Meine letzte Kundenpräsentation als IBMer !

GSE Frühjahrstagung
z/VM, z/VSE, Linux on z Systems
Berlin, April 2016

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Alle meine GSE Tagungen zu VM/VSE – später dann mit Linux

#	Wo?	Wann?
1	Hamburg	Nov. 1998
2	Prien / Chiemsee	April 1999
3	Bad Wildungen (Mgr only)	Juni 1999
4	Bamberg	Sep. 1999
5	Bad Wildungen (Mgr only)	April 2000
6	Potsdam	Mai 2000
7	Eisenach	April 2001
8	Würzburg	Okt. 2001
9	Stuttgart (Linux only)	Nov. 2001
10	Mainz	Okt. 2002
11	Hannover	März 2003
12	Ulm	Okt. 2003
13	Leipzig	März 2004
14	Dortmund	Sep. 2004
15	Berlin	April 2005
16	Garmisch-Patenkirchen	Okt. 2005
17	Dresden	April 2006

#	Wo?	Wann?
18	Nürnberg	Okt. 2006
19	Berlin	März 2007
20	Böblingen/Stuttgart (int'l)	Okt. 2007
21	Leipzig (int'l)	Okt. 2008
22	Dortmund	April 2009
23	Dresden (int'l)	Okt. 2009
24	Würzburg	April 2010
25	München (int'l)	Okt. 2010
26	Berlin (int'l)	Okt. 2011
27	Nürnberg	April 2012
28	Mainz (int'l)	Okt. 2012
29	Leipzig	April 2013
30	Hamburg (int'l)	Okt. 2013
31	Frankfurt	April 2014
32	Dresden (int'l)	Okt. 2014
33	Berlin	April 2015
34	Böblingen/Stuttgart (int'l)	Okt. 2015
35	Berlin	April 2016

G05 - Software Pricing bei z/VM und Linux Middleware auf z Systems

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Acknowledgements

A big THANK YOU to the originator of many of these slides:

David Chase

Worldwide IBM z Systems Software Pricing

dchase@us.ibm.com

http://ibm.com/systems/z/swprice

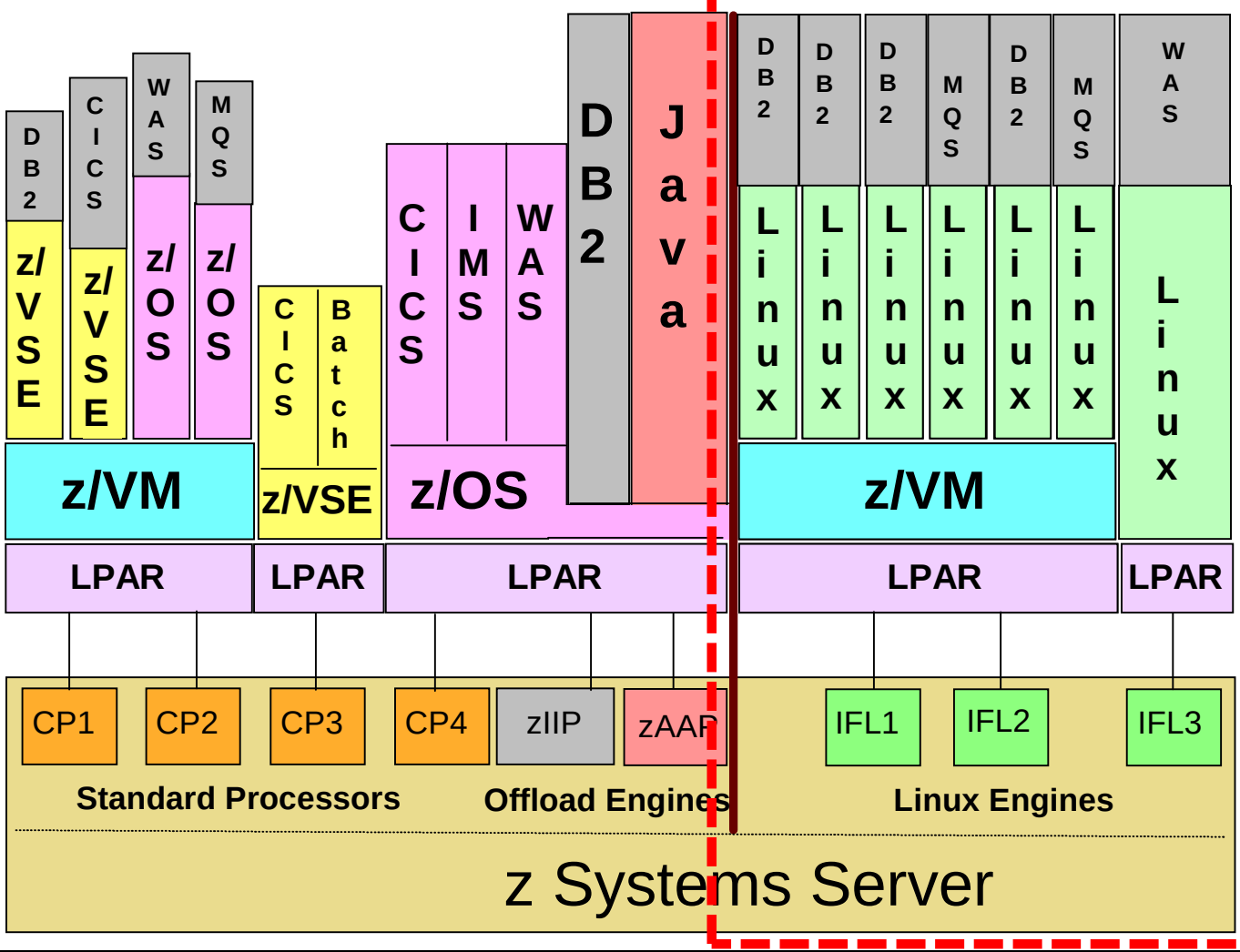
Traditional vs Distributed Software Licensing on IBM z Systems

Traditional SW Licensing

- MLC
- SMF89
- SCRT
- MSU
- AEWLC
- AWLC
- PSLC
- NALC
- MWLC
- TWLC
- GOLC
- MOSP
- ELA
- ...

