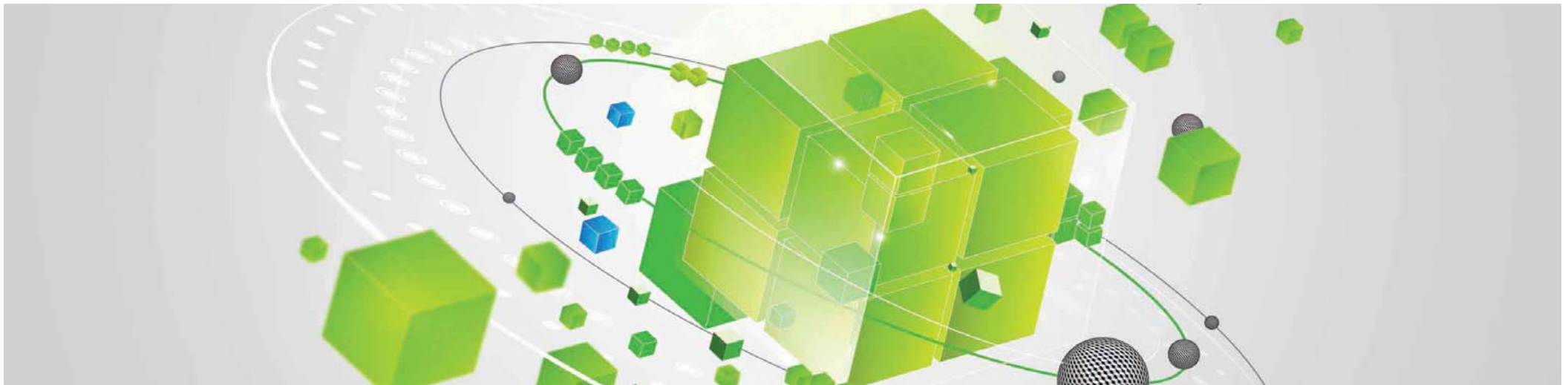


IT Growth Beyond Commodity-Processor Acceleration

Intelligence Beats Speed



Penetrating the Technology Wall

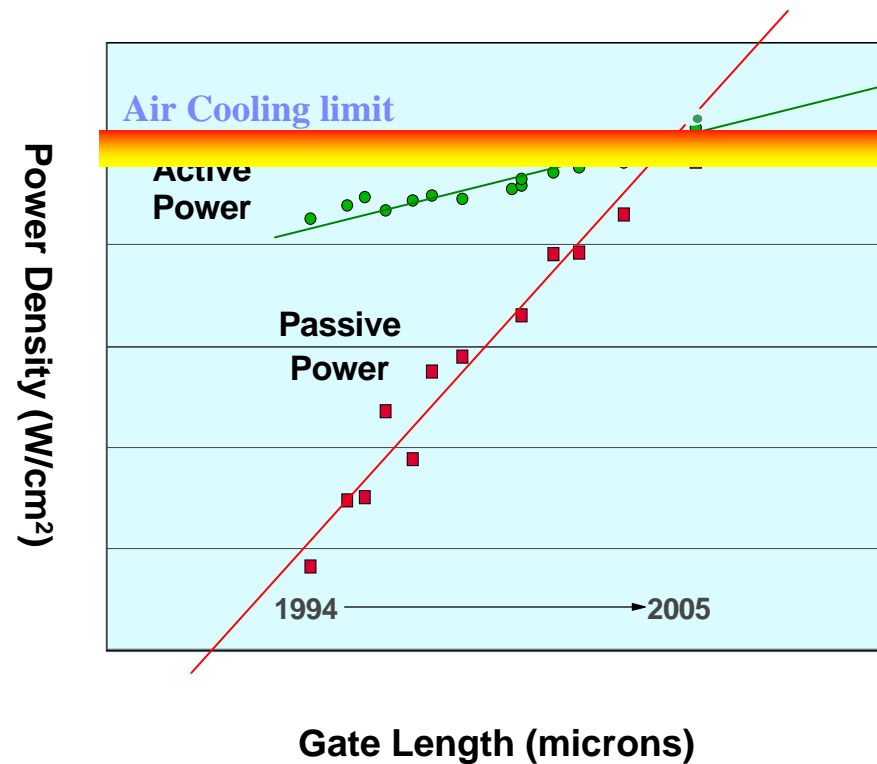


Intelligence Beats Speed

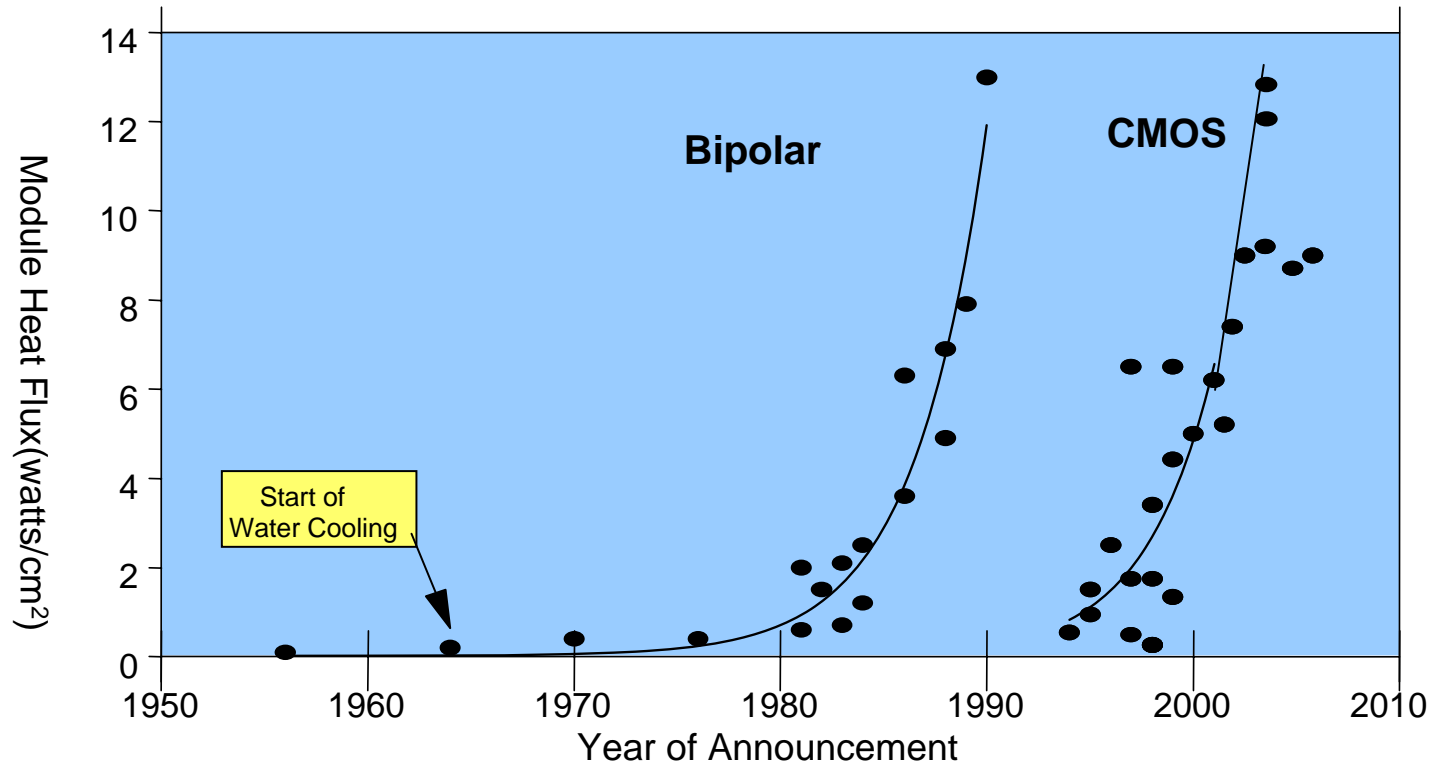
CMOS Power Issue: Active vs. Passive Power

Power components:

- Active power
- Passive power
 - Gate leakage
 - Source – Drain sub- V_t leakage



