CLABBY ANALYTICS

Case Study

Sparkassen Informatik's New Enterprise Data Center

Executive Summary

Sparkassen Informatik (SI), owned by the German Savings Banks Organization, is a highly successful provider of IT (information technology) services to the retail banking industry in Germany. Through mergers and acquisitions ─ and by being able to deliver the right amount of computing capacity coupled with reliable service at a reasonable price ─ SI supports over 290 savings banks, over 30 Million banking customers, over 175,000 banking employees ─ and owns over 30% of Germany's retail banking services market.

To gain an in-depth understanding of SI's business strategy and operations model, *Clabby Analytics* (that's me) ventured to SI's offices in Koln (Cologne) Germany, where I met with Uwe Katzenburg, stellv. Vorsitzender der Geschaftsfuhrung (the senior executive in charge of SI's production data centers and network environments). Over the course of my visit, Mr. Katzenburg detailed SI's business strategy, its business challenges, and provided insights into the reasons why his company has chosen IBM as its premier information systems and services supplier.

Based upon this visit, the follow are my research findings:

- Operational efficiency is key to SI's profitability ─ especially the operating efficiency of its information systems. As an IT service provider, it is of paramount importance that SI's enterprise information systems are tuned to deliver maximum computing power without wasting computing cycles or energy.
- To deliver maximum computing performance, SI:
    - Buys dense systems architectures (primarily large, scale-up systems and blades) that house dozens or hundreds of servers in compact systems enclosures or chassis. By consolidating computing power into dense packages, the management of thousands of servers is greatly simplified; software licensing costs are reduced; and the need to install thousands of redundant failover servers on a 1:1 ratio is scaled back;
    - Virtualizes (logically pools physical computing resources) its enterprise-class servers to increase utilization rates and reduce acquisition costs (note: very little virtualization of x86 resources has taken place to date); and,
    - Deploys advanced systems management software to automate systems/storage/network management, helping to reduce management labor costs.

Especially noteworthy is that SI will soon have installed 30 IBM System z (mainframe) footprints in 11 Sysplexes! This is anomalous and unusual in the service provider industry (most IT service providers base their compute offerings on 64-bit Unix architectures including IBM Power and Sun UltraSPARC platforms, and/or on x86-based architecture). Hence, the logic behind this decision bears closer scrutiny.

- In addition to deploying highly optimized information systems, SI has modernized its data centers ─ adding new power management systems to feed its dense architectures; updating its uninterruptable power supplies to deliver the exact amount of backup power required in case of failure; and adding new cooling facilities to efficiently dissipate the heat generated by its dense systems architectures ─ all while significantly scaling back the number of data centers it operates (*In an age where many enterprises are building more data centers, SI has downsized from 9 to 6 consolidated data centers over the past 5 years*).

By building a highly efficient information systems environment, by optimizing that environment for performance, by focusing on automated management and service delivery, and by modernizing its data center, SI has implemented what IBM is now calling a "new enterprise data center". This Case Study also examines what a "new enterprise data center" is ─ and what benefits SI is deriving from adopting this model of computing.

The remainder of this *Case Study* takes a closer look at Sparkassen Informatik's IT environment ─ seeking to learn what kind of efficiencies that SI is achieving by implementing new enterprise data center foundational principles (such as consolidation, virtualization, and data center modernization). In addition, *Clabby Analytics* takes a closer look at SI's procurement policy (SI buys computing and networking capacity and related services in bulk as part of large vendor purchase agreements [VPAs] ─ introducing further efficiencies into the company's procurement processes while helping to lower the company's acquisition and deployment costs). And this *Case Study* concludes with the observation that the efficiencies that SI has realized by adopting on demand computing and new enterprise data center principles can (and should) be adopted by other service suppliers who are interested in lowering operating costs while improving profitability.

What Is a "New Enterprise Data Center?"

In November, 2002, IBM formalized its recommendation on how to design the information systems of the future. This recommendation, dubbed "on demand computing", called for business process flow to drive underlying information systems. To enable this to happen, however, information systems buyers would need to adopt a common infrastructure (known as service-oriented architecture based on Web services and extensible markup language) ─ and information systems would have to be "optimized" (consolidated and virtualized) to support message-intensive, service-oriented process flows.