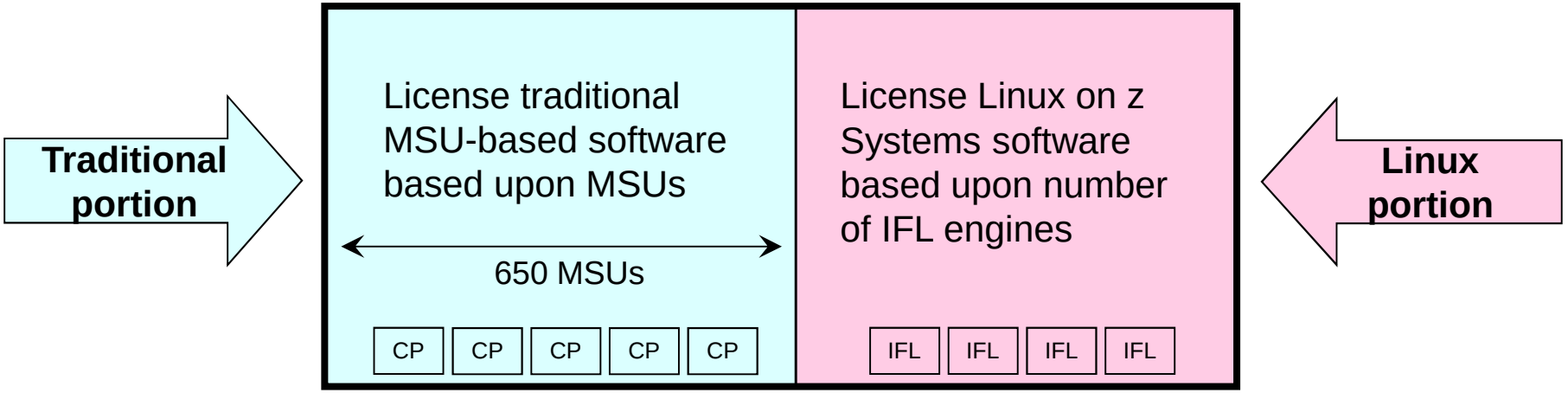
Distributed SW Licensing

- IPLA
- OTC
- S&S
- VU
- PVU
- Pools
- ILMT
- PPA
- ...



Traditional Workload collocated with Linux on z Systems

Example: 2817-705 @ 650 MSUs with 4 IFLs



Model of z Systems processor indicates the MSU rating (and number of CP engines) for pricing of traditional software licenses like z/OS or z/VSE and its middleware.

If an engine-based zSW IPLA product runs on any CPs it must be licensed on all the CPs.

Quantity of Integrated Facility for Linux (IFL) features indicates the number of specialized Linux engines for pricing of IPLA engine-based products like z/VM (and also "distributed" middleware)

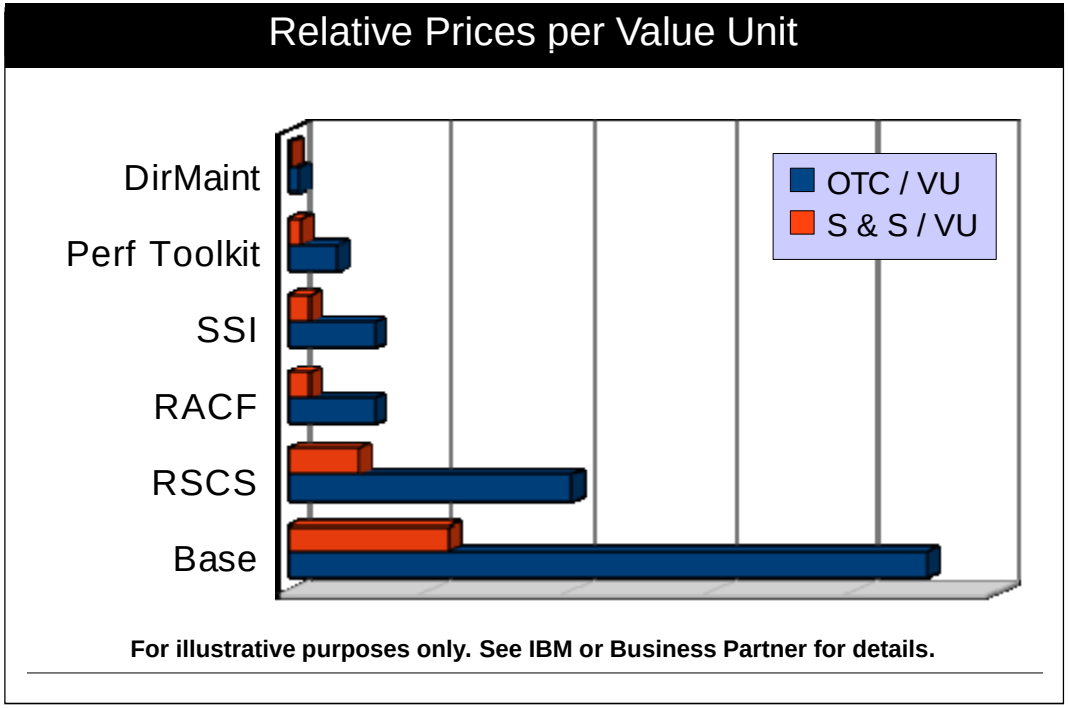
If an engine-based zSW IPLA product runs on any IFLs it must be licensed on all the IFLs.

IPLA = International Program License Agreement

z/VM is an Engine-Based zSW IPLA Product

- z/VM pricing consists of:
  - A one-time charge (OTC), per value unit
  - An (optional) annual charge for Service and Support (S&S), per value unit
- Prices are set per value unit (based on number of engines), relative prices are illustrated below on right
- The SSI feature includes LGR, and it is priced in line with the RACF® feature
- See http://ibm.com/systems/z/swprice/zipla/zvm.html

z/VM Value Unit Schedule	
Number of Engines	**Value Units per Engine**
1 to 3	**10**
4 to 6	**9**
7 to 9	**8**
10 to 12	**7**
13 to 16	**6**
17 to 20	**5**
21 to 25	**4**
26 and above	**3**



Question: When is a Value Unit not a Value Unit?

