



SAS® FORUM  
UNITED KINGDOM 2015

# Approaching a Platform Migration

Approaches to SAS migration and Platform LSF considerations for SAS/Grid

# Topics

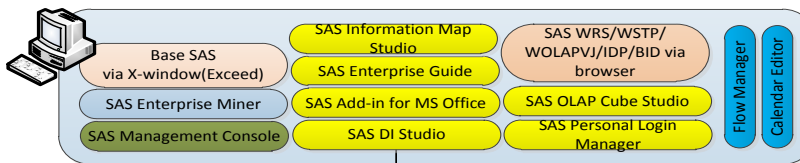
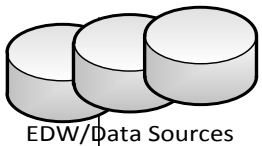
- Scope
- Architecture
- Migration
- Questions
- Grid considerations
- Questions

# Bell Canada SAS migration

- 24 months
- 16 Business units
- 50 Developers
- 200 SAS analysts
- 600 Enterprise Guide users
- 4000 Job Flows
- 4000 Web service users
- 96 cpu and 44 Tb disk

# Old architecture

- Two maxed-out Solaris M5000
- Compute and Metadata on both
- Solaris MidTier
- SAS v92
- Platform LSF and Process Manager (not Grid)



## Pre-Production

Oracle Sol/Sparc dc3c89

### Meta/Compute

SAS Metadata Server

### BUxApp/BUxApp-Adm

x 12

- SAS Workspace Server
- SAS Data Step Batch Server
- SAS Stored Process Server
- SAS Pool Workspace Server
- SAS OLAP
- LSF/PM Scheduler

SPDS

Ent Content Cat

SAS/Access to DB2/Sybase/Tera/ODBC/Oracle/MSSQL  
Data Surveyor to SAP

Pre-PRD SAN

Centrify/AD Authentication  
Metadata Security – Locked, Non-Governed  
File System Security – Locked, Non-Governed

Oracle Sol/Sparc dc3c1n

### Mid-Tier

- SAS Web Report Studio
- SAS Web OLAP Viewer
- SAS Web Stored Process Apps
- SAS BI Dashboard
- SAS Information Delivery Portal
- SAS Content Server
- SAS Analytic Platform

SASServer1  
Jboss

## Production

Oracle Sol/Sparc dc2c1s

### Meta/Compute

SAS Metadata Server

### BUxApp

x 12

- SAS Workspace Server
- SAS Data Step Batch Server
- SAS Stored Process Server
- SAS Pool Workspace Server
- SAS OLAP
- LSF/PM Scheduler

Dataflux/RTIS

SAS/Access to DB2/Sybase/Tera/ODBC/Oracle/MSSQL  
Data Surveyor to SAP

PRD SAN

Centrify/AD Authentication  
Metadata Security – Locked, Governed  
File System Security – Locked, Governed