Technology Discontinuity: Bipolar Power Crisis

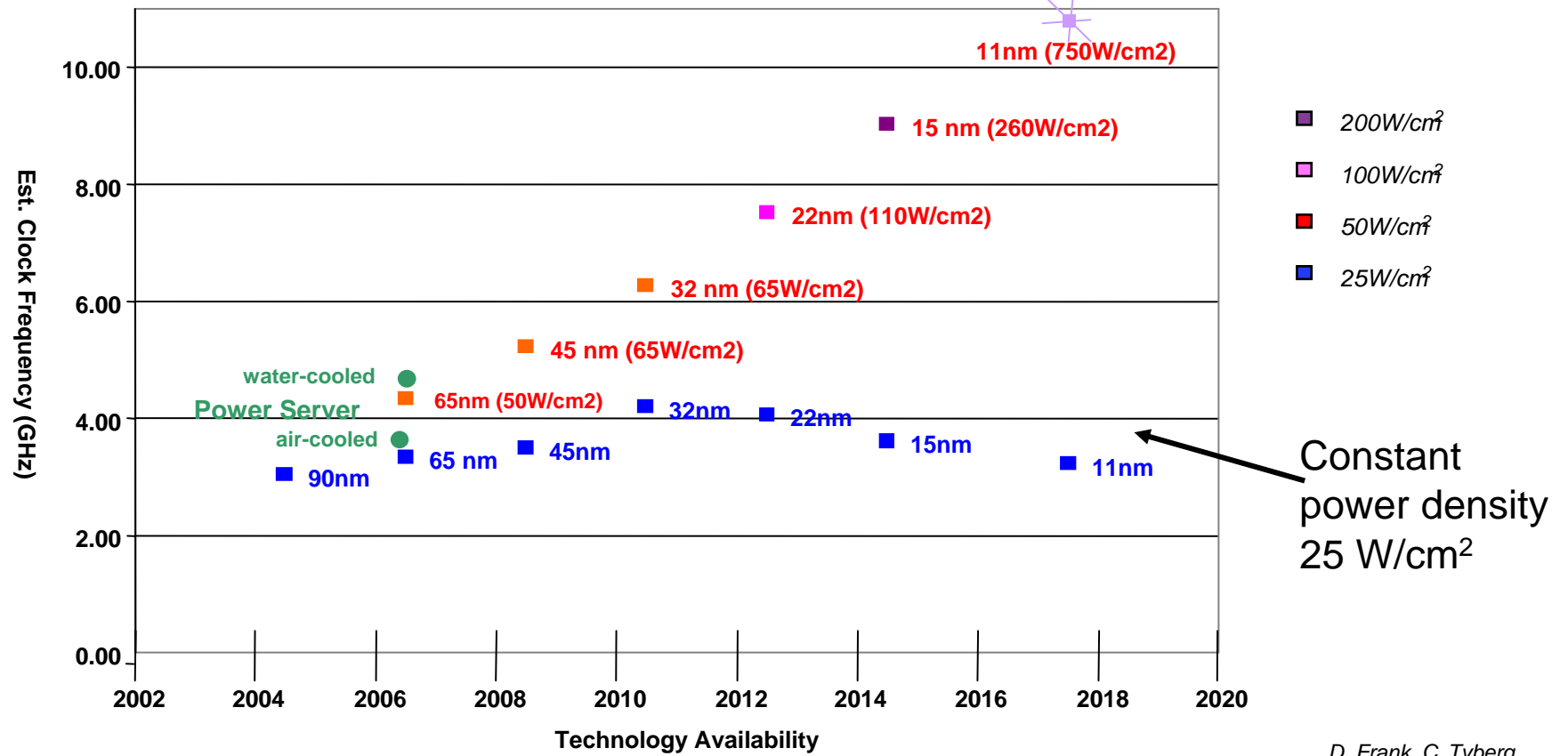


Maintenance: up to 65% reduced
Energy: up to 97% reduced
Area: up to 91% reduced

Frequency Scaling to 11 nm

Optimizing for maximum performance for each core

Constant performance improvement, 20% per gen.



D. Frank, C. Tyberg

Future Solution Focus



Intelligence Beats Speed

Mike Rhodin - Vice President IBM SW Solutions

Boeblingen Lab Visit July 14th, 2009 – at that time General Manager Northeast Europe

***IBM does since hundred years the same thing:
Help customers to solve their important problems with technology***

We started with the Chicago Meat Industry

***In the fifties Thomas J. Watson focused us on the theme:
Automation of the Banking Industry***

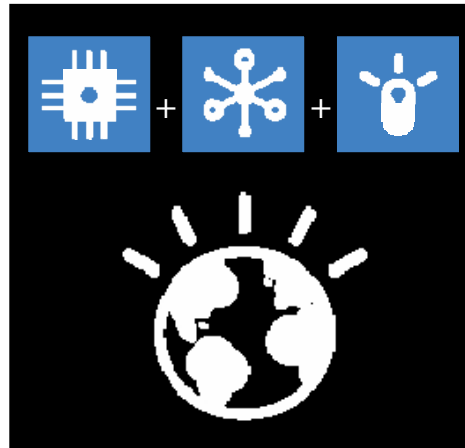
