

IBM High Performance Computing in a **Cloud Computing Model**

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Florin MANAILA
Deep Computing Architect - IBM South East Europe
florin.manaila@ro.ibm.com
www.ibm.com/technicalcomputing



IBM Technical Computing – For Science and Business

Delivers Faster, More Reliable, More Responsive Results

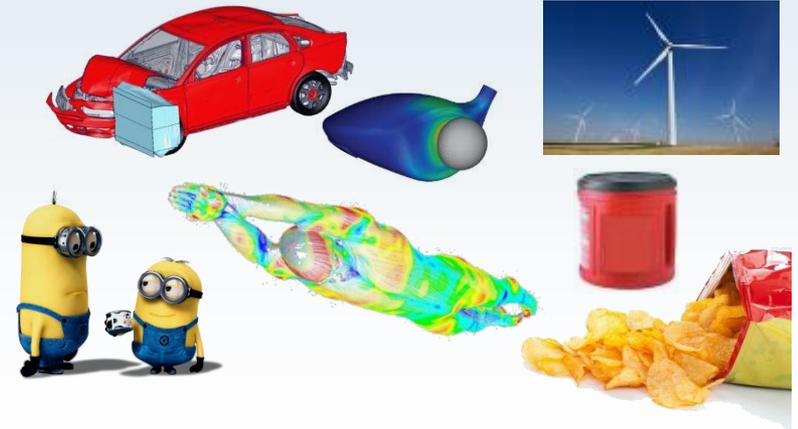
Technical Computing is how:

- The universe is analyzed
- Medical research is conducted
- Financial risk analysis is done
- Weather is forecasted
- Oil is discovered



It's also how:

- Cars are designed and crash tests are simulated
 - Wind power is deployed to maximize output
 - Bathing suits are designed for minimal drag
- Golf clubs are developed to increase distance
 - Potato chips and coffee are packaged
 - Animated movies are made

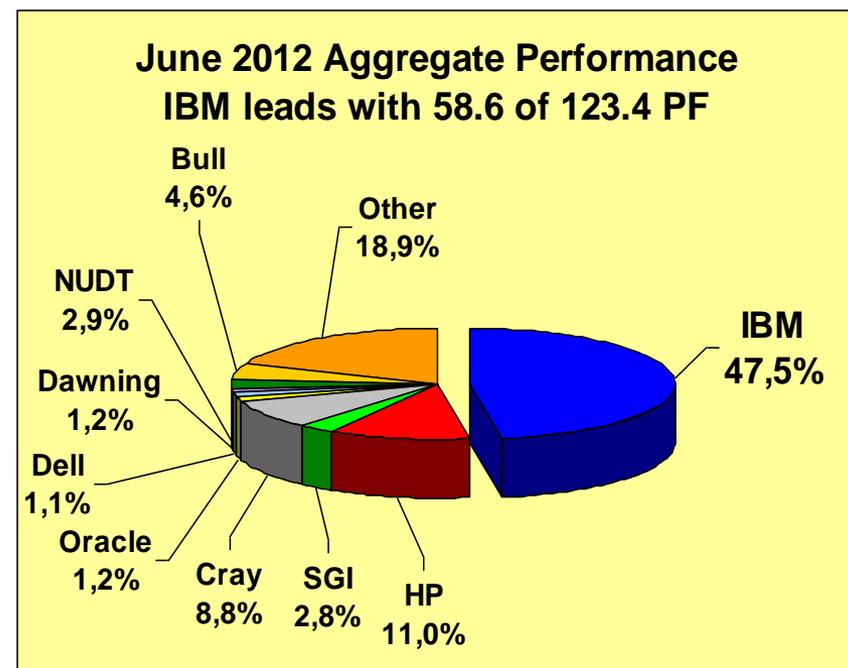
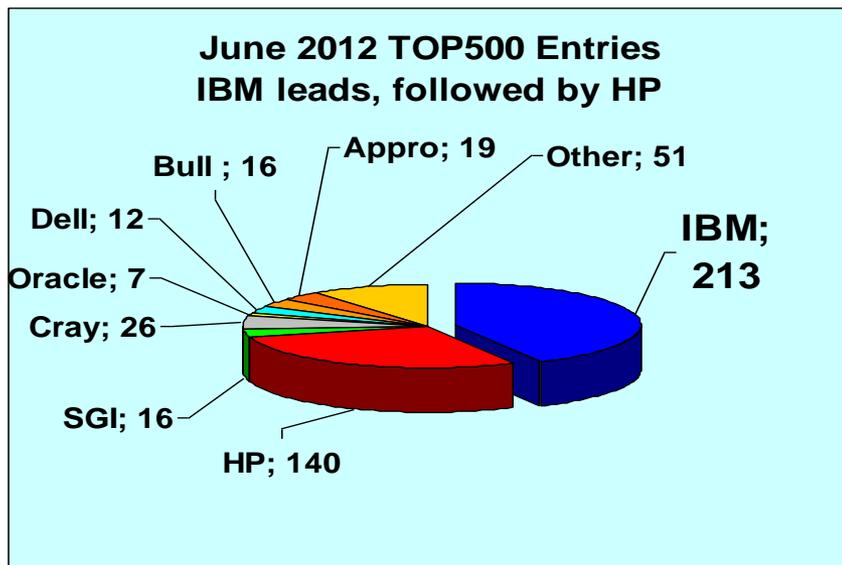


Technical Computing is how organizations achieve insight faster, reduce time and cost, and gain competitive advantage

IBM supercomputing leadership



Semiannual independent ranking of the top 500 supercomputers in the world



IBM supercomputing leadership ...

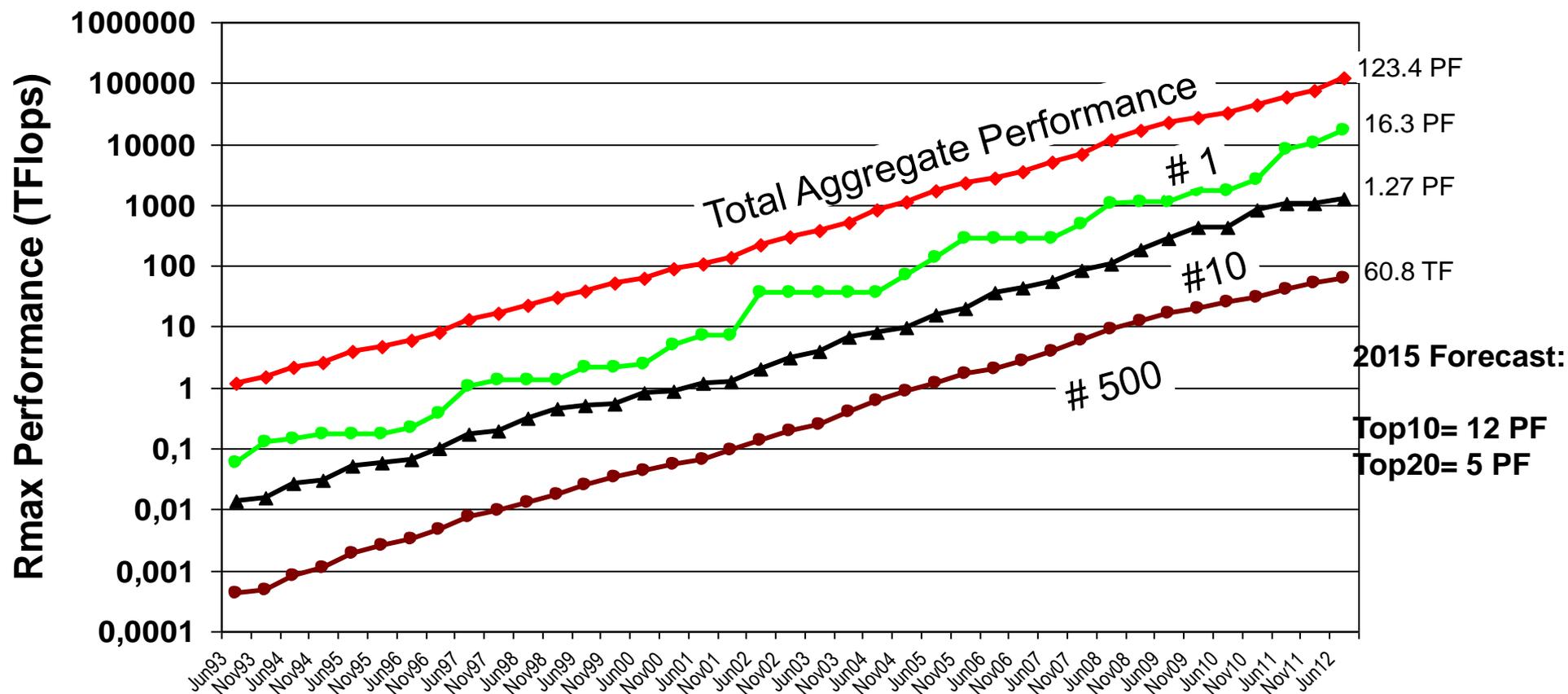
- ✓ New #1: LLNL Sequoia Blue Gene/Q 16.32 PFlops
 - ✓ 5 in TOP 10 (#3 ANL-Mira BG/Q, #4 LRZ-SuperMUC iDataPlex, #7 CINECA-Fermi BG/Q, #8 Juelich-JuQUEEN BG/Q)
- ✓ Most installed aggregate throughput with over 58.6 out of 123.4 Petaflops (47.5%) (HP 13.5/11%, Fujitsu 12.2 /9.9%, Cray: 10.9/ 8.8%)
 - Lead for 26 Lists in a row
- ✓ Most systems in TOP500 with 213 (HP: 140, Cray: 26, Appro: 19)
- ✓ Fastest system in Europe (LRZ-SuperMUC iDataPlex)
- ✓ Fastest x86 system (LRZ-SuperMUC iDataPlex)
- ✓ **20 Most energy-efficient systems**

All IBM Blue Gene/Q's

Source: www.top500.org

TOP500 Performance Trend

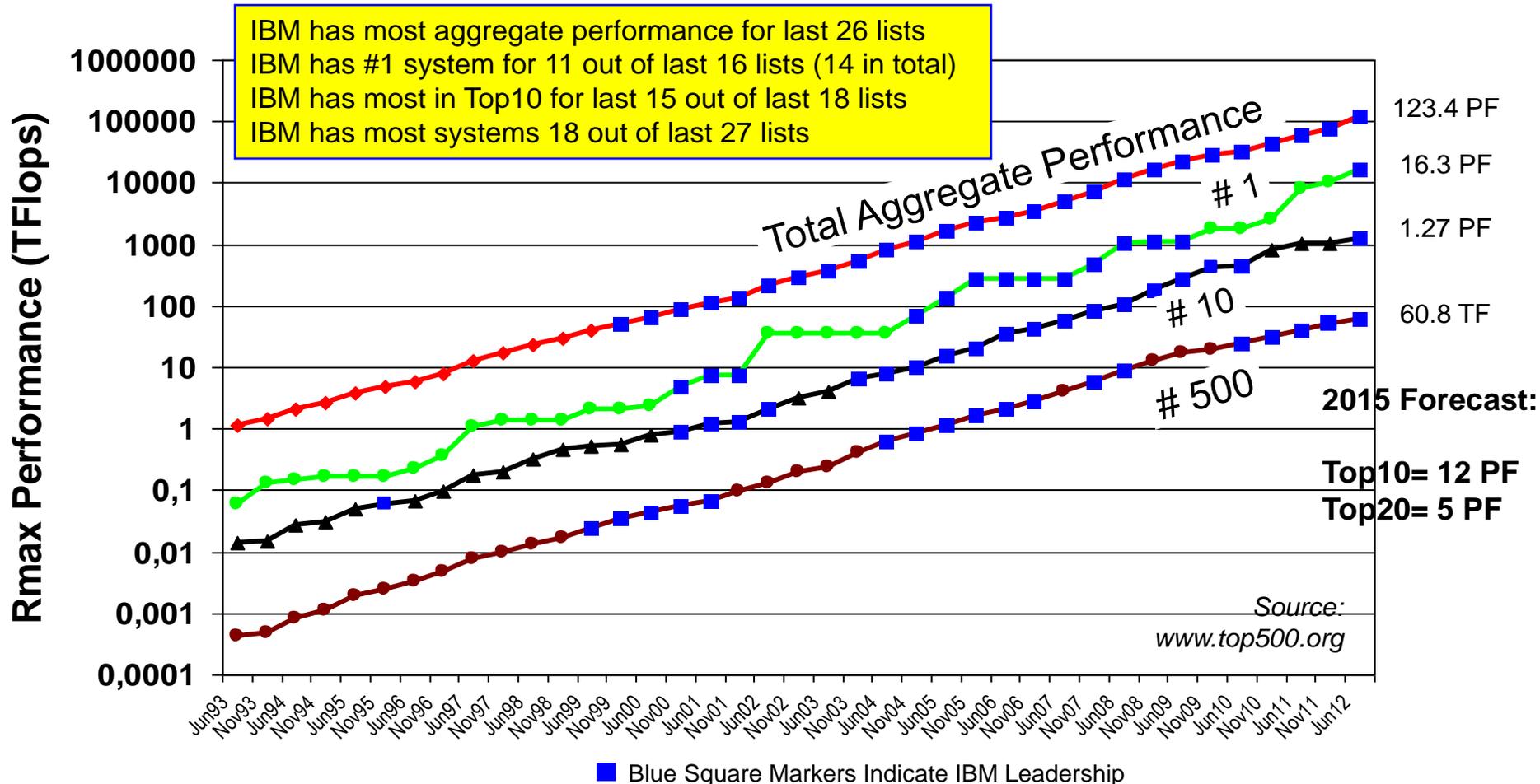
Even though there is some stepping of the performance of the #1 system, the relentless growth of the #500 clip level, #10 clip level and Total Aggregate performance all are fairly straight line trends when plotted on log scale.



