perfSONAR Monitoring Update
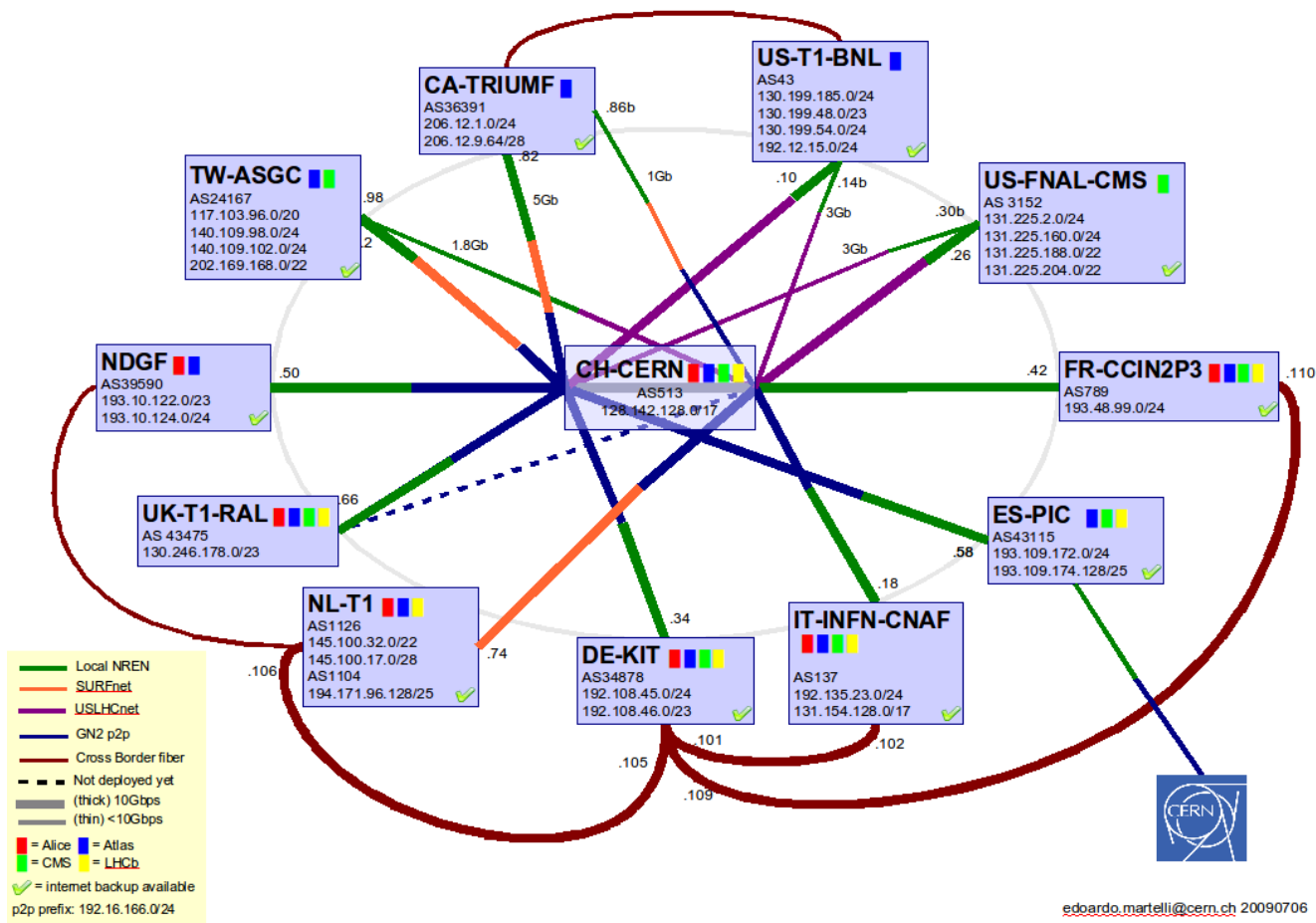
Fausto Vetter, DANTE

LHCOPN meeting, Vancouver – Canada

31st August 2009

Agenda

- LHC-OPN
  - Topology & Details
  - Monitoring
  - perfSONAR-MDM
  - Deployment
  - Visualization Tools
- Deployment Status
  - Services' Deployment Status
  - Deployment Status
  - Pending Actions
  - Lessons Learned
- Moving MDM into Operation
- Conclusions