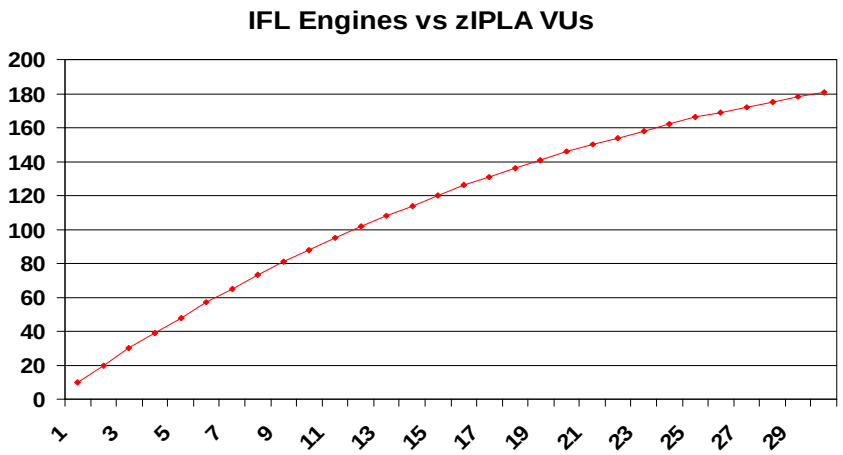
- **z Systems already had been using the term "Value Unit"**
  - z Systems IPLA software provides price performance with lower cost of incremental growth for our tools on z/OS using Value Units
  - We convert MSUs, number of messages, users, and engines into a required Value Unit entitlement using our Value Unit Exhibits

- **Processors rated on different platforms in different ways:**
  - On z Systems, we use MSUs to rate each processor model
  - On distributed platforms, each processor core is rated with a number of Processor Value Units (PVUs)

- **So: PVUs on distributed platforms are analogous to MSUs on the System z platform**
  - Distributed Processor Value Units for Linux products are unrelated to z Systems IPLA Value Units used for z/VM program products!
  - These two different kinds of Value Units are **not** interchangeable!

Comparing z IPLA VUs to Distributed PVUs

- z Systems IPLA Value Units are used for licensing z/VM products on IFL processors
- z IPLA Value Units are calculated from IFL processors according to Value Unit Exhibit 021 in the Workload Pricer
- There is a price performance curve built into the conversion from Engines to VUs
  - 1 IFL requires 10 zIPLA Value Units
  - 4 IFLs require 39 zIPLA Value Units
  - 8 IFLs require 73 zIPLA Value Units



- Distributed Processor Value Units are used for licensing Middleware on IFLs
- Processor Value Units are determined by the type of machine processor
- z13, zEC12, z196 & z10 engines are 120 PVUs, all other z engines are 100 PVUs
- The price performance curve is built into the Passport Advantage relationship using discounting of the purchase price, not discounting of the amount of entitlement needed
- So, for any distributed middleware running on Linux on z Systems:
  - z114 : 1 IFL requires 100 PVUs
  - z196 : 4 IFLs require 480 PVUs
  - z13 : 8 IFLs require 960 PVUs
- No relationship to any z/OS or z/VSE middleware

PVU Table

PVU Website Link: click here

http://ibm.com/software/lotus/passportadvantage/pvu_licensing_for_customers.html

Notes:
1) Each Integrated Facility for Linux (IFL) or Central Processor (CP) engine is equivalent to 1 processor core.

2) Refers to System z9, eServer zSeries, or System/390 servers.

3) Entitlements required for Power Processor Element (PPE) cores only.

4) The PVU requirement for the POWER7 processor technology is dependent on the maximum possible number of sockets on the server.

5) z196 refers to IBM zEnterprise 196, zEC12 refers to IBM zEnterprise EC12

6) z114 refers to IBM zEnterprise 114, zBC12 refers to IBM zEnterprise BC12

PVU Table per Core (section 1 of 2 - RISC and System z)

Processor Technologies													
	Processor Brand			Processor Type									
Processor Vendor	Processor Name	Server model numbers	Maximum number of sockets per server	Cores per socket						IFL Engine	Proc. Model Number	PVUs per Core
				(1)	(2)	(4)	(6)	(8)	(16)			
IBM	POWER7 [4]	770, 780, 795	> 4			■	■	■			All	120
		750, 755, 760, 775 PS704, p460	4			■	■	■			All	100
		PS700-703, 710-740, p260, p270, 7R1, 7R2, p24L	2			■	■	■			All	70
	POWER6	550, 560, 570, 575, 595	All		■						All	120
		520, JS12, JS22, JS23, JS43	All		■						All	80
	POWER5, POWER4	All	All		■						All	100
	POWER5 QCM	All	All			■					All	50
	zEC12, z196, System z10 [1,5]	All	All							■	All	120
	zBC12, z114, System z9, z990, S/390 [1,2,6]	All	All							■	All	100
	PowerPC 970	All	All		■						All	50
	PowerXCell™, Cell/B.E.™ 8i[3]	All	All	■							All	30
Any	Any single-core	All	All	■							All	100

z Systems

Linux Middleware Platform Comparison

§ Linux Middleware pricing determined by:

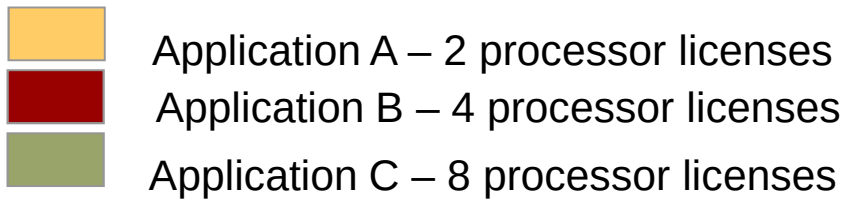
- Processor Value Unit (PVU) rating for each kind of core
  - Different for different processor technologies (p, i, x, z, Sun, HP, AMD, etc.)
  - z Systems is just one of many choices, not handled differently from the others
- Number of processor cores which must be licensed (z calls them IFLs)
- Price per PVU (constant per product, not different based upon technology)

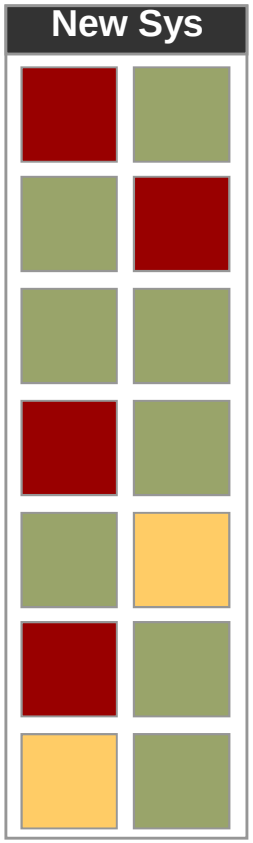
§ Examples:

Technology	PVUs / core		# cores req'd (e.g.)		Total PVUs required		Price per PVU (e.g.)		Total Price
IBM Power7	120	x	4	=	480 PVUs	x	$100	=	$48,000
IBM z13	120	x	4	=	480 PVUs	x	$100	=	$48,000
IBM Power5	100	x	4	=	400 PVUs	x	$100	=	$40,000
IBM z13s	100	x	4	=	400 PVUs	x	$100	=	$40,000
HP PA-RISC	100	x	4	=	400 PVUs	x	$100	=	$40,000
AMD Opteron	50	x	4	=	200 PVUs	x	$100	=	$20,000
Sun UltraSparc T1	30	x	4	=	120 PVUs	x	$100	=	$12,000

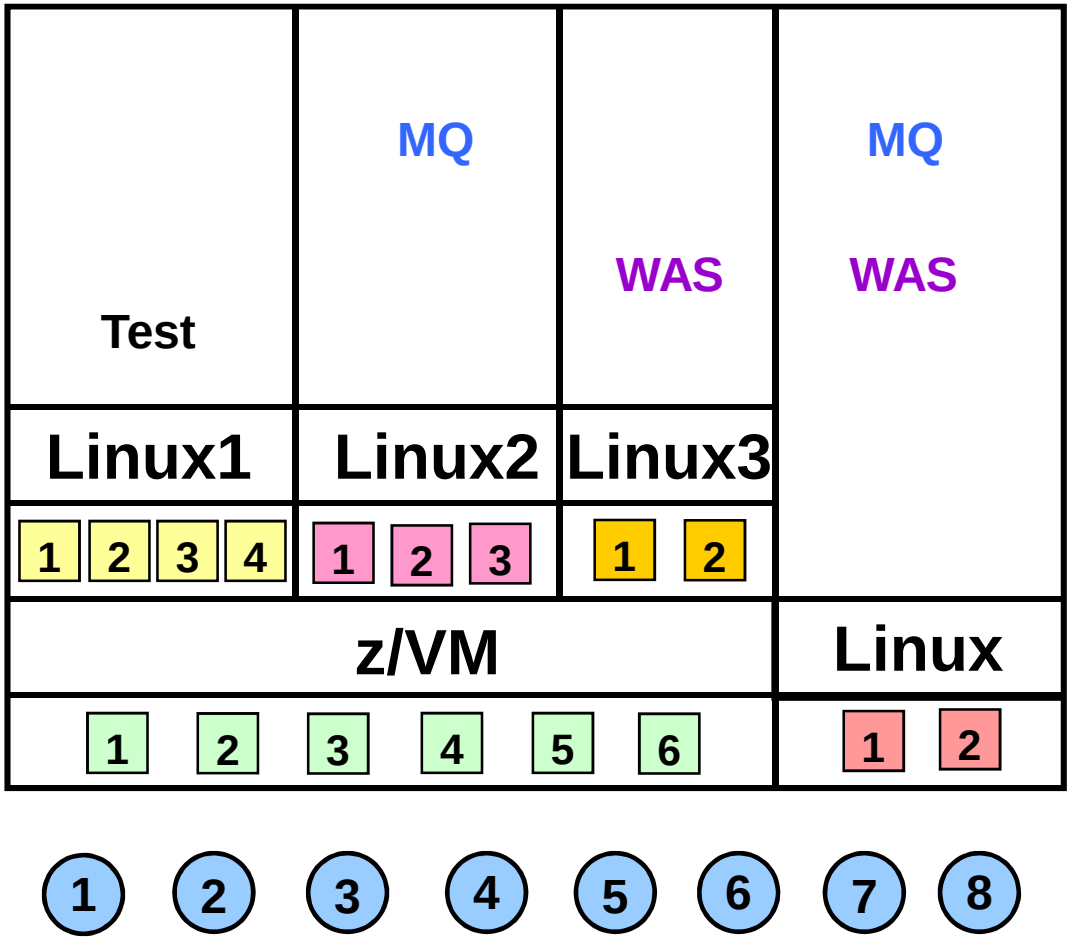
Sub-Capacity Licensing for Distributed Systems

- **Sub-capacity licensing is available for all PVU-priced software offerings that run on:**
  - UNIX (AIX, HP-UX, and Sun Solaris)
  - i5/OS, OS/400
  - Linux (System i, System p, System z)
  - x86 (VMware ESX Server, VMware GSX Server, Microsoft Virtual Server)
  - List of participating offerings on Passport Advantage Website
- **Compliance tracked using IBM License Metric Tool (ILMT) V9.0.1**
  - Available since August 12, 2014
  - Free tool to support IBM software that supports selected partitioning technologies, including z/VM V6.3 CPU Pooling
  - Required to maintain reports generated quarterly





