

## Parte 1: Linux per i Sistemi Centrali



# Cosa e' Linux

Created as an open standards-based, UNIX® OS operating environment

Packaged and shipped by many distributors, including

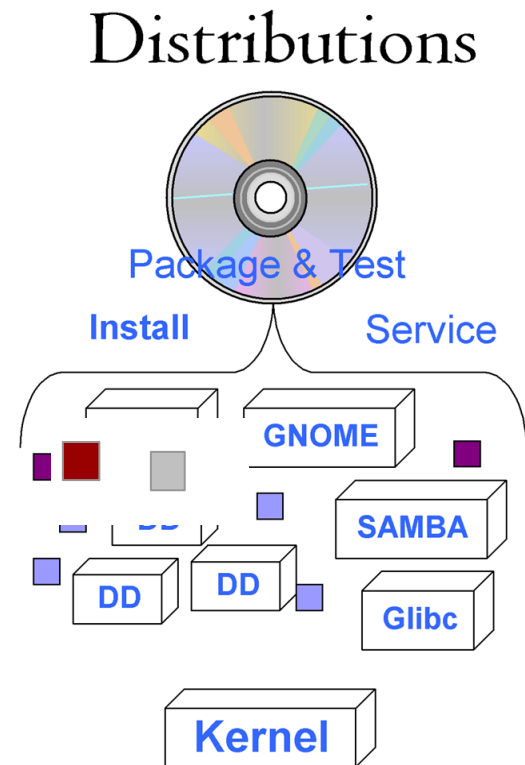
Red Hat and SUSE LINUX

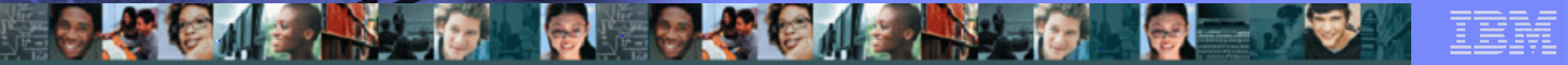
Provides a cost-effective operating environment

Delivers the power you need to run your business-critical applications

Provides a stable, security-rich operating environment

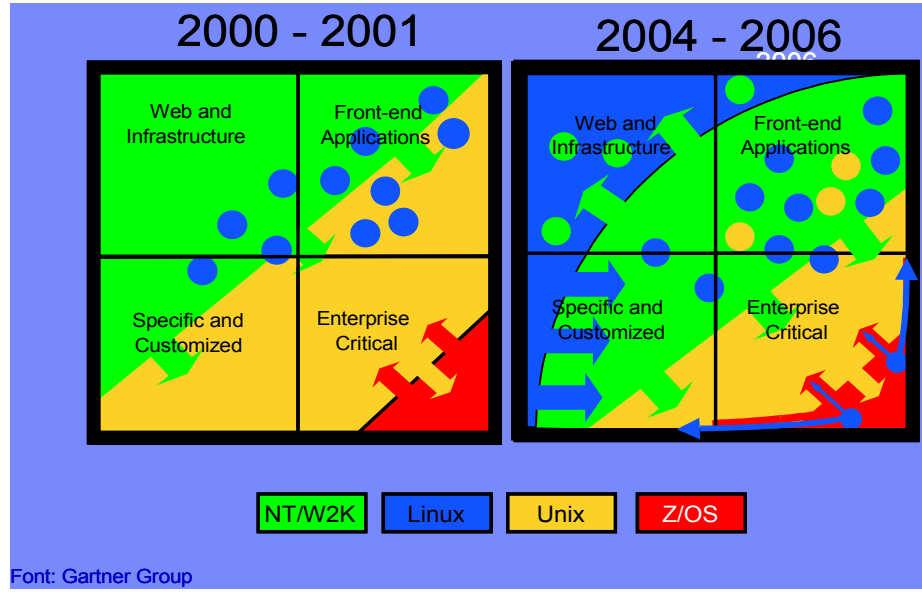
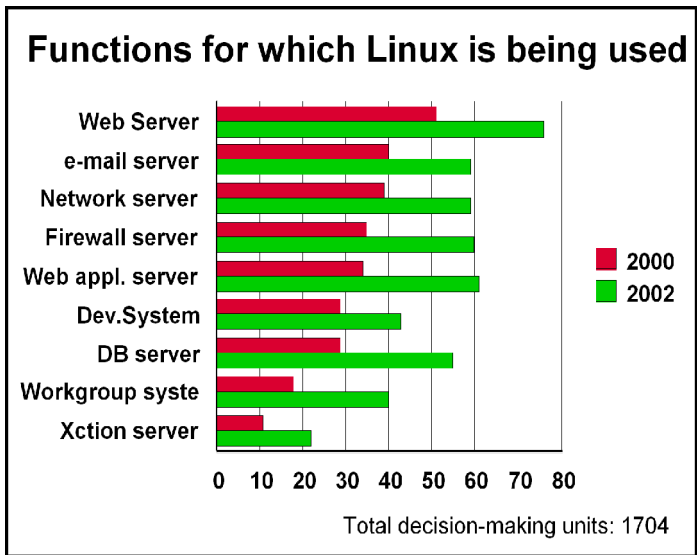
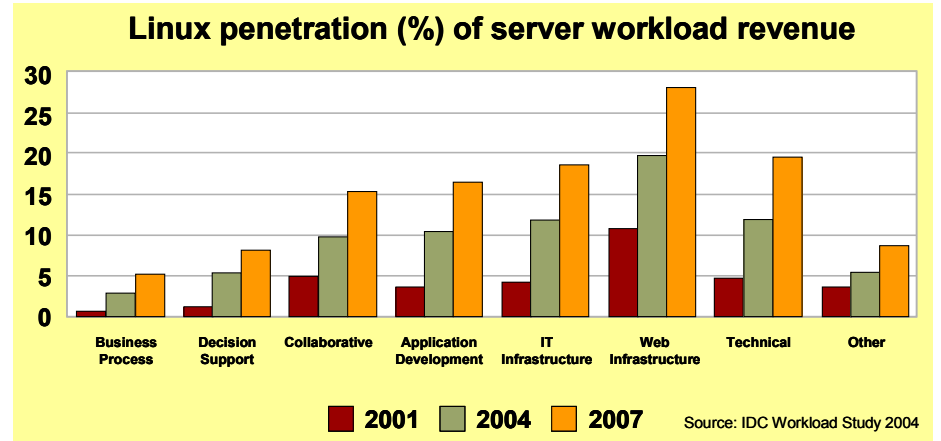
Developed and continuously tested by the open source community

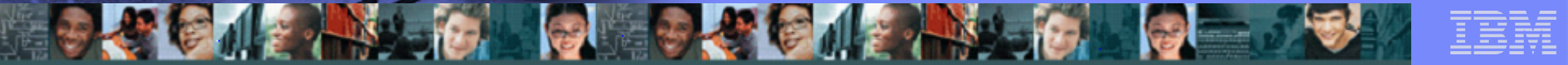




# Perche' IBM e' interessata a Linux

**Nato come Sistema Operativo di interesse prettamente 'accademico' a partire dal 2000 si e' introdotto nell'ambiente commerciale dove ha rappresentato una alternativa ad altri sistemi Operativi piu' complessi e costosi nell'area delle Applicazioni Collaterali e della Infrastruttura.**





## Perche' le Aziende scelgono LINUX

***Linux e' aperto.***

***Linux e' conosciuto***

***Linux e' poco costoso***

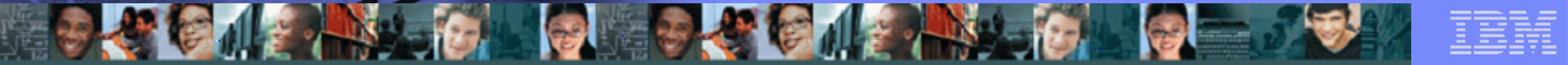
***Linux e' affidabile e facile da mantenere .***

***Linux e' ricco di applicazioni:***

- Provenienti da Open Source***
- Prodotte da ISVs***

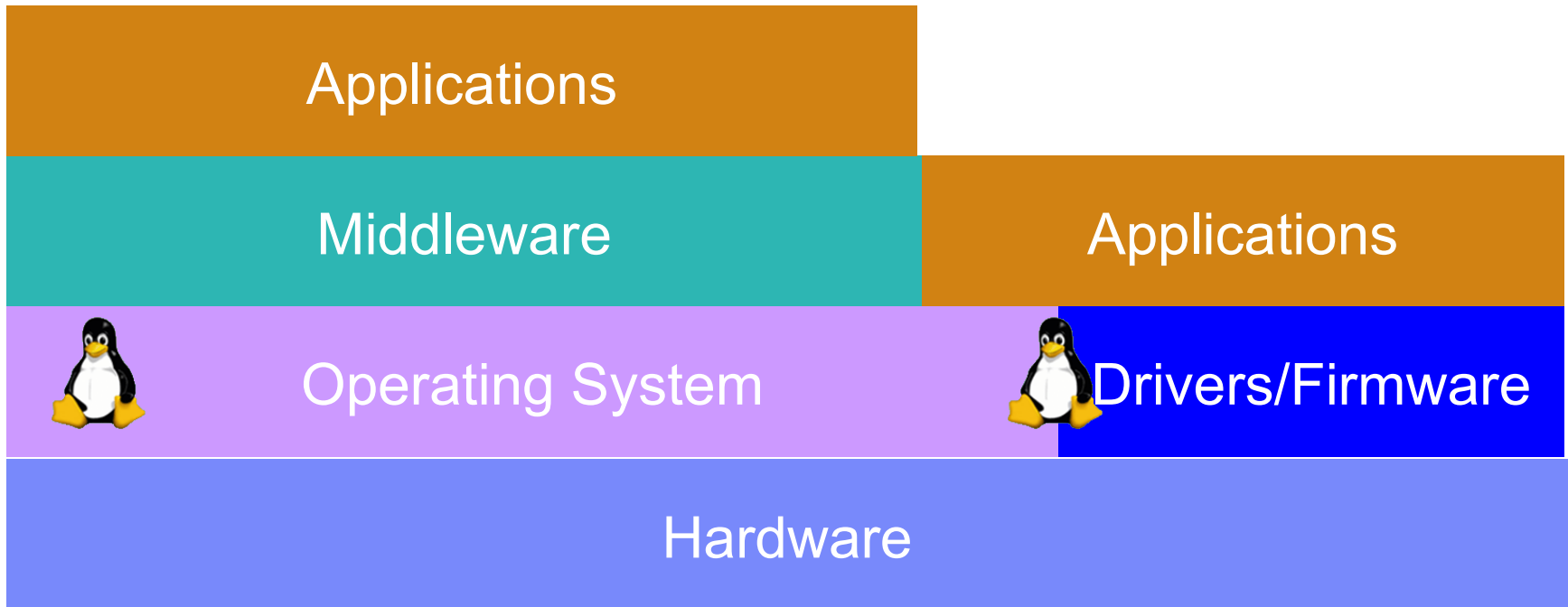
***Linux e' efficiente***

***Linux e' sicuro***

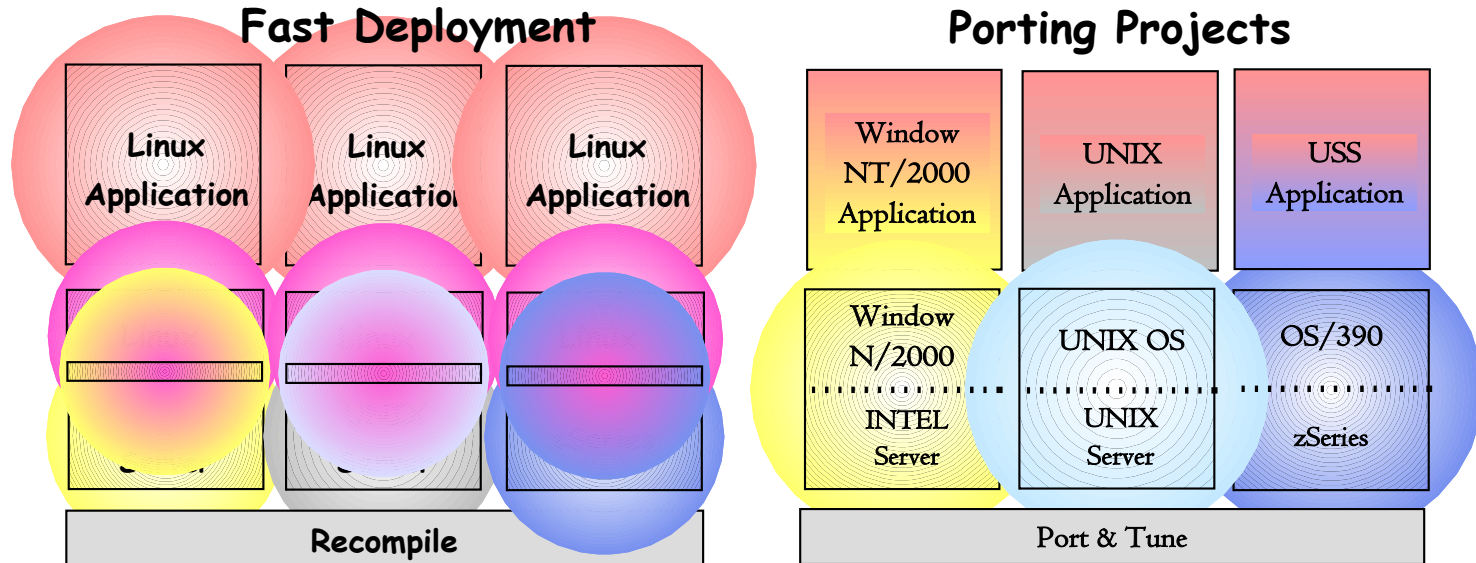


## Dove si colloca LINUX ?

**Linux si Colloca nell'area dei Sistemi Operativi:  
Esso infatti si interfaccia con l'Hardware  
direttamente o tramite appositi programmi detti  
Drivers.**

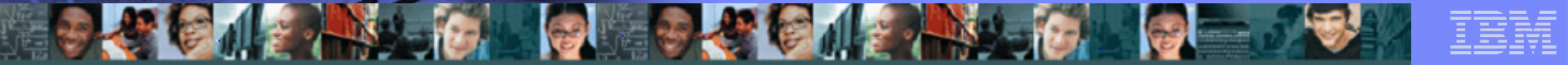


# Portabilita' del Codice Sorgente : La 'forza di Linux'



- **Linux is Linux is Linux - con minime dipendenze dall' HW**
- **Fornisce uno strumento per sviluppare applicazioni**
- **Small kernel, fast execution, great performances**
- **Linux fornisce benefici per le applicazioni di rete**
- **I server di impresa forniscono Quality of Service a Linux**

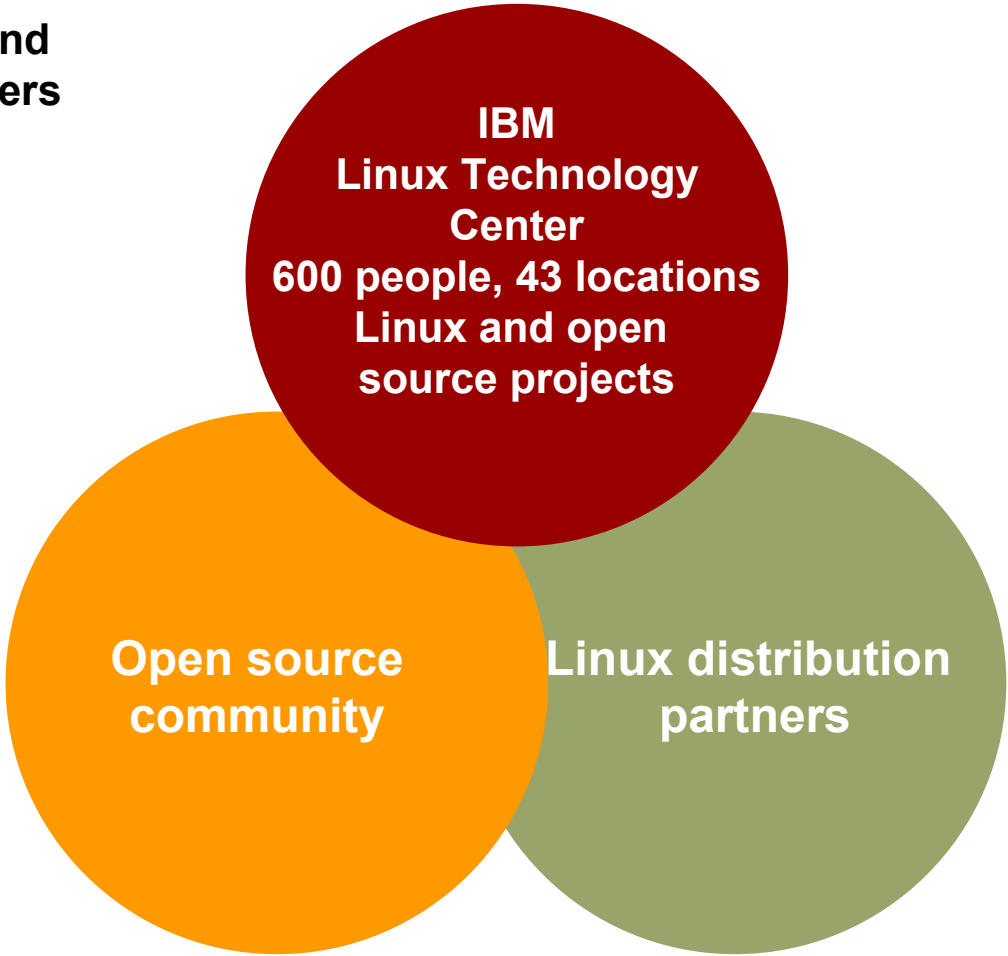
Notice - some platforms may implement Linux as "Linux API's" provided by the platform Operating Systems (eg AIX, Solaris,....)  
This does still provide for a "Recompile" portability, - as long Linux Applications do not exploit any specific platform function