Oracle Sol/Sparc dc2cb8

### Mid-Tier

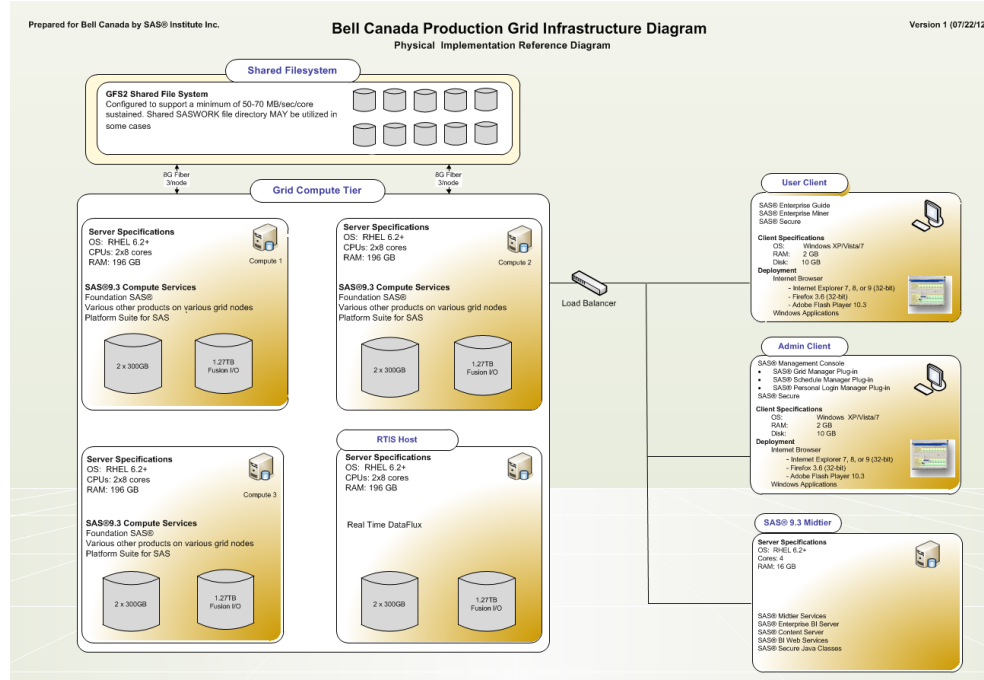
- SAS Web Report Studio
- SAS Web OLAP Viewer
- SAS Web Stored Process Apps
- SAS BI Dashboard
- SAS Information Delivery Portal
- SAS Content Server
- SAS Analytic Platform

JASS Auth w/SiteMiner  
SASServer1  
Jboss

# New architecture

- Red Hat Enterprise Linux
- Dev, QAT and Prod hardware segregation
- SASv9.4 with SAS/Grid
- Platform LSF 9.1 and Process Manager with Group admin capability

# Simpler version



# Migration approaches

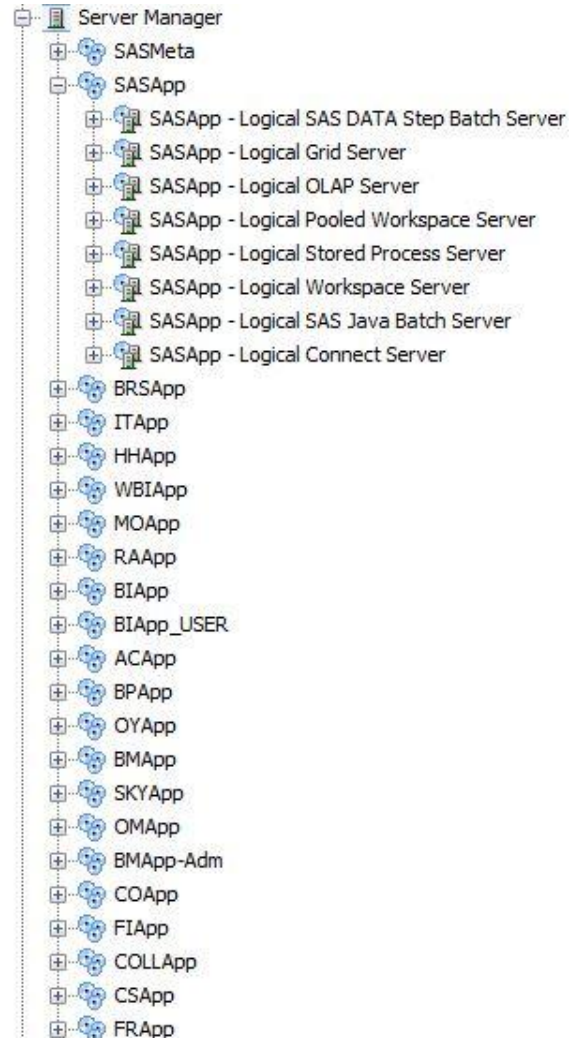
- Slow re-engineering
- Outsource
- Self service
- Big Bang

