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TPF Users Group Fall 2005

z/TPF : It's Here and It's Ready
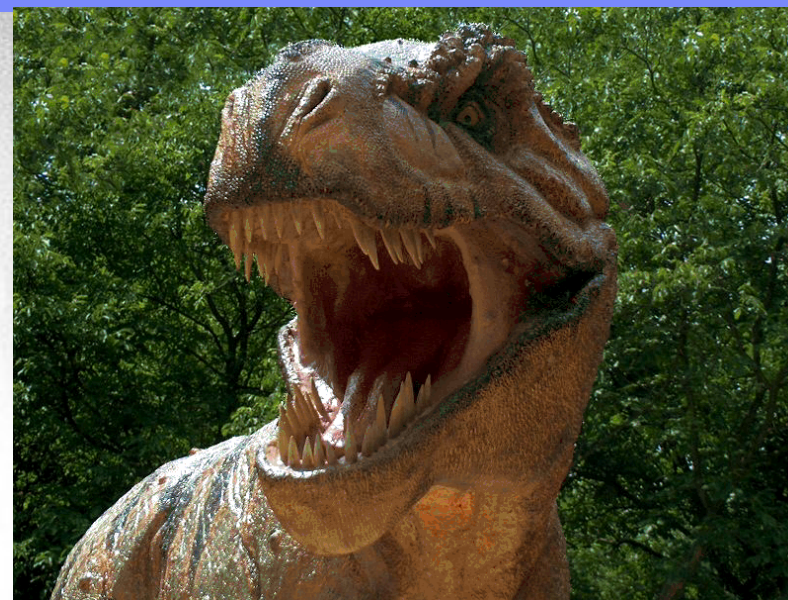
Name: Stuart Waldron, STSM

Venue: Main Tent

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z/TPF

Announcing!

- ☑ Availability
- ☑ Scalability
- ☑ Low Latency
- ☑ Integration
- ☑ Open Development
- ☑ Compatibility

World-class computing for the on demand business

What problem are we solving?
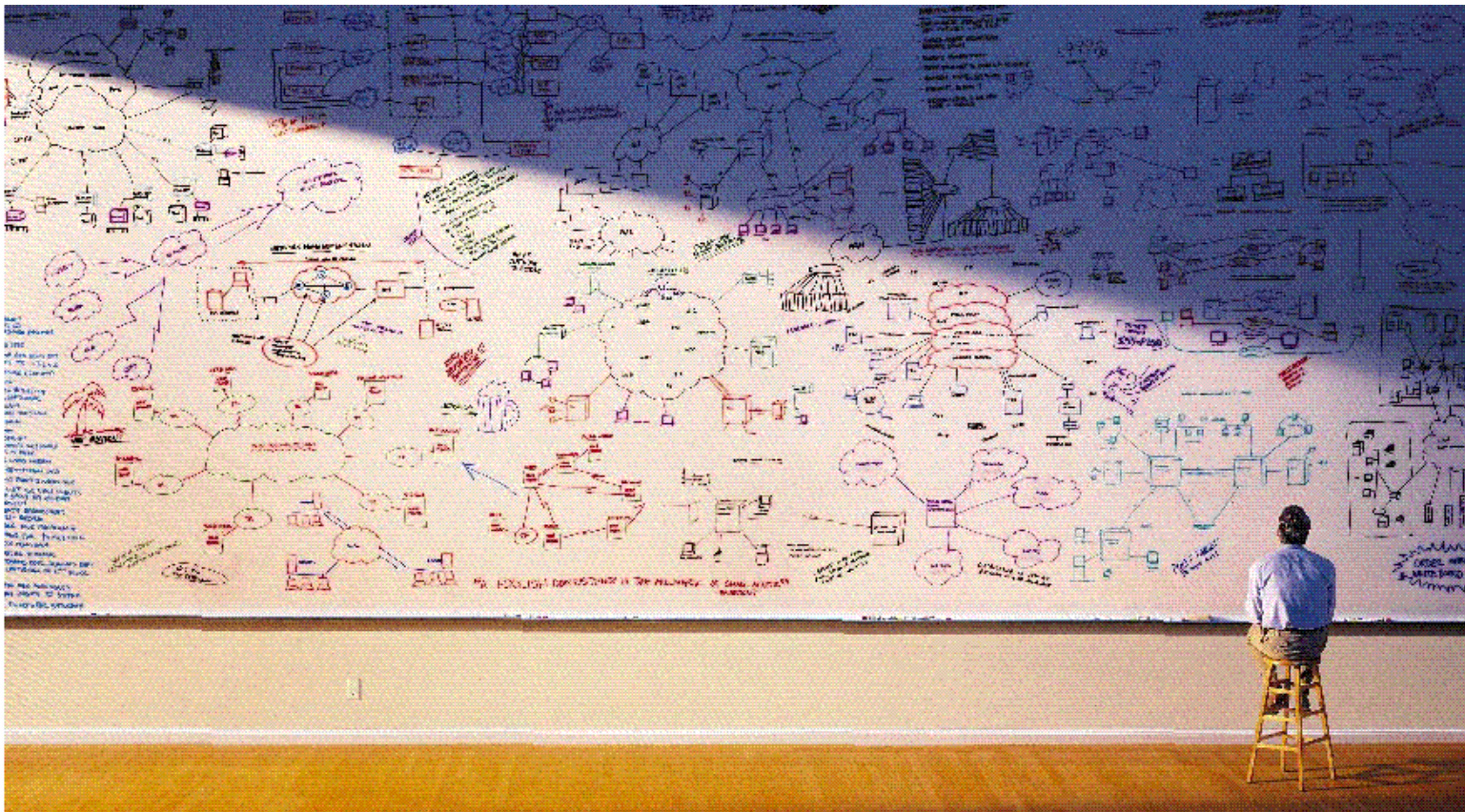
Modernization of Critical Path Assets
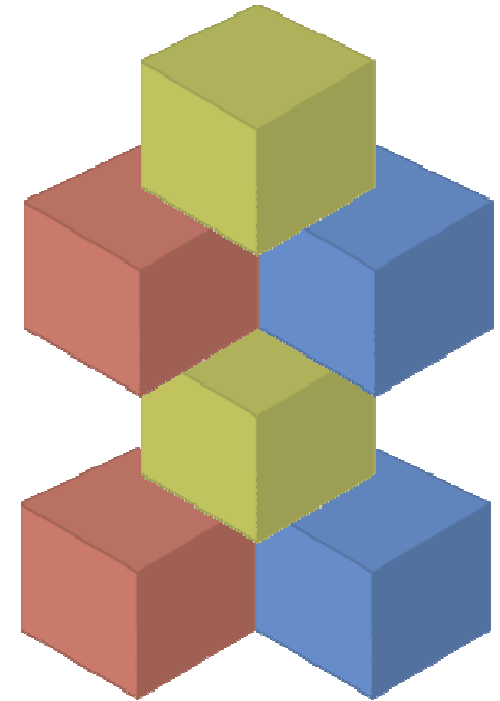
z/TPF EE V1.1
z/TPFDF V1.1
TPF Toolkit for WebSphere® Studio V3
TPF Operations Server V1.2

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Hardware Technology

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Systems Performance

Future improvements in systems performance will require an integrated design approach

Application	**Languages, Software Tuning, Efficient Programming**
	Middleware
System Level	**Dynamic optimization, Assist Threads, Morphing Support, Fast Computation Migration, Power Optimization, Compiler Support**
Chip Level	**Compiler Support, Morphing, Multiple Cores, SMT, Accelerators, Power Shifting, Interconnect Circuits**
Technology	**Packaging, Efficient Cooling, Dense SRAM, eDRAM Optics Memory**

- **Microprocessor frequency will no longer be the dominant driver of system level performance**

- **Integration over the entire stack, from semiconductor technology to end-user applications, will replace scaling as the major driver of increased system performance**

- **Systems will be designed with the ability to dynamically manage and optimize power**

- **Scale-out and small SMPs will continue to out pace scale-up growth**

- **Systems will increasingly rely on modular components for continued performance leadership**

Power is Limiting Microprocessor Frequencies

Server microprocessors cannot simultaneously utilize all their transistors due to power limitations
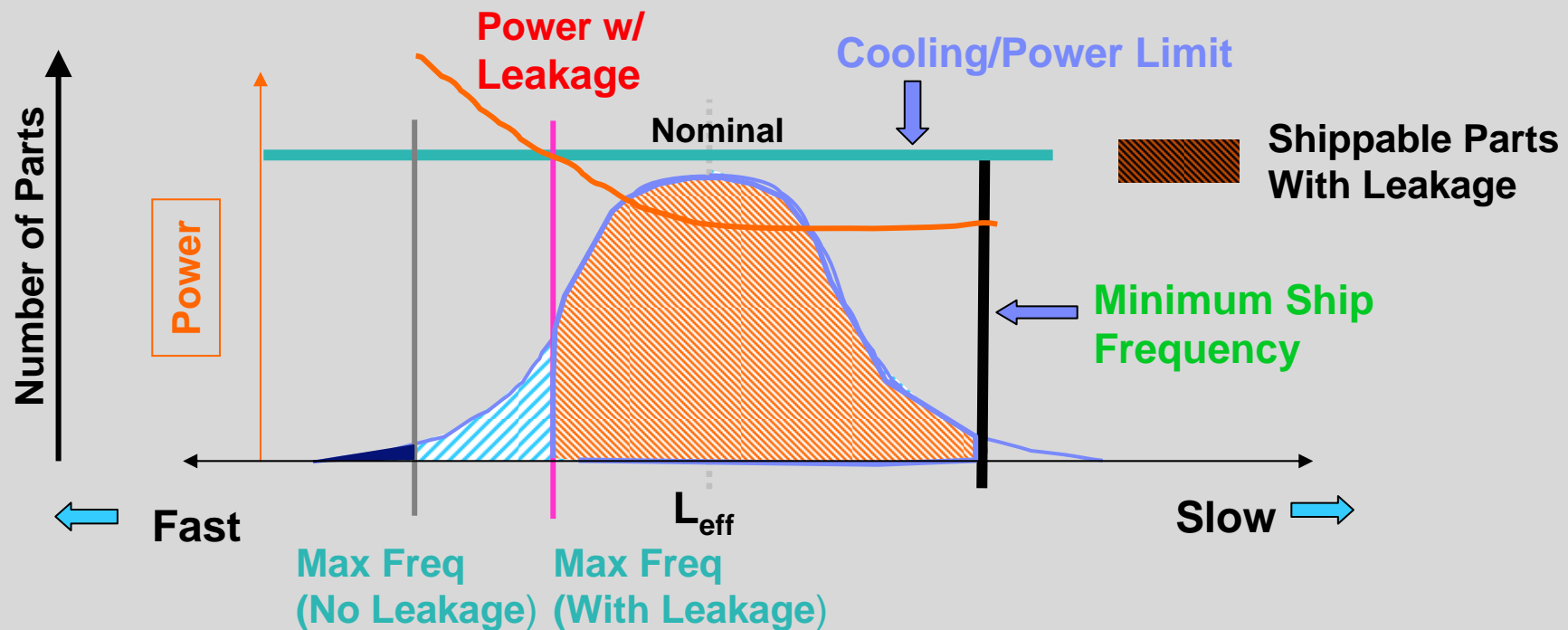
System Level Power Management Trends

Data centers will have to choose between going to water cooling or having under-populated racks

Compute Server Trend Lines Begin To Split Around 2001

Compute Servers - 1U, Blade, Custom

Compute Server Trend Lines Split In Two

Compute Servers - 2U And Greater

Storage Servers

Compute Servers

Storage Servers

Blades are pushing the power to 5KW/sqft of rack in the next 5 years

Source: ASHRAE 2005

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Scale-Out Versus Scale-Up

Performance (y-axis)

Scale-up

Scale-out

2005   2015
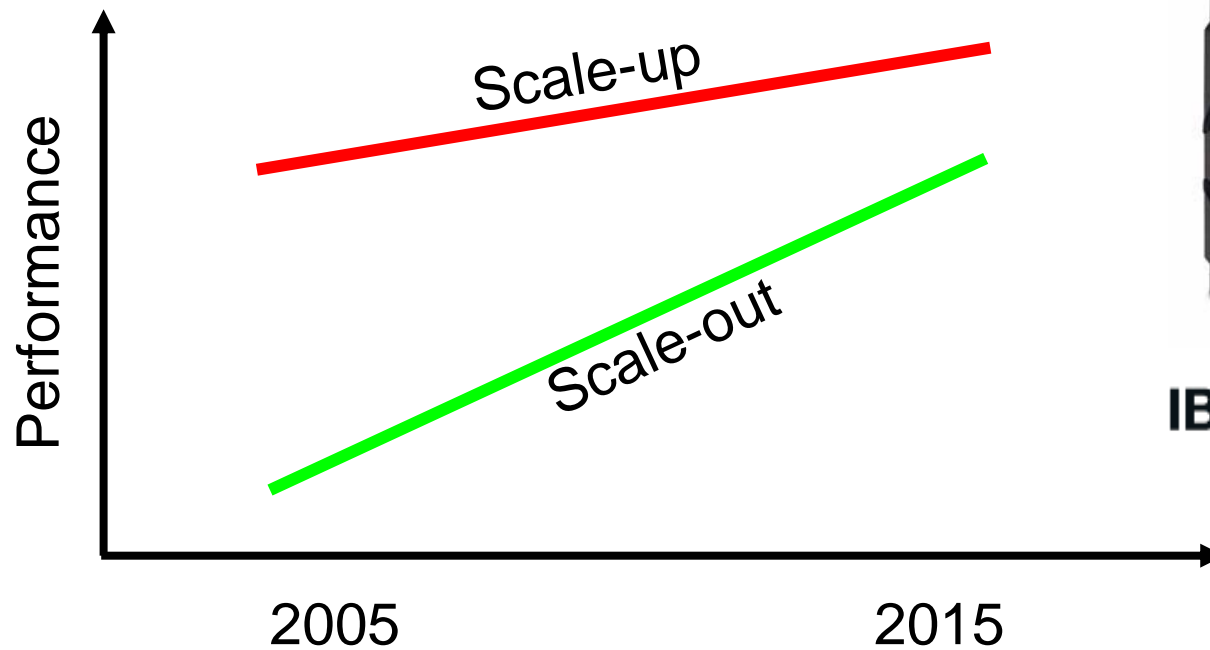
➔ **Low-cost, scale-out systems are increasing in performance**

➔ **Significant challenges remain for running high-end applications on scale-out systems**

