Sub-capacity (Virtualization) License Counting Rules

Sun Microsystems & Fujitsu Virtualization Environments

NOTE: Please use these rules along with the **IBM Passport Advantage Agreement**

December 16, 2011

Index of Items

Sub-capacity Licensing Requirements Summary

- **Customers must:**
  - ▶ Agree to the terms of the Sub-capacity Attachment, and follow Virtualization Capacity License Counting rules for their Eligible Virtualization Environment(s)
  - ▶ Use Eligible Sub-capacity Products
  - ▶ Use Eligible Virtualization Technologies
  - ▶ Use Eligible Processor Technologies
  - ▶ Use the IBM License Metric Tool (ILMT) and maintain report documentation
    - • Tivoli Asset Discovery for Distributed V7.2 (TADd) may be used in lieu of IBM License Metric Tool V7.2
    - • Certain ILMT / TADd use exceptions may apply

PLEASE   NOTE:

- *The above is only a summary. For details about sub-capacity licensing requirements, see the IBM Passport Advantage Agreement and other information referred to above, at Passport Advantage Virtualization Capacity website.*

- *Customers are responsible for the installation of the IBM License Metric Tool and for the server it runs on.*

Definitions

- **Zones:** A zone is a virtual operating system abstraction that provides a protected environment in which applications run. The applications are protected from each other to provide software fault isolation. To ease the labor of managing multiple applications and their environments, they co-exist within one operating system instance, and are usually managed as one entity

  – The **global zone** is the original Solaris OS instance. It has access to the physical hardware and can control all processes. It also has the authority to create and control new zones, called **non-global zones**, in which applications execute. Non-global zones do not run inside the global zone—they run along side it—yet the global zone can look inside non-global zones to see how they are configured, monitor, and control them. Like the other zones, this global zone is also associated with a resource pool.

- **Solaris Containers:** A zone which also uses the operating system's resource management facility is then called a container.

- **Resource pools:** A resource pool is a way to dedicate CPUs to one or more containers. CPUs are allocated to a pool when the pools are defined and can be moved by redefining the pools.

- **Containers on resource pool:** The resource pools help the dedication of CPUs to one or more Containers. Containers provide the isolation.

- **Dedicated Container:** Resources when isolated and dedicated to a single Solaris Container and its applications rather than a complete system.

- **Default Resource Pool:** is a configuration mechanism that is used to partition the resources of a host. Every host has a default pool, and all processes are initially bound to this pool. Newly created pools take their processors from the default pool, leaving less processor capacity for the default resource pool. A host can be partitioned into more than one pool.

Definitions

- **CPUs:** Processing resources as seen by the Solaris OS Kernel. This is synonymous with HW threads in the processors

- **Dynamic System Domains:** Dynamic System Domains are hardware partitioning technologies built into certain high-end SPARC hardware. They allow the administrator to create separate electrically isolated OS Domains which each run their own OS.

- **Logical Domain (LDOM):** Virtual machine that runs an independent OS instance and contains virtualized CPU, memory and storage. Each logical domain can be created, destroyed, reconfigured, and rebooted independently, without requiring to powercycle the server.

- **Logical Domains Manager:** Software used to create and manage all logical domains. The Logical Domains Manager maps logical domains to physical resources. There can be only one Logical Domains Manager per server.

- **Control Domain:** The first domain created when Oracle VM Server for SPARC software is installed. The Logical Domains Manager runs in this domain.

- **Guest Domain:** Operates under the management of the control domain.

ILMT Licensing Counting Rules – for Single Server Environments

<u>License Rules for Dynamic System Domains and Containers for each product:</u>

- for a Dynamic System Domains, the maximum* number of CPUs allocated

- for Containers, the maximum* number of CPUs assigned to the Resource Pool that it obtains processor resources from

- CPUs are processing resources as seen by the Solaris OS Kernel. This is synonymous with HW threads in the processors. Cores = CPUs / (CPUs per core)

  - CPUs or threads per core varies

    - UltraSPARC III & IV processors have 1 CPU (Thread) per processor core
    - SPARC64-VI processors have 2 CPUs (Threads) per processor core
    - SPARC64-VII processors have 2 CPUs (Threads) per processor core
    - UltraSPARC T1 processors have 4 CPUs (Threads) per processor core
    - UltraSPARC T2 processors have 8 CPUs (Threads) per processor core

    The greater of what the Dynamic System Domain or Container starts with, or the result of a change in capacity

- Aggregate fractional processor cores, apply resource pool limits, and round up at the server level to the next whole processor core - lower of the sum of the virtual cores or the server capacity

