



# Service Level Agreement(SLA)

## The intelligence layer

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# Outline



- Motivation
- Introduction of the SLA concept & SLA's elements
- How to apply SLA to RACF facility
- Architecture
- Implementation
- Status update/future plan



# Motivation



- The continue growth of the facility, the diverse needs of the scientific problem and increasingly prominent role of distributed computing requires RACF to change from a system-based to a service-based SLA with our user communities.
- SLA allows RACF to coordinate more efficiently the operation, maintenance and the development of the facility by creating a new, configurable alarm management that automates service alerts and notification of operations staff.



# The SLA Concept



- The SLA records a common understanding about services, priorities, responsibilities, guarantees.
- Each area of service scope should have the 'level of service' define.
- The agreement relates to the service that users receives and how the service provider delivers that service.



# The SLA Elements



## ➤ Establish the services

- Specify the catalog of the services that are provided and the corresponding components including applications, infrastructure and other business functions.

## ➤ Service standards

- Include concepts like availability, reliability as well as response and resolution times.

## ➤ Roles and responsibilities

- Designate everyone's responsibilities in the SLA

## ➤ Service level management

- Person who are responsible for IT service management, who are responsible to take further actions when incidents are due.

## ➤ Evaluation criteria

- Determine how well the computing facility is performing



# Previous model



- Facility operation is a manpower-intensive activity in RACF
- Sub-groups responsible for systems within the facility (tape storage, disk storage, linux farm, grid-computing, network, etc)
- Some groups may have their own monitoring systems, different monitoring mechanism.
- Facility systems were classified into 3 categories: non-essential, essential and critical. Critical components are covered 24\*7 year-round, essential components have built-in redundancy/duplication, addressed in the next business day. Non-essentials are addressed in the next business day.
- Staff provide primary coverage during normal business hours, operators contact on-call person during off-hours and weekends.



# New Model



- Introduce the concept of SLA, have the new service categories defined, with all service components mapped out to each category as well as have service dependencies being defined. Merge the monitoring within different groups into 1 system.
- Classify the services into new levels - Critical, High availability, Medium availability, Low availability. define the standard such as availability, response time, resolution time.
- Designate the roles and responsibilities to each service component including service level managers who coordinate the operations and take further actions when problems are not addressed.
- Set up evaluation criteria to determine how well the facility is performing.



# SLA Service Establishment

Microsoft Excel - Dependency\_Matrix.xls

ファイル(F) 編集(E) 表示(V) 挿入(I) 書式(O) ツール(T) データ(D) ウィンドウ(W) ヘルプ(H)