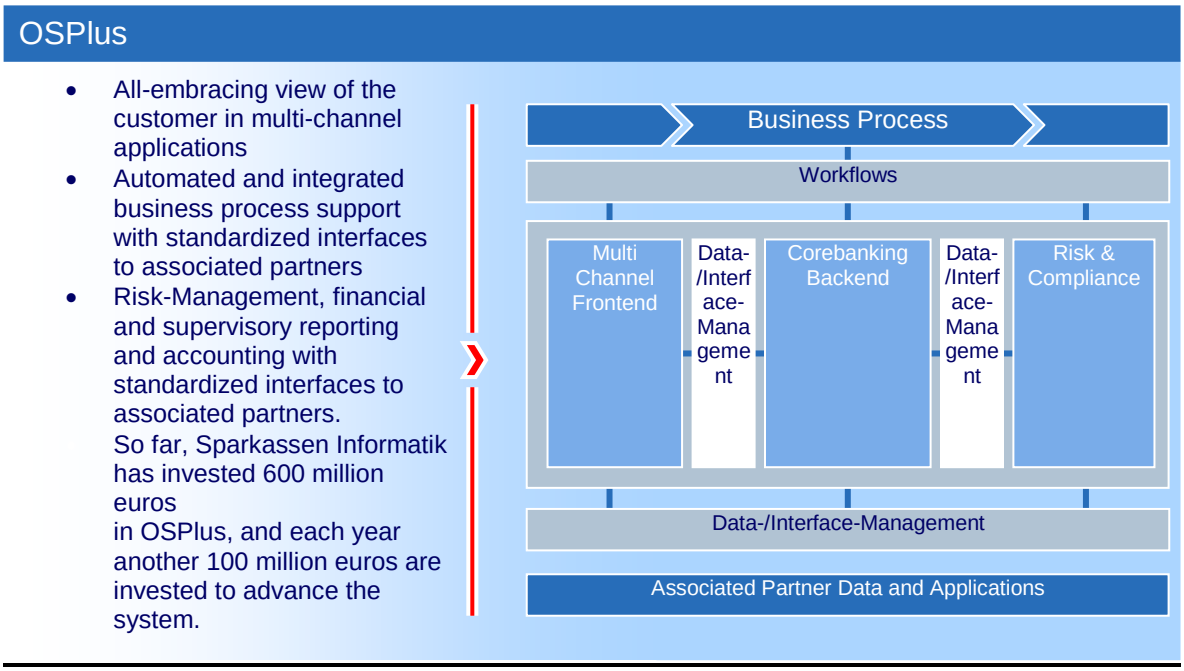
More specifically ─ at the information systems level ─ the "on demand" vision called for servers, storage, and network devices to be consolidated to reduce management costs and improve systems availability. And it called for information systems and storage arrays to be virtualized to improve utilization rates.

Resource consolidation has lead to denser packing of computing resources (more servers in a much smaller footprint) ─ while resource virtualization has upped the utilization rate of those consolidated servers. The combination of both of these activities has had a very positive effect on overall computing efficiency, but has also put some stress on data center designs (because denser systems generate more heat which must be dissipated). To deal with these heat dissipation issues, as well as to provide a framework for efficient data center energy use, IBM has evolved on demand computing to take a more

holistic view of enterprise information systems and related data centers. This holistic view is known as "the new enterprise data center".

Over the past several years, Sparkassen Informatik has embraced IBM's on demand vision in a big way. Its key product offering (OS Plus ─ shown in Figure 1 below) has been designed to efficiently flow business processes over a service-oriented architecture. And to support this environment, SI has consolidated hundreds of underutilized servers into fewer, more powerful servers ─ and has virtualized some of its unused computing capacity (particularly using System z logical partitions [LPARs] as well as virtualization facilities on its Power systems) as a means to increase the utilization rates of these consolidated servers.

Figure 1 ─ Sparkassen Informatik's OS Plus Environment



Source: Sparkassen Informatik ─ June 2008

As a result of buying into IBM's on demand vision and IBM's new enterprise data center model, SI's IT infrastructure is now one of the most efficient information systems environments that this IT research analyst has ever seen. Sparkassen Informatik runs a well tuned, performance-optimized, energy efficient systems environment that enables this company to provide its customers with their desired computing capacity at reasonable rates. The efficiency of SI's information systems environment provides the company with distinct operational advantages over both in-house banking retail organizations as well as distinct competitive advantages over fellow IT services providers.

