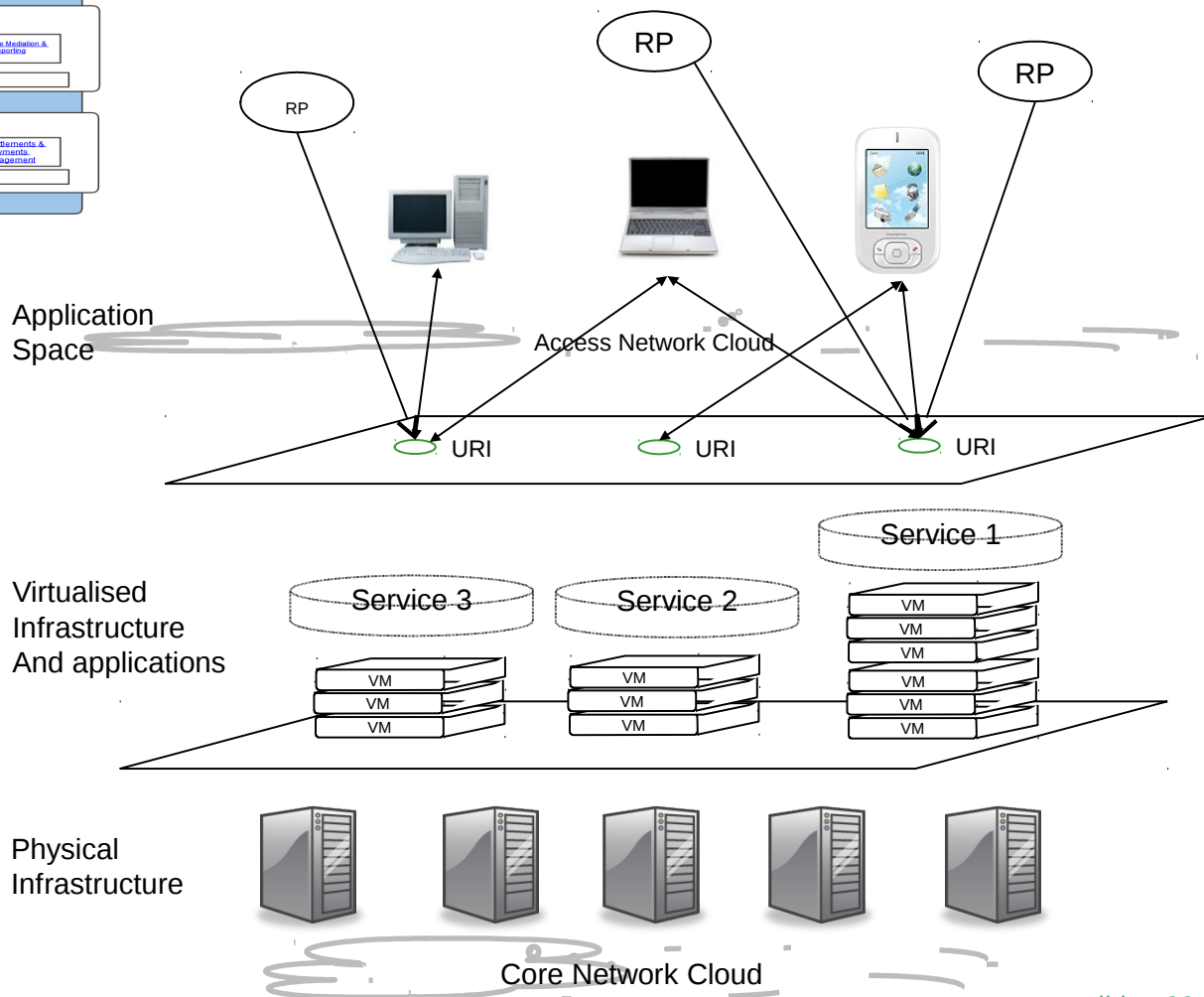
- **Synthetic Transactions / Data Collection**
  - ICMP / HTTP / HTTPS
  - ReST / WS / XML
  - DHCP / DNS / FTP / LDAP Radius
  - IMAP / POP3 /SMTP / NTP
  - JDBC / JSR160 (JMX) / WMS / WBEM
  - NSClient (Nagios Agent) / NRPE (Nagios Remote Plugin Executor)
  - SMB / Citrix
  - SNMP / SSH TCP

- **Virtualisation**
  - VMware integration
  - Open Stack (being developed)

- **Service & Network discovery**
  - VMware integration
  - Policy driven Layer 2 network discovery

Proven Scalability

- Nearly 60,000 Devices on a Single Instance (Swisscom)

- 1.2 Million Data Points Every Five Minutes (New Edge)

- 32,000 Interfaces per Device (Wind)

- 2000 events/sec (SRNS)

- 3000 Remote Monitors (Papa Johns)

Presentation supports Service Provider Business Processes
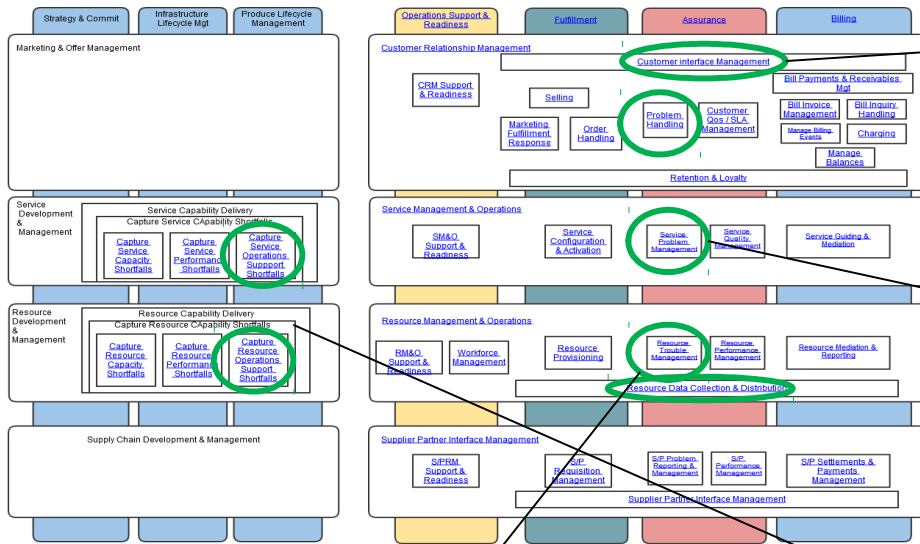
- **Customer view**
  - Customer specific dashboards / Wallboards

- **Service / Resource Problem management**

- **Event Collection**
  - OpenNMS can record all event occurrences

- **Alarm Correlation**
  - Data base automations
  - Jboss Rules correlation engine for more sophisticated down stream alarm suppressing.