質問を入力してください

T2 Support and Monitoring

|    | A                     | B                                  | C                                   | D                           | E                     | F                       | G             | H              | I                  | J                   | K             | L                              | M        | N             | O     | P        | Q               | R          |
|----|-----------------------|------------------------------------|-------------------------------------|-----------------------------|-----------------------|-------------------------|---------------|----------------|--------------------|---------------------|---------------|--------------------------------|----------|---------------|-------|----------|-----------------|------------|
| 1  | Service Class         | C                                  | C                                   | C                           | C                     | U                       | C             | C              | C                  | C                   | C             | C                              | C        | M             | M     | U        | U               | U          |
| 2  |                       | Access to mass data archive - RHIC | Access to mass data archive - ATLAS | Access to local NFS storage | Access to AFS storage | SMB File Serving (SAMB) | Data Catalogs | User Databases | Grid job execution | Local job execution | PANDA Service | Central Reconstruction Service | Gateways | Web documents | Email | Printing | Data Protection | Accounting |
| 3  | HPSS                  | X                                  | X                                   |                             |                       |                         |               |                |                    |                     |               | X                              |          |               |       |          |                 |            |
| 4  | dCache                |                                    | X                                   |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 5  | DQ2                   |                                    | X                                   |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 6  | FTS                   |                                    | X                                   |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 7  | PANDA                 |                                    |                                     |                             |                       |                         |               |                |                    |                     | X             |                                |          |               |       |          |                 |            |
| 8  | Gatekeepers           |                                    |                                     |                             |                       |                         |               |                | X                  |                     |               |                                |          |               |       |          |                 |            |
| 9  | Gateways              |                                    |                                     |                             |                       |                         |               |                | X                  | X                   |               | X                              | X        |               |       |          |                 |            |
| 10 | Farm                  |                                    |                                     |                             |                       |                         |               |                | X                  | X                   |               | X                              | X        |               |       |          |                 |            |
| 11 | Condor/LSF            |                                    |                                     |                             |                       |                         |               |                | X                  | X                   |               | X                              | X        |               |       |          |                 |            |
| 12 | User Databases        |                                    |                                     |                             |                       |                         | X             | X              |                    |                     |               | X                              | X        |               |       |          |                 |            |
| 13 | NFS                   |                                    |                                     | X                           |                       |                         |               |                |                    |                     |               | X                              | X        |               |       |          |                 |            |
| 14 | AFS                   |                                    |                                     |                             | X                     |                         |               |                |                    |                     |               | X                              | X        |               |       |          |                 |            |
| 15 | Backup                |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          | X               |            |
| 16 | Kerberos              | X                                  | X                                   | X                           | X                     |                         |               |                | X                  | X                   |               | X                              |          |               |       |          |                 |            |
| 17 | MyProxy               |                                    | X                                   |                             |                       |                         |               |                | X                  | X                   |               | X                              |          |               |       |          |                 |            |
| 18 | VOOMS                 |                                    | X                                   |                             |                       |                         |               |                | X                  | X                   |               | X                              |          |               |       |          |                 |            |
| 19 | GUMS                  |                                    | X                                   |                             |                       |                         |               |                | X                  | X                   |               | X                              |          |               |       |          |                 |            |
| 20 | DNS/LDAP/NTP          | X                                  | X                                   | X                           | X                     | X                       | X             | X              | X                  | X                   |               |                                | X        | X             | X     |          |                 |            |
| 21 | BDII                  |                                    | X                                   |                             |                       |                         |               |                | X                  | X                   |               |                                | X        |               |       |          |                 |            |
| 22 | Gratia                |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 | X          |
| 23 | RT                    |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 24 | Nagios                |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          | X             |       |          |                 |            |
| 25 | Ganglia               |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          | X             |       |          |                 |            |
| 26 | Web svr               |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          | X             |       |          |                 |            |
| 27 | Network and firewalls | X                                  | X                                   | X                           | X                     | X                       | X             | X              | X                  | X                   | X             | X                              | X        | X             | X     | X        | X               | X          |
| 28 | Power                 | X                                  | X                                   | X                           | X                     | X                       | X             | X              | X                  | X                   | X             | X                              | X        | X             | X     | X        | X               | X          |
| 29 | A/C                   | X                                  | X                                   | X                           | X                     | X                       | X             | X              | X                  | X                   | X             | X                              | X        | X             | X     | X        | X               | X          |
| 30 |                       |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 31 |                       |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 32 | Critical              | C                                  |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 33 | Managed               | M                                  |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 34 | Unmanaged             | U                                  |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |
| 35 |                       |                                    |                                     |                             |                       |                         |               |                |                    |                     |               |                                |          |               |       |          |                 |            |

