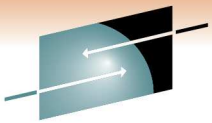


Right-Fitting Applications into Multi-Tier Hybrid Server Environments

Montgomery Bauman
mbauman@us.ibm.com

Thursday, March 3, 2011: 8:00 AM-9:00 AM
Room 201A (Anaheim Convention Center)
Session Number 8620
MVS Core Technologies Project

Session Abstract

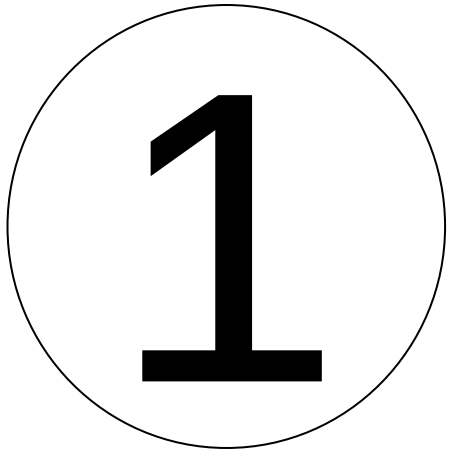
- **Right-Fitting Applications into Multi-Tier Hybrid Server Environments**
- Thursday, March 3, 2011: 8:00 AM-9:00 AM
- Room 201A (Anaheim Convention Center)
- Speaker: Montgomery Bauman (IBM Corporation)
- A lot is being said about "Workload Optimization" these days. The notion at hand is ages old. Placing the right workloads onto the right servers (or virtual servers) so as to optimize IT value (i.e. reducing cost, maximizing time to value, and minimizing risk).
- The new IBM zEnterprise server offers not just a new bigger better faster mainframe (the z196), but a new approach to server design and systems construction. Whether you view zEnterprise as a "system of systems", or as a "hybrid server", the zEnterprise approach is a novel and potentially powerful new tool to be used to advance the cause of "Workload Optimization" and to derive the benefits therefrom.
- In this session, we will seek to understand zEnterprise as a platform for "Workload Optimization". We will also explore a methodology and toolset that facilitates the comparative analysis of zEnterprise vs traditional servers. The comparative analysis covers both technical and financial attributes of traditional multi-tier heterogeneous server configurations compared with hybrid-server configurations on zEnterprise servers.
- Past Share talks have been done for "Right-Fitting Applications into Consolidated Environments (RACE)". This talk expands the mission and scope of the RACE tools to explore not just virtualization cost & value analysis, but to also explore right fit analysis leading to overall "workload optimized" solutions.... solutions that cost less, improve time to value, and reduce risk.

Topics

1. Workload Optimization - Defined
2. Fit for Purpose - Requirements Fitness
3. Total Cost of Ownership - Financial Fitness

- Appendix

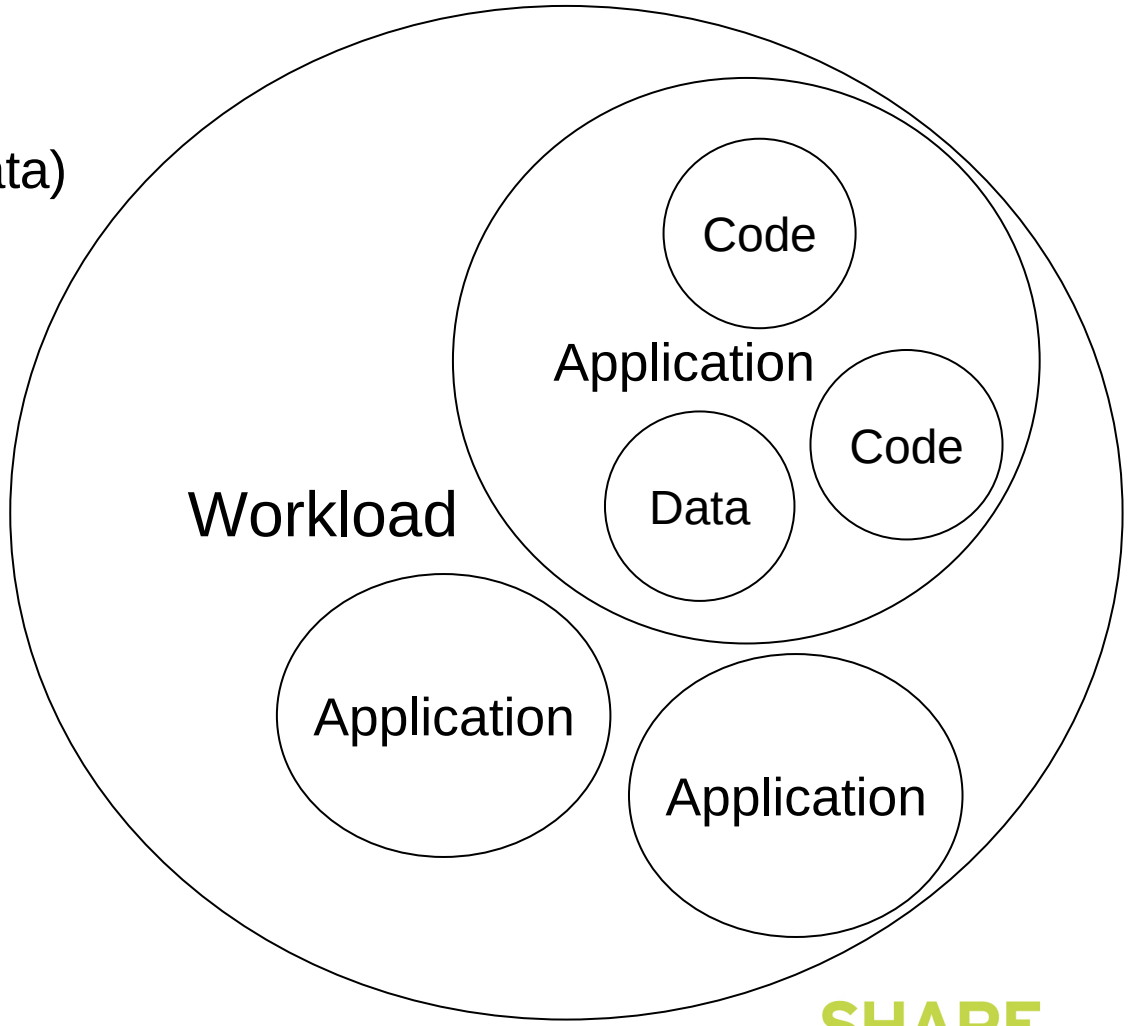
Workload Optimization - Defined



Topics

Workload Optimization - Defined

- Run the right **code**…
  - (and serve the right data)
  - (aka applications)
  - (aka workloads)
- On the right **platform(s)…**
- To satisfy (or exceed) **requirements…**
- And minimize **costs!!!**



Requirements

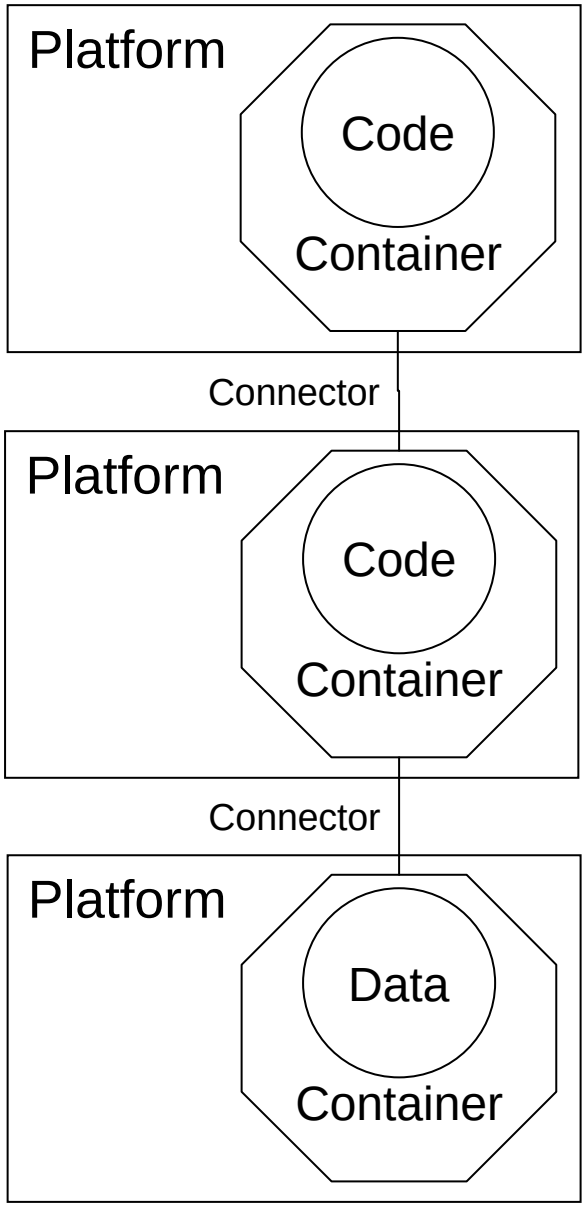
- Perform a function
- Deliver the function on time
- Deliver the function within budget
- Perform that function where needed
- Perform that function when needed
  - planned up time (and planned down time)
  - unplanned down time
- Perform that function how needed
  - in a manner the user finds productive (ease of use)
  - in a manner the user finds productive (response time)
- Make changes to the function over time
- Protect the function from illicit or illegal access or use

Costs

- **Building Costs**
  - The cost of building (or buying) & implementing components
  - The cost of building (or buying) & implementing containers
  - The cost of building (or buying) & implementing connectors
  - The cost of building (or buying) & implementing platforms
- **Operating Costs**
  - The cost of operating components, containers, connectors, and platforms
  - Including managing, monitoring, energizing, cleaning, and replenishing consumables
- **Maintaining Costs**
  - The cost of changing components, containers, connectors, and platforms
  - Including building changes, testing changes, and implementing changes

IT Services Composition

- **Components**
  - Code
  - Data
  - Rules/Scripts/Config Files/etc.
- **Containers**
  - Operating Systems
  - Middleware
  - Processes/Address Spaces
  - The “API” Provider
  - etc.
- **Connections**
  - TCP/IP RPC
  - TCP/IP DRDA
  - TCP/IP MQ
  - etc.
- **Platform**
  - Discrete Server (& Operating System)
  - Virtual Machine (& Operating System)
    - And Hypervisor
    - And Hosting server