- **User Notifications and scheduled escalation**
  - Notification escalation mechanism between users.

- **Trouble ticket integration**
  - RT and OTRS, Remedy, Jira etc.

- **Business Inte...**
  - Operations ...
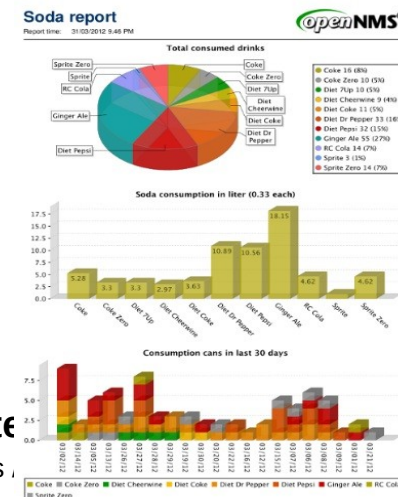
Current OpenNMS Performance Mgt

- **Polled Data collection**
  - — Multiple sources
  - — Regular collection
  - — Low cost and highly scalable

- **Threshold Alerting**
  - — Binary thresholds
  - — How do we track over time
  - — How do we predict problems

- **Reports - Jasper**
  - — Some calculation capability
  - — Primarily works with database but can use RRD data sources

- **New**
  - — Near Real Time Graphing

- **Future - Newts**
  - — Performance RRD's moving to Cassandra
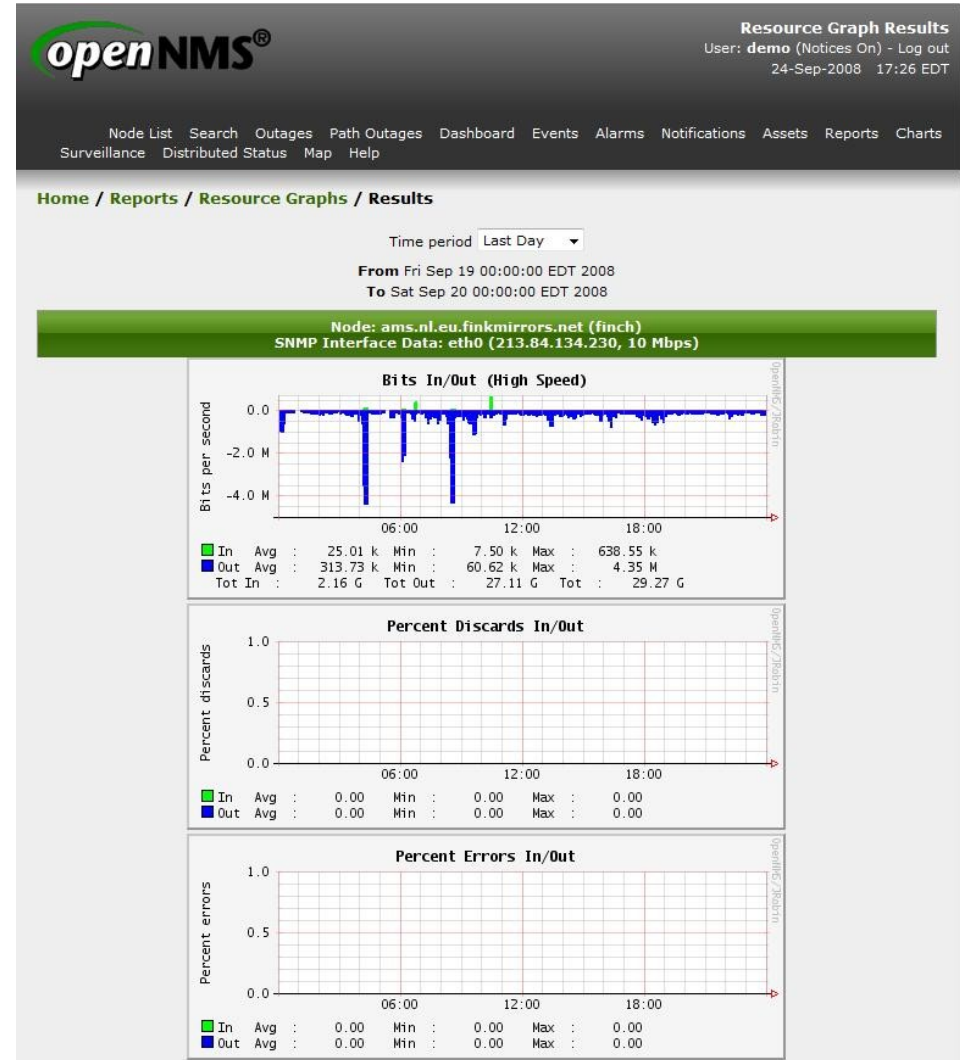
New User Dash / Wall Board (Release 1.13+)

openNMS UK
www.opennms.co.uk

Customised User Dashboard display

Rotating Wallboard display

(Boost priority for
unacknowledged problems)