# Che ruolo svolge IBM per LINUX

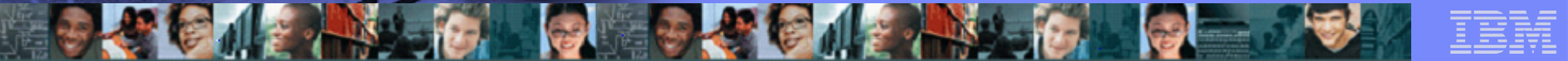
## Key maintainers and community members

- Free Standards Group
- SAMBA
- OpenLDAP
- IPv6
- SCTP
- Various device drivers
- EVMS
- JFS
- SBLIM, Pegasus
- LSM, Bastille
- PCI hot-plug
- USB
- APM
- OMNI Print
- PPC32, PPC64
- Linux-HA, Heartbeat
- Linux Test Project
- .....and growing

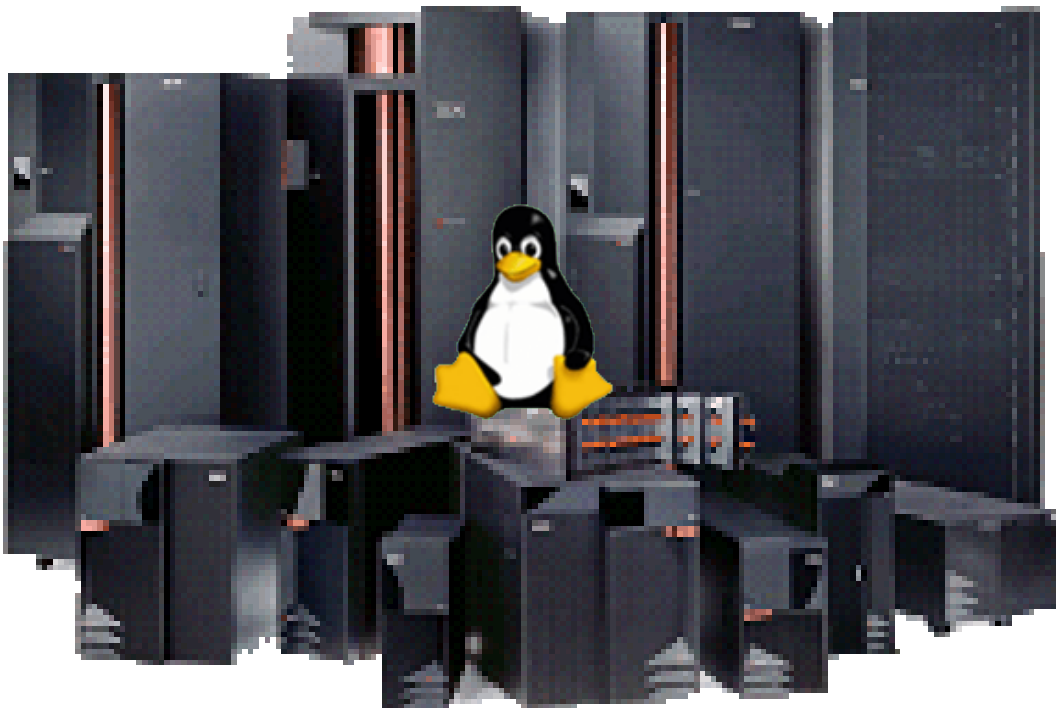


## Development areas to tune Linux on POWER And zSeries

- Scalability
- RAS
- Networking
- Systems Mgmt
- Security
- Performance
- Standards
- Test
- Quality
- Performance



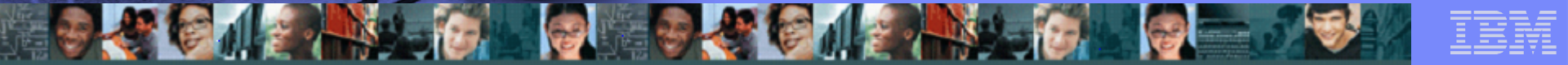
## Linux e' Supportato da IBM su tutti i Suoi Serventi



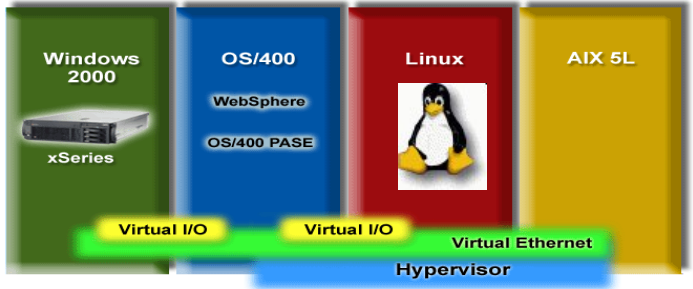
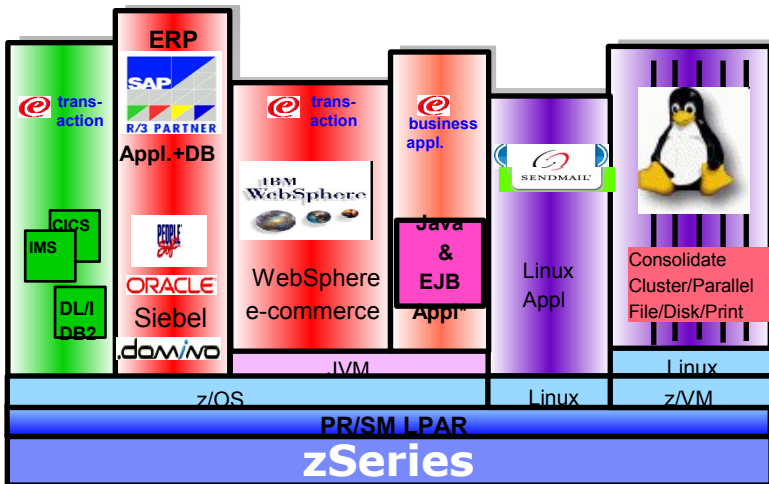
*I Serventi IBM sono suddivisi in quattro grandi gruppi detti 'Series' o 'Systems':*

- zSystems – Grandi Sistemi Centrali con spiccate capacita' di trattamento dati e zero downTime*
- pSystems – Serventi con architettura RISC e grosse capacita' di calcolo.*
- iSeries – Serventi integrati per piccole e medie aziende ed applicazioni dipartimentali.*
- xSeries – Serventi con Architettura Intel .*

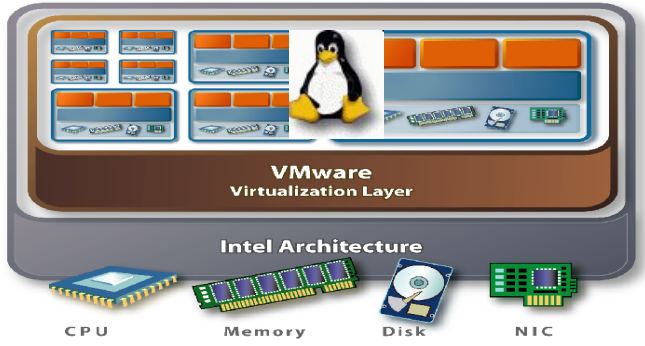
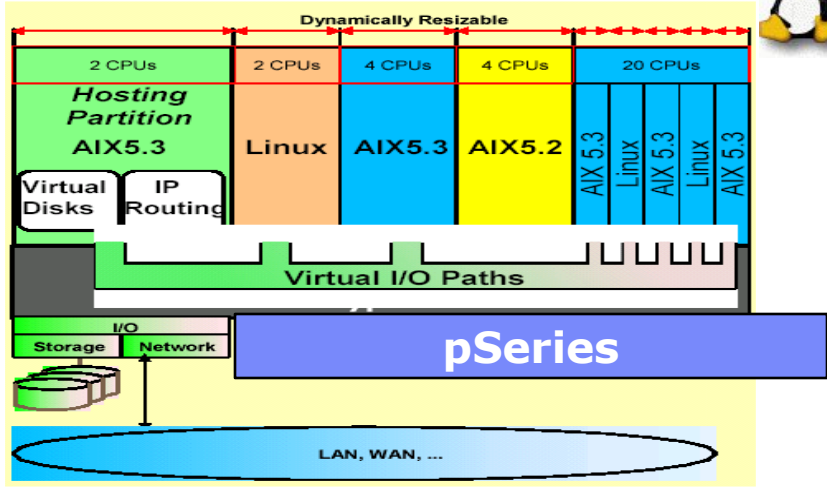




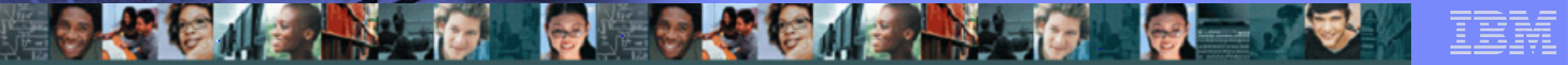
# Linux si integra perfettamente con le soluzioni di Virtualizzazione



**iSeries**



**xSeries**



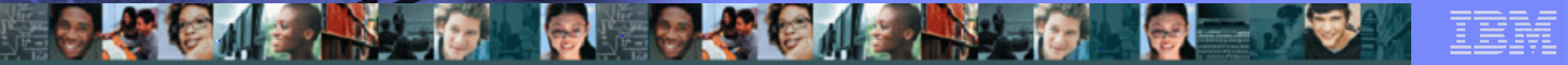
## Linux e i Grandi Sistemi IBM

**IBM ha introdotto LINUX sui Grandi Sistemi Centrali alla fine del 2000:  
Si e' trattato inizialmente di un Esercizio Accademico di una Universita' americana (Marist College) dove alcuni ricercatori hanno modificato il Kernel in modo da consentirgli di essere attivato sull' Hardware dei grandi Sistemi producendo anche i Drivers per gestire le piu' comuni interfacce di I/O, dischi, nastri magnetici e Schede di Rete.**

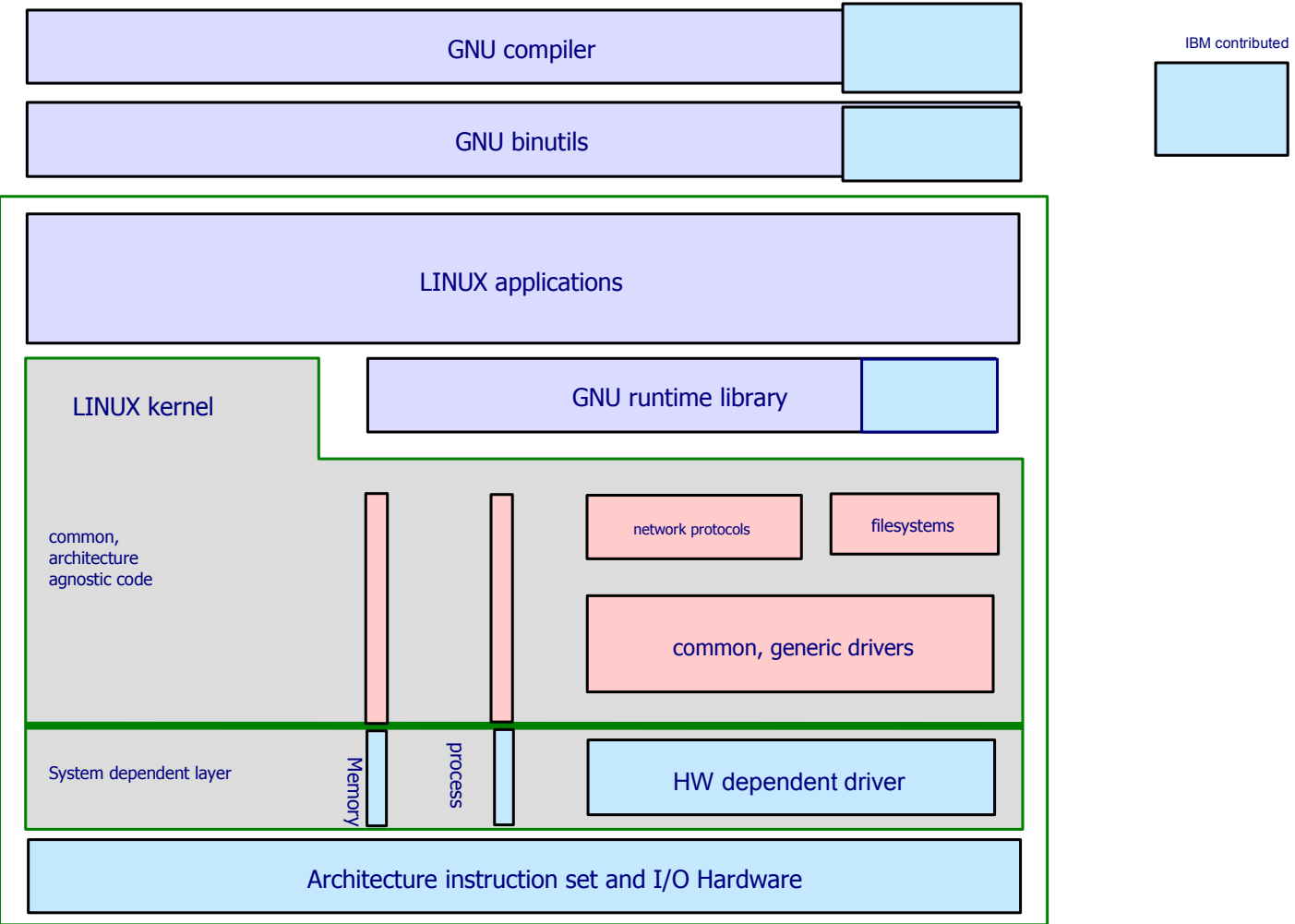


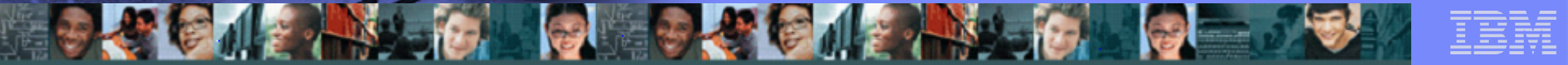
**Col contributo di altri laboratori IBM Europei e della Open Source Community l'esercizio e' diventato presto un codice affidabile che e' stato messo a disposizione della comunita' ed incluso nelle piu' comuni distribuzioni: Si tratta di una implementazioni ASCII Nativa, che pertanto entra a fare parte delle opzioni possibili per Linux al pari delle altre.**

**L'interesse del mercato per questa implementazione e' dovuto alla capacita' dei Grandi Sistemi di consolidare un grande numero di Sistemi Linux di dimensioni variabili attraverso le tecniche di Partizionamento e Virtualizzaione disponibili su questi Sistemi con caratteristiche di dinamicita' e grande flessibilita'.**

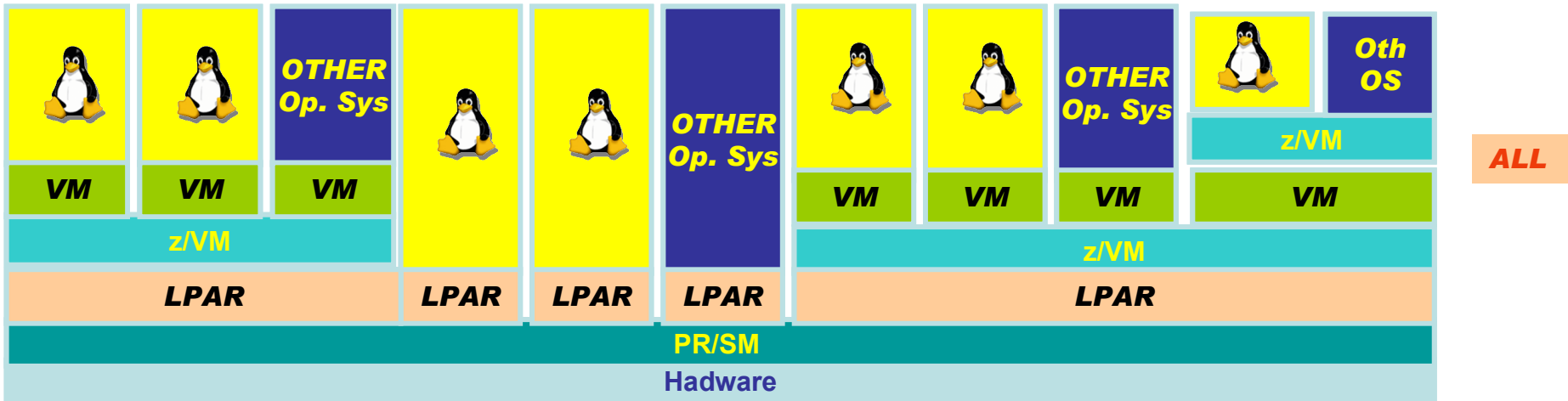
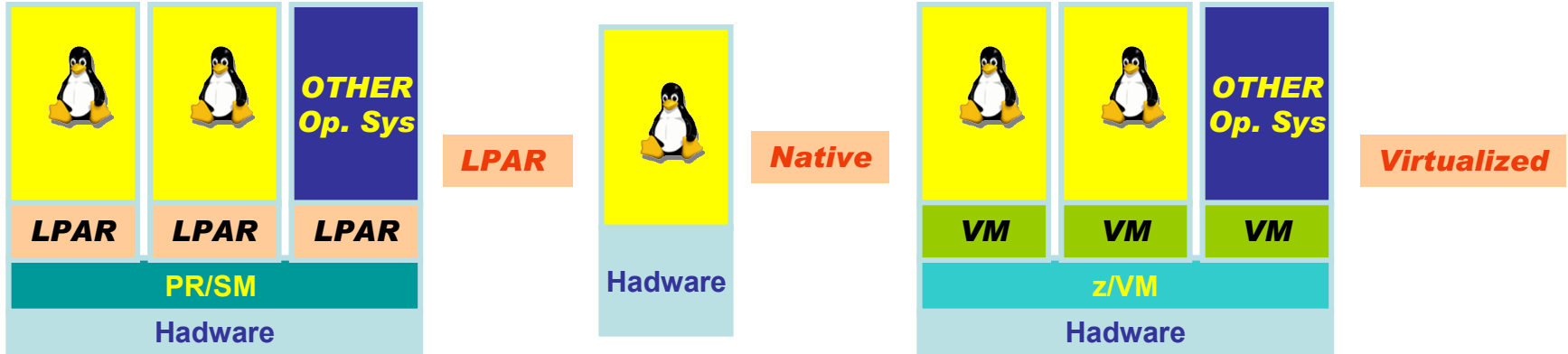