Source:
www.top500.org

TOP500 Performance Trend

Over the long haul IBM has demonstrated continued leadership in various TOP500 metrics, even as the performance continues it's relentless growth.



TOP20 Supercomputers

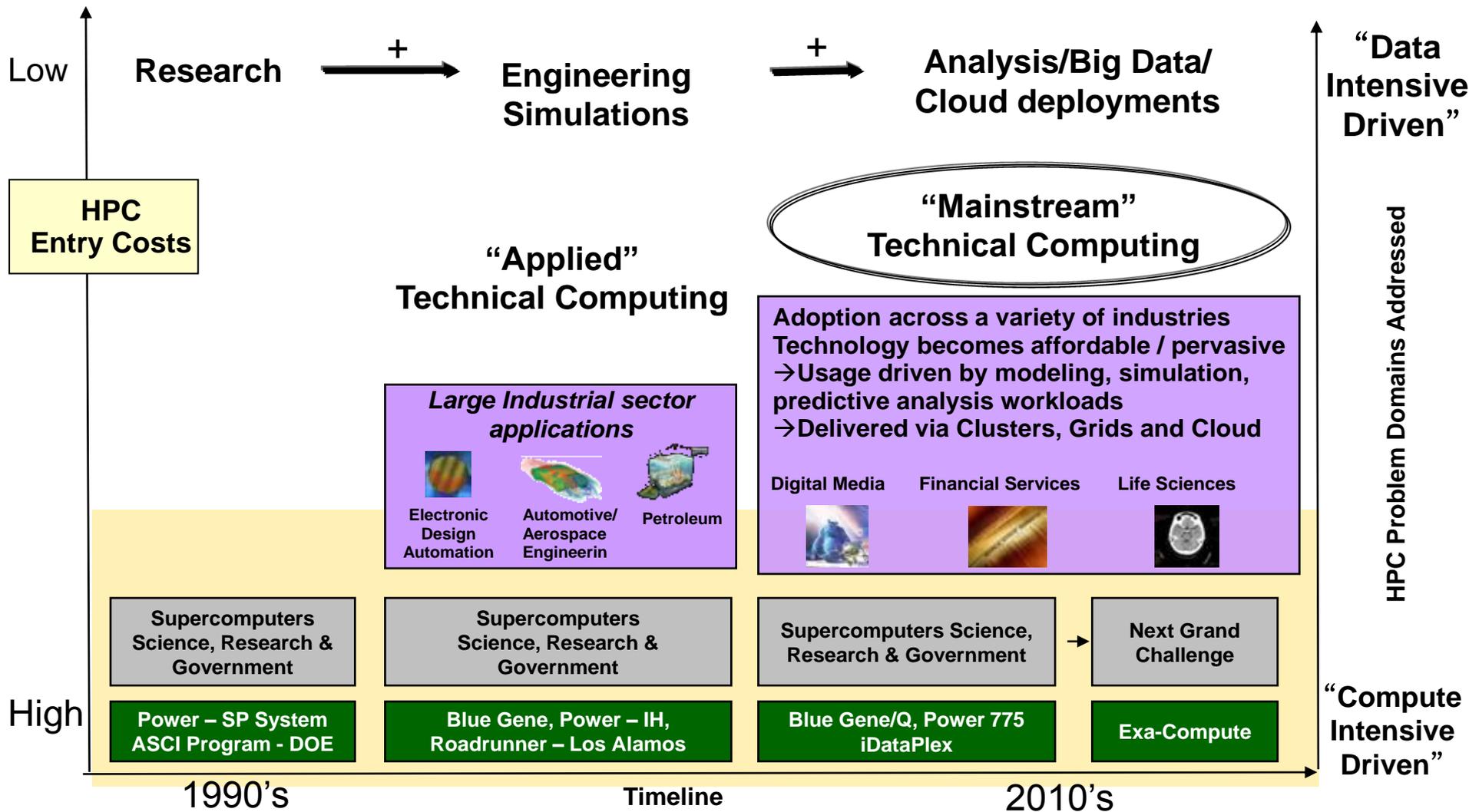
June 2012

All Top20 Systems are over 1 PFlops.
IBM has most systems in TOP20 with eight.

#	Vendor	Rmax TFlops	Installation
1	IBM	16324	DOE/NNSA/LLNL-Sequoia (96 racks Blue Gene/Q) Update
2	Fujitsu	10510	RIKEN K Computer – Japan (SPARC64 VIIIfx 2.0GHz)
3	IBM	8162	DOE/NNSA/ANL - Mira (48 racks Blue Gene/Q) New
4	IBM	2897	LRZ - SuperMUC (iDataPlex – Sandy Bridge) New
5	NUDT	2566	NUDT – Tianhe 1A China (Westmere/NVIDIA GPU)
6	Cray	1941	Oak Ridge NL - Jaguar (XT5 6C 2.6 GHz Opteron) Update
7	IBM	1725	CINECA - Fermi (10 racks Blue Gene/Q) New
8	IBM	1380	Juelich - JuQUEEN (8 racks Blue Gene/Q) New
9	Bull	1359	CEA/GENCI - Curie (Sandy Bridge) New
10	Dawning	1271	NSCS-China Nebulae (6C Xeon+NVIDIA GPU)

#	Vendor	Rmax TFlops	Installation
11	SGI	1243	NASA Ames - Pleiades (Altix mixed CPUs) Update
12	Bull	1237	IFERC Helios - Japan (Sandy Bridge) New
13	IBM	1207	Daresbury – Blue Joule (7 rack Blue Gene/Q) New
14	HP	1192	TiTech Tsubame 2.0–Japan (Westmere/NVIDIA GPU)
15	Cray	1110	Sandia - Cielo (XE6 8core 2.4GHz Opteron)
16	Cray	1053	NERSC – Hopper (XE6 12core Opteron)
17	Bull	1050	CEA Tera-100 – France (Nehalem-EX)
18	Fujitsu	1043	Univ Tokyo – Oakleaf FX (SPARC64 IXfx 1.8 GHz) New
19	IBM	1042	DOE/NNSA/LANL - RR (QS22/LS21)
20	IBM	1035	Univ Edinburgh – DiRAC (6 rack Blue Gene/Q) New

Pure science is expanding



Styles of Massively Parallel Systems Underpin HPC and Analytics

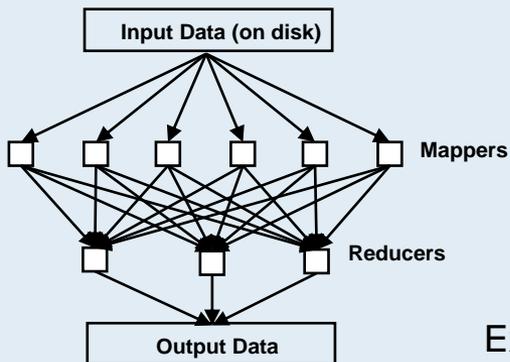
Embarrassingly Parallel

Network Dependent

Random Comms

Data Intensive: Data at Rest

JAQL, Java



Data at Rest*:
High Volume
Mixed Variety
Low Velocity

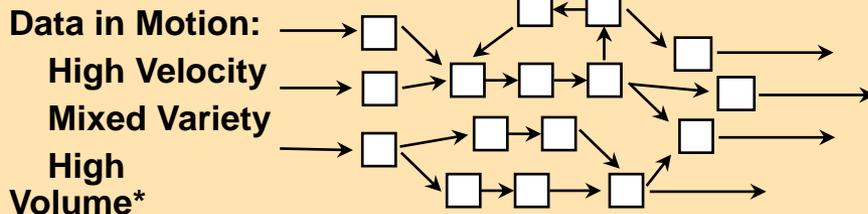
Extreme Scale-out

(*pre-partitioned)

Structured Comms

Data Intensive: Streaming Data

SPL, C, Java



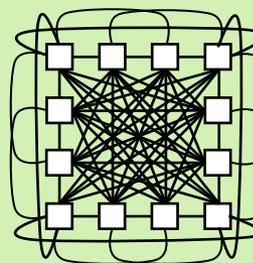
Data in Motion:
High Velocity
Mixed Variety
High Volume*

Reactive Analytics
 Extreme Ingestion

(*over time)

Data and Compute Intensive (Large Address Space)

C/C++, Fortran, UPC, SHMEM, MPI, OpenMP

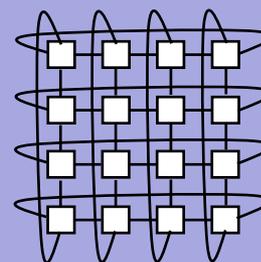


Data is Moving:
Long Running
All Data View
Small Messages

Discrete Math
 Low Spatial Locality

Compute Intensive (Data Generators)

C/C++, Fortran, MPI, OpenMP



Data is Generated:
Long Running
Small Input
Massive Output

Generative Modeling
 Extreme Physics

□ = compute node

Industry Trends– what is happening in HPC?

- **Exascale** computing will be a reality in 2018/2019; large scale is being tackled now. Universities/research institutions typically will reach 10% of national lab installations. So in 2018, will large university installations have a multi petaflop computer? What will house it? What will be the power requirements? The Power Utilization Efficiency (PUE) of your datacenter is as important as the “green solution” you put in it.
- **The Data Deluge**– big data, big data management is consuming researchers now. There are very large world-wide projects where data is measured in the 100s of petabytes. A petabyte is 10^{15} bytes of data. Big Insights, Infosphere Streams and Watson are important technologies from IBM that will drive the high end, and our file system (GPFS) will be an important differentiator.
- **Justifying HPC on Campus (the role of the Cloud)**– can be tackled by fulfilling the a myriad of campus needs for both high throughput computing and high performance (capability) computing using a shared environment. Best practices show that costs are reduced when one builds a central condominium facility where researchers can contribute their grant money and which serves the larger research community. HPC makes a research institution more competitive for grants and leads to more publications.

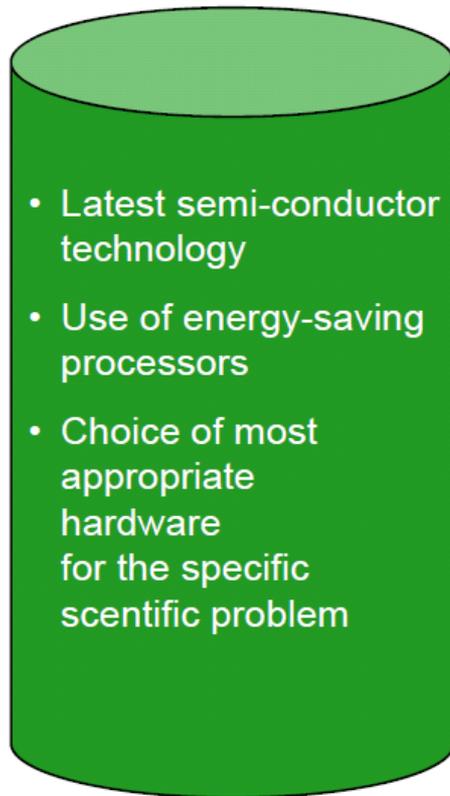


Key aspects in decisions:

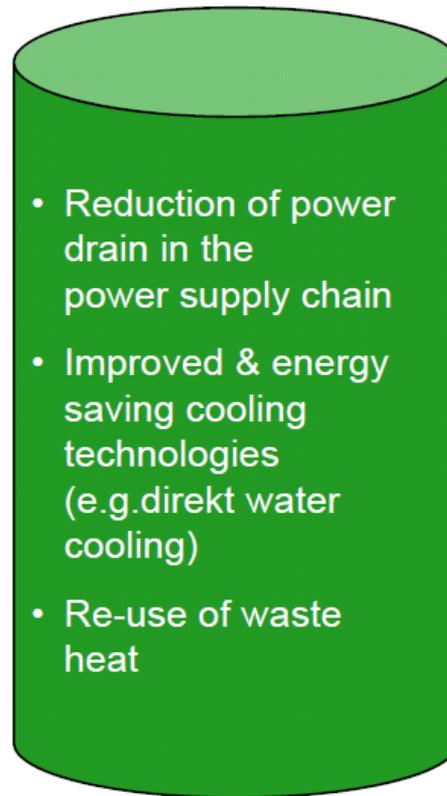
- **System Design**
 - **Project and design responsibility**
- **Data**
- **Economics**
 - **Environmental responsibility (GREEN): space, power, cooling**
- **Software and Software programming models**
- **Productivity**
 - **Management tools**
- **Reliability and availability**



