

Platform[™]
The Power of Sharing

Dynamic HPC Datacenter
- the best of Grid & Cloud
HPDC 2009 Munich



Bernhard Schott
EU-Research Program Manager bschott@platform.com Platform Computing GmbH

Date: June 2009



- Introduction on Platform Computing
 - Platform solutions for HPC in research and industry
- The best of Grids and Clouds
 - Managing the dynamic Datacenter
- Introducing Platform DDC
 - Dynamics from the Cloud – Performance from the Grid
- Summary
- Sorry, not today: Green datacenter

<http://www.ogf.org/OGF25/materials/1654/Energy+Optimization+of+Existing+Datacenters+-+Bernhard+Schott+-+Platform.pdf>

5,000,000

Managed CPUs

2,000

Customers worldwide

500

Employees in 15 offices

17

Years of profitable growth

1

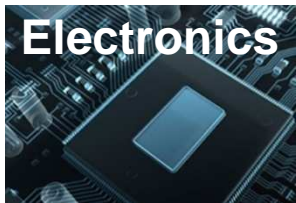
Leader in HPC



- **Recognized leader and pioneer in Grid computing and HPC**
 - 17 years solving the most challenging enterprise distributed computing problems
 - Global offices, resellers and partners
 - 24x7 worldwide service, support, and consulting
 - Continual innovation in new product development & open standards
 - Growing and profitable since its inception

Winner of Gartner's "Cool Vendor, 2006"
Platform Computing awarded "Cool Vendor in IT Operations Mgmt, 2006"

Platform Computing in Top 10 Virtualization Vendor to Watch in 2008:
<http://www.cio.com/article/160951>



Electronics

- AMD
- ARM
- Broadcom
- Cadence
- Cisco
- Infineon
- MediaTek
- Motorola
- NVidia
- Qualcomm
- Samsung
- Sony
- ST Micro
- Synopsys
- TI
- Toshiba



Financial Services

- BNP
- Citigroup
- Fortis
- HSBC
- KBC Financial
- JPMC
- Lehman Brothers
- LBBW
- Mass Mutual
- MUFG
- Nomura
- Prudential
- Sal. Oppenheim
- Société Générale



Industrial Mfg.

- Airbus
- BAE Systems
- Boeing
- Bombardier
- Deere & Company
- Ericsson
- Honda
- General Electric
- General Motors
- Goodrich
- Lockheed Martin
- Nissan
- Northrop Grumman
- Pratt & Whitney
- Toyota
- Volkswagen



Oil & Gas

- Agip
- BP
- British Gas
- China Petroleum
- ConocoPhillips
- EMGS
- Gaz de France
- Hess
- Kuwait Oil
- Petrobras
- Petro Canada
- PetroChina
- Shell
- StatoilHydro
- Total
- Woodside



Gov & Edu

- CERN
- DoD, US
- DoE, US
- ENEA
- AWE
- Georgia Tech
- Harvard Medical School
- Japan Atomic Energy Inst.
- MaxPlanck Inst.
- MIT
- SSC, China
- Stanford Medical
- TACC
- U. Tokyo
- Washington U.



Life Sciences

- Abott Labs
- AstraZeneca
- Celera
- DuPont
- Eli Lilly
- Johnson & Johnson
- Merck
- National Institutes of Health
- Novartis
- Partners Health Network
- Pharsight
- Pfizer
- Sanger Institute

Other Industries

AT&T
IRI

Bell Canada
Telecom Italia

DreamWorks Animation
Telefonica

SKG
Walt Disney Co.

GE



Platform OCS 5 and Platform Manager integrated in Dell cluster systems



Platform LSF, Platform Manager form key parts of Unified Cluster Portfolio



Platform enterprise solutions support a wide range of IBM HPC systems



Platform delivers first certified Intel® Cluster Ready solution, Platform OCS 5



Integrates Platform LSF and Platform Symphony in grid solutions



Platform OCS 5 powers the Red Hat® HPC Solution



OEMs Platform's core technology in SAS® applications

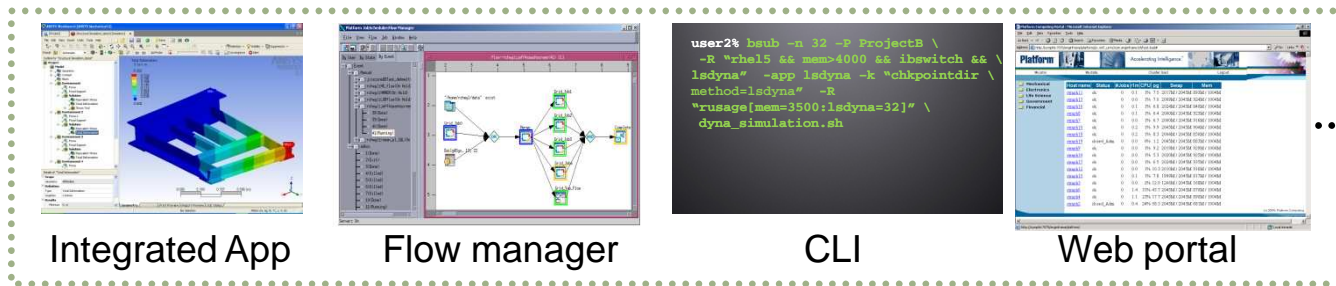


Platform™

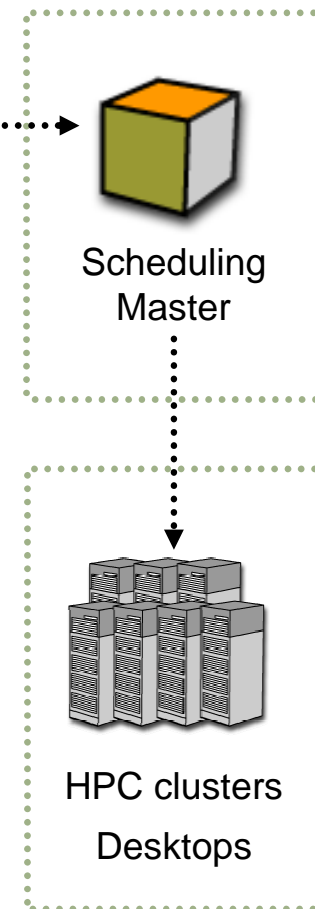


Platform Solutions for
Research & Education

User Interfaces



Workload Management



Application Execution

Platform Accelerate provides:

- Ease of use and secure UI
- High performance workload scheduler
- Data management via Web portal or flow manager
- Fault tolerance of hardware failure

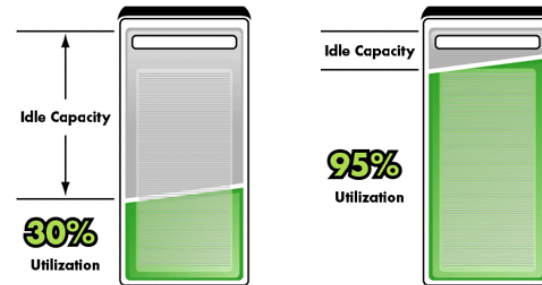
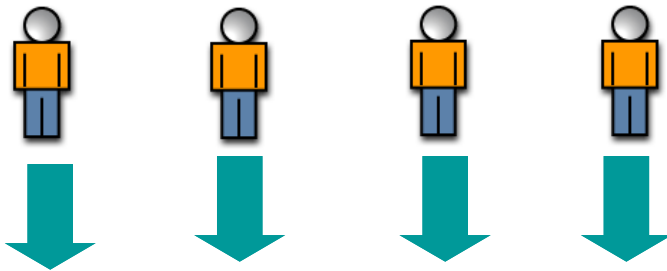
Solution components:

- Platform LSF
 - Platform LSF Desktop
- EngineFrame
- Platform Process Manager

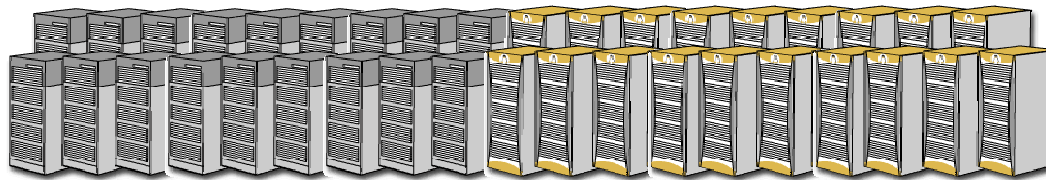


When we grid enable services or applications, applications run more quickly, asset utilization is higher and reliability comes “for free”

USER A USER B USER C USER D

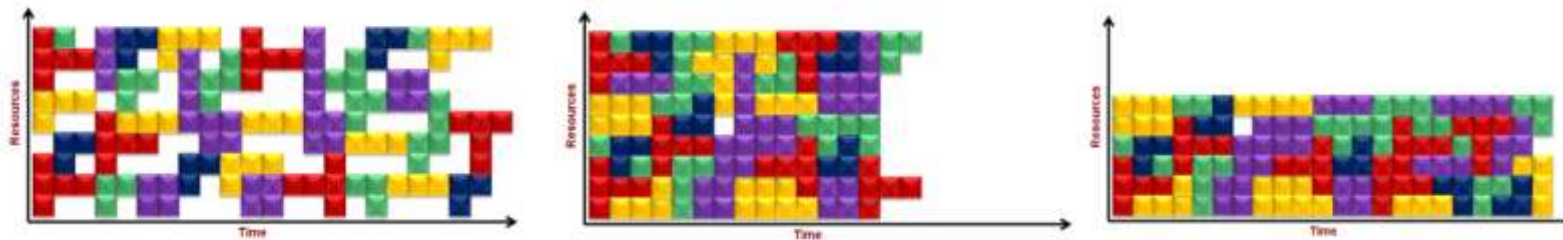


Virtualized view of compute, network and storage resources

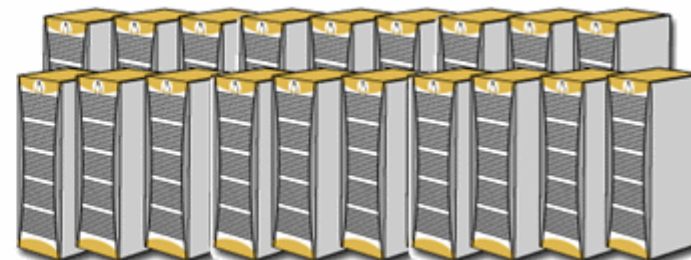


Platform LSF

By scheduling workloads intelligently according to policy, Platform LSF reduces application run-times and optimizes resource use.