# Struttura di Linux e contributo IBM per i Grandi Sistemi Centrali



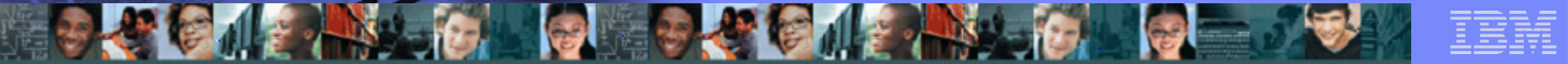


# Modalita' di Esecuzione di Linux sui Sistemi z/Architecture



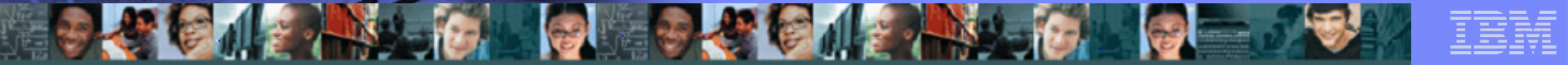
## Parte 2: Linux per i Sistemi Centrali





## Obiettivi del Modulo

- Perché Linux ?
- Come Linux ?
- Quando Linux ?



# Gli usi piu' frequenti di LINUX oggi

**Linux oggi e' usato in prevalenza per:**

**3. Infrastructure Solutions**

**5. Consolidate Workloads**

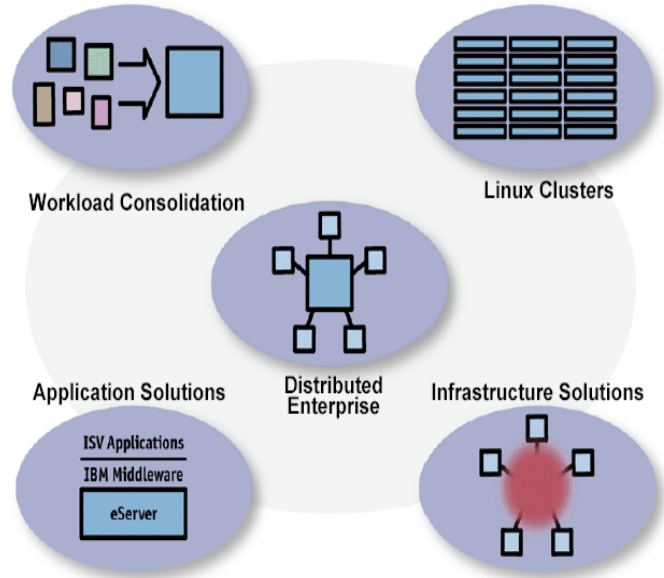
**7. Cluster Complex**

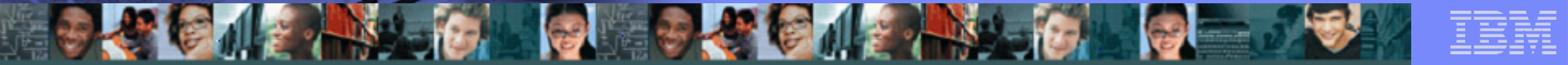
**9. Distributed Enterprise**

**11. Application Solutions**

## How Customers are Deploying Linux

Unit 14





# Opzione 1 : Soluzioni Infrastrutturali

## ■ Infrastructure Servers:

- File/Print
- Web/Application
- Application development
- Content/Caching
- Security

## ■ Vantaggi:

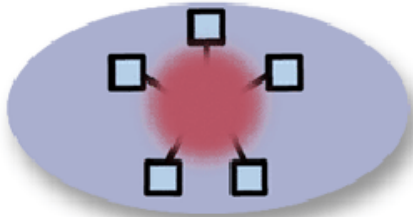
- Basso Costo
- Alta Affidabilità
- Rapida Attivazione
- Packaging Innovativo

## ■ Infrastructure Software:

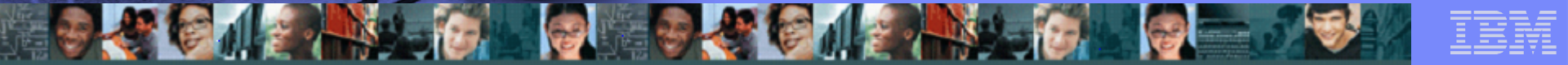
- DB2 Universal Database
- Lotus® Domino collaboration
- Tivoli® Systems Management
- MQSeries® messaging
- WebSphere

## ■ Vantaggi:

- Scalabile
- Open standards
- Collaudato

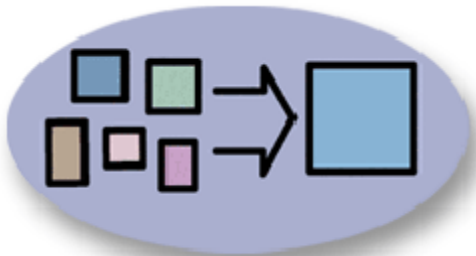


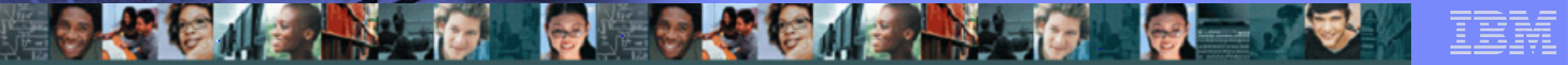




# Opzione 2 : Consolidamento per Semplificare

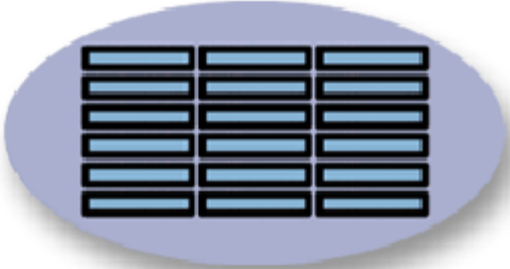
- Workload Consolidation:
  - Sostituire Molti Server con Pochi
  - Ottimizzare gli assets
  
- Vantaggi:
  - Riduzione di costi
  - Usare al meglio le macchine
  - Usare la virtualizzazione
  - Gestione dinamica dei workloads

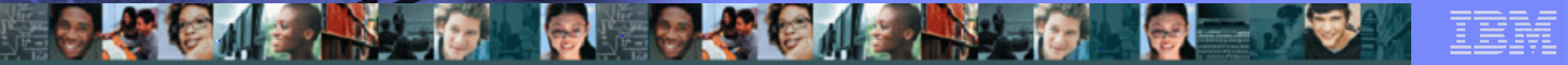




# Opzione 3 : Linux Clusters

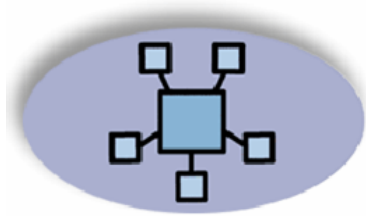
- Benefici dell'uso di Cluster con Linux:
  - HPC
  - 24 x 7
  - Scalabilita' Verticale ed Orizzontale
  - Gestione dei picchi di carico
  - Disaster recovery
- Vantaggi :
  - Supercomputing performance a basso costo
  - Software di Clustering molto diffusi
    - GPFS - General Parallel File System
    - CSM - Cluster Systems Manager
    - Globus toolkit

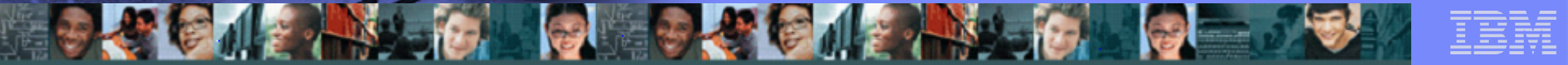




# Opzione 4 : Applicazioni Distribuite

- Soluzioni distribuite con Linux :
  - Disperse nel territorio
  - Servono differenti realta operative
- Vantaggi:
  - Facili da replicare
  - Secure
  - Gestite Centralmente

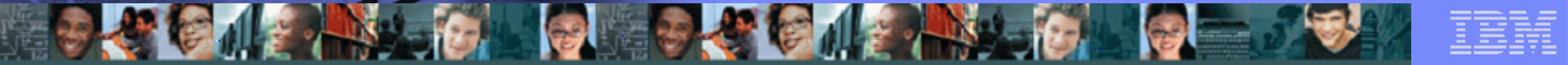




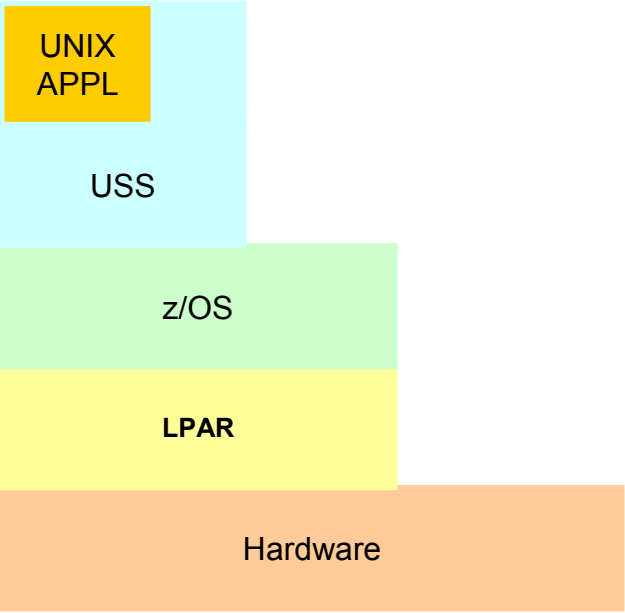
# Opzione : Soluzioni Applicative di Mercato

- Soluzioni prodotte da Independent Software Vendor (ISV) :
  - Soluzioni Verticali di Industria
  - Programmi Specifici
- Vantaggi
  - Basso Costo
  - Rapida Implementazione
  - Alta Efficienza

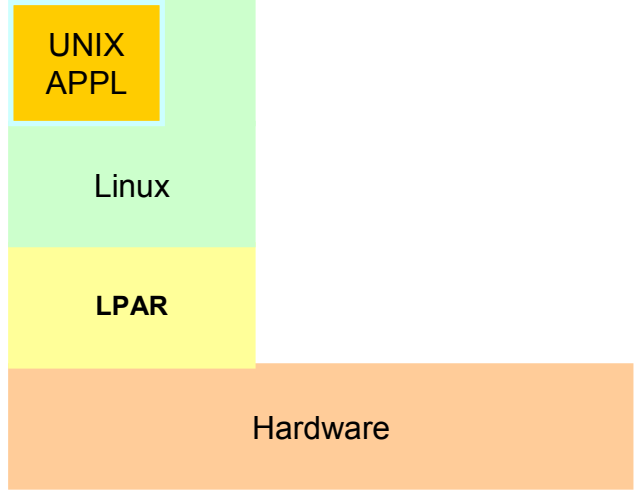




# La prima scelta : Unix System Services o LINUX sul Mainframe ?

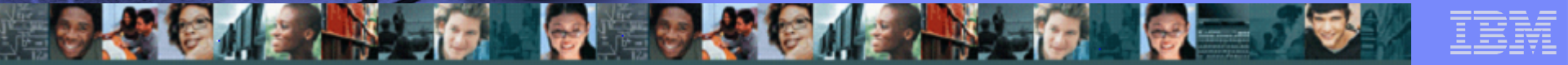


**Running on z/OS under Unix System Services**



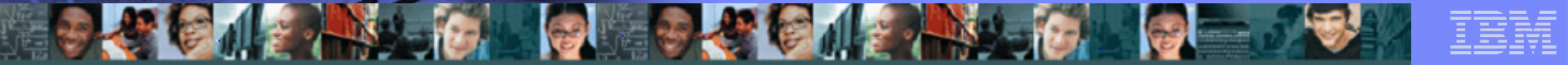
**Running natively on LINUX**

- Unix System Services di z/OS (USS) e Linux sono due maniere differenti di far girare una data applicazione di provenienza UNIX su un Mainframe: La scelta dipende dalle caratteristiche richieste in termini di disponibilita', le connessioni eventuali con altre applicazioni presenti sul Mainframe e la criticita' dell'Applicazione.***



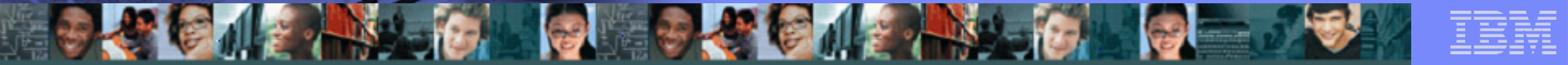
## Quando scegliere LINUX su System Zeta

- Portare una applicazione C/C++ sotto LINUX potrebbe essere piu' facile che portarla sotto USS di z/OS.
- Usare Linux Virtualizzato puo' consolidare centinaia di immagini che richiedono di rimanere differenziate ed isolate tra di loro
- Linux su System Zeta e' un Sistema Operativo a 64 bit
- Quando vi sono strette dipendenze dalla codifica nel codice (LINUX e' una implementazione ASCII mentre USS usano la codifica EBCDIC)
- Quando l'applicazione proviene da un'altra versione di LINUX
- Quando l'applicazione e' poco importante e si vuole portarla in fretta.