- ☛ **Management and virtualization**
- ☛ **High Availability**
- ☛ **RAS – Reliability Availability Serviceability**
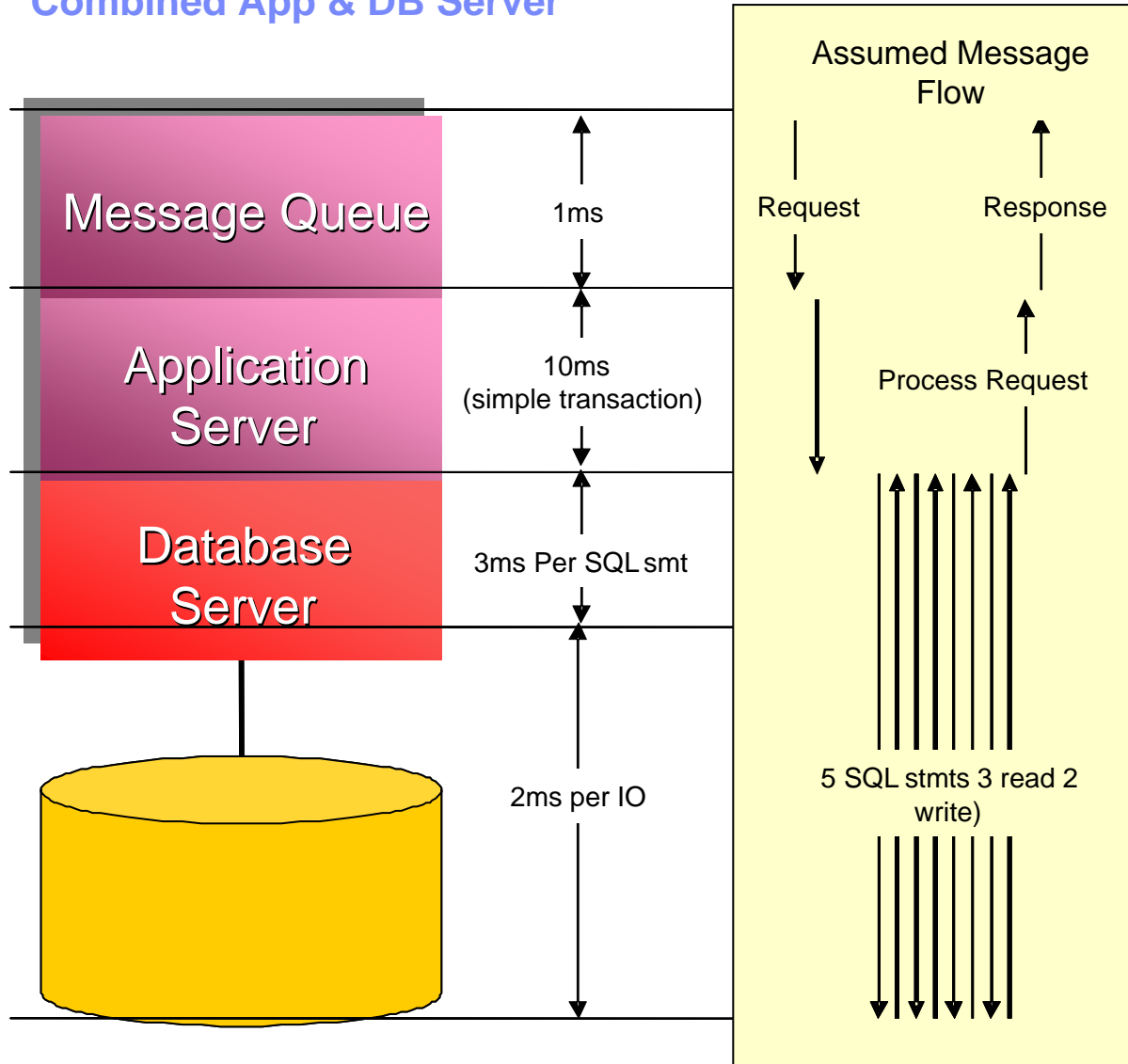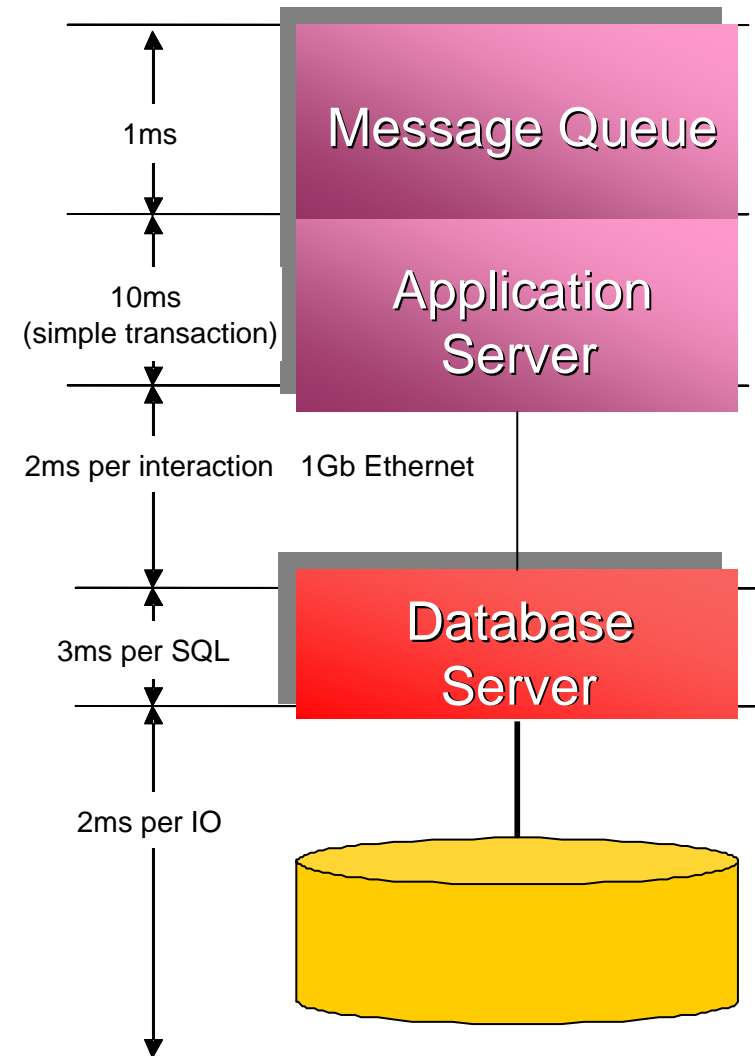
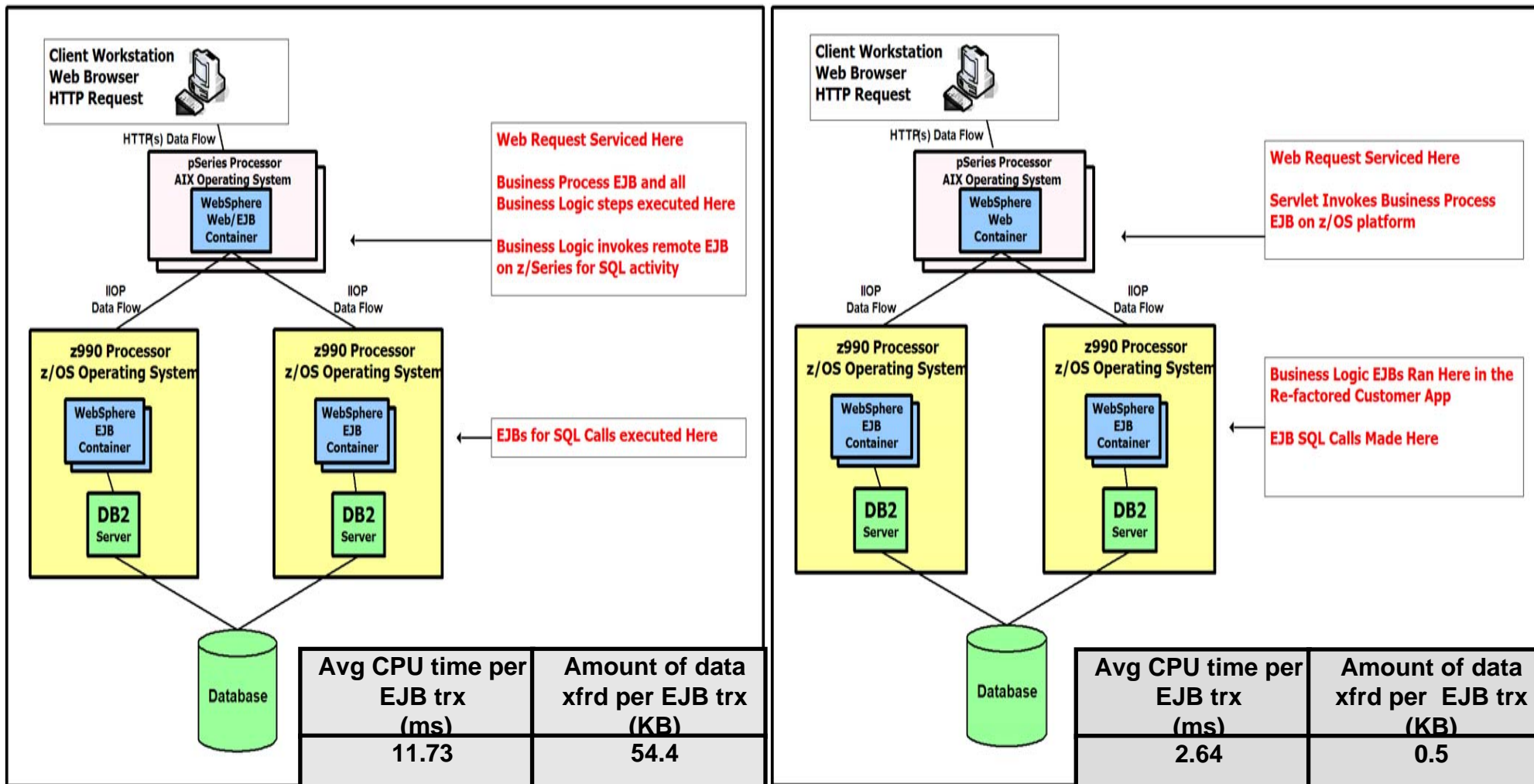# Proximity to Data - Transportation Industry Benchmark

Client Workstation
Web Browser
HTTP Request

HTTR(s) Data Flow

pSeries Processor
AIX Operating System

WebSphere
Web/EJB
Container

Web Request Serviced Here

Business Process EJB and all Business Logic steps executed Here

Business Logic invokes remote EJB on z/Series for SQL activity

IIOP Data Flow   IIOP Data Flow

z990 Processor   **z990 Processor**
z/OS Operating System   **z/OS Operating System**

WebSphere   WebSphere
EJB   EJB
Container   Container

EJBs for SQL Calls executed Here

DB2 Server   DB2 Server

Database

Avg CPU time per EJB trx (ms)	Amount of data xfrd per EJB trx (KB)
11.73	54.4

Client Workstation
Web Browser
HTTP Request

HTTR(s) Data Flow

pSeries Processor
AIX Operating System

WebSphere
Web
Container

Web Request Serviced Here

Servlet Invokes Business Process EJB on z/OS platform

IIOP Data Flow   IIOP Data Flow

z990 Processor   **z990 Processor**
z/OS Operating System   **z/OS Operating System**

WebSphere   WebSphere
EJB   EJB
Container   Container

Business Logic EJBs Ran Here in the Re-factored Customer App

EJB SQL Calls Made Here

DB2 Server   DB2 Server

Database

| Avg CPU time per EJB trx (ms)	Amount of data xfrd per EJB trx (KB)
2.64	0.5

Advantages of Business Logic Proximity to zOS data

➔**Average CPU time per EJB transaction was reduced by over 77%**

➔**Number of bytes of data transferred per EJB transaction was reduced by 99%**

http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP100558

Complexity accelerates

Is your infrastructure's complexity holding you back?
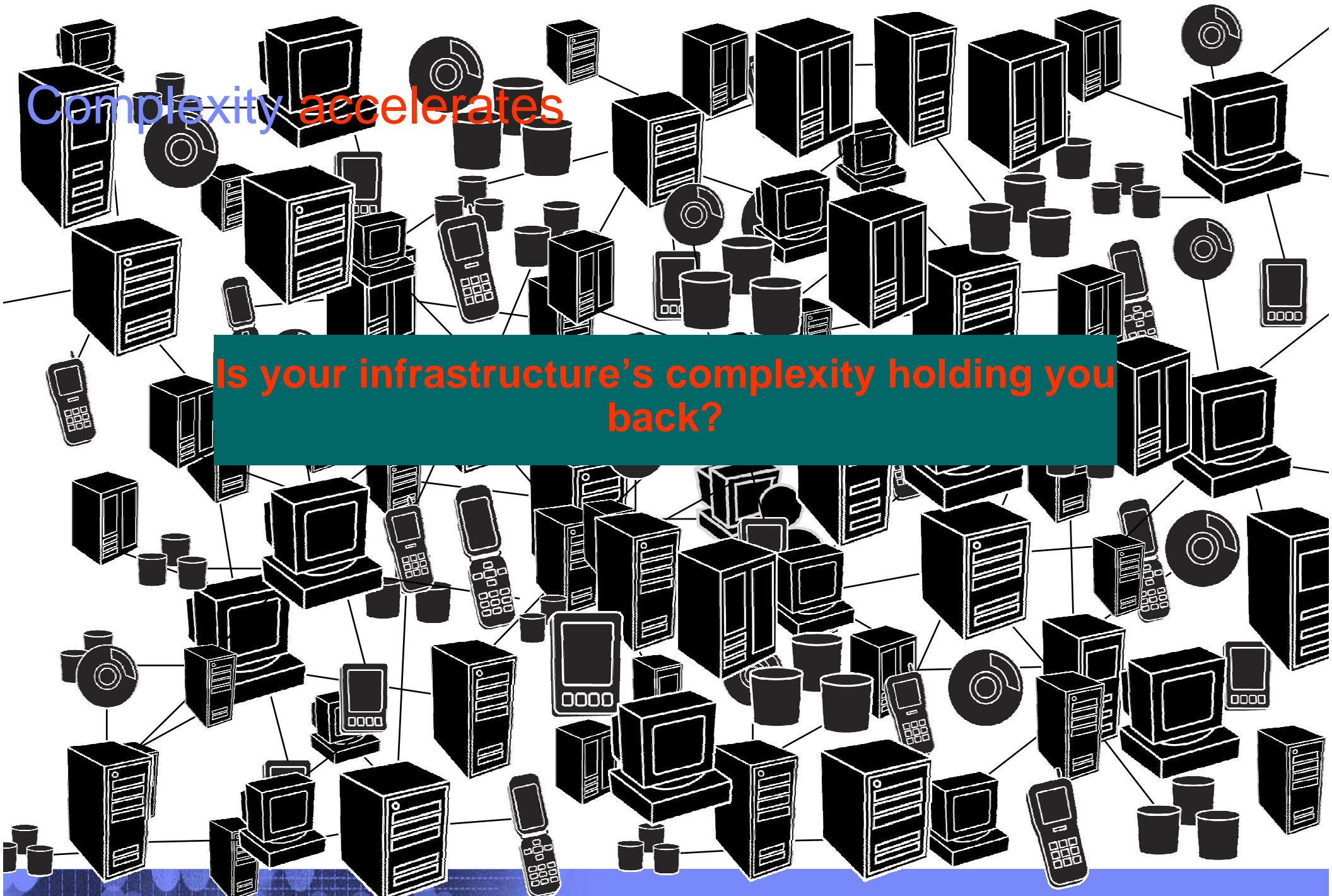
z/TPF EE V1.1
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Development Trends

