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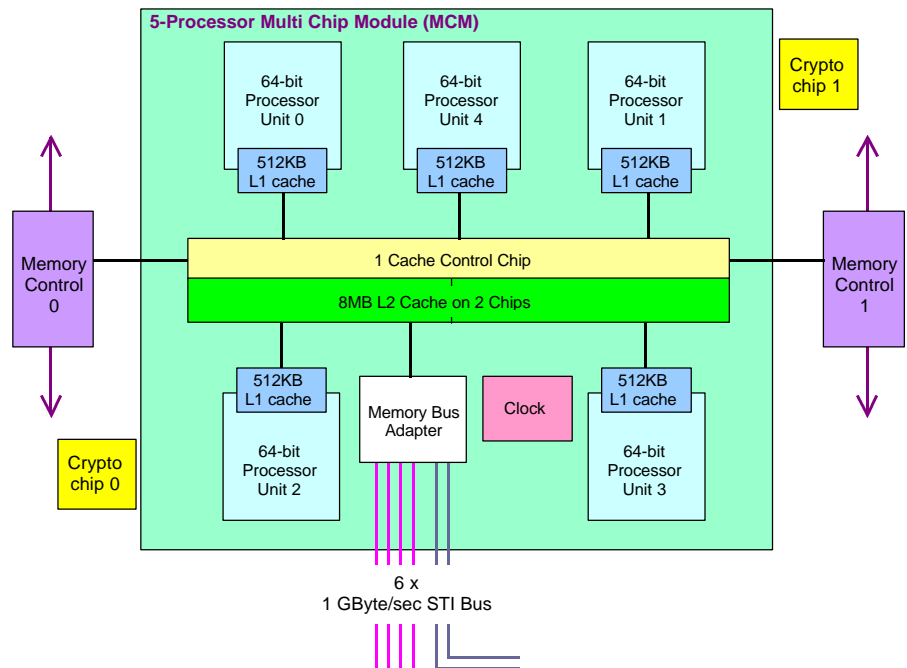
HEADLINES

IBM z800 model 0LF is a 64-bit, Linux-specific mainframe, with LPARs, OSA-Express, ESCON etc., that can have up to 4 processors.

The IBM z800 entry-level mainframe family, developed in conjunction with Hitachi, and featuring a 5-processor MCM, is a price-compelling way to get into 64-bit zSeries mainframes.

Bert Rankin, V.P. of Worldwide Marketing for NetManage, talks about the speed of OnWeb, canned 'Bluefin' and how Robert Burns would have marketed RUMBA.

Xavier Chaillot, the dashing young Frenchman now overseeing all of Hummingbird's connectivity products, brings out the J2EE-compliant, e-Gateway 2.0 that offers exceptional scalability, performance, HTTP-based 3270 file transfer and load-balancing.



The hardware architecture of the new IBM z800 mainframe family that was developed in conjunction with Hitachi

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IBM zSeries z800 Model 0LF – the Linux mainframe

Having shown Sun, emphatically, who is top-dog when it comes to top-end Unix servers with the indomitable p690 'Regatta' [October 2001], IBM is back pursuing its other favorite Unix-related initiative – that of making zSeries mainframes an unparalleled server for Linux, capable of concurrently running hundreds of Linux server images.

When the zSeries 900 was announced in October 2000 [October 2000], it already contained the *Integrated Facility for Linux (ILF)* which permitted up to 8 processors to be dedicated to Linux. ILF processor would run Linux in native mode [i.e. no other OS between Linux and the processor]. In addition to this hardware approach, there were also software-based assists for Linux, in particular *Virtual Image Facility (VIF) for Linux* and *z/VM*.

Consequently, there are four very distinct ways to run Linux on a z900:

1. native mode with ILF: where Linux can run on the entire machine, with no other operating system and with 64-bit addressing to boot.
2. **logical partition (LPAR)** mode: each zSeries mainframe can be partitioned into a maximum of 15 separate LPARs using PR/SM [5/2/1999]. Each LPAR can run its own operating system which could be different from those running on the other LPARs within the same machine. Thus, Linux could run, stand-alone, in one or more LPARs, while the other LPARs are running z/OS, VM or even VSE.
3. as a guest on top of *z/VM*: VM (Virtual Machine) is the venerable software partitioning scheme for mainframes that IBM bought from MIT c. 1970. In those early days we used to call it a 'hypervisor'



The Linux-specific
z800 0LF mainframe
source: IBM

because it enabled other operating systems [a.k.a supervisors] to run on top of it. PR/SM, c. 1987, was a hardware alternative to VM. z/VM, no different to its predecessors, provides partitioning via virtualization of CPU, I/O subsystems [e.g. OSA] and memory. Linux can run on a z/VM virtual machine. Unlike PR/SM, z/VM does not have any fixed, finite limits when it comes to partitioning – this only being dictated by the amount of physical resources on the mainframe. And even that is a performance, cum response time issue. As you start slicing the resources [e.g. CPUs] 'thinner and thinner' performance starts to degrade. With z/VM, IBM claims that you can have hundreds of Linux systems running on a single zSeries.