***Last year Sam Palmisano set the goal for the next fifty years:
Creation of a Smarter Planet***

Evolution of the Smarter Planet



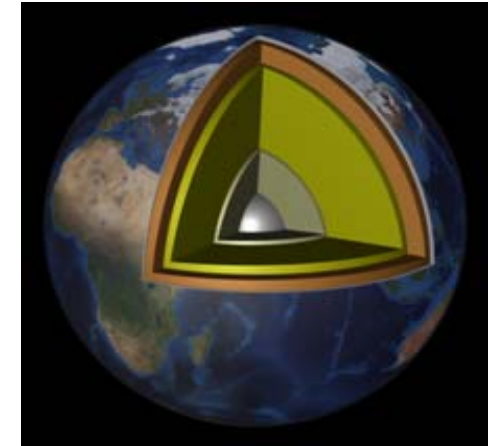
Smarter Planet (Past)

Distinct physical, people,
IT and business worlds



Smarter Planet (Present)

Instrumented, interconnected,
and intelligent



Smarter Planet (Future)

Interactive, interconnected &
interdependent, digitally
represented world

- Interconnected and interdependent behavioral models optimize Smarter Planet solutions
- Dynamic capture and assimilation of data using closed-loop models for prediction & response
- Individual and community behaviors & preferences leveraged for improved business outcomes

Workload Optimized Systems

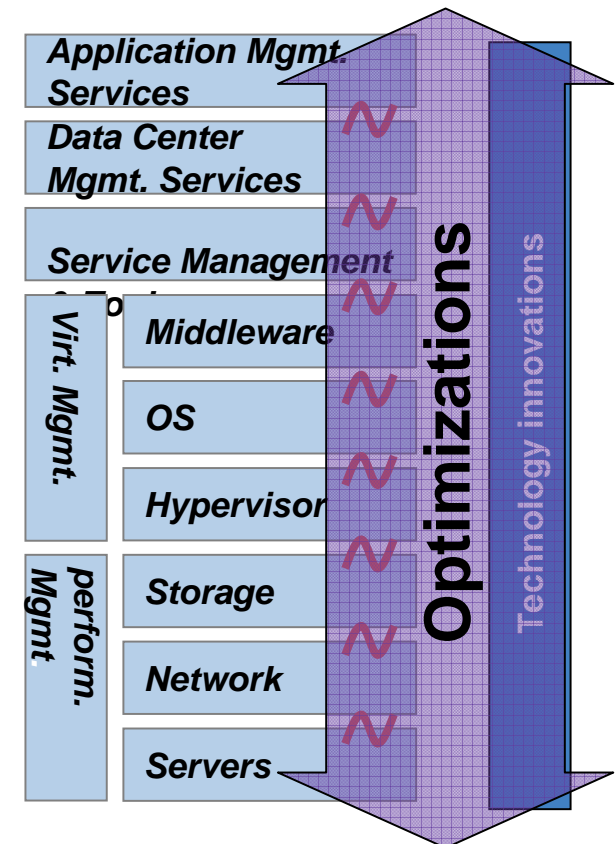


Intelligence Beats Speed

Workload Optimized Systems

A Workload Optimized System:

- provides value for particular workload or set of workloads important to the client
- provides unique functionality or differentiated performance
- reduces cost of deployment and operation
- is accomplished through co-design of HW, SW and services



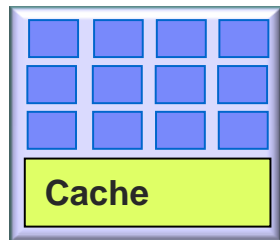
Chip Level Architecture

Many options in chip-level architecture will be available:

- Number and types of cores
- Memory hierarchy
- Interconnect structure

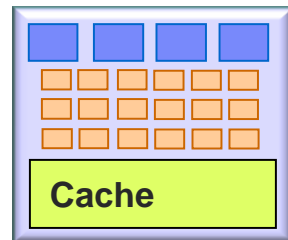
- **Optimization for Power vs Performance will be important**
- **Accelerators and heterogeneity will be exploited to optimize for workload specific special functions**

Homogeneous cores



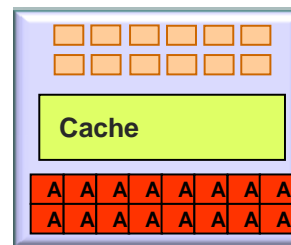
Single
ISA

Heterogeneous cores



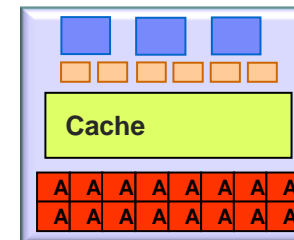
Single ISA
Different Performance

Cores + Accelerators



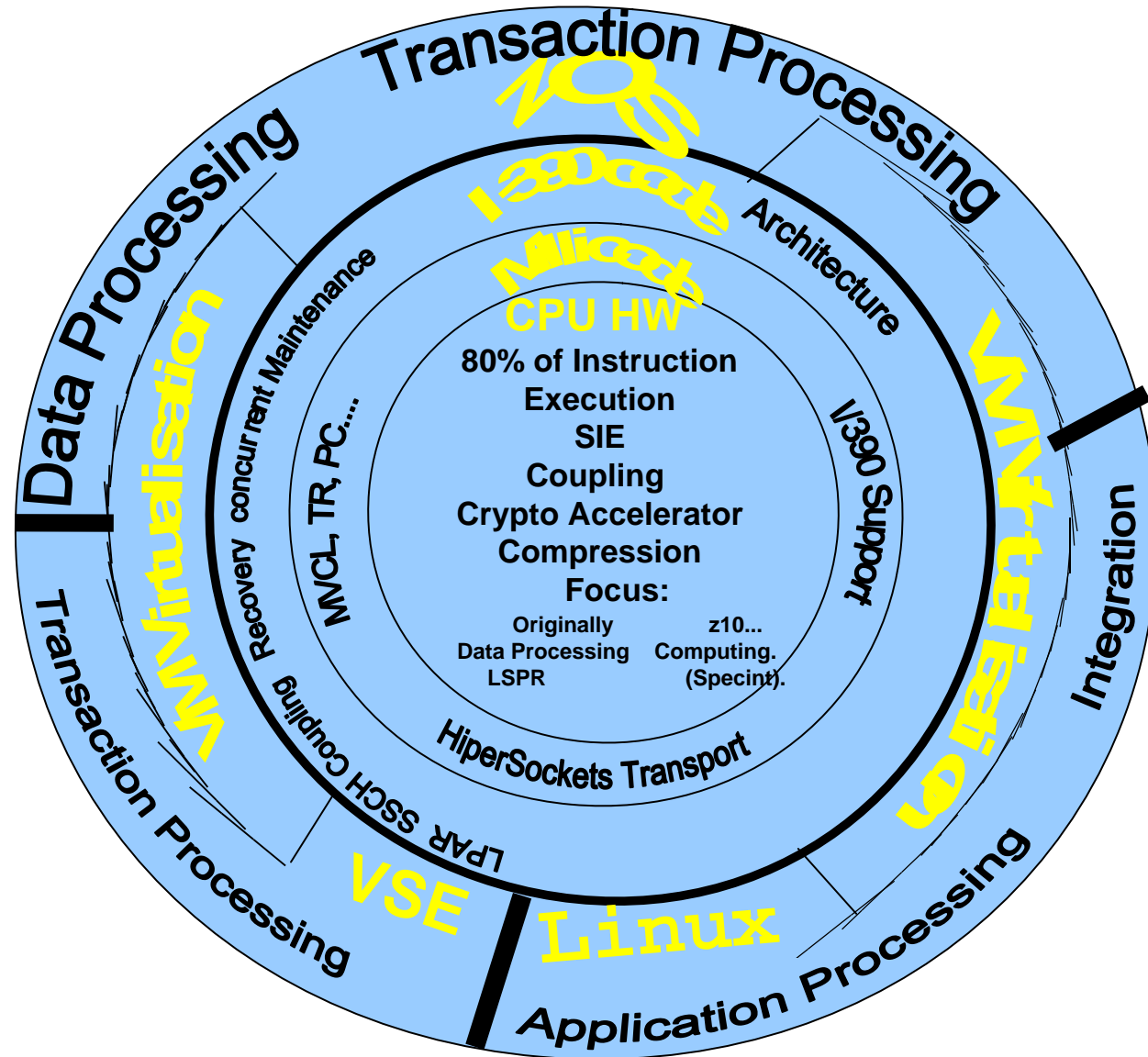
Multiple ISA
Function Specific
Accelerators