‘Instance’ as unit of migration



# Instance

- Set of logical servers
- Unix mount point
- Metadata group
- AD group



# Slow re-engineering

- Replicate Prod to separate hardware (QAT)
- Multiple instances
- 6 months transition from old Prod to QAT
- Extensive changes and testing
- 2 month cutover from QAT to new Prod

# Outsource

- Like-for-like replication
- Fixed price over 4-6 weeks
- Manual keyboard entry
- Offshore providers following standard template

# Self service

- Full access to separate instance on Dev
- Limited access to separate instance on Prod
- 3 months gradual cutover
- Careful user management

# Big bang

- Full access to separate instance on Dev
- 6 months functional testing in Dev
- Two months test load in Prod
- Cut-over on a long weekend
- No back out after first 48 hours

# Management

- Weekly Governance Committee – sponsor, business primes
- Daily activity call – project manager, tech leads
- Adhoc strategy planning – tech leads, architects

# Questions?

- Instances – Logical servers, separate file system, Groups
- Slow re-engineering – migration tool failures, manual verification using DIS, DeployedJobs and JobFlows
- Outsourcing – working within resource limitations, accommodating environment differences
- Self-service – co-ordinating stakeholders
- Big bang – risk vs benefit

# Migration to SAS/Grid

- Load balancing
- Governance
- Production hardening
- Delegation and segregation
- Monitoring
- Single node services



# Load balancing

- Protecting critical services
- Application specifics
- LSF queues
- Slots
- RTM web interface

# Governance

- Allocation of shared resources
- Conflicts and contention
- Delegation of administrative authority
- Dynamic control
- Operational rules

# Production hardening

- Change management
- Configuration
- Service guarantees
- Security
- Failover and recovery

# Delegation and segregation

- Metadata Roles
- Metadata ACTs
- Internal accounts
- Unix ACLs
- Active Directory Groups + Centrify

# Monitoring

- RTM – User and admin access
- LSF commands – bjobs, bstatus, bhist, jhist, lsload
- Unix monitoring tools – top, nmon, Vantage
- SAS MC Schedule Manager
- Platform Flow Manager

# Single node services

- SAS/Share and SAS/IntrNet
- Outgoing jdbc
- Incoming sftp
- Xcmd limitations
- DataFlux
- Hadoop

# Questions?

- Load balancing
- Governance
- Production hardening
- Delegation and segregation
- Monitoring
- Single node services

# Protecting critical services

- Metadata server(s)
- DataFlux
- Grid controller(s)
- SAS/Share
- SAS/IntrNet



# Application specifics

- Enterprise Guide – report consumers, analysts, developers
- DI Studio – Jobs, Flows
- Process Manager – Flows, calendars

# LSF Queues

- Production
- Priority
- Normal
- Express

# Slots

- 8 per cpu default
- More for ETL
- Less for EG

# RTM web interface

Cluster:  Group:  Status:  Refresh:

Model:  Type:  User:  Records:

Resource:

Search:

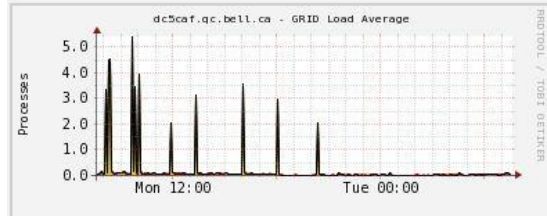
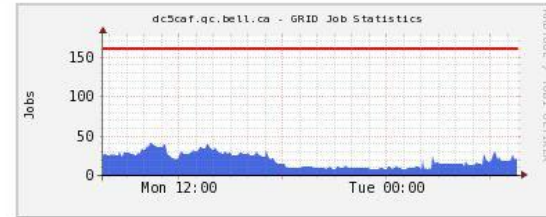
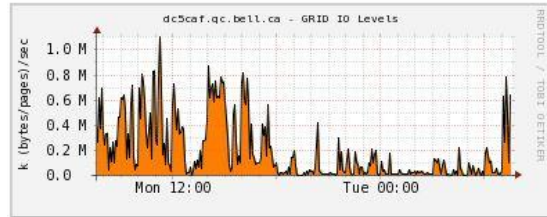
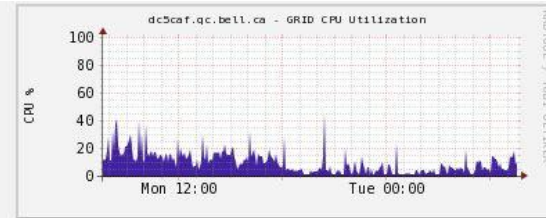
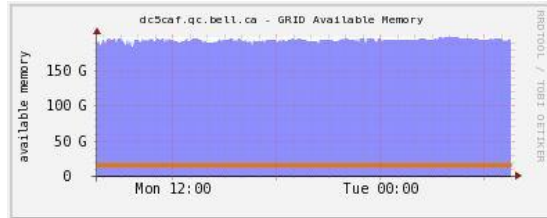
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Actions	Host Name	Cluster	Type	Model	Load/Batch	CPU Fact	CPU Pct	RunQ 1m	Max Slots	Num Slots	Run Slots**
	<a href="#">dc5caf.qc.bell.ca</a>	sas94-cluster	X86_64	Intel_EM64T	Ok:Ok	60	13.27%	0.02	160	37	37
	<a href="#">dc5cah.qc.bell.ca</a>	sas94-cluster	X86_64	Intel_EM64T	Ok:Ok	60	18.13%	0.04	160	13	13
	<a href="#">dc5caj.qc.bell.ca</a>	sas94-cluster	X86_64	Intel_EM64T	Ok:Ok	60	11.27%	0.02	60	11	11
	<a href="#">dc5cad.qc.bell.ca</a>	sas94-cluster	X86_64	Intel_EM64T	Ok:Ok	60	10.04%	0.01	160	11	11

