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Mainframe Optimization System z the Center of Enterprise Computing

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SHARE in Anaheim 2012

Presentation Abstract:

- This presentation will highlight some of the modern-day capabilities of the mainframe and how these four capabilities are helping organizations compete today. We will look at four examples of utilizing the mainframe.
  - Illustrate how to perform uber-virtualization - how a single box can support an entire life-cycle on a small foot print (the private cloud)
  - Illustrate how some of the largest SAP implementations leverage the mainframe for scale and cost.
  - Illustrate how Oracle can scale cost effetely on a private cloud.
  - Illustrate a complex ecosystem built on z/OS, Linux, and Windows all running on the modern-day Mainframe.
- In summary one will gain an appreciation for the new capabilities that the modern-day mainframe provides to organizations.

Objectives

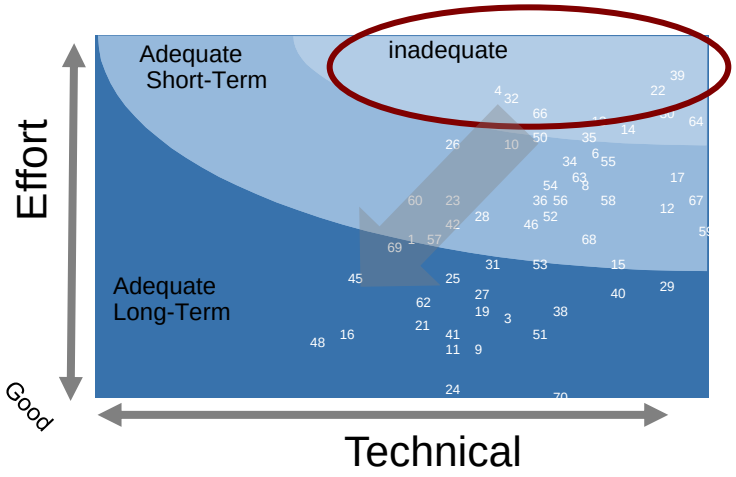
- Review the value proposition of the System z in enterprise computing
  - What are the options on the mainframe
    - Uber- virtualization / Private cloud
    - SAP on System Z
    - Oracle super scaling
    - Enabling COBOL - z/OS workload to run on Linux for System z
  - The mainframe is not dead and neither is COBOL

Mainframe Optimization

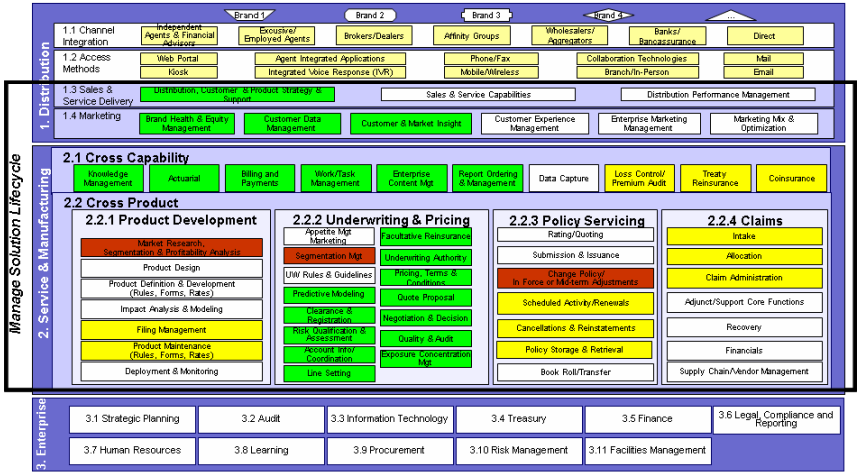
Prioritizing the work and measuring the benefits during the journey

- Accommodate changes in business imperatives
- Proactively understand the affects of the different levers within the portfolio
- Measure and monitor the progress – focus on the quantifiable results