Heterogeneous Cores + Accelerators



Multiple ISAs
Targeting power efficiency
and special function

System z, a Workload Optimized System since 45 years

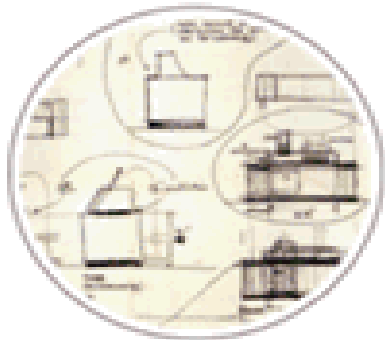


zEnterprise System



Intelligence Beats Speed

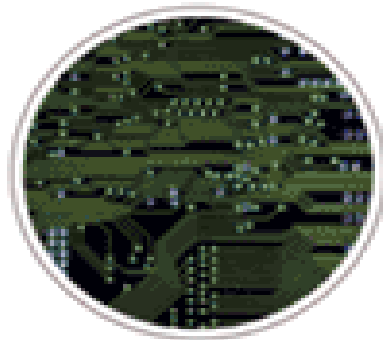
Four innovations in the history of the mainframe



1964

System/360

Centralized computing
for back-office



1990

System/390
Bipolar to CMOS

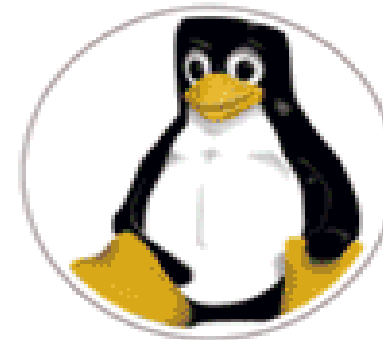
A chip-level change that
provided system-level
benefits, extending the
mainframe's architecture



1993

System/390
Parallel Sysplex

Multiple mainframes
acting as one for high
availability



2000

eServer z900
Linux on Mainframe

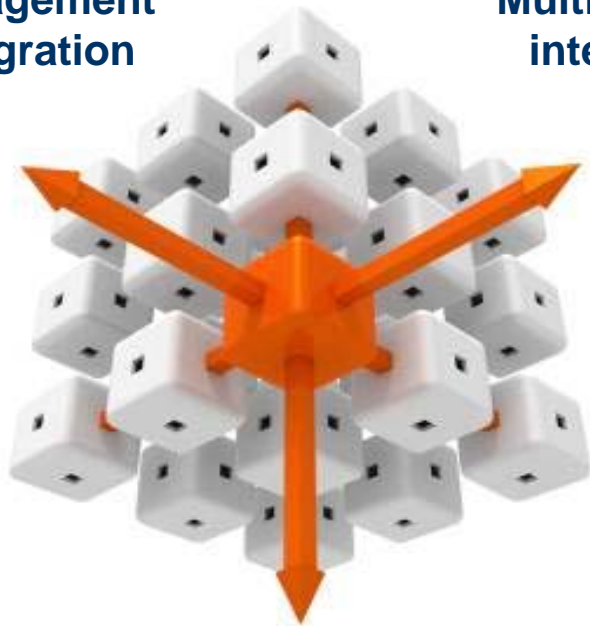
Specialty processor to
bring mainframe
qualities of service to
Linux applications

That tradition continues with zEnterprise ...

Announcing the IBM zEnterprise System: *A New Dimension in Computing*

**Management
integration**

**Multi-platform
integration**



**Stack
integration**

- The world's fastest and most scalable enterprise system with unrivalled reliability, security, and manageability.
- The industry's most efficient platform for large scale data center simplification and consolidation.
- A "System of Systems", integrating IBM's leading technologies to dramatically improve productivity of today's multi-architecture data centers and tomorrow's private clouds.

The IBM zEnterprise System:

A system of systems that unifies IT for predictable service delivery

Unified management for a smarter system: zEnterprise Unified Resource Manager

The world's fastest and most scalable enterprise system: IBM zEnterprise 196

- Ideal for large scale data and transaction serving and mission critical applications
- Most efficient platform for Large-scale Linux consolidation
- Capable of massive scale up, over 50 Billion Instructions per Second (BIPS)

- Part of the IBM System Director family, an integrated System z management facility responsible for zEnterprise platform management
- Unifies management of resources, extending System z qualities of service across the zEnterprise System