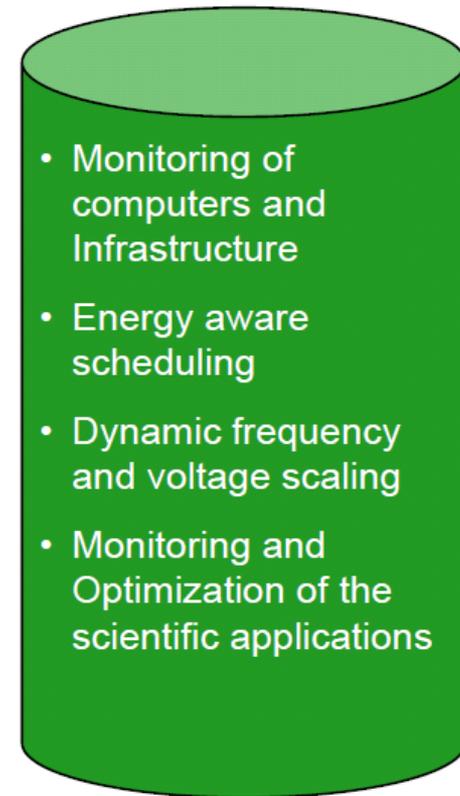
Pilars of Energy Efficient Computing



Energy efficient hardware



Energy efficient infrastructure



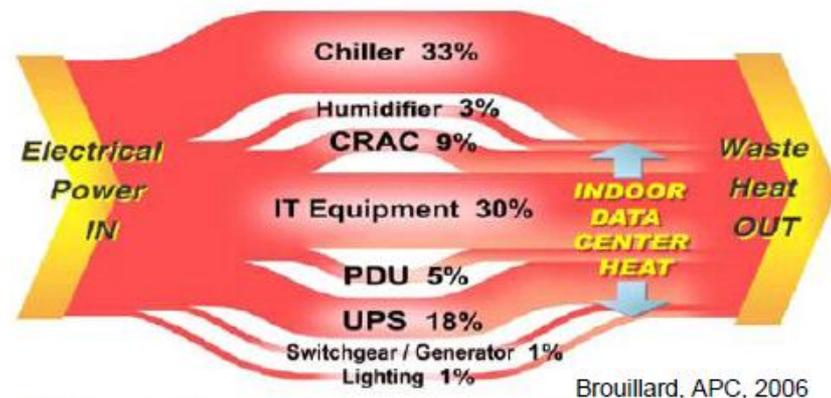
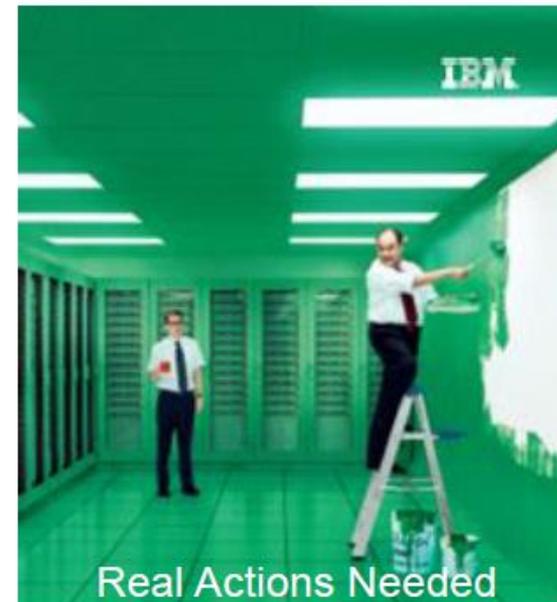
Energy aware software environment

Green Datacenter Market Drivers and Trends

- Increased green consciousness, and rising cost of power
- IT demand outpaces technology improvements
 - Server energy use doubled 2000-2005; expected to increase 15%/year
 - 15 % power growth per year is not sustainable
 - Koomey Study: Server use 1.2% of U.S. energy
- ICT industries consume 2% worldwide energy
 - Carbon dioxide emission like global aviation



Source IDC 2006, Document# 201722, "The impact of Power and Cooling on Datacenter Infrastructure, John Humphreys, Jed Scaramella"



Future datacenters dominated by energy cost; half energy spent on cooling

IBM Product Positioning

•Blue Gene

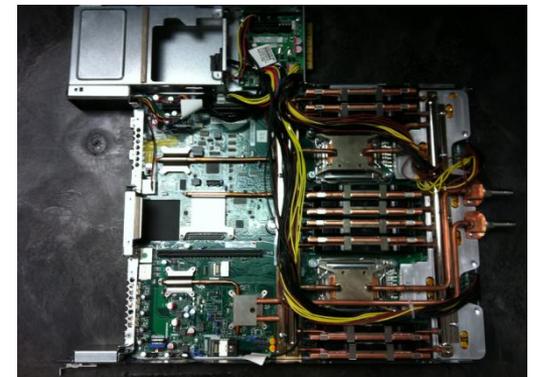
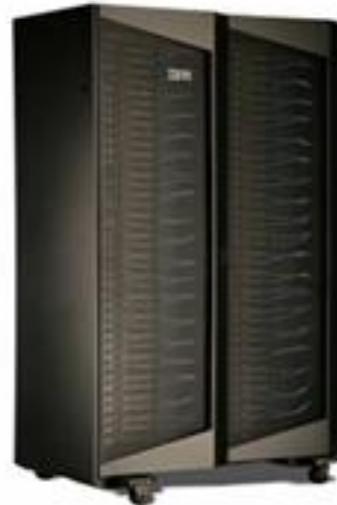
- Ultra reliable
- **Ultra high scaling capability**
- **Fast interconnect**
- **Highly energy efficient**
- Very dense packaging
- **Strong PEAK \$/Mflp price/performance**

•X86 Clusters

- Focused on “capacity”, scalability
- High ISV coverage
- **Strong PEAK \$/Mflp price/performance**
- GPU support

•POWER Platforms

- **Production ready, ultra reliable**
- **Market leader – sustained application performan**
- Large memory SMP
- Rich s/w stack (from PERCS)
- Fast interconnect
- Very dense packaging

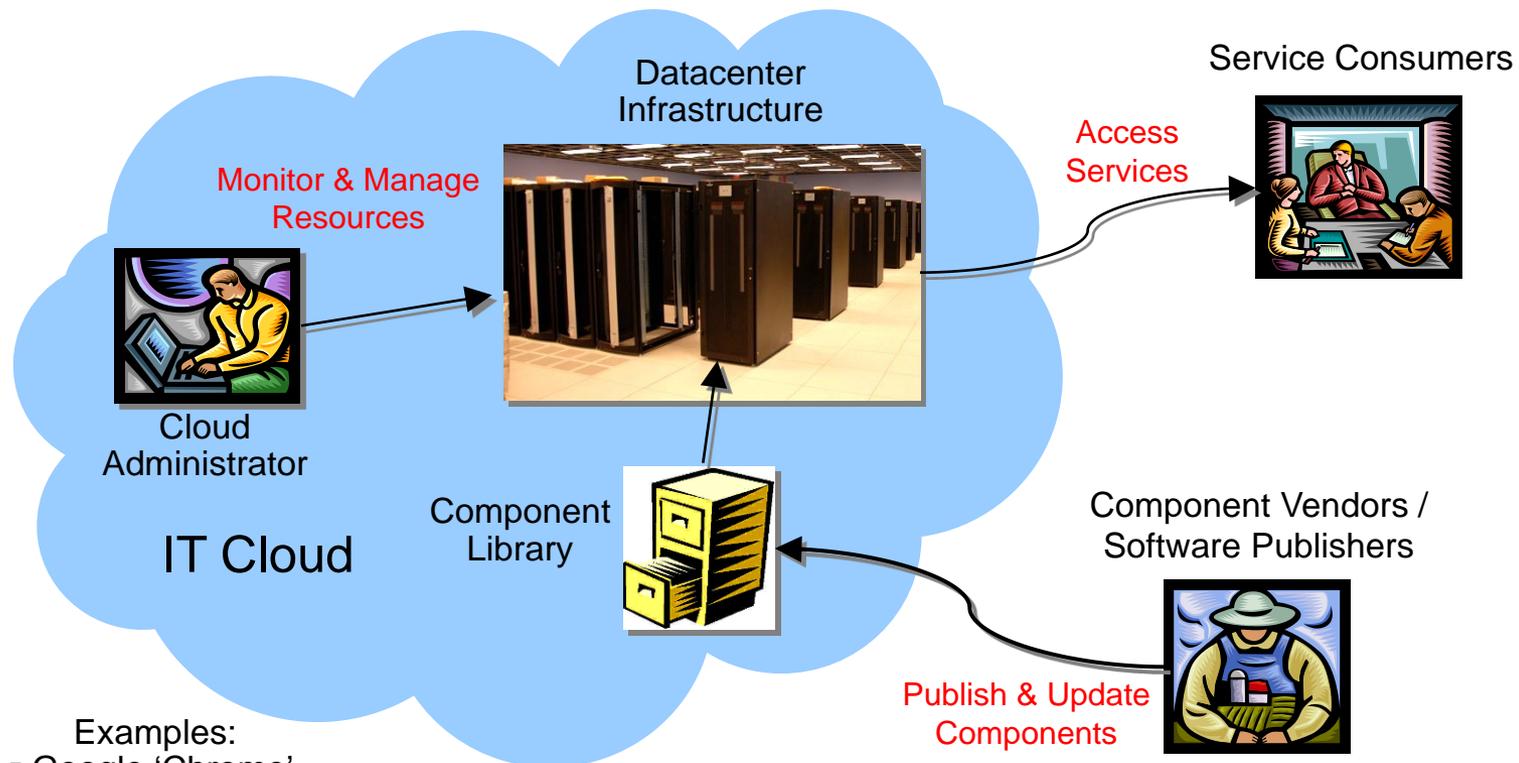


HPC IN THE CLOUD



What Is Cloud Computing?

- Cloud computing is an emerging style of computing in which applications and data are provided as services to users over the Web.
 - ⇒ The services provided can be available globally, always on, low in cost, “on demand”, and massively scalable



Examples:

- Google 'Chrome'
- Amazon Elastic Compute Cloud EC²
- IBM Research Compute Cloud RC²

Evolution of Cloud Computing

2007

2000

1990

1980

Grid Computing

- Solving large problems with parallel computing
- Made mainstream by Globus Alliance