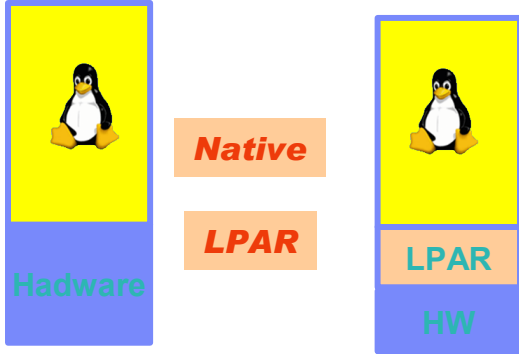


## Le principali ragioni tecniche per usare Linux sul Mainframe

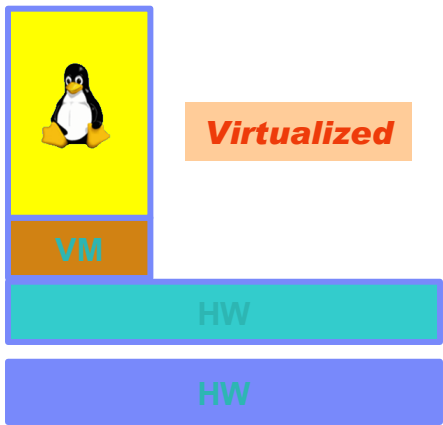
1. Scalabilità (da dieci a migliaia di immagini LINUX indipendenti).
2. Utilizzo della z/Architecture
3. Integrazione con le applicazioni preesistenti sul Mainframe.
4. Flessibilità ed apertura di LINUX col livello di servizio del mainframe.
5. Chi possiede un Mainframe può avere opportunità aggiuntive offerte da LINUX
6. Benefici del Consolidamento rispetto a mantenere molti server (uno per applicazione)
7. Migliori livelli di Servizio : Systems z QOS



# Linux su Zeta – Modi Operativi



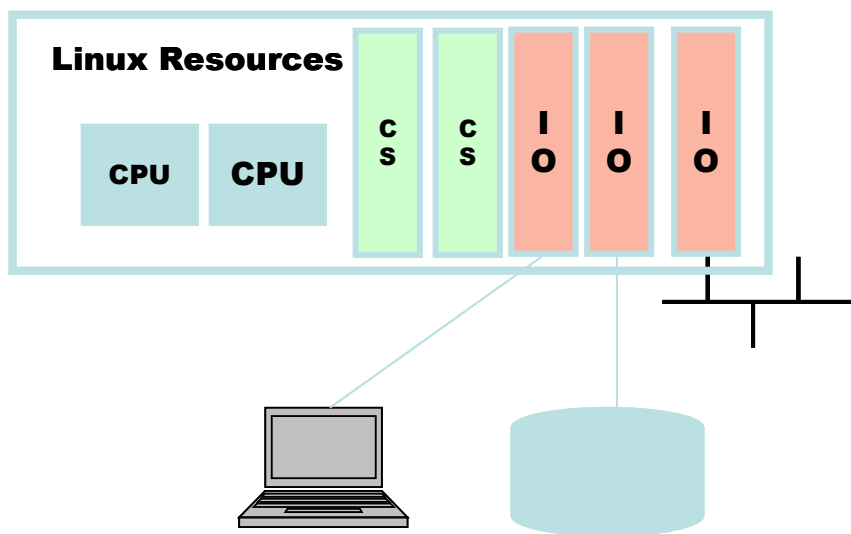
**Ogni Istanza del Sistema Operativo LINUX usa tutto l'Hardware o una sua partizione Logica (LPAR) come Sistema Operativo Primario. Tutte le risorse dell'Hardware o della Partizione Logica sono viste e possedute da LINUX OS**



**Ogni Istanza del Sistema Operativo LINUX usa una Macchina Virtuale definita e controllata da z/VM . z/VM presenta a LINUX le risorse Virtuali come se fossero Reali. Generalmente le Risorse hardware sono possedute e gestite da z/VM**



# Linux on z – Risorse Gestite



## **Le Risorse Linux sul Sistema sono :**

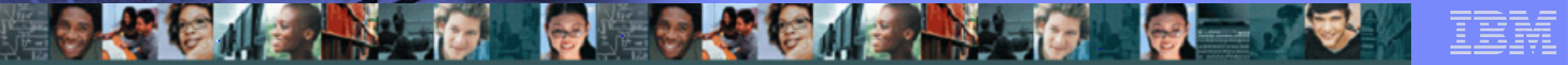
- **CPU**s
- **DASDs (Disks)**
- **IO Channels**
- **Console**

## **Linux fornisce Metodi di accesso per :**

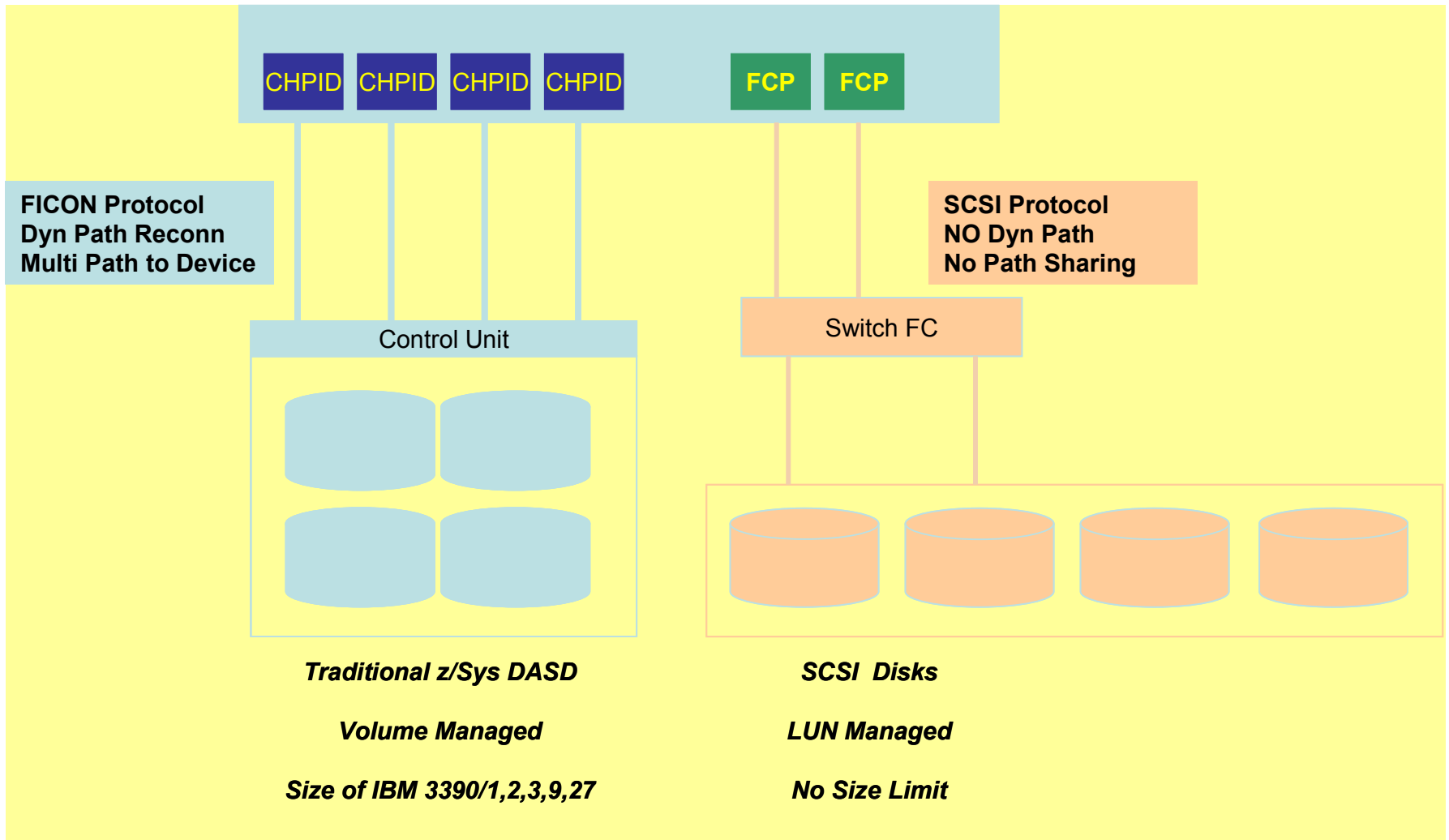
- **Traditional DASD (ECKD)**
- **SCSI Disks and tapes**
- **ETHERNET**
- **Internal TCP/IP (Hypersockets)**

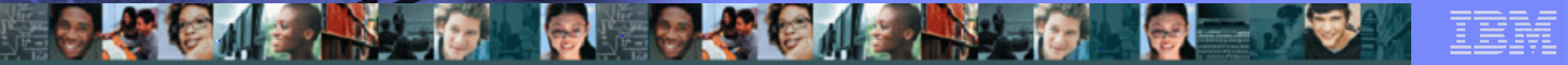
## **Inoltre vi sono Drivers aggiuntivi per:**

- **Traditional Tapes**
- **Token Ring**
- **CTCA / IUCV**
- **3270 Terminal**



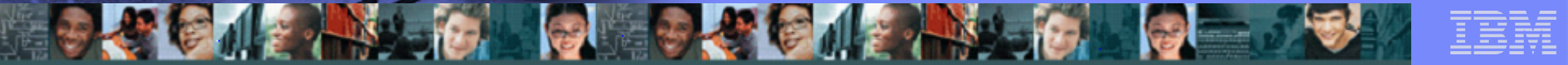
# Disk and DASD Supportati da LINUX sui Sistemi Centrali



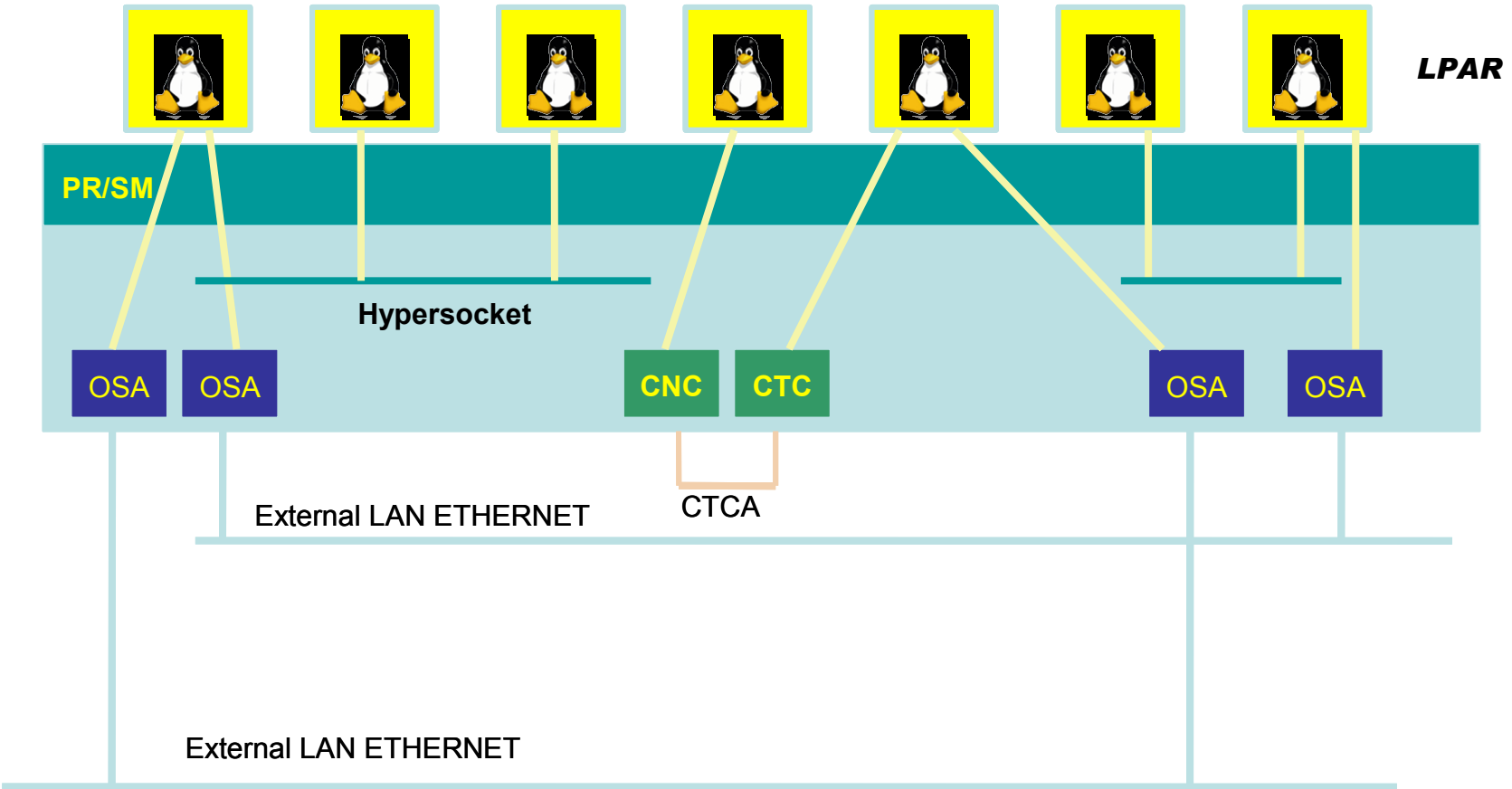


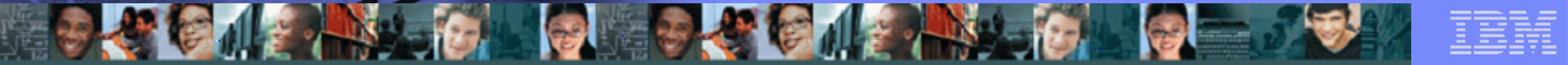
## Uso di DASD o Dischi

- I Dischi Tradizionali dei Sistemi Centrali (ECKD) possono essere usati da LINUX :
  - IBM 3390
    - Modello 1,2,3 (Fino a 2.3 Gigabytes)
    - Modello 9 (Circa 7 Gigabytes)
  - I DASD sui sistemi centrali sono caratterizzati da un nome di 4 caratteri numerici (0040, 0120,...)
  - Ogni disco deve avere un unico numero ed e' automaticamente riconosciuto durante il boot.
  
  - Informazioni presenti nel Kernel e relative al disco:
    - The DASD address
    - The allocated major and minor numbers
    - The device file name
    - The status of the DASD
    - Whether the DASD is accessible
    - The block size, number of blocks and total size of the DASD
  
- I Dischi connessi ad una Storage Area Network (SAN) possono essere usati attraverso la LUN.

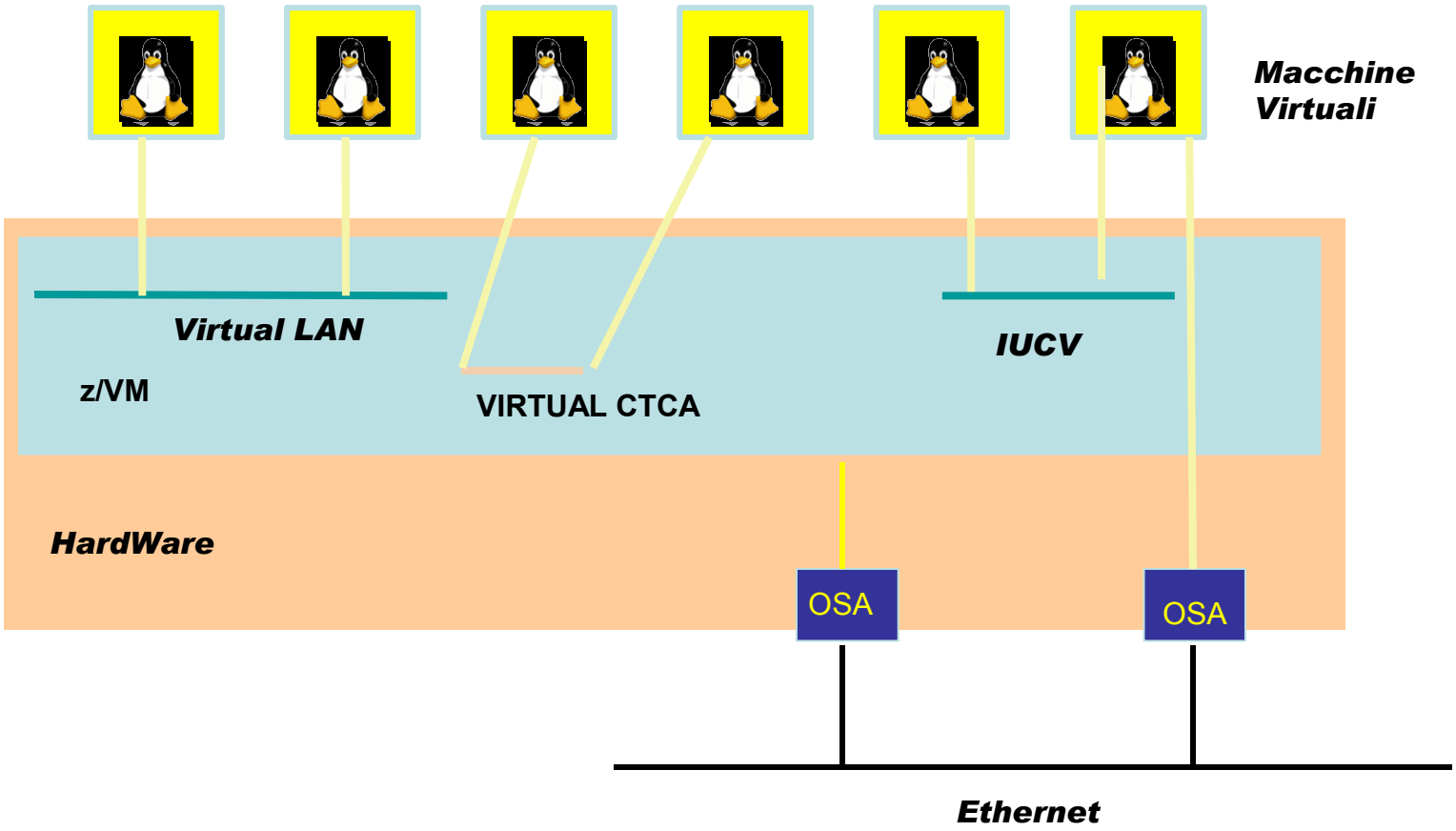


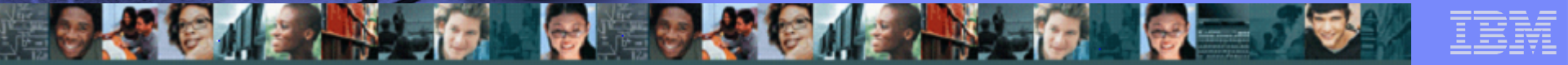
# Dispositivi di Rete Supportati da LINUX sui Sistemi Centrali