4. using VIF: VIF takes z/VM virtualization vis-à-vis Linux even further. VIF enables you to run tens to hundreds of Linux server images on a single zSeries mainframe. It is explicitly targeted at customers who want to move Linux or UNIX workloads previously deployed on multiple servers onto a single z900, *while maintaining the same number of distinct server images as before.*

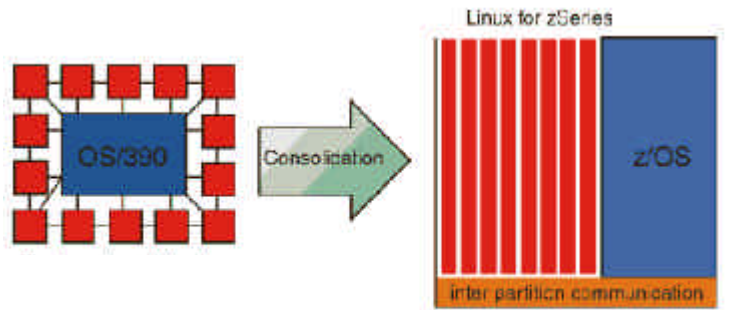
Now there is a whole new option when it comes to Linux and mainframes: the new z800 Model 0LF. This is a dedicated Linux server that can run from 20 to hundreds of simultaneous Linux images – which, nonetheless, is still a *bona fide* zSeries mainframe with LPARs, ESCON channels, FICON and OSA-Express.



The p690 which seems to share the same frame with the z800 providing a common look-and-feel for the high-end Linux servers

source: IBM

With the z800 OLF, IBM is providing customers who have heavy Linux or Unix workloads [e.g. Web or app. server hosting, ISPs, ASPs] the option of getting all of the unrivaled ‘non-stop’ availability, scalability and capacity advantages of a contemporary mainframe – at a very competitive price. Whereas Sun with the **Sun Fire 15K** [October 2001] is trying to provide mainframe-like capabilities, in particular LPARs, IBM has now taken this theme to the next step – a Linux-specific mainframe.



Original IBM picture showing Unix ‘server farm’ consolidation with z900 VIF. [September 2001]

z800 model OLF

Though the z800 model OLF is indubitably a mainframe in terms of its hardware capabilities [e.g. LPARs, CPU sparing] and I/O configuration [e.g. ESCON, OSA-Express and FICON], it can only run Linux workloads. You cannot run z/OS, OS/390, z/VM Ver. 3 (the first 64-bit version for the z900), VM/ESA, VSE/ESA or TPF [i.e. Transaction Processing Facility] on this model of the z800.

The only two OSs you can run on the z800 OLF are Linux (in native mode with IFL) or z/VM Version 4 Rel. 2 [which has been available as of October 2001]. *The other models of the z800 [next section], however, will support the full range of mainframe OSs, Linux as well as a new low cost z/OS known as z/OS.e.*

IBM, at least for the time being, does not market its own version of Linux [64-bit or otherwise] for mainframes. You get Linux for mainframes from **Red Hat**, **SuSE** or **TurboLinux**.



The z800 OLF comes with up to 4 processors – each of which could be made into a Linux engine via IFL. In addition to the ‘business’ CPUs, every OLF also has a dedicated CPU allocated as a *System Assist Processor (SAP)*

to expedite system management functions such as I/O operations. [On z900 machines, as highlighted by my chart in the **Oct. 2000** write-up, there are two to three SAPs per machine because z900 **Multi Chip Module** architecture provides for 4 ‘spare’ CPUs per module.]

z/VM Ver. 4 is unique in that it can run on an IFL-enabled engine. It can do this on both z800 and z900 models. None of the other IBM OSs can match this capability. So z/VM Ver. 4, with its powerful Linux virtualization [i.e. permit lots of concurrent Linux images] capabilities, is a true Linux enabling technology in that:

1. it can run on a IFL-enabled CPU
2. supports Linux virtualization on both standard CPUs and IFL-enabled CPUs

z/VM, however, is not inexpensive. The starting price is around \$45,000. Hence why we also have VIF. VIF costs around \$20,000 per CPU. Just one more thing to remember and factor in when talking z/VM and LPARs. An LPAR, which is a mainframe clone in its own right, can have multiple CPUs. So all the permutations you can come up with when you are trying to configure a mainframe, even a relatively small one as the OLF, can be mind numbing.