New Maps & Topology (Release 1.12+)
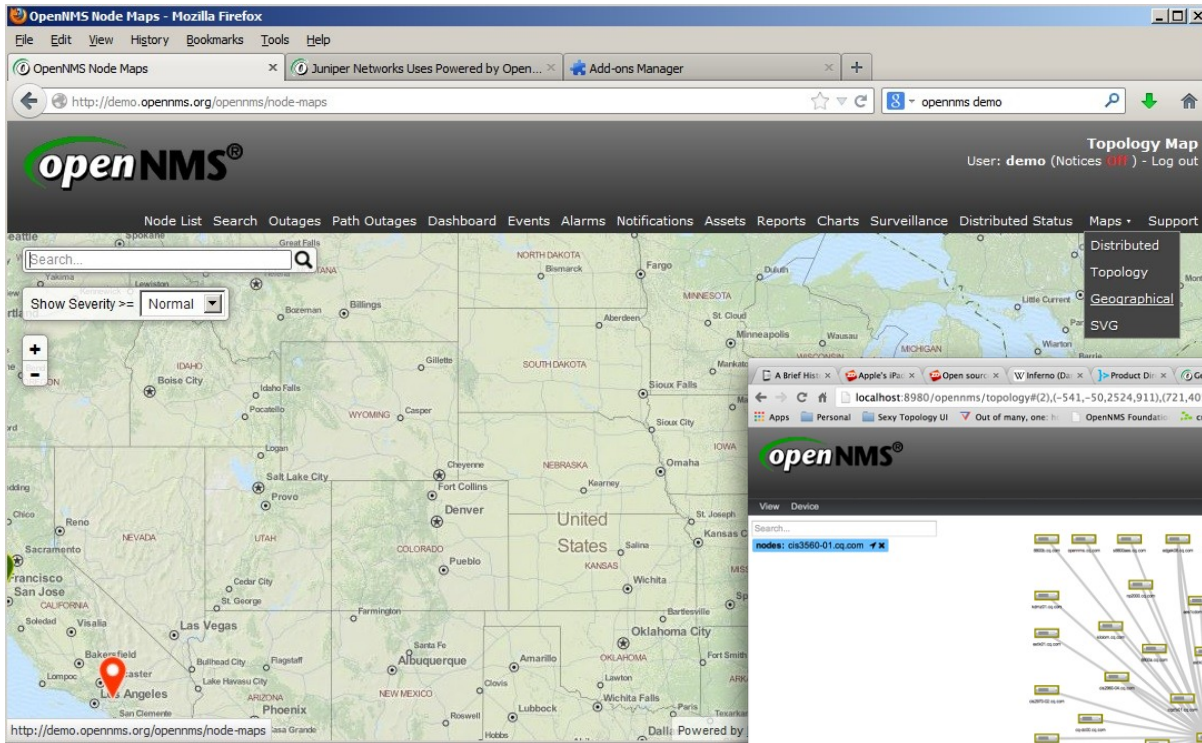
- **Geographical node map (using Google maps or Open Streetmap)**
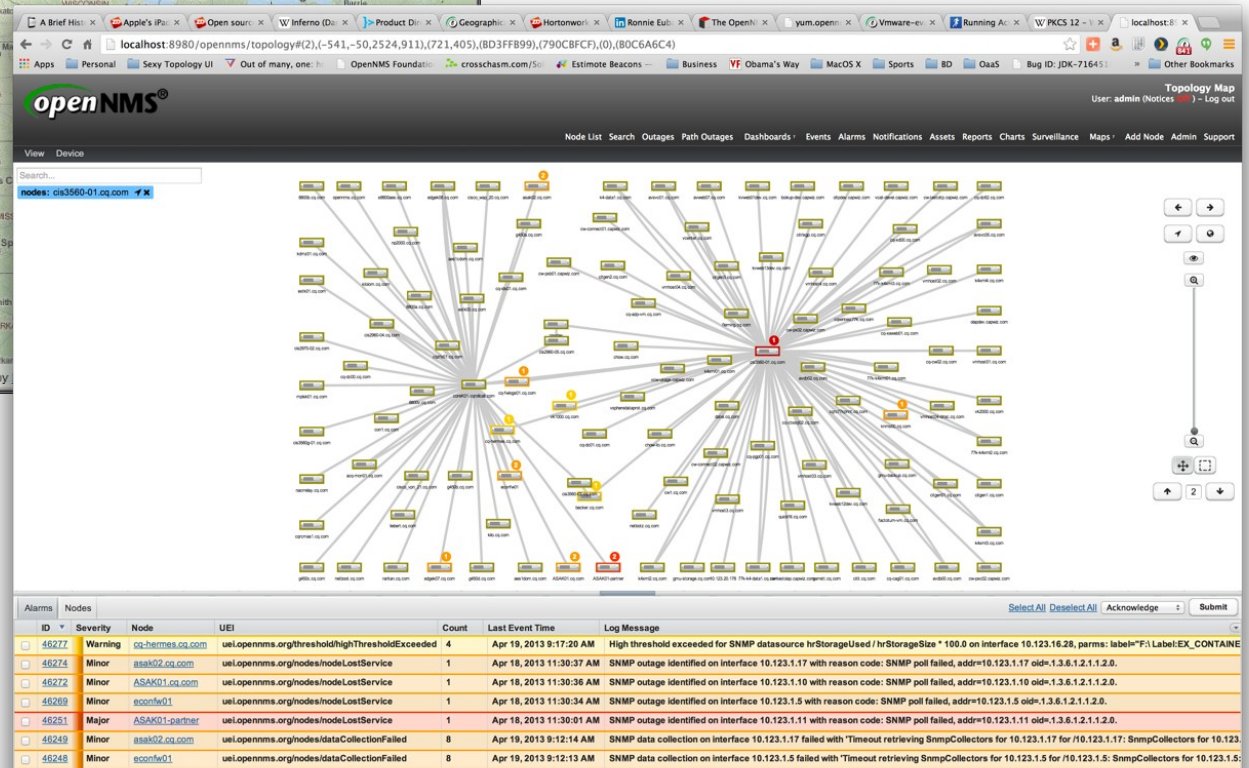
- **STUI Semantic Topology UI**
- **Allows users to semantically navigate between related nodes to diagnose problems**
- **Node relations are automatically discovered**

Wide community of commercial users

- Papa Johns Pizza http://www.papajohns.com/
- Minnesota Children's Hospital http://www.childrensmn.org/
- Oregon State University http://oregonstate.edu
- Permanente Medical Group www.permanente.net
- Myspace www.myspace.com
- Ocado www.ocado.com
- FreshDirect http://www.freshdirect.com
- Fox TV (Australia) http://www.foxtel.com.au
- BBC Monitoring www.monitor.bbc.co.uk
- FastSearch http://www.fastsearch.com/
- New Edge Networks http://www.newedgenetworks.com/
- Rackspace http://www.rackspace.com
- Swisscom Eurospot http://www.swisscom-eurospot.com
- Wind Telecomunicazioni SpA (Italy) http://www.wind.it
- BT www.bt.co.uk
- Zen Internet http://www.zen.co.uk//
- Arqiva http://www.arqiva.com/
- Airspeed http://airspeed.ie/

- And many more - 4000 downloads per week

Use Case One

OpenNMS at
AirSpeed Telecom

Dónal Cunningham, AirSpeed Telecom

dcunningham@airspeed.ie

- **AirSpeed runs the largest licensed wireless network in Ireland outside the mobile operators.**

- **Diverse and demanding customer requirements**
  - 24x7x365 proactive monitoring of customers networks.
  - best in class SLAs
  - High performance connections
  - Guaranteed availabilities to 99.999%
  - true diversity for back up solutions