Topics

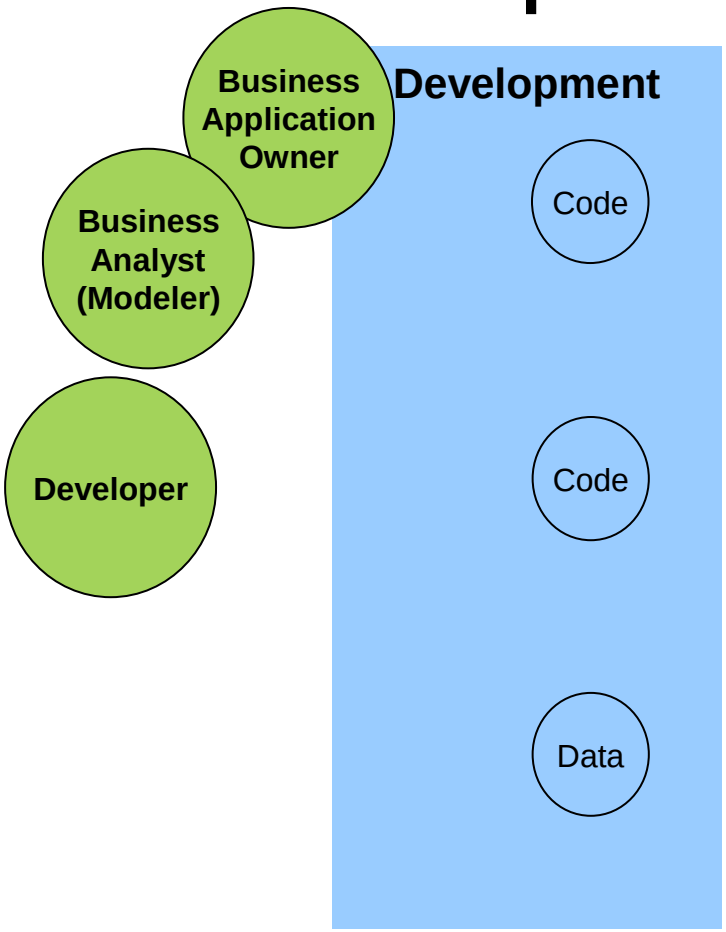
IT Service Delivery Lifecycle:
(and Component Development Lifecycle)

Steps

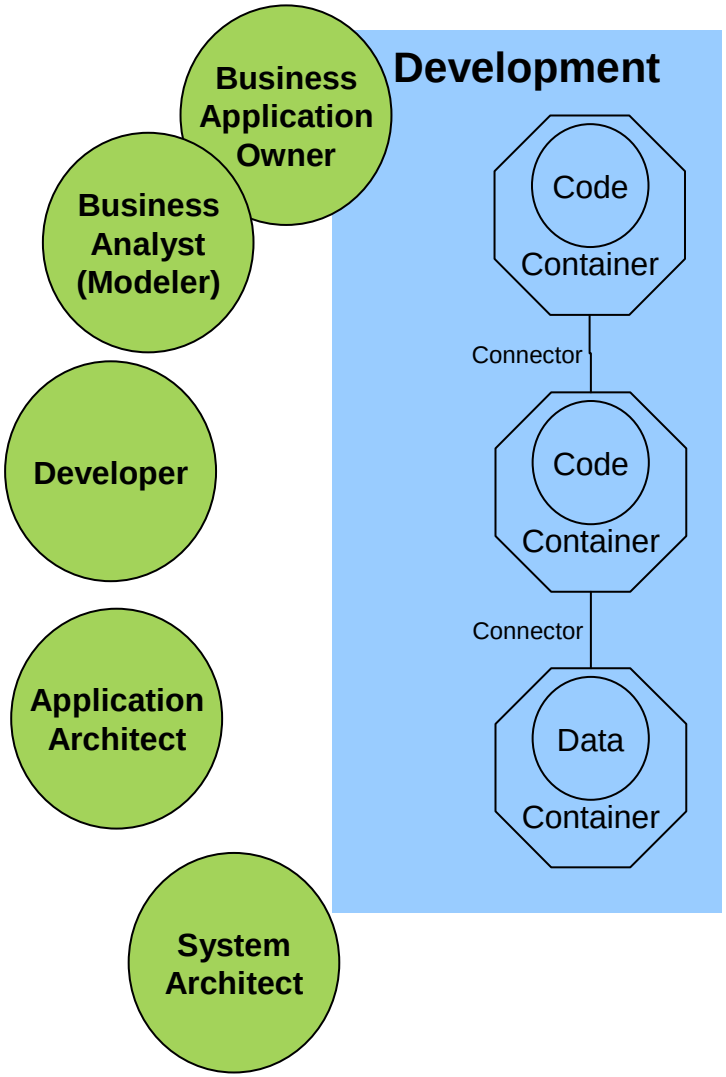
	Business Model	Architect	Code and Data	Engineer: Container Connector Platform	Test Plans	Operations Support Procedures	Operations Call Center
Build	1	2	3	3	4	4	
Test			5	5		5	
Run	6		6	6			6
Maintain	7	8	9	10	11	12	13