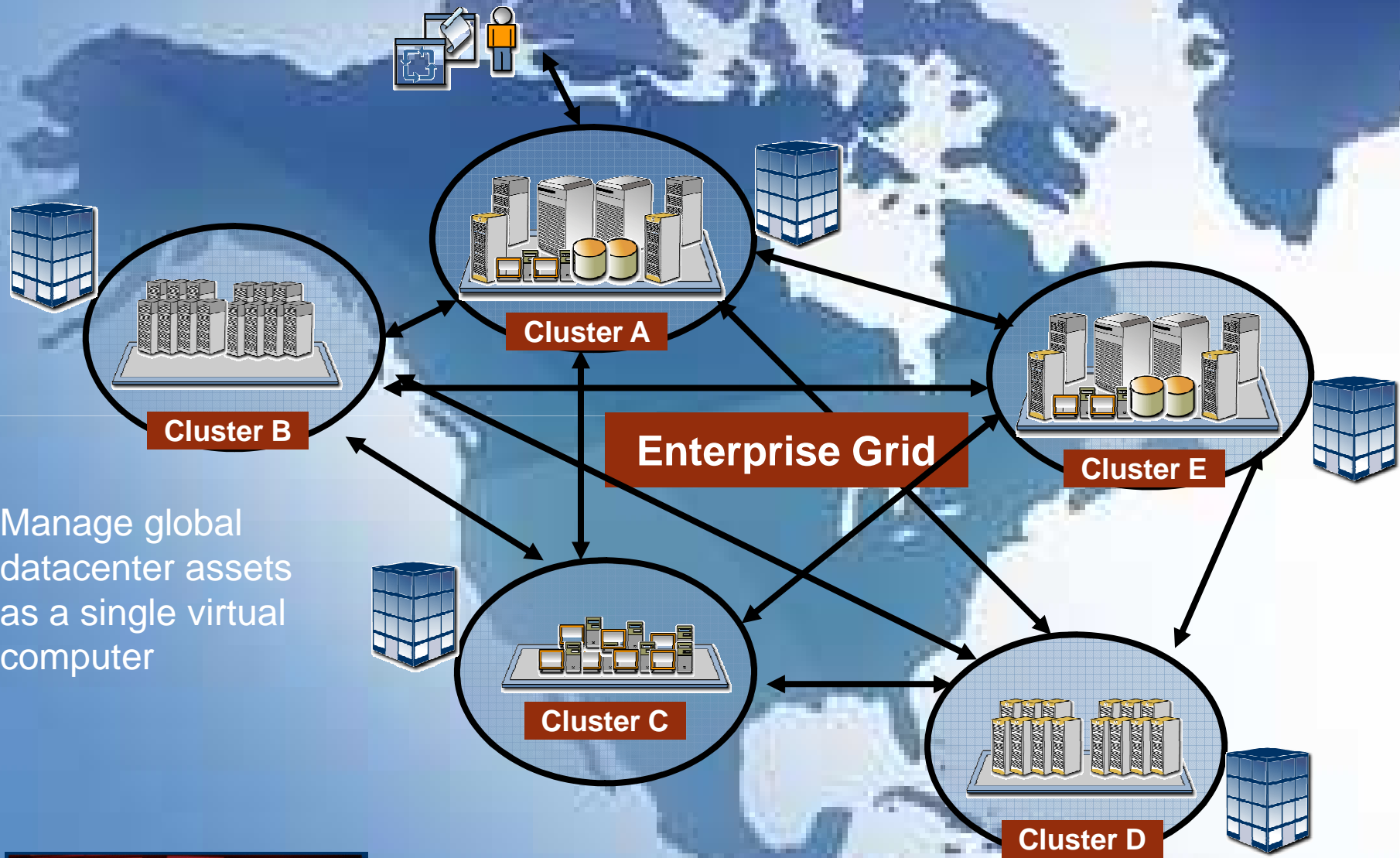


Virtualized view of compute, network and storage resources



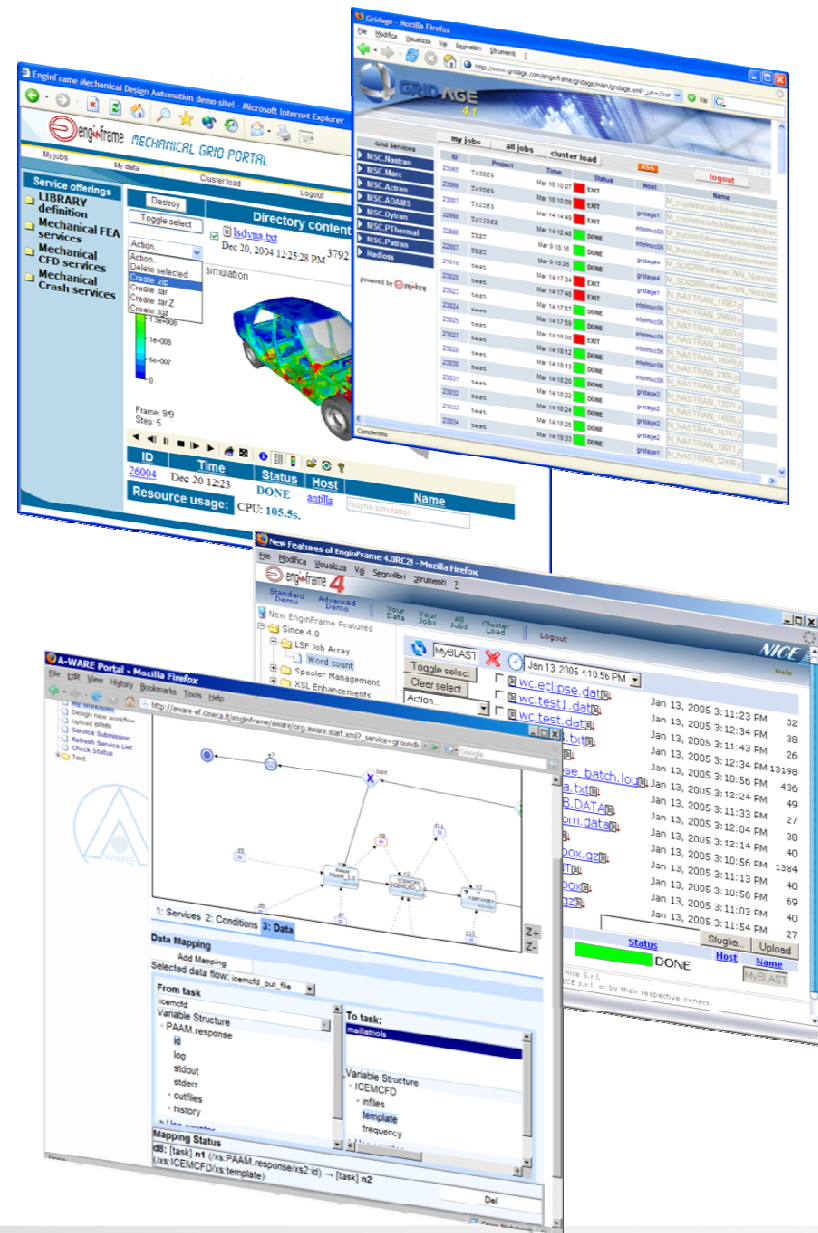


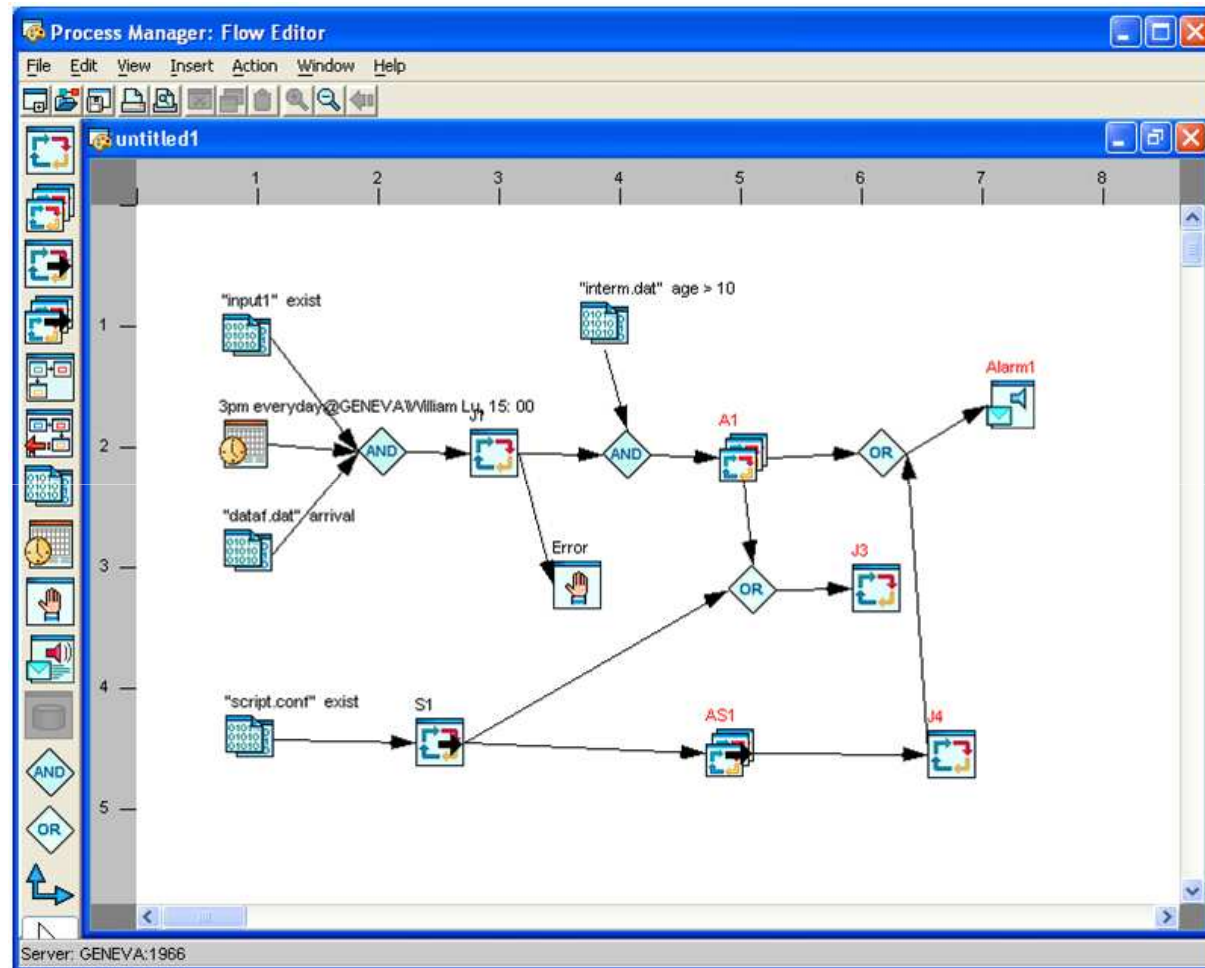
- Unmatchable **resource sharing**
 - Combine clusters into one resource pool
 - Centralized control across sites
 - Increase productivity
 - Faster turnaround
 - Resource prioritization
 - Better job throughput
 - Defer future hardware purchases
 - Lower operational cost through standardization
 - Reduce costs of downtime with high fault tolerance



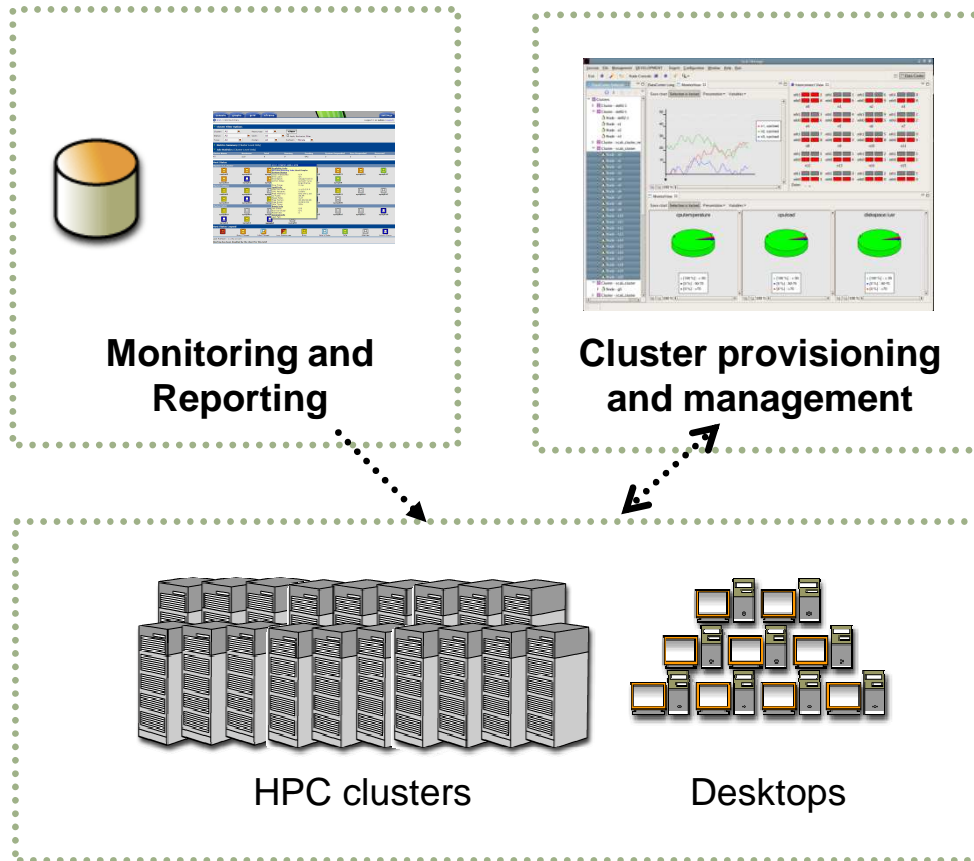
Manage global datacenter assets as a single virtual computer

- Highly customizable job submission
- Flexible, cost-effective integration of CAE & Windows desktops
- Intuitive job monitoring and management





- Manages data and job flow in one interface
- Automatically parallelizes the flow and executes in distribute environment
- Documents the flow to retain IP



Platform Manage provides:

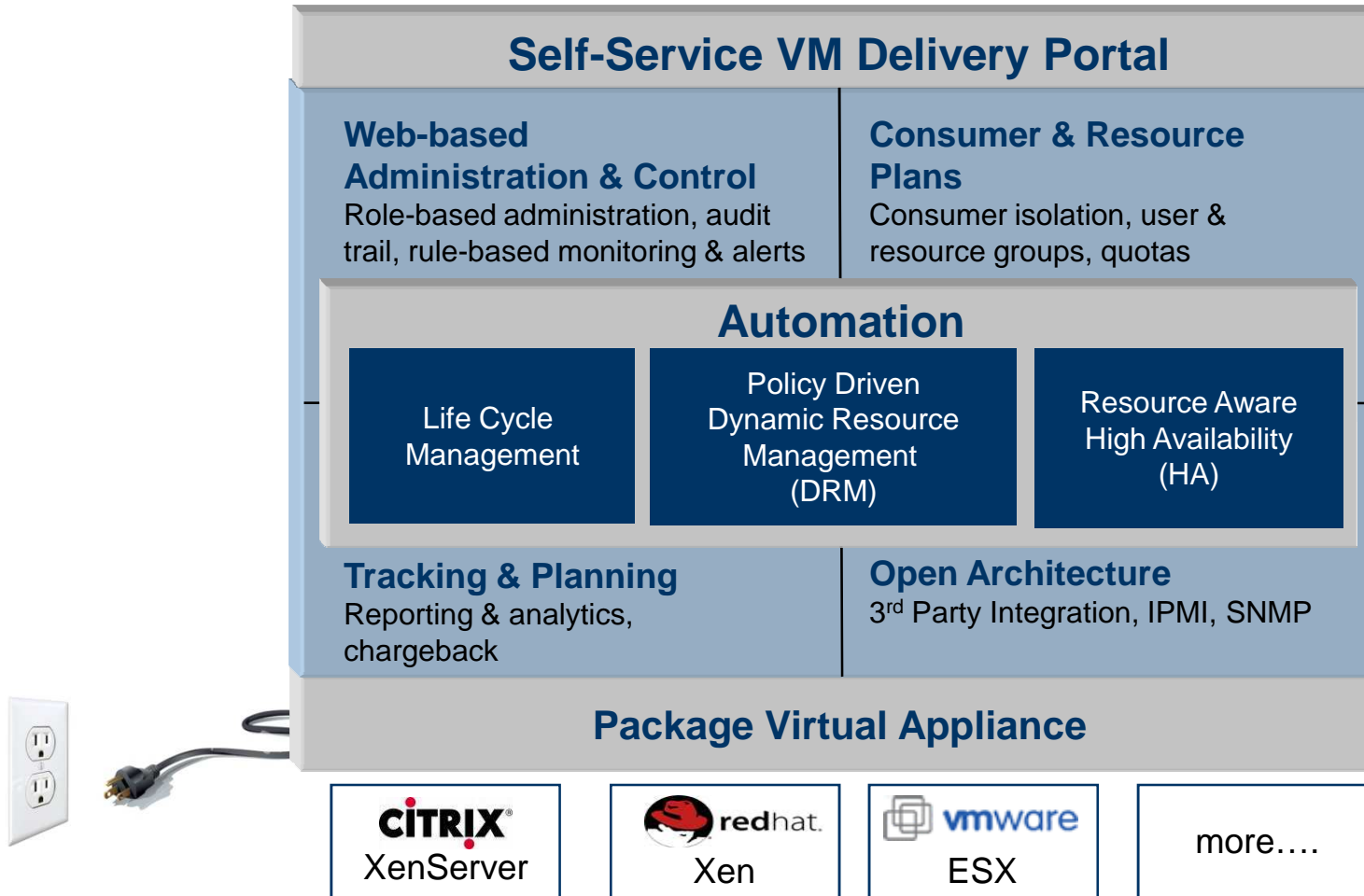
- Monitoring of multiple clusters for hosts, workload, & floating software licenses
- Host provisioning
- Remote administration

Solution components:

- Platform RTM
- Platform Manager
- OCS



Platform VMO



VMO Maximizes ROI from Virtualization



- Dashboard for multiple workload management clusters
- Job profiling
- Historical performance reporting
- Floating license monitoring
- Job accounting and charge back



HPC Community - Mozilla Firefox

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

HPCCommunity.org

User Name User Name
 Password
 Remember

HPC Community

Home Communities Forum Community Blogs Downloads Search

About The HPCCommunity.org Initiative

The HPCCommunity.org effort is a technical community for the High Performance Computing (HPC) community. We focus on:


- best practise in building, operating and managing HPC clusters
- programming HPC clusters and Grid
- components of HPC clusters such as batch schedulers, cluster filesystems, cluster monitoring, systems management including deployment and maintenance of clusters
- high performance, low latency grid middleware
- enterprise grid resource management technology
- state-of-the-art, bleeding edge research within Platform and our global research partners

HPCCommunity.org is sponsored by Platform Computing Corporation and is dedicated to supporting both Platform Computing and non-Platform technologies.




We aim to share with the community our technology from 15 years of leadership in High Performance Computing (HPC) and Grid and we welcome the participation of all interested parties.