Continuously prioritize the portfolio



Show the progress using a business view

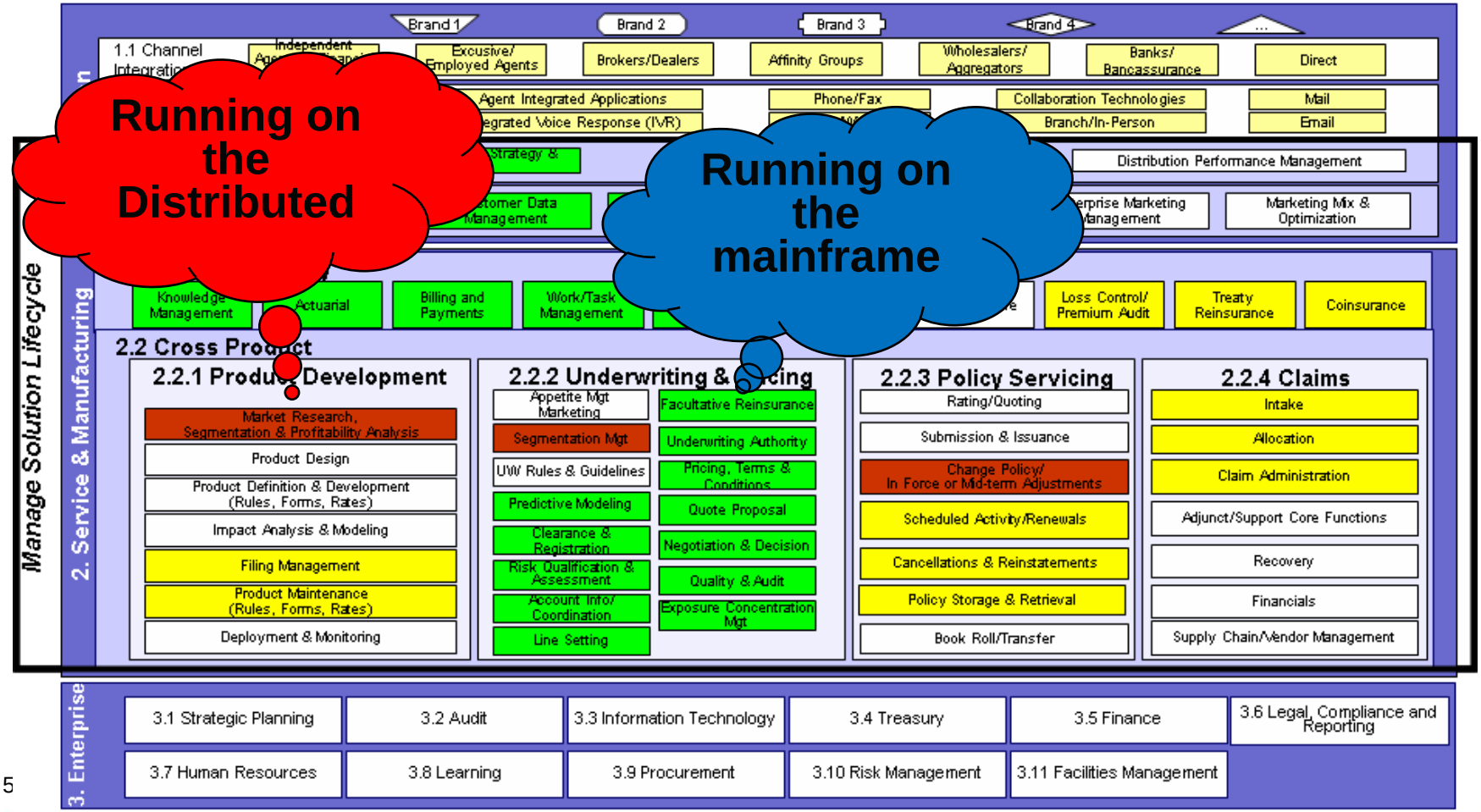


Business focus view showing the results keeps IT aligned with the changing business imperatives

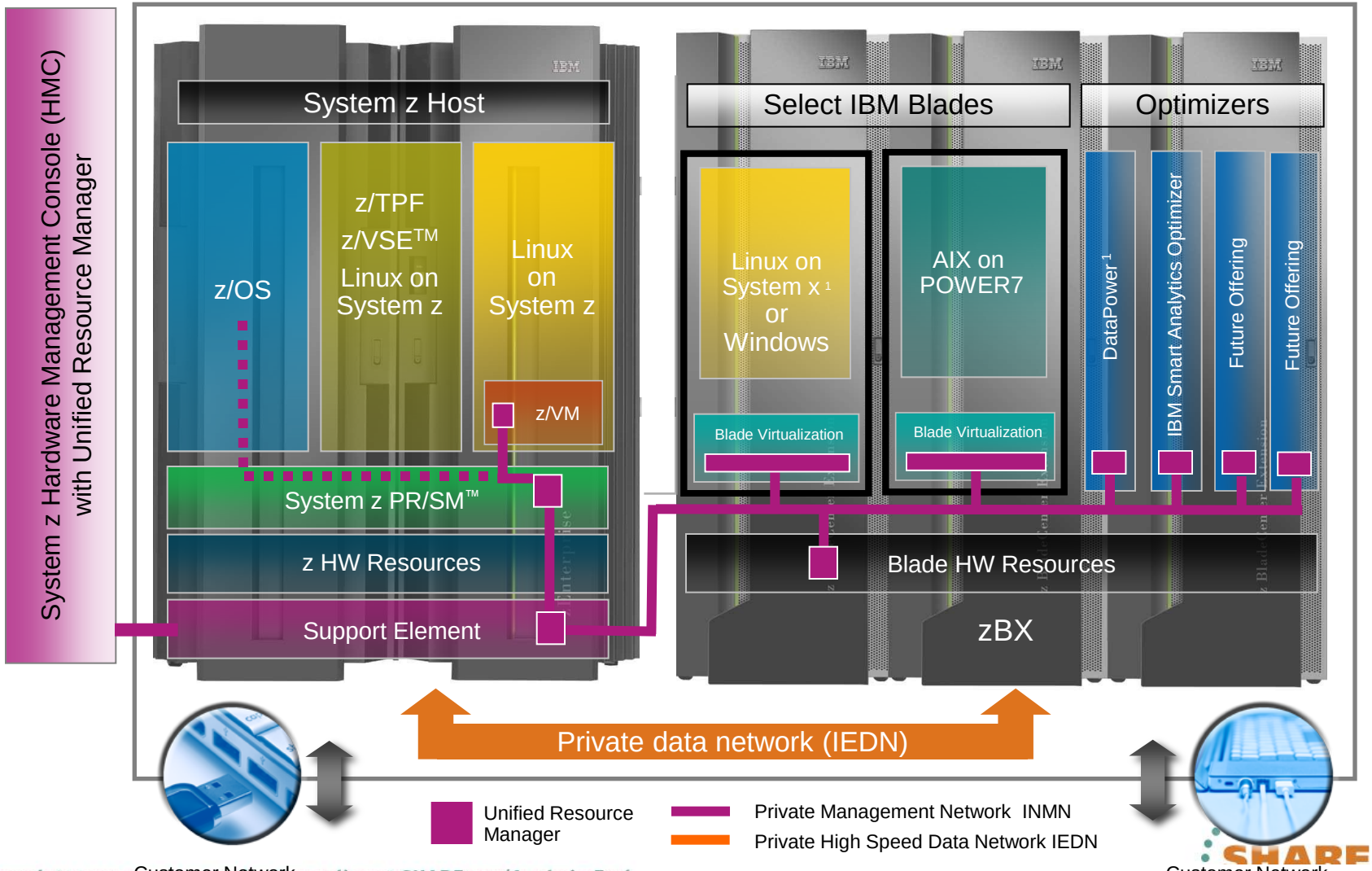
Illustrative Key of Complexity:
Orange = High Yellow = Medium
Blue = Normal Others = not in scope

Mainframe Optimization

Understanding where the business runs



Uber-virtulization
everything that works together under one umbrella
“Think outside the box but deliver within the box”



Server Consolidation / Private Cloud - Running the Organization on a Box

Leveraging LPAR technologies enables organization to exploit cost effective, scalable, and stable Open Source deployment:

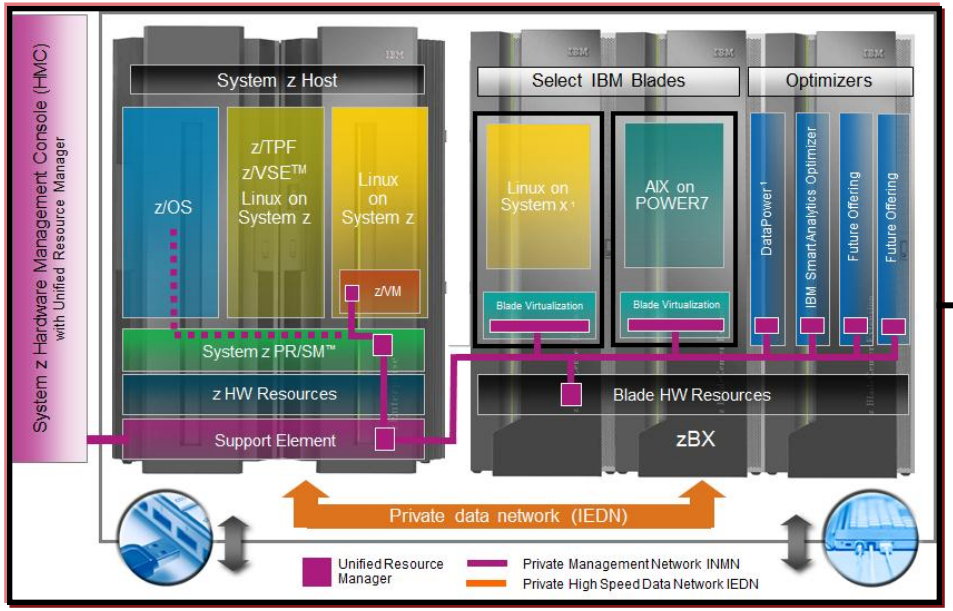
- The ability to co-locate tightly coupled workloads/solutions
- The ability to optimize hardware during functional consolidation
- The ability to prioritize (share) hardware to meet business needs (Dev/Test/Prod)
- **The ability to move running workloads from one CEC to another (new with z/VM 6.2)**