Topics

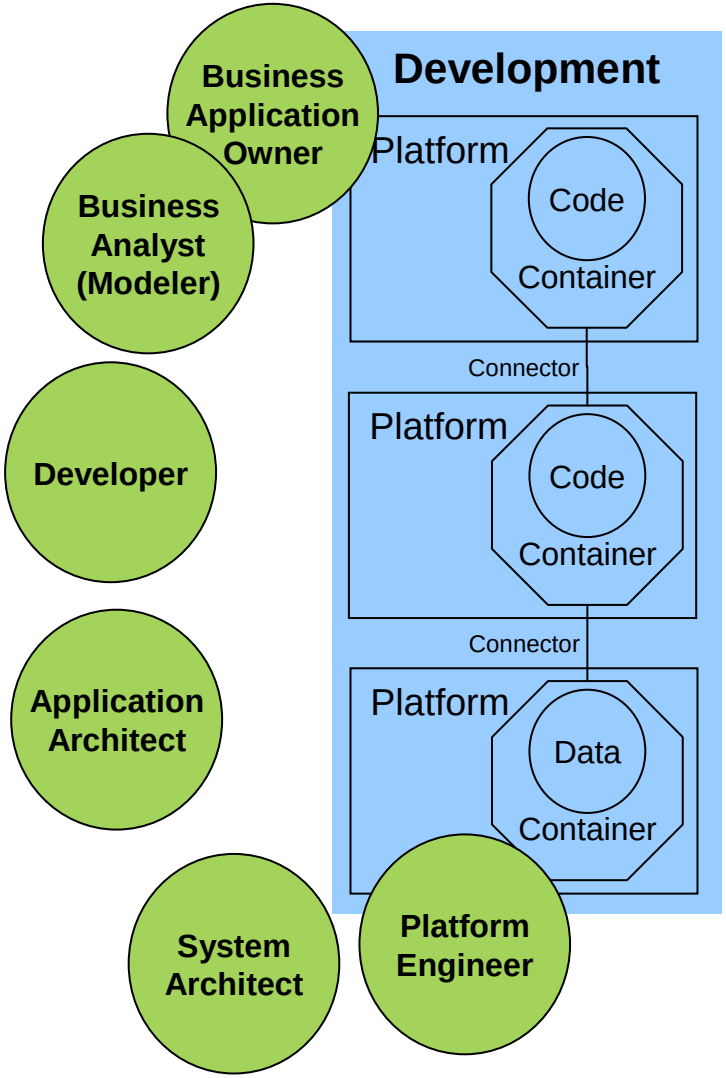
1. Build Components



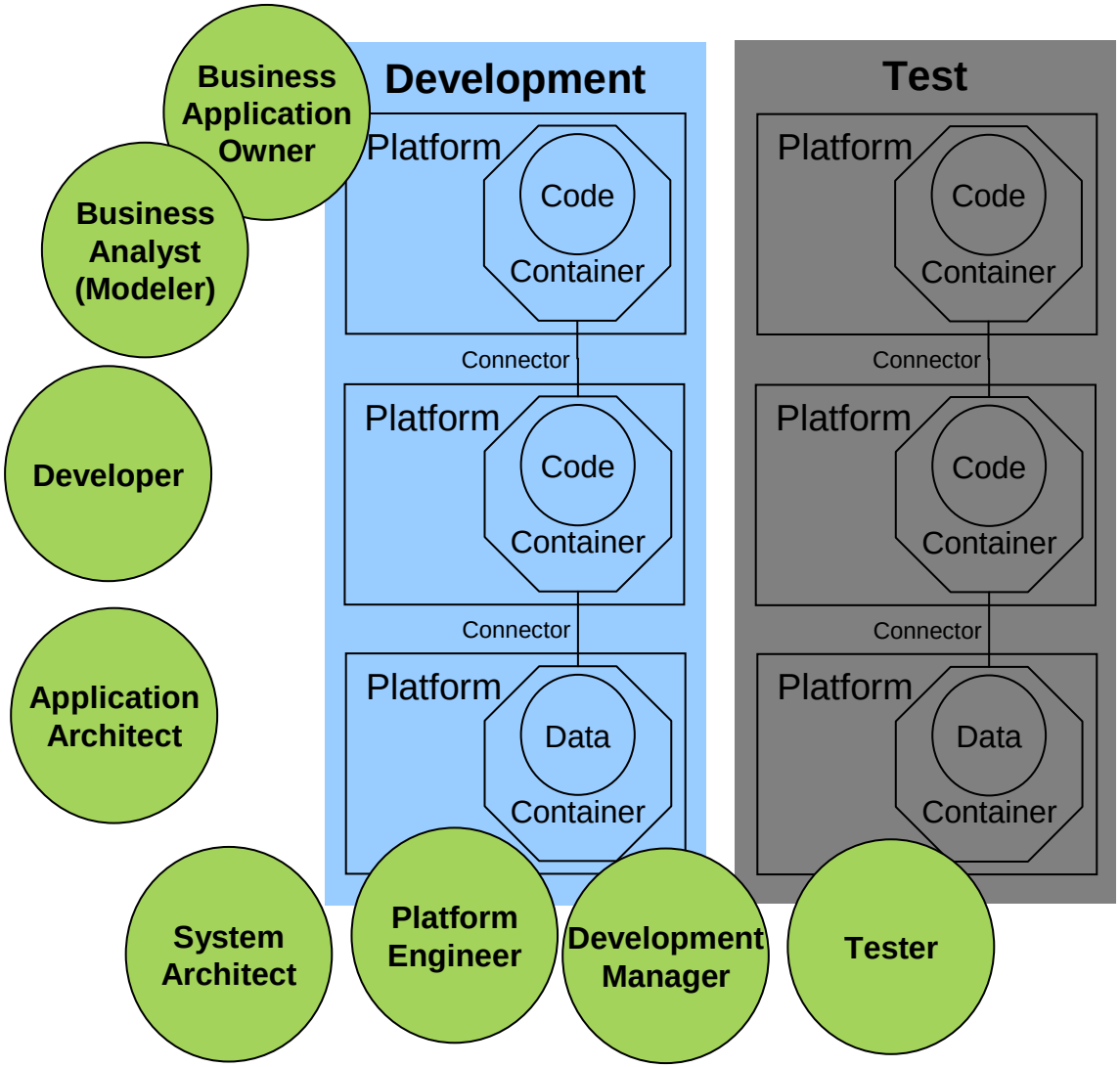
2. Build Containers and Connectors



3. Build Platforms

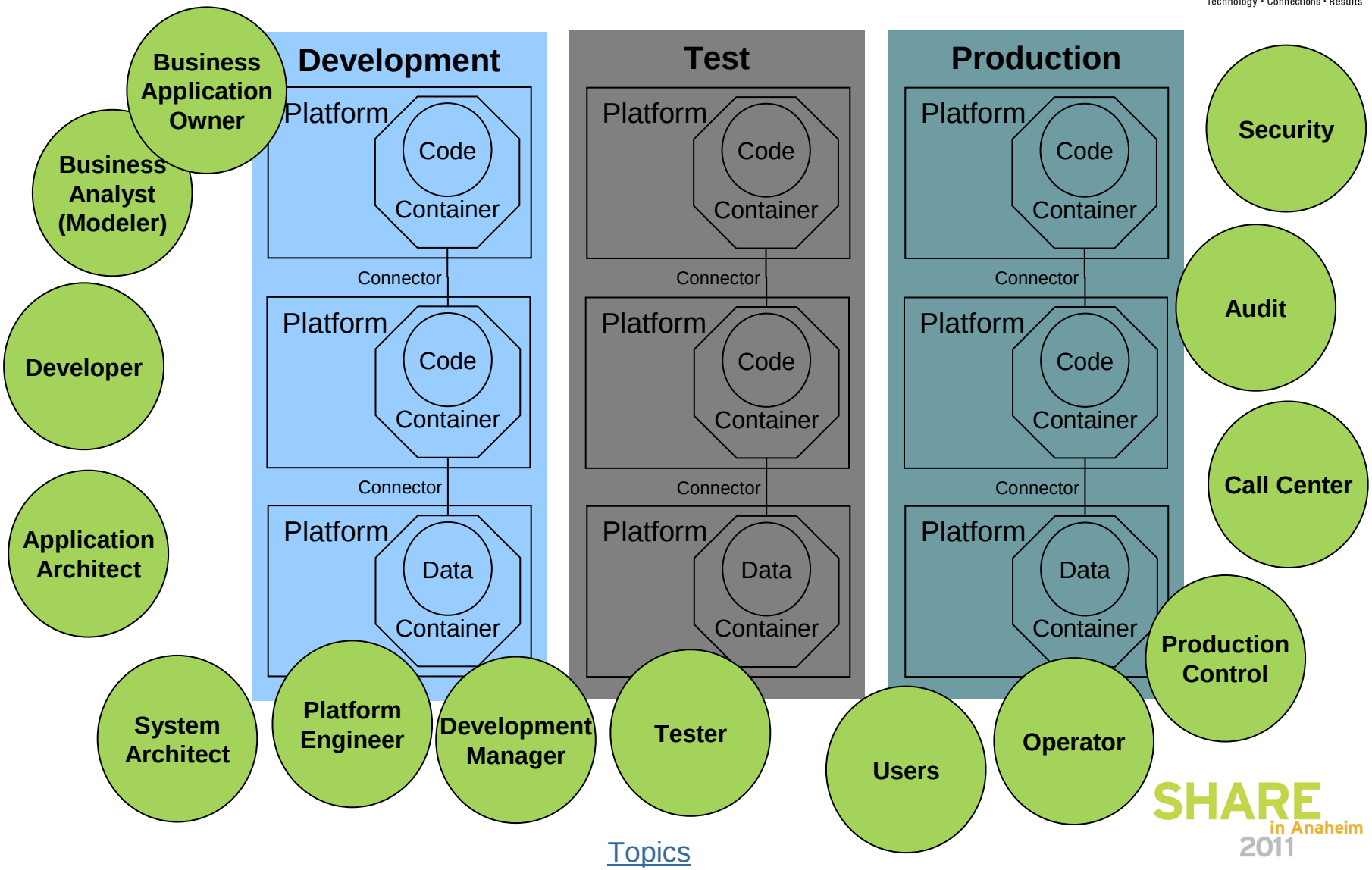


4. Build Test Environment



Topics

5. Build Production Environment



Viewpoints

- Users - The Business
  - Business Process Owner / Application Owner / End User
  - Finance
- Architects
  - Patterns / Standards / Connectors
- Developers
  - Components / Languages / Data / Data Structures
- Engineers - Platform and Infrastructure Engineers
  - Container Providers
    - Middleware and Operating Systems
  - Platform Providers
    - (Virtual) Servers and (Virtual) Storage
  - Connector Providers
    - (Virtual) Networks and Middleware
- Testers
  - Functional Test
  - Usability Test
  - Acceptance Test
  - Load Test
  - Quality Assurance Test
- Operators - Operations
  - Operators / Help Desk / Automation
  - Production Control
  - Problem / Performance Management
  - Change / Configuration Management
- Auditors
  - Logs
  - Security
  - Data and privacy protection

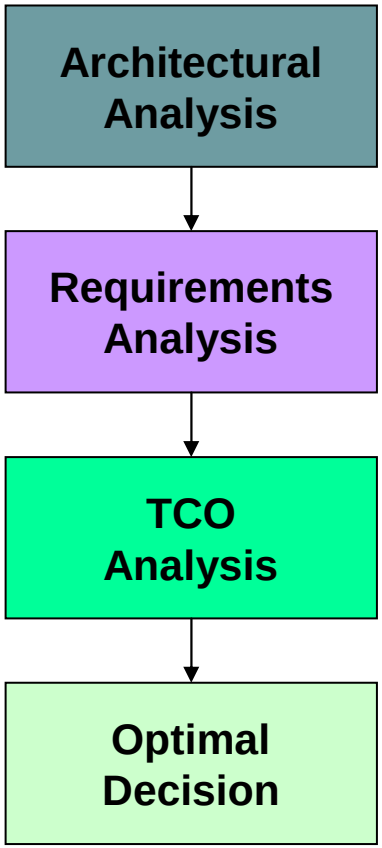
Each "viewpoint" defines "OPTIMAL" in their own terms

So What is Optimal?

- Balance of all viewpoints
  - Requirements-based decision-making
  - Consensus building
  - Balance of all cost points
  - Transparent requirements-based tradeoffs
- And decide:
  - How to build **components**
  - What **containers** to use
  - What **connectors** to use
  - **What platform to use**
    - For each container
    - For each lifecycle stage

An Approach

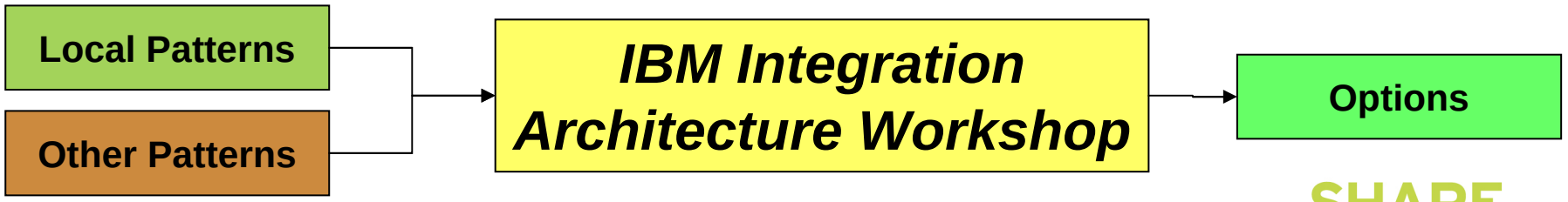
- Technology Exploration / Architecture Assessment
  - Solution Design Options
  - Options Generation & Understanding
  - e.g. zEnterprise Whiteboard Right-Fit Workshop
  - e.g. IBM Integration Architecture Workshop
- Fit for Purpose Assessment
  - Requirements-based Options Analysis
  - Creation of a Requirements-Fitness Scorecard
  - e.g. IBM Fit for Purpose Workshop
- Total Cost of Ownership Assessment
  - TCO-based Options Analysis
  - Creation of a Financial-Fitness Scorecard
  - e.g. IBM RACE Workshop



Architecture Analysis

- What's been done in the past?
  - Local architectural patterns
  - Industry architectural patterns

- Which edge do you seek?
  - Leading edge? (innovator / adopt and adapt new patterns)
  - Bleeding edge? (inventor / make your own patterns)
  - Trialing edge? (adopter / re-use tried and true patterns)



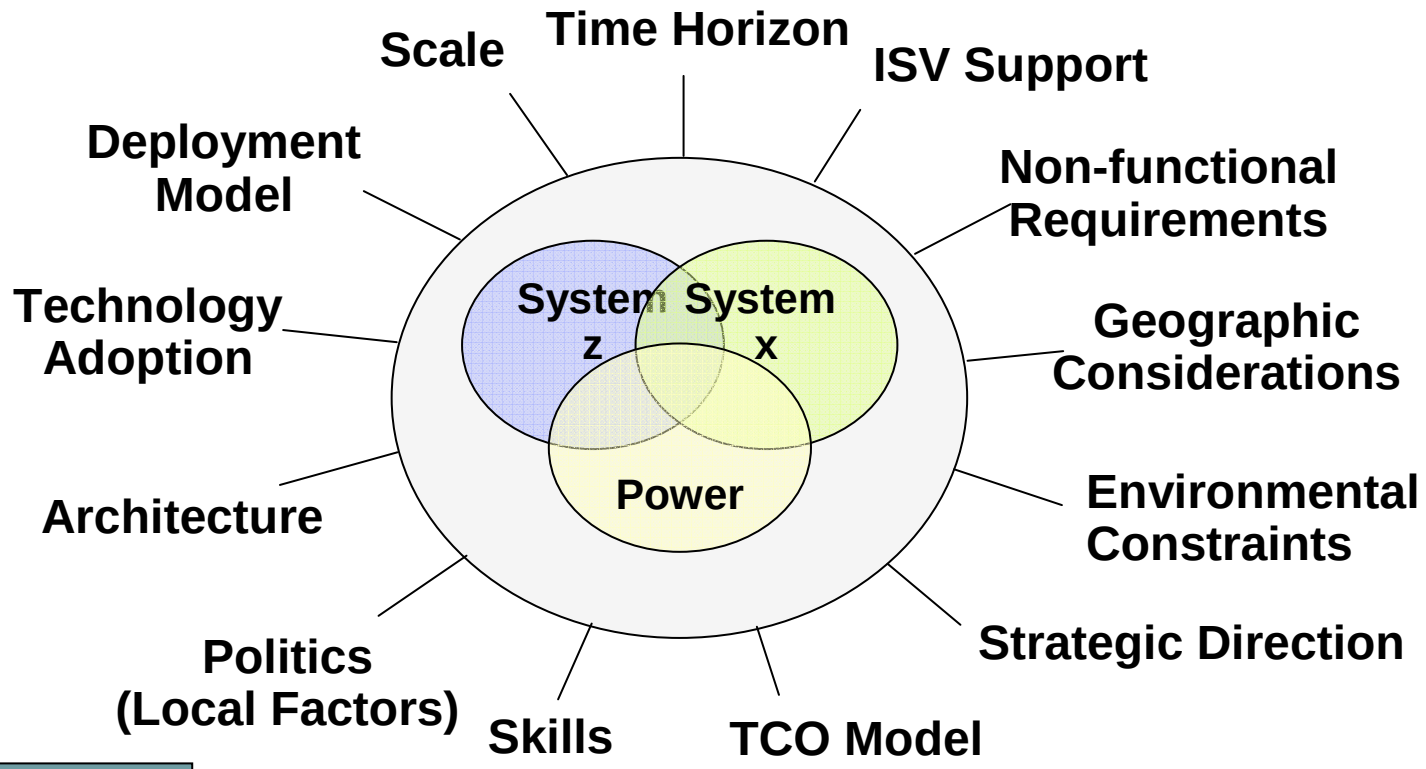
Architecture Analysis - Options

- Define the option:
  - Components
  - Containers
  - Connectors
  - Platforms
  - Lifecycle Support (dev/test/qa/prod environments)

- Limit the options analysis to those that are truly viable
  - Based upon your “patterns”
  - Based upon your “edge”
  - Boiling the ocean is not very productive