[Read more about HPCCommunity.org...](#)

Communities

 <p>Next generation, open source, HPC cluster management stack. It is the foundation of Platform OCS5 and Red Hat HPC Solution.</p>	 <p>Symphony Developer Edition is a free-to-use HPC service-oriented middleware solution that enables developers to quickly improve their application's performance. Symphony is used in production by major financial services institutions.</p>	 <p>LSF is the gold standard for workload management. Here you will find open source and free software contributed by the community.</p>	 <p>Enterprise Grid Orchestrator (EGO) is a policy-based distributed resource manager. The EGO Developers' Edition (EGO DE) includes an SDK for integrating software applications with EGO, enabling them to dynamically share a common pool of EGO managed resources.</p>
---	---	--	---

Collaborative Projects

 <p>Research into applicability of Service Oriented Middleware (SOAM) to high performance numerical computing.</p>	 <p>University of Rome is using Symphony DE and a compute grid provided by ENEA to parallelize numerical methods for pricing European options.</p>	 <p>University of Toronto is working on Snowflake, a system to support multiple concurrent virtual clusters running "on demand" on a single network to accelerate various HPC applications.</p>	 <p>Jilin University is implementing JSR237/WorkManager with Symphony. A JSR237 application can be grid-enabled with minimal changes and provide better performance/scalability</p>
---	---	--	---

» DOWNLOADS

Most Popular Files	Downloads
ego-sdk-1.2.3-0...	39
SymphonyDE4.0.0...	37
LSF_Batch_0.05...	15
Install_PMC.txt	14

» Popular Tags

configuration deployment hpc
 kusu kusu kit lcf option pricing
 quantitative analysis standards
 symphony

» Most Read Blog Posts

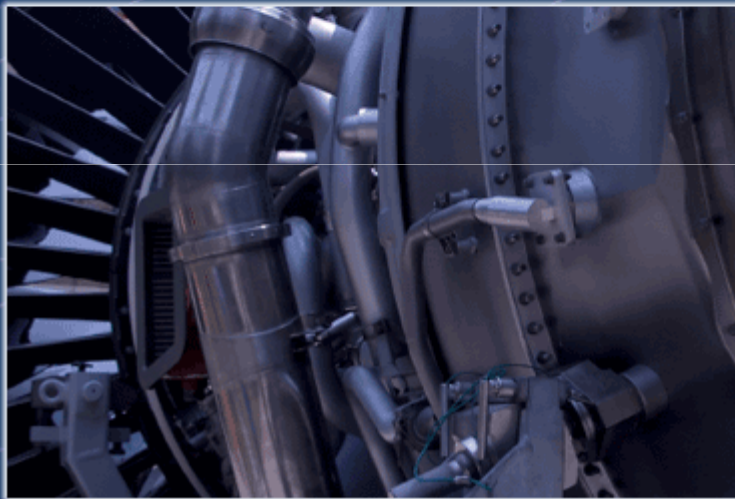
[Research Topics in HPC](#) (623 views)
[About the HPCCommunity.org initiative](#) (379 views)
[Symphony DE Application Performance](#) (351 views)
[Symphony Applications in the Financial Services Industry](#) (297 views)
[Summary of Symphony Presentation to MSR&G at U of T](#) (260 views)

» Most Read Articles

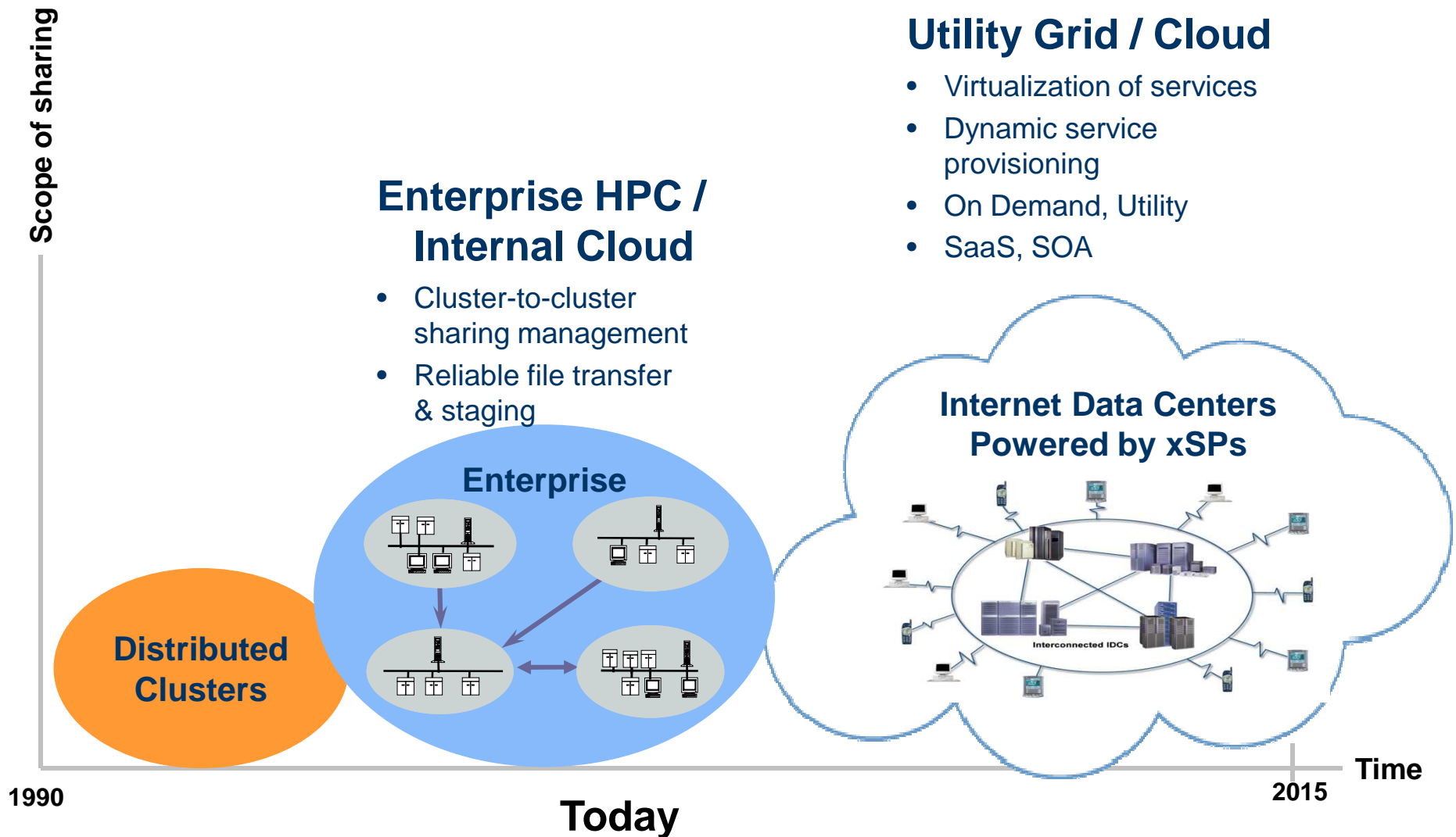
[KUSU 101: What is Beowulf Cluster Computing \(Section 1.5 - 1.7\)](#) (162 views)
[KUSU 101: What is Beowulf Cluster Computing \(Section 1.3 - 1.4\)](#) (153 views)

- Open source components Platform LSF
- LSF Perl extensions
- Free access to KUSU & LAVA
- EGO-SDK developer kit for direct SOI access

Platform™



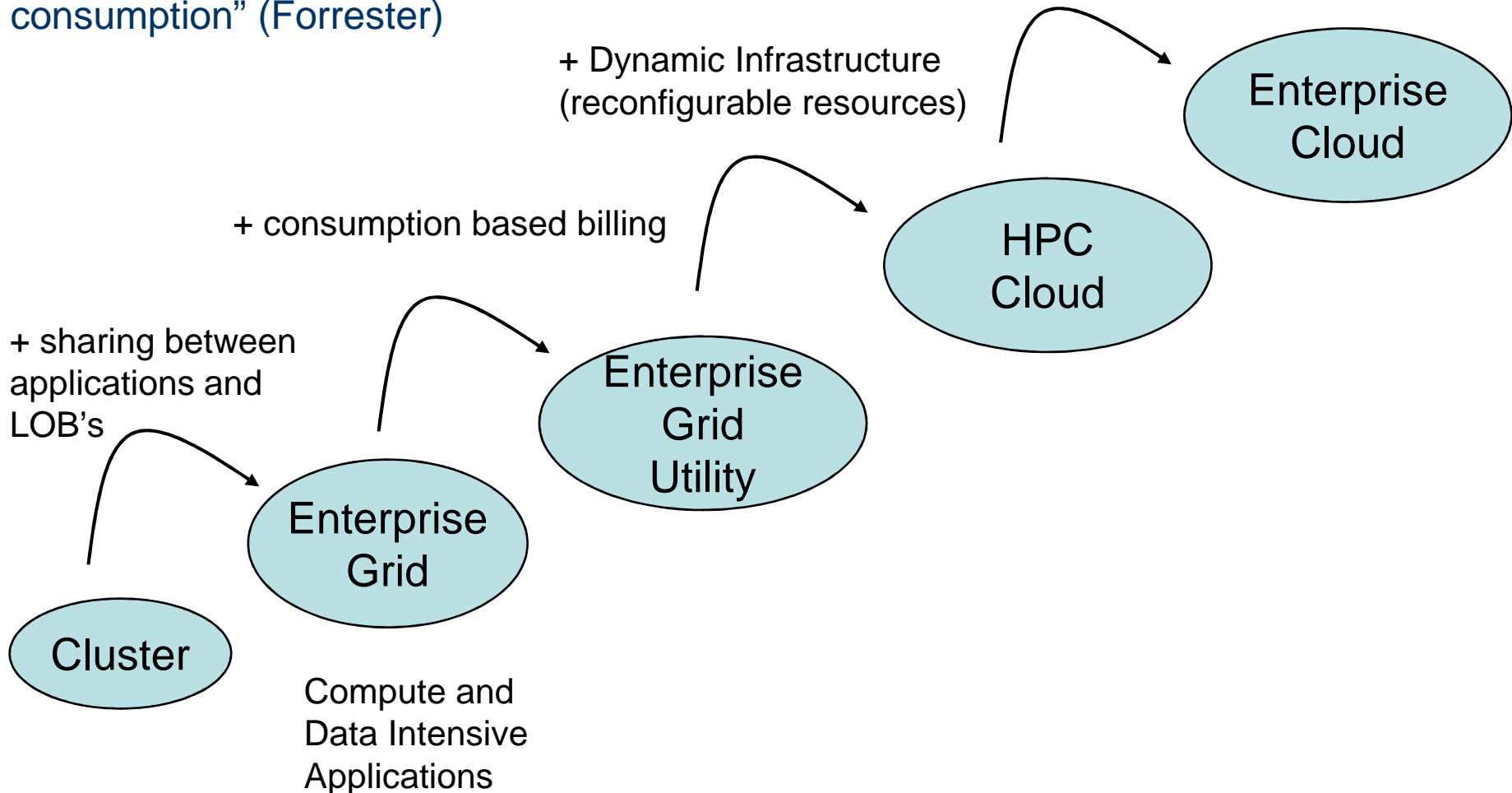
Taking the best from
Grids & Clouds
for HPC

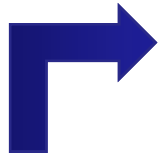




Cloud – “A pool of abstracted, highly scalable, and managed infrastructure capable of hosting end-customer applications and billed by consumption” (Forrester)

+ Applications beyond HPC





Common Practice:
HPC resources are acquired for specific purpose. They are typically dedicated for single type of work

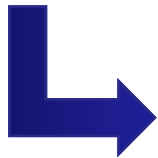


Capacity limit

- The total capacity is limited by the size of the system or cluster

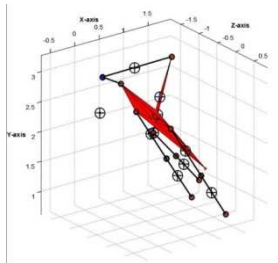
Utilization

- Provisioned for peak load
- Even if it is not fully utilized, it can't be repurposed for other applications

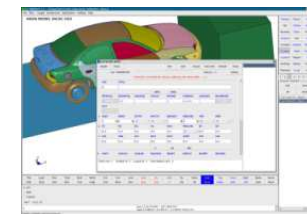
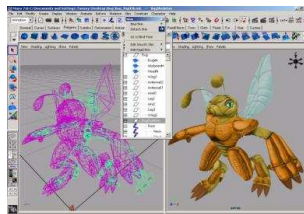


Quick Resource Provisioning

- Users compare their own HPC resource with external "cloud"



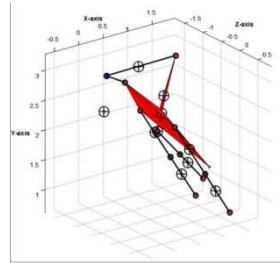
- Unlimited application resources
- Instant resource availability
- Ease of use



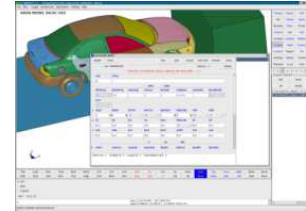
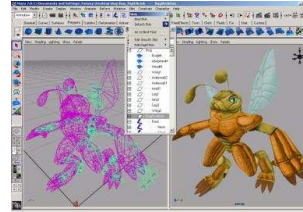
Providing application or compute resource as a service



↑
D
E
M
A
N
D



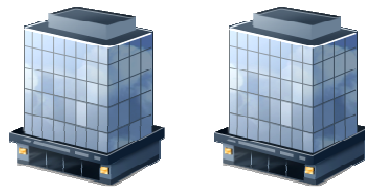
End Users



Modeling

Rendering

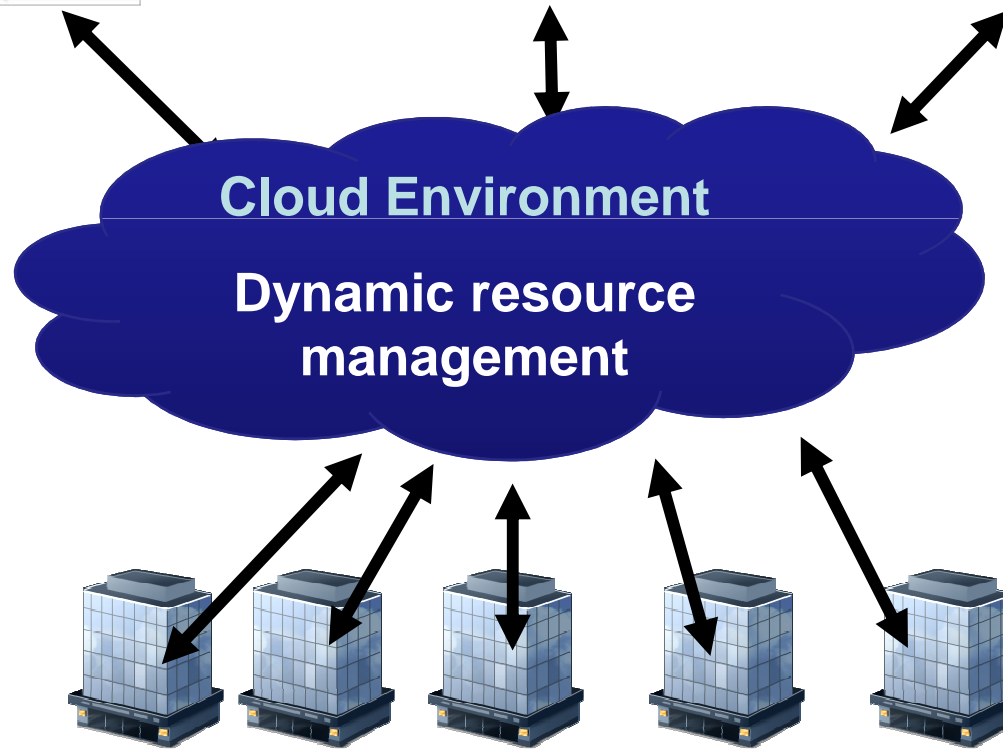
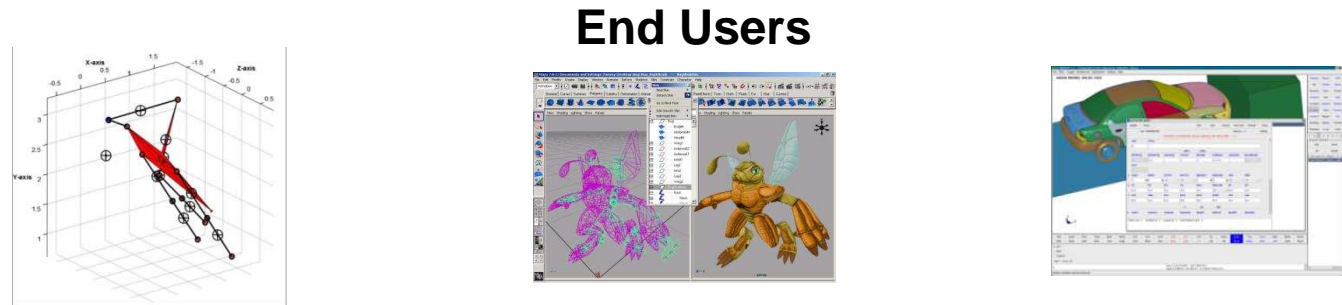
Analysis