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# RTM web interface



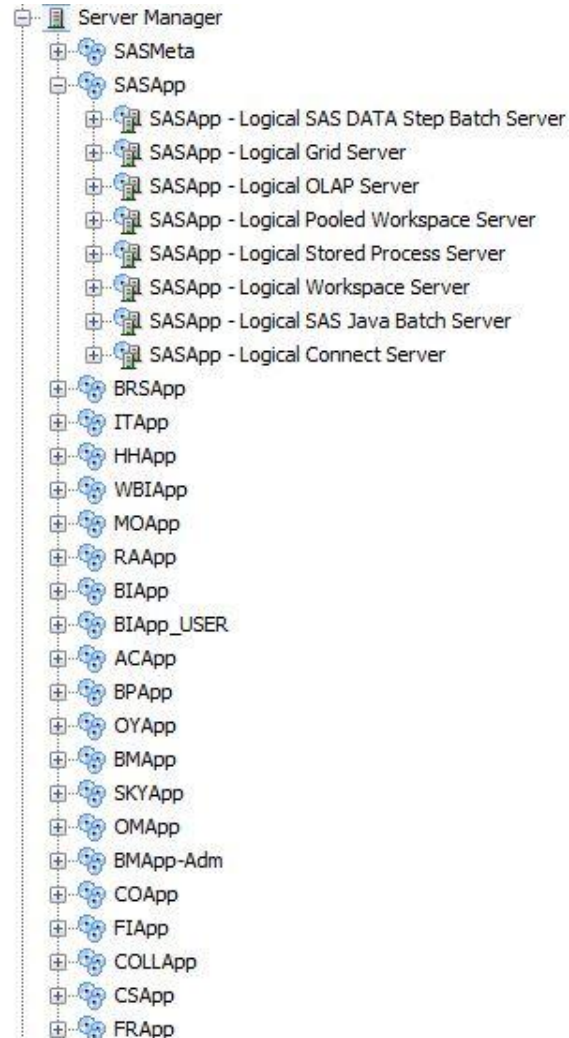
# Contact

andrew.farrer@bell.ca

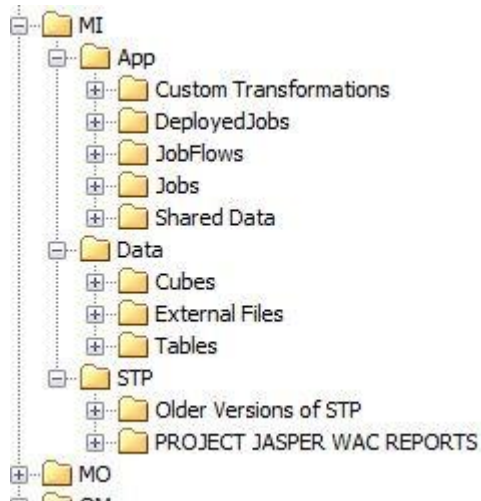
acfarrer@gmail.com

# Instance

- Set of logical servers
- Unix mount point
- Metadata group
- AD group



# Metadata objects



- Group - WBI - SAS General Servers
- Group - WBI Administrators
- Group - WBI Developers
- Group - WBI Managers
- Group - WBI Users
- OY - Group - General Servers
- OY - Group - Horizon IT Team
- OY - Group - KPI\_IPTV
- OY - Group - MDI\_TEAM
- OY - Group - OYADM
- OY - Group - OYDEV
- OY - Group - OYGROUP
- OY - Group - OYUSER
- Access Login SQL Server BBM GWSTAGUDB
- | BI | Access Login | MySql BITS-PROD
- | BI | Access Login | Oracle ACUT-PROD

- BI Admin Write ACT
- BI Analytical Group Write ACT
- BI Baseline Admin ACT
- BI Baseline All User Read ACT
- BI Baseline All User ReadWrite ACT
- BI Baseline Analytical Read ACT
- BI Baseline Only Dev Read ACT
- BI Baseline Only Dev ReadWrite ACT
- BI Baseline System Support Users
- BI Developer Job Write ACT
- BI Non Dev User Deny ACT



## Application servers

- SAS Management Console
- Environment Management
  - Authorization Manager
  - Data Library Manager
  - Map Service Manager
  - SPD Management
  - Schedule Manager
  - Server Manager
    - OMApp
    - ACApp
    - MIApp
    - RAApp
    - COApp
    - OYApp
    - RBAApp
    - FIApp
    - MSApp
    - VIApp
    - ITApp
    - COApp-Adm
    - ITApp-Adm

## Spawners and services

- SASTS - Logical Table Server
- Share Server - dc2c1s
- Orade BCV domain
- CBOW01:Modeling
- SAS Content Server
- SAS In-Process Services
- HPF
- Orade WAC
- OMApp - Object Spawner - dc2c1s
- Connect Spawner - OMApp
- ACApp - Object Spawner - dc2c1s
- Connect Spawner - ACApp
- MIApp - Object Spawner - dc2c1s
- Connect Spawner - MIApp
- RAApp - Object Spawner - dc2c1s
- Connect Spawner - RAApp
- COApp - Object Spawner - dc2c1s
- OYApp - Object Spawner - dc2c1s
- Connect Spawner - OYApp
- RBAApp - Object Spawner - dc2c1s
- Connect Spawner - RBAApp
- FIApp - Object Spawner - dc2c1s
- Connect Spawner - FIApp
- MSApp - Object Spawner - dc2c1s
- Connect Spawner - MSApp
- VIApp - Object Spawner - dc2c1s
- Connect Spawner - VIApp
- Connect Spawner - COApp
- Bell - SPDS Server

## Access groups

- Group - Fraud Administrators
- Group - Fraud Developers
- Group - Fraud Managers
- Group - Fraud Users
- Group test\_co
- Access Login - EXT - MART
- Access Login - EXT - REPORT
- Access Login - MI - Automation
- Access Login - MI - BMLAPPO
- Access Login - MI - Scorecard
- Access Login - PRCOMPDB
- BI Dashboard Administrators
- BI Dashboard Users
- BI Web Services Users
- PUBLIC
- SAS Administrators
- SAS General Servers
- SAS System Services
- SASUSERS
- Table Server Administrators
- test
- | Access Login | BCV Database
- | Access Login | Bell SPDS
- | Access Login | Modeling Database
- | Access Login | WAC
- | Business Intelligence |