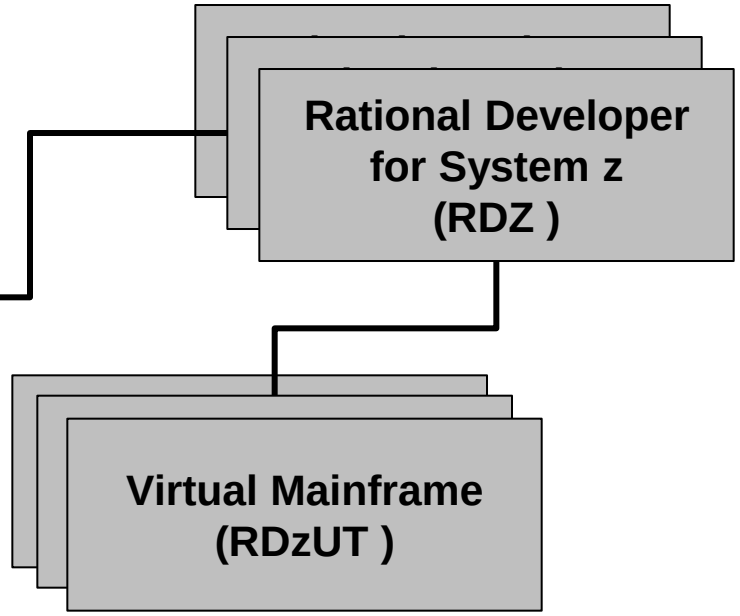
Development	LPAR	Development Support	LPAR	System Integration	LPAR	User Acceptance	LPAR	Production
Development App -01		SCM –		System Test App -01		UAT Test App -01		Prod App -01
Development App -02		Build Server		System Test App -02		UAT Test App -02		Prod App -02
…		Document Repository		…		…		…
Development App -nn		Requirements Repository		System Test App -nn		UAT Test App -nn		prod App -nn
Sandbox		Test Scripts		System Test DB-01		UAT Test DB-01		prod DB-02
Misc		Development Database(s)		System Test DB-02		UAT Test DB-02		Prod DB-02

Virtual hardware platform

SAN / NAS

Lowering the cost of development MIPS with RDzUT





- To reduce total MIPS – the use of RDzUT can be added to the development ecosystem to offload development and unit test MIPS
- To provide new capabilities
  - Isolated LPAR for upgrade testing
  - Isolated for interface / external testing
  - Operational training

Value Proposition: Oracle Consolidation

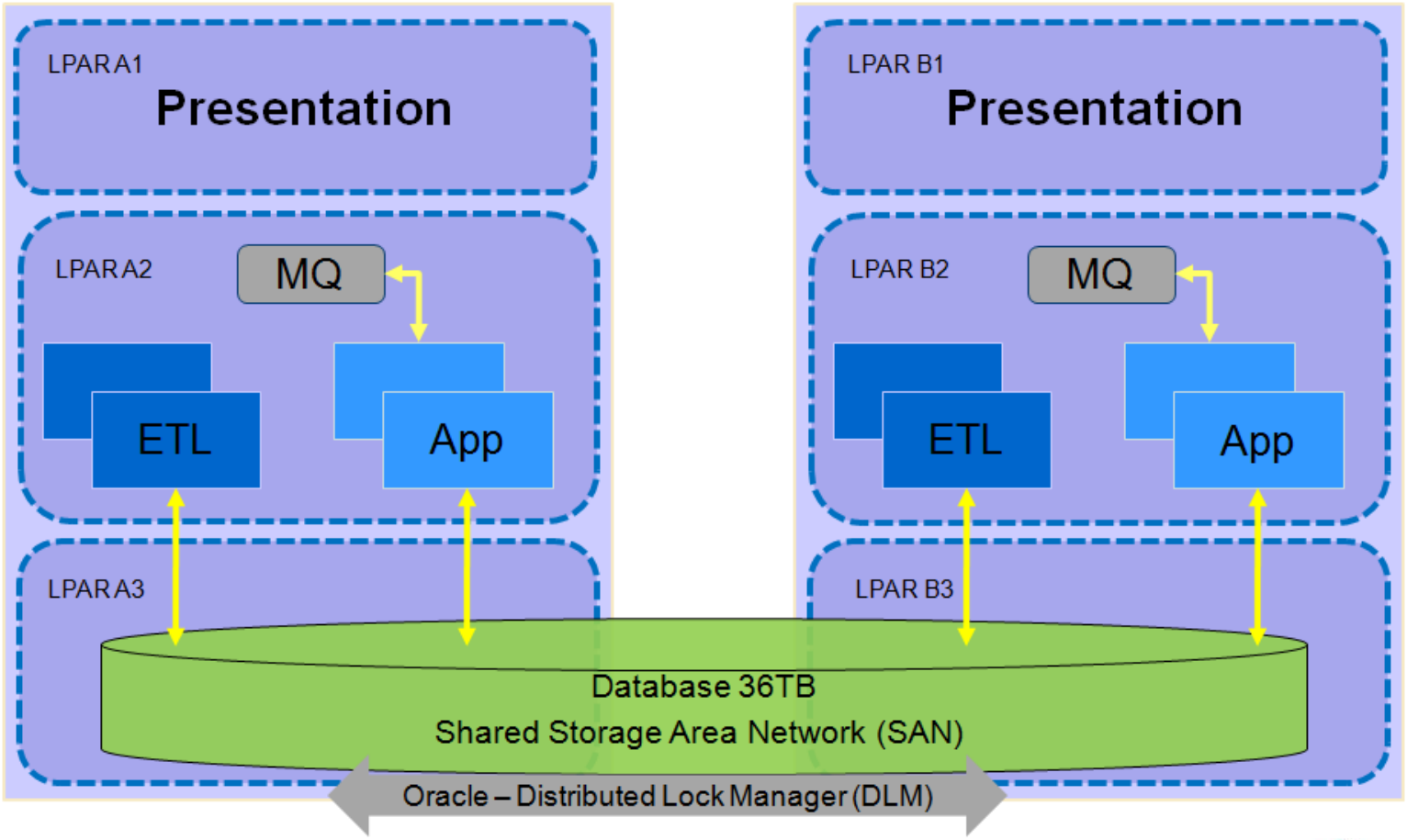
Global Company

- Achieve super scalability on a small footprint
- Oracle software costs reduced by 85%*
- Physical footprint reduced by 80% (3 Racks vs. 15 racks)**
- Background
  - 2 Node OracleRac Cluster
  - >36TB
  - Single tables of 3+ Billion rows
  - Full primary and foreign keys
  - Indexes
  - Referential Integrity turned on
- Results Achieved
  - Over 7 hours the application averaged >240,000 TPS
  - Multi-row inserts / updates
  - CPU utilization was ~50% on the Oracle server
  - Application is Java running on the IFL and there was ETL from Informatica