↓
S
U
P
P
L
Y



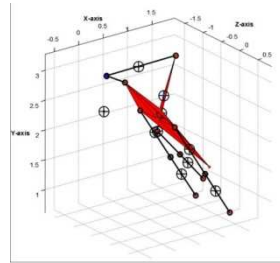
↑
D
E
M
A
N
D



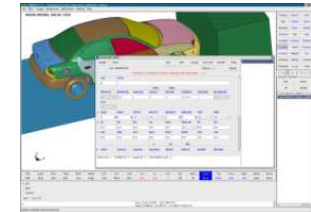
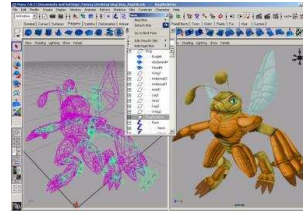
↓
S
U
P
P
L
Y



D
E
M
A
N
D

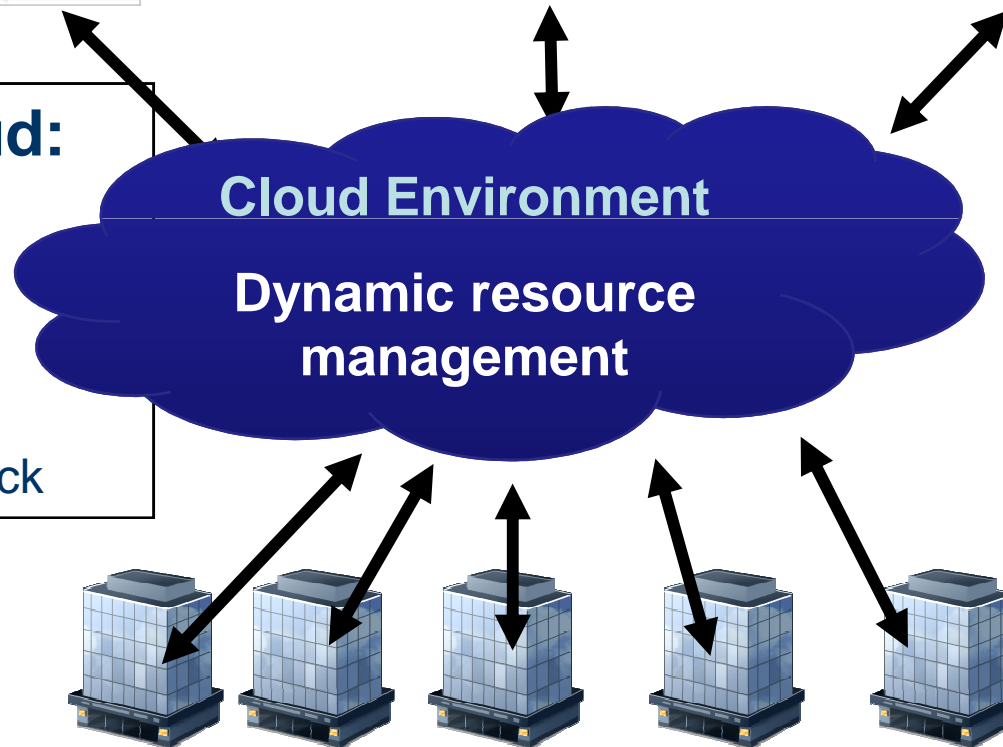


End Users



Mixing grid & cloud:

- Workload management
- Cluster management
- Dynamic VM and OS management
- Accounting & chargeback



S
U
P
P
L
Y



A note on heterogeneity:

- Applications require different resources:
 - OS: RHEL3.x, RHEL4.x, RHEL5, SL3.5, Windows2003,
 - Configurations, patches: mounts, permissions
 - Pre-installed tools and libraries: Java, compilers, ...
- Users require applications in different version and configurations
- Legacy issue:
 - “Old” applications are valuable!
 - Legacy applications need older OS, tools, config, ...
 - How old are your applications?
- The real world is heterogeneous – also in HPC!

External Cloud by Service Providers

- CapEx reduction
- Non-mission critical SLAs
- In-house IT has limited scale, scope or expertise

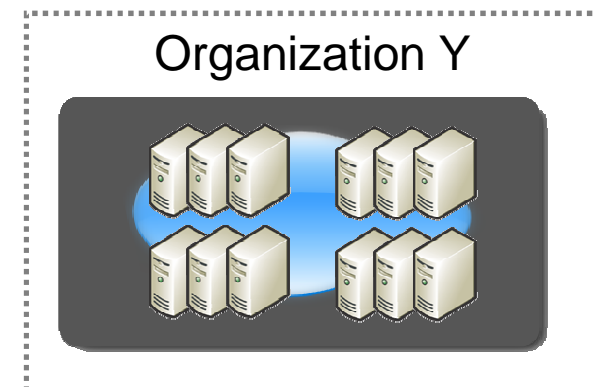
Internal Cloud by HPC Center

- CapEx and OpEx reduction
- Maximize value of underutilized resources
- Mission critical SLAs
- High security requirements
- Enterprise-specific services
- Less legal issue for application licenses

External Cloud



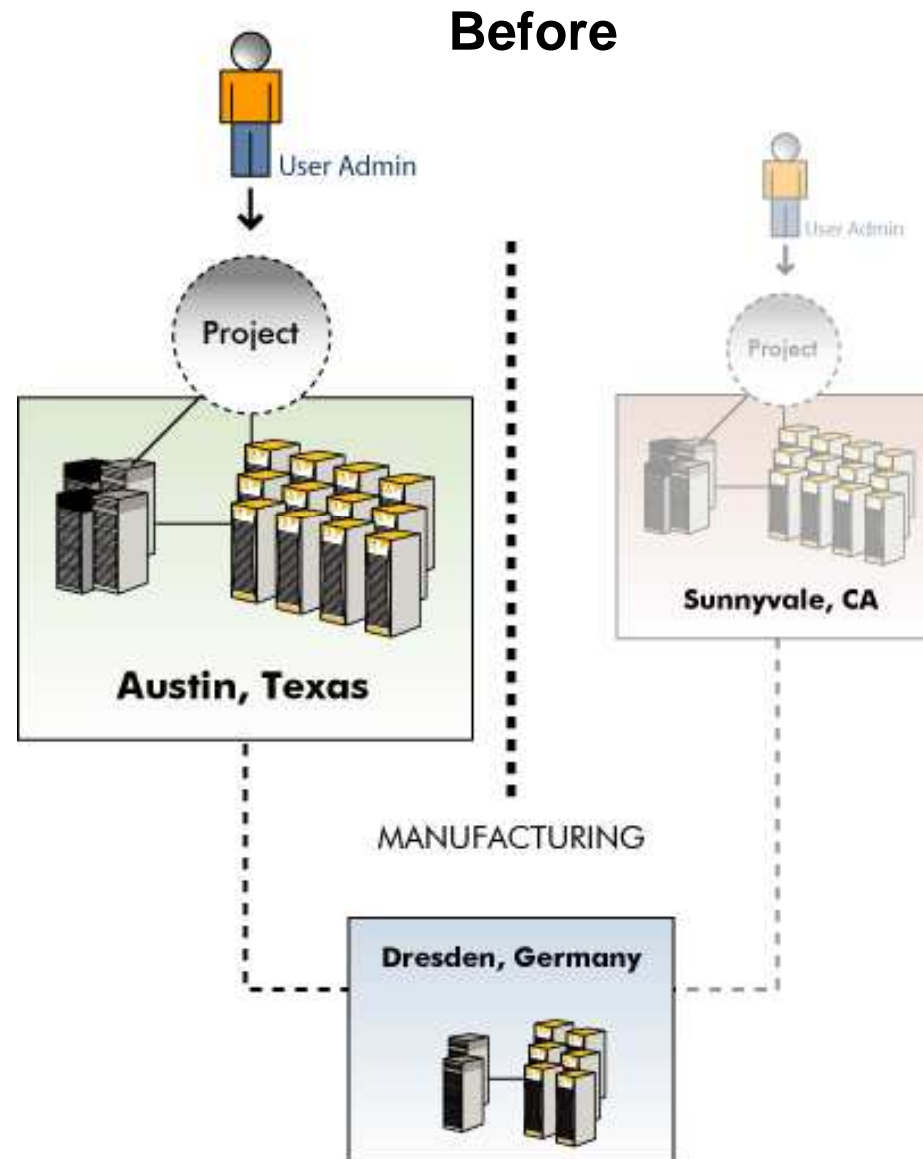
Internal Cloud





- More design, simulation & verification – faster
- Better utilization of resources in an always-available computing environment
- Better products to market faster and at lower cost

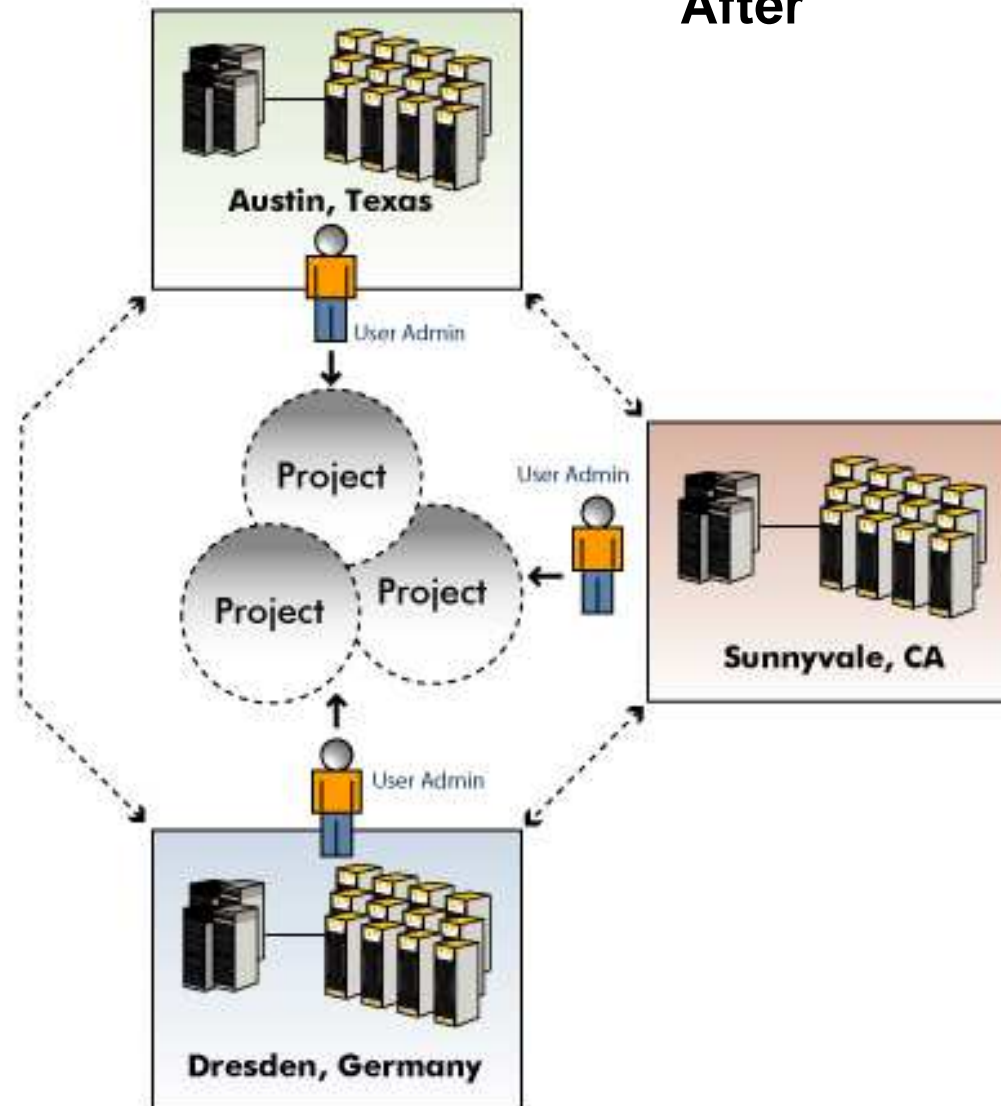
Powered by
Platform™





- More design, simulation & verification – faster
- Better utilization of resources in an always-available computing environment
- Better products to market faster and at lower cost

After



Powered by

Platform™



More & more apps
from LOB silos

FX derives
Pricing &
Hedging

Converts Pricing
& Hedging



Enterprise Mkt
Risk

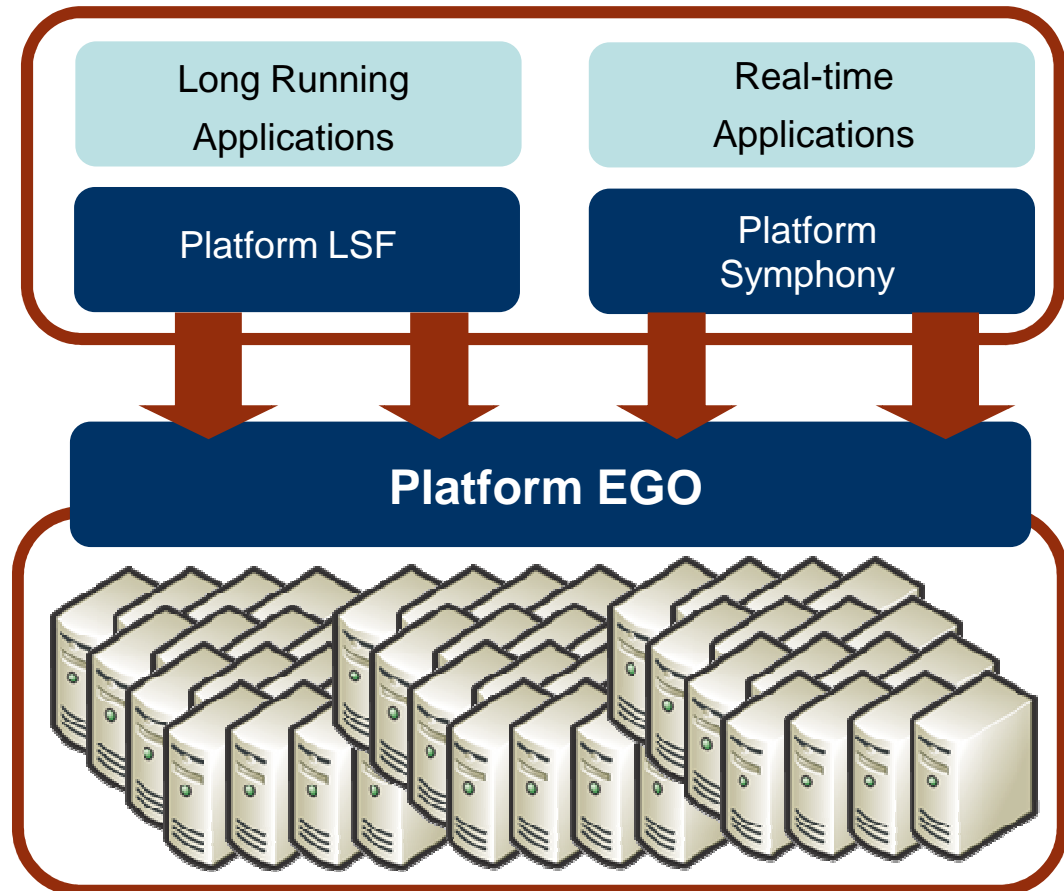
Credit Derivs,
Pricing/Hedging
Counterparty
Credit Risk