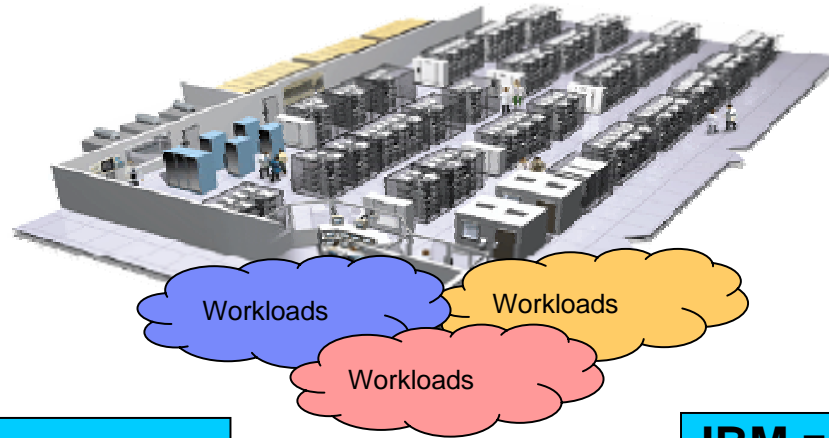
Scale out to trillion of instructions per second: zEnterprise BladeCenter Extension (zBX)

- Selected IBM POWER7 blades and System x Blades* for tens of thousands of AIX and Linux applications
- High performance optimizers and appliances to accelerate time to insight and reduce cost
- Dedicated high performance private network



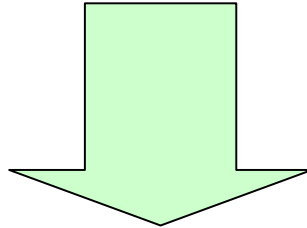
*Statement of Direction

The IBM zEnterprise System: *Putting it all together*



Fit for Purpose Processors
optimizes service delivery while
reducing cost of acquisition by up
to 35%*

**IBM zEnterprise and Tivoli service
management reduces operational
costs by up to 70%***



Fit for Purpose Storage
minimizes storage TCO by up
to 42%

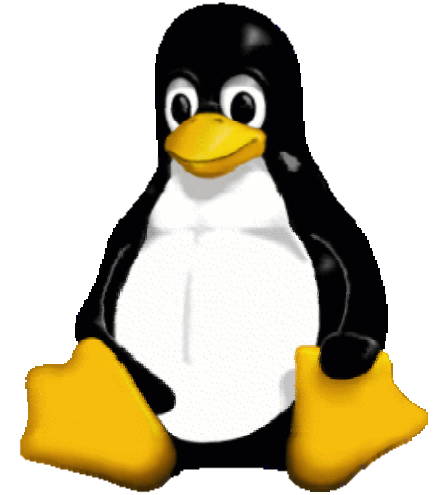


Unified Development Tools
for all environments enables skill
transfer and improves developer
productivity by up to 20%

*Based on IBM analysis of a large Financial Services company Datacenter of 100,000 MIPS and 10,000 distributed workloads, on 40,000 cores See details on ibm.com/systems/zenterprise/.....

Ten Years Linux on the Mainframe

The Beginning of a Heterogeneous Data Center in one System



From Skunk-Work in Boeblingen to a Strategic Product

UNIX on S/390	AIX	Unix System Services on OS/390	Auto Unix
May 1998	Started Linux study VSE Team GCC Compiler available (microcode)		
Oct 1998	IBM Academy of Technology Birds of Feather session (Java just in time compiler)		
Jan 1999	Feasibility Established (Kernel + 5 I/O drivers)		
Focus on baby /390 Target Sep 1999			
Aug 1999	Letter to “all IBM executives”: Linus Torvalds body language indicated: “Linux on Systems /390 no good idea”		
Two weeks later	Meeting with Linus Torvalds Santa Clara Marriott: He was enthusiastic Body language: no business talk in a disco		
Focus on IBM top down strategy			
Early Nov 1999	“Show” code to Linus Torvalds promised release into OpenSource 1999		
Dec 15th 1999	Release into developerWorks		
Dec 16th 1999	Linux 1.16.1 including Patch for Mainframes from IBM		
Jan 2000	Linux World New York – Sam Palmisano: 1B\$ into the ECO System Linus Torvalds 1B\$ is a lot of money but not that much		
May 15th 2001	Announcement in Palm Springs		

What is Linux on the Mainframe?

Linux is Linux ...