Managed Technology

- **Network**
  - Wireless point to point /multipoint
  - MPLS
  - Leased Line
  - Diversity / Back Up Network
  - Business Broadband
  - High Speed Internet
- **Wholesale Services**
  - Ethernet Private Line
  - Ethernet Virtual Private Line
  - E1 / E3 / DS3 Pseudo-wire services
  - Wholesale Voice
  - Wholesale MSSP
  - Wholesale Internet
- **Voice and Collaboration**
  - SIP Voice
  - Webcasting
  - International Peering
- **Security**
  - Managed Firewall
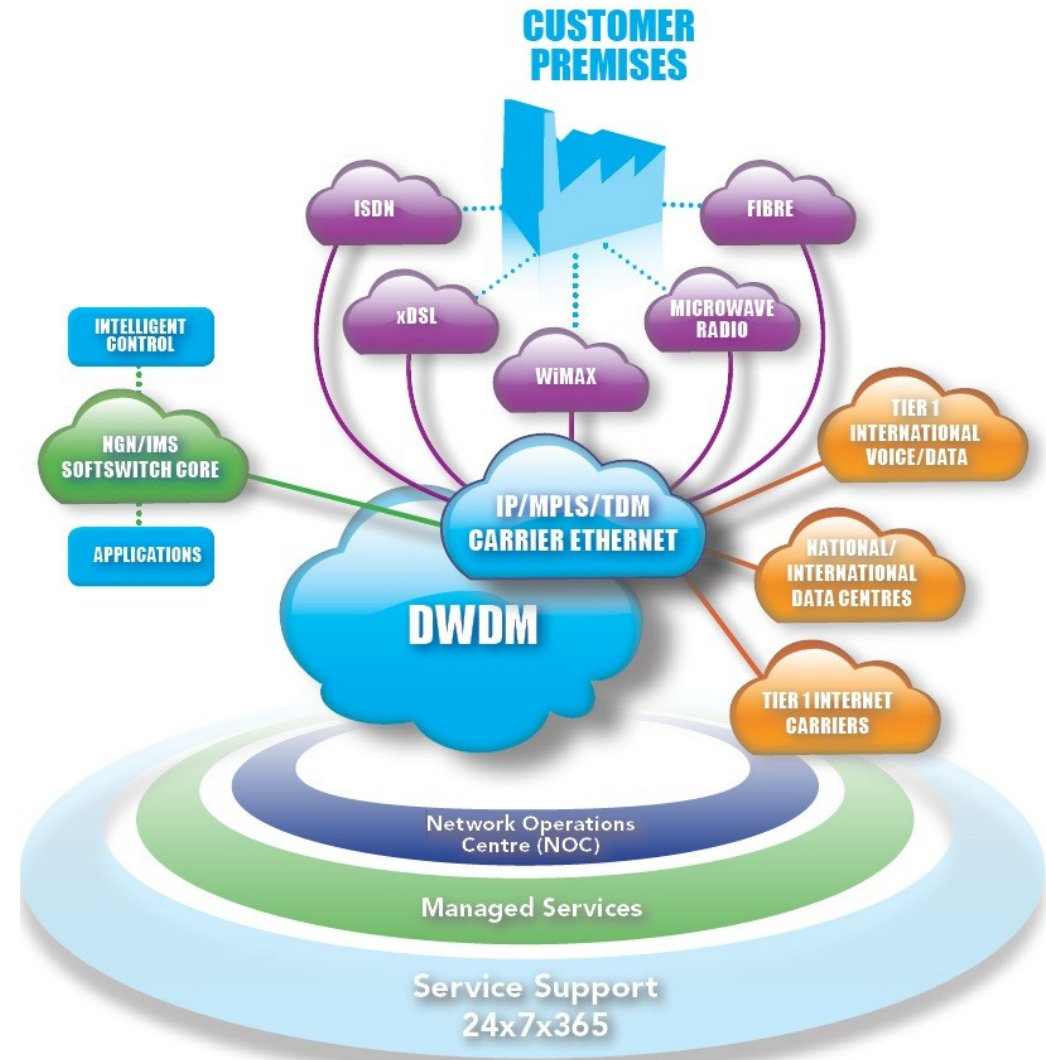
OpenNMS

- **OpenNMS is Airspeed's primary monitoring system**
  - Deployment has grown with business over 5 years

- **Why OpenNMS?**
  - Cost
  - Open Source
  - Feature rich
  - Flexibility

- **Operational Experience**
  - Highly configurable
  - Full visibility of code
  - Active online community
  - 3rd Party integration
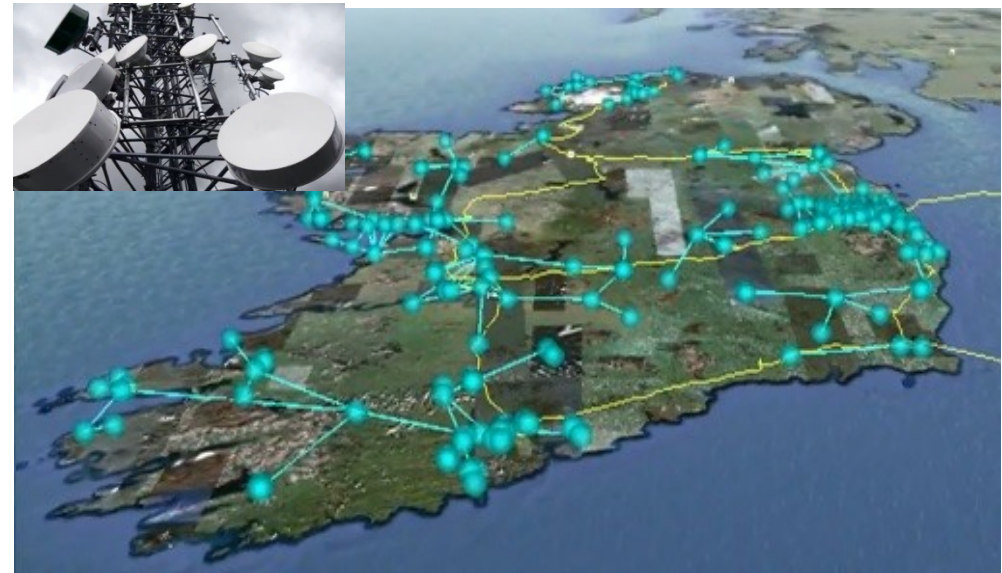
Use Case Two

OpenNMS at Arqiva

Ian Jarrett, Arqiva

ian.jarrett@arqiva.com

Diverse Services

Television Distribution

Distribute over 500 TV channels including all UK terrestrial television channels.

Television Playout

Playout services for many global brands

Digital Cinema

Electronic delivery of Digital Cinema Packages and live alternative events

Broadcast Radio

Broadcasting 500 radio stations from 1,500 transmission sites on analogue AM/FM and DAB digital radio.

Events, News & Sports

Managed global satellite and fibre distribution from all major broadcast hubs to all major broadcasters.

Studio & Production Facilities

Flexible studio and production facilities with global connectivity.

Satellite Data Communications

Mission-critical international IP data connectivity through our global teleport and terrestrial fibre infrastructure.