Fraud, Anti-
Laundering

Acc'ting, Actuarial
Analysis

Operational Risk

CRM, Data Mining,
Credit Scoring



Powered by





Software build and QA environment

- A Dozen Products
- 5 dev centers distributed globally
- Products need to support 30 different x86/64 OS

Internal test cloud for x86/64 OS

- Engineers request OS through web portal
 - Define environment
 - Define schedule
 - Define size
 - Define physical machine or VM
- Resources are provisioned automatically
- Next step: Extending the solution for technical support and field engineers

Resources ready in minutes vs. 2 days

Isolated application run time environment



VM

- Different applications can run concurrently on a multi-core node/server
- Problem in one application does not affect the others
- Create personal/group cluster

Change node/server personality



VM

- Re-domain a server/node
- Switch OS, particularly between Windows and Linux
- Running a legacy OS on the latest hardware



MultiBoot

Reduce resource fragmentation

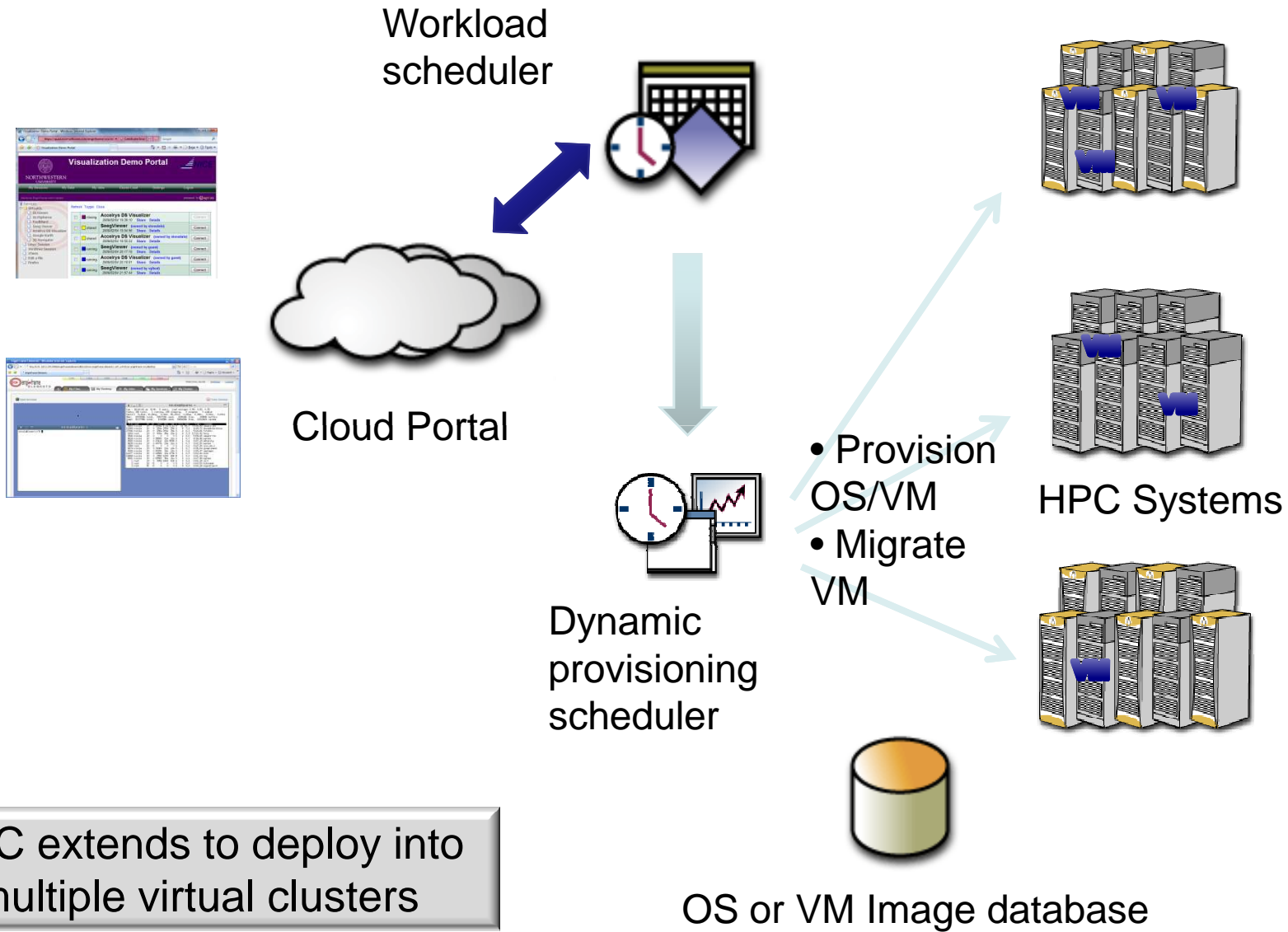


VM

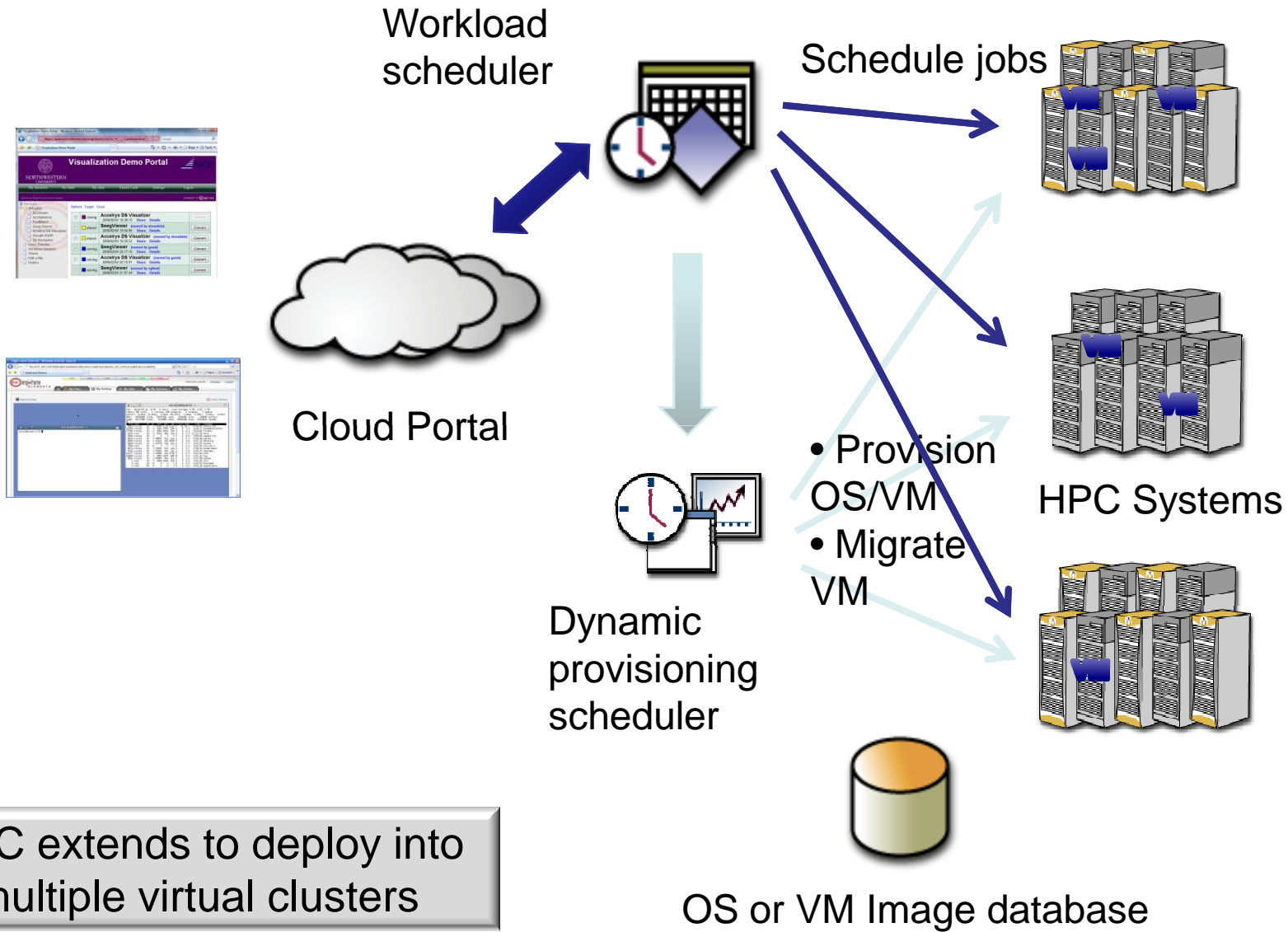
- Application migration

Capacity Planning

- “What if” analysis



DDC extends to deploy into multiple virtual clusters



DDC extends to deploy into multiple virtual clusters



	VM	RM
PROs	<ul style="list-style-type: none">- Reliability<ul style="list-style-type: none">• Isolated from hardware• Checkpointing- SLA<ul style="list-style-type: none">• Quick provisioning- Resource utilization<ul style="list-style-type: none">• Job migration	<ul style="list-style-type: none">- Application Performance- No need to have special infrastructure
CONs	<ul style="list-style-type: none">- Performance cost (=application cost) Getting better- Infrastructure cost	<ul style="list-style-type: none">- Application reliability- Slow provisioning- Resource utilization

Conclusion: use both VMs and RMs (real machines)

Platform™



Platform DDC

- dynamics from the Cloud
- performance from the Grid

- Multipurpose hosts – feature *personality*
 - Hosts can be setup with multiple personalities (OS, OS+patch+pre-installed apps, ...)
 - Dynamically provisioning hosts' personalities based on workload demand
 - Allow admin to manually change hosts' personalities
- Control Virtual Machines (VM)
 - Integration with VM server (RedHat Xen, ...)
 - Dynamically provision VMs based on workload demand (start/stop VM on a physical machine)



Dualboot/Multiboot: (Supports Windows / Linux)

Machines are pre-installed with multiple operating systems.
DDC uses network boot to select which partition to boot

Diskless booting: (Linux only)

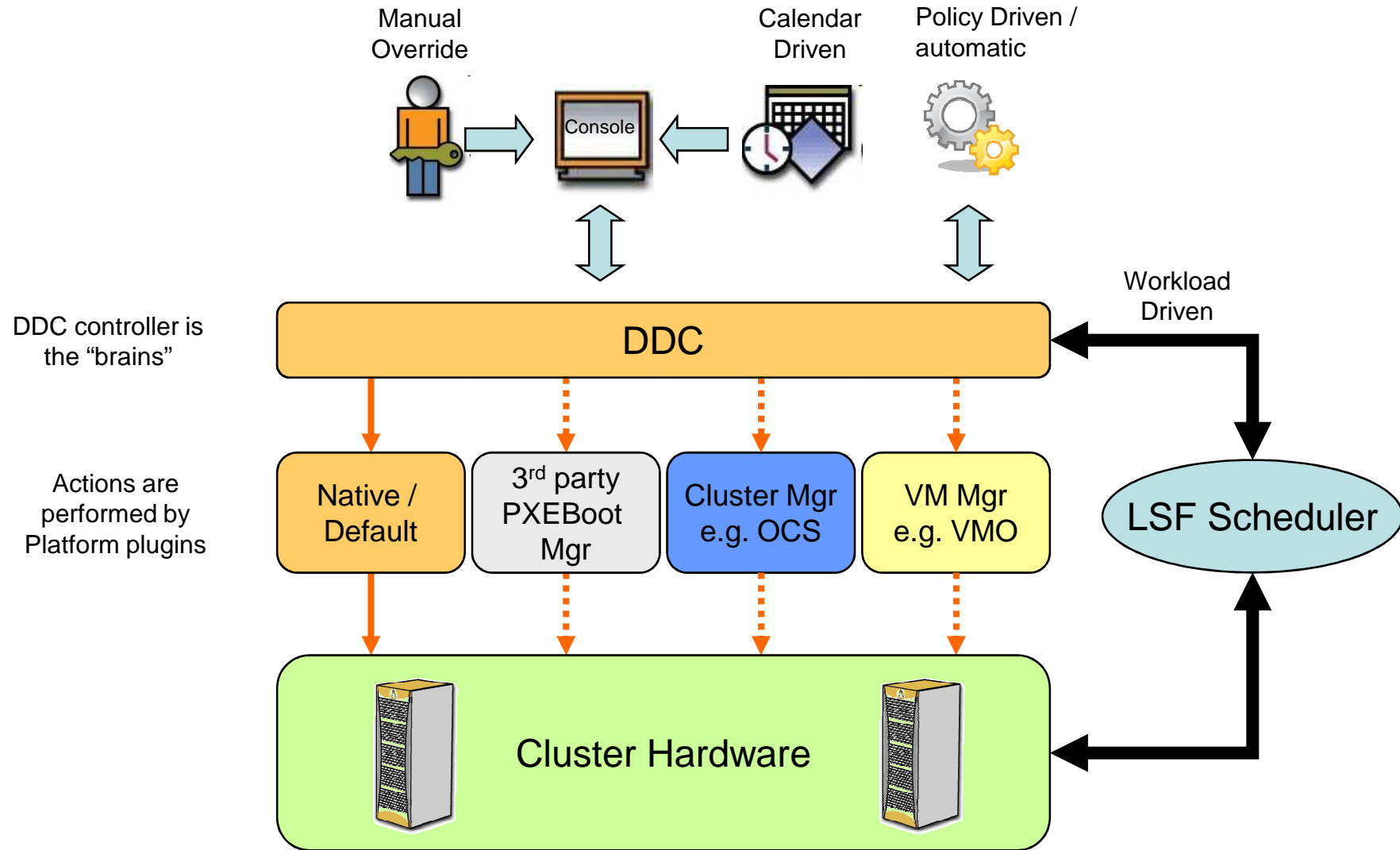
Machines do not use local disk, instead copy an OS image from a server at boot time

“Image” based installation: (Linux only)