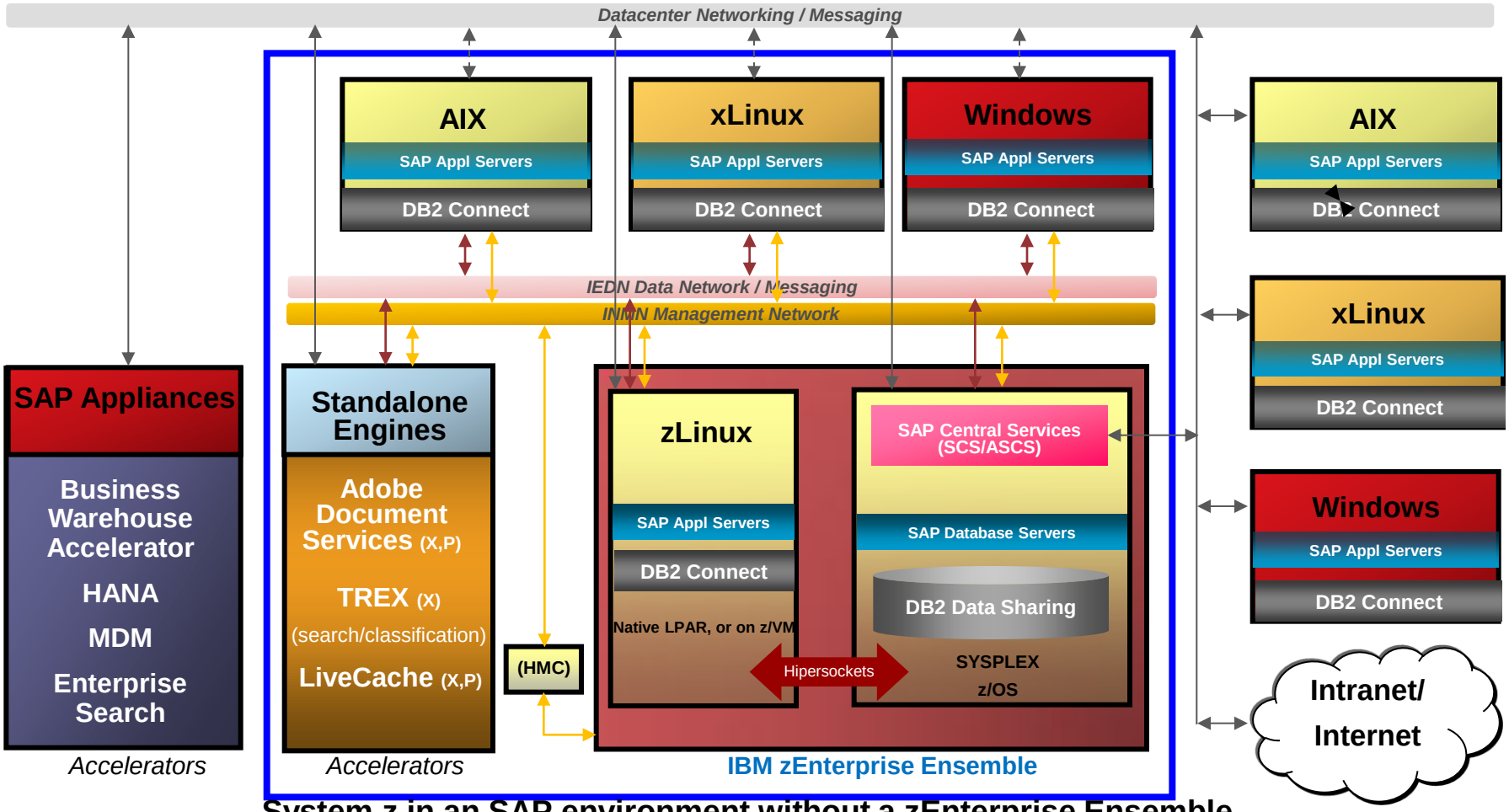
* Oracle would have required 224 Intel processors to support the same load or 4 node Superdome plus equivalent hardware for just production DR

** excluding Disk

Oracle
- Achieve Super Scalability on a Small Footprint



SAP on System z Solution Architecture of today:
Workloads are inherently heterogeneous



System z in an SAP environment without a zEnterprise Ensemble

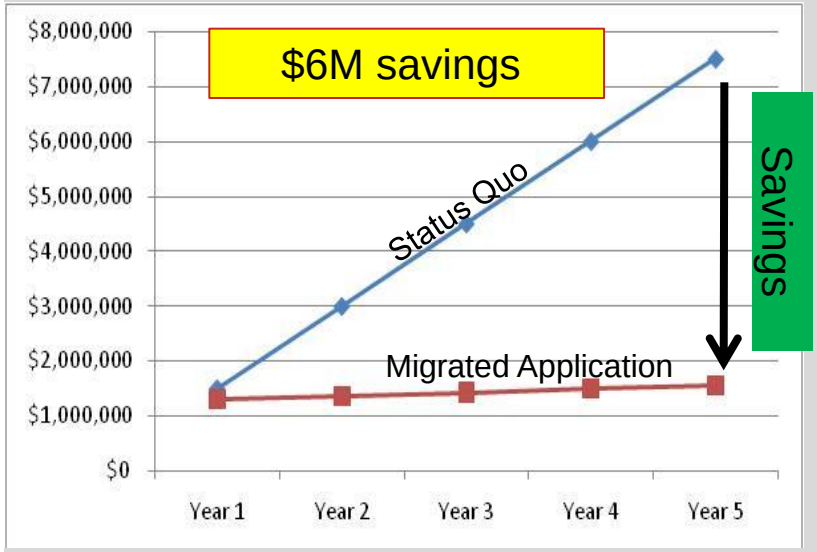
zEnterprise covers most of the application server computing requirements for today's SAP customers