Our Network

Our core assets include the UK terrestrial broadcast network together with teleports and media hubs at key locations around the world, plus comprehensive satellite capacity, multiplexes and an international fibre network.

www.opennms.co.uk

- **Arqiva has been using OpenNMS in various guises for around 10 years**
  - OpenNMS is not our primary management platform but it provides a very flexible 'network management layer' for adapting unusual requirements

- **Multiple deployments**
  - Initial trials of Digital broadcasting management
  - Trials of Smart Metering Management
  - Internal infrastructure management
  - Management of certain customer networks

- **USE CASE: This use case will look at OpenNMS flexibility for monitoring the state of BGP peers**
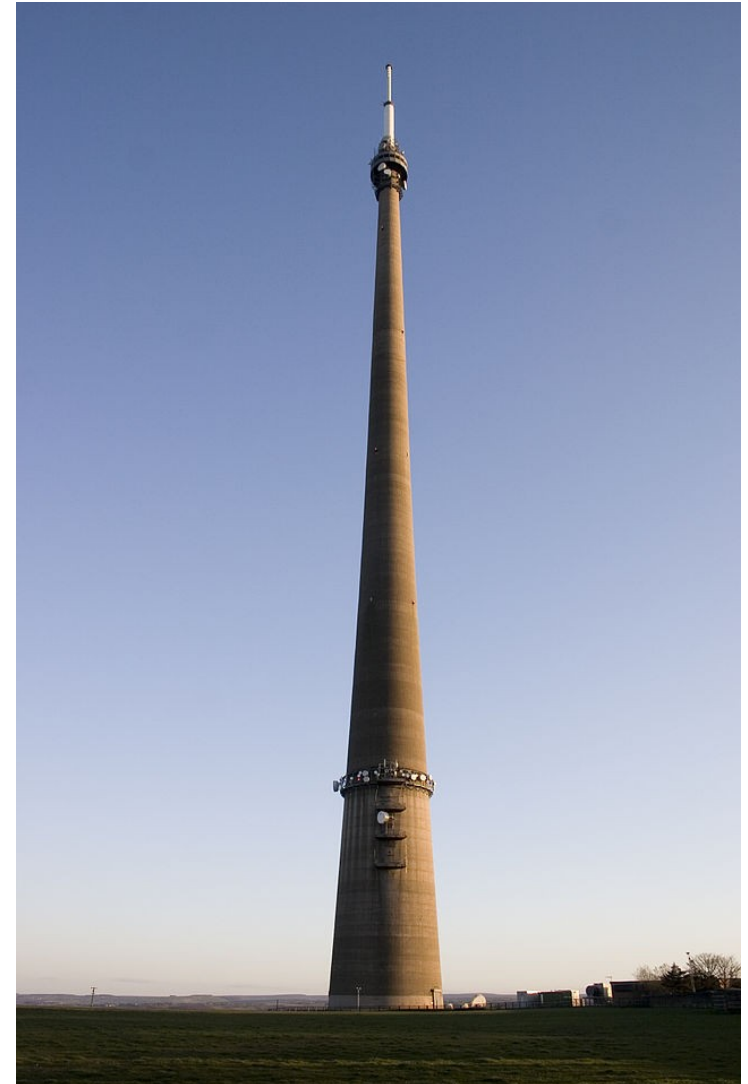
BGP in this network

- **For resilience, each customer is connected via a primary and a secondary router**
  - Our main peer maintains BGP connections to primary routers
  - Our reserve peer maintains BGP connections to secondary routers
- **BGP connections can switch between peers in order to maintain service**
  - These are seen as state changes on the peer
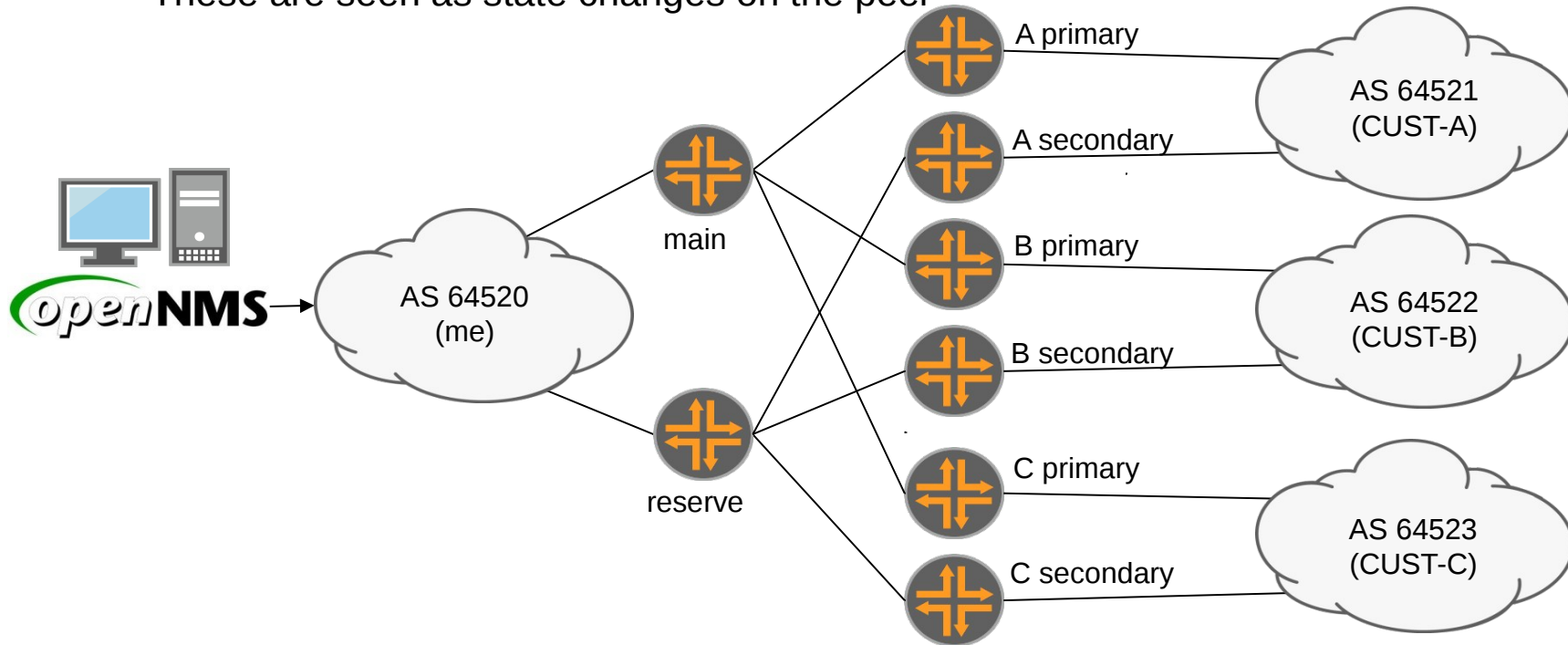
How it works: BGP Peer States

- **State changes are reported by peers as SNMP traps. However, traps can sometimes be missed**
- **So peers also use numeric values in SNMP to represent the state of BGP connections:**
    1. idle
    2. connect
    3. active
    4. open sent
    5. open confirmed
    6. established
- **OpenNMS can collect these values and sets thresholds on them. Any value other than 6 will trigger a "down" event which is re-armed when it goes back above 5**
- **OpenNMS can also maintain state for each service and tell us whether it is up or down**