Requirements Analysis: The Big Three

Requirements Analysis: Factors and Considerations



Requirements

Options

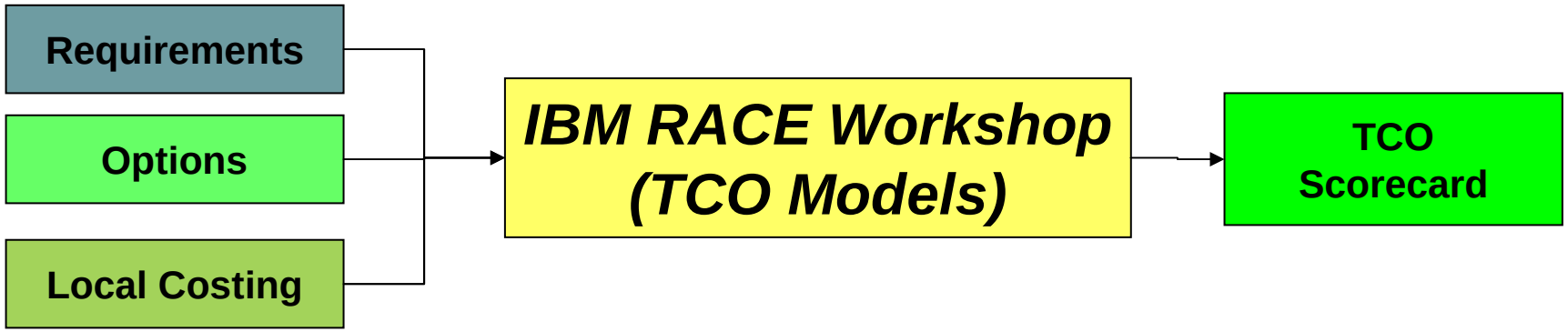
IBM Fit for Purpose Workshop

Requirements Scorecard

Topics

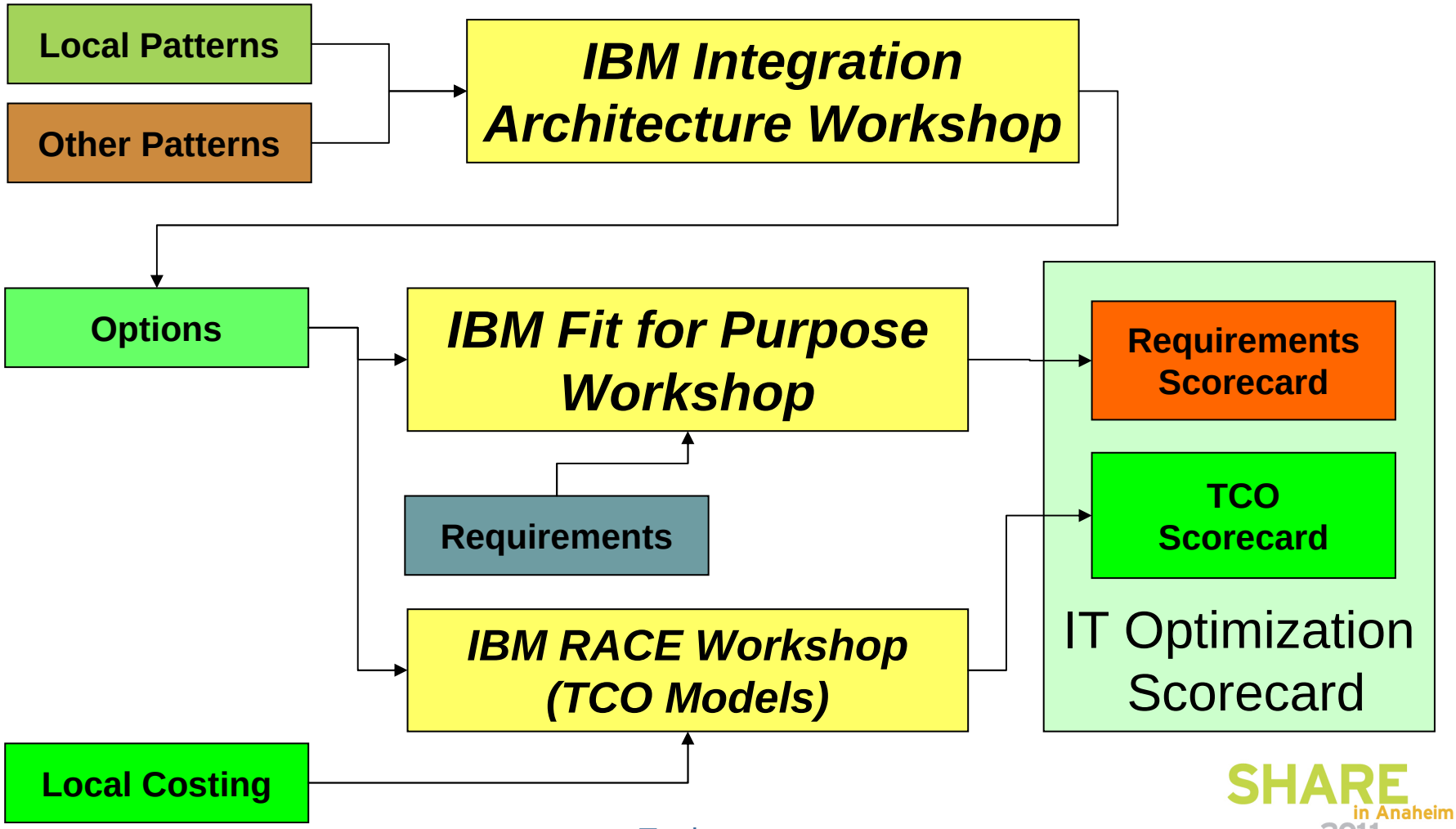
Financial Analysis

- Starts with requirements equity
- Depends upon technical equity
- And delivers a TCO scorecard



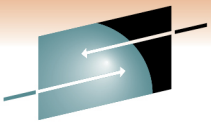
Topics

IBM and IT Optimization Assistance



Topics

End of Section



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Topics

Fit for Purpose Case Study – Requirements Fitness

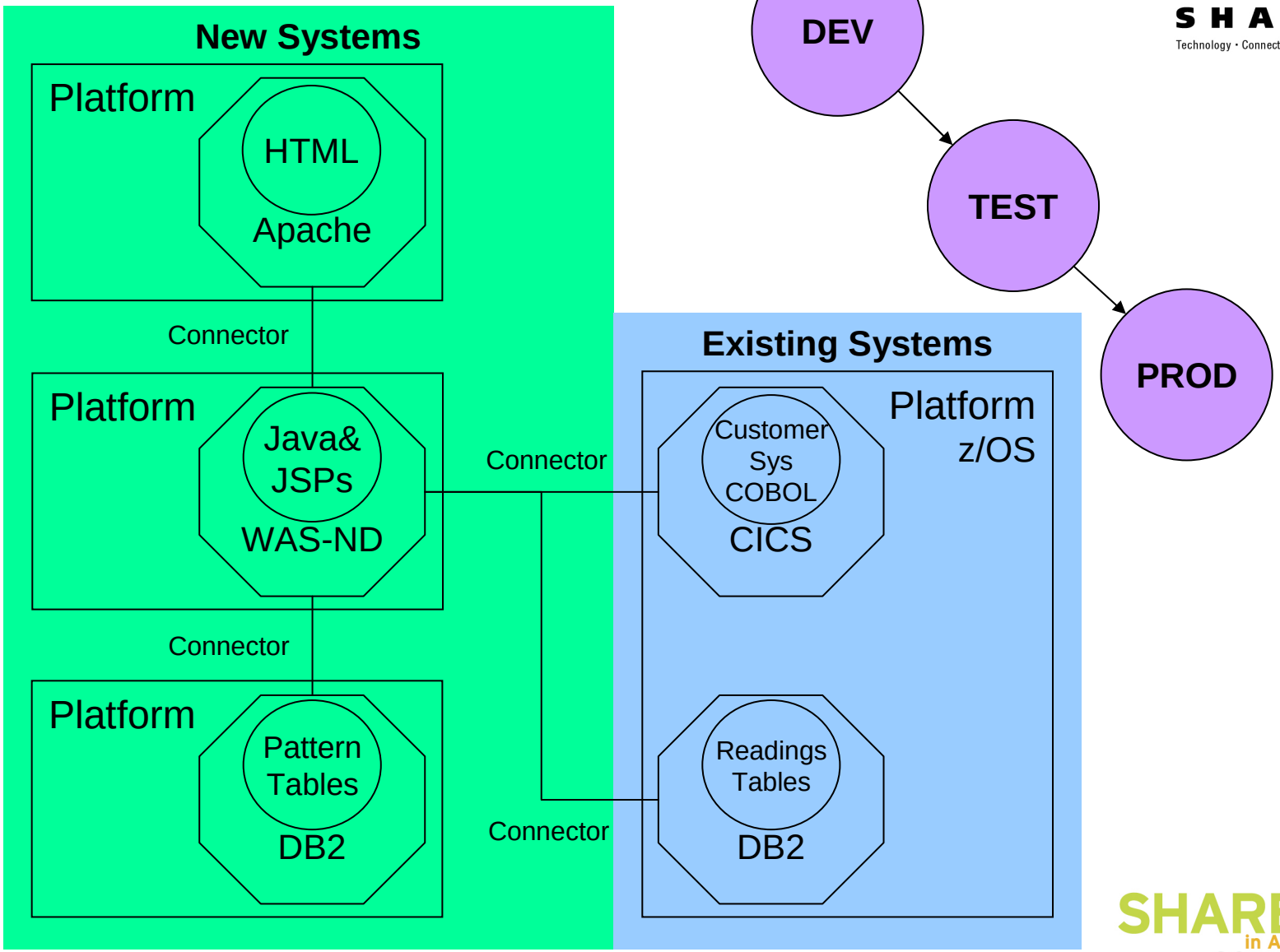
The New Business Service (New Smart Meter Customer Application)

- Industry: Electric Utility
  - Smart Grid adopter (Smart Meter provider)
  - Collecting customer meter data on 15 min intervals
- New customer service
  - Home energy usage alerts
  - When energy usage “over budget”, owner gets notified
  - When energy usage “off pattern”, owner gets notified
  - Security use case: “Away From Home”
    - If “away”, and if energy usage pattern is amiss
    - Then owner (and optionally additional parties) get notified
- Web 2.0 UI (lite-browser)

