Doing a (Dis)Honest Linux TCO Analysis or better Cost and Value

*Share* 2008 Session 9261

*Erich Amrehn*

*Romney White*

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**Agenda**

- TCO Factors
- IT Cost Trends
- TCO Case Studies
- Mainframe Advantages
- Univar Example
- References
Attention / Achtung!

- Not all charts are in the handout due to customer confidentiality requirements
- We felt it would be better to show you the information than not

- As of February 20, 2008, one € ≈ $1.38385

Major TCO Factors

- Hardware
- Software
- Other (e.g., Environmentals)
- People
TCO

Production

Hardware
Software
Maintenance
People
Environment
Unused space
Disaster Recovery
Hidden costs

Overlooked Costs

Test and development
Hardware/Software
Under utilized servers
Test and development
Maintenance

Other TCO Factors

- Availability
  - High availability
  - Hours of operation
- Backup/Restore/Site Recovery
  - Backup
  - Disaster Scenario
  - Restore
  - Effort for Complete Site Recovery
  - SAN effort
- Infrastructure Cost
  - Space
  - Power
  - Network Infrastructure
  - Storage Infrastructure
- Additional development and implementation
- Investment for one platform – reproduction for others
- Controlling and Accounting
  - Analyzing the systems
  - Cost
- Operations Effort
  - Monitoring, Operating
  - Problem Determination
  - Server Management Tools
  - Integrated Server Management – Enterprise Wide

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Other TCO Factors …

- Security
  - Authentication / Authorization
  - User Administration
  - Data Security
  - Server and OS Security
  - RACF vs. other solutions
- Deployment and Support
  - System Programming
    - Keeping consistent OS and SW Level
  - Middleware
    - SW Maintenance
    - SW Distribution (across firewall)
  - Application
    - Database Effort
    - Technology Upgrade
    - Non-disruptive System Release change
- Operating Concept
  - Development of an operating procedure
  - Feasibility of the developed procedure
  - Automation
- Resource Utilization and Performance
  - Mixed Workload / Batch
  - Resource Sharing
    - Shared nothing vs. shared everything
  - Parallel Sysplex vs. Other Concepts
  - Response Time
  - Performance Management
  - Peak handling / scalability
- Integration
  - Integrated Functionality vs. Functionality to be implemented (possibly with third-party tools)
  - Balanced System
  - Integration of / into Standards
- Skills and Resources
  - Personnel Education
  - Availability of Resources
- Further Availability Aspects
  - Planned outages
  - Unplanned outages
  - Automated Take Over
  - Uninterrupted Take Over (especially for DB)
  - Workload Management across physical borders
  - Business continuity
  - Availability effects for other applications / projects
  - End User Service
  - End User Productivity
  - Virtualization
Cost dynamics of supporting corporate IT infrastructures has changed significantly

We typically see . . .

- People expense has tripled as a %
- Software expense has doubled as a %
- Hardware is less than 1/3 of its original %

People expense is now the dominant component!

Source: IBM Scorpion studies – analysis of typical CIO budget for Mainframe plus UNIX/Windows servers

The IT Infrastructure as a Complexity Item

- Size & Volumes
- Control
- Management costs

Source: IDC
**Worldwide IT Spending on Servers, Power and Cooling, and Management/Administration**

![Graph showing IT spending trends over years with labels for different cost categories.

Source: IDC, 2006]

- **Many Servers, Much Capacity, Low Utilization = $140B unutilized server assets**

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**Categories Of Costly System Management Tasks**

![Pie chart showing distribution of costs for various management tasks.

IDC Survey Data, 2002-2004]

- **Many common management tasks must be simplified or eliminated to achieve significant improvements in IT productivity**

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Business Issue of Availability

Financial Impact of Downtime Per Hour
(by various industries)

- Brokerage Retail: $6.5 Million
- Credit Card Sales Authorization: $2.6 Million
- Airline Reservation Centers: $90,000
- Package Shipping Services: $28,250
- Manufacturing Industry: $26,761
- Banking Industry: $17,093
- Transportation Industry: $9,435

Source: ©Eagle Rocket Alliance, LTD. All Rights Reserved 2003

Unplanned Outage Causes

- 35% Hardware Failures
- 30% Application Failures
- 25% Operator Errors

IC 3606

- Loss of business
- Loss of customers – the competition is just a mouse click away
- Loss of credibility, brand image and stock value

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Downtime Costs

5 year cost of downtime - millions of dollars

Estimates for 6 real-life Manufacturing companies

Source: Business Value of Availability, Bottom Line Impact of SAP R/3 Platform Choices, ITG, November 2003
TCO / TCA / TVO / RCO / ROI ? MORE ??