Utility Computing

- Offering computing resources as a metered service
- Introduced in late 1990s



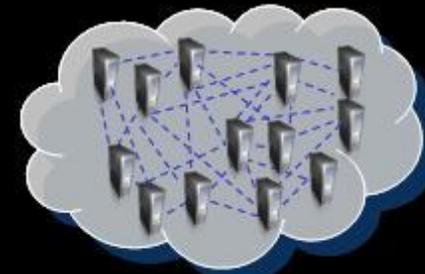
Software as a Service

- Network-based subscriptions to applications
- Gained momentum in 2001



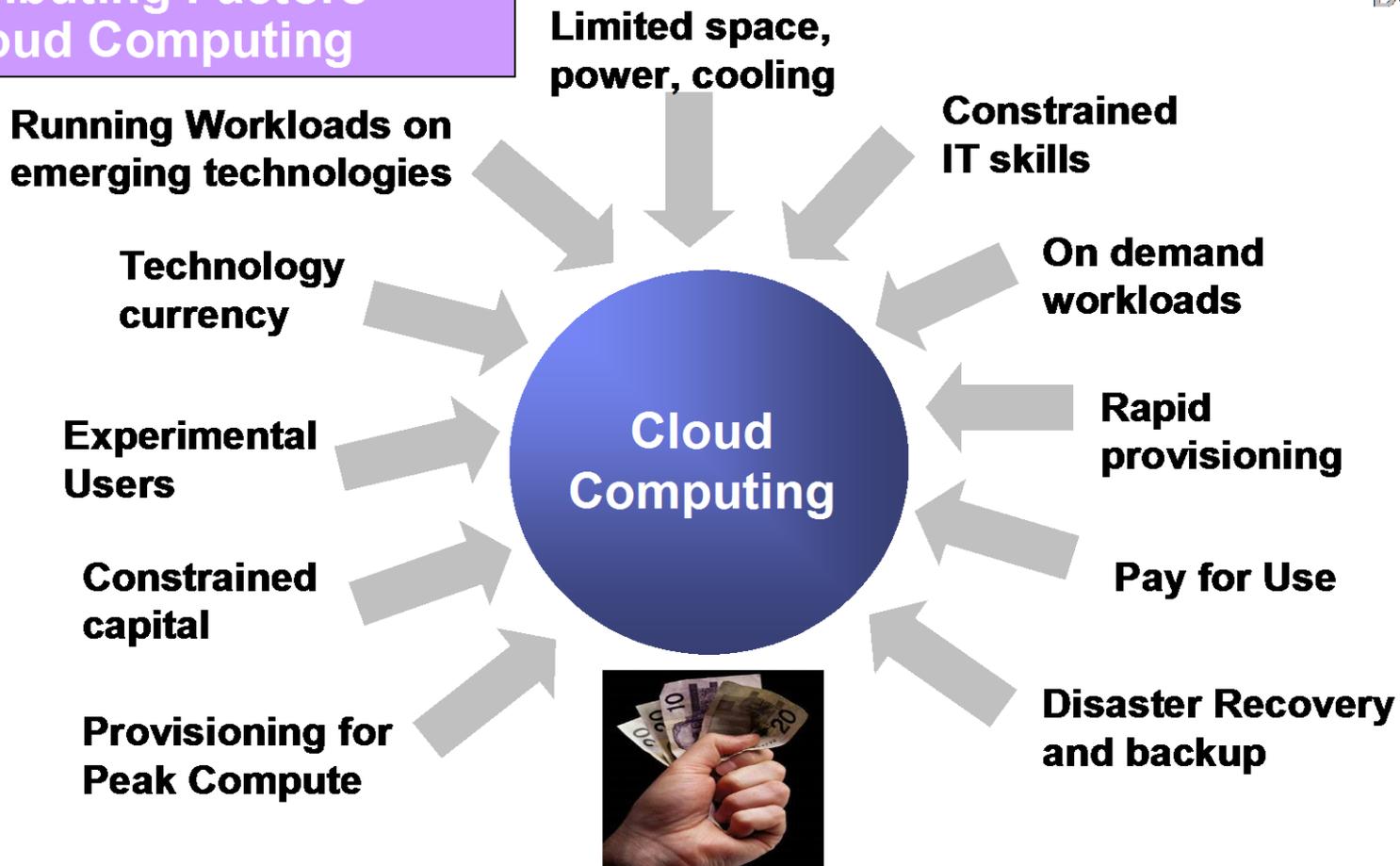
Cloud Computing

- Next generation Internet computing
- Next generation data centers



Contributing Factors to Cloud Computing

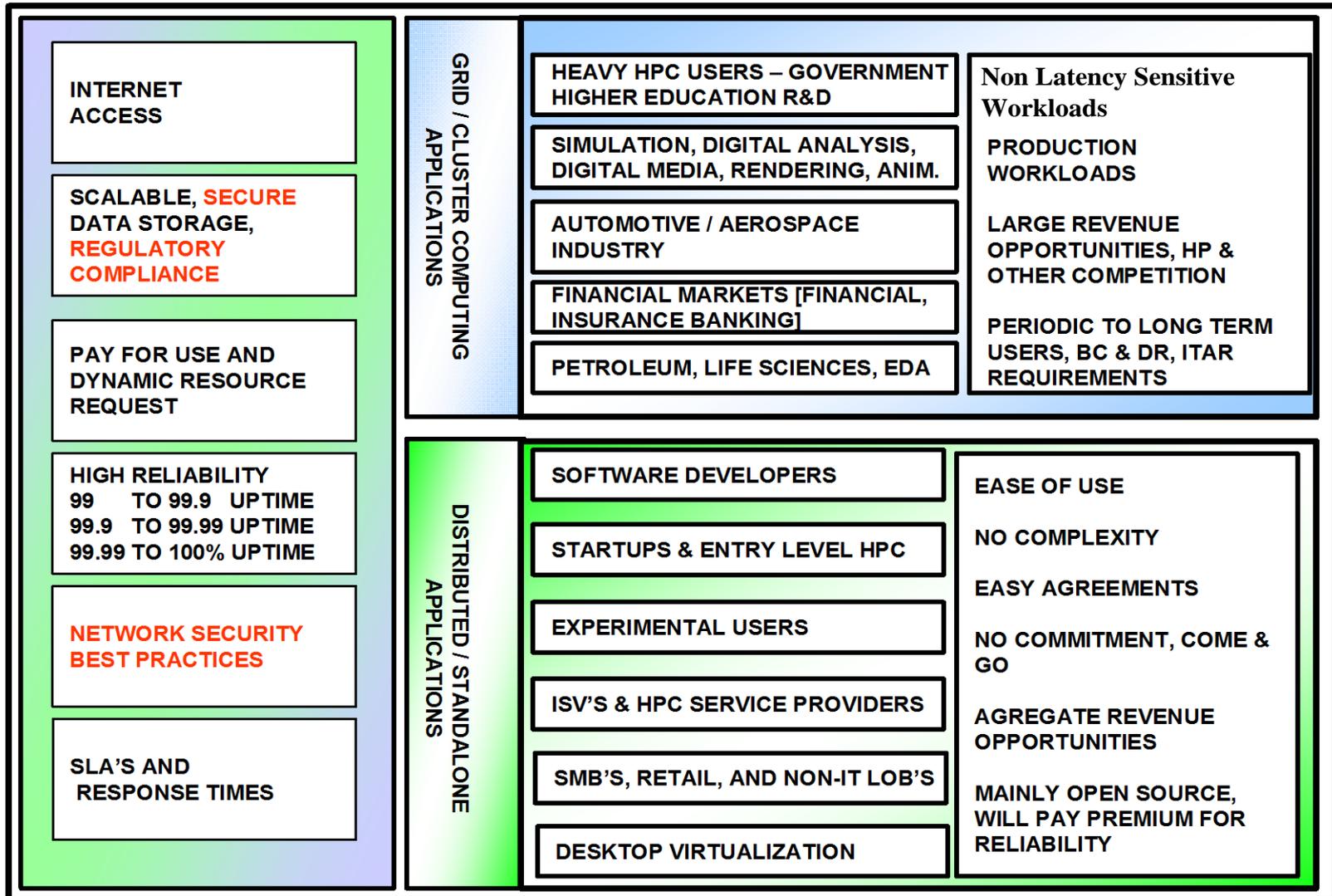
DCCoD



“More than 70% of the world’s Global 1000 organizations will have to modify their data center facilities significantly during the next five years.” - Gartner, September 2007

Energy costs 8x, Management costs 4x, 70% of IT budget is operational overhead

Cloud Computing spectrum – Observations



Srinivas Cheemalapati

Cloud support beneficial to HPC

- Application portability
- Image management
- Simulate scaling
- VM migration
- Better resource utilization
- Rapid provisioning



Application portability

- Users maintains their own virtualized OS
 - Linux, Windows, Solaris, ...
- Isolation:
 - No conflict: OS level, libraries, software, ...
 - Concurrent mix of different environments on same physical server
 - Subnetwork: cluster of servers



Image management

- Capture an HPC environment
 - Create & customize your own
 - Vendor supplied software stack
- Usage
 - Save, restore
 - Share, publish
 - Archive legacy environment
- Possible in any storage configuration
 - LVM, SAN LUN, VMWare



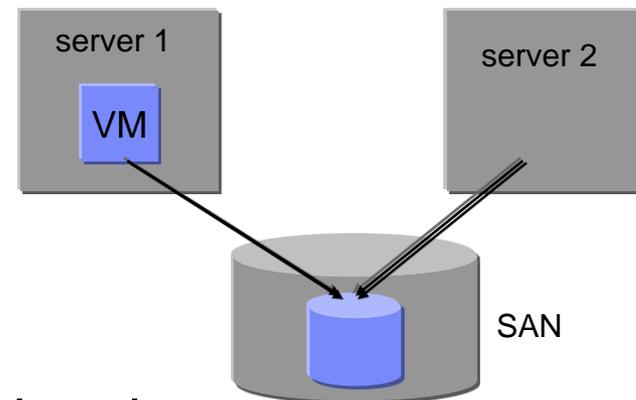
Simulate scaling

- Develop & debug large scale execution
 - Time consuming, system not productive
 - Result and execution time not a factor
- Shared cluster:
 - more efficient usage: don't need to tie up resource
 - when ready, execute on dedicated cluster



VM migration

- Fault tolerance
 - Detect pending failure: disk error, high temperature, communication error, ...
 - Migrate VM to healthy server
- Load balancing
 - High end servers
- Requirements
 - SAN, separate network for migration
 - Our observation: 300-400msec down time



Better resource utilization

- Consolidate multiple VM's on same node
- Multicore CPU in high end server
 - idle time due to disk I/O, blocking send/receive
- Network bandwidth
 - Applications have different communication requirement
- Tradeoff:
 - Flexibility in job time
 - More users, full system utilization



Rapid provisioning

- New VM in about 2-3 minutes
- No work by IT team:
 - Cluster created automatically when requested, freed up automatically when done
- With self service portal:
 - Change thinking about IT infrastructure
 - Enable more experimentation
 - Vehicle for teaching



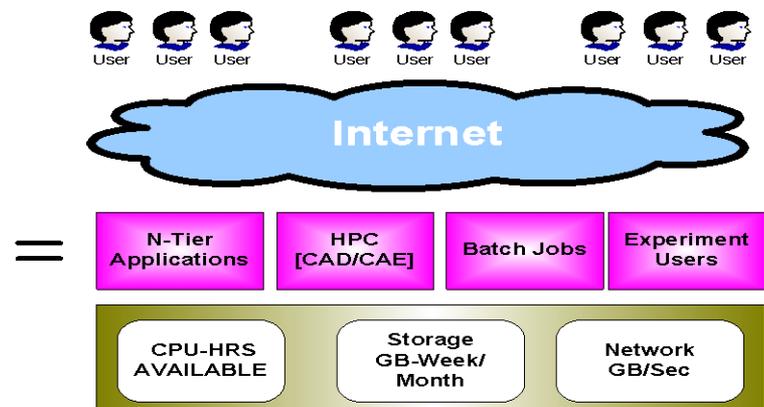
Concerns about Cloud

- Overhead
 - Virtualization cost
 - Computation, memory, disk I/O, networking
- Reliable performance
 - Resource sharing in VM's
 - Communication capacity





Building blocks for a cloud



Srinivas Cheemalapati
DCCoD

Not for distribution

The DCCoD models

❖ Dedicated

- ❖ Custom Environment – choice of data center, servers, storage, dedicated switch, WAN/LAN High Availability Network
- ❖ Dedicated resources: 1-3 year commitment
- ❖ Leased by IBM Global Financing

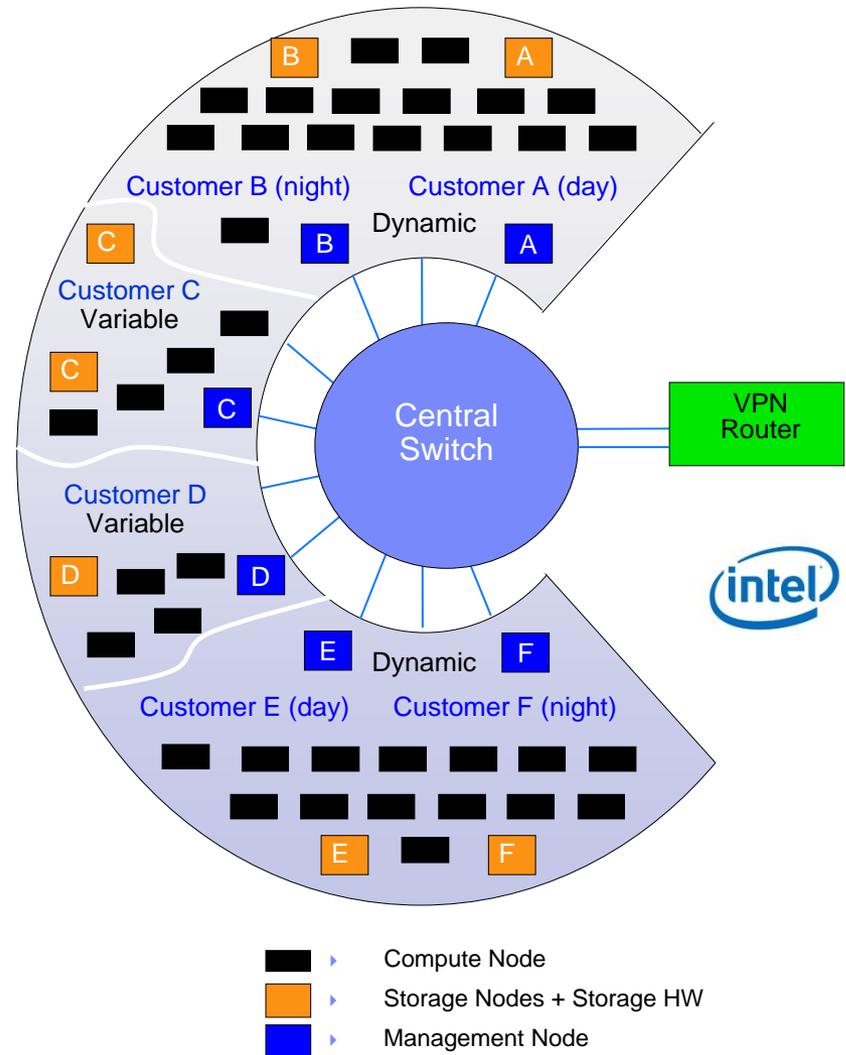
❖ Variable

- ❖ Utilize DCCoD Center infrastructure
- ❖ Virtual clusters dedicated to one client at a time
- ❖ Automated network and server provisioning
- ❖ Reserve by the week; “Pay for use”