## User Roles and security

- Metadata Server: Unrestricted
- Metadata Server: User Administration
- Metadata Server: Operation
- Add-In for Microsoft Office: Advanced
- Add-In for Microsoft Office: OLAP
- Add-In for Microsoft Office: Analysis
- Management Console: Advanced
- Management Console: Content Management
- Web Report Studio: Report Viewing
- Web Report Studio: Report Creation
- Web Report Studio: Advanced
- BI Dashboard: Administration
- Metadata Server: BU Admin
- Compensation Web Report Studio: Report Viewing

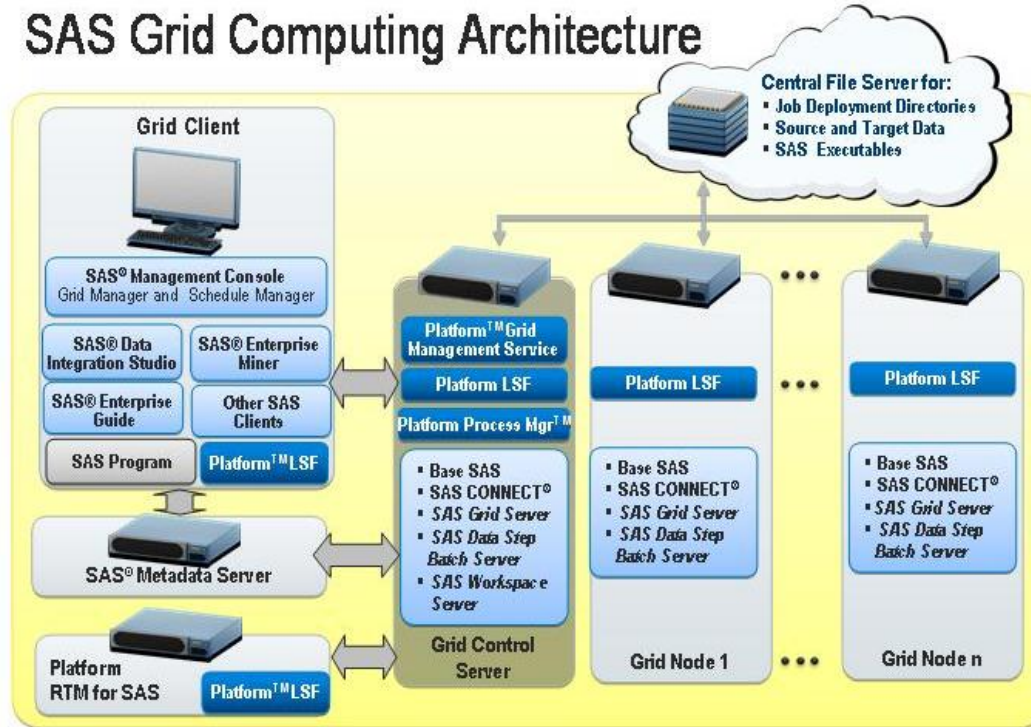
## Users

- SAS Administrator
- SAS Trusted User
- Forecast Server Administrator

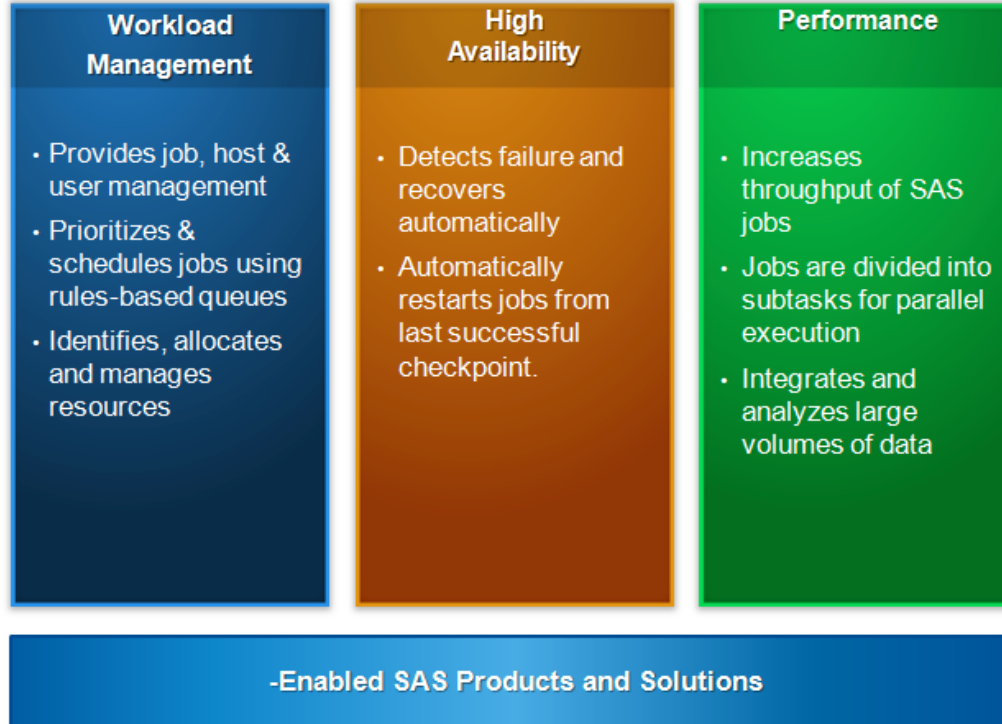
## Mid-tier configuration

- Configuration Manager
- BI Dashboard 4.2
- BI Dashboard 4.2 - Event Generator
- BI Portlets 4.2
- BI Rep Svc Workspace Config 4.2
- BI Web Services for Java 9.2
- Help Viewer Meta Config 9.2
- Information Delivery Portal 4.2
- JSR168 Remote Portlet 4.2
- Logon Manager 9.2
- Package Viewer 4.2
- Preferences Manager 9.2
- SAS Application Infrastructure
- SASTheme\_Bell
- SASTheme\_Dealers\_DO\_NOT\_USE
- SASTheme\_Virgin\_Mob\_DO\_NOT\_USE
- SASTheme\_default
- Shared Applications 9.2
- Shared Portlets 9.2
- Shared Services 9.2
- Stored Process Web App 9.2
- Web Administration Console 9.2
- Web Infra Platform Services 9.2
- Web Infra Platfrm CIntAccss 9.2
- Web Infra Platfrm Soap Svcs 9.2
- Web OLAP Viewer 4.2
- Web Report Studio 4.2
- Workflow Services 9.2
- Workflow Web Services 9.2