Is the complexity of your infrastructure costing you more than you can afford?
A power / cooling crisis is upon us…

“Sometimes we run out of power, sometimes we run out of cooling, usually we run out of both”

Anonymous

Much of the crisis is due to unrestricted server sprawl without regard to power/cooling and space
Because IT Complexity Drives Many Hidden Costs TCO

- Do you recognize this description?
  - Thousands of lightly loaded servers
  - Hundreds of application instances
  - IT everywhere across the business
    - Physically
    - Logically
  - Thousands of distributed control points
- The Result:
  - Massive complexity
  - Spiraling people, power, cooling and server costs
  - Compounded by the inability to allocate IT costs to the business
  - Lack of internal costing methodologies

Virtualization and infrastructure mgt standards are the only hope to intercept these trends!

Cost of Complexity

- Operational efficiency (1)
- Pinpointing and managing issues
- Flexibility

<table>
<thead>
<tr>
<th>Predicted average cost per end user by 2010 (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainframes</td>
</tr>
<tr>
<td>UNIX® Minis</td>
</tr>
<tr>
<td>PC Servers</td>
</tr>
</tbody>
</table>

1. 2010 prediction: Dinosaur myth, 2004 Update. Arcati Research Limited, Strategic Analysis for Enterprise IT. Based on current and projected end user costs for hardware, software, maintenance, and labor in mainframe environments.

Cost of People vs. Spending on New Systems (2)

(2) IDC Directions, April 7, 2004. The Adoption of On Demand Enterprises and Utility Computing

Cost of management

Server spending (USM$)
Energy Efficiency

Case study: Retailer consolidated 600 x86 servers onto a single mainframe

eliminated an entire floor of servers

reduced the administrative staff by 10

cut power and cooling costs by 80%


Power-Hungry Computers Put Data Centers in Bind

Today’s distributed servers draw too much electricity and generate too much heat

The Uptime Institute, an organization that represents data-center managers, predicts that power-related problems this year will cause four of the 20 major failures typically experienced by members annually, up from two of 20 last year. “The people who buy computers often aren’t the people who have to manage them.”

Outcomes:

- Rackspace Ltd., a San Antonio service that manages servers for clients, has seen its power needs swell to eight megawatts from three megawatts in the past three years — sending its monthly utility bill up roughly fivefold to nearly $300,000.
- The University of Buffalo was surprised that their new system used 50% more power than planned, causing $20K in electrical upgrades and $150K in cooling upgrades.
Customer example

Consolidation z/VM & Linux on system z

- Customer is a distribution company
- Some core applications run on two System z9 (model 705) but …
- Most of new applications run on hundreds of x86 Linux or Windows servers distributed in 3 locations
- Main issues:
  - Disaster recovery for distributed environment is not efficient at all
  - Data centers may become full if the number of physical servers continues to grow
- Server consolidation using virtualization is key to support new business growth
- Initial scope of analysis: focus on 103 Linux x86 servers (171 cores)
  - AMD Opteron and Intel Xeon processors (2.6 & 2.8 GHz) – mainly dual cores and some quad cores
- Scope reduced to a set of 75 servers excluding:
  - Servers already consolidated using VMware,
  - Sysbase and PeopleSoft AS applications not available on Linux for System z platform
### Application analysis