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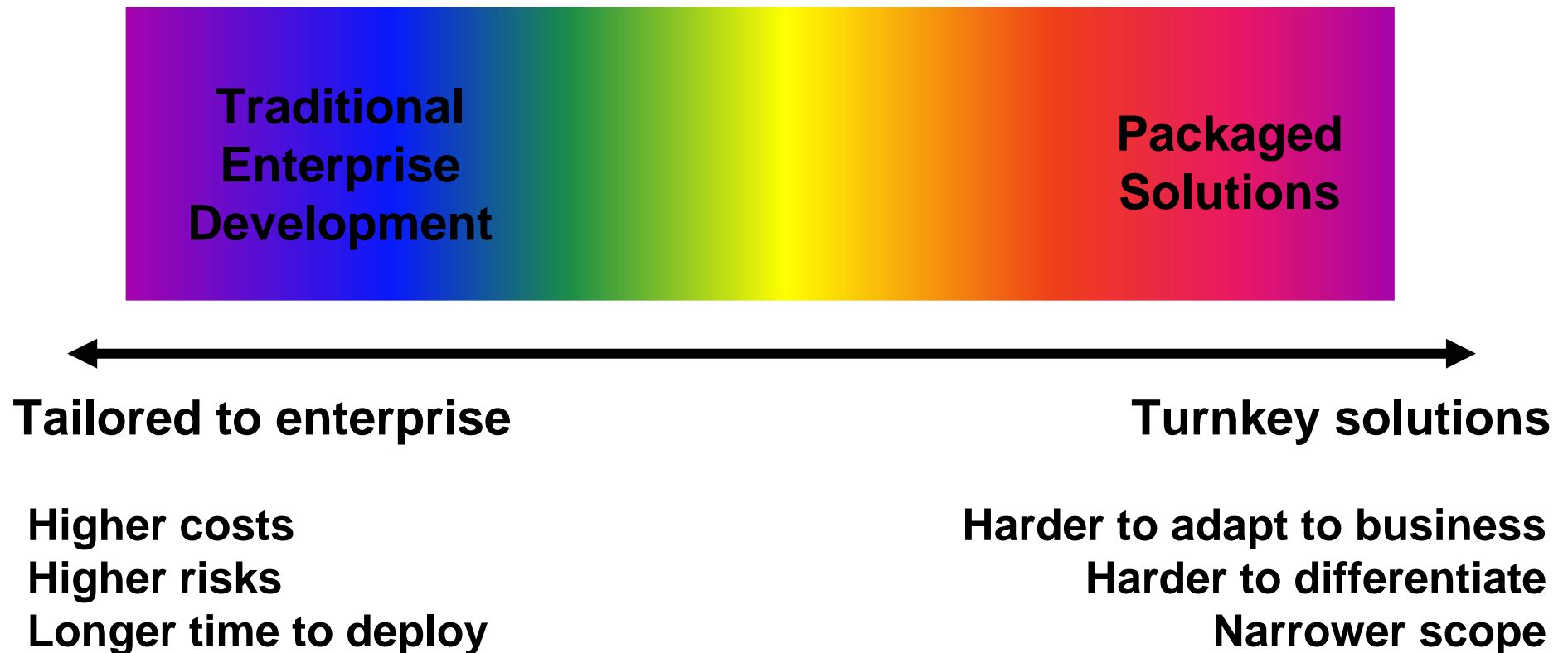IBM z/Transaction Processing Facility Enterprise Edition 1.1.0
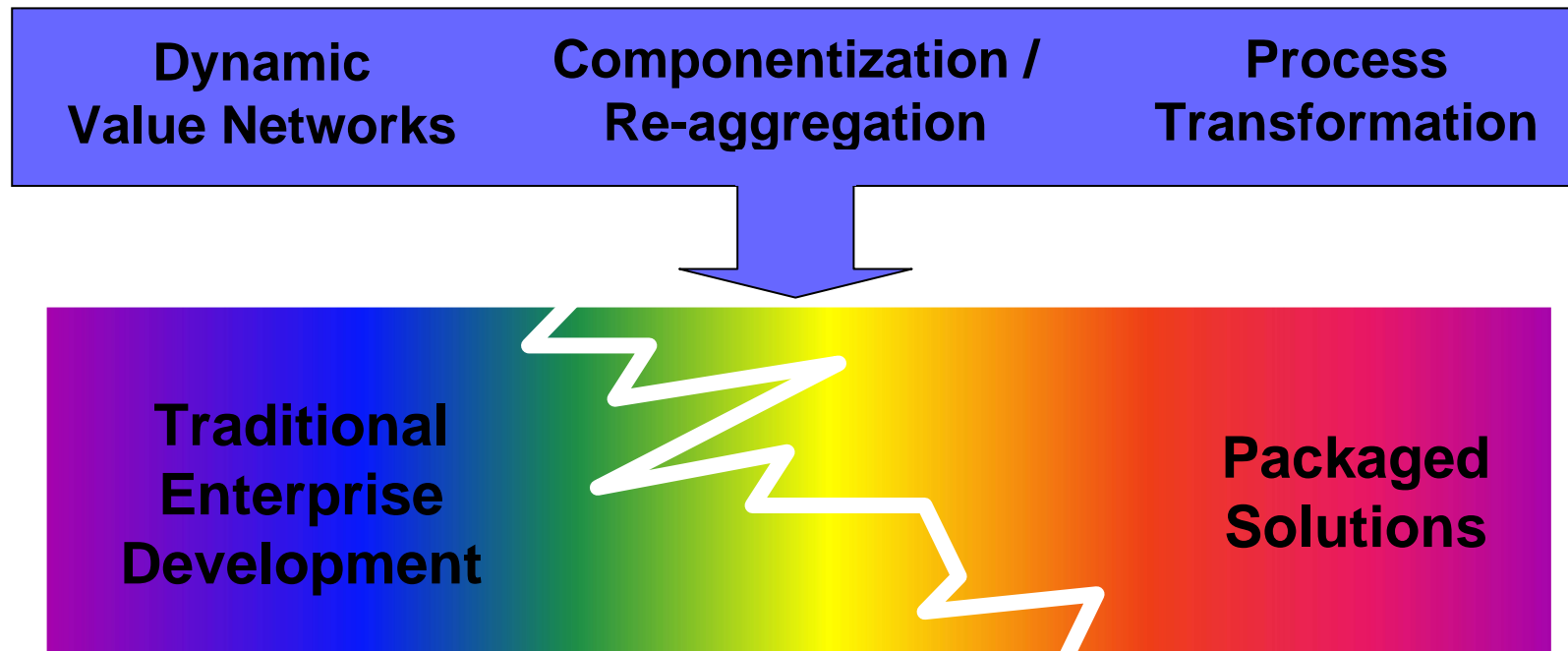
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Today: Polarization in Enterprise Application Development

Traditionally, choices were limited to developing custom software or using monolithic applications developed by ISVs
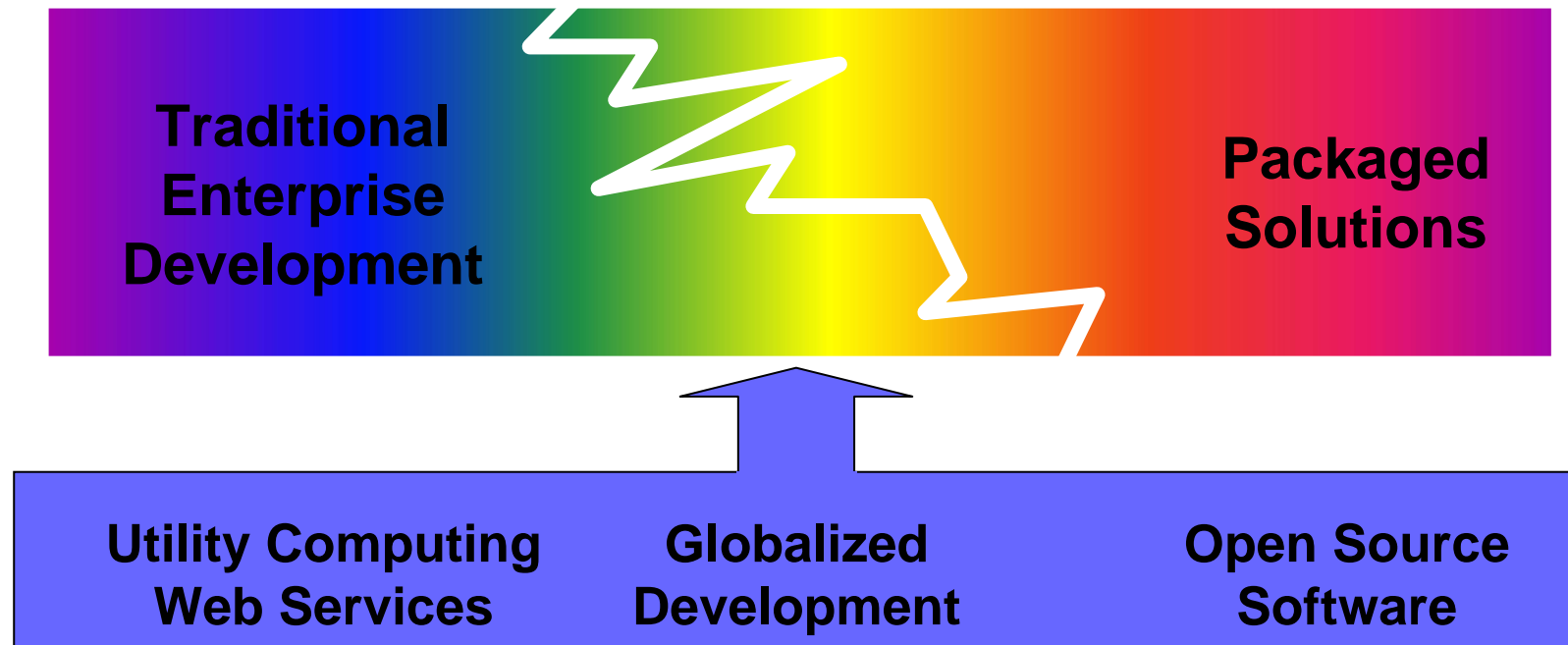
Traditional Enterprise Development   **Packaged Solutions**

Tailored to enterprise   **Turnkey solutions**

Higher costs   **Harder to adapt to business**
Higher risks   **Harder to differentiate**
Longer time to deploy   **Narrower scope**

Today's Enterprise Software is Too Rigid to Support On Demand Businesses…

Dynamic Value Networks	Componentization / Re-aggregation	Process Transformation

Traditional Enterprise Development
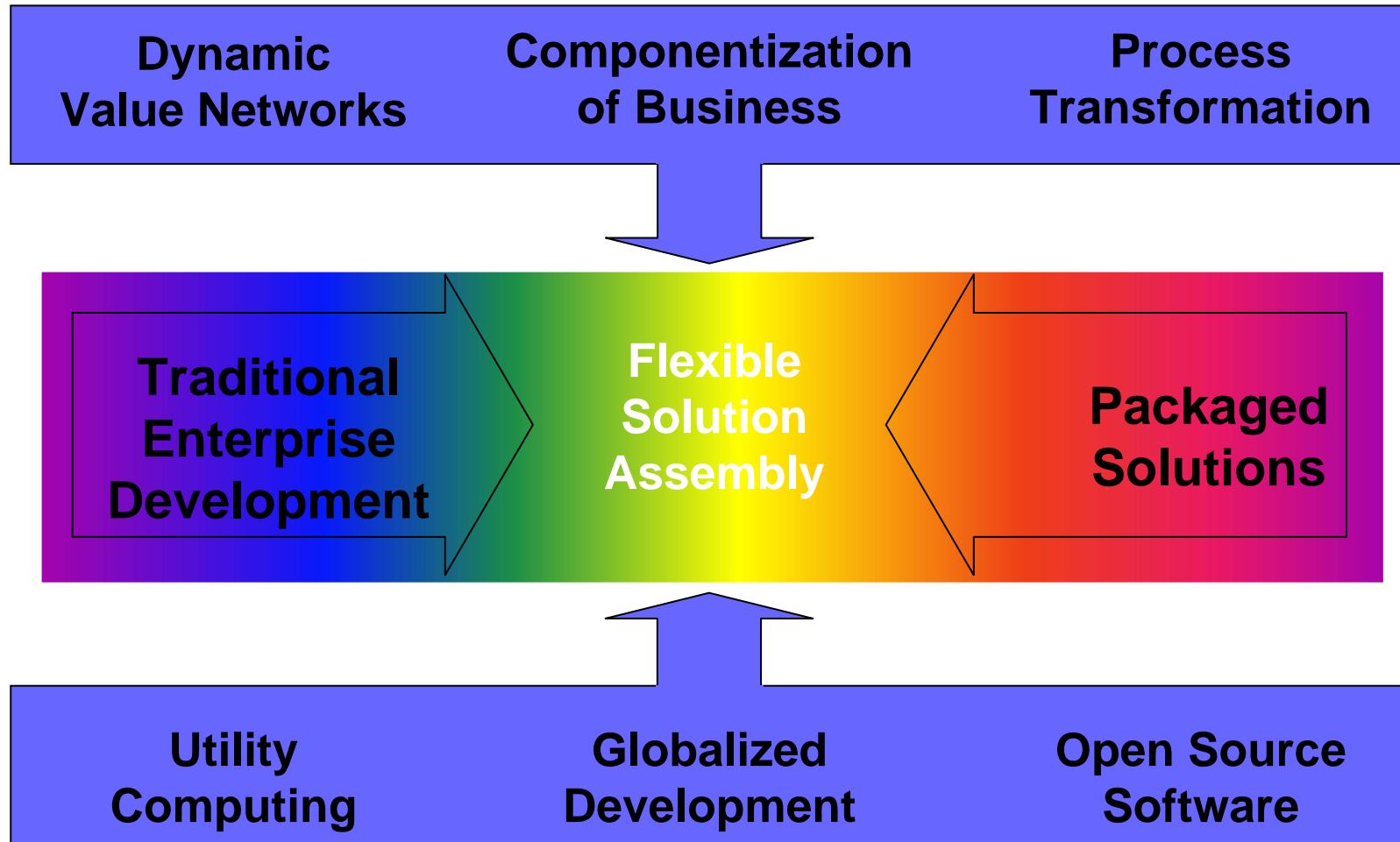
Packaged Solutions