Established connection

Down triggered

Legend: BGP Peer State

Dropped connection

Collected data, graphed by OpenNMS
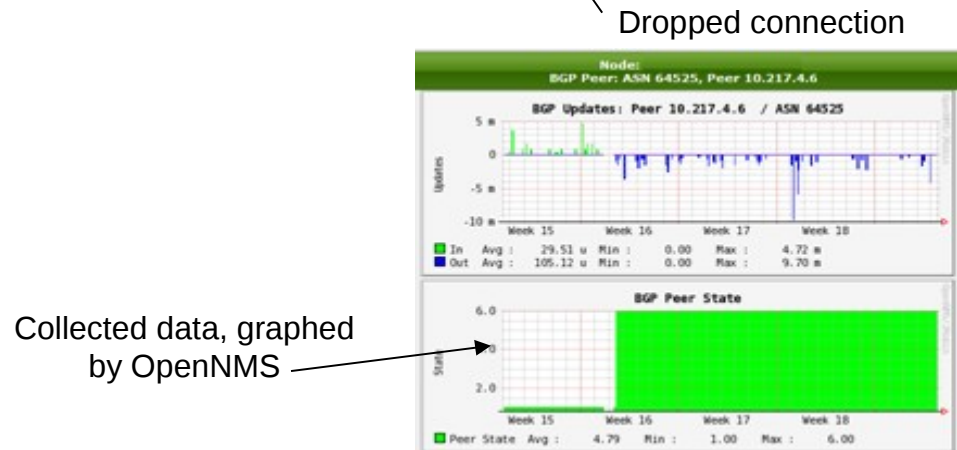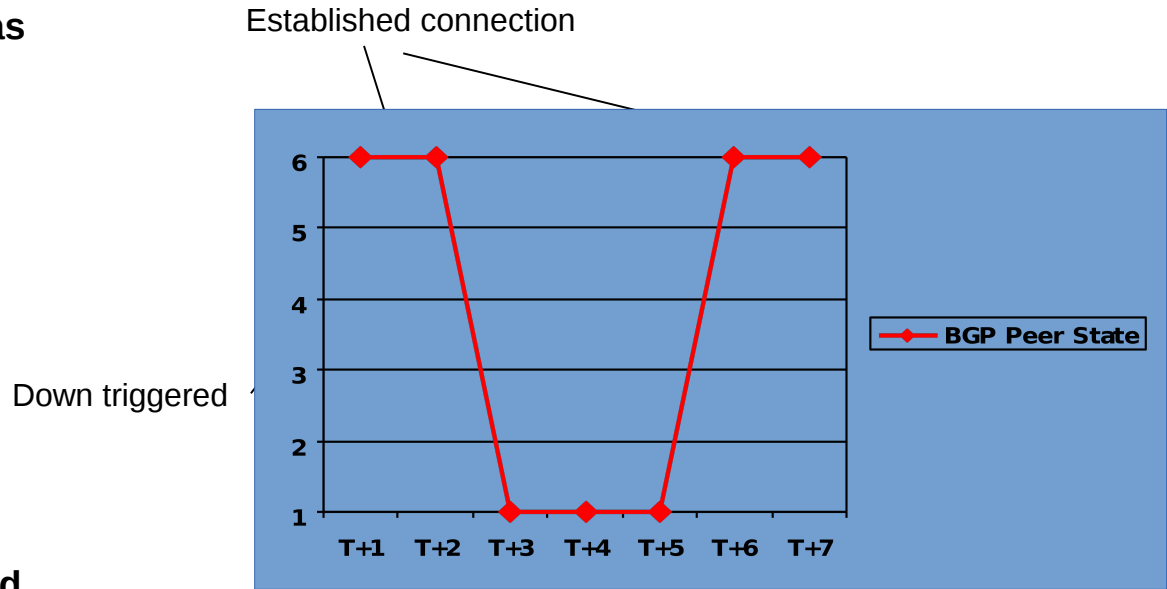
Summary

- **'when I encounter a new problem, I can usually think of a way it can be solved using OpenNMS configuration'**

- **OpenNMS**
  - Cost effective
  - Simple to use
  - Highly flexible

- **OpenNMS provides a very cost effective bridge between diverse equipment and our other OSS systems**

What Next ?

Strategic OpenNMS Architecture

- **Designed for very large deployments in service providers**

- **Fully Distributed Architecture**
  - Inherently scalable and fault tolerant
- **Big Data solution**
  - Newts = Cassandra NOSQL storage of performance data
- **SOA Technology**
  - Embedded Apache Service Mix ESB for events, messaging and control of platform
- **Modularised**
  - OSGi based modular and distributed deployment of system
- **Object Level Access Control**
  - Secure multi-tenanted solution
- **Industry Standard OSS API's**
  - TM Forum TIP etc.
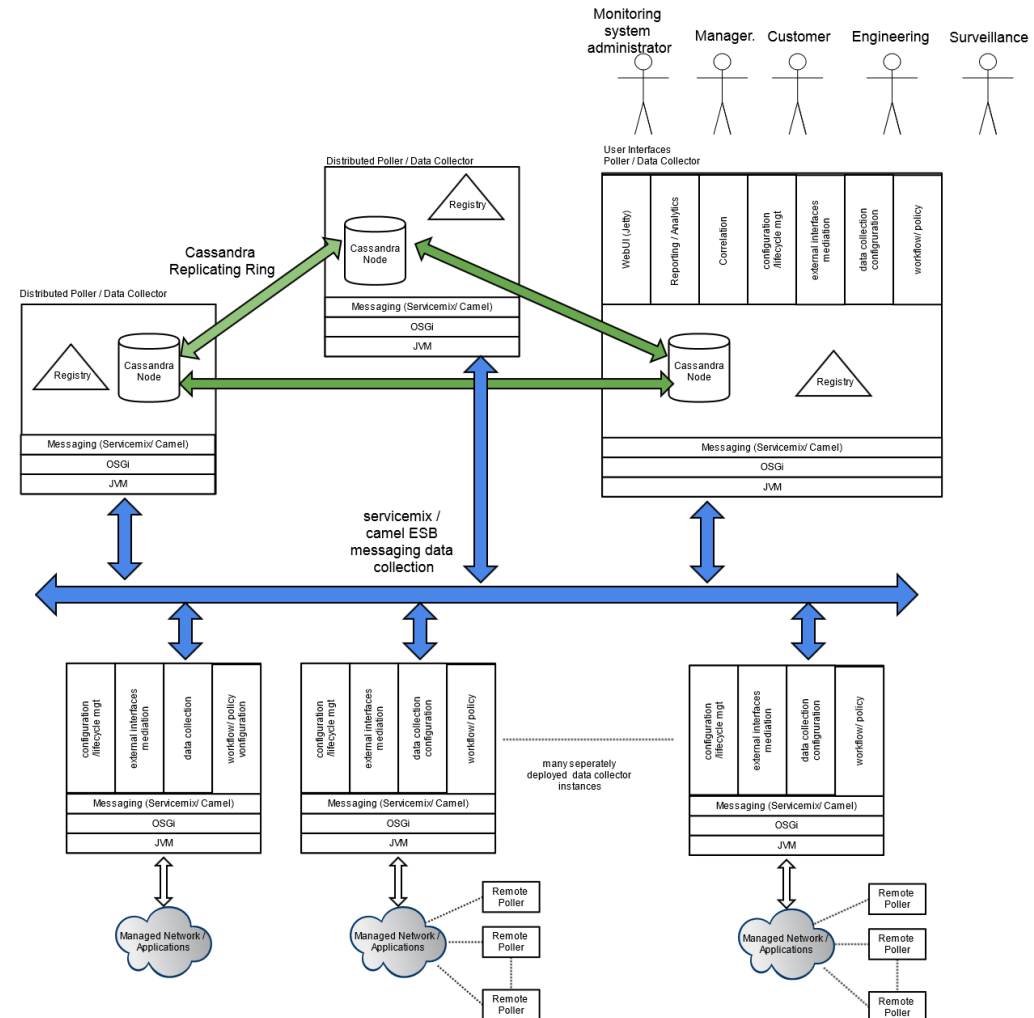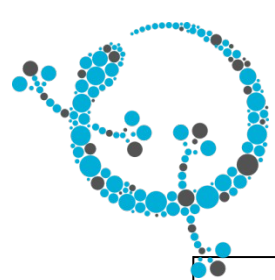
OpenNMS Newts