<table>
<thead>
<tr>
<th>Linux x86 Software</th>
<th>Type</th>
<th>Linux z Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apache HTTP</td>
<td>Web application</td>
<td>Apache HTTP</td>
</tr>
<tr>
<td>WAS</td>
<td>Web application</td>
<td>WAS</td>
</tr>
<tr>
<td>VPSX</td>
<td>Pdf converter</td>
<td>VPSX</td>
</tr>
<tr>
<td>Oracle DB</td>
<td>DB</td>
<td>Oracle DB</td>
</tr>
<tr>
<td>PeopleSoft DB (Oracle)</td>
<td>CRM application</td>
<td>PeopleSoft DB (Oracle)</td>
</tr>
<tr>
<td>RYO mail appl.</td>
<td>Mail servers</td>
<td>RYO mail appl.</td>
</tr>
<tr>
<td>RYO applications</td>
<td>Core applications</td>
<td>RYO applications</td>
</tr>
<tr>
<td>RYO SW distribution</td>
<td>Software distribution</td>
<td>RYO SW distribution</td>
</tr>
<tr>
<td>RYO XXX application</td>
<td>Core application</td>
<td>RYO XXX application</td>
</tr>
<tr>
<td>RYO EDI package</td>
<td>EDI application</td>
<td>RYO EDI package</td>
</tr>
<tr>
<td>RYO Network scripts</td>
<td>Network management</td>
<td>RYO Network scripts</td>
</tr>
<tr>
<td>CA Access Control</td>
<td>Security</td>
<td>CA Access Control</td>
</tr>
<tr>
<td>Veritas Netbackup</td>
<td>Backup management</td>
<td>Tivoli Storage Manager</td>
</tr>
</tbody>
</table>

### Number of CPU cores per application group

**Environmental:**
- 212.0 KBTU
- 62.1 KW
- 158 Rack U values

**75 servers / 149 processors / 157 cores / 334 GB of memory installed**
**459,524 RPEs installed**
Server activity during period of analysis

2 days of Server activity

Server Utilization during Consolidated peak time
(14h10)

Average % Utilization = 5.82%
Maximum % Utilization during consolidated peak time = 7.70%

Consolidation effect on System z9

Total MIPS Consumed for All Servers
for all tasks at 10s intervals

Peak activity @14h10

157 x86 cores
11 System z9
IFLs
(14 : 1 ratio)
5-year Comparison and Cost structures

Customer benefits not included in TCO: Quality of service improvement, setup of an efficient Disaster Recovery plan, fast ROI, no need for a new Data Center

Customer example

2
Deployment of new Java applications

- Large European banking customer
  - The bank wants to perform a platform technology selection for the deployment of new Web applications
  - Large System z9 environment running core banking applications, based on IMS and DB2
  - Part of customer’s centralization strategy, new databases will be implemented on the current System z9 platforms based on DB2 for z/OS
  - Technical and cost assessment study to compare WebSphere applications running on AIX vs. z/OS, accessing a DB2 database located in a z/OS System z9 LPARs in a Parallel Sysplex environment.
  - Application utilization estimated to be at 100 transactions/second during peak time.
System p+z solution architecture (100 TPS)

3-year Cost Comparison @ 100 TPS

WAS & DB2 application on z vs. WAS on p + DB2 on z 100 TPS
Telco Industry Benchmarks Allow Direct Comparison of HP Superdome to IBM z9

HP Superdome – 64 x 1.5GHz Itanium2

64 Unix processors

Call initiation rate: 1,000/second

Call initiation rate on z9 is 6.5x more

24 processors

Call initiation rate: 6,568/second

Sources: CommuniGate-Superdome-VoIP-Benchmark.pdf & IBM-CommuniGate-z9.pdf from http://www.communigate.com/Papers
Telco Industry Benchmarks Allow Direct Comparison of HP Superdome to IBM z9

HP Superdome – 64 x 1.5GHz Itanium2

Call initiation rate: 6,568/second

420 Unix processors (719,590 RPE’s)

Equal call initiation rates

Call initiation rate: 6,568/second

Sources: CommuniGate-Superdome-VoIP-Benchmark.pdf & IBM-CommuniGate-z9.pdf from http://www.communigate.com/Papers

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Telco Industry Benchmarks Allow Direct Comparison of HP Superdome to IBM z9

Energy consumption comparison (without the energy for cooling)

- Superdome: 1401600 kw/y
- Z9 EC: 95484 kw/y

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Telco Industry Benchmarks Allow Direct Comparison of HP Superdome to IBM z9

- Heat production/waste of the solutions
  - Superdomes: 541000 BTU/h ca. 180 PKW Aircooling unit
  - Z9 EC: 32000 BTU/h ca. 11 PKW Aircooling unit