Sheet1 / Sheet2 / Sheet3 /

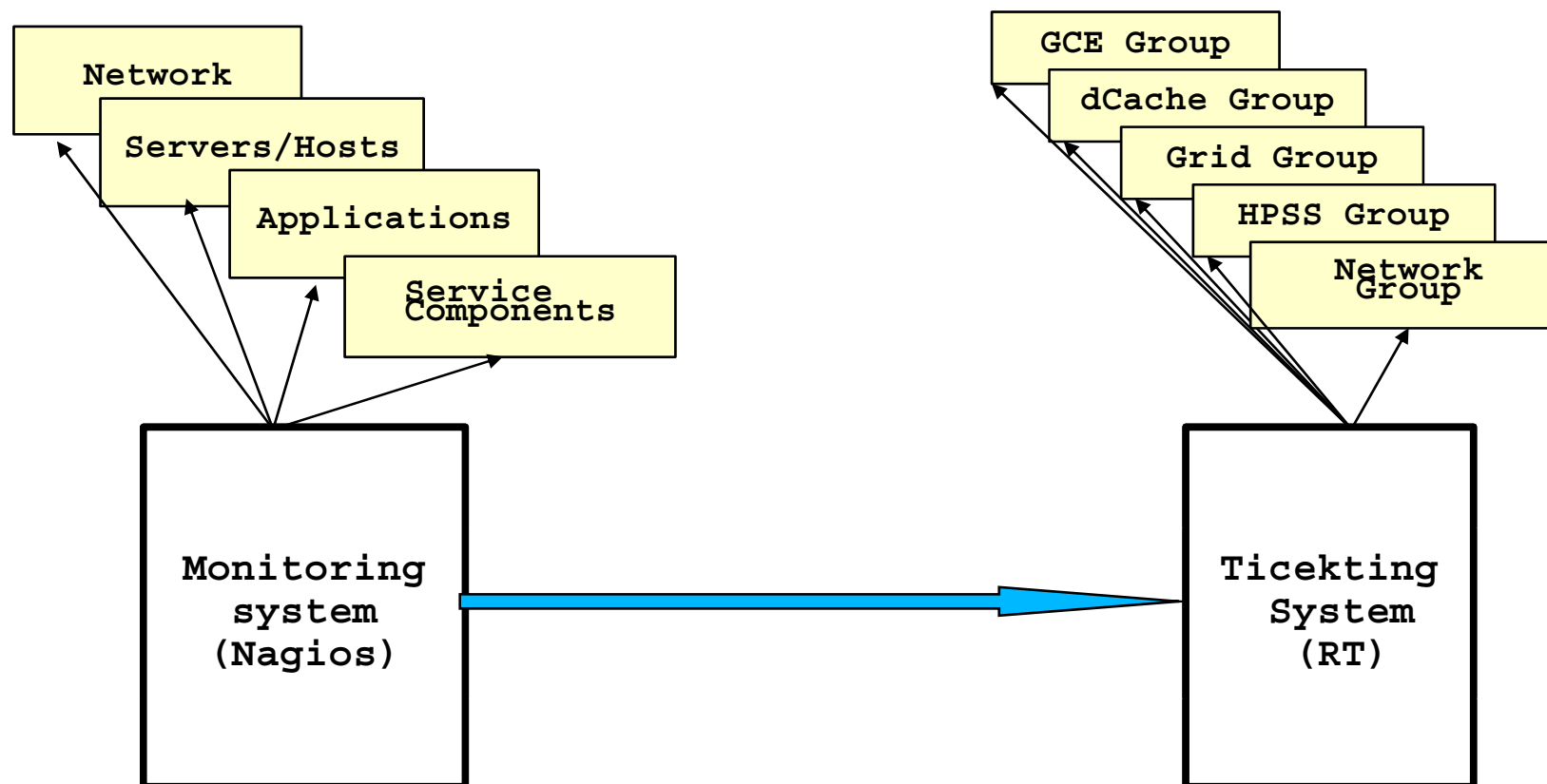
図形の調整(B) オートシェイプ(U)