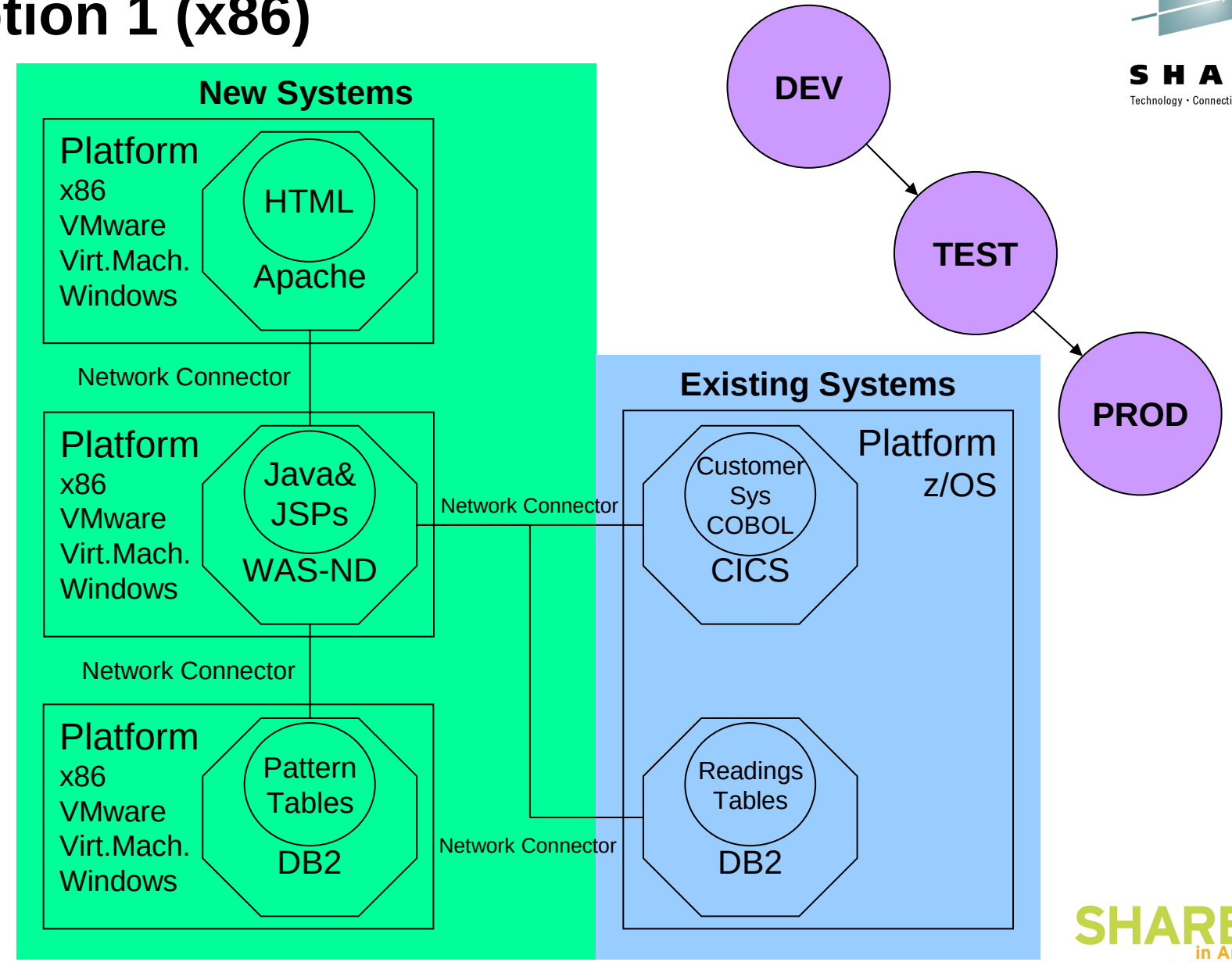
Requirements

- Function: Home and Away-from-home energy-usage alerts
- Time Line: Production offering coincident with stockholders meeting
- Available to all home owners equipped with smart meters
  - From any browser and/or from downloaded mobile app
  - Large (growing) number of users – solution scalability required
- 7x24x365 Uptime
  - High availability runtime with DR (RTO=30min RPO=5min)
- Homeowner userid / pin (customer profile) access control
  - Assured data privacy high priority
- Integration with existing customer management system
  - z/OS – Sysplex – CICSplex – CICS TS - Web Services (or EXCI)
- Integration with existing smart meter readings database
  - z/OS – Sysplex – DB2 for z/OS – Remote SQL (jdbc or similar)

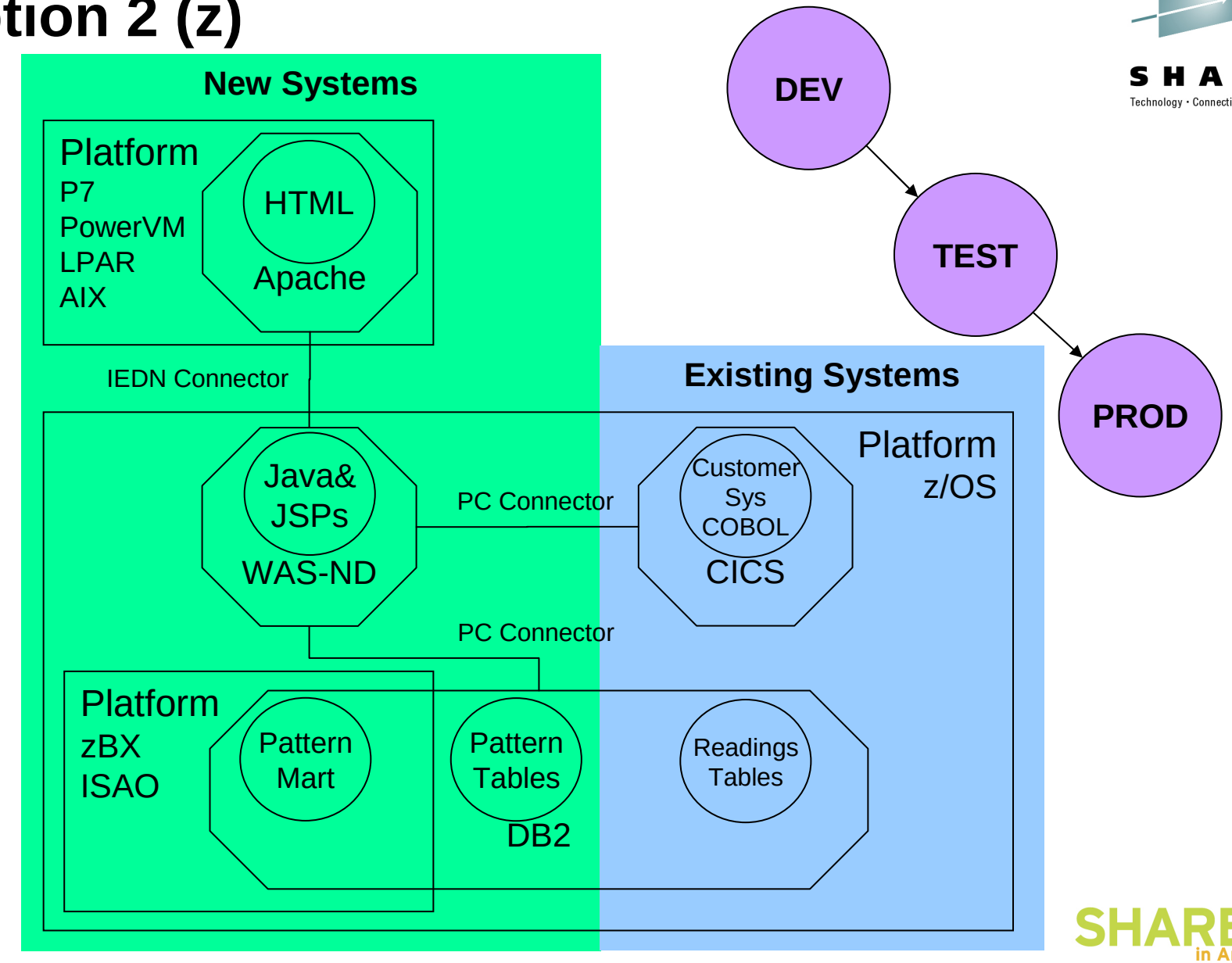
Application Architecture



Option 1 (x86)


New Systems
Platform
x86
VMware
Virt.Mach.
Windows
HTML
Apache
Network Connector
Platform
x86
VMware
Virt.Mach.
Windows
Java&
JSPs
WAS-ND
Network Connector
Platform
x86
VMware
Virt.Mach.
Windows
Pattern
Tables
DB2
Network Connector
Existing Systems
Platform
z/OS
Customer
Sys
COBOL
CICS
Readings
Tables
DB2
DEV
TEST
PROD

Option 2 (z)


New Systems
Platform
P7
PowerVM
LPAR
AIX
HTML
Apache
IEDN Connector
Existing Systems
Platform
z/OS
Java&
JSPs
WAS-ND
PC Connector
Customer
Sys
COBOL
CICS
PC Connector
Platform
zBX
ISAO
Pattern
Mart
Pattern
Tables
DB2
Readings
Tables
DEV
TEST
PROD

Options 3 4 5 6 7 8 and …

- There are certainly many more options
  - z/VM zLinux
  - POWER PowerVM AIX
  - zBX POWER AIX
  - zEnterprise z/VM zLinux
  - etc.

- In a “real” Fit for Purpose effort, all viable options would be examined … but care need be taken not to “boil the ocean”

- But for this talk (for this case study) we will keep things simple
  - And just look at Options 1 and 2

Requirements Analysis – Step 1

- Focus on requirements
- Respect for viewpoints
- Seek consensus
  - When consensus not reached
    - Understanding differences and distances
    - Sensitivity analysis (do differences matter?)

- Step 1 - List the requirements

Requirements List

Requirements List
Data privacy
Scalability
Integration with existing customer management system
Development lifecycle support
Availability
Performance
Manageability
Integration with existing smart meter readings database

Sort and Weight the Requirements

- Step 2
  - Prioritize (i.e. sort) the requirements in the list
  - Assign a weight to each requirement
    - To indicate relative importance of each requirement

Rank	Requirements List	Weight
1	Performance	6
2	Scalability	5
3	Integration with existing customer management system	4
4	Integration with existing smart meter readings database	4
5	Availability	4
6	Data privacy	3
7	Manageability	3
8	Development lifecycle support	3

Score the Options

- Step 3 – for each requirement, score the options
  - Assess each options ability to meet the requirement

Qualifier	Label	Score
Demonstrated Can Exceed	D.Exceed	7
Likely to Exceed	L.Exceed	6
Demonstrated Can Meet	D.Meet	5
Likely to Meet	L.Meet	4
Marginal	Marginal	2
Does Not Meet	No.Meet	0

			Option 1 (x86)		Option 2 (z)	
Rank	Requirements List	Weight	Score		Score	
1	Performance	6	L.Meet		L.Exceed	
2	Scalability	5	L.Meet		L.Exceed	
3	Integration with existing customer management system	4	L.Meet		D.Meet	
4	Integration with existing smart meter readings database	4	L.Meet		D.Meet	
5	Availability	4	Marginal		D.Meet	
6	Data privacy	3	L.Meet		D.Meet	
7	Manageability	3	L.Meet		D.Meet	
8	Development lifecycle support	3	D.Meet		L.Meet	

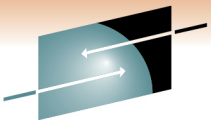
Rate the Options

- Step 4
  - Multiply the requirement's weight by the option's score
  - Add up the results

			Option 1 (x86)		Option 2 (z)	
Rank	Requirements List	Weight	Score	Result	Score	Result
1	Performance	6	L.Meet	24	L.Exceed	30
2	Scalability	5	L.Meet	20	L.Exceed	25
3	Integration with existing customer management system	4	L.Meet	16	D.Meet	20
4	Integration with existing smart meter readings database	4	L.Meet	16	D.Meet	20
5	Availability	4	Marginal	8	D.Meet	20
6	Data privacy	3	L.Meet	12	D.Meet	15
7	Manageability	3	L.Meet	12	D.Meet	15
8	Development lifecycle support	3	D.Meet	15	L.Meet	12
				123		157

This is a "Requirements Scorecard"

End of Section



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Topics

Total Cost of Ownership Case Study – Financial Fitness

Topics

Financial Fitness Analysis / TCO

- Prereq 1 – Technical Equity
  - Each option being analyzed must be sized and configured to meet the same set of requirements
- Prereq 2 – Solution Lifecycle Equity
  - Each option being analyzed must similarly meet the solution's lifecycle stages and timetable
- Prereq 3 – Financial Equity
  - Each option being analyzed must receive similar financial analysis treatment

Technical Equity

- Equitable containers
- Equitable connectors
  - Capacity
  - Availability
- Equitable platforms
  - Capacity
  - Availability
- Equitable component-lifecycle support