LHC-OPN Topology

LHCOPN – current status

CA-TRIUMF
AS36391
206.12.1.0/24
206.12.9.64/28

US-T1-BNL
AS43
130.199.185.0/24
130.199.48.0/23
130.199.54.0/24
192.12.15.0/24

TW-ASGC
AS24167
117.103.96.0/20
140.109.98.0/24
140.109.102.0/24
202.169.168.0/22

US-FNAL-CMS
AS 3152
131.225.2.0/24
131.225.160.0/24
131.225.188.0/22
131.225.204.0/22

NDGF
AS39590
193.10.122.0/23
193.10.124.0/24

CH-CERN
AS513
128.142.128.0/17

FR-CCIN2P3
AS789
193.48.99.0/24

UK-T1-RAL
AS 43475
130.246.178.0/23

ES-PIC
AS43115
193.109.172.0/24
193.109.174.128/25

NL-T1
AS1126
145.100.32.0/22
145.100.17.0/28
AS1104
194.171.96.128/25

DE-KIT
AS34878
192.108.45.0/24
192.108.46.0/23

IT-INFN-CNAF
AS137
192.135.23.0/24
131.154.128.0/17

.86b · .82 · 1Gb · .10 · .14b · .30b · .98 · 5Gb · 1.8Gb · 3Gb · 3Gb · .26 · .2 · .50 · .42 · .110 · .66 · .58 · .106 · .74 · .34 · .18 · .101 · .102 · .105 · .109

Legend:
— Local NREN
— SURFnet
— USLHCnet
— GN2 p2p
— Cross Border fiber
- - - Not deployed yet
▬ (thick) 10Gbps
— (thin) <10Gbps
■ = Alice   ■ = Atlas
■ = CMS   ■ = LHCb
✓ = internet backup available
p2p prefix: 192.16.166.0/24

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LHC-OPN Topology

LHC-OPN Details

- Number of Sites: 12 sites (1 Tier0, CERN, and 11 Tier1)
- Distinct Countries around Europe, Asia and America
- Access to network measurements data from multiple network domains
- DANTE, CERN and the 11 Tier1 sites collaborating on a customized version of perfSONAR MDM service
- Users of the perfSONAR-MDM service:
  - End-to-End Coordination Unit (E2ECU)
 - Tier1 sites (main contributor to LHCOPN operations)

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Monitoring the LHC-OPN

- Shared responsibility – No vendor specific monitoring
- Open Standard Monitoring Protocol – **perfSONAR**
- Focus of monitoring:
  - Network Layer (IP)
  - Physical Layer (SDH, DWDM, Optical Channels, Vlans)
- Regular Active Point-to-Point Measurements
  - One-Way Delay
  - Achievable Bandwidth
  - Historical Traceroute Changes
- Regular Passive Point-to-Point Measurements
  - Utilization
  - Input Errors
  - Packet Discards