Sub-Capacity with LPARs and z/VM – Example 1



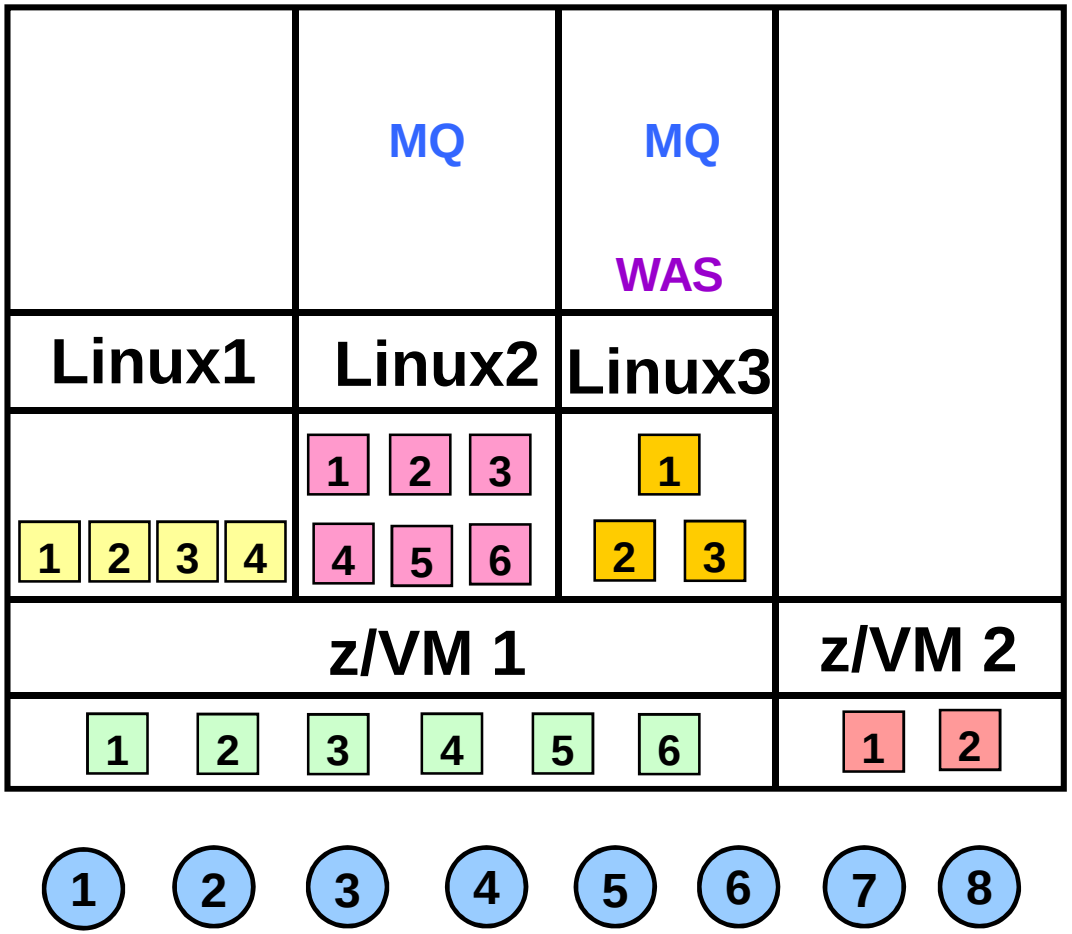
MQ must be licensed for:
3 + 2 = 5 processors
= 500 PVUs

WAS must be licensed for:
2 + 2 = 4 processors
= 400 PVUs

3 Linux Virtual Machines with 4, 3 & 2 virtual processors respectively

6 logical processors assigned to z/VM LPAR
2 logical processors assigned to Linux LPAR
8 processors in the shared IFL pool

Sub-Capacity with LPARs and z/VM – Example 2



Assumption here is 120 PVUs per IFL on a zEC12

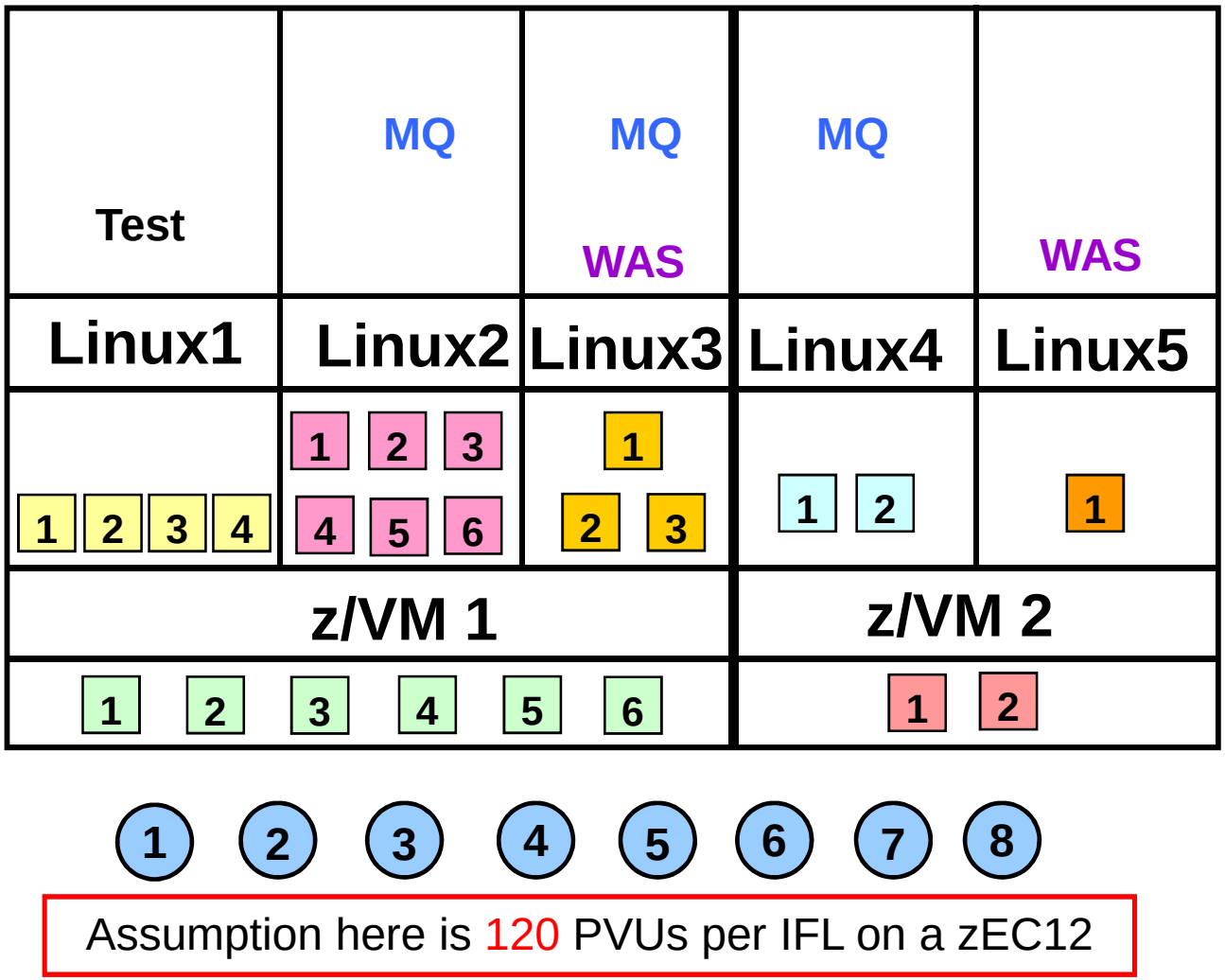
MQ must be licensed for the lower of:
6 + 3 = 9 virtual processors
or 6 logical processors (720 PVUs)

WAS must be licensed for:
3 processors (360 PVUs)

3 Linux Virtual Machines with 4, 6 & 3 virtual processors respectively

6 logical processors assigned to z/VM LPAR 1
2 logical processors assigned to z/VM LPAR 2
8 processors in the shared IFL pool