Solution Lifecycle Equity

- Solution investment period
- Production date
- Component development staging

Financial Equity

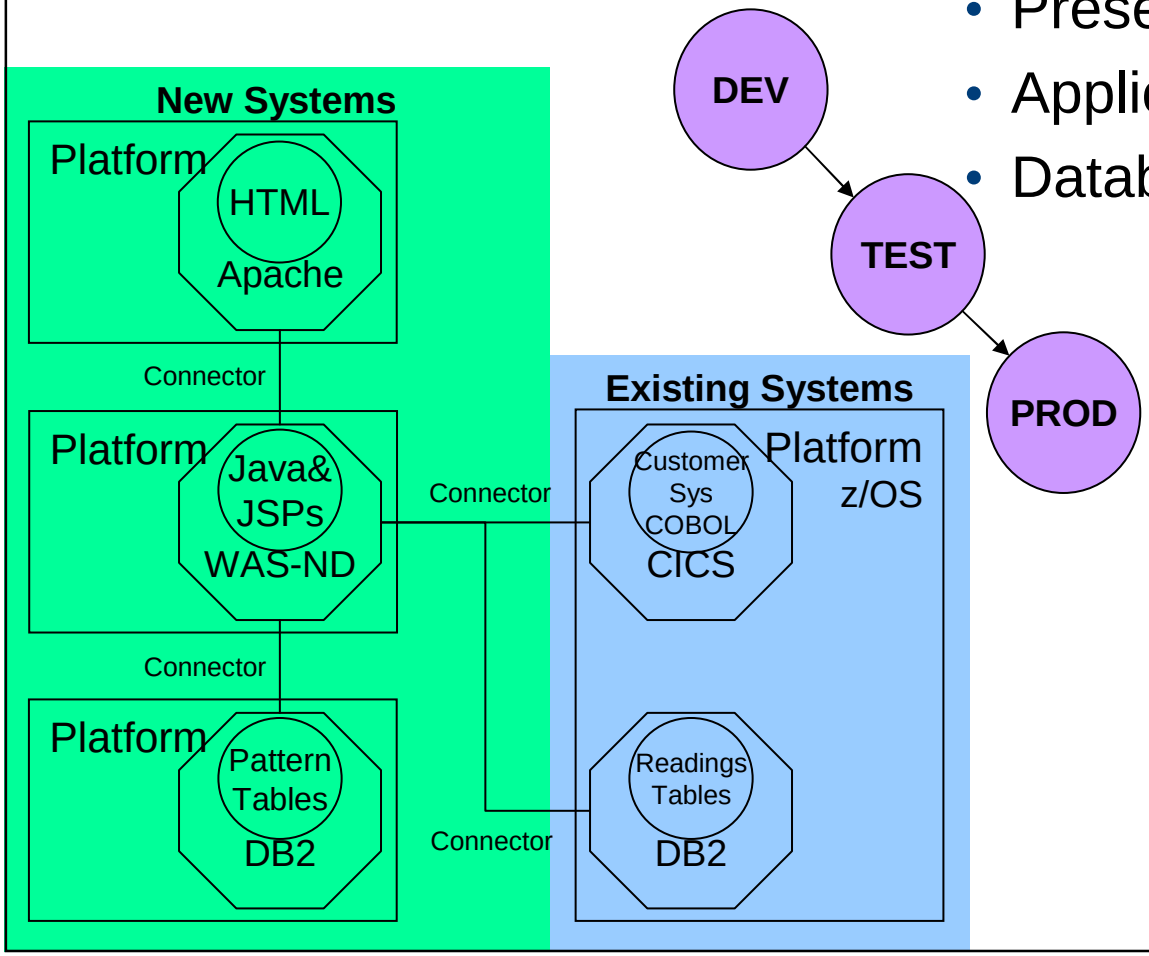
- Treatment of assets at end of life
- Depreciation treatment
- Trade-In treatment
- Tech refresh treatment

RACEv and RACEzOS

- TCO Cost Modeling Tools
- Spreadsheets
  - RACEv for distributed server (including zLinux) costing
  - RACEzOS for non-zLinux costing (usually z/OS)
- Use RACEv and RACEzOS together to model “hybrid solutions”
  - aka Multi-Tier Multi-Platform configurations

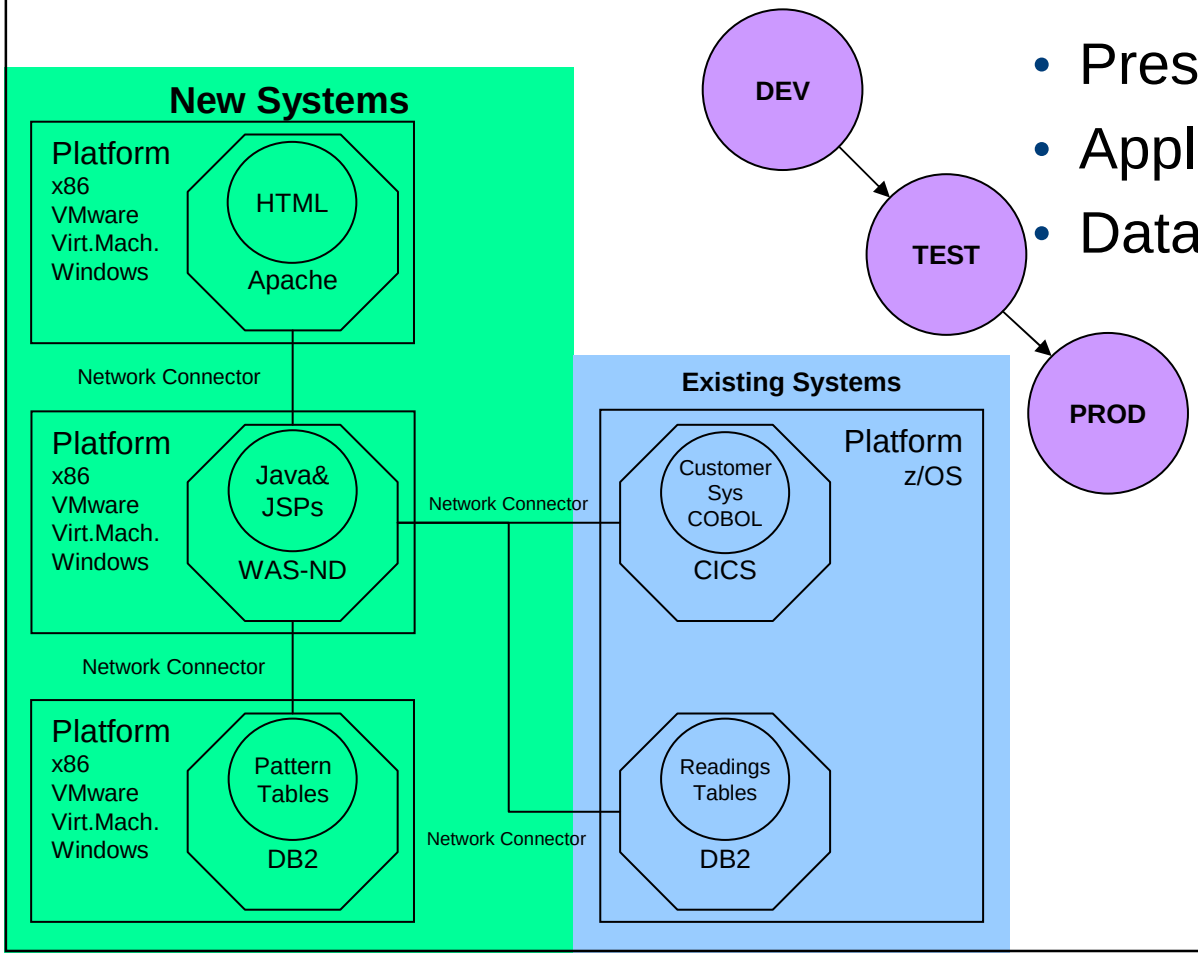
Step 1 – RACEv Subject Servers

- The set of discrete x86 servers
  - Presentation – Prod/Test/Dev
  - Application – Prod/Test/Dev
  - Database – Prod/Test/Dev



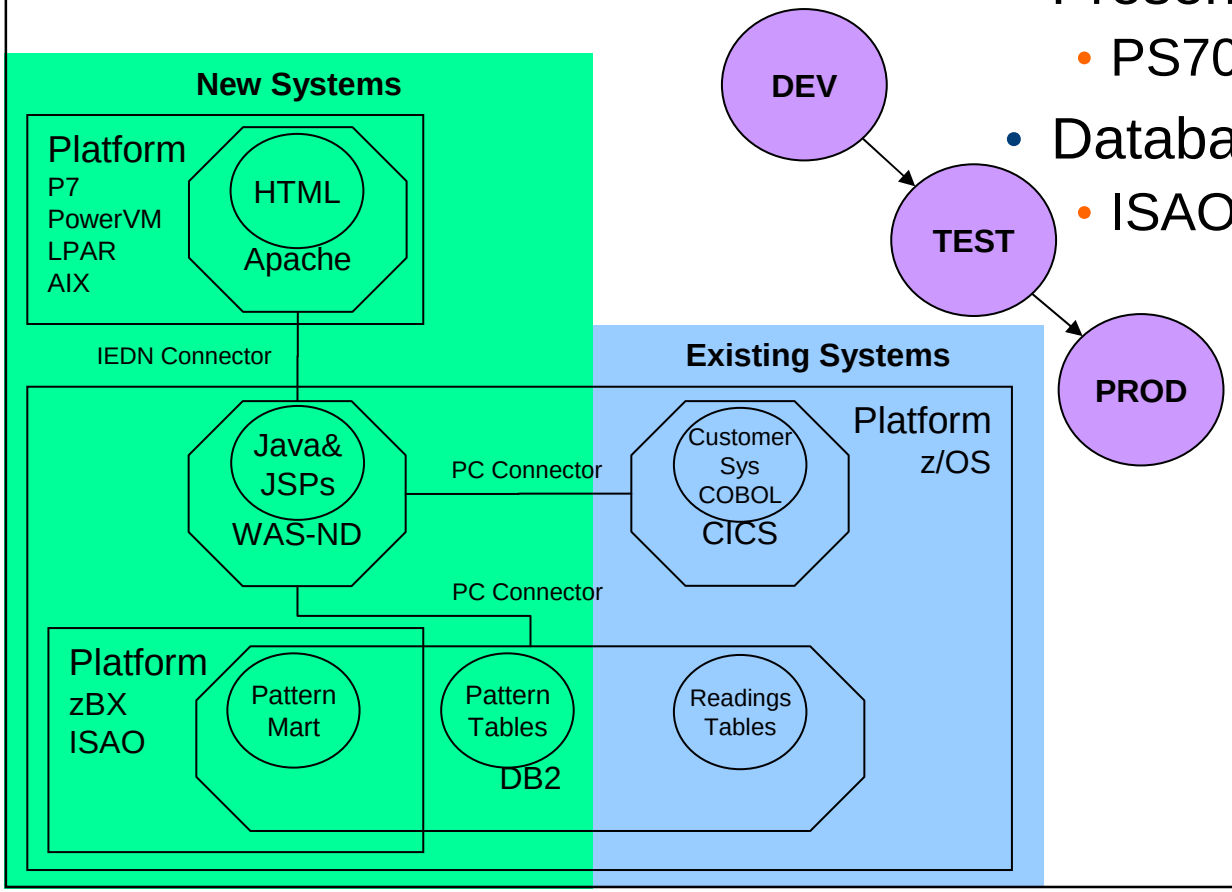
Step 2 – RACEv x86 Server Target

- The set of x86 VMware virtual server hosting blade servers
  - Presentation – Prod/Test/Dev
  - Application – Prod/Test/Dev
  - Database – Prod/Test/Dev