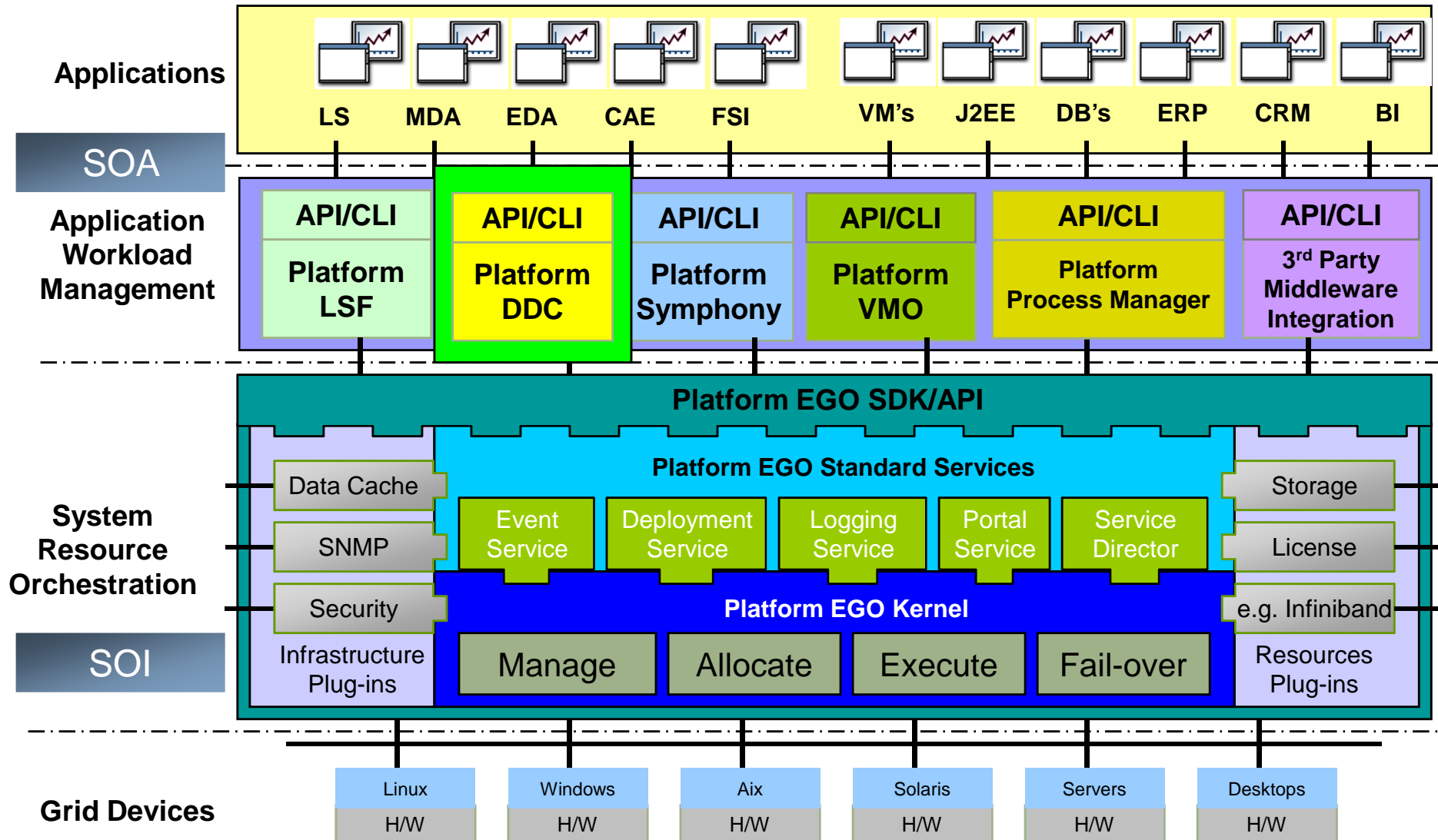
Machines are re-installed each time when they are re-purposed

Controlling VMs:

VMs are pre-installed, they can be dynamically started/stopped based on the resource usage/demand



Open & Decoupled SOA / SOI Architecture





1) Hosts' environment setup

- Hosts' OS setup, dual boot, multi-boot, diskless, image based provisioning, VMs etc..... all according to DDC's guidance
- Install applications, LSF etc...

2) Install DDC

- Install the package
- Configure the hosts information, I.e. name, IP, ipmi, personalities, into DDC
- Configure mappings between host personalities and LSF host types, OS types – possibly with other Boolean resources
- Configure DDC provision mode, policy and control parameters

3) LSF

- All hosts, all different personalities, need to be LSF hosts
- Define special queue for DDC to use, provisioning jobs
- User submit jobs requiring certain personality, can use the “-R [ostype==“personality”]”, or by default we use the host types

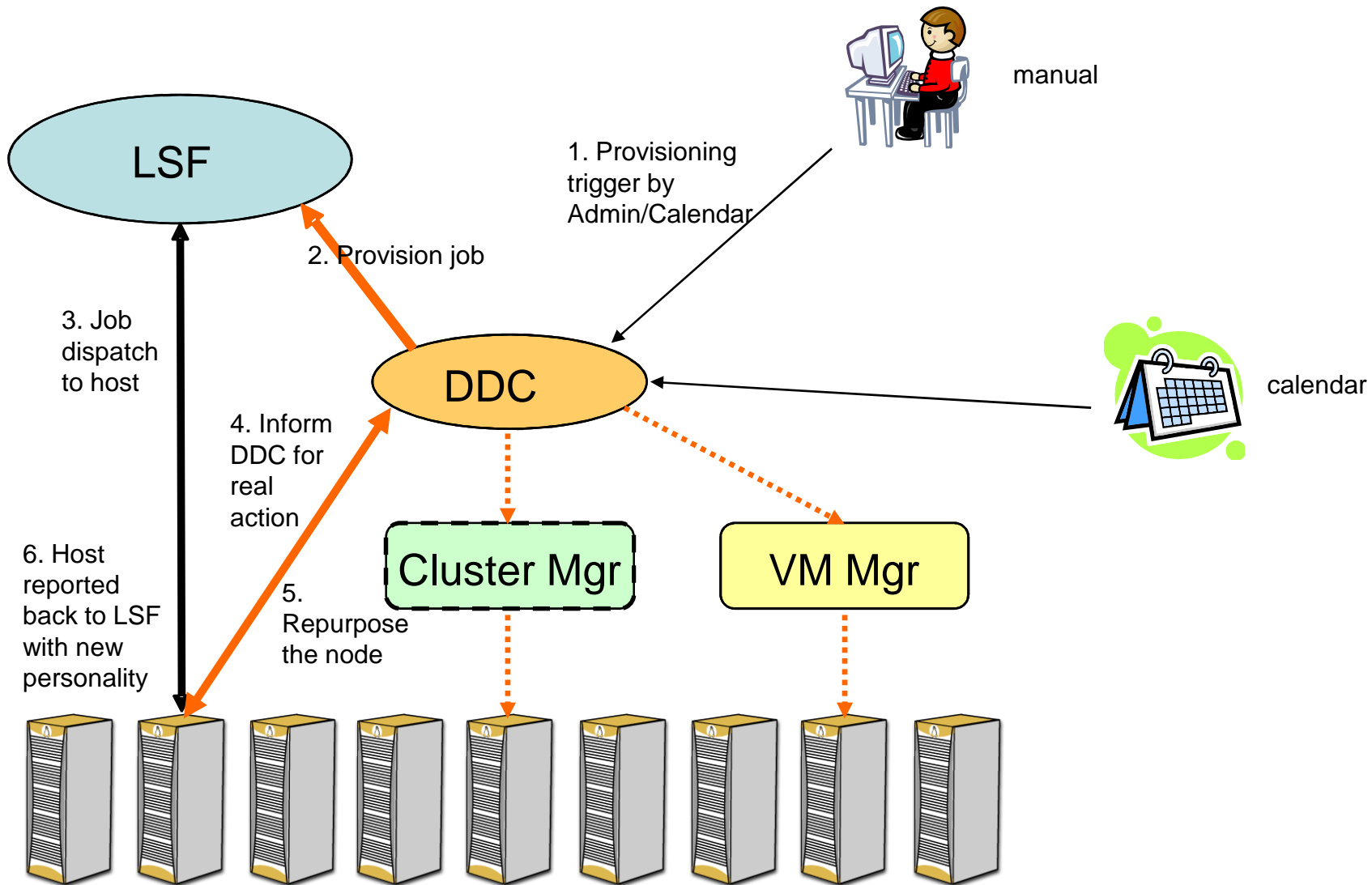


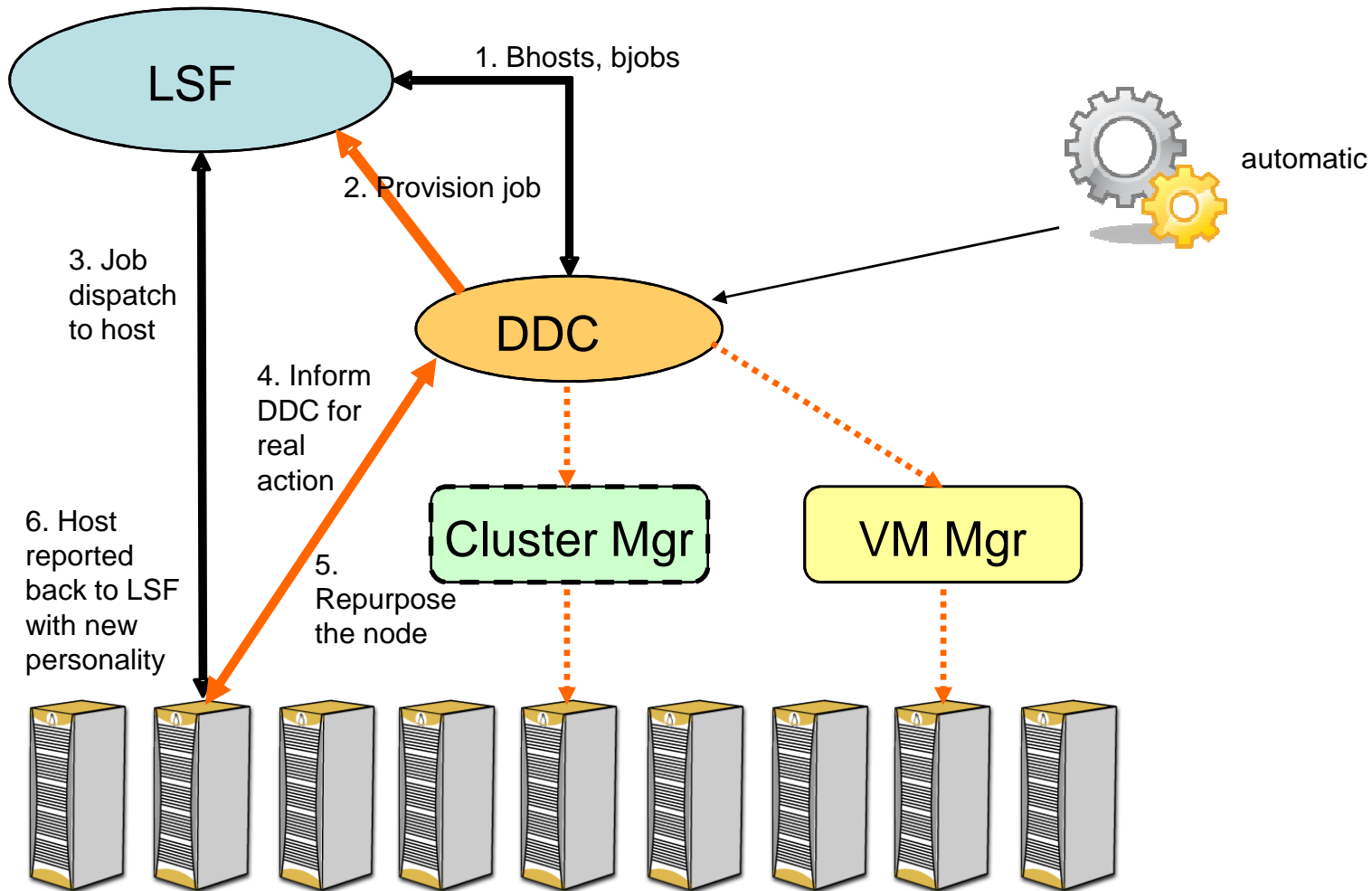
- Workload policy driven provisioning
- Calendar policy driven provisioning
- Admin can take manual actions any time

The screenshot displays the Platform Management Console interface. The top navigation bar includes links for Dashboard, About Platform Management Console, Log off, Knowledge Center, and Administrator: Isfadmin. The main content area is titled "Policy" and contains a message: "Only one of the following repurposing policy can be supported at one time, please select one from the following options." Three radio button options are presented:

- Manual Only Repurposing**: Accompanied by a person icon, it states "Use manual repurposing when you want to manage hosts for personality manually only."
- Manual And Workload Driven Repurposing**: Accompanied by a gear icon, it states "Use workload driven policy when you want to manage hosts for personality based on resource demand. click on setting button to define details." A "Settings" button is located below this option.
- Manual And Calendar Driven Repurposing**: Accompanied by a calendar icon, it states "Use calendar driven policy when you want to manage hosts for personality on calendar base. click on setting button to define details." A "Settings" button is located below this option.

An "Apply" button is positioned at the bottom left of the main content area. On the left side of the console, a tree view shows the navigation structure under "Resources", with "Host Repurposing" expanded to show "Virtual Servers" (containing delint08, amd05, and ib01b11), "Virtual Hosts", "Physical Hosts", "Policy" (highlighted in yellow), and "Events".





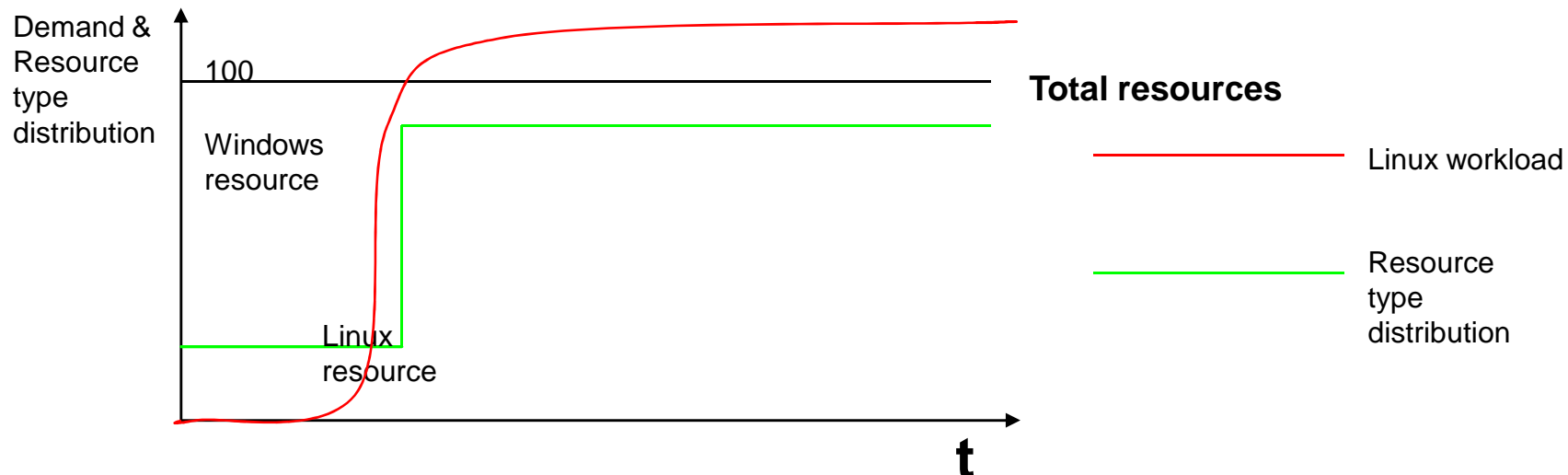


1) Description:

- Resource switching by admin (manual only)
- User asks admin requiring more Linux hosts to serve their workload, and Admin takes manual action to add 70 Linux hosts

2) Example below:

- Before: Linux:20, Windows:80
- After: Linux:90, Windows:10



Admin switching one host, Host1, to RHEL5_RM_1CPU

Dashboard | About Platform Management Console | Log off | Knowledge Center | Administrator: Isfadmin

Platform Management Console

Expand All | Collapse All | Refresh

Manage Workload

- Reports
 - Standard Reports
 - Custom Reports
- Submission
 - Batch Jobs
 - Projects
- Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy
 - Events
 - Hosts

Host Candidates | Host Personalities

Actions

Hostname = **Any**; OS = **Any**; State = **Any**; Personality = **Any**; Sort jobs by: **Host Name**; Filter Result: **28 hosts found.** [Filter Settings](#)

« First | « Previous | 1-12 | Next(13-24) » | Last(25-28) »

<input type="checkbox"/>	Host Name	State	Running OS	Personality	#CPU	#Running Jobs	CPU Usage	Min TTL	Actions
<input type="checkbox"/>	Host1	repurposing	Windows 2000	WIN_RM_2CPU	2	-	-	0	Actions
<input type="checkbox"/>	Host2	ok	Linux 2.6	RHEL5_RM_2CPU	2	0	1%	0	Actions
<input type="checkbox"/>	Host3	closed	Linux 2.6	RHEL5_RM_1CPU	1	20	20%	0	Actions
<input type="checkbox"/>	Host4	unavail							
<input type="checkbox"/>	Host5	ok							
<input type="checkbox"/>	Host6	ok							
<input type="checkbox"/>	Host7	ok							
<input type="checkbox"/>	Host8	closed							
<input type="checkbox"/>	Host9	closed							
<input type="checkbox"/>	Host10	ok							
<input type="checkbox"/>	Host11	ok							

Repurposing Host

▼ Repurposing Hosts

Hosts to Be Repurposed Host1.platform.com

Host Personality RHEL5_RM_1CPU

Handle Running Jobs

- Kill all running jobs
- Wait for running jobs to finish
- Wait running jobs to finish for: seconds

Repurpose **Cancel**



Admin manually switching hosts personality by specifying number of hosts required, Admin can also define the resource requirement string to further refine the scope. The workload manager will select the best hosts, earliest available hosts, for repurposing.