December 16, 2011

Dynamic System Domains with UltraSPARC III & IV processor

Server with 16 processor cores

DB2	**MQ**	**DB2**
Domain 1	**Domain 2**	**Domain 3**
4 CPUs	8 CPUs	4 CPUs
16		

16

Cores to be licensed

CPUs divided by Threads = processor core
CPUs divided by 1** = processor cores

DB2 cores	MQ cores	CPUs**	Partition
4		**4**	Domain 1
	8	**8**	Domain 2
4		**4**	Domain 3
8	8	**16**	Total for all Domains
16	16	16	Capacity Limit
8	8		Total processor cores

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the server

← **16 CPU in 3 Domains**

← **16 CPUs** (Threads) in the Server

← **Server with 16 processor cores**

** **Note: UltraSPARC III & IV processors have 1 CPU (Thread) per processor core**

Dynamic System Domains with SPARC64-VI processor

Server with 16 processor cores

DB2	**MQ**	**DB2**
Domain 1	**Domain 2**	**Domain 3**
8 CPUs	16 CPUs	8 CPUs
32		

16

Cores to be licensed

CPUs divided by Threads = processor core
CPUs divided by 2** = processor cores

DB2 cores	MQ cores	CPUs**	Partition
4		**8**	Domain 1
	8	**16**	Domain 2
4		**8**	Domain 3
8	8	**32**	Total for all Domains
16	16	32	Capacity Limit
8	8		Total processor cores

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the server

32 CPU in 3 Domains

32 CPUs (Threads) in the Server**

Server with 16 processor cores

** Note: SPARC64-VI processors have 2 CPUs (Threads) per processor core

Dynamic System Domains with SPARC64-VII processor

Server with 16 processor cores

DB2	MQ	DB2
Domain 1	Domain 2	Domain 3
8 CPUs	16 CPUs	8 CPUs
32		
16		

Cores to be licensed

CPUs divided by Threads = processor core
CPUs divided by 2** = processor cores

DB2 cores	MQ cores	CPUs**	Partition
4		**8**	Domain 1
	8	**16**	Domain 2
4		**8**	Domain 3
8	8	**32**	Total for all Domains
16	16	32	Capacity Limit
8	8		Total processor cores