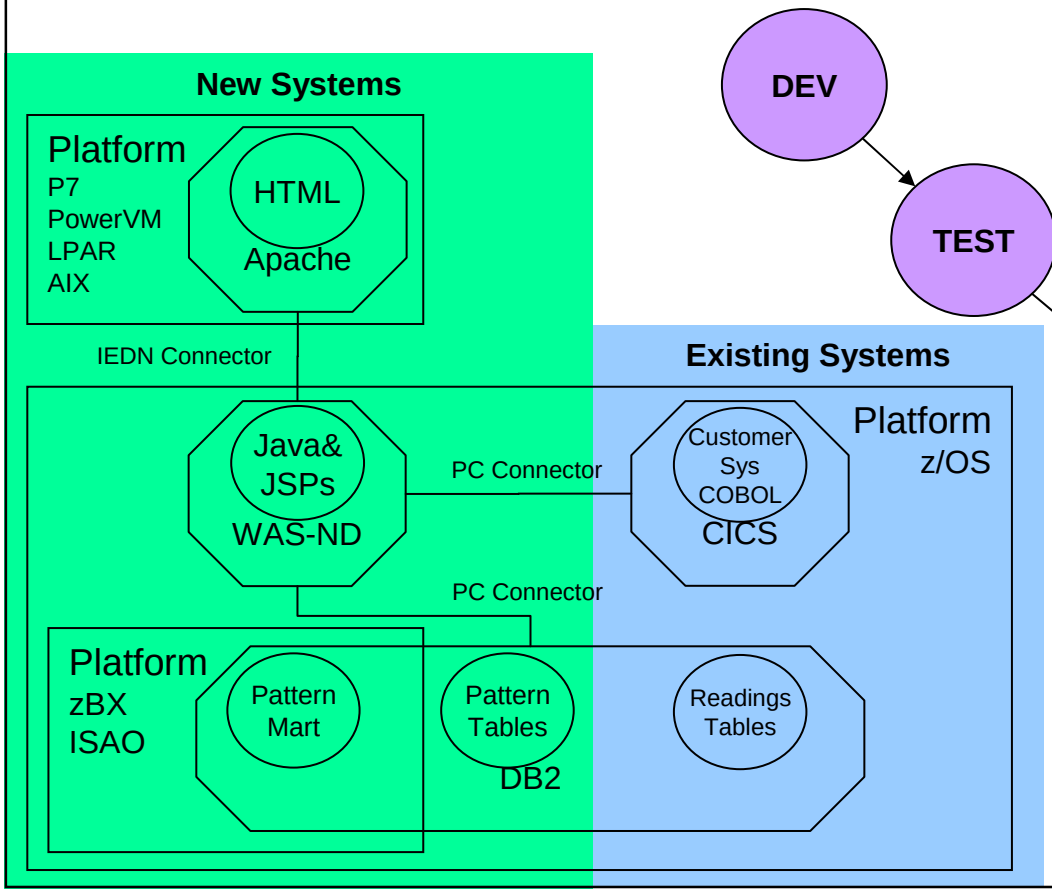


Step 3 – RACEv zEnterprise Target Distributed Elements

- The set of distributed elements in the zEnterprise solution
  - Presentation – Prod/Dev/Test
    - PS701s in the zBX
  - Database – Prod/Dev/Test
    - ISAO blades in the zBX



Step 4 – RACEzOS zEnterprise Elements



- The z/OS Elements of the solution
  - Application Servers
  - WAS for z/OS
  - PROD LPAR
  - TEST/DEV LPAR
  - WAS/DB2 co-location
  - zAAP on zIIP engines

z196

Partition Detail Report [C:\...ShareCaseStudy.zpcr]

Graph CPcalculator Documentation

zPCR V7.2b

Partition Detail Report

Based on LSPR Data for IBM System z Processors

Study ID: Not specified

Description: Loaded from Basic Mode Study C:\...ShareCaseStudy.zpcr

z196 Host = 2817-M15/700 with 6 CPs: GP=4 zAAP=1 zIIP=1

6 Active Partitions: GP=2 zAAP=2 zIIP=2

Capacity basis: 2094-701 @ 602.00 MIPS for a single partition configuration

z196 and z10 processor capacity for z/OS is represented with HiperDispatch turned ON

	Partition Identification					Partition Configuration					Partition Capacity	
Include	No.	Type	Name	SCP	Workload	Mode	LCPs	Weight	Weight %	Capping	Minimum	Maximum
☑	1	GP	Prod	z/OS-1.11	Average	SHR	4	80	80.00%	☐	3,657	4,571
☑	2	GP	Dev	z/OS-1.11	Average	SHR	2	20	20.00%	☐	900	2,251
☑	*1	zAAP	Prod	z/OS-1.11	Average	SHR	1	80	80.00%	☐	915	1,144
☑	*2	zAAP	Dev	z/OS-1.11	Average	SHR	1	20	20.00%	☐	236	1,178
☑	*1	zIIP	Prod	z/OS-1.11	Average	SHR	1	80	80.00%	☐	915	1,144
☑	*2	zIIP	Dev	z/OS-1.11	Average	SHR	1	20	20.00%	☐	236	1,178

Table View

Display: ◉ All Partitions ○ Includes Only

Pools: ☑ GP ☑ zAAP ☑ zIIP ☐ IFL ☐ ICF

Capacity Summary by Pool

CP Pool	RCPs	Partitions	LCPs	Capacity
GP	4	2	6	4,557
zAAP	1	2	2	1,151
zIIP	1	2	2	1,151
IFL	0	0	0	0
ICF	0	0	0	0
Totals	6	6	10	6,858

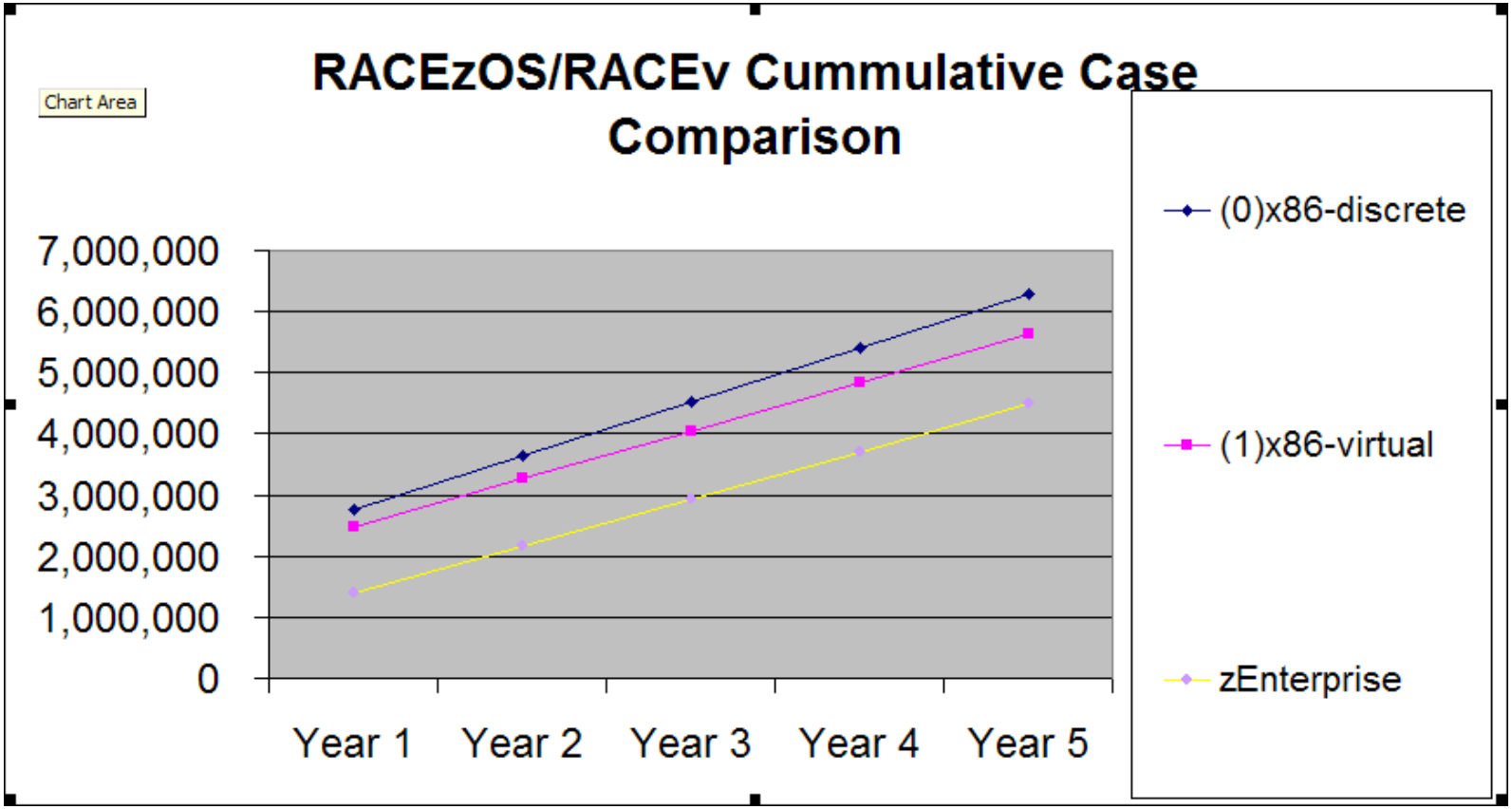
Host Summary | Modify SCP/Workload | Calibrate Reference-CPU

For significant configuration changes, capacity comparisons should be considered to have a +/-5% margin-of-error