The screenshot displays the Platform Computing interface. At the top, there are two tabs: "Host Candidates" and "Host Personalities". Below the tabs is a table with the following columns: Personality Name, Type, OS Name, # of Hosts, Idle Hosts, Share, and Deserved Hosts. The table contains the following data:

Personality Name	Type	OS Name	# of Hosts	Idle Hosts	Share	Deserved Hosts
WIN_RM_2CPU	Multiboot	Windows 2000	10	10	1	10
WIN_RM_1CPU	Diskless	Windows 2000	20	2	8	20
WIN_RM_4CPU						
RHEL5_RM_1CPU						
RHEL5_RM_2CPU						
RHEL5_RM_4CPU						
RHEL6_RM_1CPU						
RHEL6_RM_2CPU						
RHEL6_RM_4CPU						
RHEL6_RM_1CPU_64						

Overlaid on the table is a "Repurposing Host" dialog box. The dialog box has a title bar with a close button. Below the title bar is a section titled "Repurposing Hosts" with a dropdown arrow. The dialog box contains the following fields and options:

- Host Personality:** RHEL5_RM_1CPU
- Number of Hosts:** A text input field with a value of 2 and a help icon.
- Resource Requirements:** A text input field with the value "type==LINUX" and a help icon.
- Handle Running Jobs:** A group of radio buttons with the following options:
 - Kill all running jobs
 - Wait for running jobs to finish
 - Wait for running jobs to finish for: 60 seconds

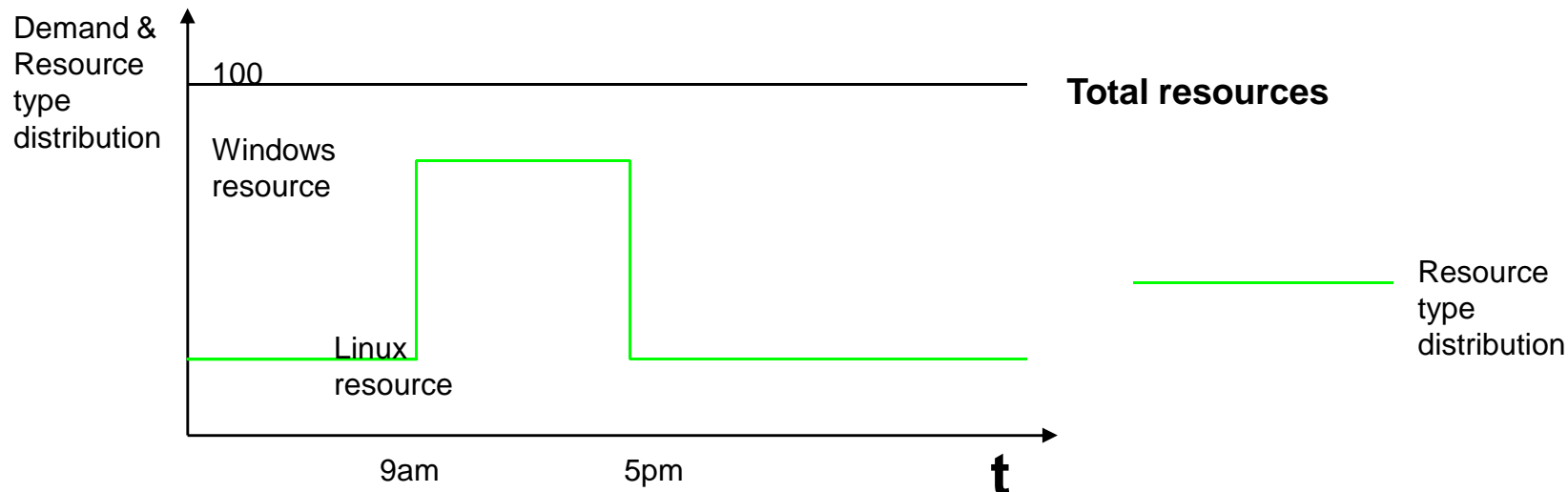
At the bottom of the dialog box are two buttons: "Repurpose" and "Cancel".

1) Description:

- Workload comes at fixed pattern, I.e. Mainly regression test, using Linux, after hours and interactive Windows work during day time.
- Calendar rules defined for this action

2) Example below:

- Two rules defined for 9am and 5pm.
- 9am: Linux:80, Windows:20
- 5pm: Linux:20, Windows:80





Platform™ Dashboard | About Platform Management Console | Log off | Knowledge Center

Platform Man

Expand All | Collapse All | Refresh

- Manage Workload
 - Reports
 - Submission
 - Batch Jobs
 - Projects
- Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy**
 - Events
 - Hosts

Policy

Calendar policy controls number of required hosts per personality for calendar time periods. One reoccurring calendar period can be defined by a rule.

▼ **Calendar Policy Properties**

Description	Calendar based policy	
Provisioning Period	30	Seconds ?
Repurposing Step	20	Hosts ?
Minimum Time to Live	24	Hours ?

▼ **Rules**

Status	Rule Name	Description	Rule Details
<input type="checkbox"/> Active	r1	Once policy for QA department	One time 📅
<input type="checkbox"/> Active	r2	Daily policy for development team1	Daily 📅
<input type="checkbox"/> Inactive	r3	Every working day	Weekly 📅



Platform Management Console

Dashboard | About Platform Management Console | Log off | Knowledge Center | Administrator: Istadmin

Expand All | Collapse All | Refresh

- Manage Workload
 - Reports
 - Submission
 - Batch Jobs
 - Projects
- Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy**
 - Events
 - Hosts

Policy

Calendar policy controls number of required hosts per personality for calendar time periods. One reoccurring calendar period can be defined by a rule.

Calendar Policy Properties

Description: Calendar based policy

Provisioning Period: 30 Seconds

Repurposing Step: 20 Hosts

Minimum Time to Live: []

Rules

Status	Rule
<input type="checkbox"/> Active	r1
<input type="checkbox"/> Active	r2
<input type="checkbox"/> Inactive	r3

Define Rule Details

Frequency pattern

Start date: Mar 15, 2009 End date: Apr 15, 2009

Start time: 12:00AM End time: 12:00AM

Recurrence frequency:

Once
 Daily
 Weekly
 All Time

Recur every week on:

Sunday Monday Tuesday Wednesday
 Thursday Friday Saturday

Hosts Requirements

RHEL5_RM_1CPU	10
RHEL5_RM_2CPU	20
RHEL6_RM_1CPU	10
WIN_RM_1CPU	
WIN_RM_2CPU	
WIN_VM_1CPU	

Buttons: Add Rule, Remove S, Apply, Cancel

Dashboard | About Platform Management Console | Logout | Knowledge Center | Platform Management

Expand All | Collapse All | Refresh

Manage Workload

- Reports
 - Standard Reports
 - Custom Reports
- Submission
 - Batch Jobs
 - Projects
- Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy**
 - Events
 - Hosts

Policy

Workload policy controls personality hosts through share number for each personality.
 Number of hosts for a personality = (total number of hosts in cluster) x share1 / (share1 + share2 + ...)

▼ **Workload Policy Properties**

Description	Workload driven policy	
Provisioning Decision Period	5	Minutes ?
Repurposing Step	20	Hosts ?
Minimum Time to Live	24	Hours ?

▼ **Hosts Allocation**

Personality Name	Type	Share	Min Hosts
RHEL_RM_1CPU	Multiboot	1	5
RHEL_RM_2CPU	Image	2	5
RHEL_RM_4CPU	Diskless	3	8
WIN_VM_1CPU	VM	4	5
WIN_VM_2CPU	VM	4	10
WIN_VM_4CPU	VM	4	10

Apply **Back**

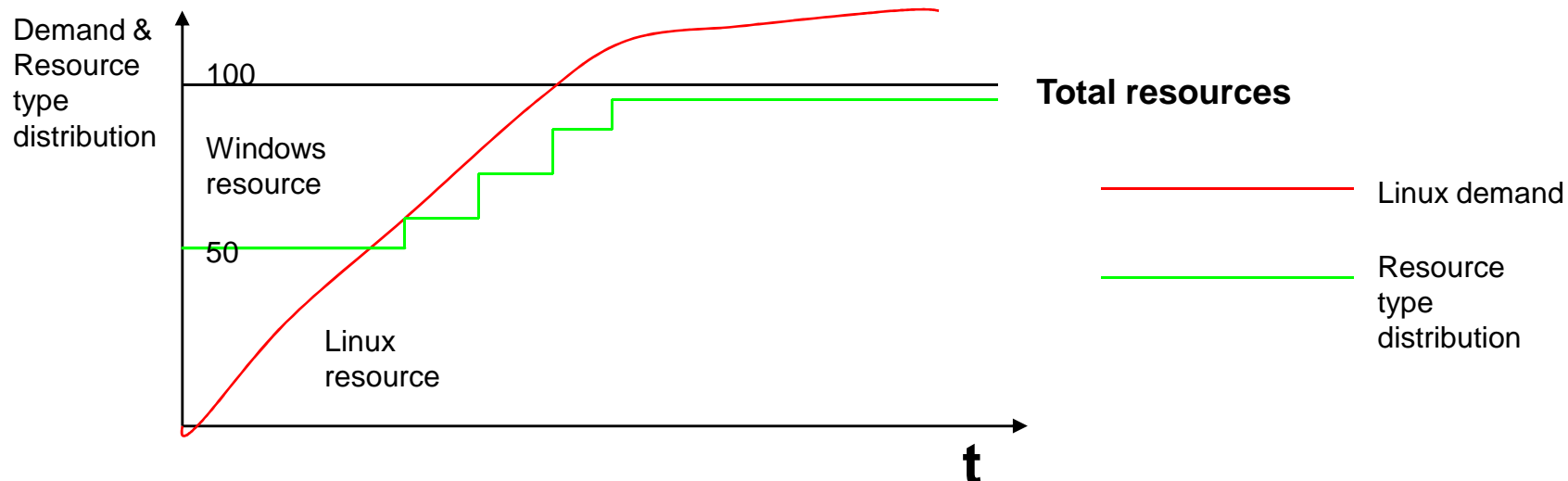


1) Description:

- High workload comes demand one resource type when the cluster resources are evenly distributed, and no demand for the other type.
- DDC will sense the shrinking availability of that resource type and will try to move other types to the demanded type, with each decision cycle and number of hosts constraint.

2) Example below:

- Two types of resources, each with a share value of 50, with 10 maximum hosts switching step and a 5 minutes cycle period.



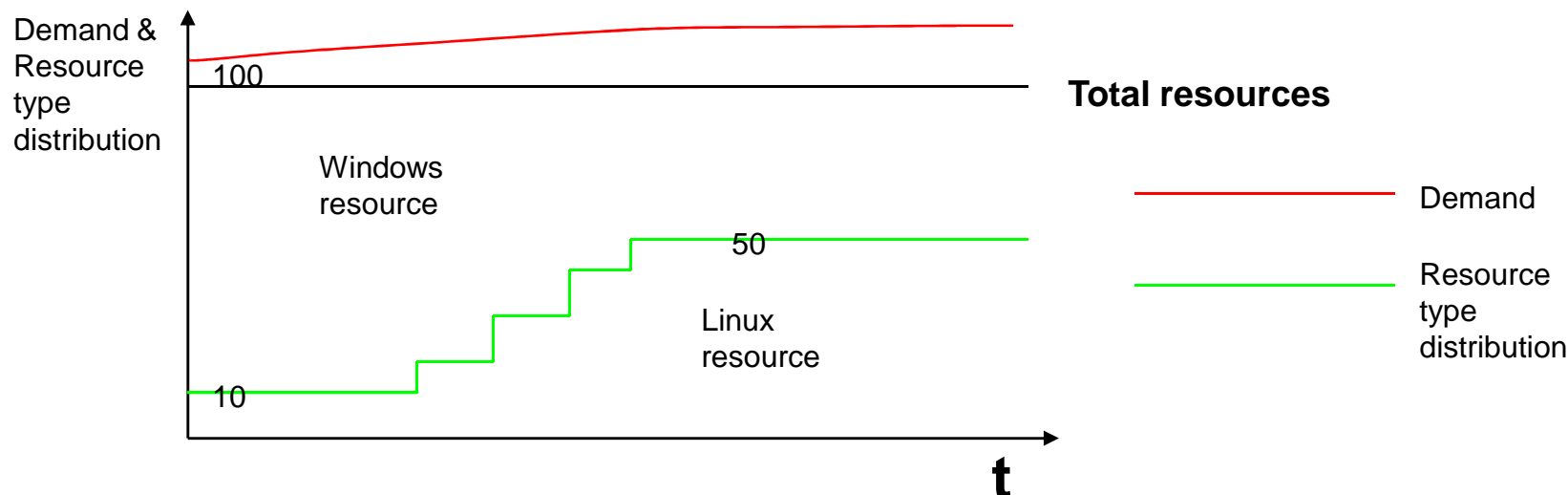


1) Description:

- High workload comes demand all resource types when the cluster resources are not evenly distributed.
- DDC will sense the shrinking availability of all resource types and will try to move the resource supply to the desired balance level, based on the each resource types' weight

2) Example below:

- Two types of resources, each with a share value of 50, with 10 maximum hosts switching each time and a 5 minutes cycle period.