Sub-Capacity with LPARs and z/VM – Example 3



Assumption here is 120 PVUs per IFL on a zEC12

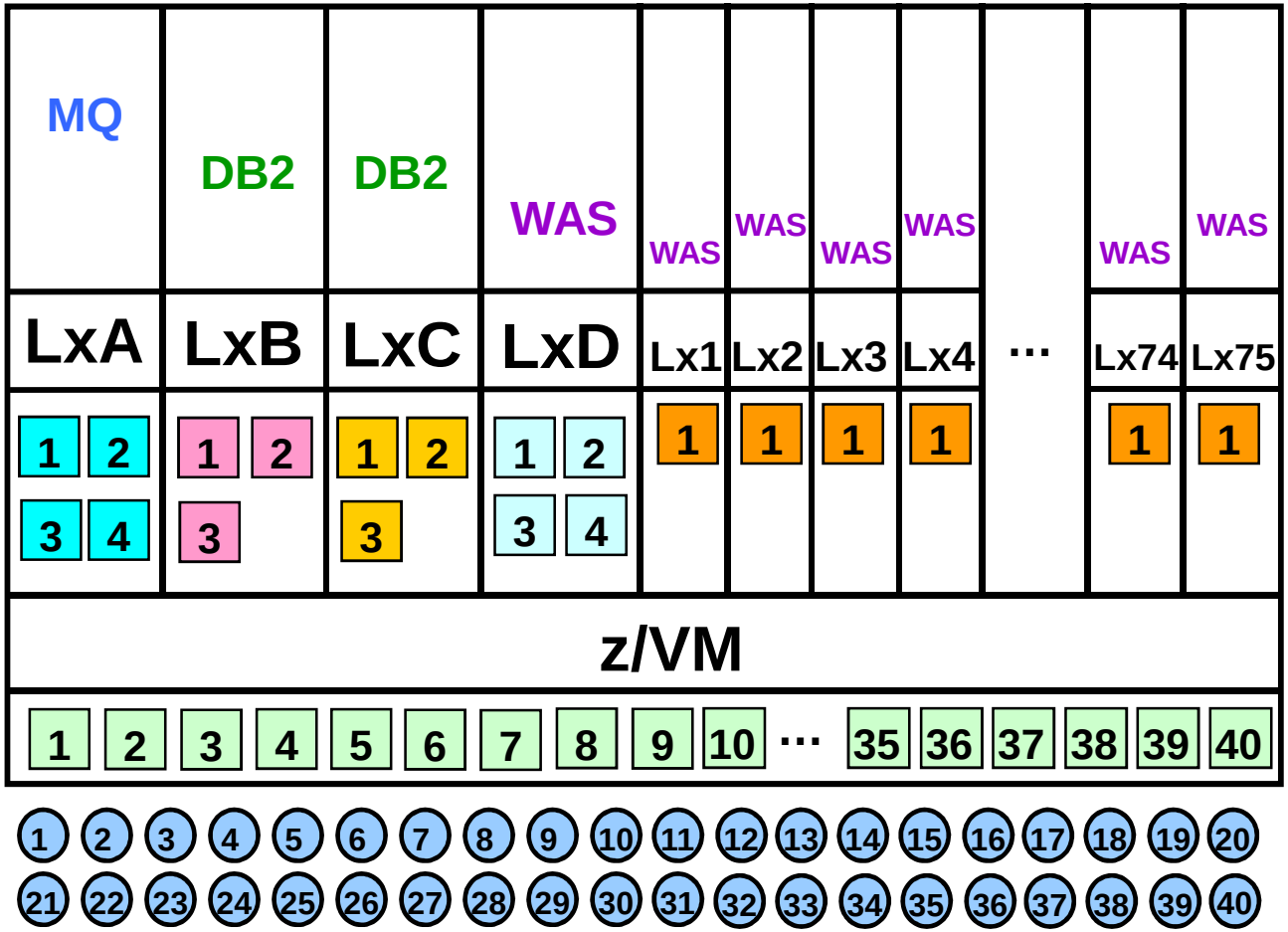
MQ must be licensed for the sum of (a)+(b):
(a) is the lower of:
6 + 3 = 9 virtual IFLs
or 6 logical IFLs
(b) is the lower of:
2 virtual IFLs
or 2 logical IFLs
So, 6 + 2 = 8 IFLs (960 PVUs)

WAS must be licensed for 3 + 1 IFLs (480 PVUs)

5 Linux Virtual Machines with 4, 6, 3, 2 & 1 virtual IFLs respectively

6 logical processors assigned to z/VM LPAR 1
2 logical processors assigned to z/VM LPAR 2
8 processors in the shared IFL pool

Sub-Capacity with LPARs and z/VM – Example 4a



MQ must be licensed for:
4 IFLs (480 PVUs)

DB2 must be licensed for
3 + 3 = 6 IFLs (720 PVUs)

WAS must be licensed for the lower of:
4 + 75 = 79 virtual IFLs
or 40 logical IFLs
(4800 PVUs)