# SAS Grid Computing Architecture



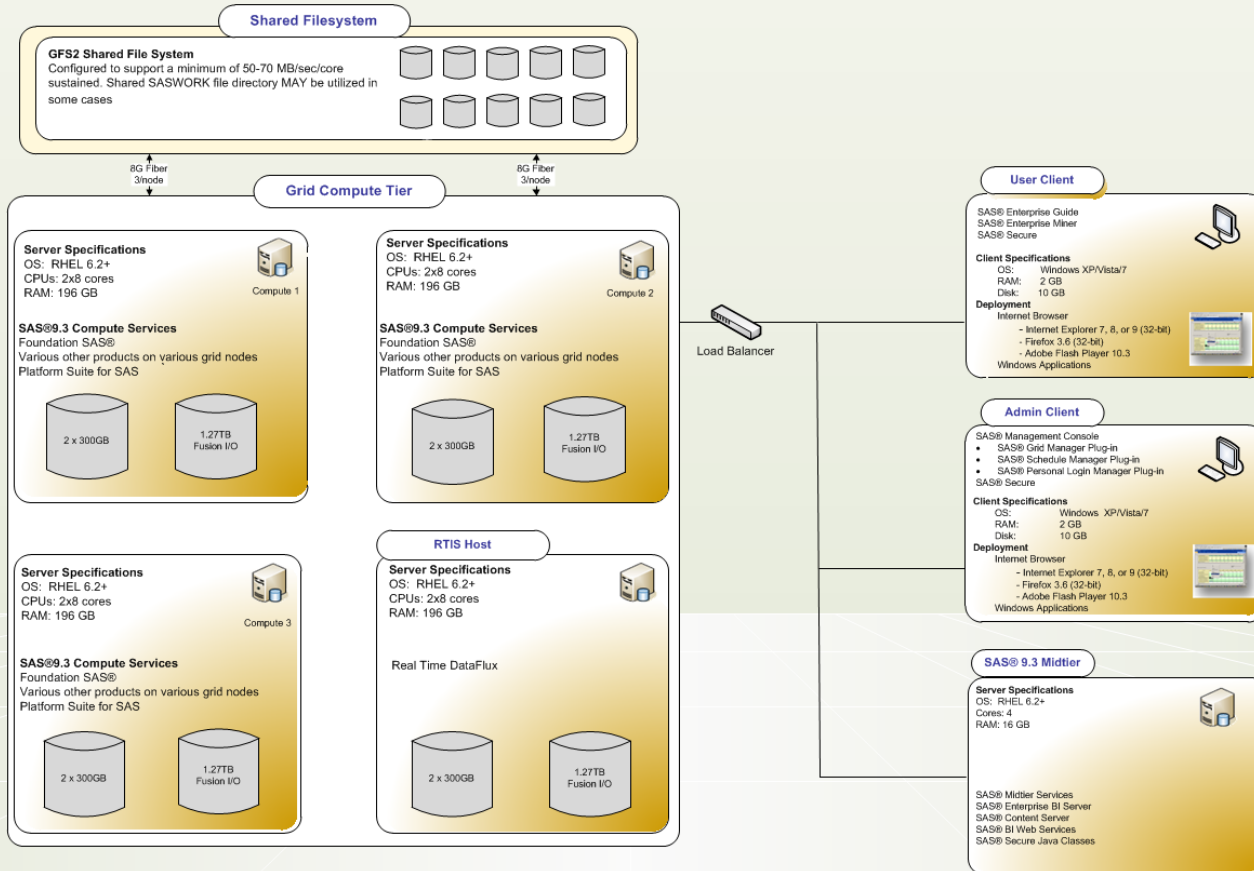
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	Grid Environment	Non-Grid Environment
<b>PROS</b>	<ul style="list-style-type: none"> <li>• Better job/resource manageability</li> <li>• Better High Availability (HA)</li> <li>• Application acceleration, Job parallelization capability</li> <li>• Better utilization of HW</li> <li>• Better flexibility and scalability</li> <li>• Better way to share a single resource pool for two or more environments scenario</li> <li>• Yield better performance overall</li> </ul>	<ul style="list-style-type: none"> <li>• Eliminate one layer of complexity</li> <li>• No impact to the current BU scheduling approach</li> </ul>
<b>CONS</b>	<ul style="list-style-type: none"> <li>• More complex to manage/troubleshoot</li> <li>• Additional training required for SAS Admin and potential SAS users in order to maximize the Grid benefit</li> <li>• Requirement to re-architecture the scheduling approach, share a single scheduler instead.</li> </ul>	<ul style="list-style-type: none"> <li>• No job parallelization</li> <li>• Less job/environment HA</li> <li>• Less hardware utilization</li> </ul>

# Bell Canada Production Grid Infrastructure Diagram

## Physical Implementation Reference Diagram



# Abstract

- In the process of moving 900 users, from SASv9.2 on Solaris to Grid/SASv9.4 on Linux, many lessons were learned. 16 business units had a diverse set of expectations and 4 different strategies were used : Self managed, Outsourced, Re Engineered and Big Bang. The presentation will cover some architecture, the project management structure and each scenario. If time permits, some useful techniques and pitfalls will be discussed.





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