Upgrading the processor family is considered a significant configuration change

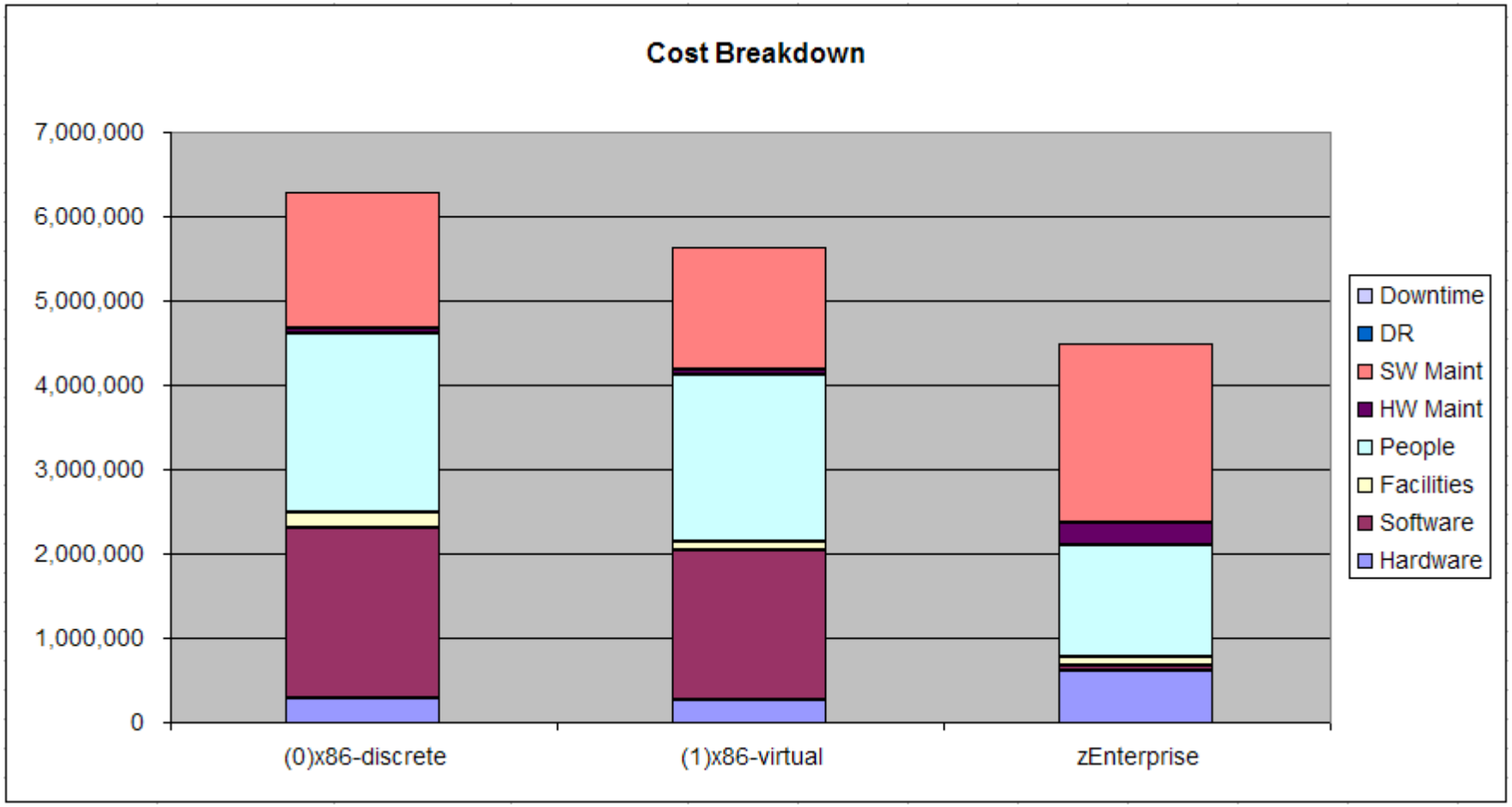
Input fields have white background; Single-click a "selection field" for drop-down list; Double click a "key-in field" to open.

Step 6 – Complete the Models
Examine the Results



Topics

Step 7 – Examine More Results



Topics

Step 8 - Iterate

- Refine Inputs
- Add Additional Cases and Solution Configurations
- Sensitivity Analysis

- Assumptions Analysis
  - The cost & value of zEnterprise Unified Resource Manager
  - The value of co-location
  - The cross-server sizing
  - Discounting
  - Admin ratios
  - etc.
  - etc.
  - etc.

In other words….

Have a productive argument! …

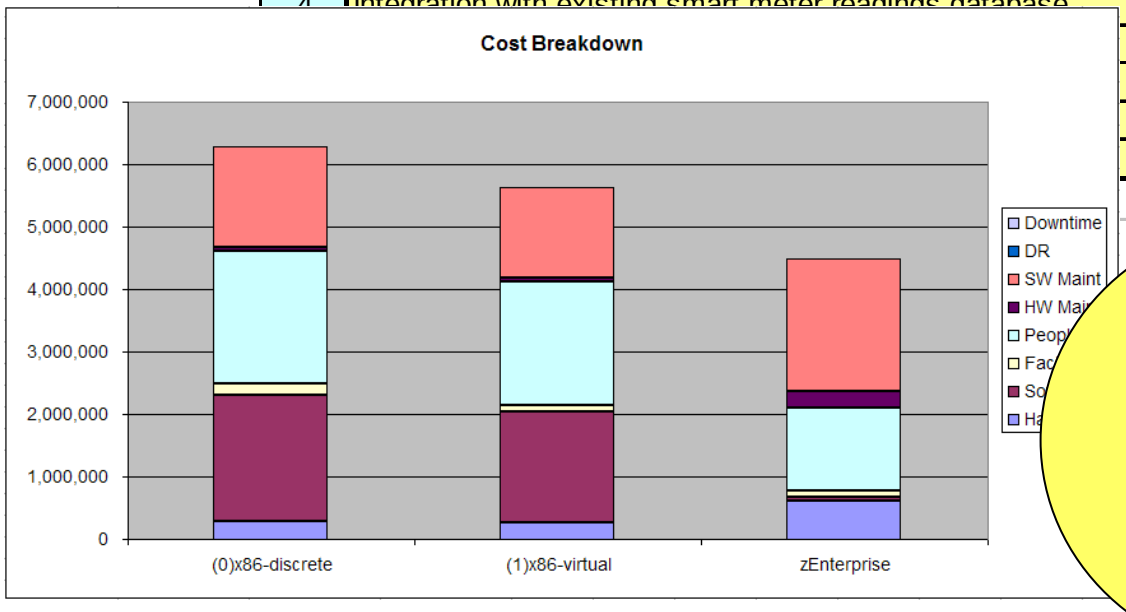
Which is what ALL of this is ALL about!!!

Topics

And Finally

- Merge the Requirements Analysis…
- And the TCO Analysis

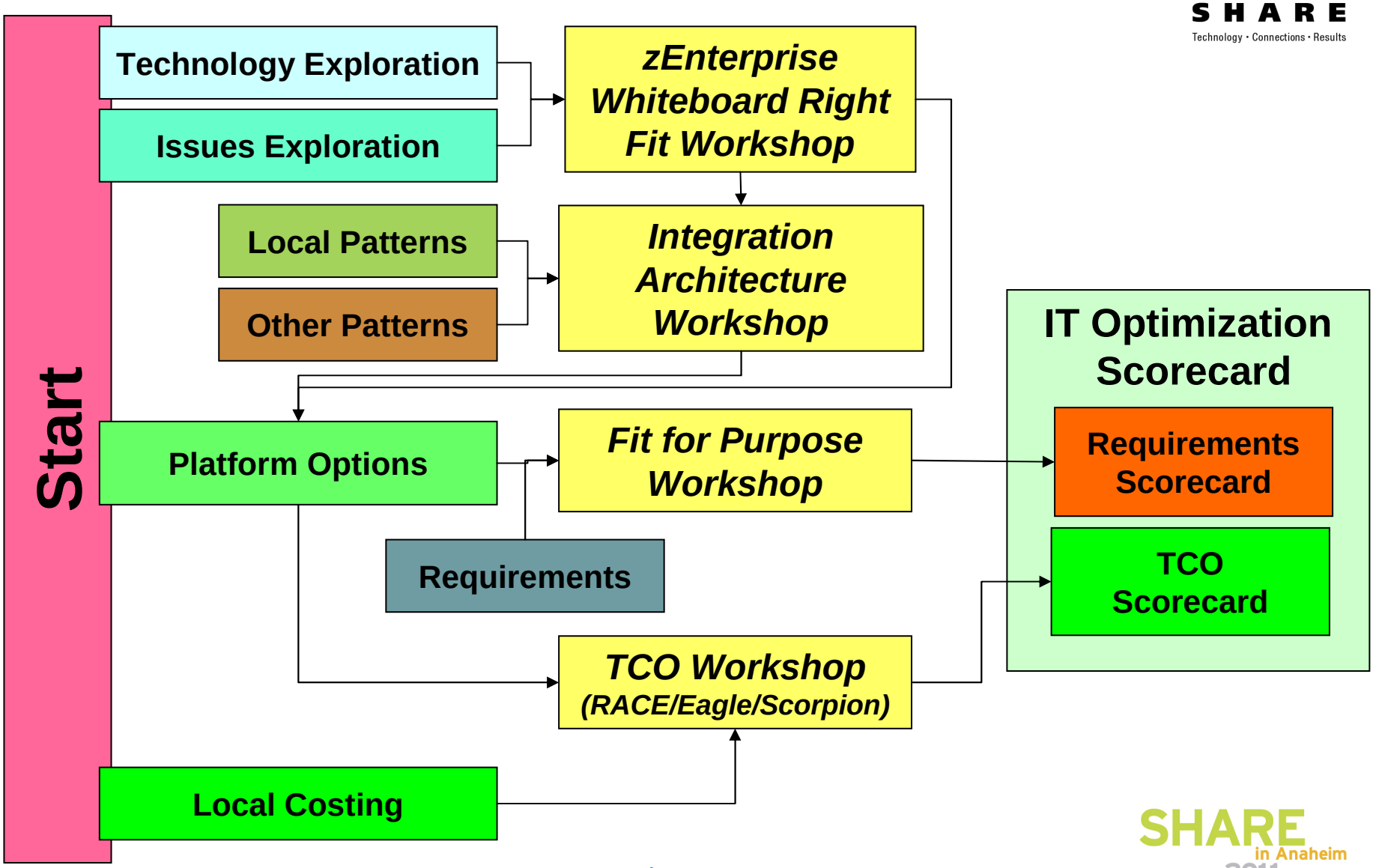
			Option 1 (x86)		Option 2 (z)	
Rank	Requirements List	Weight	Score	Result	Score	Result
1	Performance	6	L.Meet	24	L.Exceed	30
2	Scalability	5	L.Meet	20	L.Exceed	25
3	Integration with existing customer management system	4	L.Meet	16	D.Meet	20
4	Integration with existing smart meter readings database	4	L.Meet	16	D.Meet	20
		4	Marginal	8	D.Meet	20
		3	L.Meet	12	D.Meet	15
		3	L.Meet	12	D.Meet	15
		3	D.Meet	15	L.Meet	12
				123		157



And make an "optimal" decision!

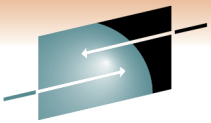
Topics

IBM IT Optimization (and zEnterprise) Analysis



Topics

End of Section



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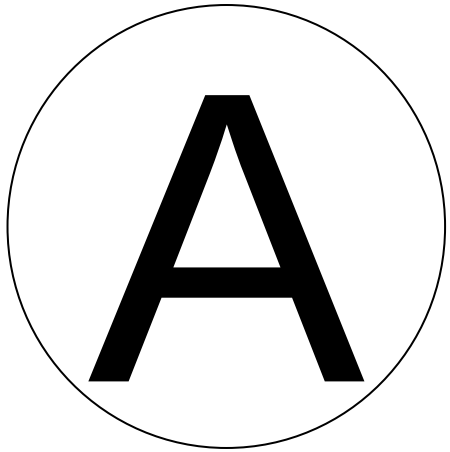
Appendix



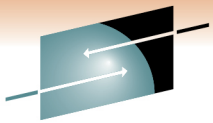
Topics

Two-Column Slide (Type Size=28)

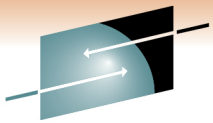
- Topic A (Type Size=24)
  - Subtopic 1 (Type Size=22)
  - Subtopic 2 (Type Size=22)
  - Subtopic 3 (Type Size=22)
  - Subtopic 4 (Type Size=22)
- Topic B (Type Size=24)

- Topic C (Type Size=24)
  - Subtopic 1 (Type Size=22)
  - Subtopic 2 (Type Size=22)
  - Subtopic 3 (Type Size=22)
    - Sub-subtopic 1 (Type Size=20)
    - Sub-subtopic 2(Type Size=20)
- Topic D (Type Size=20)

Slide with Table



Slide with Text & Graphic



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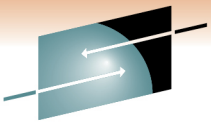

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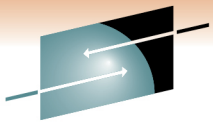
End of Presentation



Topics