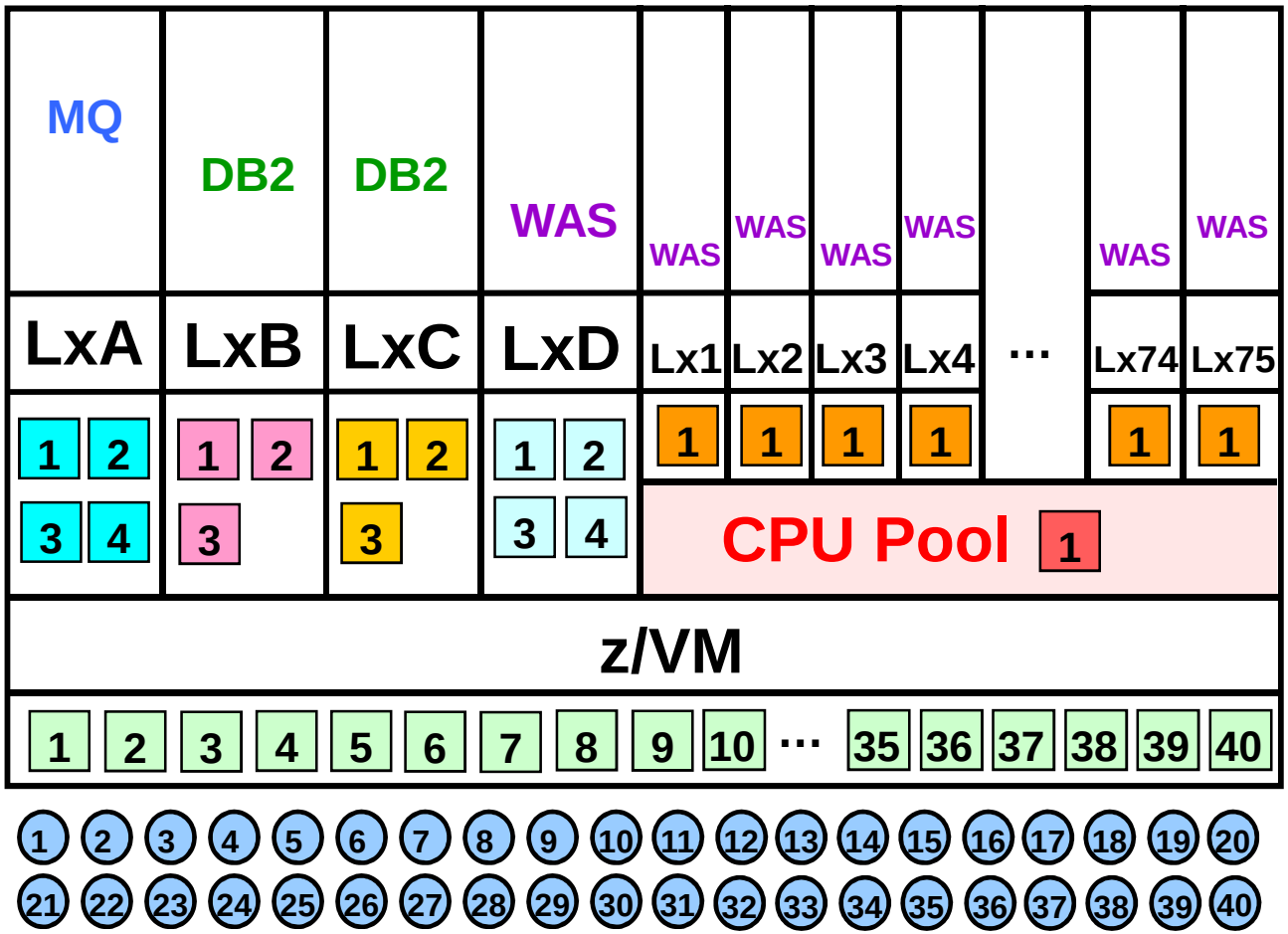
79 Linux Virtual Machines with 4, 3, 3, 4 & 1*75 virtual IFLs respectively

40 logical processors assigned to z/VM LPAR

40 processors in the shared IFL pool

Assumption here is 120 PVUs per IFL on a zEC12

Sub-Capacity with LPARs and z/VM – CPU Pooling Example 4b



MQ must be licensed for:
4 IFLs (480 PVUs)

DB2 must be licensed for
3 + 3 = 6 IFLs (720 PVUs)

WAS must be licensed for
4 + 1 = 5 IFLs (600 PVUs)

79 Linux Virtual Machines with 4, 3, 3, 4 & 1*75 virtual IFLs respectively

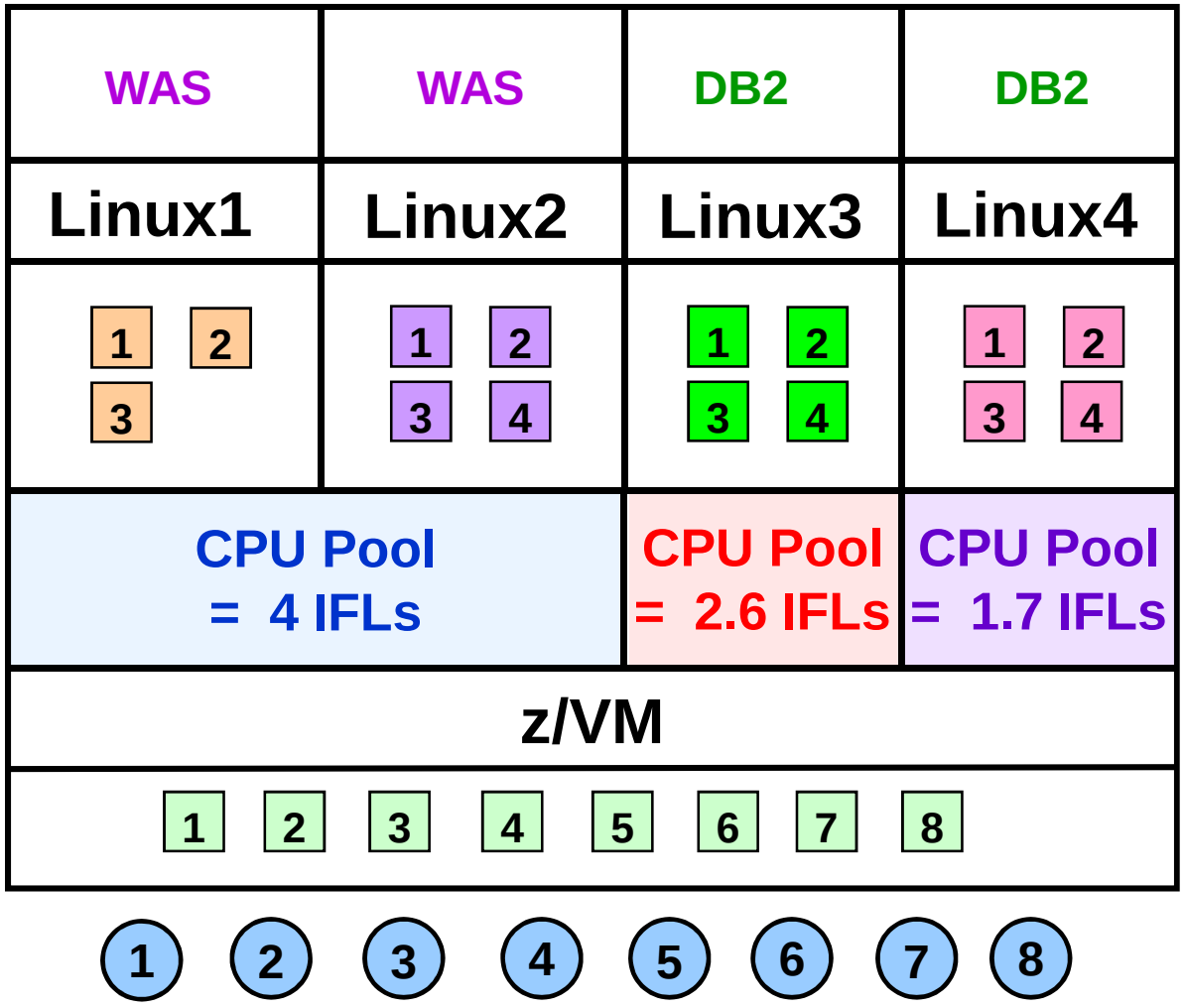
1 processor defined in CPU Pool

40 logical processors assigned to z/VM LPAR

40 processors in the shared IFL pool

Assumption here is 120 PVUs per IFL on a zEC12

Sub-Capacity with LPARs and z/VM – CPU Pooling Example 5



Assumption here is 120 PVUs per IFL on a zEC12

WAS must be licensed for the lower of:
3 + 4 = 7 virtual IFLs
or 4 pool IFLs (480 PVUs)