IBM z800 Model OLF Configurations							
Feature Code	Max. Business CPUs	Max IFL CPUs	SAP	Memory	ESCON channels	OSA-Express Ports	FICON Express Ports
3605	1	1	1	8GB	28	4	4
3606	2	2	1	8GB	28	4	4
3607	3	3	1	16GB	28	4	4
3608	4	4	1	16GB	28	4	4

IBM "Raptor" z800 'entry level', 64-bit mainframes

The z800 model OLF, [discussed above](#), is but a Linux-specific version of the overall, entry-level zSeries 64-bit 'Raptor' mainframes announced by IBM on February 18 – as the indubitable highlight of IBM's PartnerWorld 2002 event [Feb. 17 – 20] at the [Moscone Convention Center](#) in San Francisco. IBM, now again exhibiting the legendary marketing skills of old [that it had misplaced during the early 1990s], pre-announced the OLF on January 25th to coincide with [LinuxWorld](#) that took place in New York the following week. Hence the slightly baffling cart-before-the-horse chronology when it came to the details of the z800 family percolating out of IBM.

There are eight general purpose z800 models – not counting the OLF and a [Parallel Sysplex](#) coupling facility specific model [OCF](#). These models, à la the OLF, can have from 1 to 4 processors in addition to a SAP. The eight models come in two distinct groups, which are rather confusingly referred to as the 'sub-uniprocessor' and 'sub-dyadic processor' models.

This somewhat incongruous 'sub-processor' terminology (given that it is kind of difficult to go below a uniprocessor) appears to reflect the fact that IBM



hasn't offered any 'lite' mainframe families [not counting PC/390s à la the [MP 3000](#)] for nearly 15 years – with the [ES/9370s](#) (c. 1987) being the last. Since then, especially after the move to CMOS in 1994, the goal was to bring out new generations of

processors where each new processor was faster than its predecessor. *This is not the case with the z800 processor and the z800 models – though IBM readily admits that the performance of the z800 processors have been 'knee-capped' [via internal micro-code] so as to permit compelling entry level pricing both for the hardware and software.*

For example, the base model, viz. 0A1, with one processor rated at 80 MIPS is more or less in the same range [i.e. 1.1 to 1.4 times] as a base G4 processor from 1987. The performance of this processor is thus below that of the [G5s](#), [G6s](#)

and the [z900](#) [[October 2000](#)]. Hence, the sub-uniprocessor designation to denote that it is slower than a 1-way G6 or z900. The sub-dyadic denotes that z800 machine is slower than a 2-way G6 or z800.

All the z800 models use a new 5 processor Multi Chip Module (MCM).



z800 front and back. Despite its svelte appearance this is still big, *taller-than-your-average-systems-programmer, mainframe* that is 5' 11" tall, 2' 4" wide and 3' 8" deep. [Mixed metaphors: IBM now states the dimensions of its machines in millimeters – but then immediately goes onto specify clearances in inches! I guess this is IBM's compromise to appease both Americans and Europeans. Maybe soon we will get machine prices in dollars but maintenance costs in Euros.]

source: IBM



The inside of a z800 – looking like a big PC.