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perfSONAR-MDM for LHC-OPN

- Monitoring tools, hardware and operating system packed in monitoring boxes
  - To be easily deployed at any location
  - Remotely accessible by the service desk for operations and support
- Monitoring boxes deployed close to border routers at each site
- Sites to meet specific responsibilities to maximize network security and reliability
- Specific weather map tool and further diagnosis tools provided to visualize measurements results
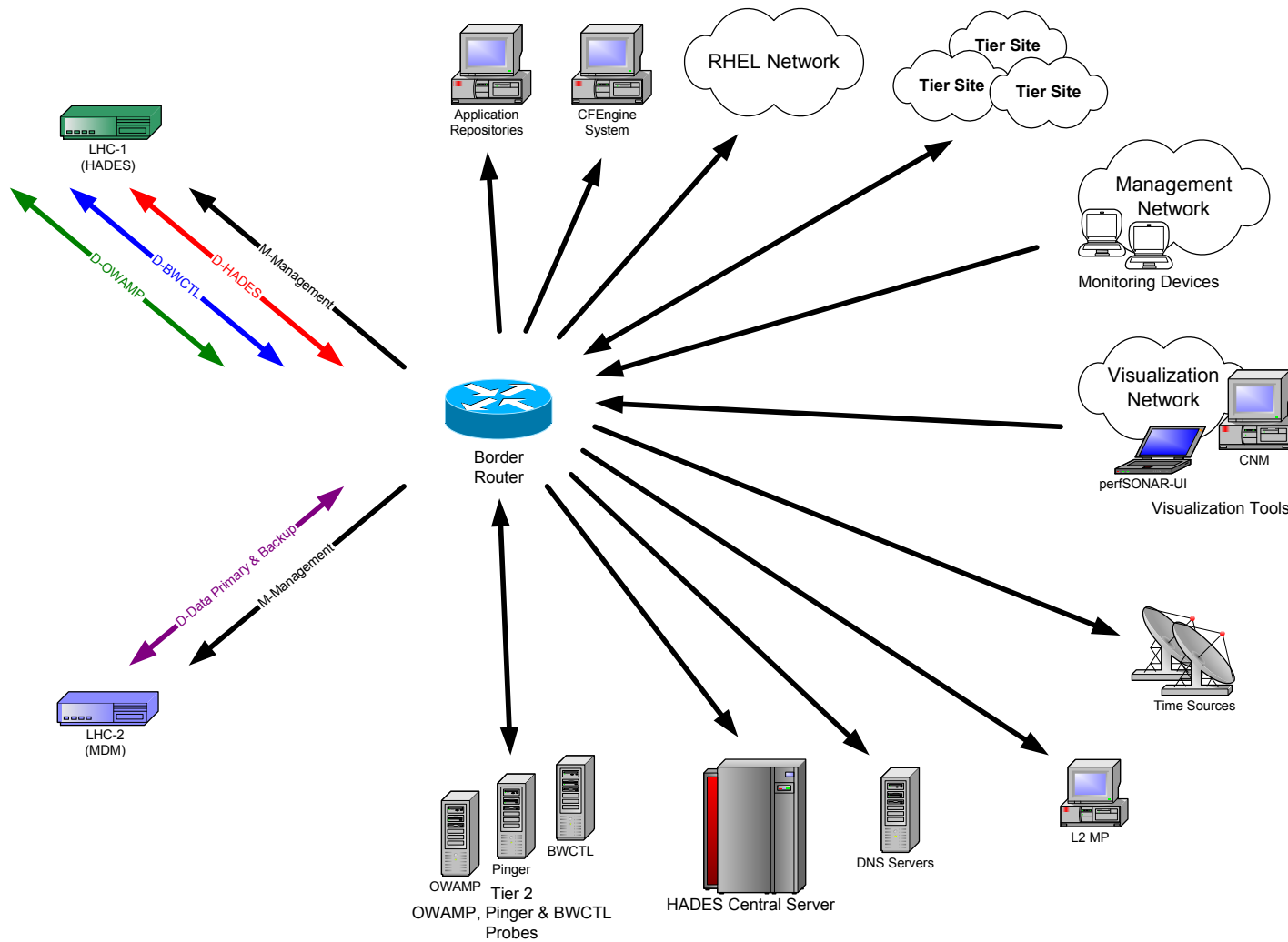- Network configuration and firewall settings play an important role