DB2 must be licensed for the sum of (a)+(b):
(a) is the lower of 4 virtual IFLs or 2.6 pool IFLs
(b) is the lower of 4 virtual IFLs or 1.7 pool IFLs

So, 2.6 + 1.7 = 4.3 IFLs rounded up to 5 IFLs (600 PVUs)

4.0 processors in CPU Pool
2.6 processors in CPU Pool
1.7 processors in CPU Pool

8 logical processors assigned to z/VM LPAR

8 processors in the shared IFL pool

Summary and Learning Points

- **IBM's two software categories are i) z Systems software and ii) distributed software, and the entitlements are not interchangeable**
- **Value Units (VUs) are used to license z Systems IPLA software and Processor Value Units (PVUs) are used to license Distributed Passport Advantage software**
- **Distributed sub-capacity terms require customers to keep track of the maximum processor capacity available to a program:**
  - IBM License Metric Tool (ILMT) calculates this
  - Customers run the tool and retain the reports
- **When running z/VM virtual machines and/or LPARs, a customer is only required to license for the real hardware resources actually available to each program, not all the virtual resources**

For the latest Passport Advantage Information

- **Go to the Passport Advantage website:**
  - ibm.com/software/lotus/passportadvantage/
  - ibm.com/software/lotus/passportadvantage/pvu_licensing_for_customers.html
  - ibm.com/software/lotus/passportadvantage/subcaplicensing.html
  - ibm.com/software/lotus/passportadvantage/Counting_Software_licenses_using_specific_virtualization_technologies.html
- **There is a lot of educational material out on that website**
- **The charts in this deck are an overview with focus on the z Systems platform**
  - The following URL on the z Systems Software Pricing Website summarizes the information in this presentation
  - ibm.com/systems/z/swprice/subcap/linux.html

So, das war’s!

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DB2*	Encina*	IBM logo*	MQSeries	S/390*	VisualAge*	z/VM*
DB2 Connect	FICON*	ImagePlus*	NetView*	System z	WebSphere*	z/VSE
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Backup

Software on z Systems

- **z Systems hardware supports any operating system which executes on the z Systems architecture**
  - IBM Operating Systems:
    - *z/OS, z/VM, z/VSE, z/TPF*
  - Open Source operating systems:
    - *Linux on z Systems*

- **Software categories for different operating system environments**
  - IBM Operating Systems:
    - *IBM Software running on the four IBM operating systems is referred to as **z Systems software** licensed via CBS/ESW*
  - OS environments other than the four IBM operating systems
    - *IBM Software running on the Linux on z Systems operating system is **distributed software** licensed via Passport Advantage*

Supported z Systems Virtualization Technologies

- Linux on z Systems runs IBM distributed middleware
- The following virtualization technologies are all supported by the distributed Passport Advantage sub-capacity licensing offering:
  - LPAR
  - z/VM virtual machines in an LPAR
    - Including CPU Pooling support introduced in z/VM V6.3
  - Native z/VM (on machines which still support basic mode)

Distributed Passport Advantage Sub-Capacity Licensing

Updated July 1, 2008

- **Original distributed sub-capacity process is changed:**
  - Compliance tool (IBM License Metric Tool V7.1 and later) will report upon all PVU (processor value unit) based software, not only sub-capacity eligible
    - Tool measures the maximum processor core capacity in PVUs **available** to each software program (not what is used, what is available)
  - Previously announced suspension of the use of the tool is now revoked, use of IBM License Metric Tool **is required** for sub-capacity licensing **with some exceptions**:
    - Not required for virtualization technologies not yet supported by the tool
    - Not required if customer has less than 1,000 employees and contractors worldwide, unless they are a Service Provider, or have contracted with a Service Provider to manage their sub-capacity server environment
    - Not required if the total physical capacity of customer's servers with sub-capacity licensing is less than 1,000 PVUs, or if licensed at full capacity
  - When IBM License Metric Tool is not required, customers **must maintain documentation for at least two years**, reconciled at least quarterly, to demonstrate on-going compliance with the terms of the sub-capacity offering

Sub-Capacity Definitions and Rules

- **Dedicated partition:**
  - Processors are always allocated in whole increments
  - Resources are only moved between partitions “explicitly” (e.g. by an operator or a scheduled job)
- **Shared pool:**
  - Pool of processors shared by partitions (including virtual machines)
  - System automatically dispatches processor resources between partitions as needed
- **Maximum license requirements**
  - Customer does not have to purchase more licenses for a product than the number of processors on the machine (e.g. maximum DB2 LUW licenses on a 12-way machine is 12)
  - Customer does not have to purchase more “shared pool” licenses for a product than the number of processors assigned to the shared pool (e.g. maximum of 7 MQSeries licenses for a shared pool with 7 processors). Note: This limit does not affect the additional licenses that might be required for dedicated partitions.

PPA Part Numbers for Linux on z Systems

- **Passport Advantage software is licensed and delivered using part numbers:**
  - Part numbers for charging for the license entitlement
  - Part numbers for the materials which deliver the code

- **Many distributed middleware products have part numbers labeled with “Linux for z Systems”**
  - These part numbers are used to track PPA software sold by z Systems sellers for Linux projects which will be deployed on z Systems hardware
  - The purchase of a “Linux for z Systems” part number does not limit the customer’s use of the license, if they later decide to redeploy on another platform they do not need to purchase another license
  - Similarly, a customer may redeploy a previously-purchased non-z license entitlement from distributed hardware onto z Systems without needing to purchase another license