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the server
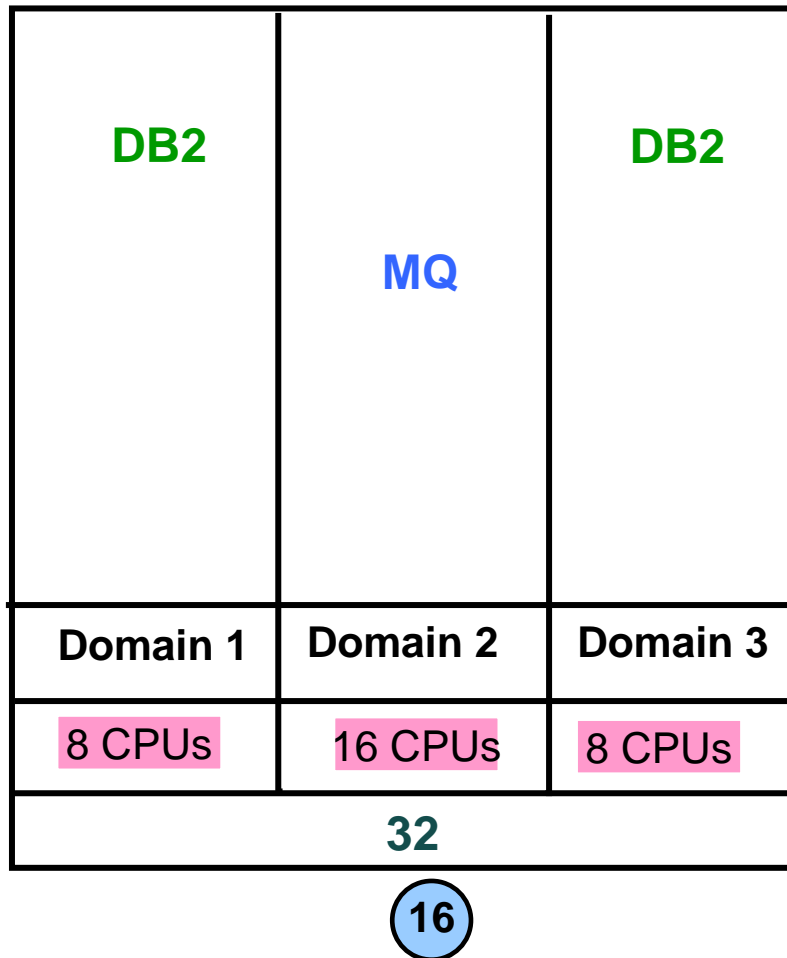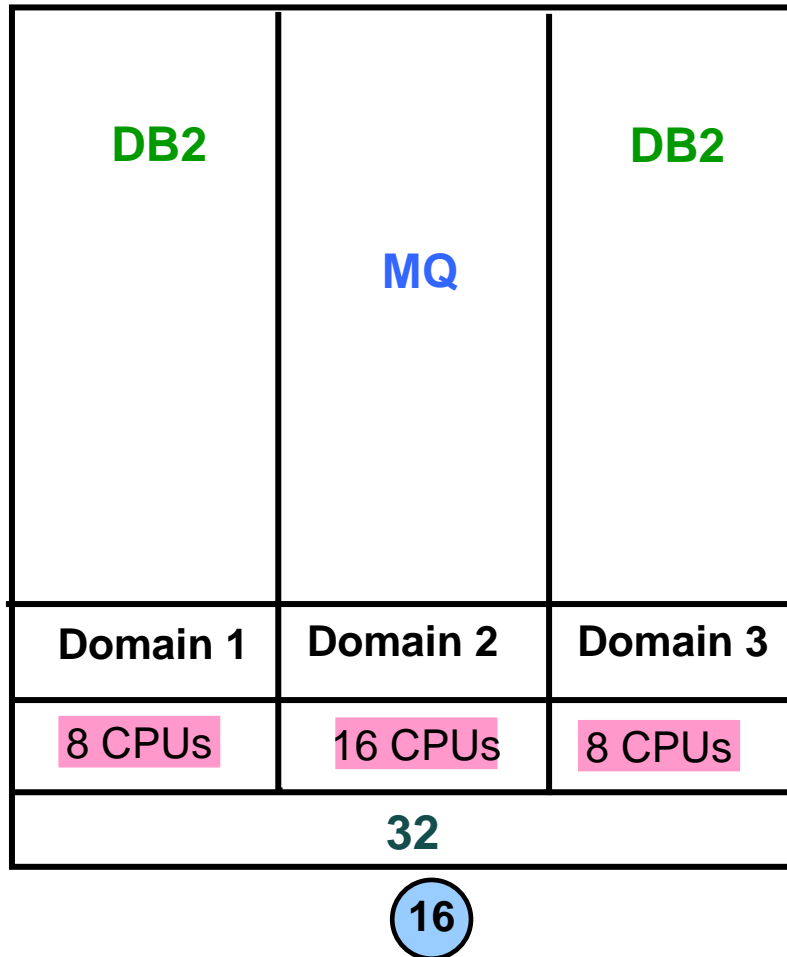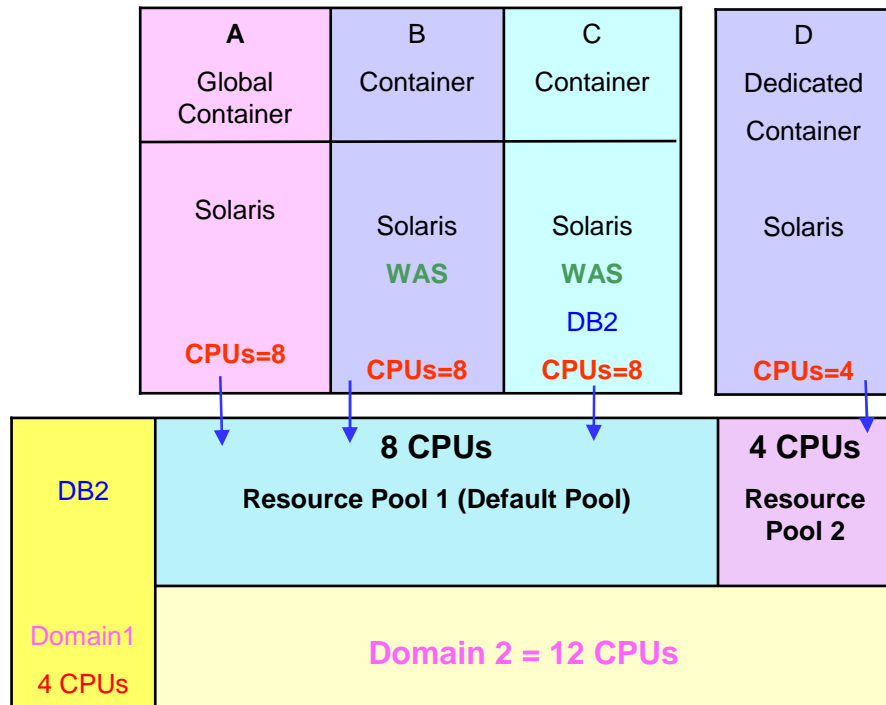
32 CPU in 3 Domains

32 CPUs (Threads) in the Server**

Server with 16 processor cores

** Note: SPARC64-VII processors have 2 CPUs (Threads) per processor core

April 7, 2009

Dynamic System Domains with Containers on <u>UltraSPARC III & IV processors</u>

<u>Cores to be licensed</u>

Server with 16 processor cores

CPUs** divided by Threads = processor core
CPUs divided by 1 = processor cores

DB2 cores	WAS cores	CPUs**	Partition
	8	8	Container B
8	8	8	Container C
8	16	16	Total Resource Pool 1
8	8	8	Capacity Limit Pool 1
8	8		Resource Pool 1
4		4	Domain 1
12	8		Total Cores