Savings Delivered in the First Year

Value Proposition: Fit for Purpose workloads

Small Application Footprint

A small application currently costing $1.5M/year to operate becomes $0.1M or a five year savings of over $6M (Including the cost of migration)

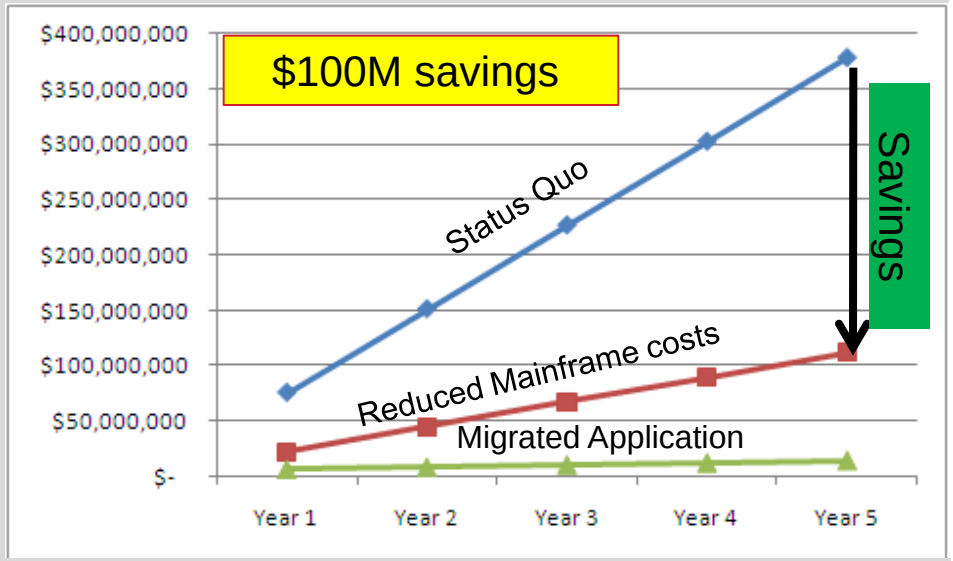


Illustrative cost comparisons:
Example 1:
z/OS $XX/CPU Hour vs IFL $Y.Y/YCPU Hour

Partial Application Deployment*

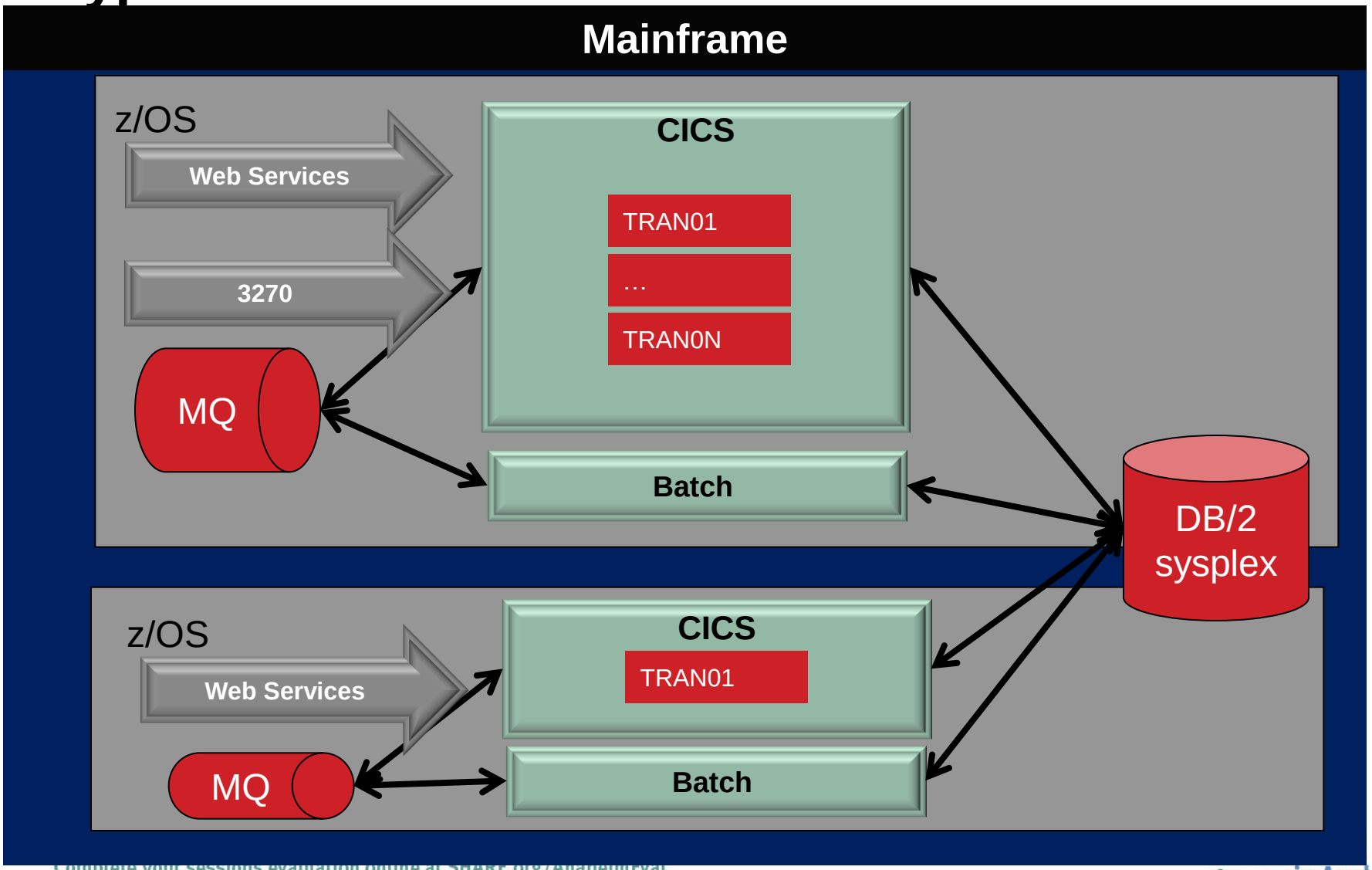
Moving a portion of a 5,000 MIP application to an IFL allows a cost reduction of $40-55M and a cost avoidance savings of $70-$90M