NoSQL Performance Data Storage and resilience Strategy

Data Centre 2 (DC2)

ONMS 2
Server 1
Server 2

ONMS 2 Backup
Server 1
Server 2

GW Router

GW Router

Self
Replicating
Ring

3rd party High Speed /
Availability WAN

GW Router

GW Router

Data Centre 1 (DC1)

ONMS 1
Server 1
Server 2

ONMS 1 Backup
Server 1
Server 2
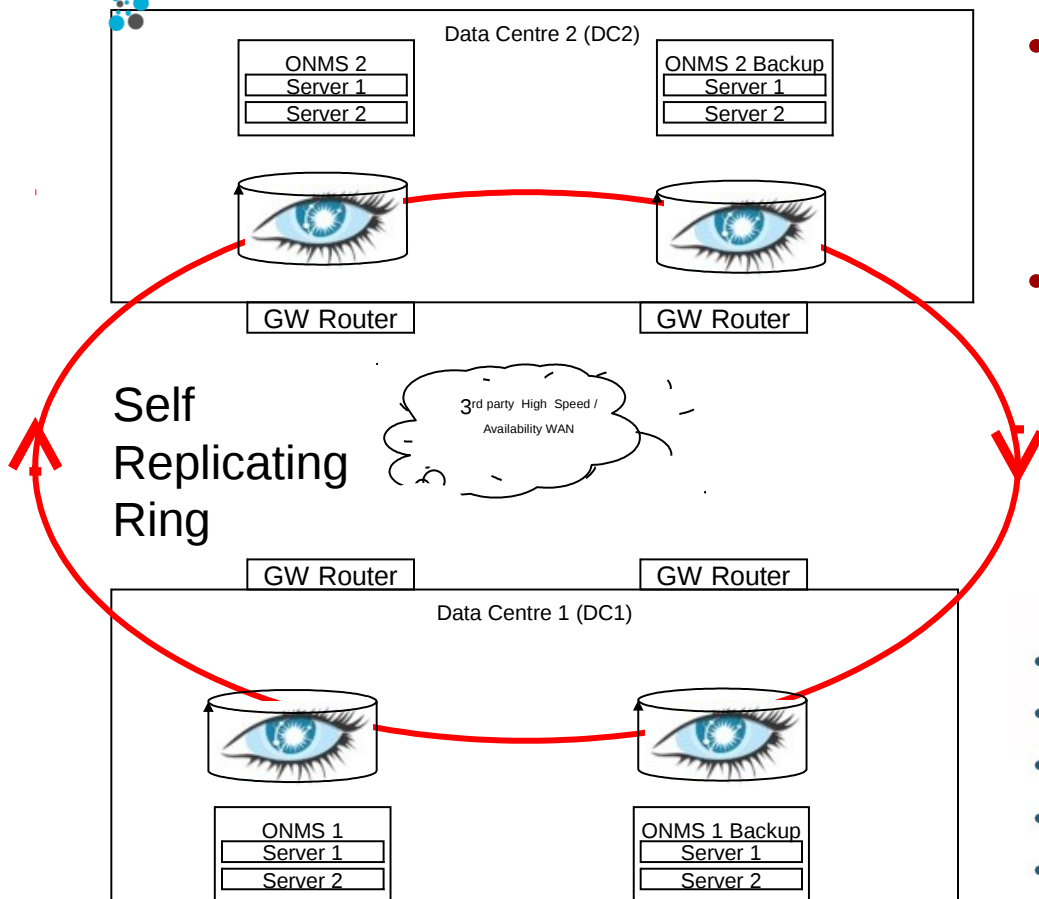
- **OpenNMS has developed a NoSQL performance data storage strategy which can provide an alternative to RRD files – See Newts v 1.0**
- **http://opennms.github.io/newts/**

Cassandra
Users

- Financial
- Social Media
- Advertising
- Entertainment
- Energy
- E-tail
- Health care
- Government

backupify   Constant Contact   CLOUDTALK

DIGITAL REASONING   GAMEFLY   ISIDOREY

inkling   Mahalo Learn Anything   OOYALA

NETFLIX   ngmoco:)   OPENWAVE

OpenX   rackspace HOSTING   ReachLocal

SQUIDOO   twitter   xobni

https://github.com/OpenNMS/newts/wiki

Please join us – we need your help

openNMS UK
www.opennms.co.uk

- **Give it a go**

  — Download and try the latest OpenNMS 14.x

  — Even if you don't yet feel OpenNMS is ready for your environment, you can help us enhance it to where you need it to be.

- **Become part of the User Community**

  — Could OpenNMS strategically or tactically fit with your organisation?