❖ Dynamic

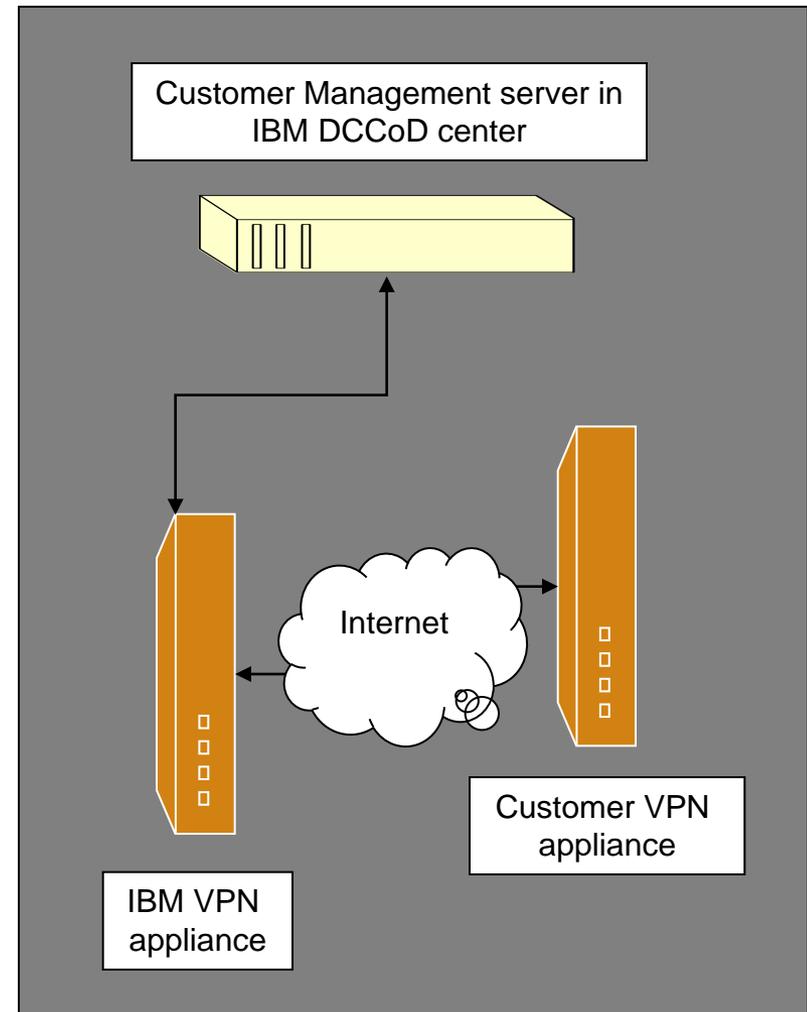
- ❖ Utilize DCCoD Center infrastructure
- ❖ Virtual clusters dedicated to one client at a time
- ❖ Automated network and server provisioning
- ❖ Reserve by the hour*; “Pay for use”
- ❖ Ideal for Intraday and post trading workloads

*Minimum commit: Monday – Friday, 8 - 10 hrs per day

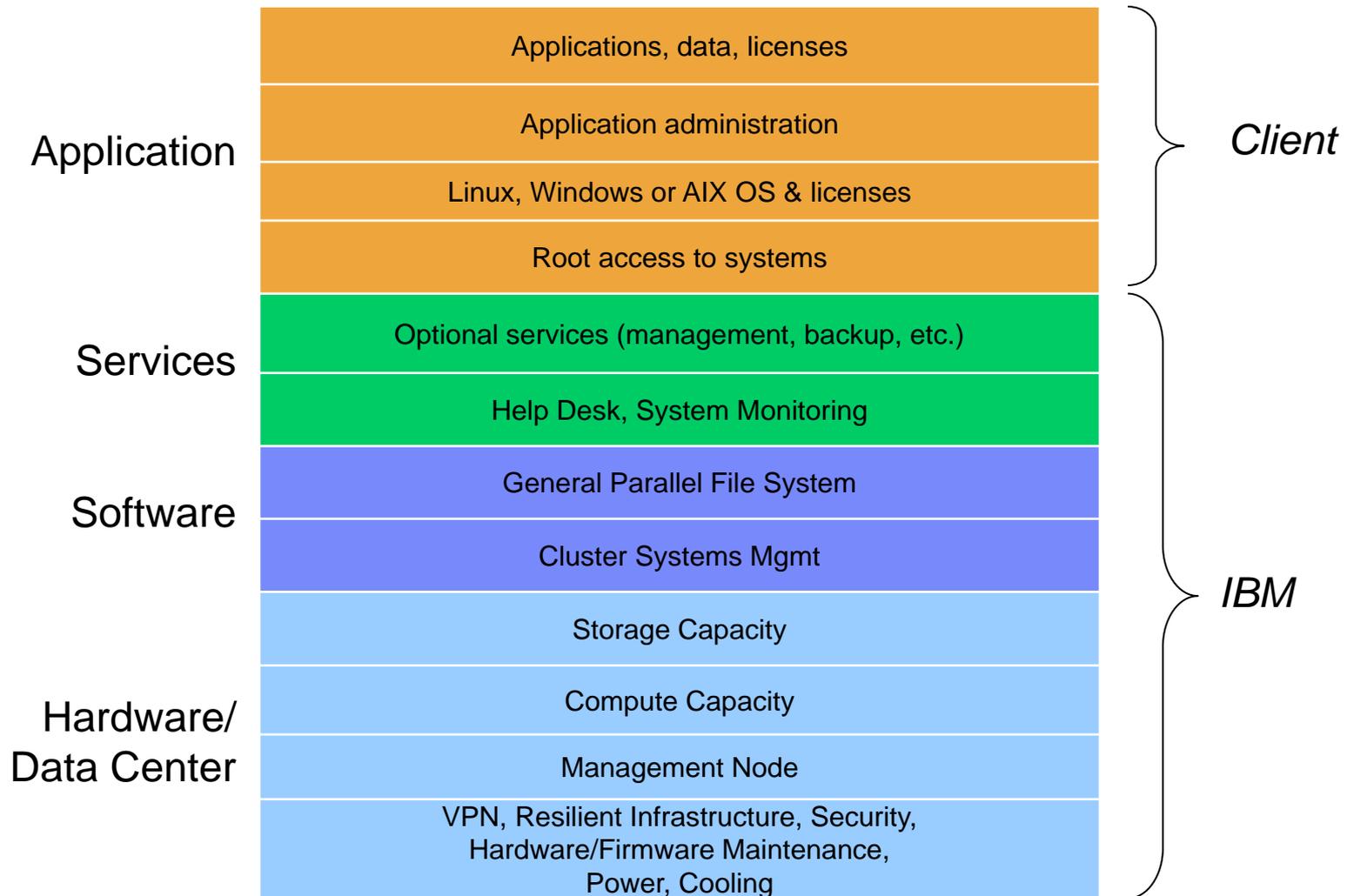


IBM DCCoD base access

- Renewable “annual membership”
- Proactive advanced planning to support on demand usage
- Ongoing Virtual Private Network (VPN) access
 - Software standard
 - Various hardware options available
- Ongoing management server footprint for test and engagement readiness
- Choice of three models to contract for compute capacity
 - dedicated, variable, dynamic



IBM & client responsibilities



Examples of Cloud Computing: “Services as a Service”

1. Software as a Service (SaaS)

- Applications are delivered through the browser to multitudes of customers.
- Customers avoid upfront investment in servers and software licensing.
- Providers spread application hosting costs over large customer base.

2. IT Infrastructure as a Service (Utility Computing)

- Data center infrastructure elements (storage, virtual servers, and even virtualized data center partitions) are provided on demand over the Web.
- Initial adoption is mainly for supplemental, non-mission-critical needs, but broader use may follow.

3. Web Services as a Service

- Web service providers offer APIs that enable developers to exploit functionality over the Internet, rather than delivering full-blown applications.

4. Development Environments as a Service

- Vendors provide development environments as a service.
- Clients build applications that run on the provider's infrastructure and are delivered to end users via the Web from the provider's servers.

5. Managed IT Services as a Service

- See http://www.infoworld.com/article/08/04/07/1:5FE-cloud-computing-reality_1.html for more details
Services such as a virus scanning service for e-mail or an application monitoring service are provided as managed services to IT groups rather than to end-users

IBM HPC MANAGEMENT SUITE FOR CLOUD



Overview

IBM HPC Management Suite for Cloud offering allows customers running technical computing and analysis workloads to consolidate their scattered cluster infrastructure, increase hardware utilization, gain access to larger cluster infrastructure and deploy their HPC applications in a Cloud environment.

Key Client Needs Addressed include

- Consolidation and efficient sharing of HPC infrastructure
- Ease of manageability and access to HPC infrastructure via a self-service web portal
- Automation (Rapid provisioning, cluster set-up, power & energy management) capabilities to optimize usage of compute resources and increase system utilization
- Centralized user management, usage metering & accounting.

Target Markets

High Performance Computing / Technical Computing and Analysis workloads in Industrial sector – Automotive, Aerospace & Defense, Chemical & Petroleum, Electronics, Financial Services, Government, Research institutes, Higher education and Life Sciences



State-of-the-art Cloud Services for High Performance Computing

- **Self service web portal**
 - Common Cloud services interface for users and administrators
 - Cloud Management Policy Administration
 - Job submission and monitoring multiple job queues

- **Rapid image deployment**
 - Diskless, Bare-metal and Virtual Machine provisioning
 - Deploy Linux and Windows images
 - Image capture and reuse

- **Power management**
 - Policies for power state management with ability for manual overrides from portal
 - Energy monitoring and usage records for provisioned nodes



State-of-the-art Cloud Services for High Performance Computing

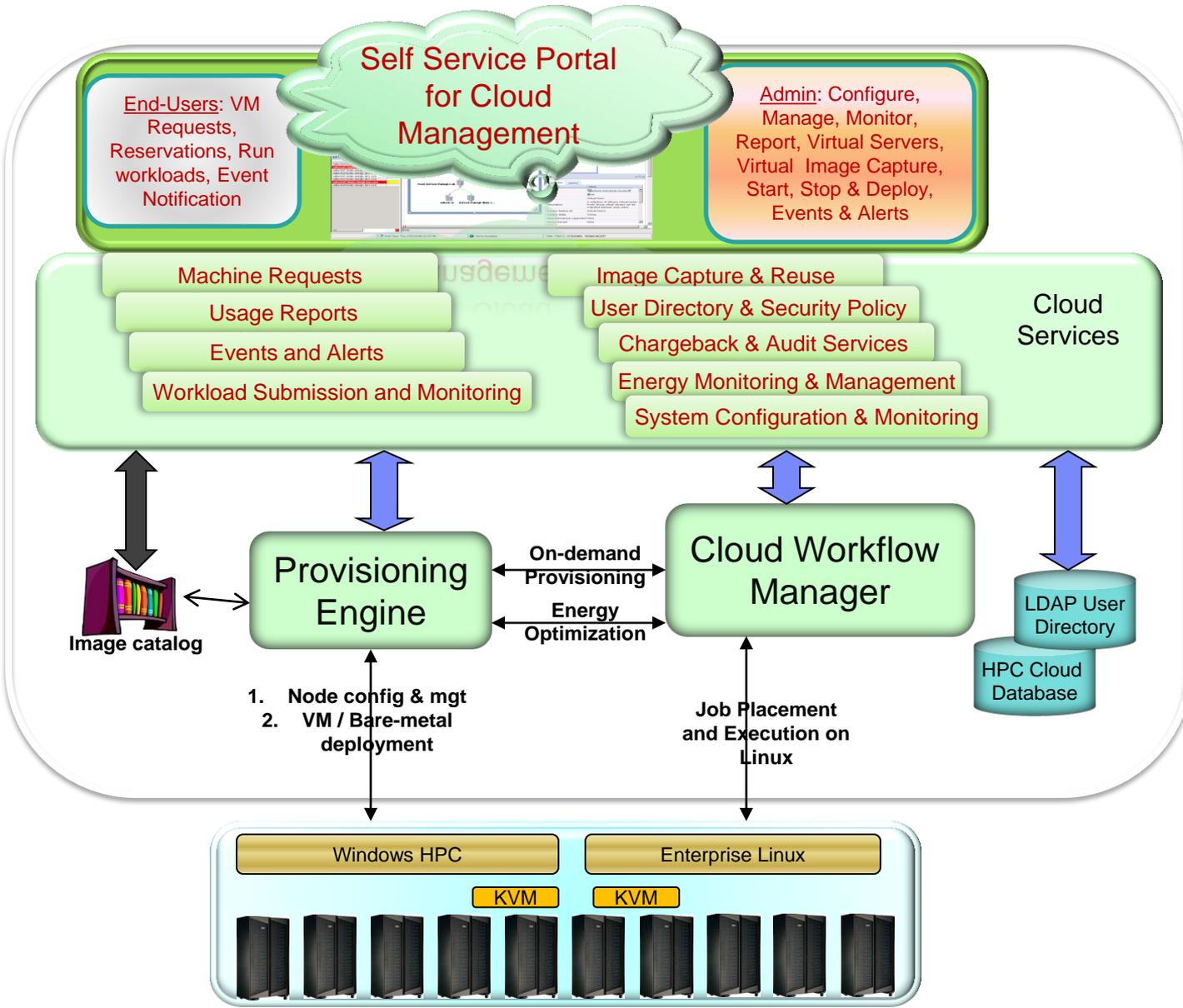
- Automated setup and configuration for HPC workloads
 - Configuration options allow high resource utilization
 - Multiple clusters (out-of-box support with LoadLeveler) within a private cloud
 - Single-point submission and monitoring for multiple LL job queues