- Companies are under pressure to deal with the inflexibility of monolithic applications in connecting with new partners and customers
- Business processes are disaggregating to take advantage of specialization and cost savings through outsourcing
- On demand businesses need IT implementations that facilitate business process transformation

… And To Take Advantage of New Opportunities for Increased Efficiency

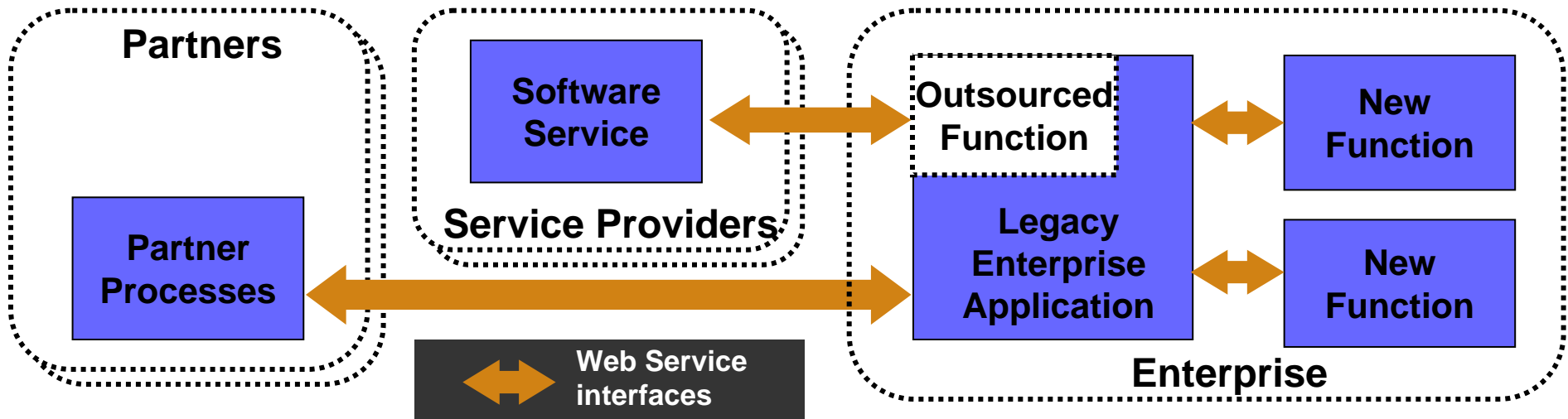- **Enterprises need flexibility to competitively leverage new technologies and business models**

Traditional Enterprise Development

Packaged Solutions

Utility Computing Web Services

Globalized Development

Open Source Software

More Flexibility is Needed to Support On Demand Businesses

Dynamic Value Networks	Componentization of Business	Process Transformation

Traditional Enterprise Development → **Flexible Solution Assembly** ← **Packaged Solutions**

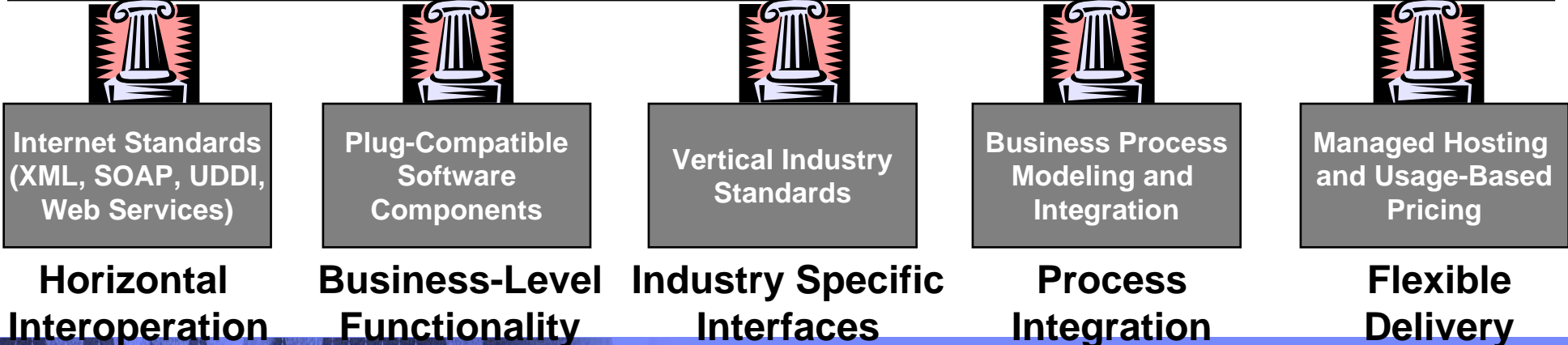| Utility Computing	Globalized Development	Open Source Software

Pressure to quickly align IT functions to business objectives and process changes will motivate companies to embrace more flexible approaches to enterprise software development and deployment

Towards Flexible Enterprise Solution Assembly

Companies are beginning to offer and draw benefits from a new standards based, service-oriented solution assembly approach
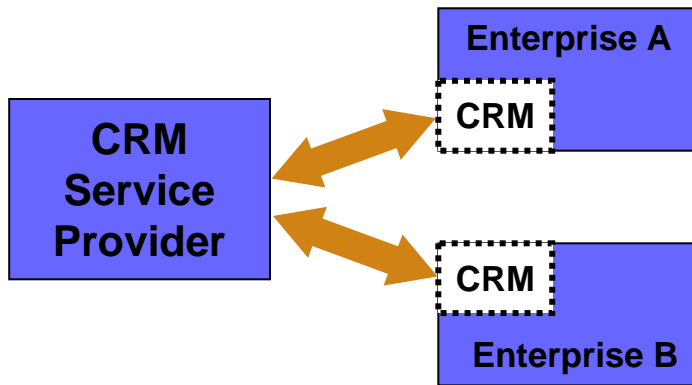
Partners

Service Providers

Enterprise

| Partner Processes | Software Service | Outsourced Function | Legacy Enterprise Application | New Function | New Function |

Web Service interfaces

Flexible Solution Assembly

| Internet Standards (XML, SOAP, UDDI, Web Services)	Plug-Compatible Software Components	Vertical Industry Standards	Business Process Modeling and Integration	Managed Hosting and Usage-Based Pricing
Horizontal Interoperation	**Business-Level Functionality**	**Industry Specific Interfaces**	**Process Integration**	**Flexible Delivery**

Benefits Enabled by a Flexible Solution Assembly Approach

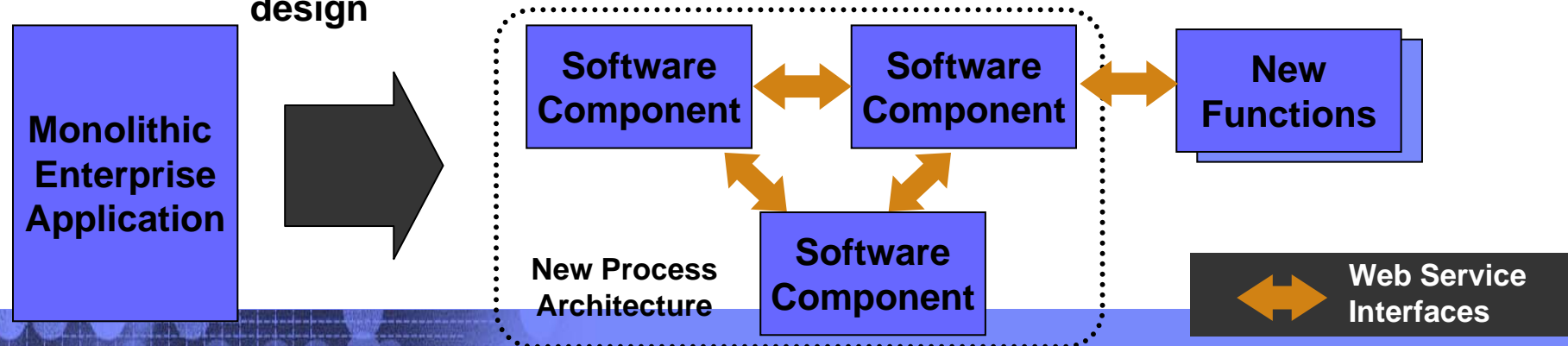**1** Service Oriented Architectures provide the ability to **leverage component business processes** delivered as services

Enterprise A

CRM Service Provider → CRM

CRM
Enterprise B

2 Emerging vertical industry standards enable **flexible interoperability between partners** along the entire value chain

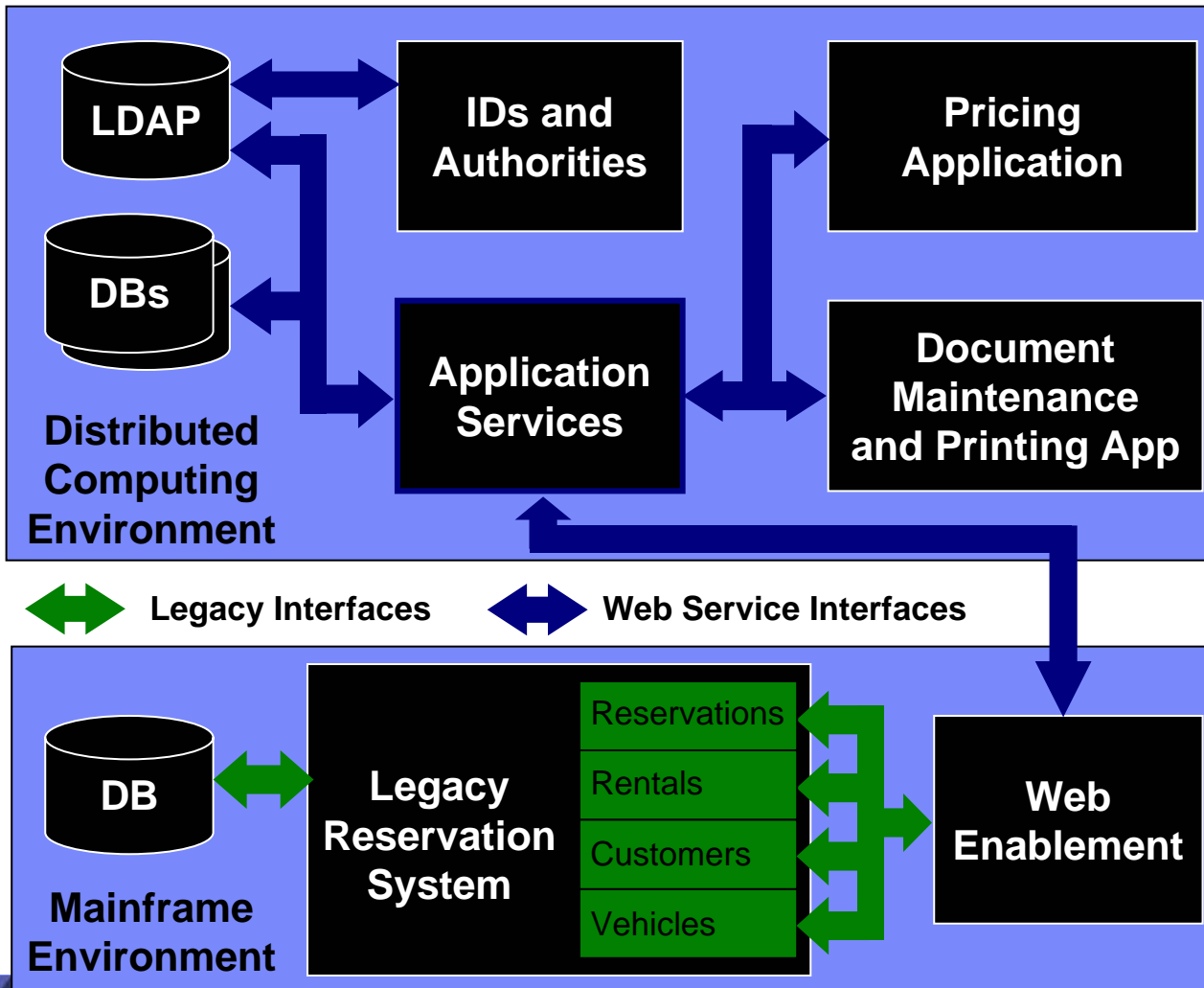Payment Processing

Manufacturer

Retailer

Distributor
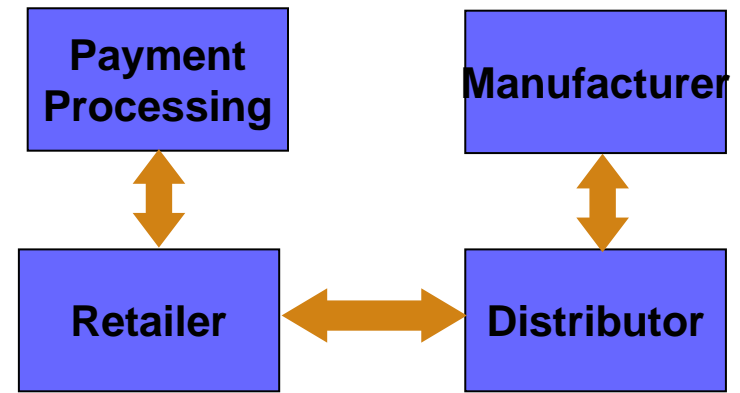
3 Componentization of business functions increases the **flexibility to adapt to changing business needs**: e.g. gradually introduce new functions, or a new business design

Monolithic Enterprise Application →

Software Component

Software Component

New Functions

Software Component

New Process Architecture

Web Service Interfaces

SOA-Based Transformation of Legacy Apps

3

Companies are modernizing their legacy systems to achieve new business flexibility. An SOA-based transformation allows companies to redesign processes, add new functions and better connect with partners at low cost.

Diagram

Distributed Computing Environment
- LDAP
- DBs
- IDs and Authorities
- Application Services
- Pricing Application
- Document Maintenance and Printing App

Legacy Interfaces | **Web Service Interfaces**

Mainframe Environment
- DB
- Legacy Reservation System
  - Reservations
  - Rentals
  - Customers
  - Vehicles
- Web Enablement

Large Car Rental Company Business Challenges

- How do I implement a new business initiative?
- How do I respond to competitive pricing pressure?
- How do I securely connect new employees worldwide
- How do I allow global branches to customize rental contracts?