SI's IT Environment: Four Lessons for Achieving Information Systems Operational Efficiency

As an IT service provider, SI clearly recognizes that any money that it can save in its own IT operations gets passed directly to the company's bottom line as increased profitability. So one of the most important questions that SI's executive board (which consists of 6 IT and business executives) needed to address from the outset of this company's formation was "how can we improve overall information systems efficiency, while reducing waste?"

Some of the answers to this question were readily obvious. Systems, storage, and network management can be labor intensive and expensive. Further, the management of distributed information systems can be extremely complex (finding and exploiting unused resources in a distributed environment can be a real challenge; as can the securing of all of the access points that proliferate in distributed systems architectures ─ each presenting an opportunity for potential security breaches). One clear solution that SI's executive board recognized was that the SI should automate the management of systems resources whenever possible to contain management costs.

Other opportunities to improve enterprise computing efficiency were, however, less obvious. For instance, is it more energy efficient to deploy hundreds of smaller servers, or dozens of very large servers? By consolidating many servers into fewer servers, SI realized that large servers, running at higher utilization rates actually burn tremendously less energy than smaller servers that run at 10% or so of capacity. (As proof of this concept, IBM recently announced its mainframe "gas gauge", a measurement tool that has been used to show that certain mainframe configurations can process the workload of 250 x86-based Linux servers using only 10-12% of the energy used by these Linux servers).

One of the cornerstone decisions made by SI's executive board has been the decision to centralize management functions across fewer systems (as opposed to managing multiple, distributed, frequently underutilized servers). Systems consolidation, accordingly, has become a key focal point for SI ─ and a matter of policy.

Four Basic Information System Design Considerations

After several years of trial and error ─ and as a result of having to integrate the information systems resources of companies that SI had merged with or acquired ─ the lessons that SI has learned with respect to improving the operational efficiency of information systems environments include:

1) Centralize information systems management to reduce complexity;
2) Automate management functions whenever possible to reduce labor costs;
3) Consolidate and virtualize distributed systems to improve utilization rates, system availability, license management, et al; and,
4) Opt for denser architectures in order to ensure that data center real estate expansion is kept under control (SI has been able to *eliminate* several data centers by deploying denser systems in its existing data centers ─ and then by modernizing those data centers to handle increased demands for energy use and cooling).

The conclusion that SI's board of 6 IT and business executives have come to over time is that centralized control of large, dense, scale-up servers can lead to significant savings in operational costs ─ especially costs related to system management; to systems acquisition (fewer servers would need to be purchased because scale-up servers offer better utilization rates than scale-out, distributed computing designs); to energy consumption and use; and to real estate

An Anomaly: Why Does IBM's System z Figure So Prominently in SI's IT Infrastructure?

As described in the previous section and the *Executive Summary*, SI has realized distinct operational cost advantages moving to a centralized, dense model of computing. To achieve these operational advantages, SI makes use of several different classes of dense

servers including System z mainframes, high-end and midrange IBM Power systems and Sun UltraSPARC-based servers ─ and occasionally scale-up x86 servers (such as IBM's X4 System x servers). SI also deploys HP and Fujitsu blade servers to handle Windows serving.

Each type of dense server runs different types of workloads:

- IBM System z, for instance, is charged with running highly secure, transaction-intensive COBOL-based workloads. CICS transaction environments remain lightening fast ─ and is still more efficient to process transactions in a tightly-coupled, dense mainframe environment than across a myriad of distributed servers and databases).
- IBM Power and Sun UltraSPARC servers run Unix application workloads ─ most importantly SI's OS Plus Portal application environment. SI could standardize on one systems platform in the Unix space ─ but has chosen to split its Unix business in order to create a "healthy competitive environment" between Sun and IBM ─ as well as to create a means to leverage acquisition costs between the two vendors.
- And Windows x86 servers run select branch custom applications, a full suite of client applications, and also provide terminal services.

A core tenet of SI's business is *reliable* delivery of computing *capacity*. And mainframes still provide the highest meantime-between-failure (MTBF) in the industry ─ while offering almost limitless expansion capacity. From a system design perspective, System z mainframes are ideal for meeting SI's reliability requirements and capacity needs. (Note that SI's System z mainframes regularly operate at close to 100% capacity while handling huge transaction volumes in a consistent, reliable, and secure manner. In addition, some of SI's Unix servers are operating at 85% utilization rates ─ while most of SI's x86 based servers are operating in a "substantially less" [unqualified] utilization range).