- Network partitioning
 - Virtual LAN setup for private clusters

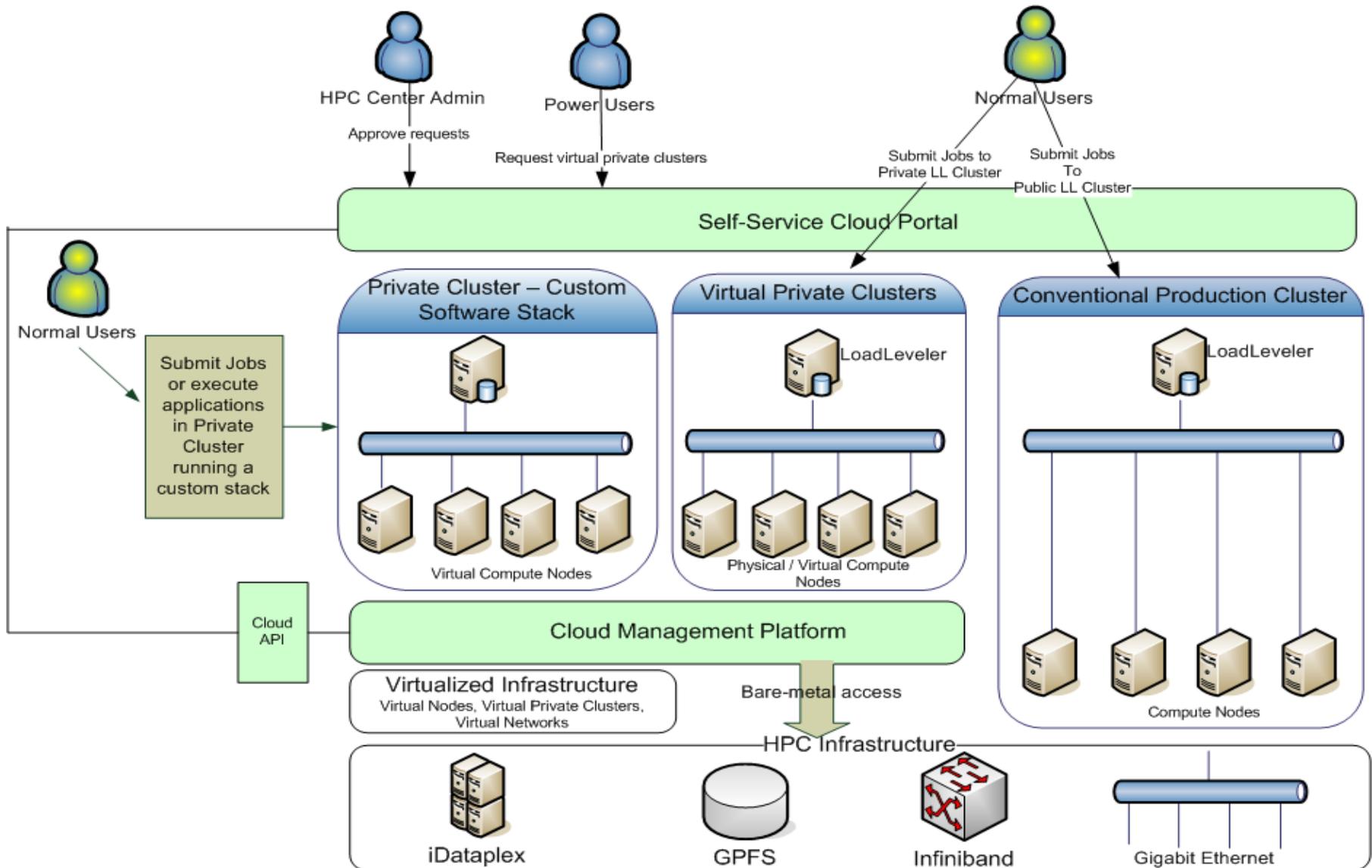
- Usage Metering & Accounting
 - Compute resource usage metrics captured in database
 - Ability to create customized billing reports

- Centralized user management and security
 - LDAP based authentication

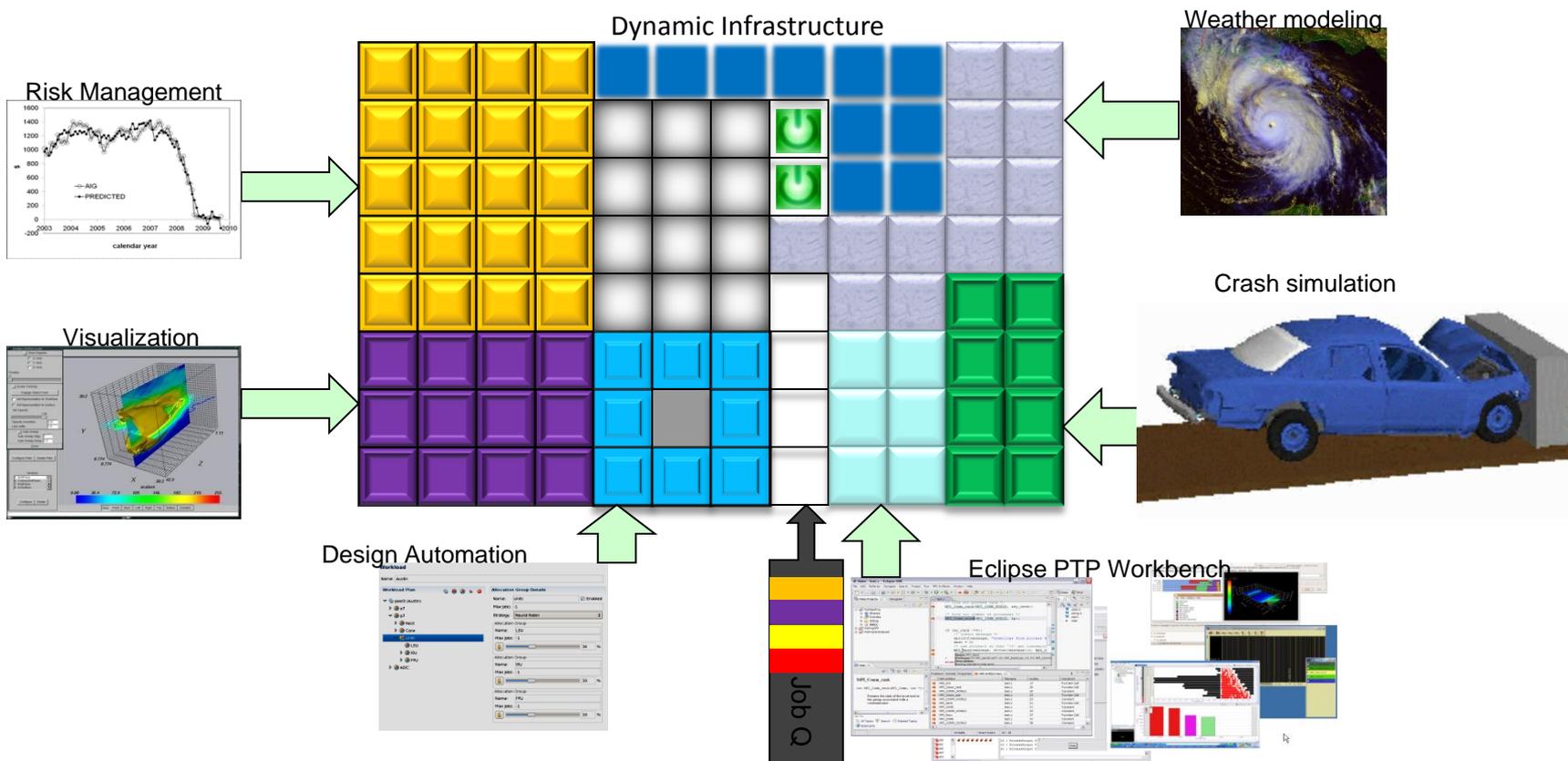
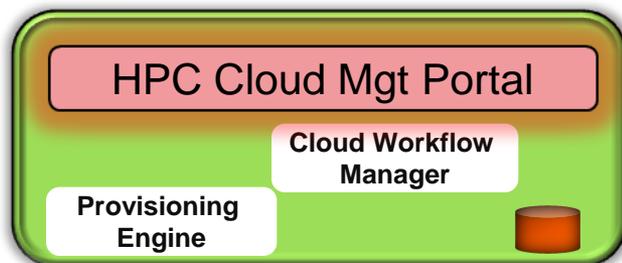
HPC Cloud Management Suite



USE CASES FOR RELEASE 1.0

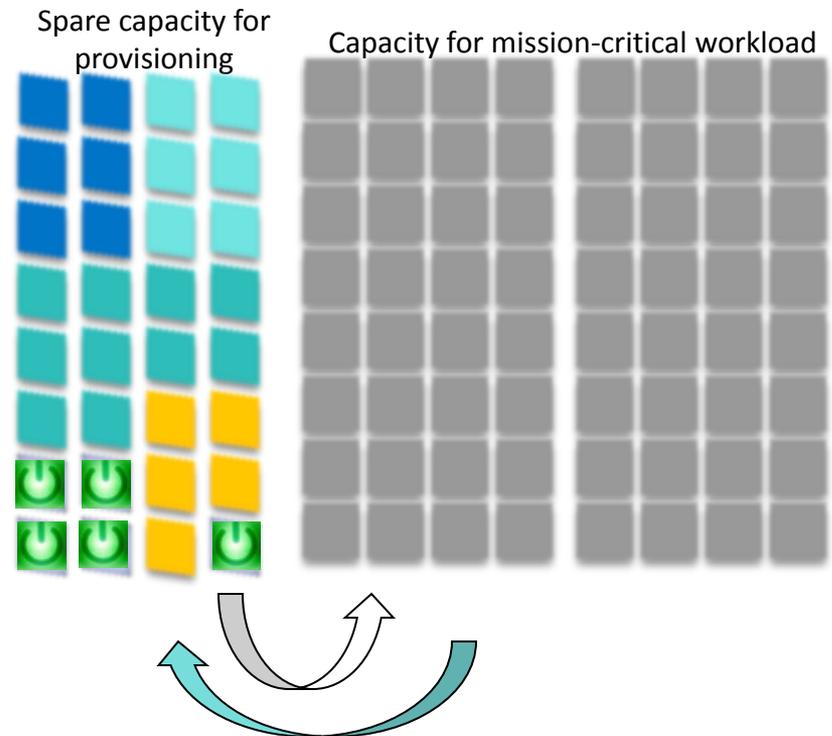


Orchestrate clusters for HPC applications...



