

Independent Assessment by Alan Radding

IBM System z case study: Salt River Project

Consolidating HPUX onto System z with Red Hat Linux

Executive Summary

The architecture committee at Salt River Project (SRP), one of Arizona's largest utilities, decided the company should explore open source technology. The IT group had been informally experimenting with Linux, and the directive from the committee provided the green light they needed. They identified a dozen aging HPUX x86-based servers and decided to virtualize and consolidate them on both Linux running on SRP's new System z9 as well as Intel based Linux.

Consolidated virtualized Linux servers on the System z promised a number of advantages:

- Save money by eliminating costly, aging hardware and software
- Reduce the likelihood of server sprawl
- Streamline system management
- Leverage the efficiency and reliability of the System z

Today, SRP runs 15 virtualized Linux servers on a System z10, upgraded from the z9. It also runs Red Hat's Satellite management system as a Red Hat Enterprise Linux (RHEL) image on the System z, which boosts administrator efficiency. And it is steadily expanding the Linux workloads it runs on the System z, having added WebSphere Application Server to its portfolio.

Virtualization has emerged as a proven way to consolidate servers and save money. This case study shows how by eliminating dedicated servers and running the workloads on virtualized Linux servers hosted on the System z organizations can lower costs, improve efficiency, and boost application performance and reliability.

Challenge—how can we capitalize on open source

The SRP architecture committee thought there could be advantages for the company in leveraging open source technology, particularly Linux. In addition to the cost advantages of open source technology, Linux would let the company move to a thoroughly modern, forward-looking UNIX-like operating system.

Until then, the company's experience with UNIX revolved around an aging version of HP-UX running on end-of-life servers. In addition, it ran the usual array of x86-based Windows systems.

More than just trying Linux, the IT group saw the move to open source as an opportunity to consolidate the distributed HP-UX servers as virtualized Linux servers. By doing so, the company would eliminate a dozen HP-UX physical servers, running them instead as virtualized Linux instances. If successful, this would result in significant savings, both immediate and ongoing.

This is in keeping with the widely embraced industry response to the proliferation of dedicated, lightly utilized servers, each hosting a single application, which focuses on the use of virtualization to consolidate multiple physical servers as virtual servers on a single piece of server hardware. Linux is often the operating system of choice for virtualization-based consolidation. By consolidating its HP-UX servers on Linux, SRP could test the advantages of Linux and open source and reduce the number of physical servers it maintained by eliminating costly end-of-life machines.

Background—Salt River Project

According to SRP, the company is one of Arizona's largest utilities providers. It has delivered low-cost, reliable power and water to Arizona customers for over 100 years. SRP includes two entities: the Salt River Project Agricultural Improvement and Power District, a political subdivision of the state of Arizona, and the Salt River Valley Water Users' Association, a private corporation.

The District provides electricity to about 935,000 retail customers in the greater Phoenix metropolitan area. It operates or participates in 11 major power plants and numerous other generating stations, including thermal, nuclear, natural gas, renewable and hydroelectric sources.

SRP's mission is to deliver ever-improving contributions to the people it serves by providing low-cost, reliable water and power along with community programs to ensure the vitality of the Salt River Valley. The Salt River Valley encompasses greater Phoenix, AZ.

Server consolidation on the System z

The directive to try Linux gave a team at SRP led by Kevin Masaryk, Senior Linux/UNIX Administrator, and Tim Moeur, Systems Infrastructure Programmer/Analyst from SRP's mainframe group, a different idea—consolidate the HPUX servers as virtual Linux servers on the company's mainframe, which it had recently upgraded to the System z9 BC.

The company had been informally testing Linux in-house for several years in a vague expectation that it might move to Linux in the future, although it had no Linux applications in production. The interest was there, but SRP needed a push.

The push came when SRP upgraded its mainframe to a z9. IBM offered incentives in the form of deep discounts to customers who would try Linux on the mainframe. That was just the incentive the company needed, especially since it already had been thinking about Linux. So, why not do it on the mainframe? That would deliver better utilization through workload consolidation and increased management efficiency. By adding Linux workloads to the System z, SRP also would take advantage of the lower TCO, increased reliability, and reduced carbon footprint of the mainframe

Now the question became which Linux on System z. Both Red Hat and Novell offered proven enterprise-class Linux distributions on the System z. The IBM incentives didn't specify a particular distribution. SRP actually had experiences with both; having experimented early with Novell's SUSE but was

leaning toward Red Hat in its distributed environment. The desire for a single corporate standard won out with SRP opting for Red Hat Enterprise Linux (RHEL) for both the System z and its distributed environment. HPUX would be phased out over time. From the System z standpoint either choice, SUSE or RHEL, would have been fine.

Benefits of Server Consolidation on System z

Companies in every industry have jumped on the idea of server consolidation as a way to control cost, reduce energy consumption, and improve management efficiency. The chosen method to do this is virtualization, which allows the organization run multiple virtualized servers within a single physical server. Specifically consolidation allows the organization to:

- Increase server utilization
- Reduce the overall server footprint (fewer physical servers)
- Reduce the overall carbon footprint
- Streamline server management
- Enable a more reliable, flexible IT infrastructure

All of this produces hard dollar savings. This is true when consolidating x86-based servers, UNIX servers, or Linux servers to more richly configured servers of the same type. If, however, you can consolidate the servers as virtual machines on a single System z the benefits can be that much greater: more virtualized servers, higher utilization, reduced management overhead plus the traditional advantages of mainframe performance, reliability, and management efficiency.