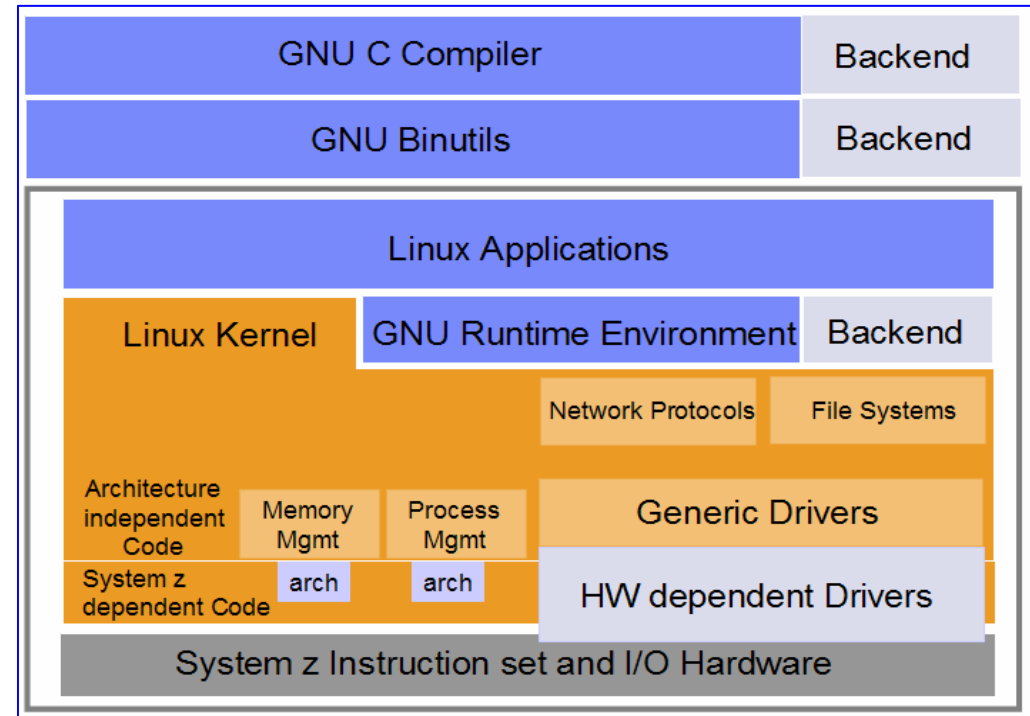
Not a special Linux

Everything relevant to Linux and System z is given to the community

About 5% - 10% code customized

Does run either native or with z/VM as a Hypervisor

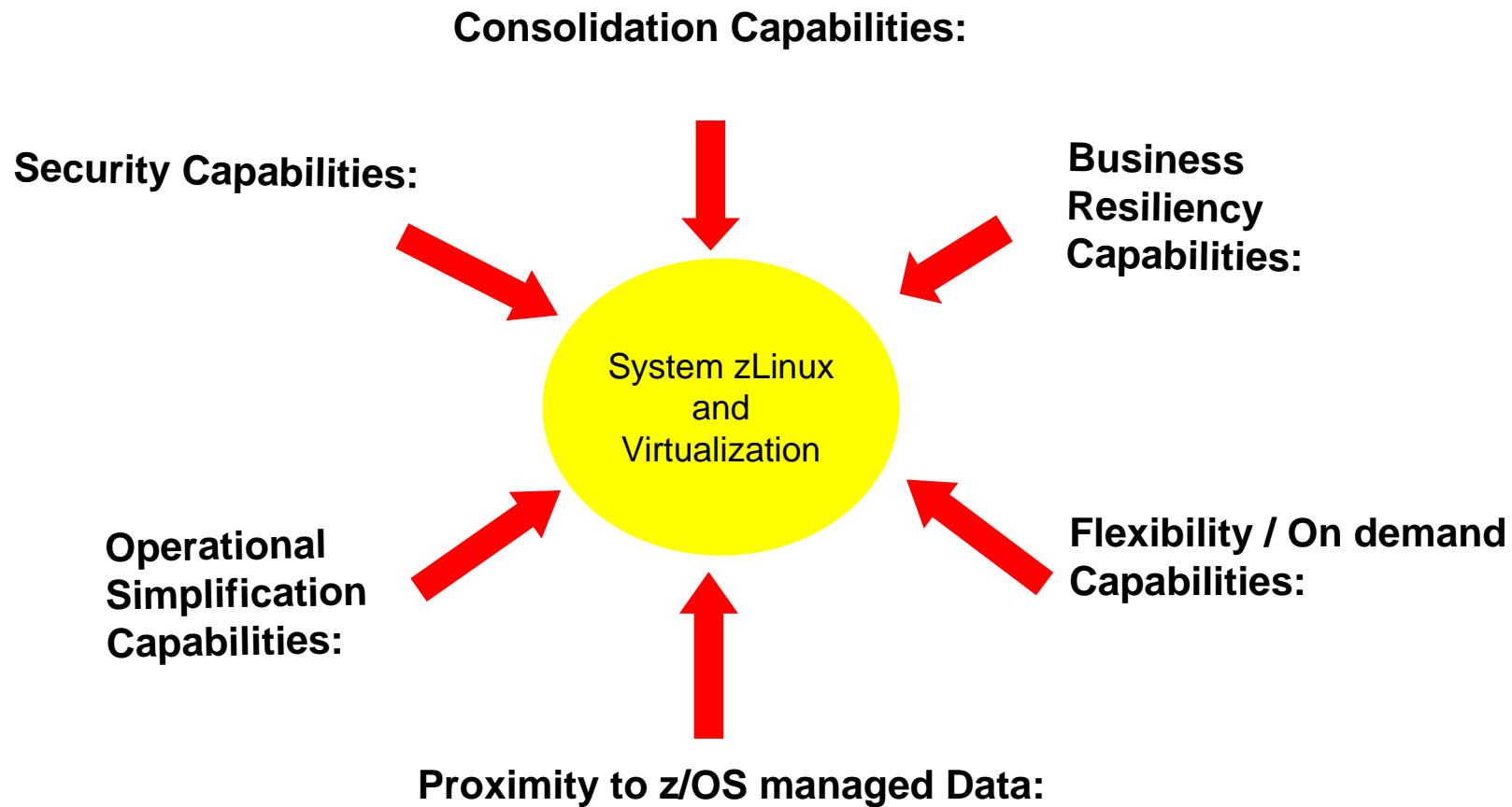
Complements other Operating Systems on IBM System z