# Dispositivi di Rete Supportati da LINUX sui Sistemi Centrali Virtualizzati

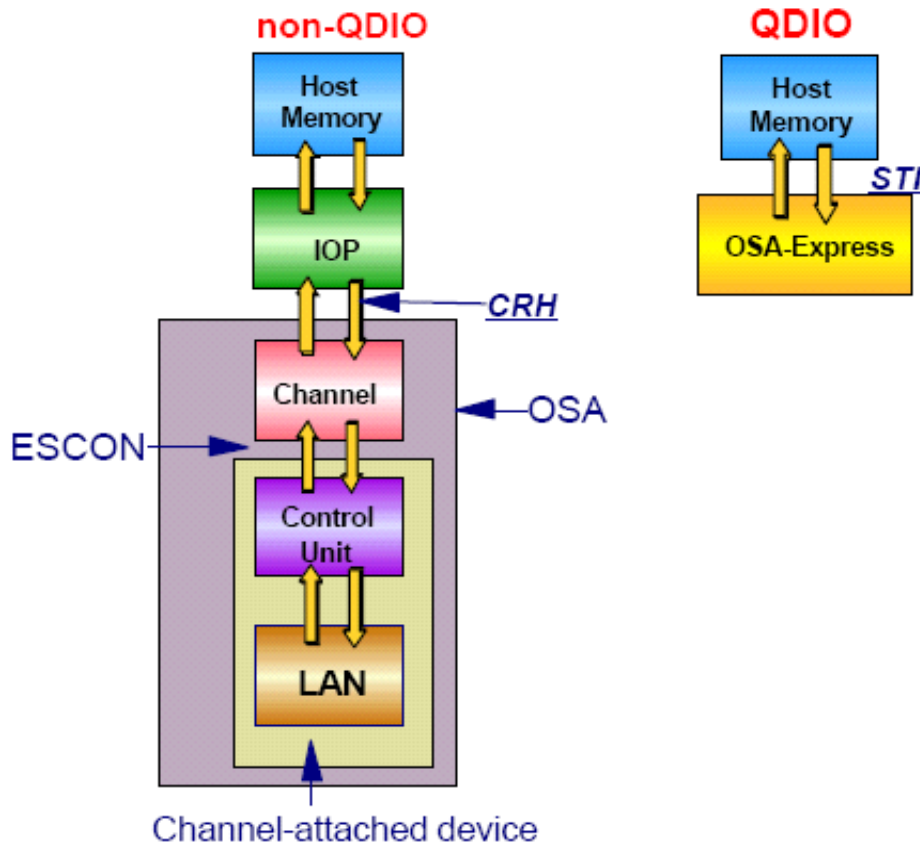




# Dispositivi di rete Supportati

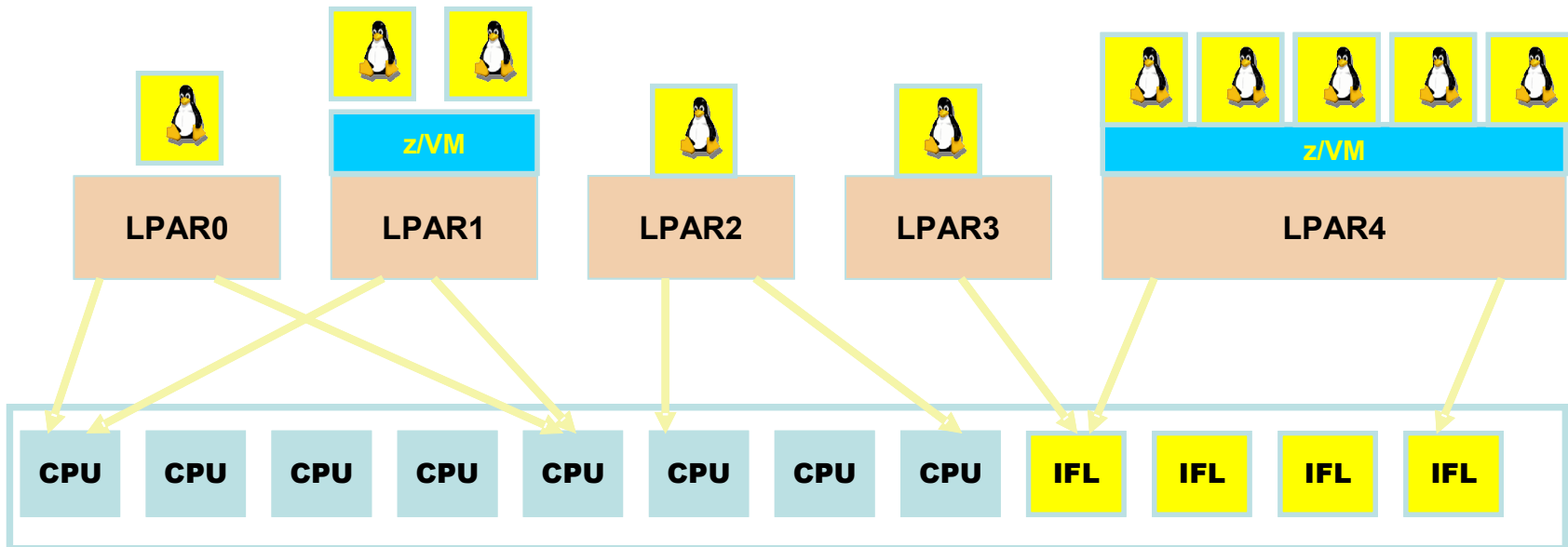
- Virtual CTC
- Real CTC
- LCS: OSA 2: Token Ring, Ethernet, Fast Ethernet
- LCS: OSA-Express: Ethernet, Fast Ethernet
- LCS: 2216: Token Ring, Ethernet
- QDIO: OSA-Express: Gigabit Ethernet, Fast Ethernet, ATM LAN Emulation, High Speed Token Ring
- Hypersockets, VM Guest LAN
- 3172
- IUCV

# Linux on z – Special I/O protocols



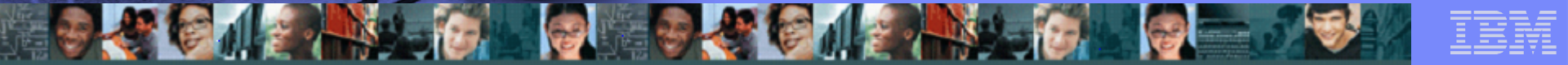
- **Spesso risorse dedicate a LINUX vengono gestite con uno speciale protocollo di tipo DMA detto Queued I/O.**
- **Grazie a questo protocollo la lunghezza delle istruzioni di I/O viene sostanzialmente ridotta:**

## Linux on z – Uso di processori Specializzati IFL

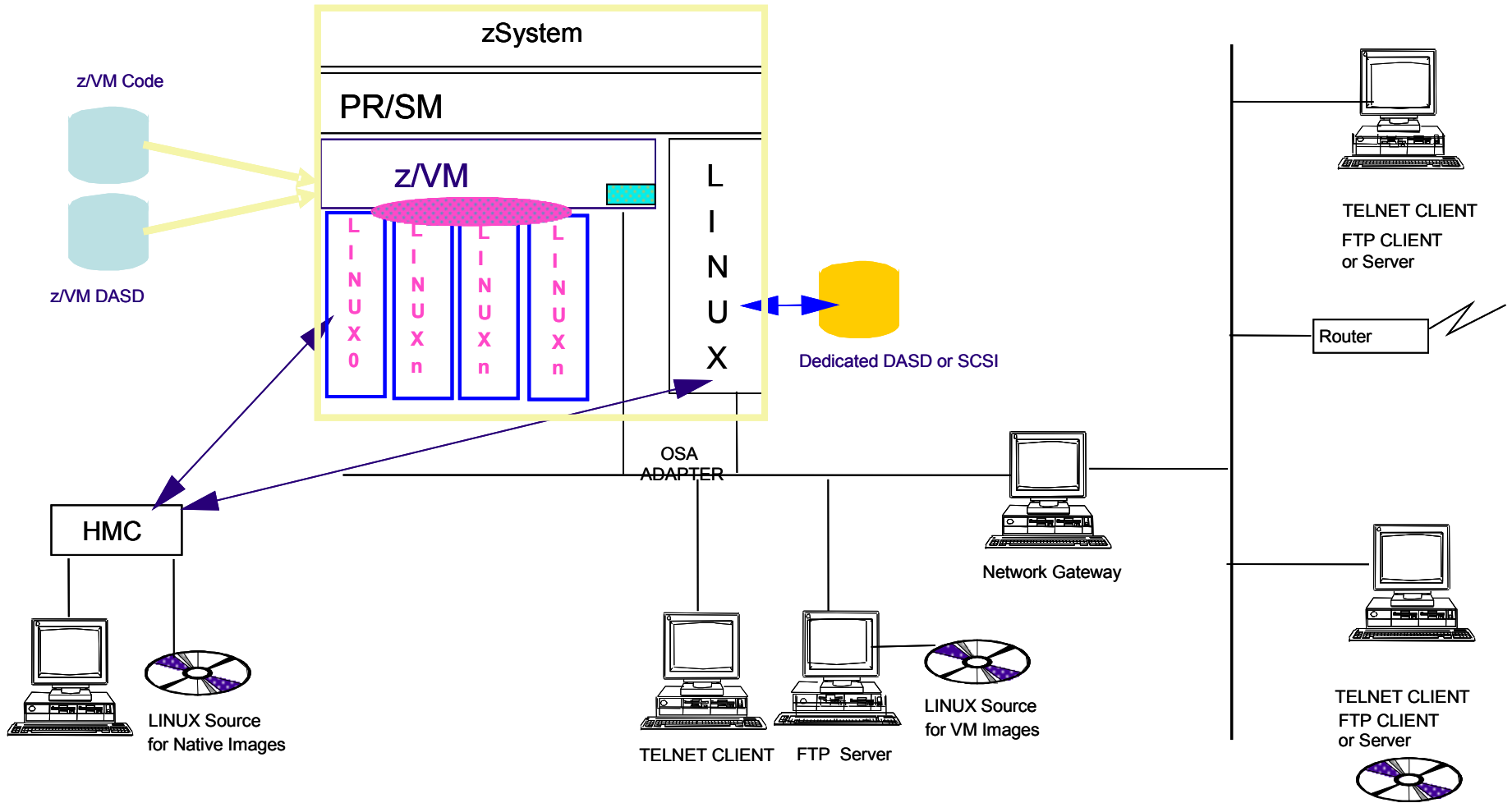


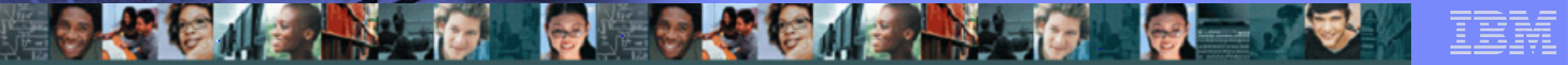
- **Le partizioni logiche (LPAR) sulle quali e' attivato LINUX o uno z/VM con soli Sistemi Ospiti di tipo LINUX possono utilizzare processori standard (CPU) o processori Specializzati di tipo IFL sia dedicati che condivisi.**
- **Non e' consentito usare nella stessa partizione logica CPU ed IFL contemporaneamente .**





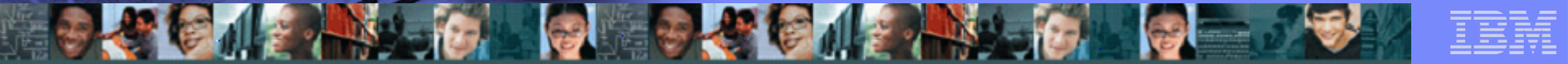
# Linux on z – il Processo di Installazione





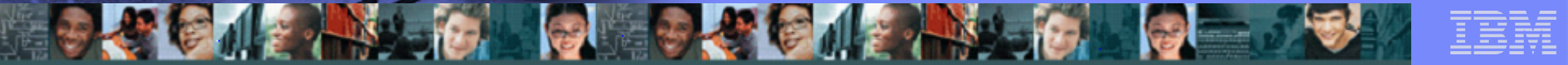
## Linux for zSeries Web serving

- Linux sui Sistemi Centrali e' una ottima scelta per gli Internet Service Provider (ISP) and Application Service Provider (ASP)
- ..
- I Service Providers tipicamente usano molti server uguali che usualmente forniscono tipici Servizi WEB
- Le imprese dal loro canto possono realizzare dei consistenti risparmi accorpare molti server su un Singolo Sistema
- Oltretutto le imprese ottengono risparmi negli spazi, nell'energia elettrica nel raffreddamento.
- Servizi tipici sono anche quelli di infrastruttura come Firewall, DNS , file and Printer servers
- Uno dei vantaggi e' rappresentato dall'unico punto di controllo.



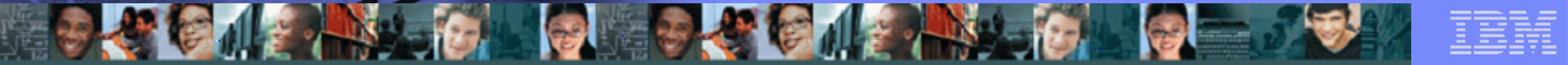
## Apache Web Server e Application Servers

- Uno dei piu' popolari Web Server utilizzabili sotto LINUX e' Apache by the National Center for Super Computing Applications (NCSA) .
- Apache e' un Web Server completo basato su Open source.
- Apache puo' essere installato sotto LINUX anche in macchine Virtuali sotto z/VM
  
- Web application server
  - Tecnicamente un Application Server e' un Middleware in grado di ospitare programmi applicativi , nell'uso pratico si suole indicare un Middleware in grado di fare girare programmi scritti in Java con lo standard Java 2 Enterprise Edition (J2EE).
- Java application servers disponibili sotto LINUX Zeta:
  - IBM WebSphere Application Server
  - BEA WebLogic
  - Lutris Enhydra
  - Tomcat (Open Source)
  - Resin from the Apache Project (Open Source).



# File systems

- Linux su Zeta supporta diversi File System I piu' comuni sono:
  - Convenzionali
    - EXT2. (Tipico Unix File System)
    - NFS: network file system (Usato per accessi remoti)
    - Swap: swap file system (Usato per la paginazione di LINUX)
    - Proofs (Virtual File System in memoria)
    - Smbfs (Detto Samba , permette lo sharing con Files di Windows)
  - Journaled
    - ReiserFS,
    - XFS
    - JFS
    - ext3
    - GFS.
  - Temporanei
    - TMPFS



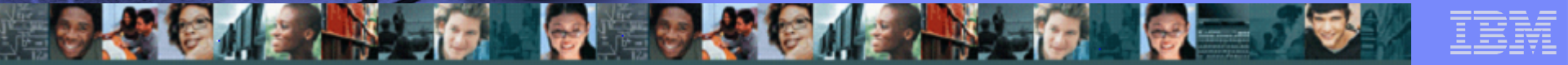
# Cosa serve per Attivare un Sistema LINUX su un Sistema Centrale

## ■ Requisiti Hardware :

- Un Sistema di architettura zeta o S/390 con un minimo di 16 Mbytes di Memoria (minimo consigliato 64 MB).
- Una Partizione LOGica LPAR definita come sopra
- Una Macchina Virtuale sotto z/VM

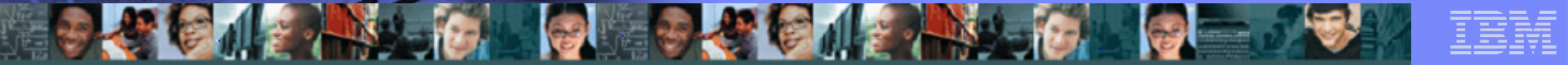
## ■ Requisiti Software :

- Una distribuzione LINUX per z Architecture.
- z/VM di Livello 4.3 o superiori



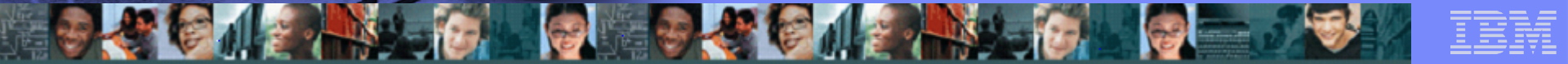
## Le Distribuzioni LINUX Disponibili per I Sistemi Centrali

- Suse (by Novell)
- Red Hat
- Turbolinux
- .....
  
- Kernel (including kernel-headers) 2.4.21 che include :
  - kerntypes 2.4.21 (o 2.6)
  - on demand timer patch
  - OCO modules tape\_3590
  - tool-chain:
    - binutils 2.14.90.0.4
    - gcc 3.3
    - glibc 2.3.2
  - utilities:
    - modutils 2.4.7
    - s390-tools 1.2.4
  - debug tools:
    - gdb 5.3
    - strace 4.4



## Pianificazione della Installazione

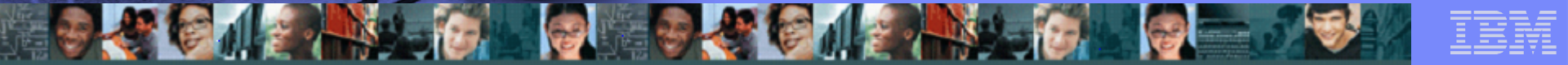
- Pianificazione del File Systems:
  - Conventional File system
  - Journaled File System
  - Virtual File System
  - Swap File System:
  
- Pianificazione della distributions: SuSE, Red Hat, and Turbolinux
- Think Blue from Millenux Inc. and what might be more properly called, Linux for S/390 *file system* from Marist.
- Decidere le parti di Linux da installare.
- Vedere **Linux for IBM eServer zSeries and S/390: Distributions.**



## Pianificazione delle Applicazioni .

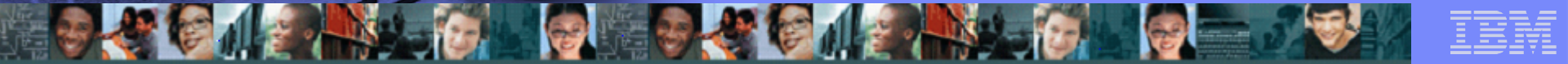
- Porting applications from UNIX to Linux can be considered relatively easy since Linux is designed to be platform independent, and for a given level, the Linux kernel has almost identical capabilities and characteristics across all its architectural implementations.
- Applications
  - Come with your Linux distribution.
  - Open source applications that are not shipped by distributors.
  - Commercial applications from independent software vendors.