For organizations like SRP, which already had a mainframe, this kind of consolidation is an easy decision; especially with the incentives IBM gives when moving new workloads and non-IBM workloads to the System z. For organizations that come new to the System z, it will take somewhat longer to recoup the upfront investment out of the consolidation savings, but a System z

newcomer also will have even greater leverage to shake loose more generous discounts from IBM, which will help speed the payback.

Implementation

The Linux implementation on System z went smoothly although there was an expected learning curve, reports Moeur. The first lesson the SRP team learned was the limitations of running Linux in an LPAR. z/VM, the team quickly discovered, is a much better option in terms of efficiently utilizing System z resources. z/VM can run many more Linux images on a single LPAR.

The initial Linux workload consisted of DB2 Connect with HiperSockets. DB2 Connect is IBM's communications infrastructure for connecting Web, Windows, UNIX, Linux, and mobile applications to data. HiperSockets provides communication between Linux images, or between Linux and other operating system images on the System z. This initial connectivity between the System z, Linux, and other platforms in the SRP environment won over the non-mainframe community to Linux on the System z.

SRP also implemented Red Hat's Satellite management technology as a System z Linux image. The organization's Linux team uses it to manage distributed Linux systems across the enterprise.

Subsequently, the company successfully added some of its WebSphere applications to Linux running on the System z.

Only one application, Oracle, proved disappointing from a performance standpoint. Looking back, the team realizes it underestimated the resource demands Oracle would place on the IFL. Even with just a few users, Oracle performance was unsatisfactory. Today, SRP runs Oracle on x86-based Linux servers.

SRP now has 15 virtual Linux servers running on the System z, up from the initial dozen and is actively seeking new Linux workloads wherever it is appropriate. The z9 has been upgraded to a z10 with 2 IFLs, z/OS, z/VM, and

RHEL v4 and v5. Linux images are backed up to an earlier System z890. Data is stored on EMC Symmetrix storage at the data center and a backup site.

The company's primary System z production applications, however, remain DB2 and CICS. It runs a mix of homegrown and packaged applications for customer service, billing, administration, and operations.

Winning the System z Linux credibility battle

No one at SRP questioned the value of the System z. It had been the company's mainstay for years and it continues to deliver reliable, consistent performance for its legacy applications.

The only question was whether it was the best choice for Linux. Especially among the proponents of other platforms, there was considerable apprehension about moving to Linux on the System z.

Cost became the compelling driver. The savings the company enjoyed from consolidated license fees, both for DB2 Connect and WebSphere, allowed an easy deployment of multiple instances of each to allow a three-tier architecture of test, QA, and production, each with redundant servers for failover and high-availability. With the success of the initial proof-of-concept implementations, the decision to implement Linux on System z was an easy one to make.

SRP Systems and Software

System z10 BC
2 IFLs
z/OS
z/VM
zLinux, RHEL v4, v5
CICS
DB2
DB2 Connect
WebSphere
EMC Symmetrix storage

Results

SRP experienced a number of benefits from the consolidation of HPUX servers as virtual Linux servers on the System z:

- Reduced costs due to lower software licensing and maintenance fees
- Lower costs resulting from higher utilization and lower energy consumption
- Increased administrative efficiency due to consolidation
- Improved system performance
- Increased system reliability and stability
- More efficient system management across distributed and System z environments

Although server sprawl hadn't been a pressing problem initially, the elimination of a dozen HPUX servers resulted in significant savings and reduced workload for system administrators.

Lessons Learned

The SRP consolidation of distributed HPUX servers to virtualized Linux on the System z went surprisingly smoothly. Still, the company would do a few things differently:

- Better understand the capacities of the IFL at the outset
- More accurately model and estimate the resource consumption of Oracle
- Recognize the value of z/VM from the start
- Do better sizing initially
- Be more proactive in managing change

None of these issues, however, prevented the organization from successfully implementing the initial consolidation or slowed the growth of virtualized Linux on the System z

Independent Assessment analysis

For years IBM has been beating the drum for consolidation of servers as virtualized Linux systems on the System z, and recently the concept has gained

traction. To make that happen, IBM has been slashing the cost of the necessary pieces, namely the IFL.

That strategy apparently is having the desired effect, at least in the case of SRP. The vendor offered SRP a deal on a new System z with significant discounts on the included IFL. It clearly paid off—SRP has since upgraded to an even newer System z, bought another IFL, and steadily increased the number of virtual Linux machines.

What shouldn't be overlooked in the wheeling and dealing it took to get SRP to take the plunge is the ease of the implementation and server consolidation process that followed. SRP got the initial consolidation up and running without significant problems and has continued to increase the number of virtualized servers on System z Linux. I suspect in the future if the SRP team revisits the Oracle issue—its only setback in the Linux on z migration—it will be able to make it work too

About Independent Assessment

Independent Assessment (<http://www.independentassessment.com>) is the IT and business assessment, analysis, and writing service of Alan Radding, an independent business and IT analyst/writer for over 20 years. It provides independent ROI and TCO analysis, competitive assessment and positioning reports, case studies, white papers, and Web content.

Independent Assessment publishes *dancingdinosaur*, the independent blog covering the System z, <http://dancingdinosaur.wordpress.com>