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Deployment

Site Deployment

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connect • communicate • collaborate
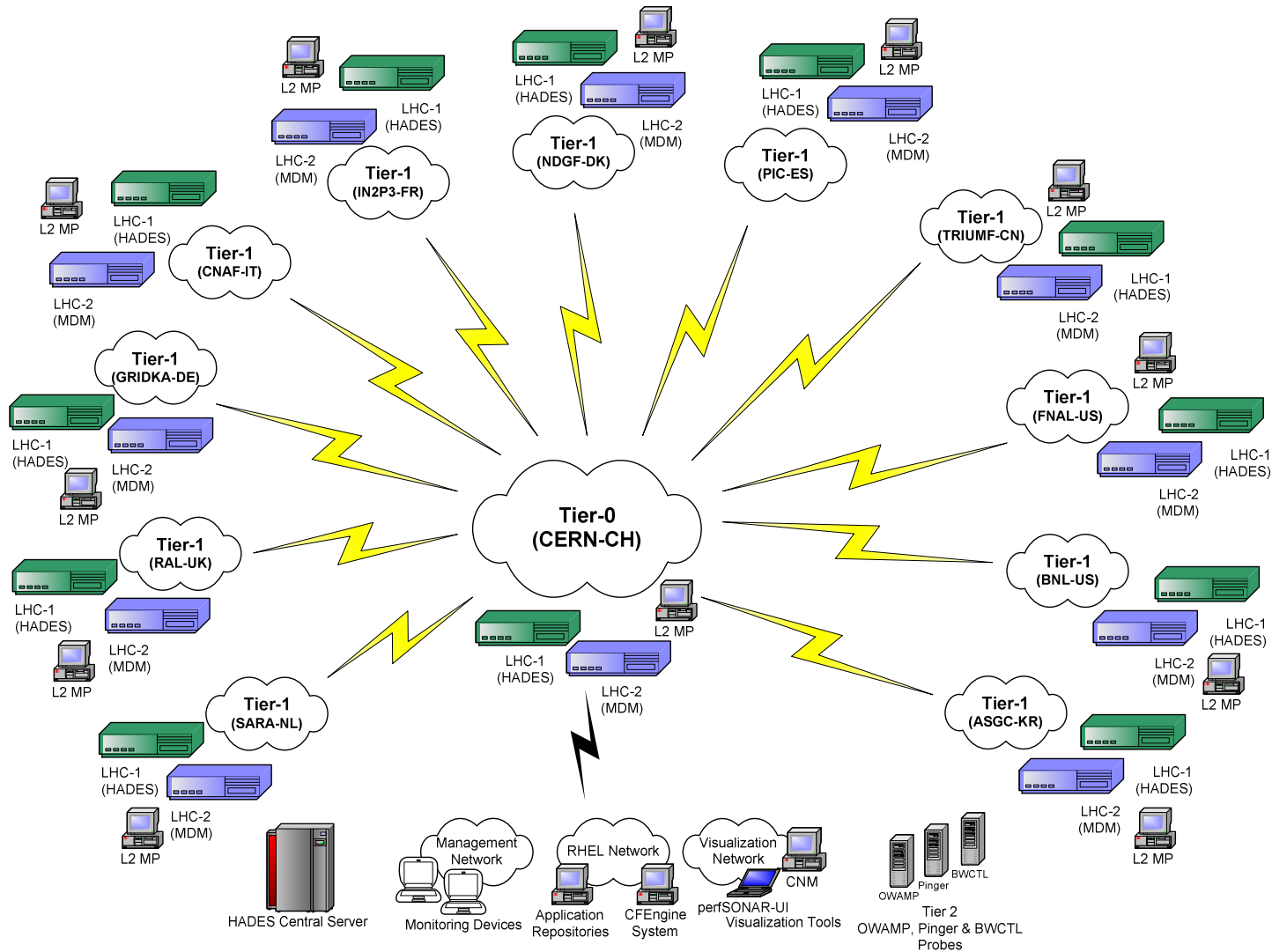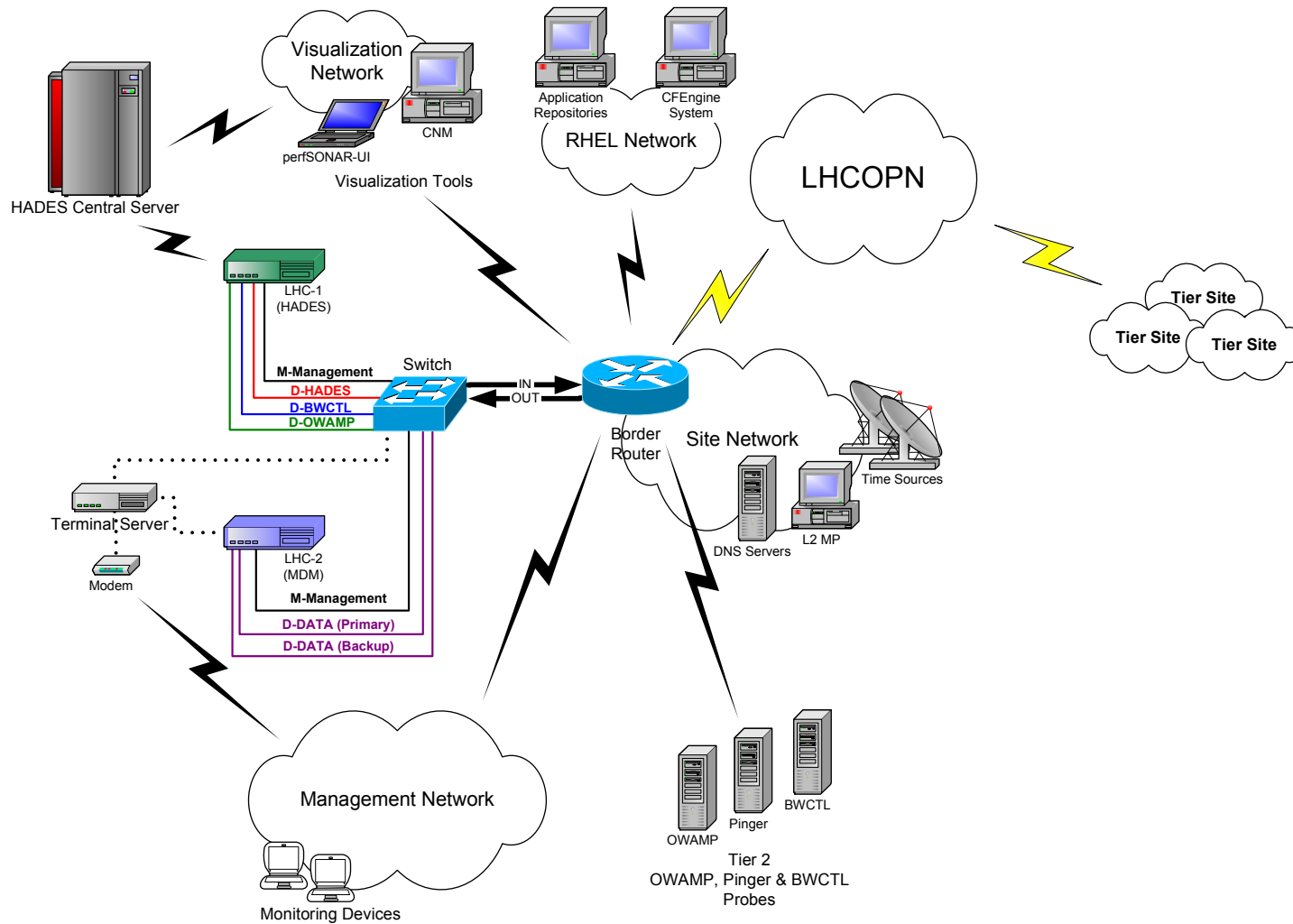
Deployment Components