## Le Applicazioni sotto LINUX

- Ciascun processore richiede una versione del KERNEL differente, cio' e' dovuto al diverso 'instruction set ' dei vari processori (INTEL, RISC, Zeta, EPIC)
- Pertanto Versioni di LINUX per INTEL (le piu' comuni) non possono essere usate sui Sistemi Centrali.
- Per disporre di una versione adeguata si puo:
  - Ricompilare il Kernel per quella versione
  - Munirsi di una distribuzione gia' pronta per i Sistemi Centrali
- Per la stessa ragione le Applicazioni devono essere ricompilate quando si cambia il tipo di processore
  - Usualmente la portabilita' delle applicazioni LINUX e' garantita, tuttavia e' necessario disporre del Codice Sorgente dei Programmi.
  - Pacchetti applicativi di cui non si dispone il Sorgente o la versione specifica , anche se prodotti per LINUX non possono funzionare su processori diversi da quelli per cui sono stati compilati e pertanto occorre ricompilarli (No compatibilita' Binaria).

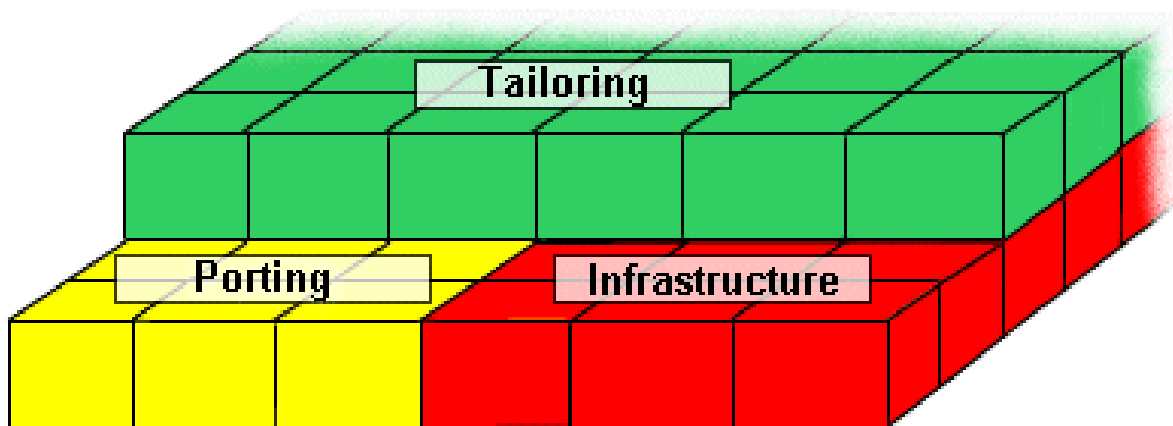


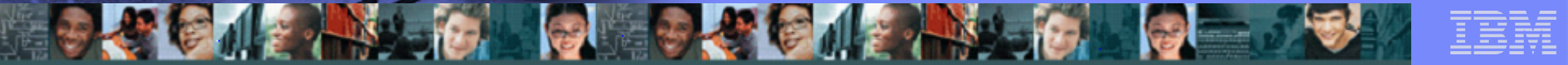
## IL Porting di Applicazioni LINUX e' Semplice

- Nella maggior parte dei casi si tratta solo di copiare il codice sorgente ed attivare lo script di compilazione (MAKE) direttamente sul Sistema Centrale.
- Se LINUX e' gia' stato installato usando una distribuzione per Sistemi Centrali (IBM System Zeta) la ricompilazione e' l'unica attivita' da fare
- Occorre tuttavia tenere conto di alcuni elementi che discuteremo nei Fogli Successivi.

## Quali Applicazioni LINUX sui Sistemi Centrali

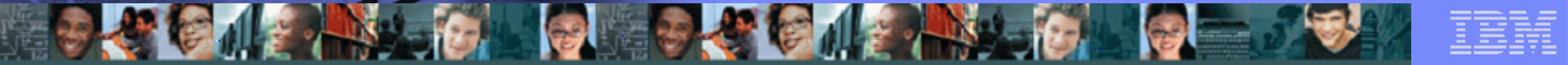
- Perche' Portare applicazioni Linux sui Sistemi Centrali?
- Cosa Serve per farlo ?
- Quale e' lo sforzo necessario ?
- Chi puo' darmi maggiori Informazioni.





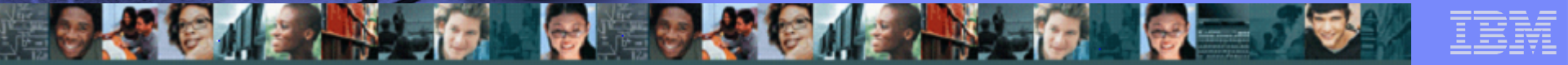
## Considerazioni sul Porting

- Dipendenza da Terze Parti:
  - La proprietà del Codice Sorgente potrebbe essere di Terzi.
- Dipendenza dalla Distribution (Suse, redHat etc):
  - Alcune applicazioni potrebbero usare programmi di utilità caratteristici di una specifica distribuzione.
- 31-bit versus 64-bit:
  - LINUX su System Zeta può funzionare sia a 31 che a 64 bit.
  - Per sfruttare a pieno le caratteristiche dell'Hardware è opportuno utilizzare e quindi compilare le applicazioni a 64-bit, usando una distribuzione a 64 bit.
- Programmi che contengono codice dipendente dalla architettura:
- Il Grado di difficoltà nel Porting può dipendere dal Linguaggio di Programmazione.

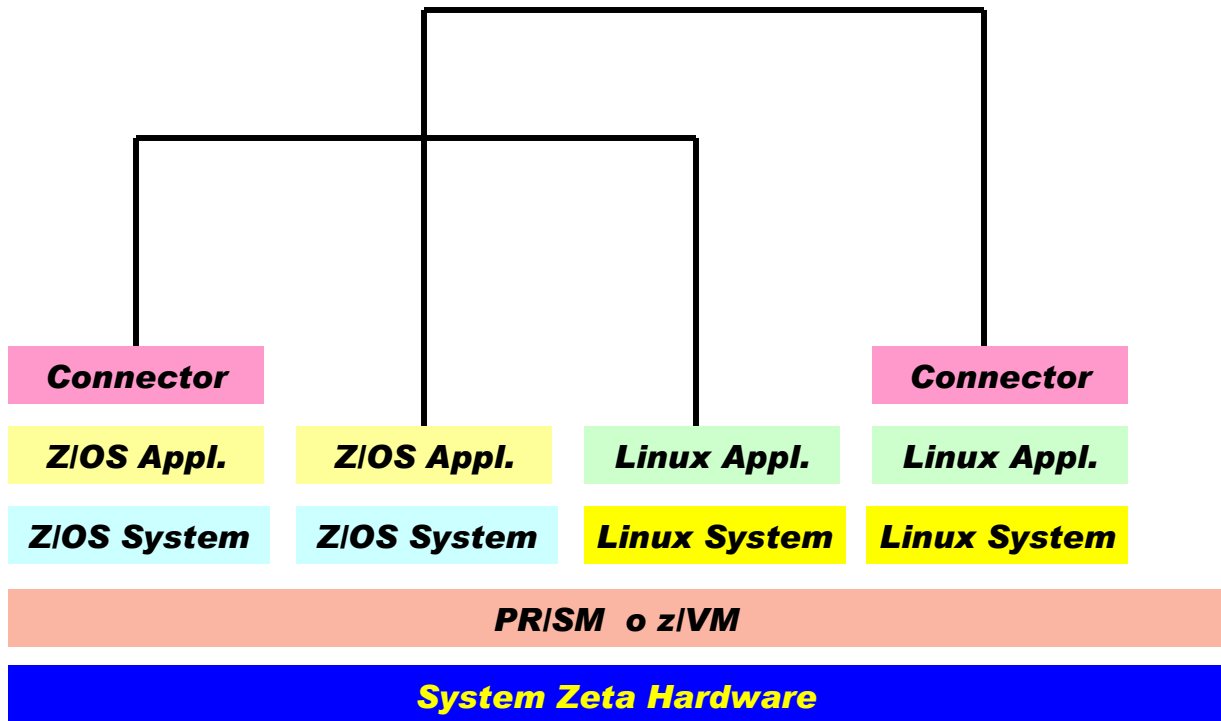


## Considerazioni sul Porting – segue -

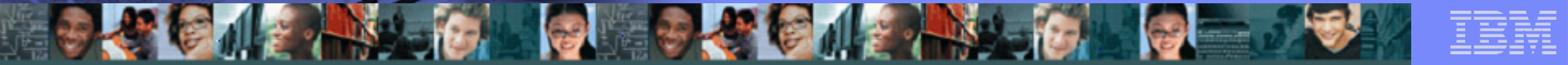
- **Alcuni files sono differenti o danno informazioni diverse :**
  - /proc
- **Compilatori Supportati :**
  - Currently C/C++, perl, tcl, python, scheme, Regina (Rexx), IBM Java JDK disponibile in WebSphere®, and altri JDKs disponibili in Open Source.
- **Middleware, libraries, and databases:**
  - I Middleware richiedono una specifica versione per LINUX System zeta.
  - I database richiedono una versione specifica:
    - MySQL,
    - Postgres,
    - DB2® UDB,
    - DB2 Connect.
  - Altri Middleware disponibili
    - WebSphere 3.5,
    - MQ Client,
    - Tivoli®,
    - Apache .



# Esempio : I Connectors to Back-End Systems



## Parte 3: Le Opportunità Linux per System z

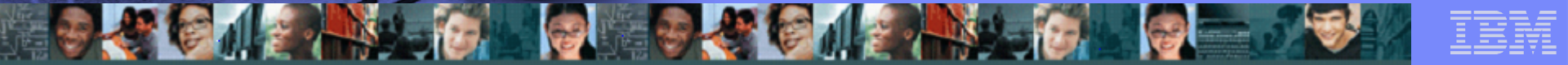


## How to Decide on a Linux Server Platform

- **This research explores the decision factors that data center management should consider when selecting a server architecture on which to run Linux applications. We present the questions you need to answer, and provide examples of how to decide what's best for your company: The mainframe as a Linux platform or some other server based on platform capabilities.**

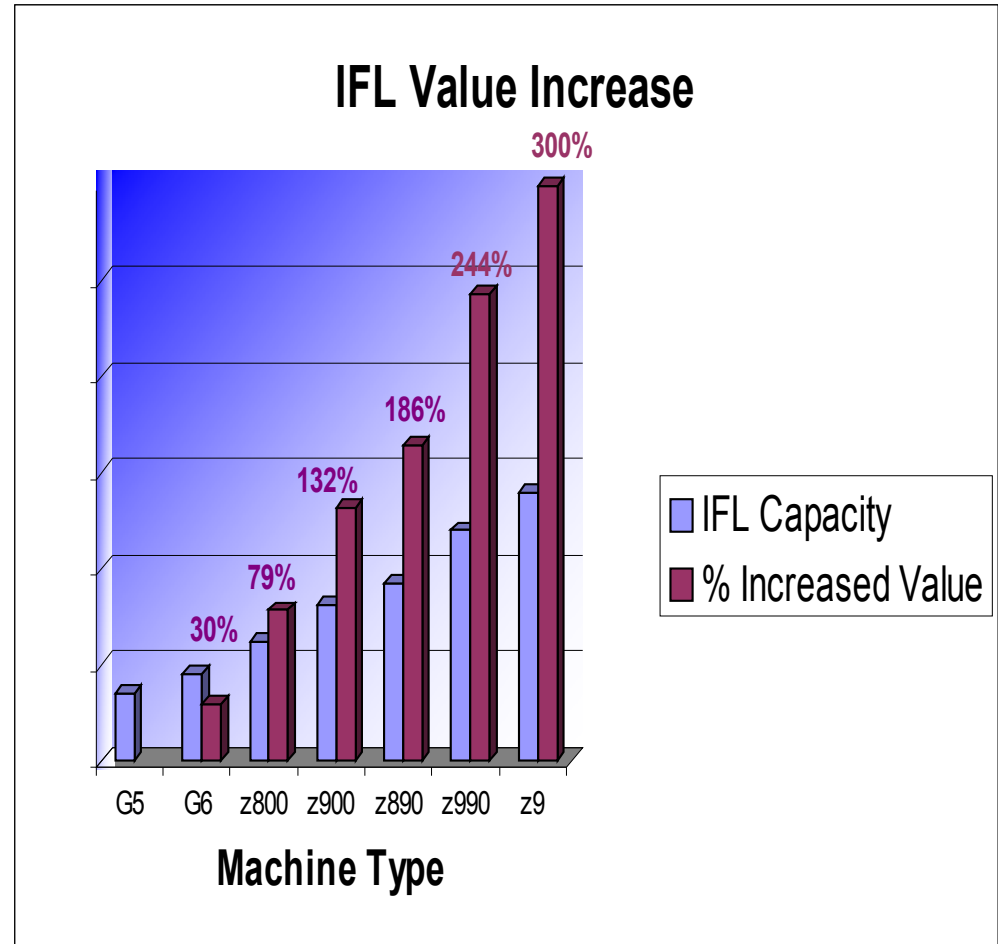
# Gartner

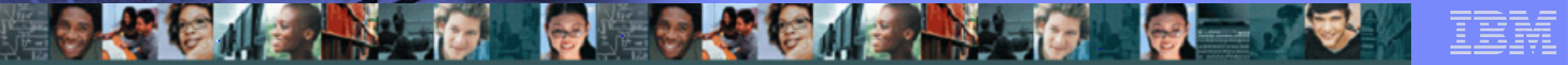




## Unique Value of IFL

- IFL Price has remained constant
- IFLs move with upgrades
- 30% more capacity!!!
- Distributed model over same time:
  - 2 Technology Refreshes (New Hardware)
  - 2 System migrations





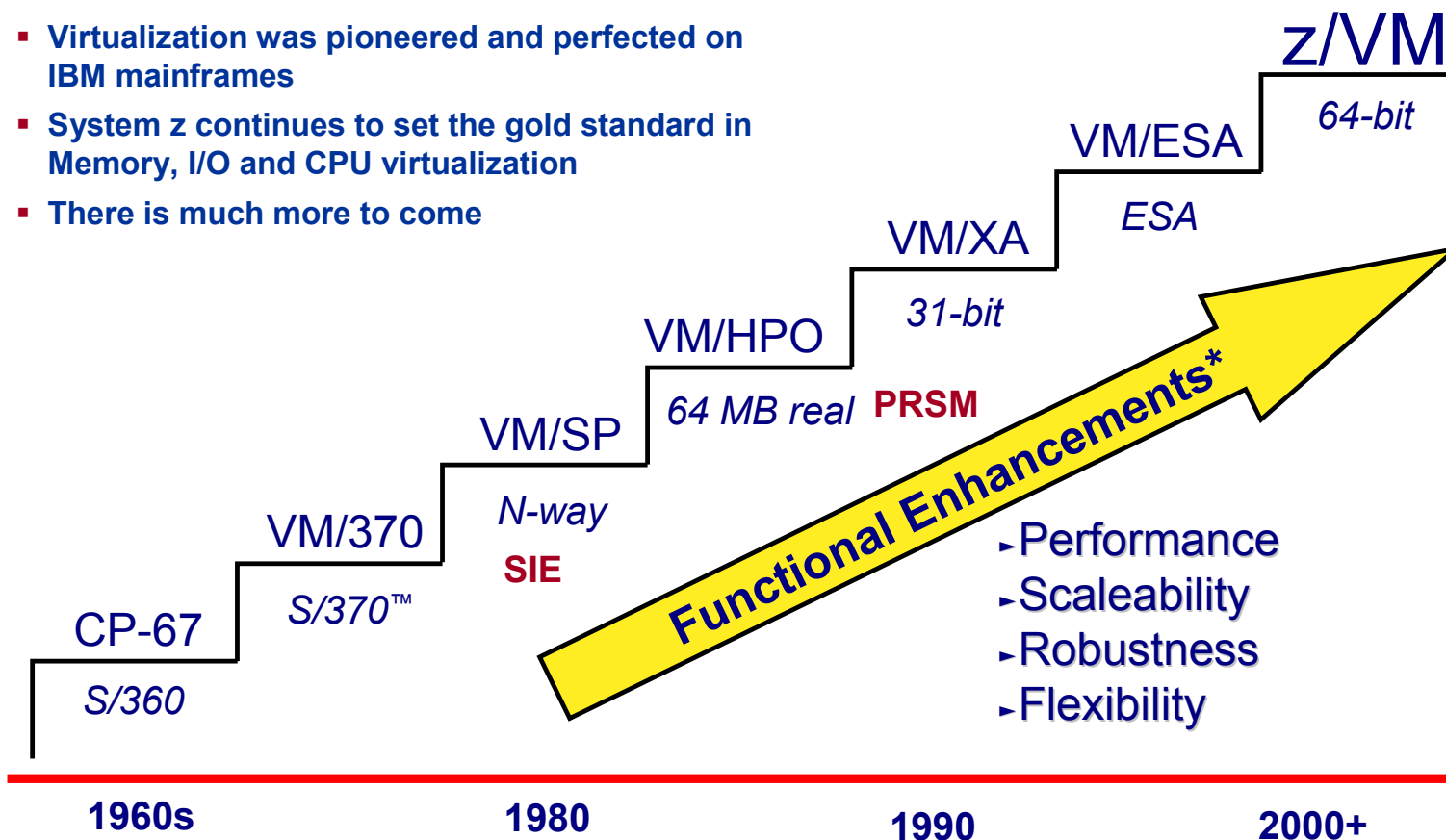
## What will be the hardware cost over a three-year or longer period?