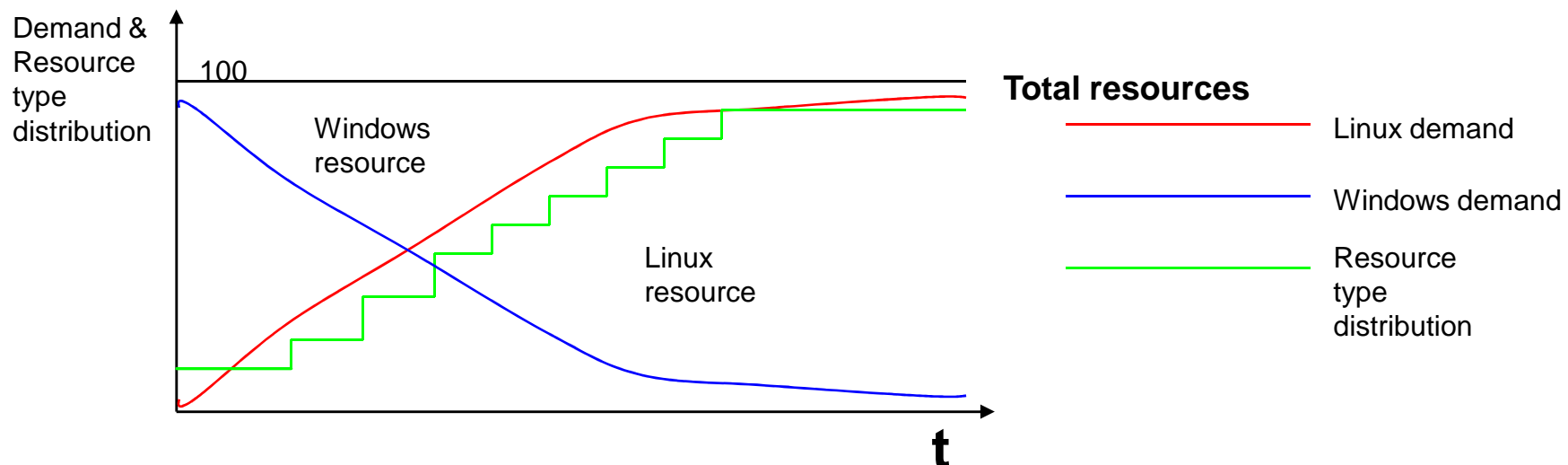


1) Description:

- ∅ High workload comes demand changes from one resource type to another resource type.
- ∅ DDC will gradually change the personality from one type to another type

2) Example below:

- ∅ Two types of resources, with 20 maximum hosts switching each time and a 5 minutes cycle period.





1) Similar rules can apply to VMs too:

- Maintain the minimum amount of VMs started and start more when the VMs are used.
- Only start a limited number each time
- Decision time period would be the same
- Each VM type would also get a share so we can keep a ratio of them when system is busy
- The total number of VMs running on a server is limited by the server's number of CPUs and memory size

2) Use Boolean resource to indicate VMs

- User can submit jobs specifically asking for VMs, or vice versa



Expand All | Collapse All | Refresh

- Manage Workload
 - Reports
 - Standard Reports
 - Custom Reports
 - Submission
 - Batch Jobs
 - Projects
- Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy
 - Events
 - Hosts

Virtual Hosts

This table shows all virtual hosts existing in the selected virtual server host. To start or shutdown virtual hosts, select "Start Up" or "Shut Down" action list.

Maximum Number of Virtual CPUs: 16
Maximum Memory: 8G

Actions

<input type="checkbox"/>	VM Name	State	VM Hostname	Running OS	Personality	#CPU	Memory(MB)	#Running Jobs	CPU Usage	Time To Live	Actions
<input type="checkbox"/>	VM1	starting	Host1	Windows 2000	WIN_RM_2CPU	2	512	-	-	0	Actions
<input type="checkbox"/>	VM2	ok	Host2	Linux 2.6	RHEL5_RM_2CPU	2	512	0	1%	1	Actions
<input type="checkbox"/>	VM3	ok	Host3	Linux 2.6	RHEL5_RM_1CPU	1	1024	0	20%	2	Actions
<input type="checkbox"/>	VM4	closed	Host4								
<input type="checkbox"/>	VM5	unavail	Host5								
<input type="checkbox"/>	VM6	unavail	Host6								
<input type="checkbox"/>	VM7	ok	Host7								
<input type="checkbox"/>	VM8	stopping	Host8								
<input type="checkbox"/>	VM9	closed	Host9								
<input type="checkbox"/>	VM10	ok	Host10								
<input type="checkbox"/>	VM11	closed	Host11								
<input type="checkbox"/>	VM12	closed	Host12								

Shut Down Virtual Host

▼ **Migrate Virtual Host**

Virtual Host Host1.platform.com

Current Virtual Server delint08.lsf.platform.com

Migrate to Virtual Server



Platform Management Console

Dashboard | About Platform Management Console | Log off | Knowledge Center | Administrator: Isfadmin

Expand All | Collapse All | Refresh

Host Candidates | Host Personalities

Actions

VM Name = **Any**; OS = **Any**; State = **Any**; Personality = **Any**; Sort jobs by: **VM Name**;
Filter Result: **28 hosts found**. [Filter Settings](#)

VM Name	State	VM Hostname	Host Type	Personality	#CPU	Memory(MB)	Server Host	#Running Jobs	CPU Usage	Min TTL	Actions
VM1	starting	Host1	Windows 2000	WIN_RM_2CPU	2	512	delint08	-	10%	0	Actions
VM2	ok	Host2	Linux 2.6	RHEL5_RM_2CPU	2	512	delint08	0	1%	1	Actions
VM3	off	Host3	Linux 2.6	RHEL5_RM_1CPU	1	1024	delint08	-	-	2	Actions
VM4	unavail	Host4	Windows 2000	WIN_RM_4CPU	4	1024	amd05	0	10%	0	Actions
VM5	ok	Host5	Linux 2.4	RHEL5_RM_1CPU	1	1024	amd05	10	40%	0	Actions
VM6	starting	Host6	Linux 2.6	RHEL6_RM_1CPU	2	512	amd05	-	-	10	Actions
VM7	closed	Host7	Linux 2.6	RHEL6_RM_1CPU	1	2048	amd05	0	10%	0	Actions
VM8	starting	Host8	Windows 2000	WIN_RM_2CPU	2	512	amd05	-	-	0	Actions
VM9	off	Host9	Windows 2000	WIN_RM_1CPU	1	2048	delint08	0	0%	0	Actions
VM10	ok	Host10	Windows 2000	WIN_RM_2CPU	1	512	ib01b11	10	10%	4	Actions
VM11	ok	Host11	Linux 2.6	RHEL6_RM_1CPU	1	512	ib01b11	20	20%	0	Actions
VM12	migrating	Host12	Linux 2.6	RHEL6_RM_1CPU	1	512	ib01b11	-	-	0	Actions

Virtual Servers: delint08, amd05, ib01b11, **Virtual Hosts**, Physical Hosts, Policy, Events, Hosts

Preferences



Platform™ Dashboard | About Platform Management Console | Log off | Knowledge Center | Administrator: istadmin

Platform Management Console

Expand All | Collapse All | Refresh

- Manage Workload
 - Reports
 - Standard Reports
 - Custom Reports
 - Submission
 - Batch Jobs
 - Projects
- Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy
 - Events
 - Hosts

Events

Event Table shows latest 100 events about host repurposing.

First Previous 1-12 Next (13-24) Last (25-28)			
Event Date	Event Type	User	Event Content
Wed Feb 18 11:12:23 EST 2009	INFO	Policy:P1	Repurpose host ib01b05 to Windows 2000
Mon Feb 18 12:12:13 EST 2009	ERROR	Administrator	Host ib06b02 is down
Wed Feb 18 11:12:23 EST 2009	INFO	Policy:P1	Repurpose host ib01b05 to RedHat 5 (1CPU)
Mon Feb 18 12:12:13 EST 2009	ERROR	Administrator	Host ib06b02 is down
Wed Feb 18 11:12:23 EST 2009	INFO	Policy:P1	Repurpose host VM02 to Windows 2000
Mon Feb 18 12:12:13 EST 2009	ERROR	User1	Host ib06b02 is down
Wed Feb 18 11:12:23 EST 2009	WARN	Policy:P1	Repurpose host ib01b05 to Redhat 5(2CPU)
Mon Feb 18 12:12:13 EST 2009	ERROR		Host VM01 is down
Wed Feb 18 11:12:23 EST 2009	WARN	Policy:P1	Repurpose host ib01b05 to Windows 2000
Mon Feb 18 12:12:13 EST 2009	ERROR	Policy:P3	Host ib06b02 is down
Wed Feb 18 11:12:23 EST 2009	WARN	Policy:P1	Repurpose host ib01b05 to Windows 2000
Mon Feb 18 12:12:13 EST 2009	INFO	Administrator	Host VM01 is UP

[First](#) | [Previous](#) | **1-12** | [Next](#) (13-24) | [Last](#) (25-28)

[Preferences](#)



Platform™ Dashboard About Platform Management Console Log off Knowledge Center Administrator: Isfadmin

Platform Management Console

Expand All | Collapse All | Refresh

- Manage Workload
 - Reports
 - Standard Reports
 - Custom Reports
 - Submission
 - Batch Jobs
 - Projects
 - Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy
 - Events
 - Hosts

Host Personality Allocation

▶ [Report properties](#)

▼ [Report parameters](#)

Time

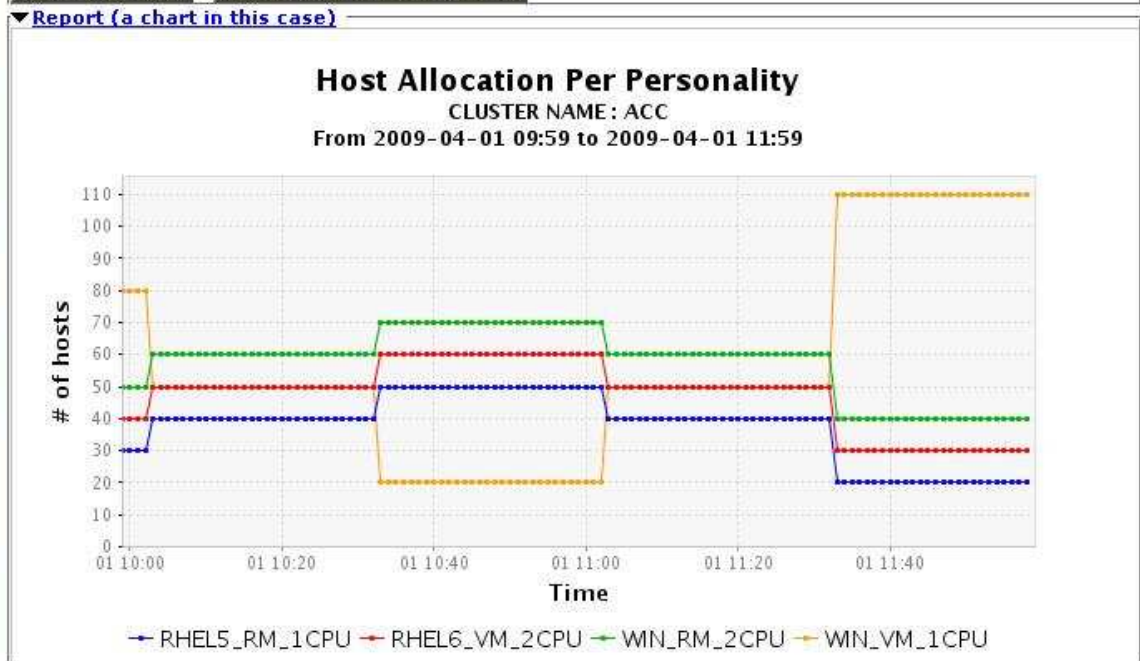
Specified amount of time

Specified date/time range

Specify an amount of time: ago until now.

Cluster:

Produce Report **Copy to New Custom Report**





Platform™ Dashboard About Platform Management Console Log off Knowledge Center Administrator: Isfadmin Platform Management Console Help

Expand All | Collapse All | Refresh

- Manage Workload
 - Reports
 - Standard Reports
 - Custom Reports
 - Submission
 - Batch Jobs
 - Projects
 - Resources
 - Host Repurposing
 - Virtual Servers
 - delint08
 - amd05
 - ib01b11
 - Virtual Hosts
 - Physical Hosts
 - Policy
 - Events
 - Hosts

Host Repurposing Demand vs Supply

Report properties

Report parameters

Time

Specified amount of time
 Specified date/time range

Specify an amount of time
 ago until now.

Personality

Produce Report **Copy to New Custom Report**

Report (a chart in this case)

Host Repurposing Demand vs Supply

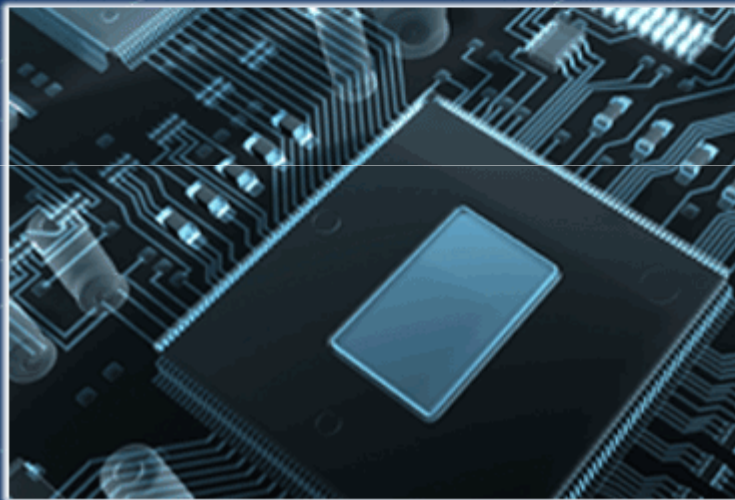
PERSONALITY NAME : RHEL5_RM_1CPU

From 2009-04-01 02:01 to 2009-04-01 12:01

Time	Allocation	Demand	Supply
02:00	13	15	19
03:00	12	14	19
04:00	11	13	19
05:00	10	12	19
06:00	12	14	19
07:00	14	16	19
08:00	15	17	19
09:00	16	18	20
10:00	17	19	19
11:00	18	20	18

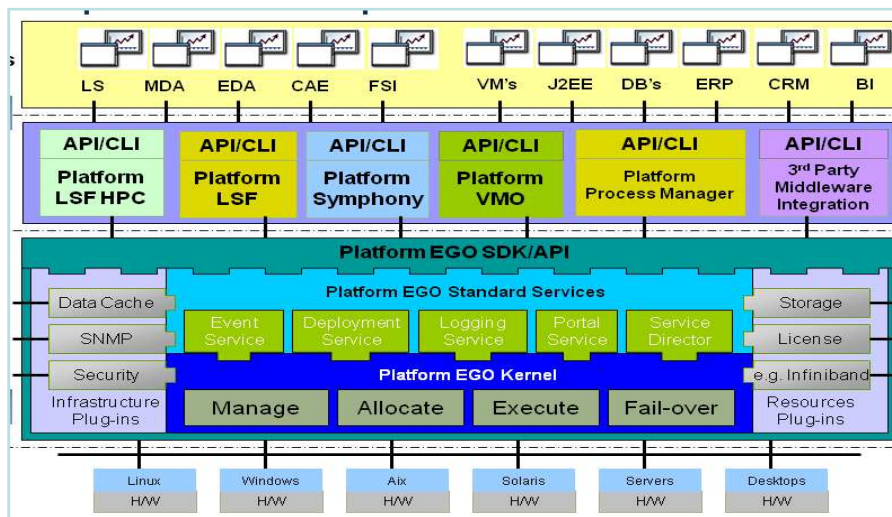
Legend: ALLOCATION (blue line), DEMAND (red line), SUPPLY (green line)

Platform™



Summary

- Can the HPC Datacenter please the user (=customer)?
 - Provide Cloud-style agility towards both users and resources
 - Beat the legacy issue
- Taking the best of both Grid and Cloud to enforce business resp. scientific process execution – effectively & efficiently
- Looking forward to discuss and share with you!



Bernhard Schott
Dipl. Phys.
EU-Research Program Manager

Platform Computing GmbH
Mobile +49 (0) 171 6915 405
Email: bschott@platform.com
Skype: [bernhard_schott](https://www.skype.com/user/bernhard_schott)
Web: <http://www.platform.com/>

PlatformTM

Powering High Performance

Thank you

www.platform.com