コマンド



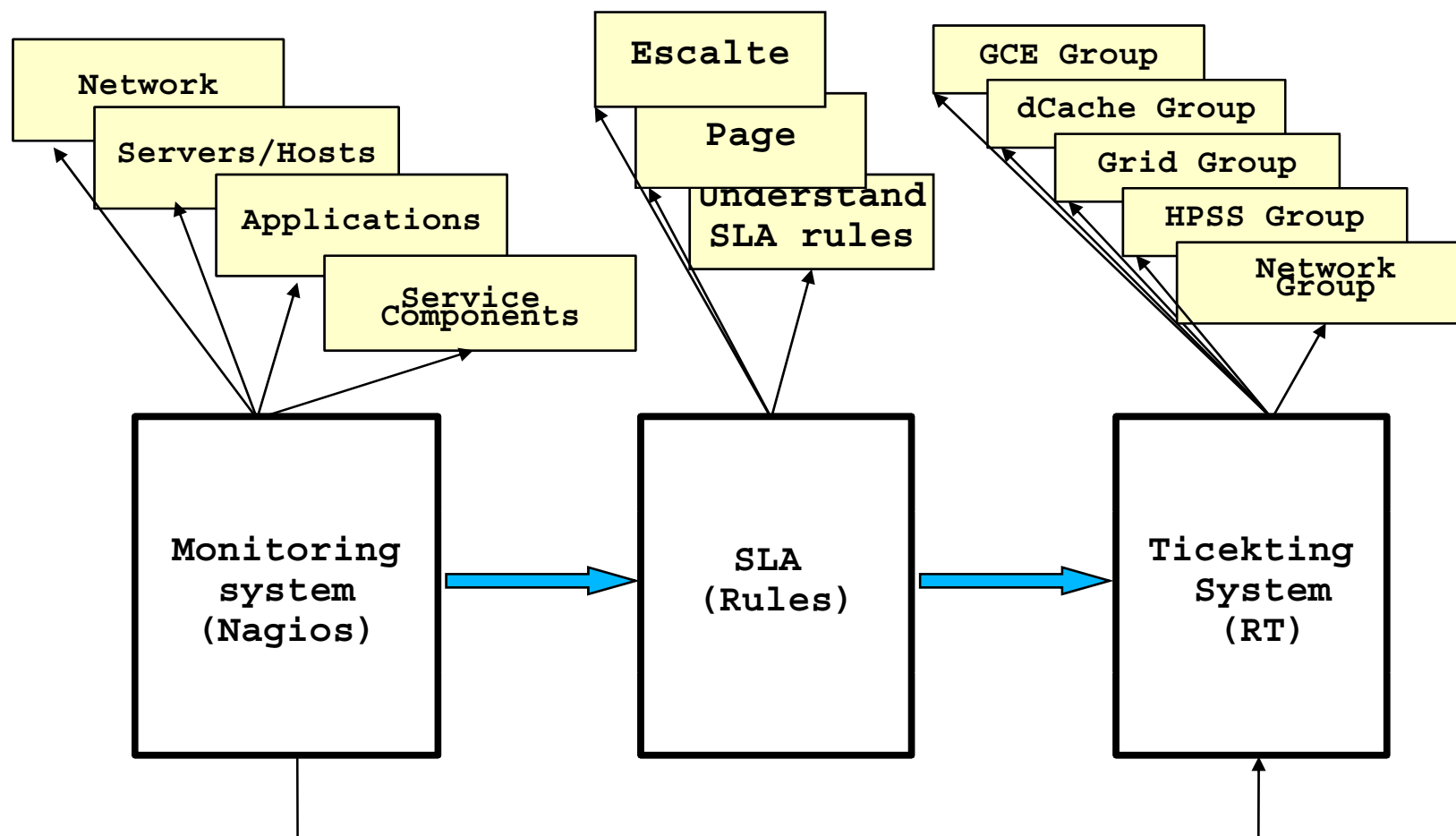


# Existing Architectures



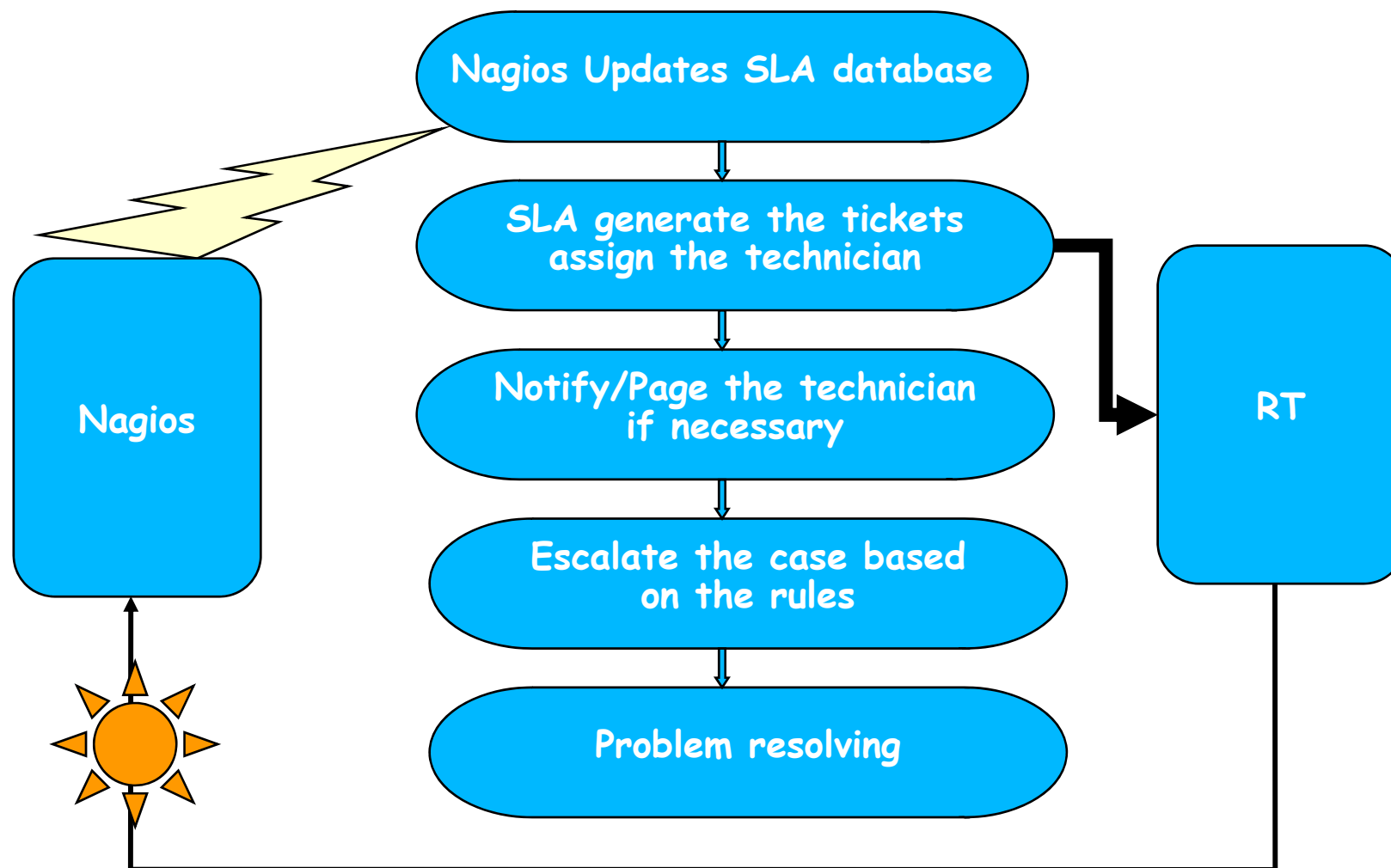


# New Architectures





# Process Flow





# Implementation



## ➤ Monitoring system

- Redhat Enterprise 5.3,
- Nagios V3.x

## ➤ SLA

- Redhat Enterprise 5.3
- mysql Server V5.0
- Python V2.4

## ➤ Ticketing system

- Redhat WS 4.x
- RT V3.4.5



# SLA Configurable Rules



## [Rule-Name]

host: hostname

service: service

hostgroup: #RE compatible field (default 'any')

queue: #RT Queue

owner: #RT ticket owner (default queue owner)

priority: #RT ticket priority (default 'none')

auto\_up: #0/1 to indicate if paging should occur (default '0')

firstContact: #First person to page, can be pager #, or rt name (default disabled)

secondContact: #Second person to page, can be pager #, or rt name (default disabled)

importance: #0-10, only used if more than one rule applies to a host & service (default 0)

## Examples:

[Thumpers]

hostgroup: Thumper\_Servers\_\*

service: FM\_faulty

Priority: 1

queue: GCE

owner: mizuki

firstcontact: mizuki

secondcontact: smithj4



# Nagios



Nagios - Mozilla Firefox

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https://webdocs.racf.bnl.gov/nagios/

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Buy.com... HEPIX Sp... Webauth... Webauth... Unix at c... cfengine... Enabling ... Le Palais... Thumper... Cacti Enabling ... berserk... Windows... Books24x7 Thors/Th... Bethpag... Enabling ... Google ... Nagios x