Visualization Tools

- Data can be accessed via:
  - LHC-OPN Portal
    - *Provides a central location to reach available visualization tools*
    - *Authenticates users via Multi-Domain methods*
  - LHC-OPN Weathermap
    - *Links connecting all Sites*
    - *Utilization Data*
    - *One-Way Delay*
    - *Traceroute Outputs*
  - E2E Monitoring
    - *Monitors spans of circuits placed in different network domains*

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Visualization Tools

- Data can be accessed via:
  - perfSONAR User Interface (UI)
    - *perfSONAR's main visualization tool*
    - *Java Web Start Based Application*
    - *Displays data from perfSONAR LHC-OPN deployments*
  - HADES
    - *Display One-Way Delay & Traceroutes related metrics*
    - *Maps are used for navigation*

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Services' Deployment Status

	RRD-MA	SQL-MA	SSHTelnet-MP	XML-LS	AS	HADES	BWCTL-MP	Traceroute
NL-T1-NL-AMSTERDAM	✓			✓		✓	✓	✓
UK-T1-RAL-UK-OXFORD								
DE-KIT-DE-KARLSRUHE	✓			✓		✓	✓	✓
FR-CCIN2P3-FR-LYON	✓			✓		✓	✓	✓
ES-PIC-ES-BARCELONA	✓	✓	✓*	✓	✓	✓	✓	✓
NDGF-DK-COPENHAGEN	✓		✓	✓		✓	✓	✓
CH-CERN-CH-GENEVA	✓	✓		✓		✓	✓	✓
IT-INFN-CNAF-IT-BOLOGNA	✓			✓		✓	✓	✓
CA-TRIUMF-CA-VANCOUVER	✓			✓		✓	✓	✓
US-FNAL-CMS-US-CHICAGO	✓			✓		✓	✓	✓
US-T1-BNL-US-NEWYORK	✓			✓		✓	✓	✓
TW-ASGC-TW-TAIPEI	✓			✓		✓	✓	✓