... while running mission-critical workload

- ⊕ All machines in the cloud are able to run mission critical workload when desired
- ⊕ Spare capacity is configured to run low priority work
- ⊕ A provisioning request from a HPC Cloud, the workload will be vacated and the nodes will be provisioned.
- ⊕ Provisioned nodes are restored to default image for running normal workload before rejoining
- ⊕ Idle nodes go into power save or power off mode



In Summary, benefits of an optimized HPC cloud management suite

■ Visibility

- monitor your HPC Cloud on the web



■ Control

- keep your HPC Cloud in its desired state using policy-based administration

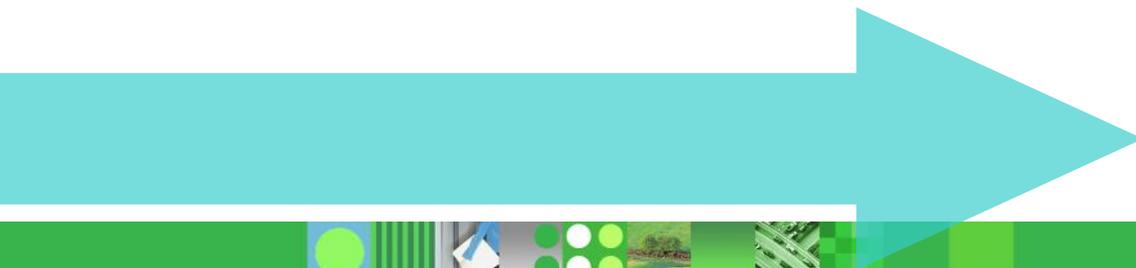
■ Automation

- manage huge and growing infrastructures while controlling cost and quality



■ Performance

- experience the full performance and scalability of a proven HPC platform



Multi-site HPC cloud vision for large enterprises

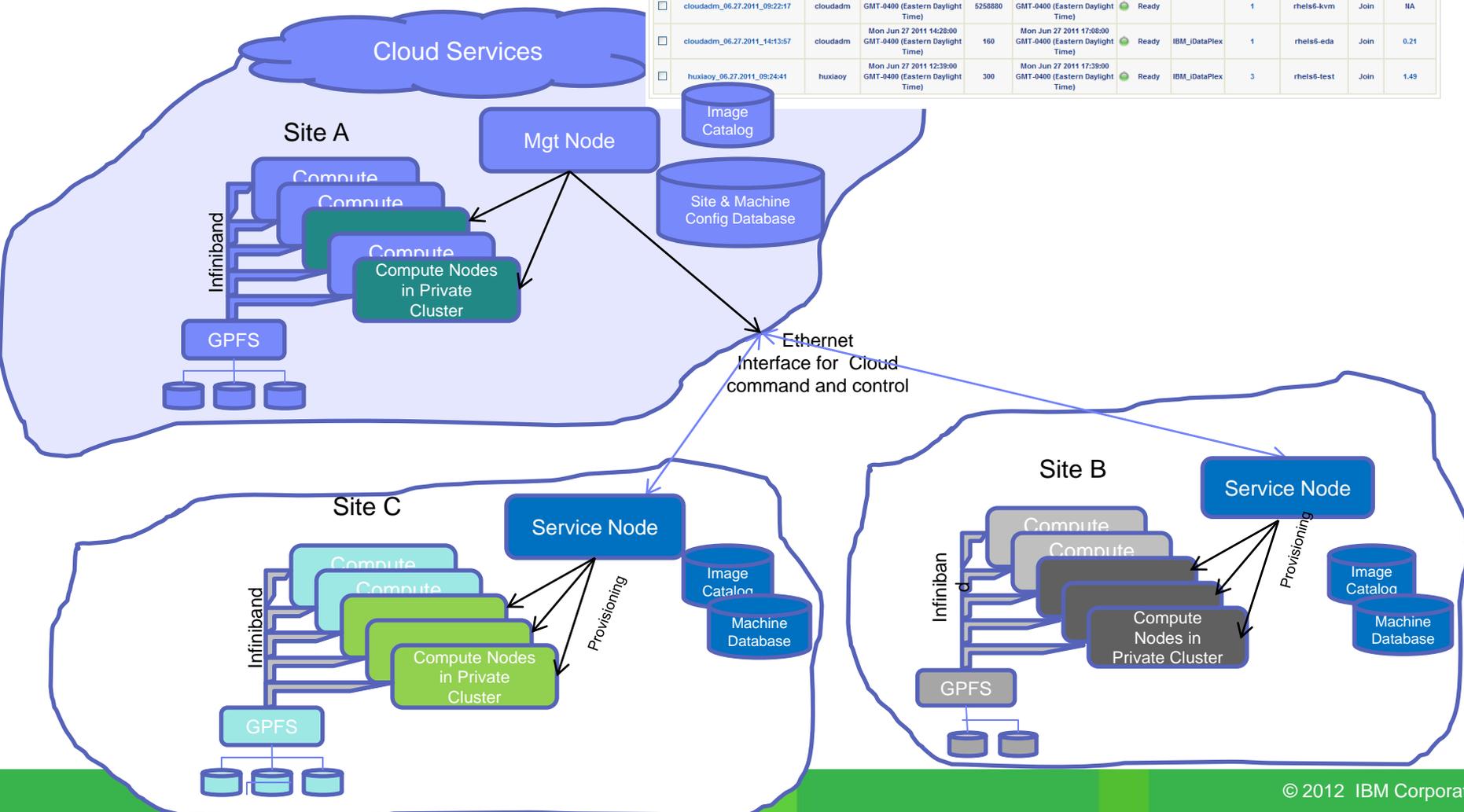
HPC Cloud Management Portal

Job Management | Monitoring | Energy Management | Billing / Metering | Users / Groups

List View | Calendar View

Cancel Request Refresh

<input type="checkbox"/>	Request	Owner	Start Date	Duration(m)	End Date	State	Type	# Machines	OS Image	Sub C	Energy(KWh)
<input type="checkbox"/>	cloudadm_06.27.2011_09:22:17	cloudadm	Mon Jun 27 2011 09:42:17 GMT-0400 (Eastern Daylight Time)	5258880	Sat Jun 26 2021 09:42:17 GMT-0400 (Eastern Daylight Time)	Ready		1	rhels6-kvm	Join	NA
<input type="checkbox"/>	cloudadm_06.27.2011_14:13:57	cloudadm	Mon Jun 27 2011 14:28:00 GMT-0400 (Eastern Daylight Time)	160	Mon Jun 27 2011 17:08:00 GMT-0400 (Eastern Daylight Time)	Ready	IBM_DataPlex	1	rhels6-eda	Join	0.21
<input type="checkbox"/>	huxiaoy_06.27.2011_09:24:41	huxiaoy	Mon Jun 27 2011 12:38:00 GMT-0400 (Eastern Daylight Time)	300	Mon Jun 27 2011 17:38:00 GMT-0400 (Eastern Daylight Time)	Ready	IBM_DataPlex	3	rhels6-test	Join	1.49



Example of:

IBM HPC CLOUD PORTAL



HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=Request

HPC Cloud Management Portal

IBM HPC Cloud Management Portal Welcome, cloudadm [Sign out](#)

Home Request Resources - Image Library - Job - Monitoring - Energy Management - Billing / Metering - Users / Groups -

- New Request
- View Requests

Select machines

Type: IBM iDataPlex

How many machines would you like? 1

Options Setup LoadLeveler Cluster

Schedule Your Reservation

Start Date: 11/10/2010 06:43
Time on this machine is Wed Nov 10 06:35:31 2010 EST (GMT -05)
Allow 5 minutes for setup

Duration: 100 minutes

End Date: 11/10/2010 08:23

Back Next Cancel

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=listProv

HPC Cloud Management Portal

HPC Cloud Management Portal Welcome, cloudadm [Sign out](#)

Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

List View **Calendar View**

Cancel Request

<input type="checkbox"/>	Request ID	Owner	Start Date	Duration	End Date	State	Type	# Machines	OS Image	Sub C	Energy(kWh)	Charge
<input type="checkbox"/>	cloudadm 11.09.2010 13:48:10	cloudadm	Tue Nov 9 13:55:00 2010	1024	Wed Nov 10 06:59:00 2010	Ready	Bare-metal	<u>4</u>	rhels6-LL	Yes	<u>8.53</u>	US \$273.00
<input type="checkbox"/>	cloudadm 11.09.2010 23:14:43	cloudadm	Tue Nov 9 23:22:00 2010	500	Wed Nov 10 07:42:00 2010	Ready	VM	<u>2</u>	rhels6-LL	No	NA	US \$66.66
<input type="checkbox"/>	cloudadm 11.10.2010 06:26:54	cloudadm	Wed Nov 10 06:34:00 2010	1024	Wed Nov 10 23:38:00 2010	Waiting	Bare-metal	<u>2</u>	rhels6-BASE	No	NA	US \$136.53
<input type="checkbox"/>	huxiaoy 11.10.2010 06:28:10	huxiaoy	Wed Nov 10 06:35:00 2010	500	Wed Nov 10 14:55:00 2010	Setup	Bare-metal	<u>2</u>	rhels6-LL	Yes	NA	US \$66.66

Total 4 Provision requests

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=listImage

HPC Cloud Management Portal

IBM **HPC Cloud Management Portal** Welcome, cloudadm [Sign out](#)

Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

Manage Images

Add Image

All Images:

Delete Add

Select	Name	OS	Machine Type supported	Description	Additional Software
<input type="checkbox"/>	rhels5.4	Redhat Enterprise Linux Version 5.4 (x86_64)	IBM iDataPlex	Redhat Enterprise Linux Version 5.4	
<input type="checkbox"/>	rhels6-BASE	Redhat Enterprise Linux Version 6 (x86_64)	IBM iDataPlex	Redhat Enterprise Linux Version 6 (Base)	VNC Server
<input type="checkbox"/>	rhels6-LL	Redhat Enterprise Linux Version 6 (x86_64)	IBM iDataPlex	Redhat Enterprise Linux Version 6	LoadLeveler PE VNC Server
<input type="checkbox"/>	sdfdsf	Redhat Enterprise Linux Version 6 (x86_64)	iDataPlex	dsf	dsf
<input type="checkbox"/>	windows2008	Windows Server 2008 (x86_64)	IBM iDataPlex	Windows Server 2008	

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=submitJCF

HPC Cloud Management Portal

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Home Request Resources Image Library **Job** Monitoring Energy Management Billing / Metering Users / Groups

- Work with Jobs
 - Submit Job Command File**
 - Create and Submit Jobs
 - Upload data file

Submit to:

Public area (Not in any provision)

Provision: cloudadm_11.09.2010_23:14:43 Ready

Specify a LoadLeveler job command file in your local filesystem to submit.

Or, specify the name of a LoadLeveler job command file on the server. You can specify either the full path name of a file, or a file name relative to the logged-in user's home directory.

Enter the file name:

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpeccloud/portal.cgi?function=viewJobs

HPC Cloud Management Portal

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Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

Work with Jobs
Submit Job Command File
Create and Submit Jobs
Upload data file

List View Graphic View

Jobs in Public Area

Jobs in cloudadm_11.09.2010_23:14:43

- Select Action - Go Refresh

<input type="checkbox"/>	ID	Name	State	Owner	Time Submitted	Class
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.0	cpu_burn_prepare	Completed	cloudadm	Wed Nov 10 07:01:33 2010	No_Class
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.1	cpu_burn_01	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.10	cpu_burn_10	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.11	cpu_burn_11	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.12	cpu_burn_12	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.13	cpu_burn_13	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.14	cpu_burn_14	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.15	cpu_burn_15	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.16	cpu_burn_16	Running	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/>	i01n01.pbm.ihost.com.102.2	cpu_burn_02	Running	cloudadm	Wed Nov 10 07:01:33 2010	large

Jobs in cloudadm_11.10.2010_06:26:54

Jobs in huxiaoy_11.10.2010_06:28:10

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpecloud/portal.cgi?function=viewJobs

HPC Cloud Management Portal

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Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

List View Graphic View

Jobs in Public Area

Jobs in cloudadm_11.09.2010_06:26:54

- Select Action -

ID	Owner	Time Submitted	Class
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	No_Class
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com	cloudadm	Wed Nov 10 07:01:33 2010	large
<input type="checkbox"/> i01n01.pbm.ihost.com.102.2	cloudadm	Wed Nov 10 07:01:33 2010	large

Jobs in cloudadm_11.10.2010_06:26:54

Jobs in huxiaoy_11.10.2010_06:28:10

ID: i01n01.pbm.ihost.com.102.1

Job Name: i01n01.pbm.ihost.com.102

Step Name: cpu_burn_01

State: Running

Class: large

Owner: cloudadm

Priority: 50

JobType: Serial

Hosts Running: i01v02.pbm.ihost.com

Group: No_Group

Unix Group: cloudgrp

Queue Date: Wed Nov 10 07:01:33 2010

Hold Until Date:

Dispatched Date: Wed Nov 10 07:00:58 2010

Completed Date:

Completion Code:

Account Number:

Image Size: 1 kb

Provision ID: cloudadm_11.09.2010_23:14:43

Submitting User:

Queue: cpu_burn_02

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File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpecloud/portal.cgi?function=listMach&all=1

HPC Cloud Management Portal

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Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