### 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

- Unhandled
- Host Problems
- Unhandled
- Network Outages

Show Host

Comments

- Downtime
- Process Info
- Performance Info
- Scheduling Queue

Reporting

- Trends
- Availability
- Alert Histogram
- Alert History
- Alert Summary
- Notifications
- Event Log

Configuration

- View Config

### Current Network Status

Last Updated: Wed Mar 18 18:25:02 EDT 2009  
Updated every 90 seconds  
Nagios® 3.0.6 - [www.nagios.org](http://www.nagios.org)  
Logged in as mizuki

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

### Display Filters:

Host Status Types: All  
Host Properties: Any  
Service Status Types: All Problems  
Service Properties: Any

### Host Status Totals

| Up  | Down | Unreachable | Pending |
|-----|------|-------------|---------|
| 360 | 4    | 0           | 0       |

| All Problems | All Types |
|--------------|-----------|
| 4            | 364       |

### Service Status Totals

| Ok  | Warning | Unknown | Critical | Pending |
|-----|---------|---------|----------|---------|
| 824 | 3       | 1       | 6        | 61      |

| All Problems | All Types |
|--------------|-----------|
| 10           | 899       |

### Service Status Details For All Hosts

| Host                     | Service            | Status   | Last Check          | Duration        | Attempt | Status Information  |
|--------------------------|--------------------|----------|---------------------|-----------------|---------|---|
| dc085.usatlas.bnl.gov    | FM_Faulty          | WARNING  | 03-18-2009 18:18:50 | 1d 0h 22m 12s   | 4/4     | SNMP WARNING - *2*  |
| dc088.usatlas.bnl.gov    | FM_Faulty          | WARNING  | 03-18-2009 18:15:36 | 0d 0h 59m 26s   | 4/4     | SNMP WARNING - *2*  |
| dc089.usatlas.bnl.gov    | FM_Faulty          | WARNING  | 03-18-2009 18:15:39 | 0d 23h 52m 23s  | 4/4     | SNMP WARNING - *1*  |
| grid02.usatlas.org       | check_nrpe_timeout | CRITICAL | 03-18-2009 18:17:17 | 26d 8h 10m 45s  | 4/4     | CHECK_NRPE: Socket timeout after 30 seconds.  |
|                          | grid_proxy         | CRITICAL | 03-18-2009 13:16:17 | 26d 5h 10m 45s  | 3/3     | CHECK_NRPE: Socket timeout after 40 seconds.  |
|                          | grmcp              | CRITICAL | 03-18-2009 18:18:51 | 26d 8h 9m 41s   | 4/4     | (Service Check Timed Out)   |
| gridmon.racf.bnl.gov     | fts                | CRITICAL | 03-18-2009 18:17:34 | 27d 7h 50m 28s  | 4/4     | Failed to determine the interface version of the service: getInterfaceVersion: SOAP fault: SOAP-ENV:Client - CGSI-gSOAP: Could not open connection ! (connect failed in tcp_connect0) |
|                          | fts_oracle         | CRITICAL | 03-18-2009 18:17:37 | 27d 7h 50m 28s  | 4/4     | Failed to determine the interface version of the service: getInterfaceVersion: SOAP fault: SOAP-ENV:Client - CGSI-gSOAP: Could not open connection ! (connect failed in tcp_connect0) |
|                          | guc                | CRITICAL | 03-18-2009 18:24:37 | 29d 9h 12m 50s  | 4/4     | ERROR: guc failed   |
| phnixthump06.rcf.bnl.gov | disk_4var          | UNKNOWN  | 03-18-2009 18:15:13 | 133d 1h 18m 47s | 4/4     | SNMP problem - No data received from host   |

10 Matching Service Entries Displayed



# RT



#12413: Service WARNING alert for FM\_Faulty on dc089.usatlas.bnl.gov detected by Nagios SLA. - Mozilla Firefox

File Edit View History Bookmarks Tools Help

https://rt-racf.bnl.gov/rt/Ticket/Update.html

Most Visited Smart Bookmarks Red Hat Red Hat Magazine Red Hat Network Red Hat Support Google Bookmark docs.sun.com: R...