Mainframe Virtualization Advantages

One of the reasons that mainframes perform at such high utilization rates relates directly to the strength of the mainframe virtualization environment. System z architecture has been virtualized for almost forty years ─ and features several advanced management capabilities including logical partitioning, advanced memory management, the ability to support thousands of virtual machines per system, and so on. x86-based servers, by contrast, offer comparatively "basic virtualization" capabilities.

Some of the major differences between x86 virtualization versus System z virtualization are illustrated in the following chart (Chart 1).

Chart 1 — Comparative Differences in x86 Virtualization vs. IBM's System z

Attribute	z/VM V5.3	VMware ESX 3	System z Value
Supported operating systems	Linux, z/OS, z/VSE, z/TPF, z/VM itself	Linux, Windows, Netware, Solaris 10	z/VM-on-z/VM = added flexibility
Scalability and Performance			
Hypervisor scalability	Up to 32 CPUs, 256 GB of memory, 8 TB of "active virtual memory"	Up to 32 CPUs, 64 GB of memory	Cost-saving, extreme scalability of virtual server environment
Virtual Machine (VM) scalability	Up to 64 CPUs, 1 TB of memory, extensive I/O bandwidth	Up to 4 CPUs, 16 GB of memory, modest I/O bandwidth	Virtualizes servers on z/VM that cannot run on VMware
CPU sharing	No limit	Up to 8 VMs per CPU	Add servers without adding HW
Architected (practical) VM limit	Thousands (hundreds) per copy of z/VM	128 (singles) per copy of VMware	Avoid real server sprawl
CPU capacity on demand	Yes, non-disruptively	No	Fast, easy capacity growth
In-memory support	Minidisk cache; Virtual Disks in Storage; DCSS (shared program executables)	Shared virtual memory pages (detected via background operation)	Enhanced resource utilization
Logical Partition (LPAR) support	Yes	No	Secure Linux access to z/OS
Flexible Operations			
Resource over-commitment support (memory, CPU, network, I/O)	Extensive	Modest	Absorb workload spikes; add more servers to a "full" system
Reconfiguration of Virtual Machines	Non-disruptive re-config for CPU, I/O, networking; VM re-boot for memory	VM reboot required for re-config of CPU, memory, ethernet, disk	Higher server and application availability; staff productivity
Command and control, monitoring, automation infrastructure	Extensive, robust, time-tested	Modest	Cost-optimized systems management support
Virtual Machine mobility support	No; single-image scalability of z/VM does not require mobility for mgmt	Yes; essential for workload mgmt across multiple copies of VMware	Can dynamically add or remove resources to meet demand
Integrity and Security			
Fault isolation / hypervisor security	Hardware-assisted isolation*; CAPP/EAL 3+	No I/O virtualization separation; CAPP/EAL 2	Helps to avoid security breaches; data security and integrity
Run multiple copies of hypervisor on single server	Yes; share CPU, I/O, and networking resources among z/VM systems	No	Workload isolation; lower-cost failover (using same hardware)

* z/VM runs in System z LPARs, which have achieved EAL 5 certification; System z HiperSockets provide high-speed, secure connectivity among LPARs.

Source: IBM Corporation — June, 2008

When comparing System z to other systems architectures, it is easy to understand why SI has made such a huge commitment to IBM System z architecture. System z represents an ideal design point for Sparkassen Informatik. System z's can operate at 100% of capacity for extended periods of time with little risk of failure — enabling SI to achieve its main operational reliability and efficiency goals. Further, System z's small footprint (small is relative, but considering the amount of processing that it performs a System z delivers one heck of a lot of computing in a comparatively small computing envelope) is important because data center real estate space is limited. And finally, System z's efficient power consumption characteristics make System z an even more attractive offering due to rising energy costs.

Purchasing Efficiency and the Strategic Use of the VPA

Purchasing efficiency also play a strong role in SI's success. Due to its in-depth understanding of the German retail banking marketplace, SI is able to accurately model its future computing capacity needs, and, accordingly, is able to structure large vendor

purchase agreements (VPAs) that provide the company with tremendous product/services discounts. These discounts further strengthen SI's competitive advantage by reducing system/services acquisition costs.