A	B	C	D
Global Container	**Container**	**Container**	**Dedicated Container**
Solaris	Solaris **WAS**	Solaris **WAS** **DB2**	Solaris
CPUs=8	**CPUs=8**	**CPUs=8**	**CPUs=4**

DB2

8 CPUs
Resource Pool 1 (Default Pool)

4 CPUs
Resource Pool 2

Domain1
4 CPUs

Domain 2 = 12 CPUs

16

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the resource pool.

28 CPUs in 4 Containers

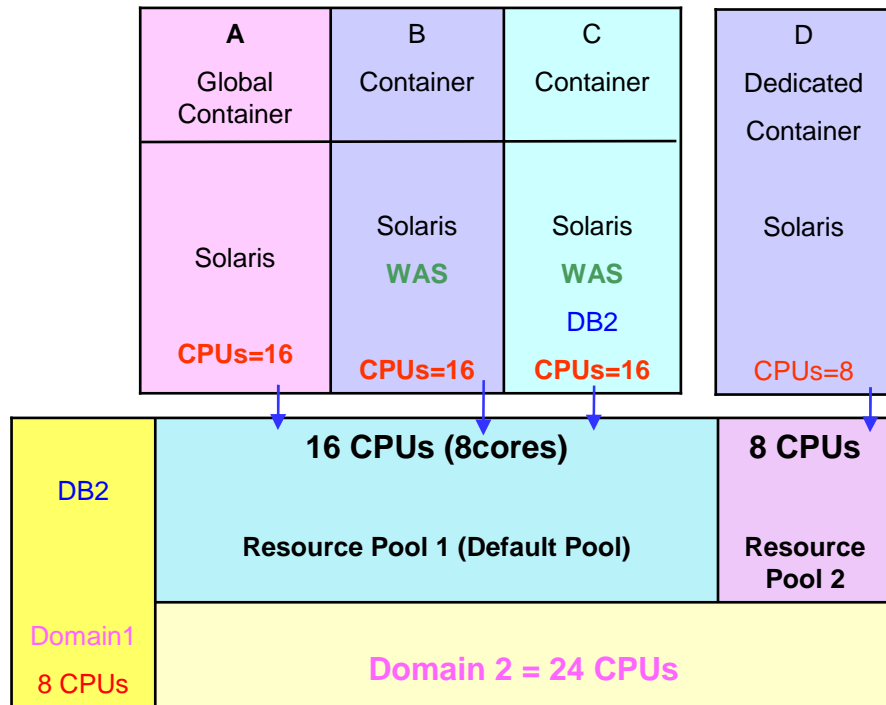**12 CPUs in 2 Resource Pools**

16 CPUs (Threads) in 2 Domains**

Server with 16 processor cores

** Note: <u>UltraSPARC III & IV processors have 1 CPU (Thread) per processor core</u>

Dynamic System Domains with Containers on SPARC64-VI processors

Cores to be licensed

CPUs** divided by Threads = processor core
CPUs divided by 2 = processor cores

DB2 cores	WAS cores	CPUs**	Partition
	8	16	Container B
8	8	16	Container C
8	16	32	Total Resource Pool 1
8	8	16	Capacity Limit Pool 1
8	8		Resource Pool 1
4		8	Domain 1
12	8		Total Cores

Server with 16 processor cores

A	B	C	D
Global Container	**Container**	**Container**	**Dedicated Container**
Solaris	Solaris WAS	Solaris WAS DB2	Solaris
CPUs=16	CPUs=16	CPUs=16	CPUs=8

DB2

Domain1
8 CPUs

16 CPUs (8cores)

8 CPUs

Resource Pool 1 (Default Pool)

Resource Pool 2

Domain 2 = 24 CPUs

16

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the resource pool.

56 CPUs in 4 Containers

24 CPUs in 2 Resource Pools

32 CPUs (Threads) in 2 Domains**

Server with 16 processor cores

** **Note: SPARC64-VI processors have 2 CPUs (Threads) per processor core**

Dynamic System Domains with Containers on SPARC64-VII processors

Cores to be licensed

CPUs** divided by Threads = processor core
CPUs divided by 2 = processor cores

DB2 cores	WAS cores	CPUs**	Partition
	8	16	Container B
8	8	16	Container C
8	16	32	Total Resource Pool 1
8	8	16	Capacity Limit Pool 1
8	8		Resource Pool 1
4		8	Domain 1
12	8		Total Cores

Server with 16 processor cores

A Global Container	B Container	C Container	D Dedicated Container
Solaris	Solaris WAS	Solaris WAS DB2	Solaris
CPUs=16	CPUs=16	CPUs=16	CPUs=8

DB2 | **16 CPUs (8cores)** | **8 CPUs**

Resource Pool 1 (Default Pool) | **Resource Pool 2**

Domain1 8 CPUs | **Domain 2 = 24 CPUs**

16

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the resource pool.