System Status

Scope: **Weeks** Days Hourly around 11/10/2010

Filter by machine name: **GO**

Energy-Schemes / Power Settings - Select Action - **GO**

										< Nov 2010		Dec 2010			Jan 2011 >								
<input type="checkbox"/>	Machine	Arch	Type	OS	Status	Power Status	Energy Schemes	Mode	Energy	7	14	21	28	5	12	19	26	2	9	16	23	30	
<input type="checkbox"/>	i01n03	x86_64	iDataPlex	rhels6-LL	In Use	on	On Demand	J+P	0.07 kWh	huxiaoy													
<input type="checkbox"/>	i01n05	x86_64	iDataPlex	rhels6-LL	Avail	off	unknown	PO	NA														
<input type="checkbox"/>	i01n06	x86_64	iDataPlex	rhels6-LL	Avail	off	unknown	PO	NA														
<input type="checkbox"/>	i01n07	x86_64	iDataPlex	rhels6-LL	Avail	off	unknown	PO	NA														
<input type="checkbox"/>	i01n08	x86_64	iDataPlex	rhels6-LL	Avail	off	unknown	PO	NA														
<input type="checkbox"/>	i01n09	x86_64	iDataPlex	rhels6-BASE	In Use	on	unknown	J+P	0.06 kWh	cloudadm													
<input type="checkbox"/>	i01n10	x86_64	iDataPlex	rhels6-BASE	In Use	on	unknown	J+P	0.07 kWh	cloudadm													
<input type="checkbox"/>	i01n11	x86_64	iDataPlex	rhels6-LL	Avail	on	Power Save	J+P	NA														
<input type="checkbox"/>	i01n13	x86_64	iDataPlex	rhels6-LL	Avail	on	Power Save	J+P	NA														
<input type="checkbox"/>	i01n14	x86_64	iDataPlex	rhels6-LL	Avail	on	Power Save	J+P	NA														
<input type="checkbox"/>	i01n15	x86_64	iDataPlex	rhels6-LL	In Use	on	On Demand	J+P	0.05 kWh	huxiaoy													
<input type="checkbox"/>	i01n16	x86_64	iDataPlex	rhels6-LL	Avail	on	Power Save	J+P	NA														

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File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=energyScheme

HPC Cloud Management Portal

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Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

Energy Schemes System Energy Policies

Energy Schemes:

<input type="checkbox"/>	Name	Type	Fixed CPU Freq	CPU Freq Scope	Up Threshold (% CPU Load)	Sampling Rate (milliseconds)	Remark
	Max Performance	Static	max_freq	NA	NA	NA	Sets the CPU to run at the highest frequency.
	Power Save	Static	min_freq	NA	NA	NA	Sets the CPU to run at the lowest frequency.
	On Demand	Dynamic	NA	max_freq ~ min_freq	80	10000	Dynamically changes CPU frequency in response to CPU utilization.
<input type="checkbox"/>	Custom-Static-Optimal	Static	2660 MHz	NA	NA	NA	Sets the CPU to run at frequency 2660 MHz.
<input type="checkbox"/>	Custom-Dynamic	Dynamic	NA	2660 MHz ~ 1596 MHz	70	20000	Dynamically changes CPU frequency in response to CPU utilization.

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=sysEnergy

HPC Cloud Management Portal

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Welcome, cloudadm [Sign out](#)

- Home
- Request Resources
- Image Library
- Job
- Monitoring
- Energy Management
- Billing / Metering
- Users / Groups

- Energy Schemes
- System Energy Policies

Set system energy policies:

When an allocation is setup
Set energy scheme of each node to: Power Save

When an allocation is ready
Set energy scheme of each node to: On Demand

When an allocation expires/is canceled
Set energy scheme of PO nodes to: Power Off
Set energy scheme of J+P nodes to: Power Save

Other Settings
Set energy scheme of JO nodes to: On Demand

Submit

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File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=listProv

HPC Cloud Management Portal

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Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

List View Calendar View

Cancel Request Refresh

<input type="checkbox"/>	Request ID	Owner	Start Date	Duration	End Date	State	Type	# Machines	OS Image	Sub C	Energy(kWh)	Charge
<input type="checkbox"/>	cloudadm 11.09.2010 13:48:10	cloudadm	Tue Nov 9 13:55:00 2010	1024	Wed Nov 10 06:59:00 2010	Ready	Bare-metal	4	rhels6-LL	Yes	8.80	US \$273.00
<input type="checkbox"/>	cloudadm 11.09.2010 23:14:43	cloudadm	Tue Nov 9 23:22:00 2010	500	Wed Nov 10 07:42:00 2010	Ready	VM	2	rhels6-LL	No	NA	US \$66.66
<input type="checkbox"/>	cloudadm 11.10.2010 06:26:54	cloudadm	Wed Nov 10 06:34:00 2010	1024	Wed Nov 10 23:38:00 2010	Ready	Bare-metal	2	rhels6-BASE	No	0.02	US \$136.53
<input type="checkbox"/>	huxiaoy 11.10.2010 06:28:10	huxiaoy	Wed Nov 10 06:35:00 2010	500	Wed Nov 10 14:55:00 2010	Ready	Bare-metal	2	rhels6-LL	Yes	0.01	US \$66.66

Machine List of huxiaoy_11.10.2010_06:28:10

Energy-Schemes / Power Settings			- Select Action -	GO		
<input type="checkbox"/>	Name	Arch	Type	Power Status	Energy Schemes	Energy
<input type="checkbox"/>	i01n03	x86_64	iDataPlex	on	On Demand	7.90e-03 kWh
<input type="checkbox"/>	i01n15	x86_64	iDataPlex	on	On Demand	5.50e-03 kWh

- Select Action -
- Power Save
- Max Performance
- On Demand
- Custom-Static-Optimal
- Custom-Dynamic
- Power On
- Power Off
- Power Reset

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpeccloud/portal.cgi?function=listProv

HPC Cloud Management Portal

IBM HPC Cloud Management Portal Welcome, cloudadm Sign out

Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

List View Calendar View

Cancel Request Refresh

<input type="checkbox"/>	Request ID	Owner
<input type="checkbox"/>	cloudadm 11.09.2010 23:14:43	cloudadm
<input type="checkbox"/>	cloudadm 11.10.2010 06:26:54	cloudadm
<input type="checkbox"/>	cloudadm 11.10.2010 07:19:32	cloudadm
<input type="checkbox"/>	huxiaoy 11.10.2010 06:28:10	huxiaoy

Energy Information of huxiaoy_11.10.2010_06:28:10

Energy Information

huxiaoy_11.10.2010_06:28:10:

Energy usage for huxiaoy_11.10.2010_06_28_10

energy (wh)

Sub C	Energy(kWh)	Charge
No	NA	US \$66.66
No	0.18	US \$136.53
Yes	NA	US \$160.00
Yes	0.14	US \$66.66

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpccloud/portal.cgi?function=billing

HPC Cloud Management Portal

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Home Request Resources Image Library Job Monitoring Energy Management **Billing / Metering** Users / Groups

Accounting

Billing Info

Today **Week** Month Year All

User	Account Balance (US \$)	Requests	Usage Time (mins)	Total Charge (US \$)
cloudadm	48448.59	cloudadm 11.08.2010 07:10:13(66.66),cloudadm 11.08.2010 07:14:24(26.66),cloudadm 11.08.2010 07:15:57(66.66), cloudadm 11.08.2010 08:19:38(133.33),cloudadm 11.08.2010 13:32:21(6.66),cloudadm 11.08.2010 13:33:01(13.33), cloudadm 11.08.2010 13:34:58(6.66),cloudadm 11.08.2010 13:45:30(6.66),cloudadm 11.08.2010 14:00:35(6.66), cloudadm 11.08.2010 14:26:35(133.33),cloudadm 11.08.2010 21:26:15(66.66),cloudadm 11.08.2010 21:30:05(6.66), cloudadm 11.08.2010 22:59:58(6.66),cloudadm 11.08.2010 23:11:30(6.66),cloudadm 11.09.2010 00:42:37(100), cloudadm 11.09.2010 09:40:47(133.33),cloudadm 11.09.2010 13:48:10(273),cloudadm 11.09.2010 14:09:43(4), cloudadm 11.09.2010 14:16:24(4),cloudadm 11.09.2010 16:17:19(53.33),cloudadm 11.09.2010 16:54:49(13.33), cloudadm 11.09.2010 23:14:43(66.66),cloudadm 11.10.2010 00:50:27(26.66),cloudadm 11.10.2010 02:38:05(13.33), cloudadm 11.10.2010 02:42:35(13.33),cloudadm 11.10.2010 03:15:12(0.66),cloudadm 11.10.2010 06:26:54(136.53), cloudadm 11.10.2010 07:19:32(160),	11708	1551.41
huxiaoy	49502.94	huxiaoy 11.09.2010 02:54:32(200),huxiaoy 11.09.2010 23:18:07(230.4),huxiaoy 11.10.2010 08:28:10(66.66),	1700	497.06
lyuj	49926.68	lyuj 11.09.2010 00:35:57(13.33),lyuj 11.09.2010 02:35:29(20),lyuj 11.10.2010 01:57:44(13.33), lyuj 11.10.2010 01:59:29(13.33),lyuj 11.10.2010 02:03:01(13.33),	500	73.32

HPC Cloud Management Portal - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://129.40.23.2/cgi-bin/hpeccloud/portal.cgi?function=listUser

HPC Cloud Management Portal

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Home Request Resources Image Library Job Monitoring Energy Management Billing / Metering Users / Groups

All Users:

<input type="checkbox"/>	User ID	Group(s)	Role	Description
<input type="checkbox"/>	cdlwlbj		User	
<input type="checkbox"/>	cloudadm	all	Administrator	
<input type="checkbox"/>	fuzhiwen		User	
<input type="checkbox"/>	huxiaoy		User	
<input type="checkbox"/>	jyuj		User	
<input type="checkbox"/>	kmarthi	all	User	
<input type="checkbox"/>	potter	all	User	

[Add a user](#)

IBM WORLD COMMUNITY GRID



Every time Henrik Erikson
takes a break,
AIDS research advances.

Here's a smart way of benefiting humanity.
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A3

William Wong is
hard at work
for cancer research.

Here's a smart way of benefiting humanity.
Use your computer's downtime to add power to World Community Grid.
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A3



✔ Register
Select Projects
Download
Explore

Member Name: florin.manaila
 - Select Projects
 - Download software
 - Install software
 - Explore World Community Grid

Check the box(es) for the project(s) to which you want to contribute your spare computing time. Click continue when you are finished. Don't worry, you can make different selections later if you change your mind.

Available Projects

- Participate in All Projects
- [Say No to Schistosoma](#)
- [GO Fight Against Malaria](#)
- [Drug Search for Leishmaniasis](#)
- [The Clean Energy Project - Phase 2](#)
 - Please review the [system requirements](#) before opting to participate in this project
- [Help Cure Muscular Dystrophy - Phase 2](#)
- [Help Fight Childhood Cancer](#)
- [Help Conquer Cancer](#)
- [Human Proteome Folding - Phase 2](#)
- [FightAIDS@Home](#)

Please note: Some projects may occasionally have periods where no work is available. If you choose to receive work for only one project, the project may, at times, not have work units available for download. For this reason, we recommend that you select more than one project.

continue

Visit the Forums

If you need technical assistance beyond what's available in [Help](#), please [visit the forums](#) to post your questions and get answers on how others are using World Community Grid.

Related Resources

- > [Software Overview](#)
- > [System Requirements](#)
- > [Points System](#)
- > [Member Policy](#)





Register	Select Projects	Download	Explore
Member Name: florin.manaila	- Projects selected: Human Proteome Folding - Phase 2	- Download software - Install software	- Explore World Community Grid

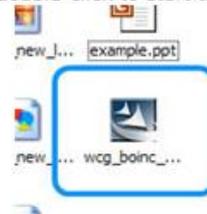
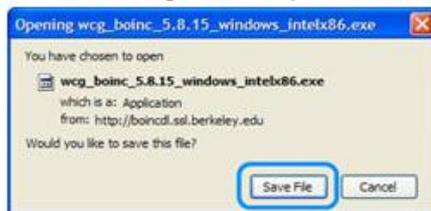
The World Community Grid software will be downloaded for:



Windows® (6.10.58)
(7, Vista, XP, Me, 2000)
md5: c12b490e917b500b1c664d7c43acdc35

If you'd like to download the software for a different operating system, [click here](#).

When the download box appears, click "Save," and choose a location (Desktop is a good choice). When the download is finished go to where you saved the file and double-click to start the installer.



- Click the button to start the download: [download now](#)

NOTE: When you have successfully installed the software and connected your computer to World Community Grid, you will be taken to the next page automatically. If you think that you have completed the process correctly, but the page does not advance, then please look at the following items to help you determine what additional steps may need to be taken:

- Print a full set of instructions by [clicking here](#)
- Look [here](#) to see if your firewall might be stopping you
- You may need to [configure a proxy](#)

If these items do not help, then please consider getting help from other members in the [Support Forums](#). Or if you would rather, you can use our [contact us page](#) to ask for assistance.

Visit the Forums

If you need technical assistance beyond what's available in [Help](#), please [visit the forums](#) to post your questions and get answers on how others are using World Community Grid.

Related Resources

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- > [System Requirements](#)
- > [Points System](#)
- > [Member Policy](#)



florin.manaila@ro.ibm.com

THANK YOU