* Patent Pending

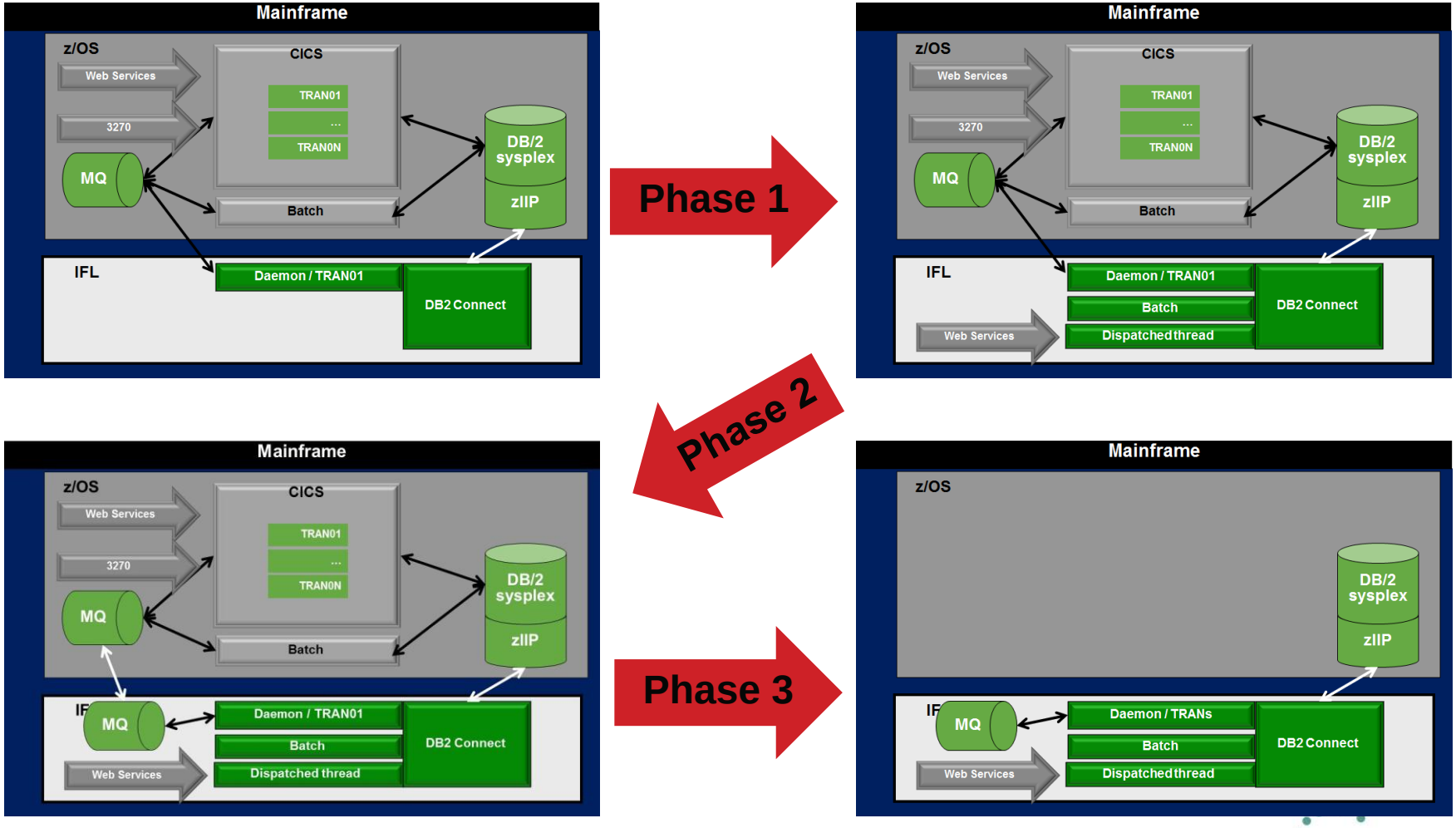


Illustrative cost comparisons:
Example 2:
z/OS engine $ XXX vs. IFL engine XXX / 90
Comparable Intel server required 5-10 more or 2-3x

Mainframe Application Configuration Typical



Low risk migration



Fit for Purpose – Utilization Summary
Volume doubles during the migration

Phase 2 Migration

- May 2009
- System continues to Run hot

CP Processor Utilization by Hour

Processor/Hour	00 %	01 %	02 %	03 %	04 %	05 %	06 %	07 %	08 %	09 %	10 %	11 %	12 %	13 %	14 %	15 %	16 %	17 %	18 %	19 %	20 %	21 %	22 %	23 %
ALPHA																								
2010/05/28-FRI	59	64	63	62	57	58	60	66	73	81	80	88	82	85	81	86	92	91	73	72	55	63	58	58
2010/05/27-THU	63	60	67	53	52	52	60	85	83	74	82	78	72	81	74	85	92	84	67	62	63	58	58	56
2010/05/26-WED	66	68	69	53	48	58	45	56	75	79	81	85	83	89	81	84	78	79	59	67	63	62	67	61
2010/05/25-TUE	65	61	62	51	47	44	51	62	61	60	63	61	61	73	72	80	81	81	76	74	60	62	55	51
2010/05/24-MON	45	58	62	53	49	50	49	52	56	64	65	67	63	74	73	78	87	81	81	70	61	57	52	41
2010/05/23-SUN	85	61	49	47	50	34	32	35	35	34	30	20	62	71	60	45	36	33	28	31	32	37	33	38
2010/05/22-SAT	69	95	65	65	68	66	63	68	72	74	72	74	64	53	50	49	51	45	50	44	41	40	39	76
ALPHA Average Mon-Fri	60	62	65	54	51	52	53	64	70	72	74	76	72	80	76	83	86	83	71	69	60	60	58	53
ZETA																								
2010/05/28-FRI	97	85	79	65	79	82	81	83	87	94	96	97	97	97	90	95	94	89	94	85	92	95	86	82
2010/05/27-THU	91	85	80	60	61	59	68	68	85	91	88	95	90	94	96	95	97	96	88	85	71	77	77	87
2010/05/26-WED	90	87	88	68	68	79	62	76	89	93	94	99	89	95	93	94	90	91	84	88	93	99	85	68
2010/05/25-TUE	93	95	84	82	77	70	80	83	95	96	91	89	82	92	93	92	96	96	97	85	81	86	89	76
2010/05/24-MON	79	81	78	74	60	67	65	73	89	95	95	95	97	98	97	96	98	96	97	93	86	90	90	72
2010/05/23-SUN	93	94	79	84	75	59	60	37	40	39	35	24	60	-	-	-	-	-	-	39	92	79	58	56
2010/05/22-SAT	92	100	100	95	91	85	88	93	92	94	96	95	93	93	85	84	89	81	75	77	88	77	74	89
ZETA Average Mon-Fri	90	87	82	70	69	71	71	77	89	94	93	95	91	95	94	94	95	94	92	87	85	89	85	77