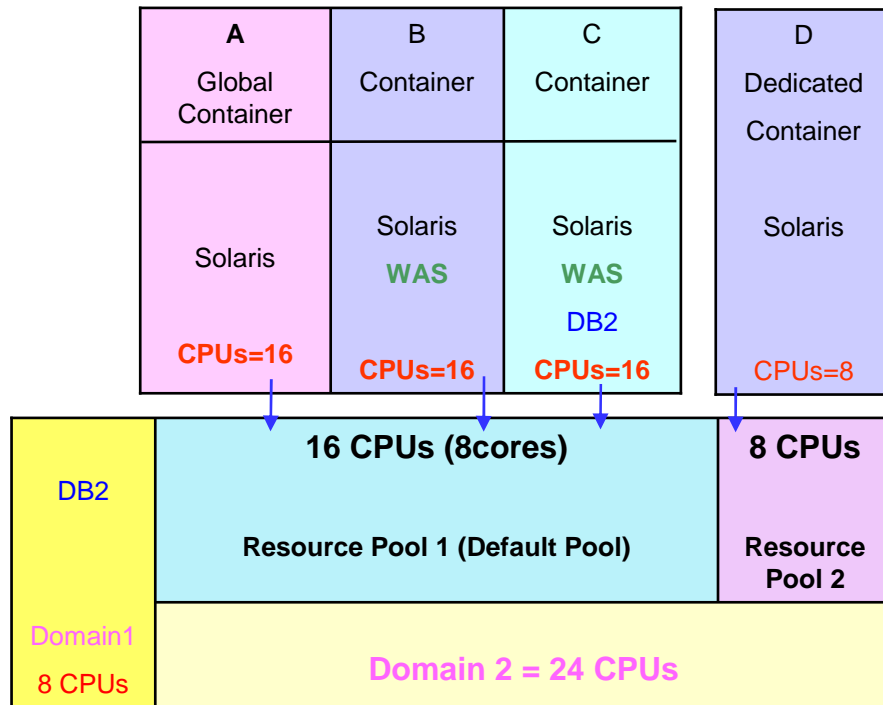**56 CPUs in 4 Containers**

24 CPUs in 2 Resource Pools

32 CPUs (Threads) in 2 Domains**
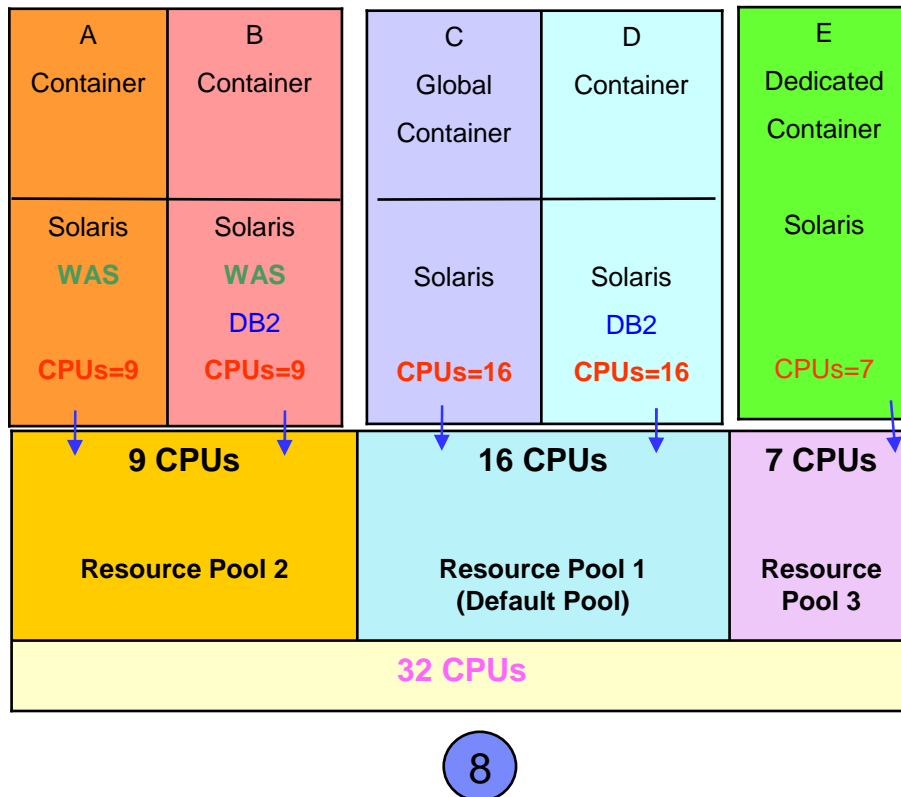
Server with 16 processor cores

** Note: SPARC64-VII processors have 2 CPUs (Threads) per processor core

Containers on UltraSPARC T1 (Niagara 1)
(without Logical Domains – LDOMs)