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Enterprise Service Bus

z/TPF : It's Here and It's Ready

WebSphere ESB

Name: Stuart Waldron, STSM
Venue: Main Tent

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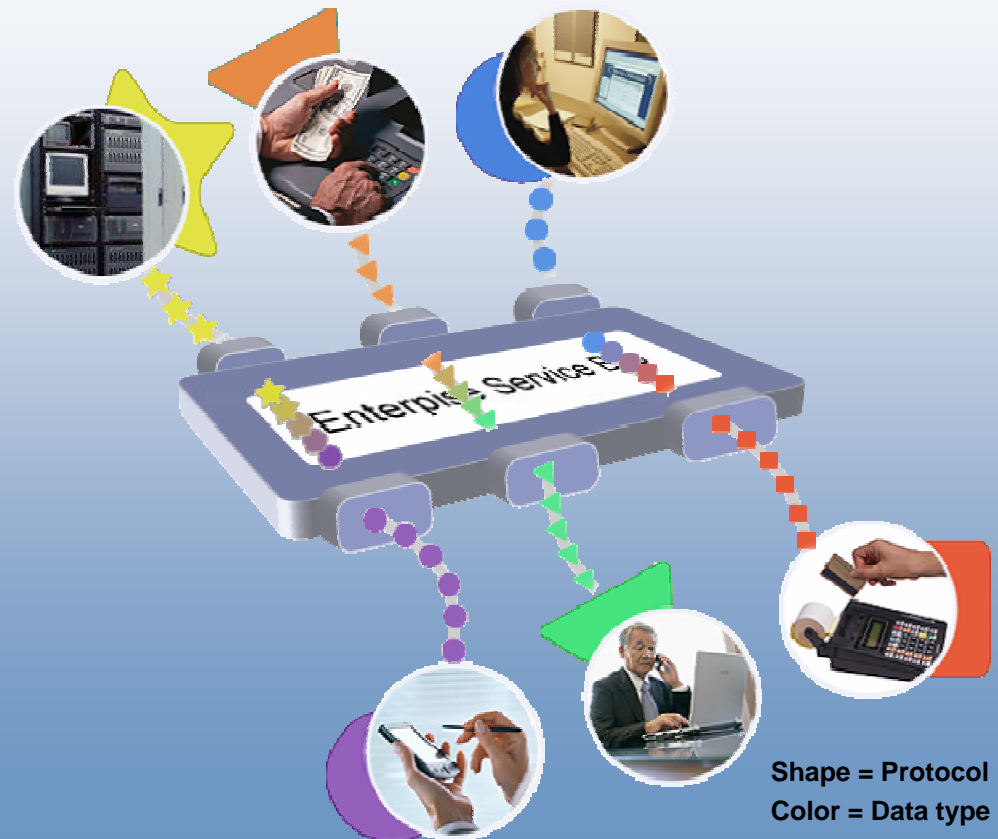
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Enterprise Service Bus – A Definition

An Enterprise Service Bus (ESB) is a flexible connectivity infrastructure for integrating applications and services.
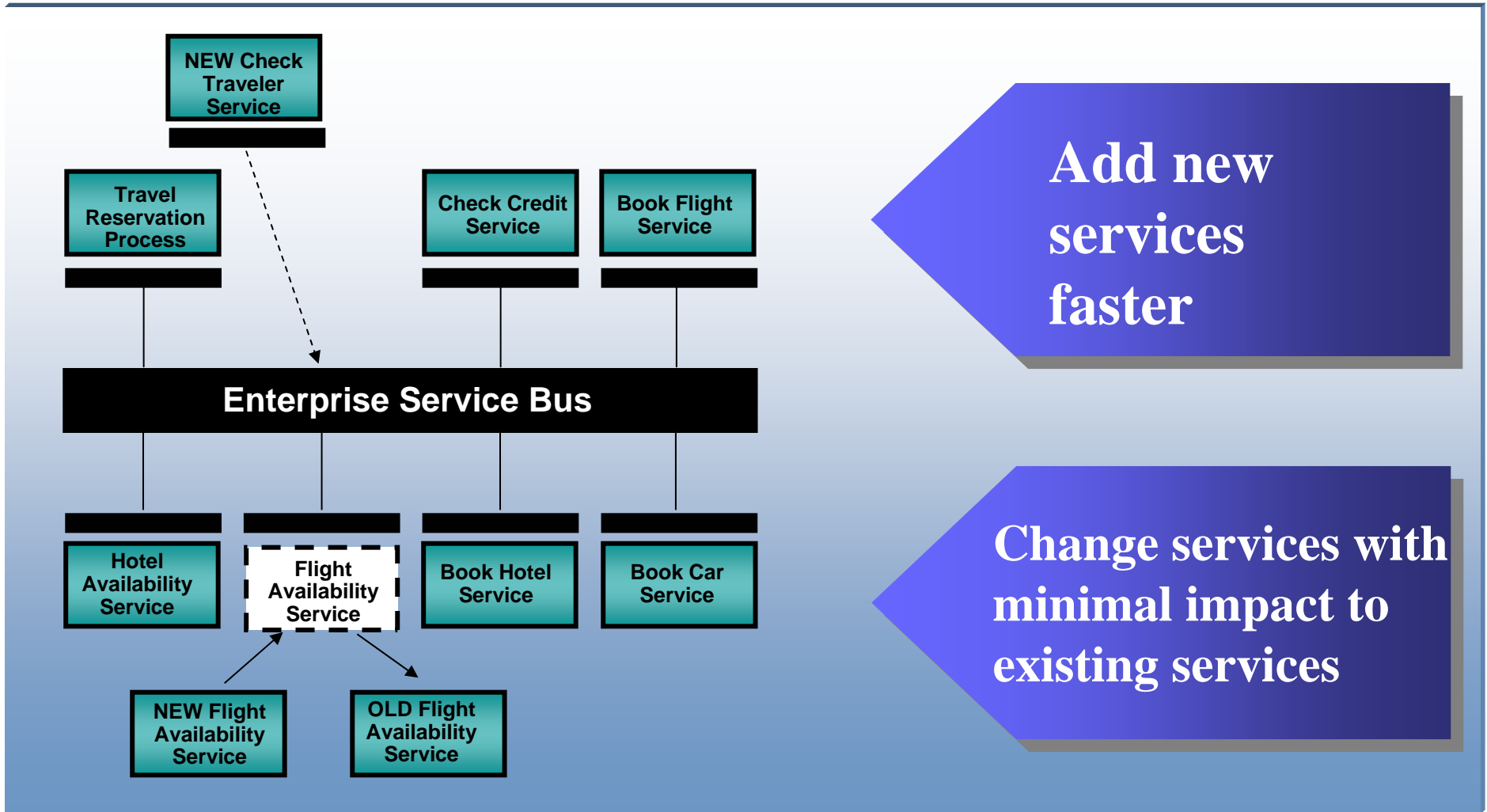
An ESB powers your SOA by reducing the number, size, and complexity of interfaces.

An ESB performs the following between requestor and service

- **ROUTING** messages between services

- **CONVERTING** transport protocols between requestor and service

- **TRANSFORMING** message content between requestor and service

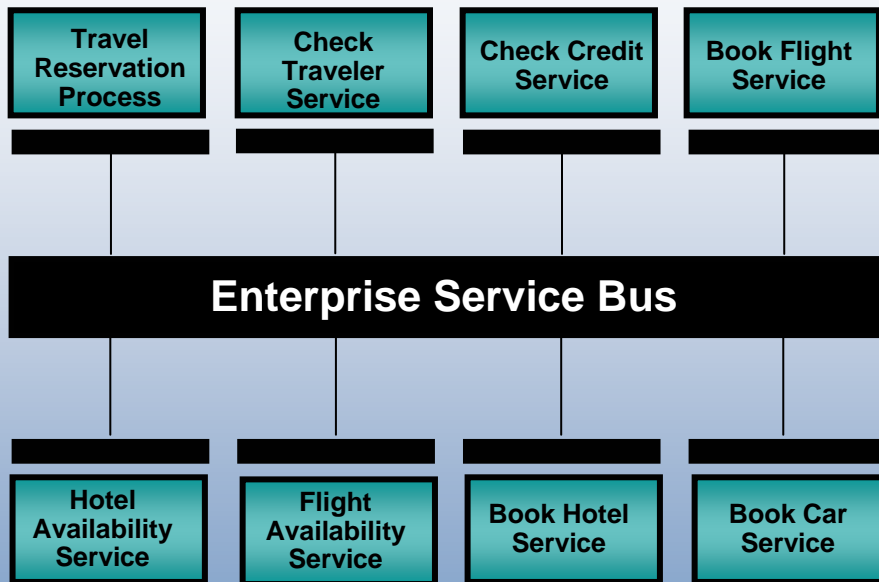- **HANDLING** business events from disparate sources

Enterprise Service Bus

Shape = Protocol

Color = Data type

ESB Value Proposition: Focus on your core business rather than your IT

NEW Check Traveler Service

Travel Reservation Process

Check Credit Service

Book Flight Service

Add new services faster

Enterprise Service Bus

Hotel Availability Service

Flight Availability Service

Book Hotel Service

Book Car Service

NEW Flight Availability Service

OLD Flight Availability Service

Change services with minimal impact to existing services

Two key types of ESB

1 **If all your applications conform to the Web Services standards…**

Travel Reservation Process	Check Traveler Service	Check Credit Service	Book Flight Service

Enterprise Service Bus

Hotel Availability Service	Flight Availability Service	Book Hotel Service	Book Car Service

…then all you may require is an **ESB** focused on standards-based service integration.

2 **If not all your applications conform to the Web Services standards…**

Travel Reservation Process	Check Traveler Application	Check Credit Application	Book Flight Application

ADVANCED **Enterprise Service Bus**

Hotel Availability Service	Flight Availability Application	Book Hotel Application	Book Car Application
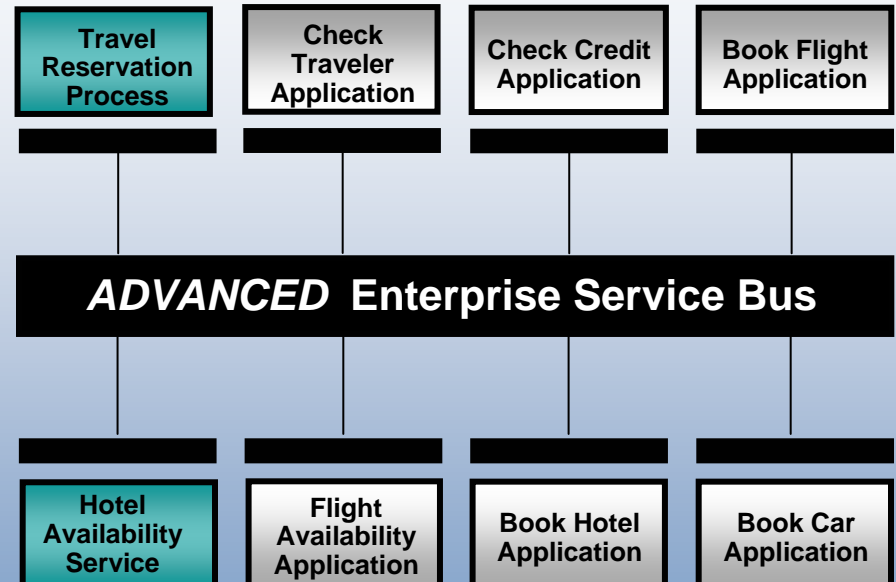
…then you may require a more **advanced ESB** focused on the integration of services with existing non-services assets.

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The Needs of the Business Requires a Flexible Solution

Web User Does Schedule Display on Browser
Network looks for "Schedule Service"

Gets bind information that says "Schedule Service" is native web service and connects directly

Agent User Does Availability Display on "Green Screen"

"Green Screen" not native Web Service so uses Gateway Service to enter the bus

Network looks for "Availability Service"

Bind information says Availability is not

a native web service, use transformation engine

Availability connection made with the

help of the gateway and transformation services of the BUS

Note* The directory is not accessed on every message. Bind information can be built in an build time!
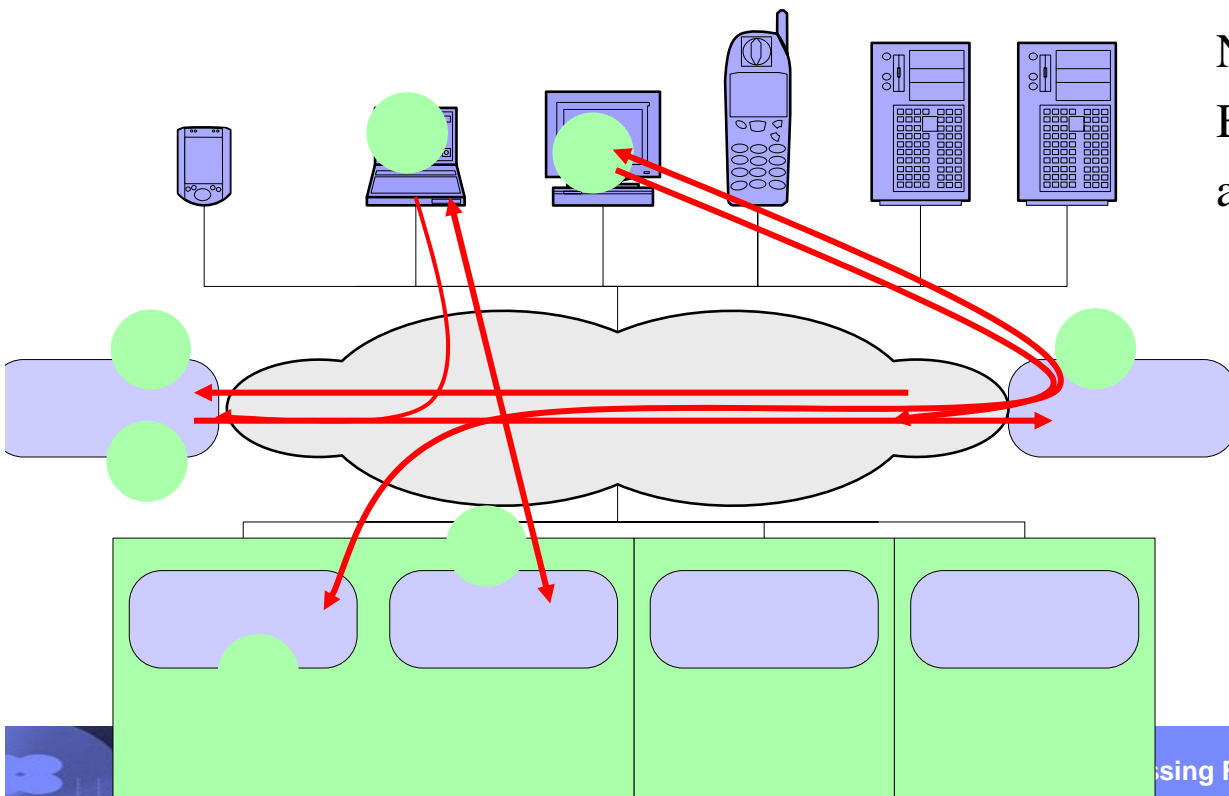
Messaging Oriented Middleware (MOM) is not Web Services