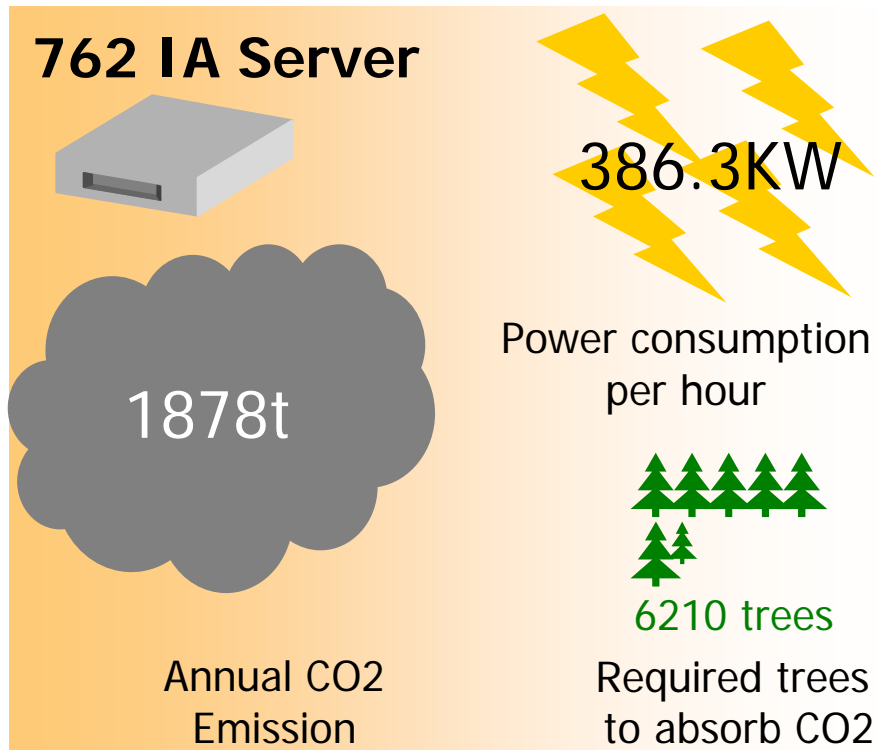
... and Linux on IBM System z exploits the unique values of the platform!

Linux is Linux... *but...*

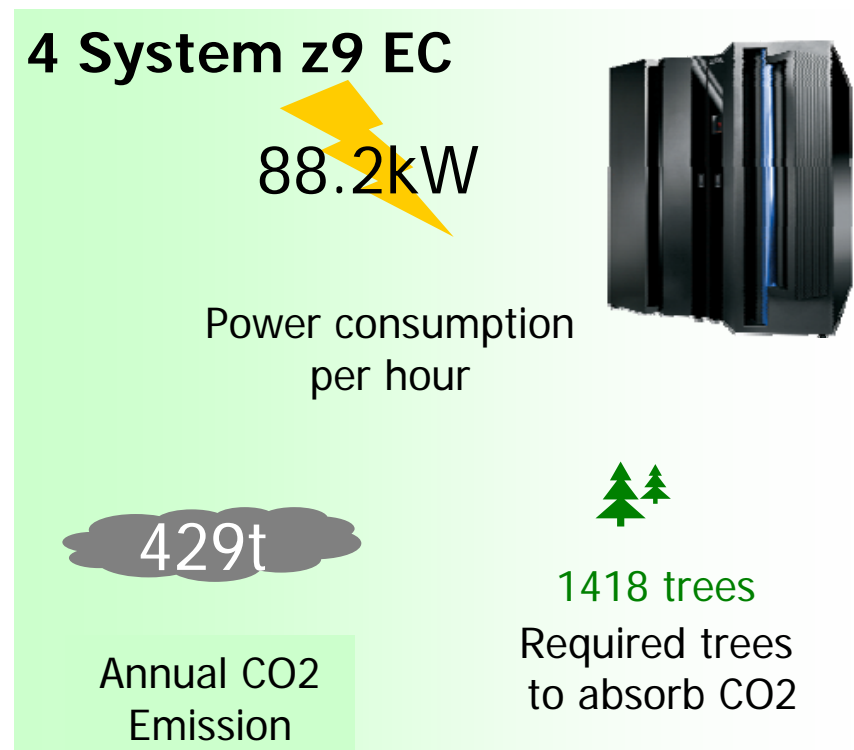
System z provides unmatched value propositions to Linux workloads



Japanese Bank



Green Effect



The Role of Linux in IBM Products

MCP based (Embedded Linux)

- True Embedded Devices (Controllers/Service Modules)
 - OS burned into Flash/ROM at manufacturing
 - System control/service stack must be operational at first boot
 - *Examples: FSP (System i/p/z), AMM (BladeCenter), IMM(System x)*
- Systems Management Devices
 - OS needs to be pre-installed
 - Management stack must be operational immediately
 - *Examples: HMC (Power & z), System z Service Element, SanVC (Storage)*
- Special Purpose Appliances
 - OS and software stack combination manufactured into device
 - Customer cannot install OS after system purchase
 - *Examples: RSS 4690(RSS), DataPower(SWG), Image Capture(GBS), XIV((Storage)*
- Diagnostics/Systems Deployment
 - Diagnostic image delivered as bootable CD, flash drive
 - Image cannot be created by customer to include OS and diagnostics
 - *Examples: ToolsCenter(System x), RSS Diags(RSS), Tivoli OS Provisioning(SWG)*



Software Group Offerings

- OpenClient for Linux
- IBM Client for Smart Work
- Websphere Cloud Burst

