New Common Standard Billing Unit (SBU) Rates

Category: Allocations & Accounts

Effective May 1, 2011, a common **Standard Billing Unit** (SBU) will be used for allocating and tracking computing time usage at both the NASA Advanced Supercomputing (NAS) Facility and the NASA Center for Climate Simulation (NCCS).

This new common SBU uses a Pleiades Westmere node as the baseline system. A job that occupies 1 Westmere node for 1 hour is charged 1 (new) SBU, regardless of how many cores in the node are actually used. Use of other resources will be charged based on how efficient they are compared to a Pleiades Westmere node.

An important difference between the new charging procedure and the old one is that the new SBU is node-based instead of core-based. However, because the entire Columbia system is a single node, a new measurement called the **Minimum Allocatable Unit** (MAU) was introduced when the new SBU was developed. An MAU is the smallest unit of hardware resource that PBS will allocate to a job.

- For Pleiades, 1 MAU equals 1 node (16 cores for Sandy Bridge, 12 cores for Westmere, 8 cores for Nehalem and Harpertown).
- For Columbia, 1 MAU equals 4 cores.
- For NCCS systems, 1 MAU equals 1 node of each system.

Even though NAS SBU charging has been core-based up to this point, the MAU concept has been present. For example, Pleiades users requesting a single core have been charged for all of the cores in a node.

On Columbia, PBS rounds core allocations up to the nearest multiple of four. So, a 1-hour, 1-core job on Columbia was charged 4 (old) SBUs for having the 4 cores for 1 hour.

Differences Between the New Common SBU and the Old NAS SBU	
New Common SBU	Old NAS SBU
MAU-based	core-based
Baseline: Westmere on Pleiades	Baseline: Columbia

The SBU Rates

The new SBU represents the amount of work that a Minimum Allocatable Unit (MAU) can perform in one hour on the baseline system. Usage on a system that can complete more work with 1 MAU in 1 hour will be charged at a higher rate. Systems not as powerful as the baseline will be charged lower rates.

As the baseline system, the Pleiades Westmere (Intel Xeon 5670) is given an SBU rate of 1. So, a job that occupies 1 Pleiades Westmere node for 1 hour is charged 1 SBU.

Each system at NAS and NCCS is then given an SBU rate relative to the Pleiades Westmere.

See further down the page for information on how the SBU rates were obtained.

NAS SBU Rates					
System	Pleiades	Pleiades	Pleiades	Pleiades	Columbia
Architecture	SGI ICE X	SGI ICE 8400EX	SGI ICE 8200EX	SGI ICE 8200EX	SGI Altix 4700
Processor	Sandy Bridge	Westmere	Nehalem	Harpertown	Itanium-2
Cores per MAU	16	12	8	8	4
SBU Rate (per MAU)	1.82	1.00	0.80	0.45	0.18

NCCS SBU Rates					
System	Discover	Discover	Discover	Discover	Discover
Architecture	Dell PowerEdge C6100	IBM iDataPlex	IBM iDataPlex	Linux Cluster Custom	Linux Cluster Custom
Processor	Westmere	Nehalem	Harpertown	Woodcrest	Dempsey
Cores per MAU	12	8	8	4	4
SBU Rate (per MAU)	0.95	0.69	0.38	0.20	0.15

The Charging Formula

The following formula is used to calculate the SBUs charged to a PBS job:

```
SBUs charged = number of MAUs x number of wall clock hours x SBU Rate
```

Given that an SBU is a representation of an amount of useful work, a job should be charged similar numbers of SBUs, independent of the efficiency of the system used.

Requesting Allocations and Checking Usage

When using the e-Books online submission system to apply for allocations, principal investigators will continue to estimate the number of runs on each processor type of a system, the number of processors per run, and the wall clock hours per run. Calculators within e-Books total the processor-hours from these estimates and convert the processor-hours to new SBUs.

The **`acct_ytd`** at NAS and **`allocation_check`** at NCCS should be used for checking the amounts allocated and used.

For projects that began on November 1, 2010 and were awarded Columbia and/or Pleiades hours, the allocations and amount used in the old SBUs will be converted to the new SBUs.

What Happens to the Old SBUs?

Prior to May 1, 2011, allocations and usage were based on the old SBU unit. These historical accounting data will be converted to use the new SBU unit and will be reflected when you use the commands **`acct_ytd`**, **`acct_query`**, or **`allocation_check`**.

```
New SBU = Old SBU x C

      total number of new SBUs/hour across system
C =   ___________________________________________
      total number of old SBUs/hour across system
```

Allocation Recalculation

If your project was awarded on Nov. 1, 2010, the allocation will be converted to new SBUs with the following approximate conversion factors:

Pleiades	Columbia
0.0509	0.045

Historical Accounting Data

Accounting data (between March 1, 2005 and April 30, 2011) using the old SBU unit will be converted to the new SBU unit with the following conversion factors:

Westmere	Nehalem	Harpertown	Columbia	RTJones	Schirra
0.046	0.046	0.062	0.045	0.043	0.071

How SBU Rates Were Obtained

The SBU rates were obtained using a weighted average of the performance of six benchmark applications on each system, where "performance" is defined as the relative number of runs of an application that can be made in a fixed amount of time using a fixed number of MAUs, compared to that number for the baseline. The applications were chosen to be representative of the work done on NASA's HEC platforms. The weighting factors that are used approximate how much the codes (or ones similar to them) are used on those platforms.

Benchmark Suite and Weighting Factors

Application	Enzo	FUN3D	GEOS-5	OVERFLOW-2	USM3D	WRF
Cores Used	240	960	1176	480	480	384
Approximate Walltime Used on Baseline System	30 min	30 min	30 min	30 min	30 min	30 min
Weighting (Proportional Usage)	0.20	0.10	0.15	0.20	0.20	0.15

More Information

For additional details, see the feature story, NAS and NCCS Moving to a Common Standard Billing Unit May 1, 2011.

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