- **Stand-alone x86** — Consider the lower hardware costs of the x86 platform when not needing to support a large number of Linux systems. The x86 servers are normally replaced, rather than upgraded, when new technology is desired; therefore, companies end up repurchasing the total capacity again.
- **x86 with VMware** — VMware will enable a lower initial hardware cost when compared with x86 stand-alone through consolidation. The replacement of servers pointed out above also applies to this environment.
- **Unix platforms** — Unix platforms' hardware will cost more than x86 hardware, but higher levels of consolidation make it possible to mitigate part or all of this higher cost. There is no memory overcommit; therefore, more memory will be required. HP's vPars cannot share hardware resources and will, therefore, be less cost-effective than IBM's Power 5/6 servers. Again, the same comments on system replace apply for these systems.
- **System z** — Consider issues such as the System z's ability to upgrade the IFL specialty engines in technology and capacity at little or no charge when the systems are upgraded vs. the replacement of other systems. As referenced earlier in this research, the cost of System z memory is significantly more than that of x86 platforms but will require less memory per Linux system than the x86 environment because of the ability of z/VM to offer significant memory overcommit in most environments compared with VMware ESX. The lower cost of the IFL specialty engine (\$95,000 or \$125,000), compared with general-purpose engines, is an important factor and enables Linux workloads to have a better TCO than mainframe legacy applications.

# IBM Virtualization Technology Evolution

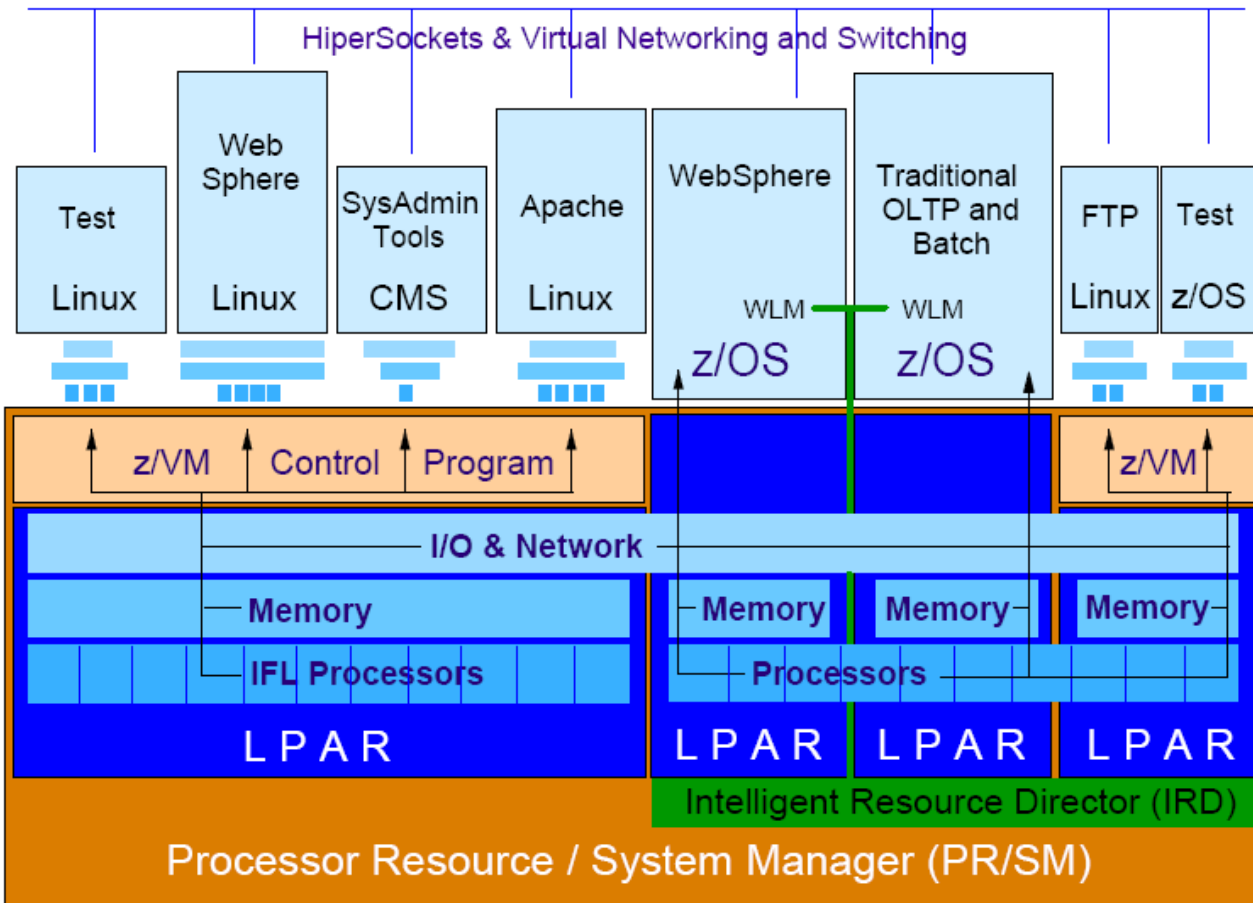
*The virtual machine concept is not new for IBM...*

- Virtualization was pioneered and perfected on IBM mainframes
- System z continues to set the gold standard in Memory, I/O and CPU virtualization
- There is much more to come

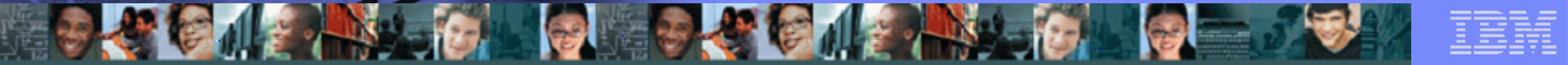


\* Investments made in hardware, architecture, microcode, software

# System z – The Ultimate Virtualization Resource



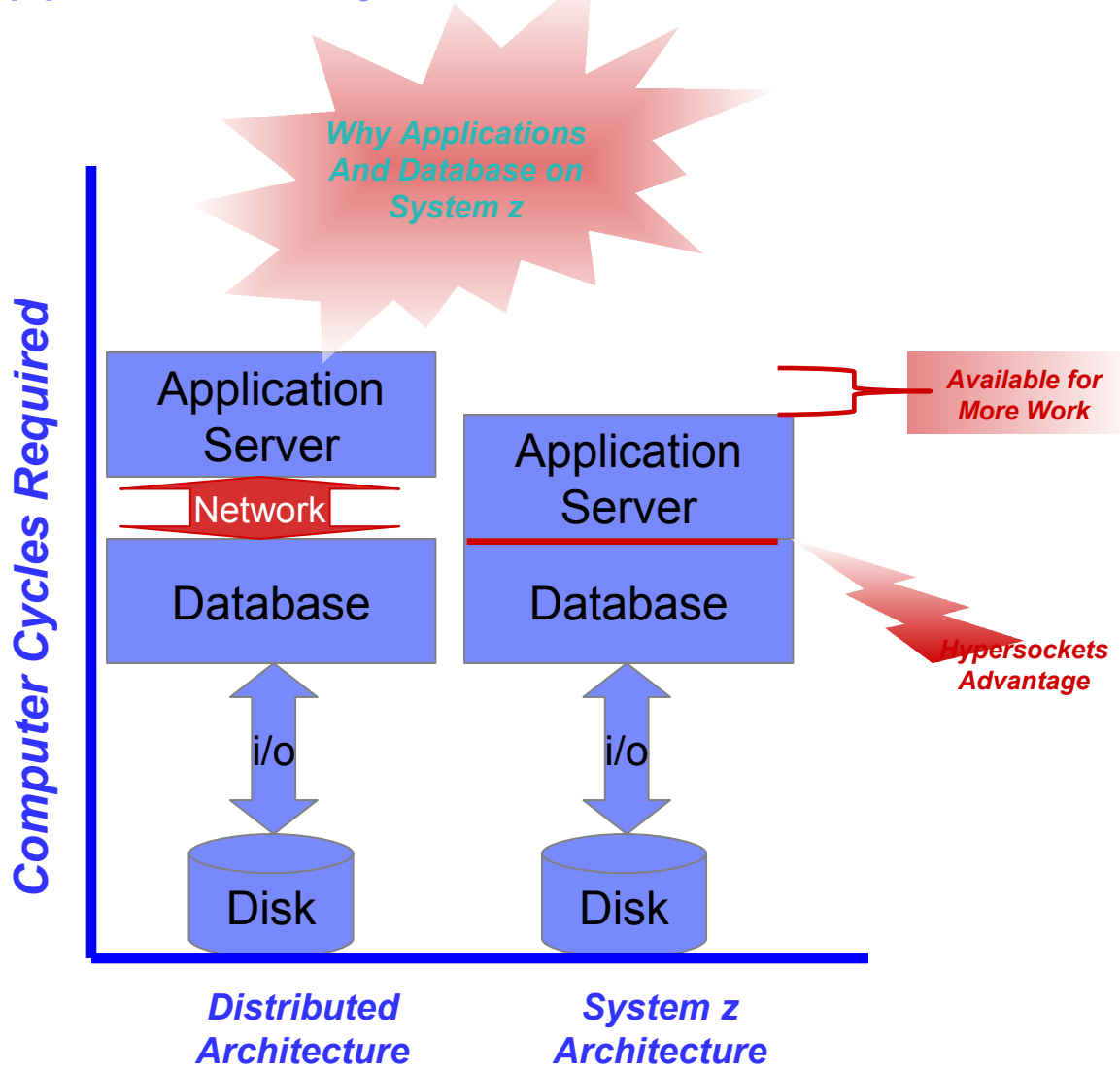
- **Multi-dimensional virtualization technology**
  - ▶ zSystem provides logical (LPAR) and software (z/VM) Partitioning
  - ▶ PR/SM enables highly scalable virtual server hosting for LPAR and z/VM virtual machine environments
  - ▶ IRD coordinates allocation of CPU and I/O resources among z/OS and non-z/OS LPARs
  - ▶ I/O can be shared directly by partitions



## How effective is the platform in using its resources such as processor and memory?

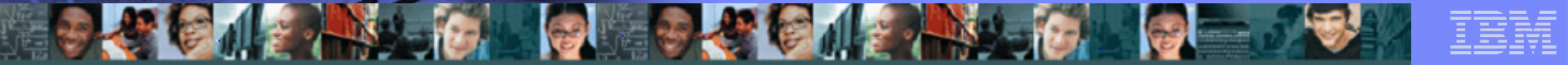
- **Stand-alone x86** — Individual Linux servers provide the worst use of processors and memory because nothing is shared.
- **x86 with VMware** — With VMware, we have had reports of up to 60% processor use while maintaining desired performance. Also, VMware can provide up to 2-to-1 memory overcommit, depending on application-addressing patterns. Although memory is shared, the overcommit is a low ratio, which is an inefficient memory use model. It is more limited in supporting high-capacity individual applications, such as very large database applications.
- **Unix platforms** — IBM's Power 5/6 and HP vPars virtualization implementations do not share memory and, therefore, will have no capability for memory overcommit. They will require the total memory of the combined Linux systems supported, just as the standalone x86 systems do. This translates to an inefficient memory use model. With higher capacity I/O than x86 systems, they can support larger individual applications. HP vPars does not share resources.
- **System z** — The System z is designed to run at close to 100% use with low overhead (some factors are the amount of cache memory on the processor chip and the fast task switch architecture implemented), while memory overcommit on the System z has been reported at over 8-to-1 and above in many cases, depending on addressing patterns. This is based on the System z memory management and high-performance paging subsystem. This is meaningful when looking at TCO (trade-off between the higher cost of System z memory and overcommit ratios) and looking at the maximum number of Linux systems that can be run on a single server based on configuration limits. High capacity I/O can support large individual applications also.

# Application Layer Performance



## ISV Application Server Options

- ✓ Web Sphere
- ✓ IBI Web Focus
- ✓ Web Logic
- ✓ PeopleSoft Applications Server



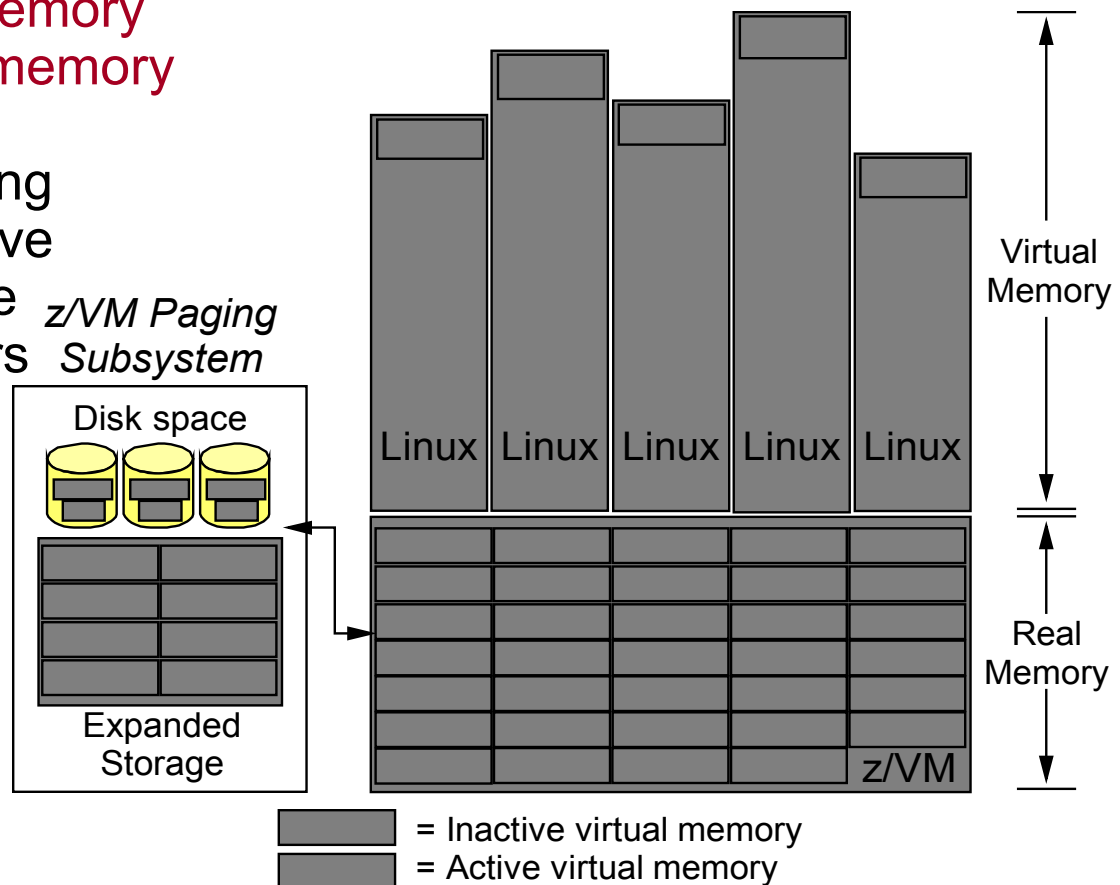
## What interaction and interoperability with other platforms or other Linux images is needed?

- **Stand-alone x86** — No special help is provided in this environment.
- **x86 with VMware** — Communication among Linux and Windows systems in a single VMware ESX server system can be done using virtual network interface cards and virtual switches to create a virtual LAN. It is not as optimized as the mainframe hypersockets and is limited to fewer systems based on the total number of Linux and Windows systems running on a single physical server.
- **Unix platforms** — Advanced Power Virtualization on Power 5/6 provides for a virtual LAN capability (IEEE 802.1Q compatible). This will allow in-memory communication among the logical partitions. The support is a combination of firmware and software, and is not as optimized as the mainframe hypersockets. HP's vPars provides no special help in this environment because there are no shared resources.
- **System z** — If the Linux systems need to interact with applications running on an IBM System z mainframe (that is, z/OS) or among other Linux systems, then the use of the hardware-assisted hypersockets with these systems running on the same System z will enable high-performance and secure TCP/IP communication among them. This is done with a shortened TCP/IP stack on each end and a memory-to-memory move, rather than movement across a network. The System z is more limited in its interactions with Windows servers because it cannot run Windows systems under z/VM. The System z can support a very large number of Linux systems that can use this internal communication capability concurrently.