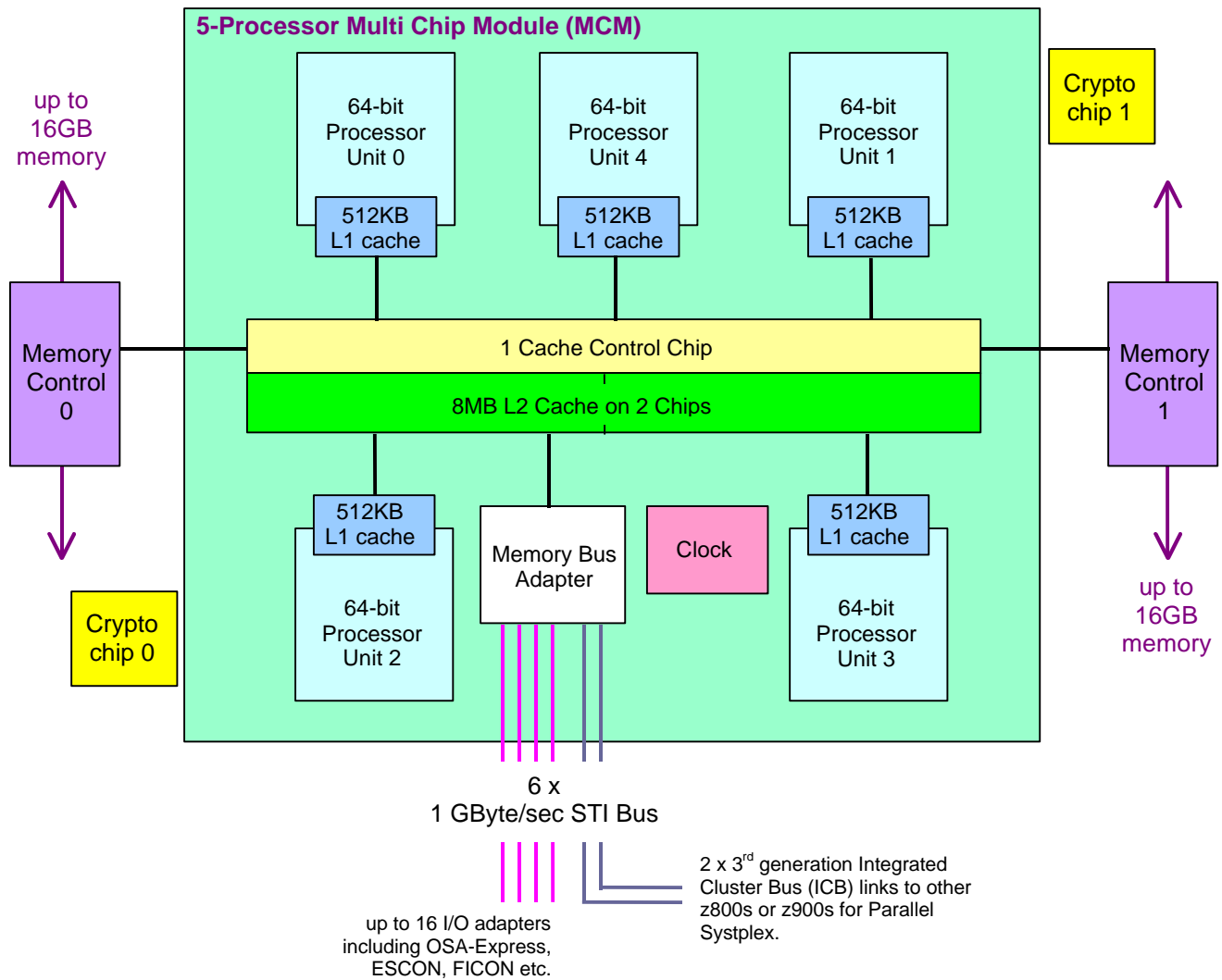
source: IBM

IBM zSeries – machine type 2066 – models							
	Model	Business CPUs	Nominal IBM MIPS	SAP	Max IFL or ICFs	Max CBU/ CuoD	Max Spare without CBU
sub-uni models	0A1	1	80	1	2	0 – 2	3
	0B1	1	115	1	2	0 – 2	3
	0C1	1	140	1	2	0 – 2	3
sub-dyadic models	001	1	185	1	2	0 – 2	3
	0A2	2	260	1	2	0 – 1	2
	002	2	340	1	2	0 – 1	2
	003	3	485	1	1	0 – 1	1
	004	4	625	1	0	0	0

Notes:

1. all the z800s, including the model OLF, are based on a new 5 processor Multi Chip Module (MCM) as shown below. One of the processors is always allocated as a SAP. That leaves 4 processors that can be used for business workloads, ICF, CBU or spares. Some of the processor restrictions are imposed by IBM as opposed to the hardware. In theory, it would also be possible to run IFL on the 'business CPU' – on the 1-way machines. But that would then make these models analogous to the OLF.
2. Max IFL or ICF (optional Internal Coupling Facility for Parallel Sysplex) column indicates *additional processors* that can be allocated to these tasks.
3. Capacity Back Up (CBU) and Capacity Upgrade on Demand (CuoD) column indicates processors that may be temporarily brought online to handle peak workloads.
4. The last column shows the number of processors available as hot-standby, non-disruptive workload takeover spares in the event of a processor failure.