Telco Industry Benchmarks Allow Direct Comparison of HP Superdome to IBM z9

- HP Superdome – 64 x 1.5GHz Itanium2
  - $23.8M (HW, SW for 3 years)
  - k€ 1220 * (Energy for 3 years)
  - Total: about US$ 25.5 M

- Z9 24-way Benchmark
  - $10.3M (HW, SW for 3 years)
  - k€ 83 * (Energy for 3 years)
  - Total: about US$ 10.5 M

*1) Energy costs in Germany 2007 – 14.5 ¢/cent / kw/h.
- UPS and availability/recovery features are not evaluated
**Customer Studies**

**Representative customer**
- **Websphere**

**Hardware**
- 5000+ MIPS
- 1000+ servers (25% Unix)

**Software**
- Websphere currently on Solaris
- Oracle and DB2

Customer perception:
Solaris environment is 1/5 the cost of the mainframe

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**A Real Client Example of finding “All the Costs”**

**Current Production WebSphere Environment**

<table>
<thead>
<tr>
<th>HTTP Server Layer</th>
<th>Internal HTTP servers – prod1-6</th>
<th>Internal HTTP servers – prod1-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web App Server Layer</td>
<td>WAS</td>
<td>WAS</td>
</tr>
</tbody>
</table>

**DB2 Universal Database**
- Session DB

**S/390**
- production databases and transactions

**LOB**
- production systems and transaction

Source: Scorpion Study 1999 - 2004
A Real Client Example of finding “All the Costs” Production SUN Server Architecture

- Customer perception was that the mainframe would be 5x the cost of the existing Sun implementation

Customer Example: Distributed SUN Server Solution – perception… isn’t always reality!

- Customer thought they only had 24 UNIX servers
  - But these were just the PRODUCTION servers
  - In addition they had 49 servers for Development, Test and Disaster Recovery
The Total Cost of Acquisition may be a Misleading Indicator for Large Enterprise Deployments

George J. Weiss
Vice President and Distinguished Analyst in Gartner Inc.

Only the Holistic View will give you the Entire Picture!

Server Analysis

By Function

Total: 273
- Large servers: 22 (8%)
- Smaller servers: 44 (16%)
- Tivoli, ADSM servers: 125 (46%)
- Firewalls: 82 (30%)

76% of servers are infrastructure
16% are smaller servers
8% are very large appl/db servers

By Estimated Costs

Total: 23,9
- Large servers: 14,3 (60%)
- Smaller servers: 1,6 (7%)
- Tivoli, ADSM servers: 6,3 (26%)
- Firewalls: 1,7 (7%)

Server costs dominated by large application/database servers
Server Analysis

By People Efficiency
(52 People (int + ext))

2.1 servers/person
- 6 large applications; 34 servers
- 22 large, 12 small, med servers
- 7.3 (large) servers per application
- Firewalls 5
- 10%
- Tivoli, ADSM servers 21
- 40%
- Small Apps. 10
- 19%
- Large Apps. 16
- 31%

16.4 firewalls/person
82 Firewalls

3.2 servers/person
- 10 small applications; 32 servers
- 26 small, 6 med servers
- 3.2 (small) servers per application

6.0 sys man /person
125 Sys.man. servers

Big productivity differences between cloned infrastructure and application/database servers

Server Demographics – Avg Unix and Intel CPU Utilization

This graph represents the portfolio of customer studies performed from 2000 thru 2004 categorized by average CPU utilization

- Avg Intel CPUS%
- Avg Unix CPUS%

- Peak Unix 41%
- Peak Intel 28%
- Avg Unix 15%
- Avg Intel 7%

Customer Engagement (In Chronological Order)
What is a zRACE Rapid Assessment?

- **zRACE:**
  - Is an assessment methodology used to develop a Total Cost of Ownership scenario comparison for our clients …
  - Is used to evaluate potential benefits of consolidating workloads from Intel and/or UNIX platforms onto System z IFLs (specialty engines running Linux) or WebSphere Applications on zAAP engines.
  - A 5 year TCO analysis comparing current case versus a distributed alternative …
  - Takes advantage of new or existing System z footprints as the target environment …
  - Uses a combination of assumptions, estimates, industry numbers and actual client data to develop cost models.