- It is important to understand the difference between MOM and Web Services
  - MOM implies a broker that acts as a central point of control to route <u>all messages</u>
  - Can be used to implement a service architecture, but is not web services
  - Brokers become bottlenecks and cause the duplication of business logic (needed for routing)
- Web Services is different
  - There is no central router or middleware, an intelligent network routes messages point to point when they support the same data and protocol formats
  - Conversion services are only called when needed and business logic is not duplicated
  - The bus (ESB) concept allows for point to point and brokered connections when needed

This is not a Web Services Implementation!
   This is a middleware/MOM design
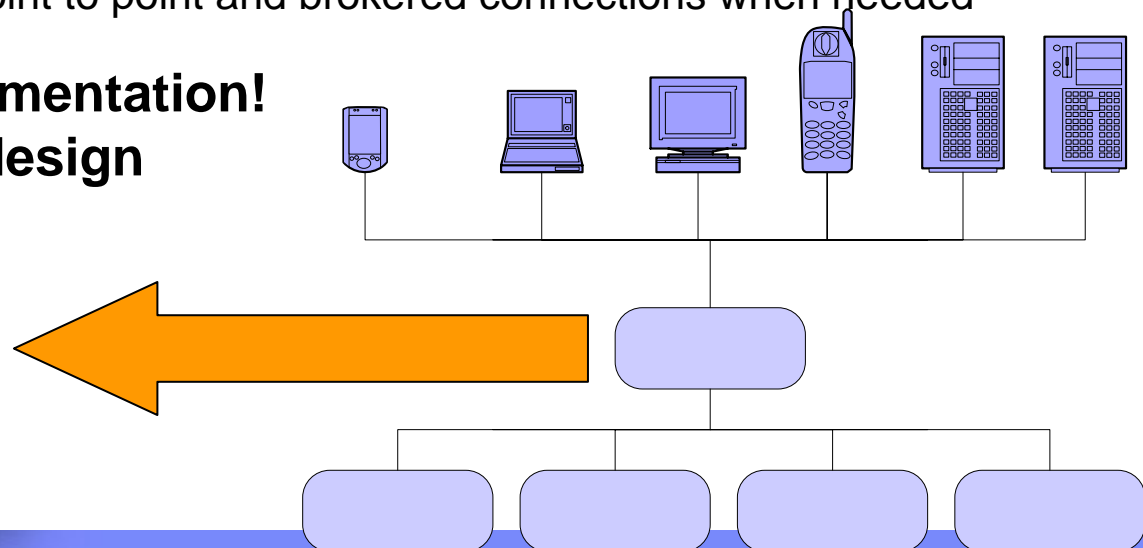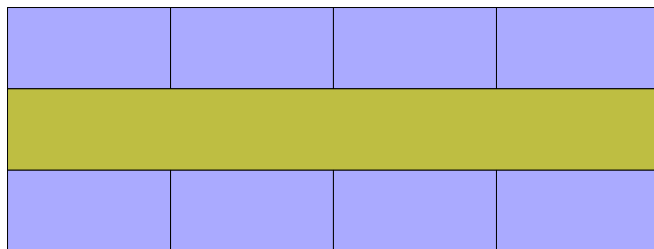
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Z/TPF SOA Strategy

z/TPF : It's Here and It's Ready

Name: Stuart Waldron, STSM
Venue: Main Tent

AIM Enterprise Platform Software

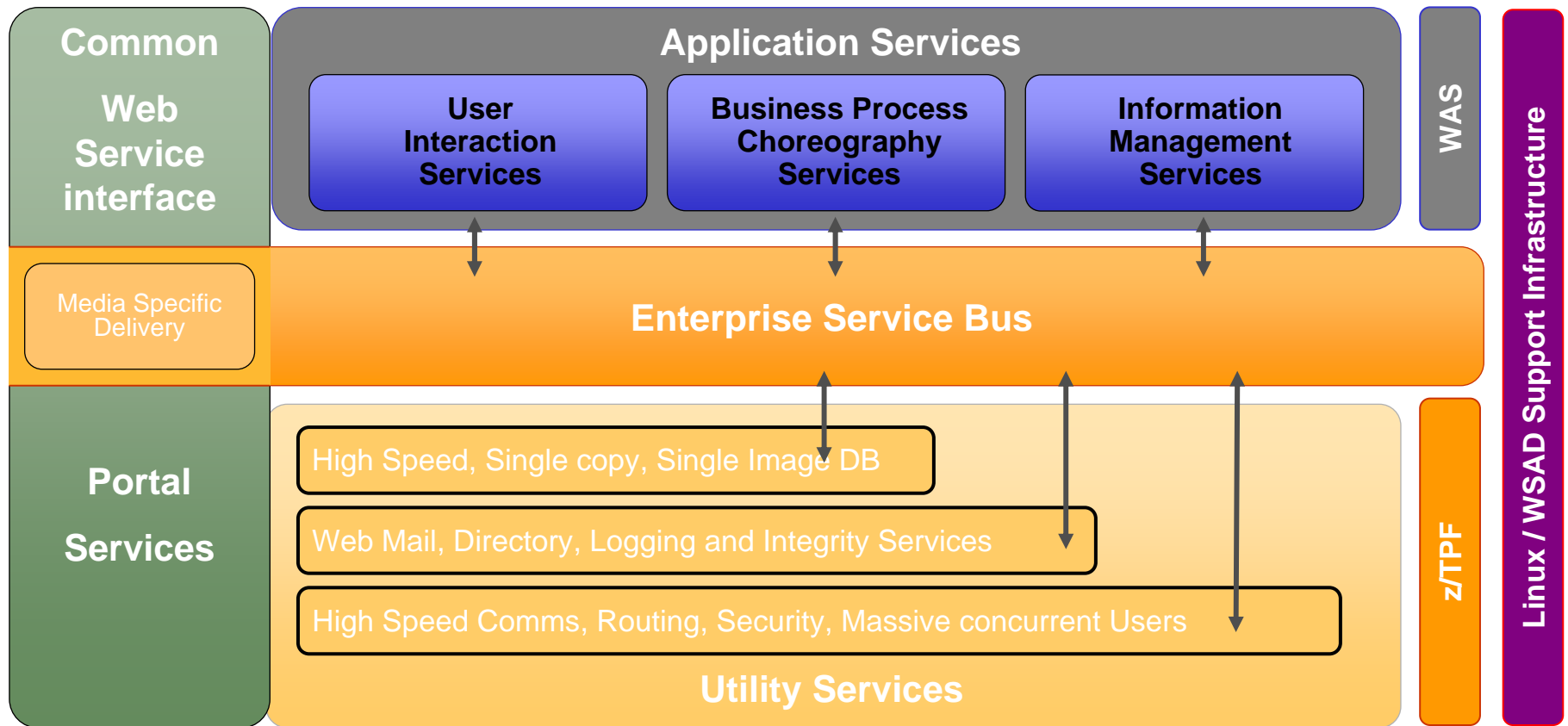IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

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Service Oriented Architecture with z/TPF

Sophisticated Business Logic

Common Web Service interface

Media Specific Delivery

Portal Services

Application Services

| User Interaction Services | Business Process Choreography Services | Information Management Services |

WAS

Enterprise Service Bus

High Speed, Single copy, Single Image DB

Web Mail, Directory, Logging and Integrity Services

High Speed Comms, Routing, Security, Massive concurrent Users

Utility Services

z/TPF

Linux / WSAD Support Infrastructure

Heavy Lifting, QoS, Price Performance

*WAS – WebSphere ® Application Server

z/TPF / zSeries Strategy

Data Analysis

Accounting

Data Transform

Licensing

z/TPF

Business Applications

Customer Preferences

Business Applications

Customer Detail Records
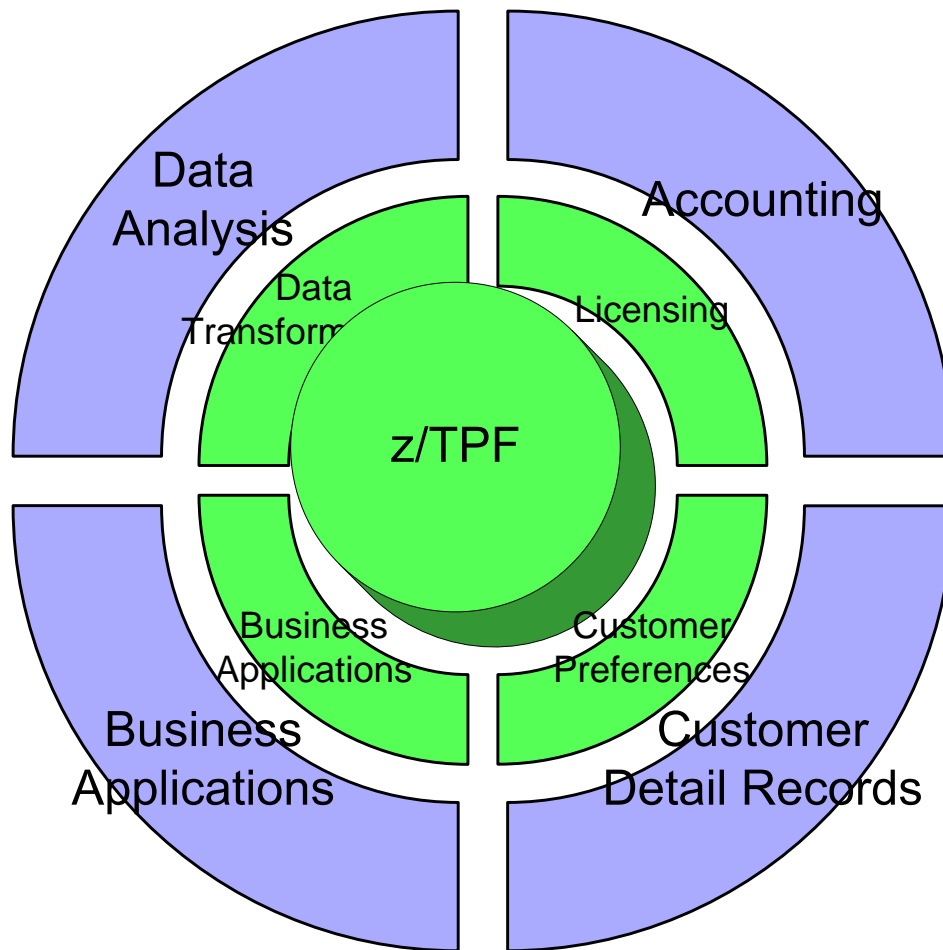
- **z/TPF on zSeries providing vertical scaling for high I/O and critical processing (center, green)**
  - TPF holds single image databases, network processing, logging, etc.
- **Linux on zSeries providing a horizontal sale, commodity cost and processing model (green)**
  - Running most business logic, using z/TPF as a data source for critical records for restart at near zero latency
  - Linux images largely non persistent (stateless) and don't have to be fault tolerant (because TPF is)
- **Outer ring on commodity HW and SW (blue)**
  - Suitable for business processes where latency to z/TPF core is acceptable

z/TPF / zSeries Strategy "The non mainframe"

- Gradually moving most business logic to a highly productive environment such as WebSphere
- Move as much of that logic as possible to cost effective commodity servers running Linux
  - With near zero latency and IFL, Linux on z is also very competitive
- z/TPF provides fault tolerant QoS where needed
  - Linux can now be used for much more than by itself
- z/TPF development and support is Linux based
  - Hence you have mainframe QoS with an <u>all Linux support model</u> with much of the business processing on commodity HW and SW
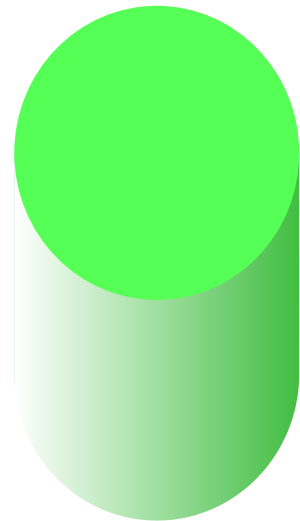
Server Architectures

- Typical UNIX architecture, an application tier(s) connected to a DB tier
  - Many are considering moving the application tier to Linux, leave the DB tier on UNIX

- A similar architecture is possible on the zSeries server
  - An application tier on Linux on z (or outboard on blade if latency tolerable)
  - A DB tier on TPF for high volume and high availability needs
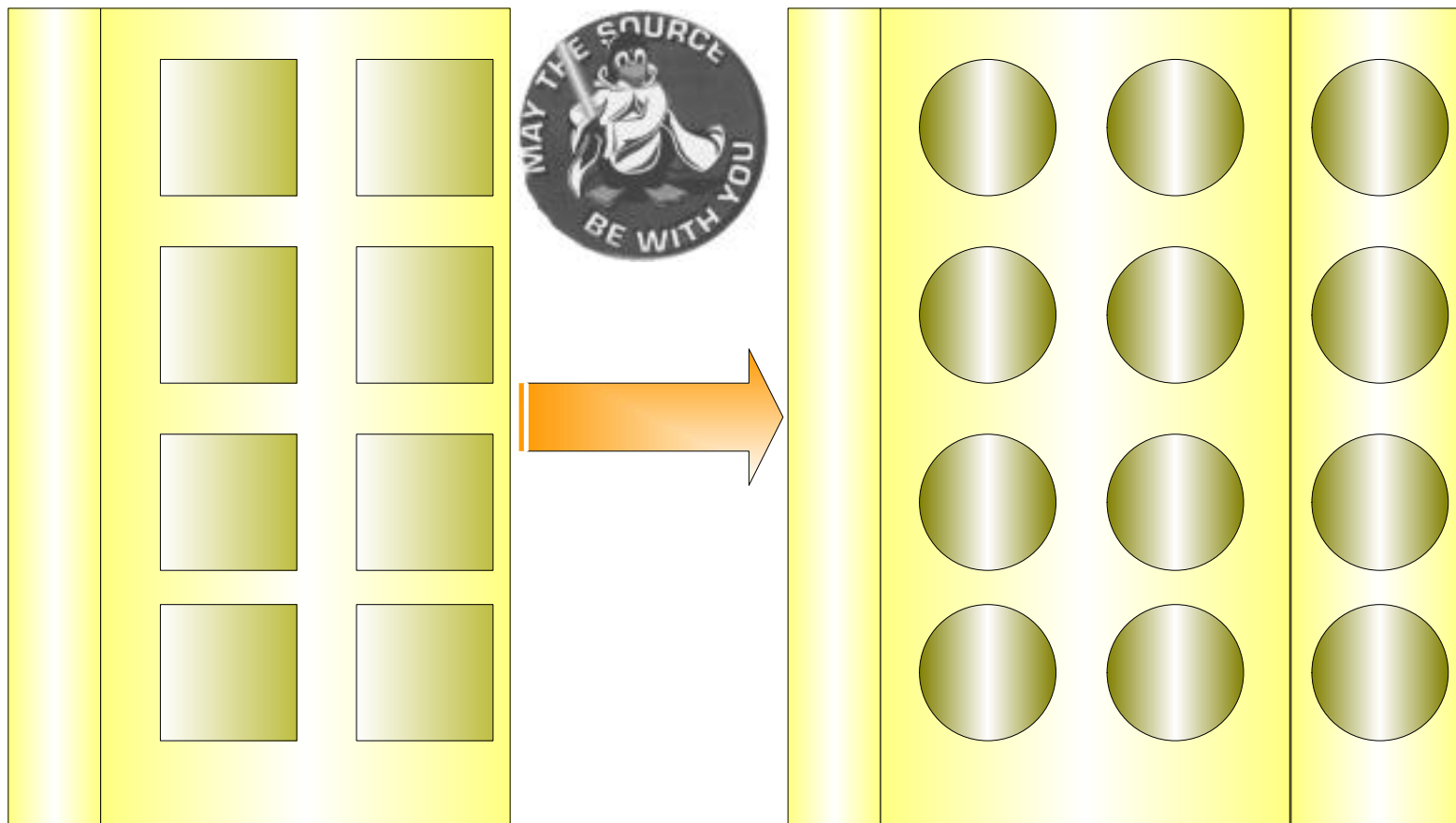 - A DB tier on UDB on Linux for other needs