Cores to be licensed

CPUs** divided by Threads	=	processor core
CPUs divided by 4	=	processor cores

DB2 cores	WAS cores	CPUs**	Partition
	2.25	9	Container A
2.25	2.25	9	Container B
2.25	4.50	18	Total Resource Pool 2
2.25	2.25	9	Capacity Limit Pool 2
2.25	2.25		Resource Pool 2
4.00		16	Container D
6.25	2.25		Total
8	8	32	Capacity Limit
6.25	2.25		Total Server
7	**3**		Total Cores (round up)

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the resource pool.

Server with 8 processor cores

A Container	B Container	C Global Container	D Container	E Dedicated Container
Solaris WAS CPUs=9	Solaris WAS DB2 CPUs=9	Solaris CPUs=16	Solaris DB2 CPUs=16	Solaris CPUs=7

9 CPUs	16 CPUs	7 CPUs
Resource Pool 2	Resource Pool 1 (Default Pool)	Resource Pool 3

32 CPUs

(8)

57 CPUs in 5 Containers

32 CPUs in 3 Resource Pools

32 CPUs (Threads) in the server**
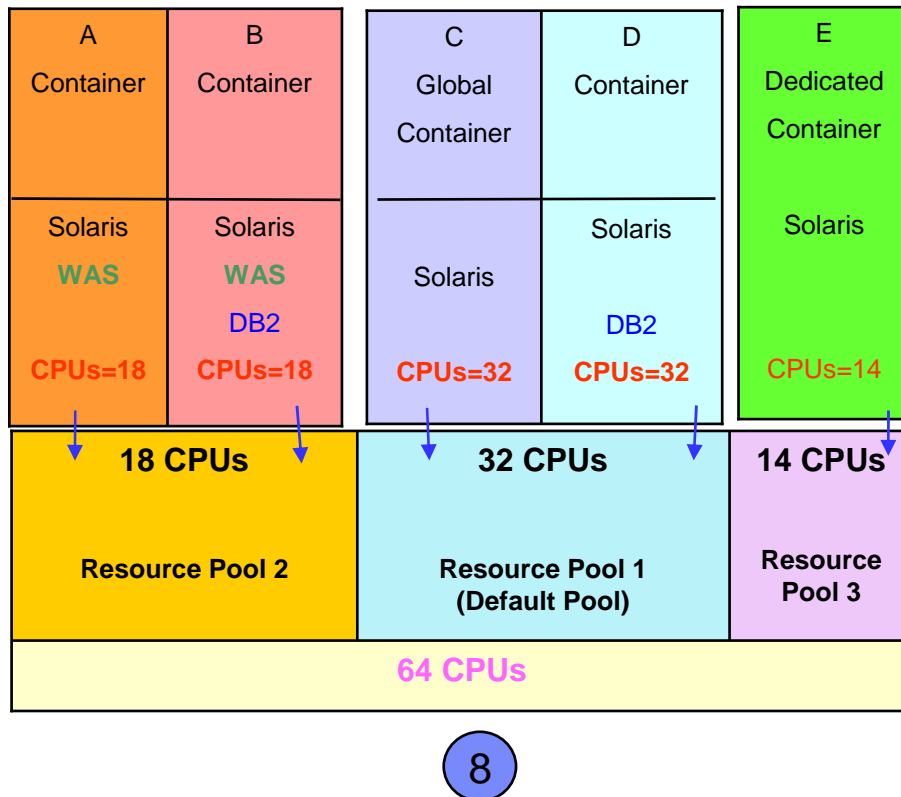
Server with 8 processor cores

** Note: UltraSPARC T1 processors have 4 CPUs (Threads) per processor core

Containers on UltraSPARC T2 (Niagara 2)
(without Logical Domains – LDOMs)

Cores to be licensed

CPUs** divided by Threads = processor core
CPUs   divided by   8   = processor cores

DB2 cores	WAS cores	CPUs**	Partition
	2.25	18	Container A
2.25	2.25	18	Container B
2.25	4.50	36	Total Resource Pool 2
2.25	2.25	18	Capacity Limit Pool 2
2.25	2.25		Resource Pool 2
4.00		32	Container D
6.25	2.25		Total
8	8	64	Capacity Limit
6.25	2.25		Total Server
7	3		Total Cores (round up)

Server with 8 processor cores

A Container	B Container	C Global Container	D Container	E Dedicated Container
Solaris WAS CPUs=18	Solaris WAS DB2 CPUs=18	Solaris CPUs=32	Solaris DB2 CPUs=32	Solaris CPUs=14

18 CPUs	32 CPUs	14 CPUs
Resource Pool 2	Resource Pool 1 (Default Pool)	Resource Pool 3

64 CPUs

(8)

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the resource pool.