70%

90%

Phase 3 Migration

- Nov 2009
- Volume doubled
- System Running at 50% Capacity

CP Processor Utilization by Hour

Processor/Hour	00 %	01 %	02 %	03 %	04 %	05 %	06 %	07 %	08 %	09 %	10 %	11 %	12 %	13 %	14 %	15 %	16 %	17 %	18 %	19 %	20 %	21 %	22 %	23 %
ALPHA																								
2010/11/15-MON	51	63	50	35	32	38	25	26	32	38	43	38	36	35	39	43	32	34	33	54	47	42	35	40
2010/11/14-SUN	97	85	44	29	25	16	14	15	20	14	14	14	66	46	21	21	17	23	18	19	30	29	29	32
2010/11/13-SAT	61	89	88	66	50	51	50	45	45	41	41	41	39	36	35	36	31	28	23	32	46	40	32	65
2010/11/12-FRI	57	50	36	38	44	51	35	39	44	46	52	48	44	49	41	53	44	40	41	48	52	48	38	70
2010/11/11-THU	59	68	48	39	32	45	32	28	35	31	34	34	33	29	30	33	32	33	29	30	42	39	33	35
2010/11/10-WED	63	67	65	53	44	50	36	38	43	60	50	51	44	42	34	49	40	37	38	38	55	45	39	42
2010/11/09-TUE	53	71	73	59	45	48	43	44	38	41	45	41	42	55	49	44	44	48	33	43	63	46	38	40
ALPHA Average Mon-Fri	57	64	54	45	39	46	34	35	38	43	45	42	40	42	39	44	38	38	35	43	52	44	37	45
ZETA																								
2010/11/15-MON	58	67	47	34	34	52	35	37	39	47	50	51	45	45	54	49	40	53	43	68	54	50	48	53
2010/11/14-SUN	95	92	51	43	40	32	20	19	26	25	26	20	80	58	31	29	23	27	25	32	29	36	36	32
2010/11/13-SAT	86	91	90	85	80	54	46	48	49	44	44	60	61	38	41	43	38	46	45	40	37	30	34	66
2010/11/12-FRI	67	47	51	49	47	56	60	52	45	67	54	57	51	54	57	61	51	46	53	51	51	64	53	89
2010/11/11-THU	70	59	54	37	54	43	42	35	35	37	43	35	41	48	46	44	36	40	48	45	45	52	42	49
2010/11/10-WED	69	82	71	57	57	73	49	44	51	53	60	54	47	51	55	69	46	53	49	55	49	59	54	43
2010/11/09-TUE	75	78	80	53	54	61	58	45	56	60	55	59	50	54	58	61	52	49	45	52	46	61	55	61
ZETA Average Mon-Fri	68	67	61	46	49	57	49	43	45	53	52	51	47	50	54	57	45	48	48	54	49	57	50	59

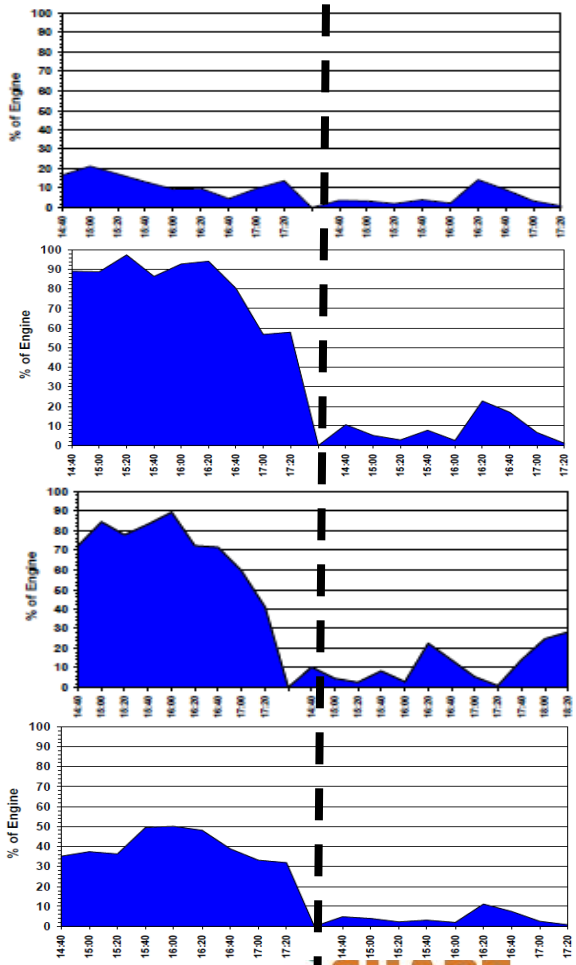
45%

50%

Summary of CICS Workload Migration

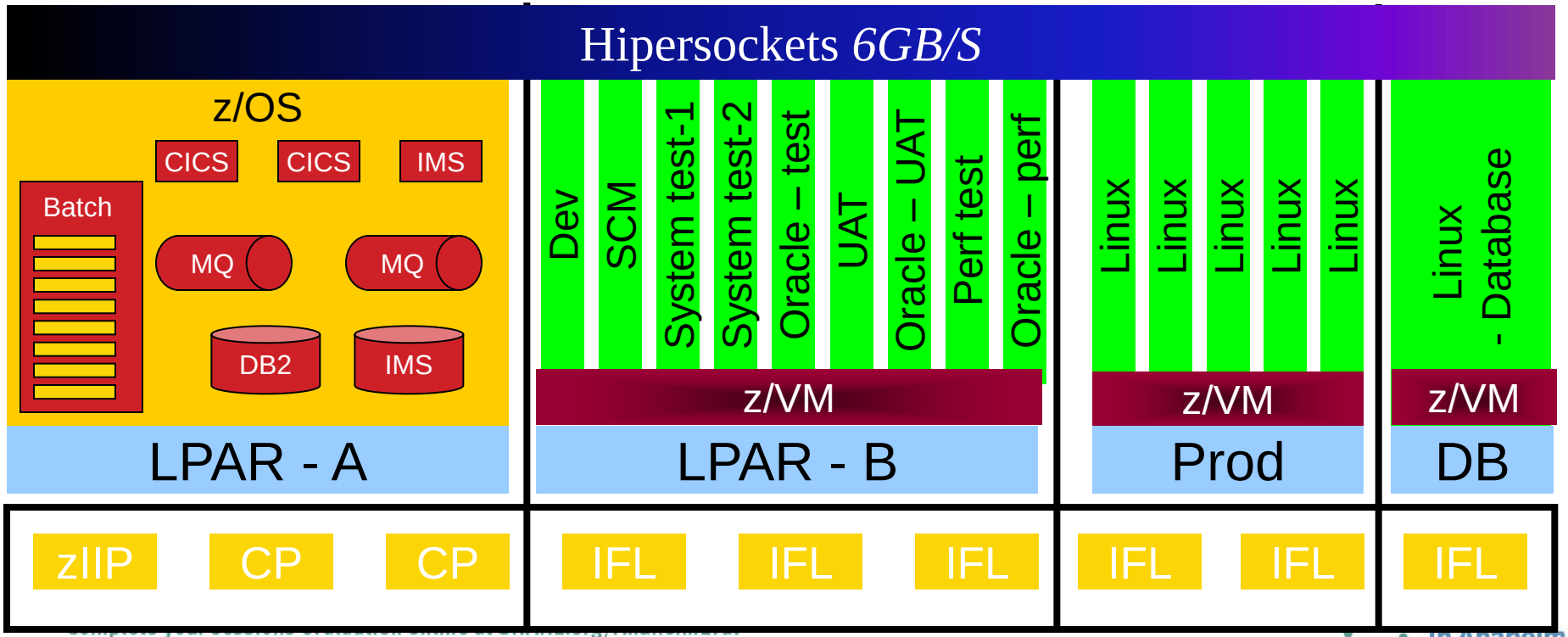
- Trans ABC & EFG response time increased from .4s to 12s due to workload migrated to IFL
- CPU utilization on CECA remained consistent
  - **XYPA** and **XYPC** decreased **(This is good)**
  - XYOA and XYUA increased **(out of scope workload)**
- CPU Utilization on CECB remained consistent due to growth in XYOB and XYUB **(out of scope workload)**
- CPU Utilization decreased for both CICSONE and BATCHONE work
  - XYPA saw largest decrease (**savings of 1 engine) ~ 760 MIPS**
  - XYPC saw decrease **(saving of .5 engines) ~ 380 MIPS**
  - 1705 QAZ jobs ran on 3/17 - 3525 QAZ jobs ran on 6/3
- CPU Utilization for MQ increased 5-7% on all 4 lpars
- CPU Utilization for DDFPTS increased - transactions doubled
- IFL utilization increased from 15% to 60% **(This is good)**
- ZIIP utilization increased (10% - 20%) **(This is a good)**
- Coupling Facility Utilization remained consistent
  - Requests to QSP0PTSQUEUES1 decreased by 87%