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Deployment Status

- Deployment Started at: October / 2008
- Progress:
  - Tier0 & 10 out of 11 Tier1 Deployed
  - Hardware Support:
    - *MDM – SUN servers:*
      - *Purchase for one year support is on going (Silver Support)*
      - *Renewable on yearly basis - Single agreement with SUN*
      - *Servers are under 3 years warranty*
    - *Hades – Bee servers:*
      - *Servers are under 3 years warranty*
      - *Return to Base Support (Germany)*

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Deployment Status

- Progress:
  - **RedHat Linux licenses** bought for one year – renewable on yearly basis
  - 7 out of 12 sites have deployed **GPS antennas**:
    - *US-T1-BNL is looking for alternatives*
    - *CH-CERN, FR-CCIN2P3, IT-INFN-CNAF and US-CMS-FNAL are in the process of deployment*
  - 6 out of 12 sites have deployed **Terminal Servers**:
    - *DE-KIT and FR-CCIN2P3 had incompatibility issues*
    - *ES-PIC didn't have RJ45 console connectors and KVM was not able to configure the management IP*
    - *Terminal server was not available at IT-CNAF*
    - *US-CMS-FNAL and US-T1-BNL do not plan to deploy*

Deployment Status

- Progress:
  - All 12 sites have deployed the **dedicated switch** and connected to the border router
  - **Out-of-band access** via telephone provided only by **UK-T1-RAL**
  - **Automated software update** was deployed
  - **RRD-MA** is deployed and configured at 11 out of 12 sites
  - **HADES measurements**, **Recurrent TCP BWCTL** and **Traceroute** tests are scheduled amongst 11 out of 12 sites
  - **SSHTelnet-MP** is deployed at **NDGF** (no authentication needed) and **ES-PIC** (authentication needed) – **FR-CCIN2P3** desires this feature, but incompatibility was found – expecting a new release to try it out
  - **perfSONAR MDM 3.2** was fully installed on all active MDM boxes

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Pending Actions

- Expecting action from **UK-T1-RAL** to finish deployment – boxes, terminal server & GPS are physically installed on site, but network access is not configured to the boxes – **configuration cannot go further**
- **US-T1-BNL** has to open the firewall to the monitoring infrastructure
- **SQL-MA** usage for storage of Circuit Data replacing **E2EMon-MP**
- GPS Antenna Installation at: **CH-CERN**, **FR-CCIN2P3**, **IT-INFN-CNAF** and **US-CMS-FNAL**

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Moving MDM into Operation

- More structured and formal communication process is required
- Proper change management has to be in place to synchronize any network change – otherwise monitoring can give wrong figures to user
- Monitoring infrastructure is already in place
  - Planned to extend in the future – Backup
- Service desk is already in place and operational
  - 2 IT & perfSONAR Engineers
  - Response time: regular UK working hours
- Backup procedure and infrastructure – Planned

Lessons Learned

- Large deployment of perfSONAR MDM takes long time
- GPS installation is time consuming because involves:
  - Logistics
  - Finance Procedures
  - Requesting Authorization
- Firewall settings are hard to implement due sites' overall policies
- Installation problems are likely to happen during deployment
- Hardware purchase is time consuming and some times can cause problems
- Ticket system is useful to track progress on deployment
- Shipment procedure outside Europe is different – causing a process change on the deployment for these specific sites
- Phased deployment process did not work – dependent on too many out of control factors

Lessons Learned

- Hades servers must be shipped together with an adaptor for the Eric card compatible with the site's electric regulations and standards
- Hardware support from SUN is quite useful
- Introduction meeting was important to get sites' engagement
- Regular meetings were an efficient way to manage the progress and problems during the deployment
- Each site is a very singular deployment, but very similar in the steps
- Forms were a very efficient way to gather the required data for configuration and to explain what was needed from the users
- Sending boxes straight to site and configuring them remotely was a good choice (for European MDM boxes)

Conclusions

- perfSONAR MDM service is being delivered as planned
- Some tasks are really long term
- Each site has different operation mode
- Communication played an important role in this deployment
- Site's contacts were the main responsible to ensure the deployment happen on time and as expected
- Deployment process went quite clean and smooth

perfSONAR Deployed ! ! ! Ready for usage . . .

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Comments?!?

- Thank you for participating in this deployment and for your attention today…

- Any comments about the deployment:
  - Service Desk:
    - *Monitoring tools*
    - *Communication channel*
  - Service Desk Engineers:
    - *Skills set*
    - *Communication*
    - *Response time*
    - *Cordiality*

- Any other relevant questions and/or comments?

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