114 CPUs in 5 Containers

64 CPUs in 3 Resource Pools

64 CPUs** (Threads) in the server

Server with 8 processor cores

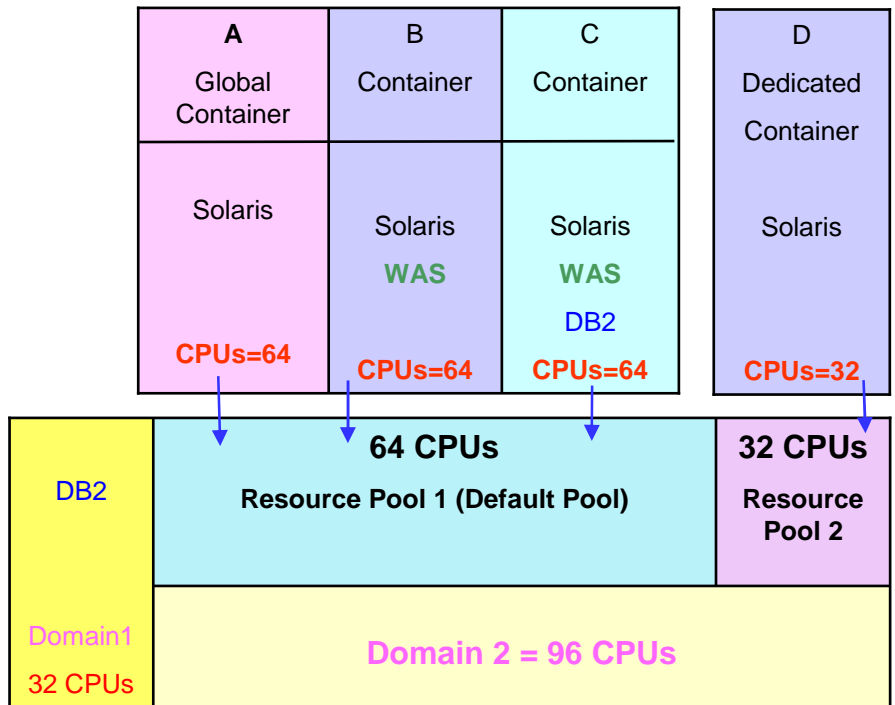** Note: UltraSPARC T2 processors have 8 CPUs (Threads) per processor core

Containers on UltraSPARC T2 (Niagara 2)
(with Logical Domains – LDOMs)

Cores to be licensed

CPUs** divided by Threads = processor core
CPUs divided by 8 = processor cores

Server with 16 processor cores

DB2 cores	WAS cores	CPUs**	Partition
	8	64	Container B
8	8	64	Container C
8	16	64	Total Resource Pool 1
8	8	64	Capacity Limit Pool 1
8	8	64	Resource Pool 1
4		32	Domain 1
12	8		Total Cores

A	B	C	D
Global Container	Container	Container	Dedicated Container
Solaris	Solaris **WAS**	Solaris **WAS** DB2	Solaris
CPUs=64	**CPUs=64**	**CPUs=64**	**CPUs=32**

License Rule: The lower of the sum of each partition for a product, or the processor capacity of the resource pool.

DB2	**64 CPUs** **Resource Pool 1 (Default Pool)**	**32 CPUs** **Resource Pool 2**
Domain1 32 CPUs	**Domain 2 = 96 CPUs**	

224 CPUs in 4 Containers

96 CPUs in 2 Resource Pools

128 CPUs (Threads) in 2 Domains**

16

Server with 16 processor cores

** Note: UltraSPARC T2 processors have 8 CPUs (Threads) per processor core

July 28, 2009

- The licensing rules in the preceding pages reflect how ILMT will operate to calculate PVUs

- If ILMT does not yet support a Eligible Virtualization Environment, or you qualify for an exception to use ILMT, you will need to follow the Manual Calculation of Virtualization Capacity.