SI, however, implements its VPA differently than many competitors and large customers (internal bank IT departments). Instead of only buying and then deploying/integrating servers and storage, SI partners with its suppliers to develop its future architectures and to influence product development to better serve SI's needs.

> ***By structuring these large VPAs, SI is able to greatly lower its systems acquisition, deployment, and integration costs. Further, by focusing on what it does best (building retail banking applications and providing computing services), SI is able to focus on customer service while expanding market share. SI's system makers/systems integrator partners, on the other hand, are able to focus on what they do best (design and deploy efficient systems environments — the forté of these suppliers). This strategic use of the VPA provides SI with distinct cost advantages over its service provider competitors, and these cost advantages clearly show up in the company's financial bottom line as increased profitability due to reduced acquisition and reduced operations costs.***

A Closer Look at Sparkassen Informatik's Data Centers

Although Sparkassen Informatik has clearly demonstrated that it knows how to build highly-optimized computing environments, *Clabby Analytics* did have one concern about SI's future direction ─ and that is in the area of cooling.

When discussing the availability of power, SI indicated that obtaining power for its data centers has not been a major problem to date. But as worldwide demand for power continues to increase, the ready availability of power may someday become a real problem for SI. (For instance, Germany is looking to decommission several nuclear power plants ─ which could force the country to burn more fossil fuel, or to rely more heavily on alternate energy sources (wind, solar, or bio). This availability-of-power situation will need to be closely monitored by SI if the company is to continue to meet its growth/expansion goals.

One way to cut back on power consumption is to run a highly efficient data center. And one of the biggest power consumption problems in the data center is heat dissipation. Few IT managers understand that the power required to operate chillers, air conditioners, power distribution units, and uninterruptable power supplies actually exceeds the power drawn by IT equipment by approximately a 65:35 ratio. Although Sparkassen Informatik's data center consolidation efforts have been exemplary, *Clabby Analytics* would like to see SI increase its use of water cooling in its dense data centers. The thermal conductivity of water is significantly greater than the conductivity of air (by some calculations, about 4,000 times more efficient). By adopting water cooling (as opposed to relying on air cooling), SI may be able to significantly lower its power consumption and cooling costs, with savings passing directly to SI's bottom line as reduced operational costs.

Summary Observations

Simply stated, SI's business strategy involves providing reliable computing services at a price point that substantially undercuts a retail bank's internal computing costs, as well as undercuts computing costs offered by its competitors. To do this, SI uses technologies that enable it to deliver highly reliable services (specifically, powerful, highly scalable RAS

[reliability, availability, security] servers); and also relies on technologies that help reduce systems/storage/network management costs (automated management software).

SI recognized early-on the cost advantages that it could realize by consolidating its server environments; and the asset utilization advantages it could realize by virtualizing its servers and storage devices. Further, SI also recognized that the adoption of service-oriented architecture could simplify the integration of hardware and software assets resulting from its many acquisitions. And, finally, SI has also focused on data center consolidation, and has designed its data centers for energy efficiency and effective heat dissipation.

> ***Sparkassen Informatik has become a leading pioneer in the implementation of the new enterprise data center model. The company's aggressive adoption of the principles of consolidation and virtualization, its standardization on SOA infrastructure, and its implementation of efficient data center cooling and energy use have helped to improve its competitive position while also enabling the serve its customers in an extremely cost effective manner. SI's competitors have been slower to react to these changes in computer/data center design — and, as a result, SI has consistently gained market share.***

One element that makes SI "unusual" is its hearty embrace of IBM Systems z architecture. With 30 System z footprints in 11 Sysplexes, with a large CICS environment, and a highly-integrated DB2 database environment, SI is driving transaction rates through the roof on high performance, 100% utilized, energy efficient System z servers. System z is the perfect consolidation/virtualization/energy efficiency architecture for specific SI workloads ─ and SI has found a way to exploit System z to the max to deliver secure and reliable IT services.

What SI has done with its information systems can be emulated across multiple industries and across data centers of all sizes. The deployment and optimization of dense systems architectures will necessitate some changes in data center design (especially around cooling) ─ but SI has proven that running optimized, energy efficient information systems has a clear, profound, positive impact on enterprise competitiveness as well as enterprise profitability.

Clabby Analytics
http://www.clabbyanalytics.com
Telephone: 001 (207) 846-0498