Application Tier
DB Tier RDBMS
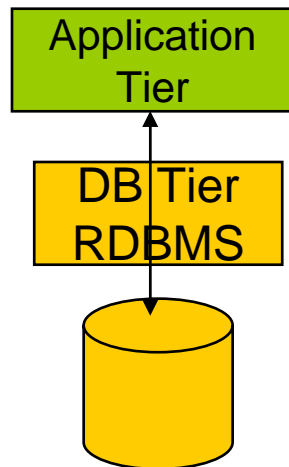
Targeted for Linux

CPU cycles wasted by tier to tier latency

Create an "Application Tier" in Linux on z

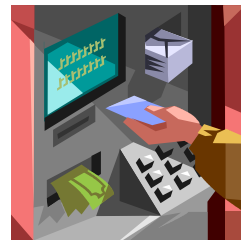All the same z box , zero latency LPAR to LPAR, use cheaper IFLs for Linux

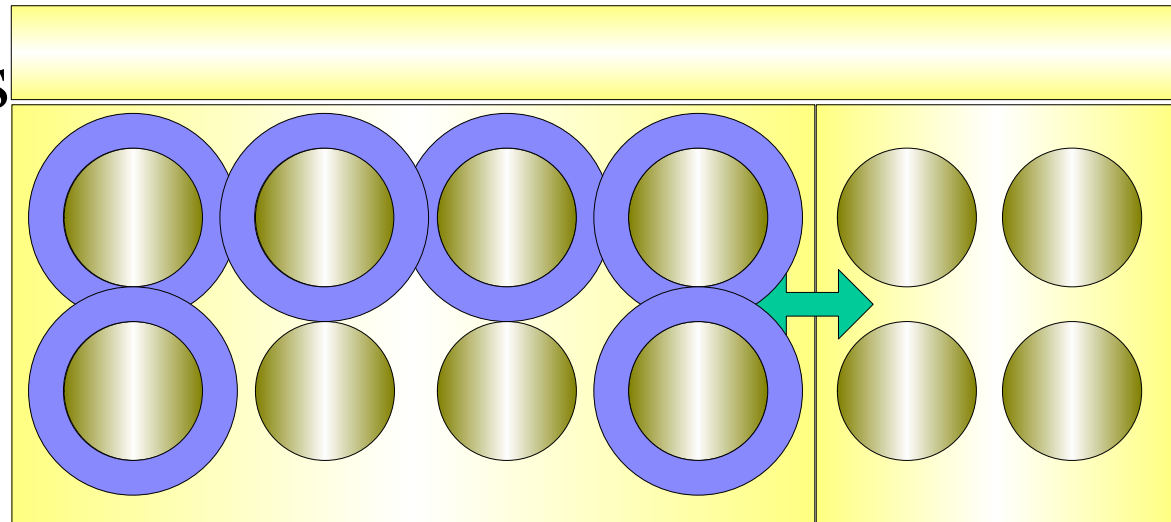| Application Tier |
| --- |
| DB Tier TPF |
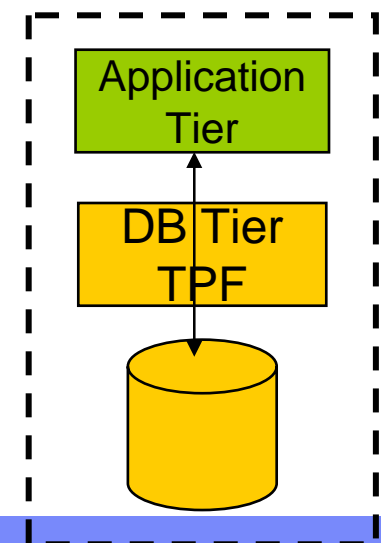
Transformation of Legacy Assets

Transformation of Legacy Assets

- Legacy assets repackaged to match actual usage pattern

- Access methods replaced with a services model
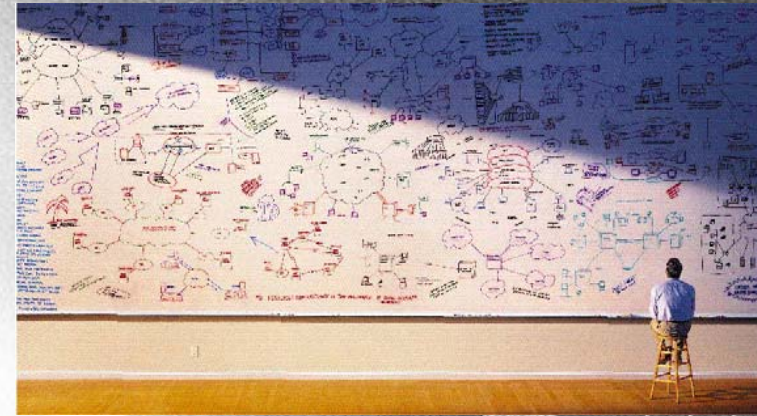
- Common support model

Network of Business Services

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The Problem We are Trying to Solve

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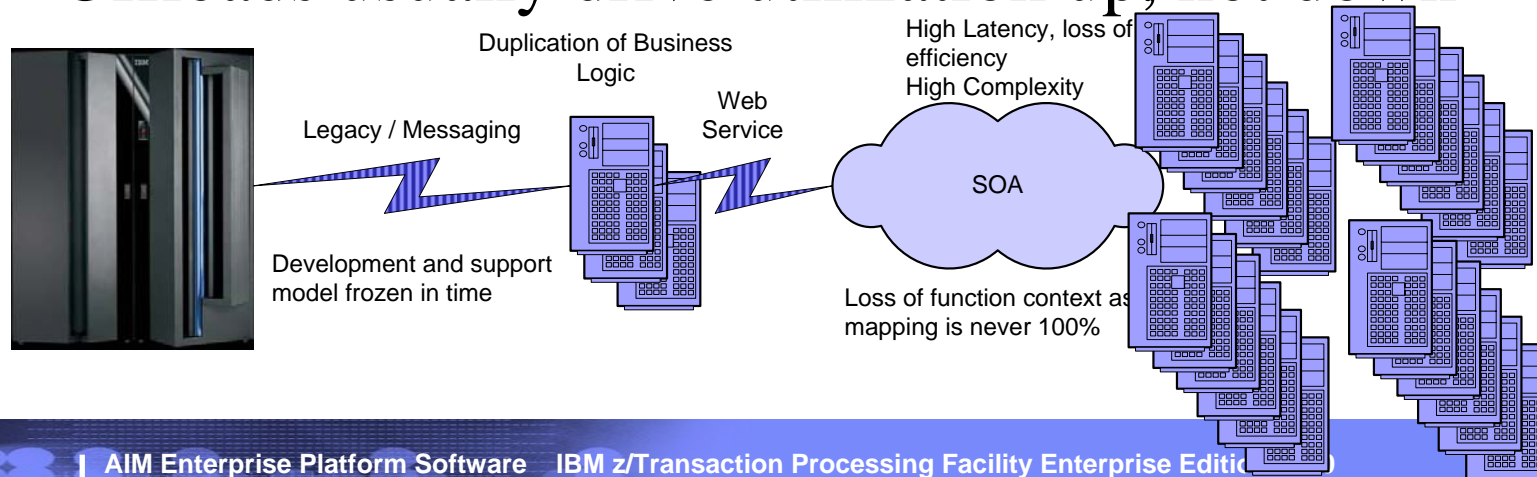
TPF Today

- ## TPF 4.1
  - ### z/OS development model
    - Lack of skills, lack of open support, lack of tooling
  - ### 31 bit memory
    - Insufficient for web services, C++ and Java
  - ### Stratified or "Cocoon" Architecture
    - Surround TPF with new architectures but don't change it
    - Requires more specialty skills
    - Leaves business function as one large monolithic block

Current TPF Applications

TPF Today

- ## Stratified architecture

  - – Supporting legacy development and communications
  - – Duplicating business logic in mid-tier servers to be able to map services requests
  - – Inefficient use of servers due to wait time (latency)
  - – Offloads usually drive utilization up, not down

Duplication of Business Logic

Web Service

High Latency, loss of efficiency
High Complexity

Legacy / Messaging

SOA

Development and support model frozen in time

Loss of function context as mapping is never 100%

z/TPF

- z/TPF 1.1
  - Open development model
    - Commodity skills, commodity tooling
  - 64 bit memory
    - Foundation for newer technologies
  - Inclusive or shared Architecture
    - z/TPF now a vertically scaling part of a distributed system
    - Promotes the componentization and distribution of function

5 Year Plan
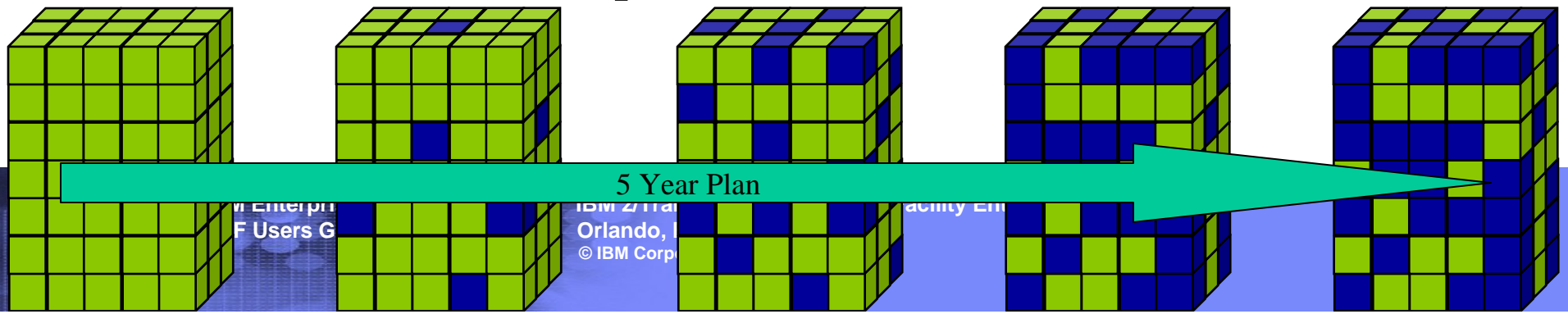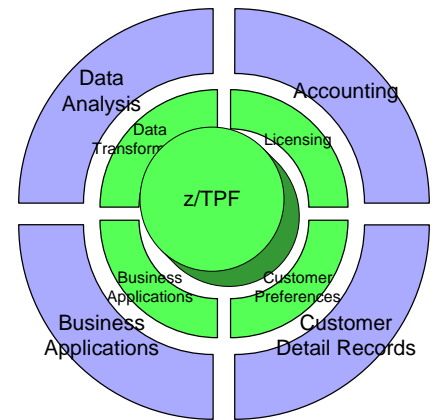
Linux and z/TPF

- Cost Savings
  - Lower Direct Development Costs
    - Commodity skills
  - Higher productivity
    - Higher level languages, better tooling, porting code
  - High utilization of components
    - z/TPF and virtual Linux servers connected with zero latency
  - Better composite cost model of Linux on IFLs, Blade servers and z/TPF on workload charging
    - z/TPF "sweet spot", low pathlength with high I/O
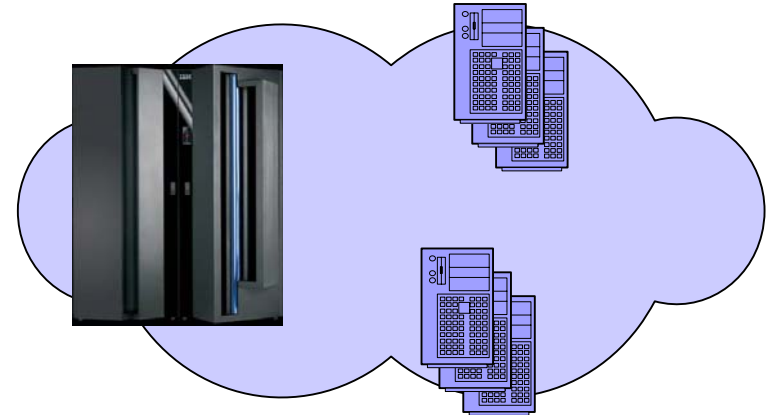
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Migration Assistance