Evolution of the CMOS Mainframes starting with the S/390 G1									
	Intro.	MIPS per CPU	Δ	Max. No. CPUs per machine	Max. MIPS/ Machine	Max. Memory	Max. OSA-Express	Max. 800Mbps FICON	
31-bit	G1	Sept. '94	11 to 13		6-way	60		0	
	G2	June '95	22	83%	10-way	165		0	
	G3	Sept. '96	45	105%	10-way	325		0	
	G4	June '97	63	40%	10-way	450		0	
	G5	Aug. '98	152	141%	10-way	1,069	24GB	12	12
	G6	May '99	201	32%	12-way	1,614	32GB	12	24
64-bit	900	Oct. 2000	225(?)		16-way	2,500	64GB	12 dual-port	96
	800	Feb. 2002	185(?)		4-way	625	32GB	12 dual-port	32



Schematic diagram of the z800 architecture highlighting the new 5 processor Multi Chip Module.

	z800 vs. z900 Multi Chip Module (MCM)	
	z800	z900
# Chips	10	35
# Processors	5	20
Processor Cycle Time	1.6 nano seconds	1.3 nano seconds
# Memory Bus Adapters (MBAs)	1	4
# L2 Cache Chips	2	8
Amount of L2 Cache	8MB	32MB
Clocks	1	1
Dimensions	2.8" x 2.8"	5" x 5"

Made in Japan

The z800 is the fruitful result of an inspired collaboration between IBM and Hitachi, who not that long ago was a major competitor when it came to high-end bipolar mainframes. IBM's intent to collaborate with Hitachi was announced on March 13, 2001 [March 2001] – with special emphasis given to the fact that IBM was giving Hitachi access to its cutting edge MCM technology which is the heart of all of IBM's CMOS machines.

The new 5-processor MCM that powers all the z800s was jointly developed between the two companies and a significant portion of a z800 is manufactured for IBM by Hitachi – in Japan. Consequently the z800s will be labeled as 'Made in Japan.' Given this relationship, Hitachi no doubt will encourage its mainframe installed base to migrate to z800s and z900s.

This is wonderful news for IBM. Whereas IBM had at least four mainframe competitors [e.g. Amdahl, Fujitsu, Comparex] as recently as a few years ago, it now really has the entire field to itself [without anybody even mentioning that dreaded 'anti-trust' word that plagued IBM's mainframe plans in the 1970s and 1980s] thanks to its relentless drive to make CMOS technology mainframes so compelling. Now with the new low-cost mainframes and Linux-on-mainframes to boot, IBM in 2001, after a 13 year hiatus, finally saw revenue growth in the mainframe sector.

z/OS.e

The z800 models [not counting the OLF] comes with its own entry-level, 64-bit z/OS operating system with a 'e' postfix that could denote either 'entry' or 'e-business'. z/OS.e, which IBM intends to offer at around \$1,200/month per z800 processor, is geared to promote what IBM is calling zSeries 'Entry License Charges' (zELC) for software. z/OS.e and zELC sets out to minimize the 'sticker shock' that Unix and NT folks have when they see mainframe software prices. So this is another enlightened move by IBM to extend the appeal of 21st century, Linux-capable mainframes.

HITACHI

z/OS.e can be run as the only operating system on a z800. It can run on its own LPAR, on multiple LPARs or on top of z/VM. It can and will coexist with all other operating systems including z/OS, OS/390, z/VM, VM, VSE and TPF. You could also have it alongside Linux – for example with Linux running on an IFL.

The operating system options for the z800, given the wide range of possibilities coupled with the 31- and 64-bit addressing, is understandably getting rather complicated – with the z800 only supporting z/OS and z/OS.e in 64-bit mode. This chart should help:

	ESA/390 31-bit	z/Architecture 64-bit
z/OS.e Ver 1 Rel 3(+)	no	yes
z/OS Ver 1 Rel 1 to 5	no	yes
OS/390 Ver 2 Rel 10	yes	yes
OS/390 Ver 2 Rel 8-9	yes	no
Linux for zSeries	no	yes
Linux for S/390	yes	no
z/VM Ver 4 Rel 1 – 2	yes	yes
z/VM Ver 3 Rel 1	yes	yes
VM/ESA Ver 2 Rel 4	yes	no
VSE/ESA Ver 2 Rel 4-7	yes	no
TPF Ver 4 Rel 1	yes	no

Bottom Line

This is another major feather in the cap for IBM on the server front. In terms of scalability, high-availability, capacity and ruggedness, mainframes are in a class of their own especially when it comes to running high-volume, mission-critical applications – which now include J2EE application servers, Web servers and e-applications including CRM and SCM. z800 harks back to the IBM 4300 entry level mainframes of the early 1980s, in that BigBlue's goal is to ensure that the cost is not an insurmountable barrier when it comes to mainframe ownership.

More on z/OS.e and z/OS Ver. Rel. 3 next month.