Before After



Summary
- Uber - Virtualization on a Small Footprint

- Leverage existing floor space
- Dynamic load balancing
- Development and test can share the same hardware
- No physical network equipment required to connect internal servers
- Internal servers can remain on separate virtual LANS
- Simplified and reduce cost for DR

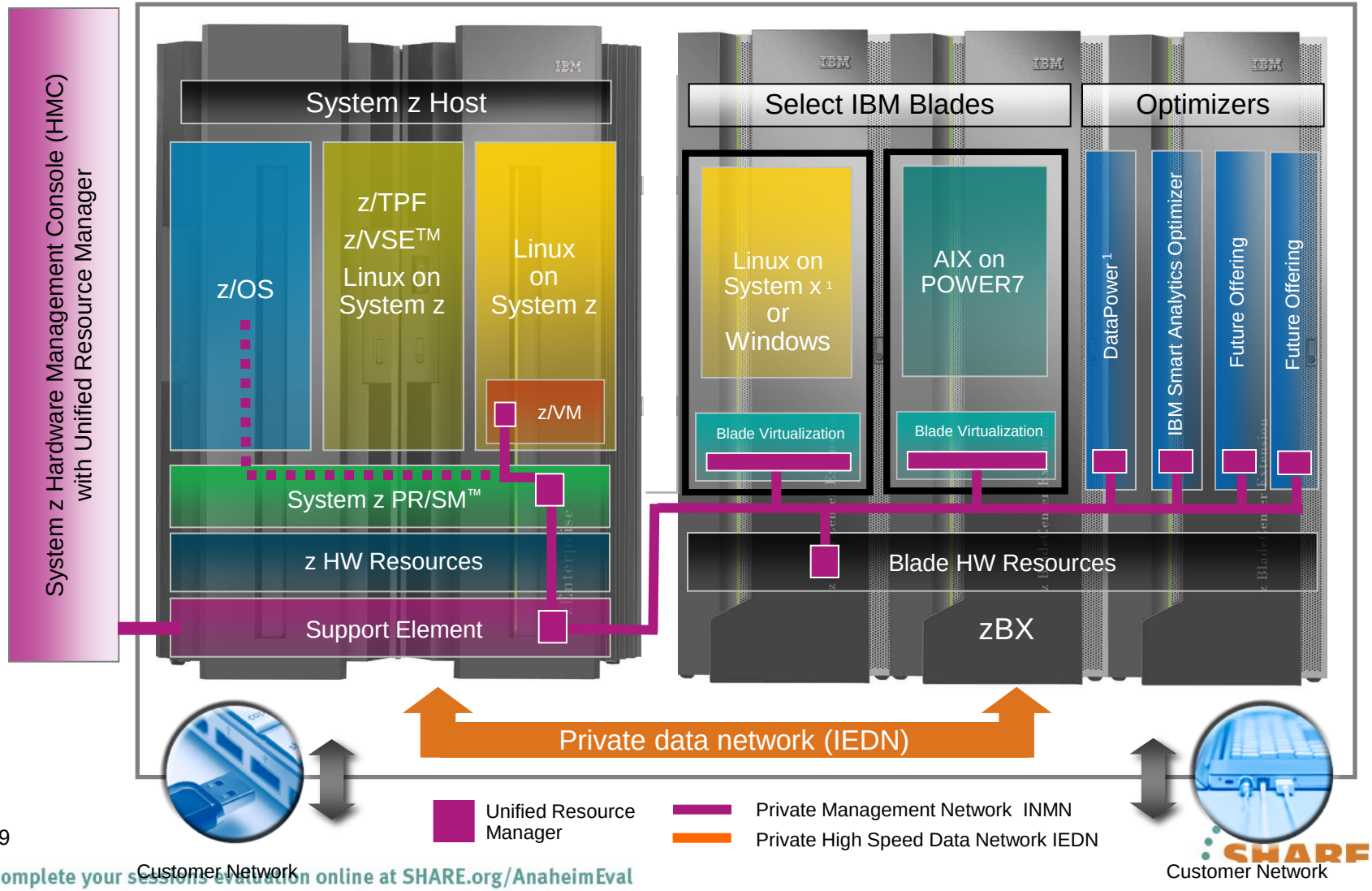


Looking back now

- Having just senior leadership sponsorship is not good enough
- Agree on what the objectives are
  - Reduce COST vs. GP MIPS vs. TOTAL MIPS vs. etc…
- Pick something simple to pilot first
- Understand the current production workload and don't get roped into supporting things that don't happen today

- Other things to consider
  - Change the code on z/OS and validate the same code works in both places – maintain a single code base
  - Start setting up the operations early
  - Don't be surprised during testing that you find things that really don't work in production today

Uber-virtulization
everything that works together under one umbrella
“Think outside the box but deliver within the box”



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