The Cases We Propose to Compare

- **Case 0 - Stay the Course / Do Nothing**
- **Case 1 - Virtualize Using System z**
- **Case 2 - Virtualize Using x86 VMware**

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Zodiac helps build solution-by-solution business cases

... and business cases that show a Greener Environment!
Mainframe Cost Trends

Mainframe hardware, software, and labor costs have decreased 17.3% per year

Kevin Campbell

“For Univar, the ROI model that we have used for this consolidation takes into account all of the hard costs that we’re comfortable with predicting;
the elimination of hardware leases,
the elimination of software maintenance
suggests that we should see a return on our migration investment within three to four years.

What that doesn’t try to quantify are the soft benefits such as simplifying the process we currently have to move data from platform to platform. It doesn’t attempt to quantify the costs inherent in maintaining all of that. Also - eliminating racks of equipment - we have drastically reduced the cooling and power supply demands on our datacenter. All of these are what we regard as soft benefits that are well worth having, but which we didn’t attempt to quantify”.
Driving Down Costs Requires Knowing What You Have
If there aren’t accurate measures . . . how do you know it’s effective?

. . . on average, approximately 15% of Global IT budgets are attributable to mainframe-related purchases, contracts, and activities, but, at the same time, 25-30% of the IT budget is recovered via billing for mainframe-resident services . . .

. . . in the past, chargeback systems focused on isolating IT system events that could be relatively easily tracked and could be shown to generate sufficient ‘revenues’ to cover the IT budget. Now, however . . . , the focus is on building systems that reflect the real underlying relationship between IT resource consumption and cost accrual. Despite this change in focus, mainframe platforms remain the keystone for chargeback architectures, particularly in the financial services industry . . .

Will Cappelli, Vice President, META Group

IBM Mainframes provide technology and tools to accurately track and report resources consumption in mixed workload environments to help better manage cost and improve investment decisions.

Meta Consulting has developed a chargeback methodology to enable enterprises to allocate costs more equitably and accurately across all platforms in the entire IT infrastructure.

Solutions from newly acquired Isogon provide customers the tools they need to manage their software costs.

Logical Steps

1. ‘Full’ Inventory of IT infrastructure servers
2. Group the Servers into ‘homogeneous’ ISLANDs
   - A manageable ISLAND should contain not more than 500 servers (300 is the best number)
   - Group the servers by Location/Application/Function, not by platform
   - A typical Island should contain less than TEN different applications
   - The application grouping is very important for understanding the consolidation potential
3. Rank the servers by consolidation potential (A,B,C,D,...)
   - Easy to consolidate on any platform (Infrastructural Servers)
   - Easy to consolidate on a similar platform (Data Base or Middleware)
   - Not so easy to consolidate (Need for Porting process)
   - Cannot consolidate
   - Out of Scope
4. Run the Zodiac or zRace Business Cases by using:
   - The Application/The Consolidation Potential
5. Run Zodiac or zRace
   - Obtain a cost picture
   - Obtain a savings picture
   - Obtain a target model (no more than one)
Mainframe Advantages

- Least expensive except for smallest multi-user systems
- Biggest factors in wide Total-Cost-per-User differences
  - Much lower operating/support staff level/costs on mainframe compared to UNIX and Windows
  - Mainframe software costs very visible; distributed costs hidden and duplicated
- UNIX or Windows distributed platforms
  - Require 2.5X to 3X more staff than today’s mainframe to support similar workloads
  - Profusion of server/storage hardware and software needed in enterprise configurations, often 10-fold more “iron” than zSeries
- Dramatic reductions in mainframe staffing levels
  - 10-fold reduction in mainframe staffing (operators and systems programmers) per MIPS over last 7 years
    - From IBM’s major advances in self-healing, self-managing, self-protecting, autonomic technologies for the mainframe
  - Scalability – doubling users adds 90% for mainframe but 125% for distributed
  - Expect continuing mainframe advances will halve this again over next five years

Source: Arcati
Bibliography

- SearchDataCenter: Mainframe server consolidation should be on your hit list
- SearchDataCenter: Mainframe TCO getting more bang for the buck, analyst report says. By Mark Fontecchio December 20, 2006.