- **Contribute**

  — Bug reports, feature requests, documentation, configurations, helping other users

  — Development partners; sponsoring or contributing new features

 — Research partners; labs / universities

Thank you / Questions

Backup

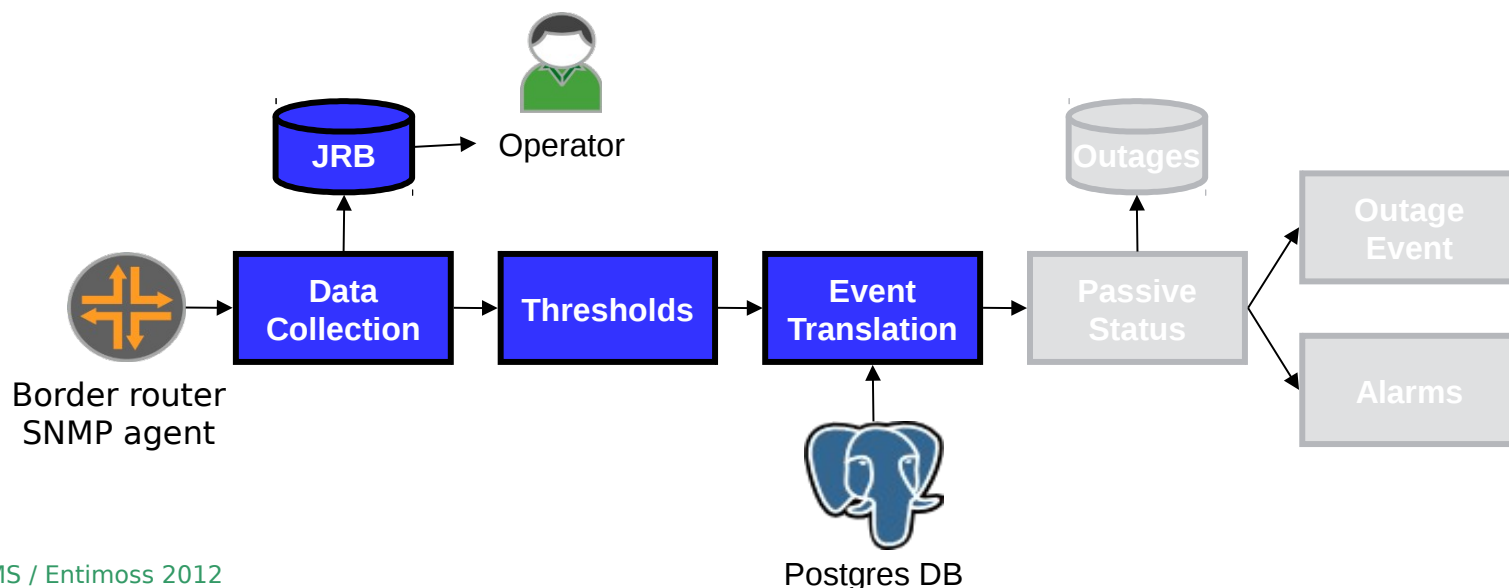**Additional info on Arqiva Use Case**

How it works: BGP

- **The Border Gateway Protocol, BGP, is an application layer routing protocol that runs on routers**
- **It is a very scalable routing protocol that achieves its scalability by grouping together collections of routes into logical "Autonomous Systems" (AS)**
  - RFC 1930 reserves the block 64512 – 65535 for private use, i.e. not to be advertised on the global Internet.
- **Information about each AS is provided by a Border Router, which forms a relationship with other border routers known as peers**

AS 64521
(CUST-A)

Border Router

AS 64520
(me)

Border Router   Border Router

AS 64522
(CUST-B)

Border Router

AS 64523
(CUST-C)
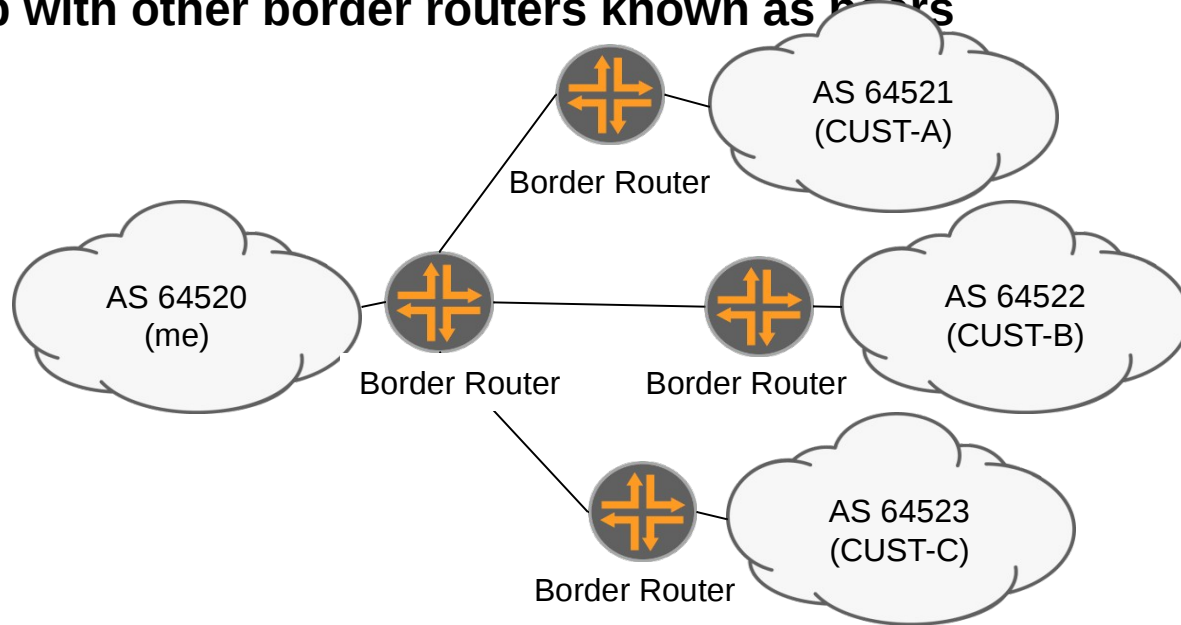
How it works: Inside OpenNMS

- **We used OpenNMS version 1.8.16**
- **OpenNMS collects BGP peer states from the SNMP agent on each border router**
  - This is stored in "round robin" files that can be used to build graphs and reports etc.
- **Each value is checked against a threshold which might trigger a falling or re-arm event**
- **This is OK, but threshold events do not contain information about services**
- **To do this, triggered events are copied and enriched with service data from an external database**
  - This data can include customer (service) name, path type (primary or secondary) and state (live or backup) etc.

JRB

Operator

Data Collection → Thresholds → Event Translation → Passive Status → Outage Event / Alarms

Outages

Border router SNMP agent

Postgres DB

How it works: Inside OpenNMS

- **Threshold events can be translated into service events, which relate to a service on a specific interface**
- **Because a service is not a real physical "thing", OpenNMS must passively rely upon events in order to maintain its up/down status**
- **When a "Passive Status" goes up or down, OpenNMS updates an outage record which is viewable by operators, along with outage events and alarms**

Border router SNMP agent → Data Collection → Thresholds → Event Translation → Passive Status → Outage Event / Alarms → Operator

JRB

Outages

Postgres DB