Disable Cookies CSS Forms Images Information Miscellaneous Outline Resize Tools View Source Options

HEPIX Sp... Webauth... Webauth... Unix at c... cfengine... Enabling ... Le Palais... Thumper... Cacti Enabling ... berserk... Windows... Books24x7 Thors/Th... Bethpag... Enabling ... Google ... Nagios #12...

Stalled Tickets

History

sla-nagios@rcf.rhic.bnl.gov - Ticket created

Subject: Service WARNING alert for FM\_Faulty on dc089.usatlas.bnl.gov detected by Nagios SLA

From: sla-nagios@rcf.rhic.bnl.gov

Nagios detected a new SLA problem for:

Host: dc089.usatlas.bnl.gov

Service: FM\_Faulty

State: Service WARNING

Date/Time: Tue Mar 17 18:35:39 2009

Nagios Server: gcmemon01

URL: https://webdocs.racf.bnl.gov/nagios/cgi-bin/extinfo.cgi?type=2&host=dc089.usatlas.bnl.gov&service=FM\_Faulty

Host Groups: Thor\_Servers\_sw199

Service Groups: dCache

SLA Rule: none

Priority: None

Due on: Fri Mar 18 06:26:01 2011 [in 2 years]

Message: SNMP WARNING - \*1\*

[Reply] [Comment]

Download (untitled) text/plain 458b

Tue Mar 17 18:51:03 2009 RT\_System - Outgoing email recorded [Show]

Tue Mar 17 18:51:03 2009 RT\_System - Outgoing email recorded [Show]

Tue Mar 17 18:51:03 2009 RT\_System - Given to mccarthy

Tue Mar 17 18:51:04 2009 RT\_System - Outgoing email recorded [Show]

Tue Mar 17 18:51:04 2009 sla-nagios@rcf.rhic.bnl.gov - Nagios Server gcmemon01 added

Tue Mar 17 18:51:04 2009 sla-nagios@rcf.rhic.bnl.gov - Nagios Service Groups dCache added

Tue Mar 17 18:51:04 2009 sla-nagios@rcf.rhic.bnl.gov - Nagios Service FM\_Faulty added

Tue Mar 17 18:51:04 2009 sla-nagios@rcf.rhic.bnl.gov - Nagios Host dc089.usatlas.bnl.gov added

Tue Mar 17 18:51:04 2009 sla-nagios@rcf.rhic.bnl.gov - Nagios Host Groups Thor\_Servers\_sw199 added

Wed Mar 18 11:30:29 2009 mizuki - Correspondence added [Reply] [Comment]

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John,

fmadm reports c0k4d0 (in slot 4 - the 2nd disk from left of the bottom row) has a failure. Can we have Sun called and replace the disk if necessary.

This is good exercise for disk replacement on Thor.

PS: Ignore the fmadm faulty report on dc085/dc088. These 2 boxes are currently running some test.

Thanks!

Mizuki

Wed Mar 18 11:30:30 2009 RT\_System - Status changed from 'new' to 'open'

Wed Mar 18 11:30:30 2009 RT\_System - Outgoing email recorded [Show]

Wed Mar 18 11:30:30 2009 RT\_System - Outgoing email recorded [Show]

Wed Mar 18 11:20:48 2009 mizuki - Correspondence added [Reply] [Comment]

Download (untitled) text/plain 320b

https://rt-racf.bnl.gov/rt/Ticket/Display.html?id=12413

rt-racf.bnl.gov Open Notebook



# Evaluation

Nagios - Microsoft Internet Explorer provided by CA

https://webdocs.racf.bnl.gov/nagios/

Google 'dropped\_link\_error\_or\_filtered'

Search

Bookmarks

Check

Translate

AutoFill

angie...