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Information

- z/TPF Migration Portal

  http://www.ibm.com/tpf/ztpfmigration

  – z/TPF Migration Manual

  – TPF Users Group Presentations

  – TPF Newsletters

  – z/TPF Frequently Asked Questions

  – Links to related subjects
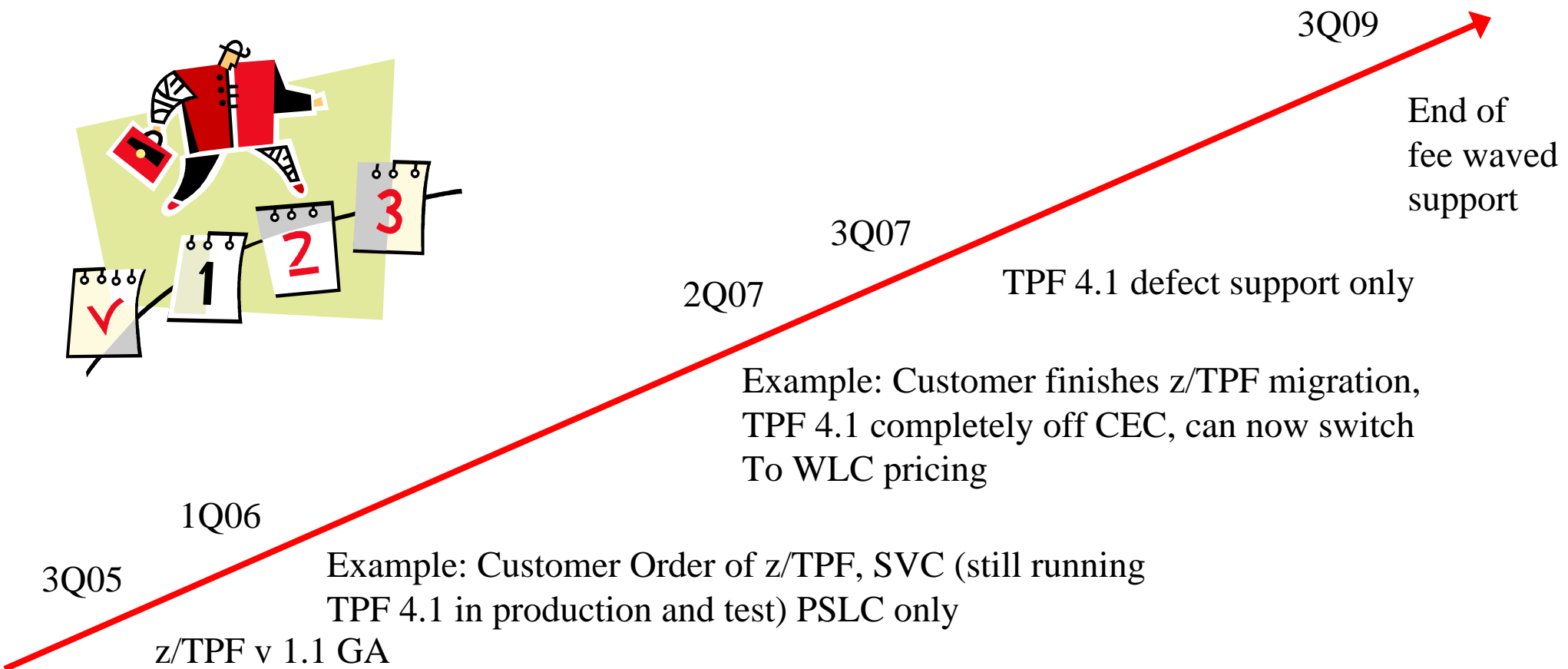
  – And more !

z/TPF

Migration Updates

- TPF 4.1 Service beyond end of service date
  - End of Service date 9/07
  - IBM commitment to provide defect support only for TPF 4.1 through 9/09
- Single Version Charging
  - IBM is offering a program known as SVC
  - It allows a customer to purchase a z/TPF 1.1 license, paying only that license fee and run both z/TPF and TPF 4.1 on the same box for up to 24 months
- A PRPQ for HLASM running on Linux on z will be available by year end (currently mid-November)

Sample Migration Timeline

3Q09

End of
fee waved
support

3Q07

TPF 4.1 defect support only

2Q07

Example: Customer finishes z/TPF migration,
TPF 4.1 completely off CEC, can now switch
To WLC pricing

1Q06

3Q05

Example: Customer Order of z/TPF, SVC (still running
TPF 4.1 in production and test) PSLC only

z/TPF v 1.1 GA

Code Conversion Tools

- Convert registers instructions
- Convert 31 and 32 bit values to 64 bit register values
- Convert (most) branch instructions
- Convert appropriate literal instructions to immediates
- Convert macro names as needed
- Convert obsolete SPMs
- Convert $ to underscore

- Convert long data types to integers
- Convert TPF4 build scripts to z/TPF makefiles
- Build the GCC cross compiler
- Convert usrtpf.cntl file
- Add /tpf to the headers
- Remove trigraph statements
- Remove trailing blanks after "/" in macros

Single Source APARs, example

- PJ29575 -- Add PTR32 type definitions
- PJ29630 -- Add the time_t32 and size_t32 definitions
- PJ29593 -- Add wrappers for header file changes and for the tpf directory
- PJ29576 -- Provide single-source packed decimal support
- PJ29692 -- Add the CPROC and CALLC macros
- PJ29640 -- Add the PRLGC, EPLGC, CSTKC and PBASC macros
- PJ29849 -- Add support for floating point migration (HFP and BFP)
- PJ29980 -- Provide API for conversion between native and HFP or BFP
- PJ29937 -- Add gettimeofday() to sys/time.h from sysgtime.h
- PJ29957 -- add time zone (TZ) environment variable

Single Source Issues, example

- Loading the program base
- Using the ECB register save area
- Accessing the program name and nesting information
- Handling moving code at execution time
- Eliminated $ from file names and macro names
- Defining transfer vectors and data programs
- Calling C/C++ programs from assembler programs
- C / C++ library routines written in BAL
- Code relocation
- Large block sizes for tape
- TPF 4.1 Fixes available

IBM Software Group

z/TPF Planning

z/TPF : It's Here and It's Ready

Name: Stuart Waldron, STSM

Venue: Main Tent

AIM Enterprise Platform Software

IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

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PUT Status

- **PUT 20 (TPF 4.1)**
  - MQ enhancements
    - Channels, remote admin, JMS
  - Comms
    - PCICA, CPACF, TCP/IP enhancements, session rebalance
  - Debugger Enhancements
  - z/TPFDF enhancements

- **PUT 2 (z/TPF)**
  - Comms
    - Poll(), Crypto Express 2 (CEX2A, CEX2C), clean up sockets on soft IPL, IP trace with open tools
  - CP I/O measurement support
  - XML APIs
  - Loader enhancements
  - Norm State Pool Reallocation
  - Sub Capacity Reporting
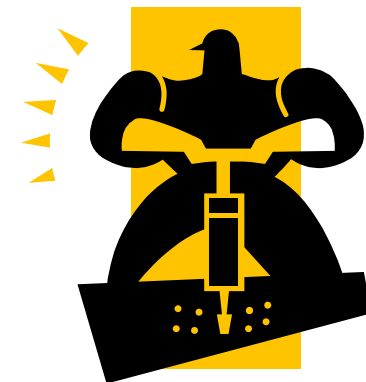
IBM

IBM Software Group

z/TPF Provisioning

z/TPF : It's Here and It's Ready

Name: Stuart Waldron, STSM

Venue: Main Tent

AIM Enterprise Platform Software

IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

z/TPF EE 1.1 Pricing Directions

- Adopt mainstream pricing models
  - Discontinue Model Group, ELC and HPO pricing (PRPQ)

- Parallel Sysplex License Charge (PSLC)
  - MSUs in a single LC complex aggregated*

- WorkLoad Charging (WLC)
  - Very Similar to what is currently offered for z/OS®
  - Based upon 4 hour rolling average
    - Acts as a monthly high water mark
  - MSUs in a single LC complex aggregated*
  - Sub Capacity Reports (SCRT) to be sent by Customer Monthly
  - eWLC (and zELC) for z800 and z890

* Statement of
Direction

z/TPF EE 1.1 Pricing Directions

- WLC

  – Workload License Charges is a monthly license pricing metric designed to support today's on demand business requirements

    - Grow hardware capacity without necessarily increasing your software charges

    - LPAR-level granularity

    - Experience a low cost of incremental growth

    - Manage software cost by managing workload utilization

  – To qualify the customer must follow a LPAR naming convention and produce a valid SCRT report

SCRT Example, 2064-110 rated at 327 MSUs

Actual

Peak

Highest Rolling

4 hour average

(used for billing)
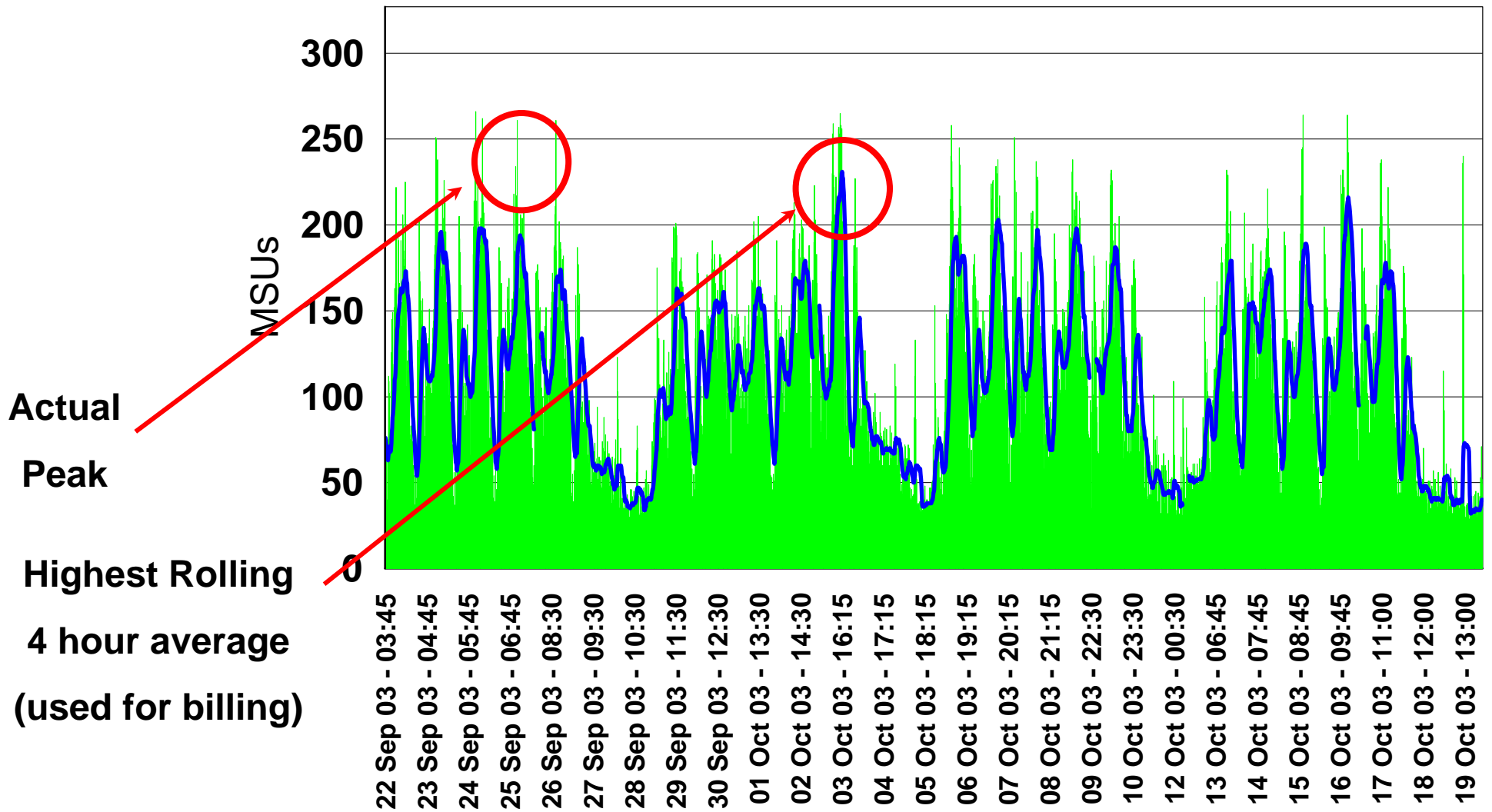
z/TPF EE 1.1 Pricing Directions

- EWLC
  - Entry Workload License Charges, In support of an on demand operating environment, IBM offers Entry Workload License Charges (EWLC) for z800 and z890 customers
    - EWLC enables qualifying z800 and z890 customers to pay for sub-capacity eligible IBM software based on the utilization of the LPAR or LPARs where that product executes
    - z800 standalone customers may choose to adopt EWLC pricing. The other option for z800 standalone customers is zSeries Entry License Charges (zELC).
  - http://www.ibm.com/servers/eserver/zseries/swprice/

SCRT Example, 2086-470 rated at 208 MSUs

Two Sources of data:

z/TPF itself **(1st priority data, usually what production will report**

PR/SM **(2nd priority data, what test systems will report**

Rolling four

hour average

Partitions

Real CPUs

LPAR1	LPAR 2	LPAR 3	LPAR 4
85%	80%		
z/OS	z/TPF	z/TPF	Linux
DB2	z/TPFDF	z/TPFDF	
CICS			

CP1	CP2	CP3	CP4	IFL

z/TPF EE 1.1 Pricing Directions

- SCRT
  - Sub-Capacity pricing, for either EWLC or WLC, requires the customers fully migrate all z/OS® and z/TPF licenses to utilize the Sub-Capacity Reporting Tool to generate Sub-Capacity Reports. These Sub-Capacity Reports must be generated and sent via e-mail to IBM each month
  - IBM must receive the report by the 9th or full capacity is assumed
  - You must report for 95% of the period
  - z/TPF will write SMF 72 and 89 records to tape, to be processed by z/OS®
  - SCRT support is targeted for PUT2
    - z/OS® could be used to support z/TPF
- IBM plans to use SCRT to introduce a variety of initiatives for z/TPF aimed at reducing the total cost of ownership when running new workloads

Why a Penguin?

- *Linus Torvalds, the creator of the Linux Kernel, was visiting his friend Andrew Tridgell, the creator of the Samba suite. They were walking through the Zoo in Canberra when, without warning, a huge flock of vampire attack penguins dove out of the sky and tried to carry Linus away. Fortunately, Andrew had an umbrella. Still, one of the birds was able to nip Linus' hand with its fanged beak. Rumor has it that on moonlit nights Linus still runs out into the darkness and jumps, stark naked, into icy water. Of course, he's Finnish and may always have done this. In any case, this is why the Penguin is the Linux Mascot.*

What Else is IBM Doing ?

- Today
  - z/TPF Test, Drivers, Automation and Performance   Kevin Jones
  - z/TPF Maintenance   -   Brian Laferriere
  - z/TPF Programming Model   Mike Shershin
  - ??   Mark Anzani
- Tomorrow
  - z/TPF File Systems   z/TPFDF Update
  - z/TPF Enhancements of Interest for Appl Programmers   SOA Discussion
  - TPF Toolkit   TPF Operations Server
  - z/TPF Information Center   z/TPF TCPIP
  - z/TPF Cryptography   Networking Announcement
- Wednesday
  - An Introduction to Linux   Debugging z/TPF Dump

- Tonight – IBM's Hospitality Suite
  - Demos of many of the functions you will be hearing about today and tomorrow
  - Plus additional topics such as Tivoli, and IBM Storage, IBM Services and Education Offerings

Please be sure to bring your card to receive your gift

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