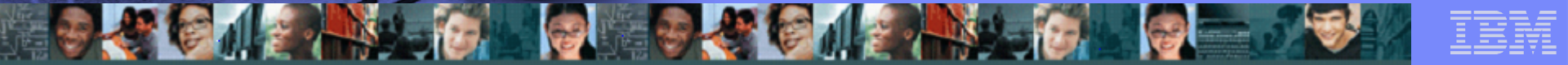
# Linux and z/VM Technology Exploitation

## *Cooperative Memory Management*

- Problem scenario: virtual memory utilization far exceeds real memory availability
- z/VM Control Program paging operations become excessive
- Overall system performance and guest throughput suffers



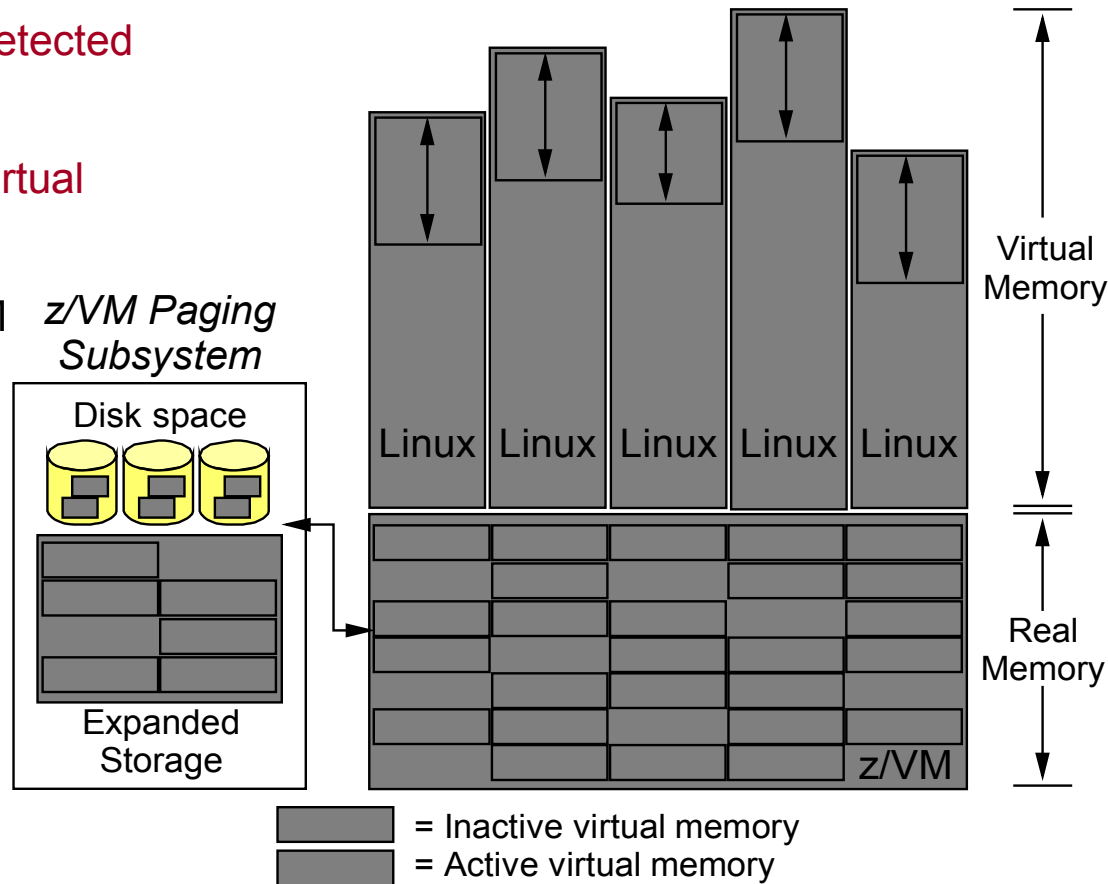


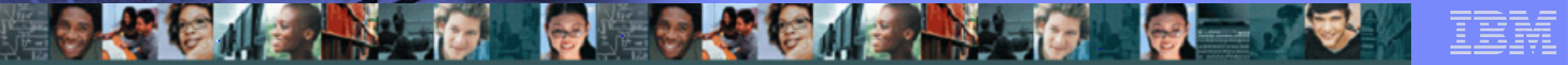


# Linux and z/VM Technology Exploitation

## *Cooperative Memory Management*

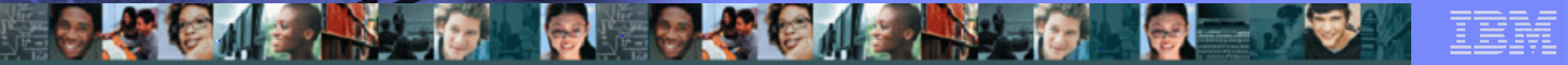
- Solution: real memory constraint detected by z/VM Virtual Machine Resource Manager
- Linux images signaled to reduce virtual memory consumption
- Linux memory pages are released
- Demand on real memory and z/VM paging subsystem is reduced
- Helps improve overall system performance and guest image throughput
- z/VM V5.2 support available with PTF for APAR VM64085
- Linux support currently available with SLES 9 and 10





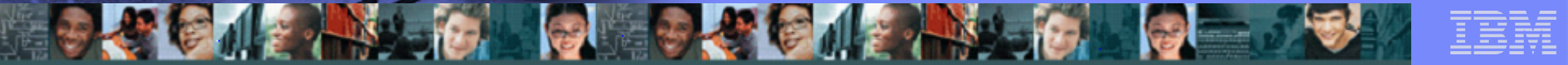
# What Makes Best Fit

- Leverage classic strengths of the zSeries
  - High availability
  - High i/o bandwidth capabilities
  - Flexibility to run disparate workloads concurrently
  - Requirement for excellent disaster recovery capabilities
  - Security
- Shortening end to end path length for applications
  - Collocation of applications
  - Consolidation of applications from distributed servers
  - Reduction in network traffic
  - Simplification of support model



# Just some IBM Solutions examples

- **Data Proximity**
  - MQ Series
  - DB2 Connect
- **Application Integration**
  - CICS Transaction Gateway
  - IMS Connect
  - WebSphere Application Server Suites
- **IBM Software Consolidation**
  - Domino
  - Informix
  - Tivoli



## Just some non-IBM Solutions examples

- **DataBase Solutions**
  - Oracle
- **Application Solution**
  - Oracle Application
  - SAP
- **Open Source Solution**
  - LAMP Application
  - Jboss / Apache
  - Networking
- **...and more!**
  - CommunigatePro for VoIP
  - .NET applications

# Oracle on Linux for System z9 and zSeries

## Server consolidation

- Potential reduced costs
- Simplified infrastructure
- Simplified systems management through centralization
- Enhanced business continuity and recoverability
- Best TCO characteristics can be obtained from consolidating many servers with low CPU utilization and taking advantage of the virtualization capabilities of z/VM and/or LPAR technology.

## Customer Proven

- Implemented by customers in state and local government, federal government, utilities and telco
- Biggest: 29 CPU z990 IFL-only, ~55 DBs
- Smallest: 9672 RA6 (1 CPU) running VM/ESA® – VSE/ESA™

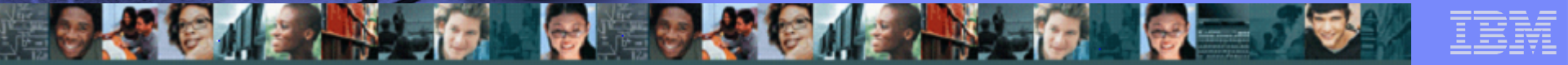
## Oracle Database 10g

- Oracle Database 10g is 64-bit only
- SUSE SLES9 and Oracle 10g 10.1.0.3 certified
- Red Hat RHEL 4 certification in process

## Oracle Collaboration Suite (OCS) certified

- **EBusiness Suite (EBS) in process to be certified on Database 10g**
- Both EBS and OCS are split tier, i.e. only the database certified to run on Linux for System z9 and zSeries





## zSeries Linux as Infrastructure

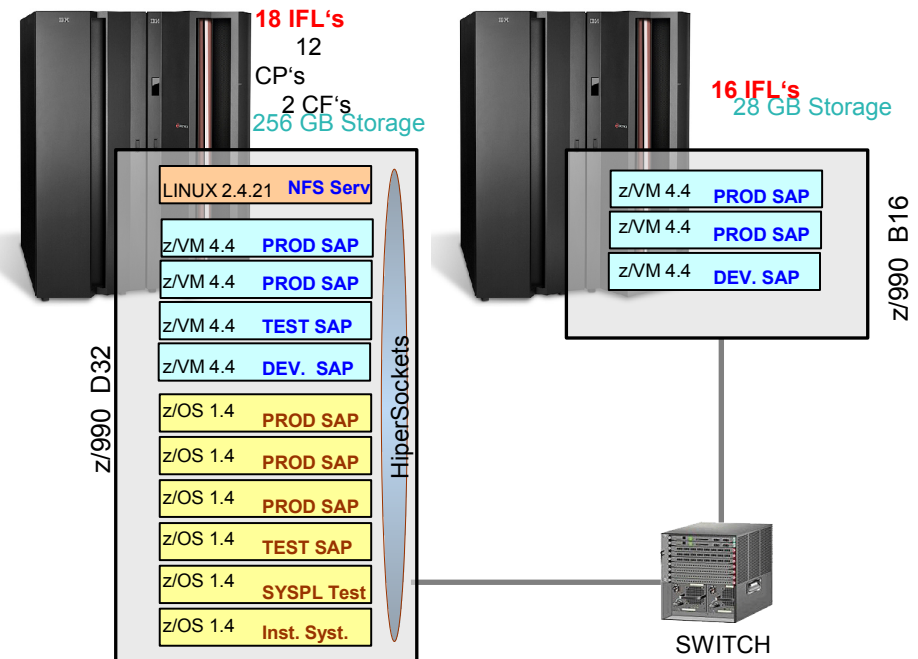
- Network Infrastructure components come with the Linux Distributions
  - FTP
  - NFS,
  - DNS etc.,
- Infrastructure workloads are generally minimal, yet they are critical to the business.
- Advantage hosting these services from Linux zSeries are
  - Availability of the hardware
  - Disaster recovery capabilities, and the a
  - Ability to host these critical workloads

# SAP Application Server with Linux on zSeries

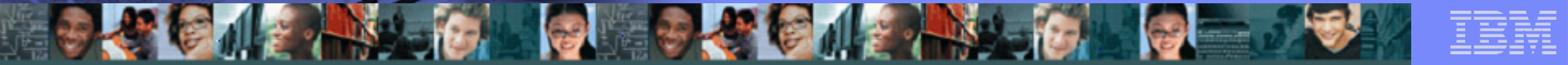
## Consolidation of SAP Application Servers – why ?

- Scale to numerous servers
- Efficiently share system resources
- Balance workloads and resources according to business priorities
- Rapid provisioning of configured new servers
- Tight integration with existing workloads and data
- Improved security and systems management
- High availability
- High performance in Batch processing using HiperSockets
- Optimization of disaster recovery – only one platform
- Readily available skills for application and system development and administration

Actual LPAR structure



[ibm.com/software/success/cssdb.nsf/CS/DNSD-6ARDZV?OpenDocument&Site=eserverzseries](http://ibm.com/software/success/cssdb.nsf/CS/DNSD-6ARDZV?OpenDocument&Site=eserverzseries)



# The evolution from email to IP Communications

## Market needs



Awards



Industry Contributions

SPECmail world record in messaging: 12,500 messages per minute or 2.5 million mail users, sending 30 million e-mail messages per day.

HP Benchmark with 10 million voice subscribers





# What is CommuniGate Pro?

- Server software solution for IP Communications - messaging, collaboration, video and voice
- Well-known messaging product with legendary scalability and OEM appeal
- IMS-ready Session Call Control and Application/Presence Server



- “Just Add Nodes” with the Dynamic Cluster and SIP Farm
- Media server with built-in Conference server
- SIP-based IP/Hosted PBX
- EdgeGate Services
- Complete development platform for customization and voice applications

# IBM and NEXIDA: .NET application tests on z/Linux

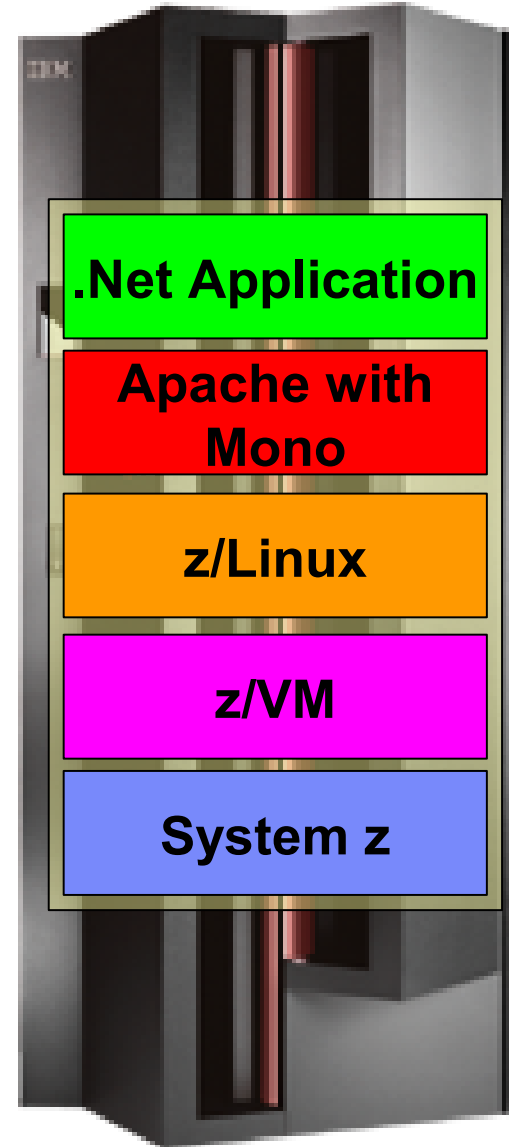
Quadrature manuali - Parametri di ricerca

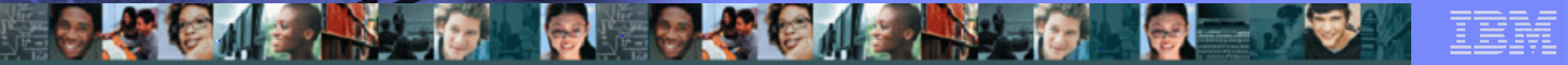
Cognome: \_\_\_\_\_  
 Nome: \_\_\_\_\_  
 Matricola Da: \_\_\_\_\_ A: \_\_\_\_\_  
 Ruolo: \_\_\_\_\_  
 Sede lavorante: \_\_\_\_\_  
 Sede: \_\_\_\_\_  
 Centro di Costo: \_\_\_\_\_

2007 (Maggio)  
 May, 2007

Dipendente	Mon 30 Apr	Tue 1 May	Wed 2 May	Thu 3 May	Fri 4 May	Sat 5 May	Sun 6 May
000000088 ALVES EMERICK MARIYA	Oraio 7-12:30 6:20 Timbratore 14:38 12:32 Totale 6:07	Oraio RIP	Oraio RIP Certificativi PE 6:35	Oraio RIP Certificativi PE 6:30	Oraio RIP Certificativi PE 6:30	Oraio RIP Certificativi PE 6:00	Oraio RIP Certificativi PE 6:00
000000203 AMAR MONICA	Oraio 21-7 10:00 Timbratore 21:00 8:57:00 Totale 19:00 Certificativi 87 6:00	Oraio RIP	Oraio 21-7 10:00 Timbratore 21:00 07:00 Totale -14:00	Oraio 21-7 10:00 Timbratore 21:00 14:54 20:02 Totale 3:08	Oraio RIP Certificativi NA 3:00	Oraio RIP Certificativi NA 7:00	Oraio RIP Certificativi NA 7:00
000000176 ARVUNESOU ECATERINA	Oraio 7-14 7:00 Timbratore 06:52 14:02 Totale 7:11	Oraio 7-14 7:00 Timbratore 06:52 14:02 Totale 7:18	Oraio 7-12 3:00 Timbratore 06:54 10:10 Totale 3:54	Oraio 14-21 30 7:30 Timbratore 13:52 21:38 Totale 7:46	Oraio 7-14 7:00 Timbratore 06:58 14:00 Totale 7:05	Oraio 21:30-7 9:30 Timbratore 21:21 8:07:13 Totale 9:53	
000000080 BALDAN MIRTA	Oraio RIP Certificativi PE 7:00	Oraio RIP	Oraio RIP Timbratore 08:53 12:31 12:56 17:32 Totale 7:54	Oraio RIP Timbratore 08:21 12:30 14:00 17:32 Totale 8:09	Oraio RIP Timbratore 08:55 12:30 14:00 17:30 Totale 7:05	Oraio RIP	Oraio RIP
000000173 BALLARIN ANASTASIA	Oraio RIP	Oraio RIP Certificativi PE 7:00	Oraio RIP Certificativi PE 6:30	Oraio RIP Certificativi PE 7:00	Oraio RIP Certificativi PE 6:30	Oraio RIP Certificativi PE 7:00	Oraio RIP

N. dipendenti trovati 214





## IBM and NEXIDA: .NET application tests on z/Linux (2)

- “Ufficiopersonale” is a Staff Management Application developed by Nexida using .NET framework
- Functional tests run at the IBM Italy Milan System z Lab
- Tested configuration:
  - IBM System z890
  - z/VM 5.3
  - Linux for System z (Novell SLES 10 SP1)
  - Mono 1.2.5
  - Apache2 with mod\_mono
  - MySQL DB Server v5