Find: main

Previous

Next

Options

**Nagios**

General

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- Documentation

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- Scheduling Queue

Reporting

- Trends
- Availability
- Alert Histogram
- Alert History
- Alert Summary
- Notifications
- Event Log

Configuration

| Host                  | % Time Up           | % Time Down     | % Time Unreachable | % Time Undetermined |
|-----------------------|---------------------|-----------------|--------------------|---------------------|
| dc001.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc005.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc006.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc008.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc009.usatlas.bnl.gov | 99.897% (99.897%)   | 0.103% (0.103%) | 0.000% (0.000%)    | 0.000%              |
| dc011.usatlas.bnl.gov | 99.926% (99.926%)   | 0.074% (0.074%) | 0.000% (0.000%)    | 0.000%              |
| dc012.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc013.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc014.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc016.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc018.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc019.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc020.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc024.usatlas.bnl.gov | 100.000% (100.000%) | 0.000% (0.000%) | 0.000% (0.000%)    | 0.000%              |
| dc028.usatlas.bnl.gov | 99.998% (99.998%)   | 0.002% (0.002%) | 0.000% (0.000%)    | 0.000%              |
| dc030.usatlas.bnl.gov | 99.998% (99.998%)   | 0.002% (0.002%) | 0.000% (0.000%)    | 0.000%              |
| dc031.usatlas.bnl.gov | 99.995% (99.995%)   | 0.005% (0.005%) | 0.000% (0.000%)    | 0.000%              |
| dc032.usatlas.bnl.gov | 99.971% (99.971%)   | 0.029% (0.029%) | 0.000% (0.000%)    | 0.000%              |
| dc033.usatlas.bnl.gov | 99.953% (99.953%)   | 0.047% (0.047%) | 0.000% (0.000%)    | 0.000%              |
| dc034.usatlas.bnl.gov | 99.988% (99.988%)   | 0.012% (0.012%) | 0.000% (0.000%)    | 0.000%              |
| dc035.usatlas.bnl.gov | 99.989% (99.989%)   | 0.011% (0.011%) | 0.000% (0.000%)    | 0.000%              |
| dc036.usatlas.bnl.gov | 99.998% (99.998%)   | 0.002% (0.002%) | 0.000% (0.000%)    | 0.000%              |
| dc037.usatlas.bnl.gov | 99.992% (99.992%)   | 0.008% (0.008%) | 0.000% (0.000%)    | 0.000%              |
| dc038.usatlas.bnl.gov | 99.960% (99.960%)   | 0.040% (0.040%) | 0.000% (0.000%)    | 0.000%              |
| dc039.usatlas.bnl.gov | 99.955% (99.955%)   | 0.045% (0.045%) | 0.000% (0.000%)    | 0.000%              |
| dc040.usatlas.bnl.gov | 99.965% (99.965%)   | 0.035% (0.035%) | 0.000% (0.000%)    | 0.000%              |
| dc041.usatlas.bnl.gov | 99.962% (99.962%)   | 0.038% (0.038%) | 0.000% (0.000%)    | 0.000%              |
| dc042.usatlas.bnl.gov | 99.983% (99.983%)   | 0.017% (0.017%) | 0.000% (0.000%)    | 0.000%              |
| dc043.usatlas.bnl.gov | 99.985% (99.985%)   | 0.015% (0.015%) | 0.000% (0.000%)    | 0.000%              |
| dc044.usatlas.bnl.gov | 99.687% (99.687%)   | 0.313% (0.313%) | 0.000% (0.000%)    | 0.000%              |
| dc045.usatlas.bnl.gov | 99.944% (99.944%)   | 0.056% (0.056%) | 0.000% (0.000%)    | 0.000%              |
| dc046.usatlas.bnl.gov | 99.998% (99.998%)   | 0.002% (0.002%) | 0.000% (0.000%)    | 0.000%              |
| dc017.usatlas.bnl.gov | 99.998% (99.998%)   | 0.002% (0.002%) | 0.000% (0.000%)    | 0.000%              |
| dc048.usatlas.bnl.gov | 99.951% (99.951%)   | 0.049% (0.049%) | 0.000% (0.000%)    | 0.000%              |
| Average               | 99.973% (99.973%)   | 0.027% (0.027%) | 0.000% (0.000%)    | 0.000%              |

Internet

100%





# Status update/Future plan



- Merge SLA to RT due to the close relationship between SLA & RT.
- Change the notification method from Nagios to SLA to avoid user misbehave. Reading directly from Nagios object cache to keep the consistency and accuracy.
- Enhance the rule engine in order to deliver more efficient/informative alerts.
- Enhance the Web UI to give the visual outlook of the condition of the infrastructure.