- The Manual Calculation of Virtualization Capacity rules can be found in the following pages

- To find out if a Eligible Virtualization Technology is supported by ILMT visit
    Passport Advantage Sub-capacity licensing information

Manual Calculation of Virtualization Capacity

- <u>Eligibility Criteria</u>: Customers must use the IBM License Metric Tool, with the following exceptions
  - ▸ ILMT does not support the Eligible Virtualization Environment
  - ▸ Customer has fewer than 1000 employees and contractors - Tool recommended
  - ▸ Customer server Full Capacity licensing for a PVU product is less than 1000 PVUs (on servers with an Eligible Virtualization Environment) - Tool recommended

- <u>Requirements:</u> For the above exceptions, customers must manually manage, track and prepare Audit Reports
  - ▸ An Audit Report must be prepared at least once per quarter and identify the following detail: Each Eligible Sub-Capacity Product deployed in each Eligible Virtualization Environment
  - ▸ An Eligible Virtualization Environment can be a Single Server or a Group of Servers (Server Cluster)
  - ▸ In addition to the above detail, the report should provide a summary total of the required number of PVUs by and for each Eligible Sub-Capacity Product
  - ▸ Audit Reports must be prepared as frequently as is required to maintain a history of increases to Virtualization Capacity and Full Capacity
  - ▸ Each Audit Report must be **signed and date stamped**, at least once per quarter

The above is only a summary. For detailed terms please see the <u>*Sub-capacity licensing attachment*</u>

Manual Calculation of Virtualization Capacity – Rules

For Single Server Environments:

- <u>License Rules for Dynamic System Domains and Containers for each product:</u>

- for a Dynamic System Domains, the maximum* number of cores. CPUs allocated / (CPUs or Threads per core)

- for Containers, the maximum* number of cores assigned to the Resource Pool that it obtains processor resources from. CPUs allocated / (CPUs or Threads per core)

- CPUs are processing resources as seen by the Solaris OS Kernel. This is synonymous with HW threads in the processors. Cores = CPUs / (CPUs or Threads per core)
    - CPUs or Threads per core varies
        - UltraSPARC III & IV processors have 1 CPU (Thread) per processor core
        - SPARC64-VI processors have 2 CPUs (Threads) per processor core
        - SPARC64-VII processors have 2 CPUs (Threads) per processor core
        - UltraSPARC T1 processors have 4 CPUs (Threads) per processor core
        - UltraSPARC T2 processors have 8 CPUs (Threads) per processor core

    The greater of what the partition starts with or the result of a change in capacity (in whole cores)

- Aggregate whole processor cores, lower of the sum of the virtual cores or the server capacity

If you want to use sub-capacity licensing for any other Sun technology, including Resource Pool limits, you must use the ILMT tool

Manual Calculation of Virtualization Capacity - Worksheet Example

Worksheet has 3 tabs;

use the following tabs

- Instructions & Information

- Single Server

Web Link: Worksheet for
Manual Calculation of
Virtualization Capacity

VIRTUALIZATION ENVIRONMENT - SINGLE SERVER

- This worksheet is for one standalone server for one Software Product
- Per the Instructions on the first tab, you may choose to leverage this approach or develop / leverage
  your own processes and reporting format so long as you capture all of the information below
- Enter data in input fields below (shaded area) .... * Mandatory

Date of this Audit Report *	March 31 , 2009
Product Name *	IBM WEBSPHERE APPLICATION SERVER NETWORK DEPLOYMENT
Program Identification Number (57xx-xxx)	5724-H88
P/N Description	IBM WEBSPHERE APPLICATION SERVER NETWORK DEPLOYMENT PROCESSOR VALUE UNIT (PVU)
Part Number	D55WJLL
Server ID / Location	Server ID # F6015; Bldg 1, Room 1, Somers, NY
Server Vendor / Brand	IBM System x
Server Model	xxxxx
Virtualization Technology used *	VMware ESX 3.5
Processor Technology (Vendor, Brand,Type,Model#) * **(A)**	Intel Xeon Quad Core Model 35XX
PVUs per core * **(A)**	70
Total Activated Cores on Server * **(C)**	8
Full Capacity PVUs for Server * **(C)**	560

DO NOT DELETE ROW

VM, Partition ID * (whatever identifier used for any subdivision of a server such as LPAR #, IP address, hostname, etc.)	Cores **(B)** per Partition or VM *	User Comments
A	4	
B	4	
C	2	
D	2	

Sum of Virtual Cores *	12	
PVUs per core *	70	
Virtualization Capacity PVUs by Product for Server *	840	
PVU Licenses required by Product for Server * **(C)**	**560**	

* Mandatory Field

(A) PVU's required for each physical processor core are listed on the PVU table (see link below, including vendor/brand designations)
http://www-01.ibm.com/software/lotus/passportadvantage/pvu_licensing_for_customers.html

(B) For purposes of 'Manual Calculation' of Virtual Capacity, 1 virtual core (or CPU) is equivalent to 1 physical core. Enter values in whole cores.

(C) Lower of Full Capacity or Virtualization Capacity

▶ ▶| \ Instructions + Information \ Single Server / Group of Servers "Cluster" /

Key Web Links

- PVU

  - PVU table and other information

- Sub-capacity

  - Passport Advantage Sub-capacity licensing information

  - Virtualization Capacity License Counting Rules

  - Passport Advantage Sub-capacity licensing terms

  - Passport Advantage Sub-capacity licensing FAQs