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The Connection

A Journal for the HP Business Technology Community

HP NonStop Business Continuity Product Suite:

An Introduction

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The Darknet

March – April 2015 { Volume 36, No. 2 }

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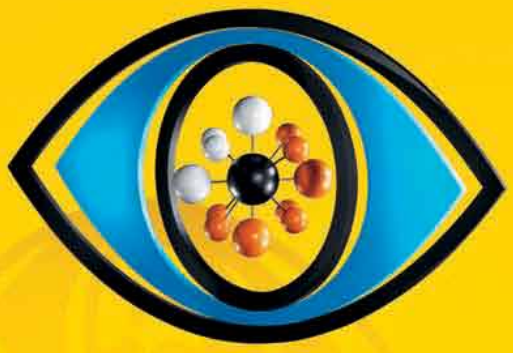

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News from HP's NonStop Enterprise Division

Database/Business Processing Solutions

Over the past year I've had the opportunity to lead the Mission Critical Solutions business at HP, and during that time, what I hear most from our customers and partners is how much Mission Critical matters to their business; users' transactions matter, their data matters, and how you handle and store matters. And with the megatrends of cloud computing, security, mobility, and big data driving ever-increasing amounts of data, mission-critical is more important than ever. Along with growing customer demands driven by a globally-connected, always-on world—enterprises everywhere are under enormous pressure to ensure their business processes and customer-facing applications are continuously available, when and where they're needed.

In this mission-critical environment, business processing, online transaction processing (OLTP), and enterprise databases are the most-critical workloads to ongoing success—and are driving the need for workload-optimized, proven technology that can deliver continuous business and lower risk. That means an enterprise's IT infrastructure must effectively meet the requirements for large-scale, 'high-value' workloads with an extremely available, scalable, and efficient platform. To create business value from these mission-critical applications, IT requires a new model for Compute—with the right compute, for the right workload, at the right economics… every time.

Only HP has the complete portfolio of technology, solutions, and services to support these 'high-value' workloads. As part of that portfolio, HP Integrity NonStop systems deliver the very highest-availability level, massive scalability, and the lowest TCO in class. For decades enterprises have trusted NonStop systems to power mission-critical 24x7 solutions, recognizing the distinct advantages of unmatched continuous availability and scalability. And now, HP is offering the flexibility and choice of an unparalleled portfolio of HP Integrity NonStop fault-tolerant systems for high-value business workloads and customer- facing applications—each with the same NonStop fundamentals. Where exactly is NonStop? Everywhere you'd expect, and perhaps a few places you didn't:

- Financial Services: Multi-channel retail wholesale, and mobile payments processing
- Telco: Mobile network mgmt., HLR/HSS data services, and machine-to-machine
- Retail: Point-of-sale (POS) transactions and online order processing
- Healthcare: Real-time patient and laboratory data, and provider info retrieval
- Manufacturing: Continuous production control processes and multi-channel distribution
- Transportation: Regional and global reservations, ticketing, and route scheduling
- Utilities: Customer usage tracking, billing, and call center services

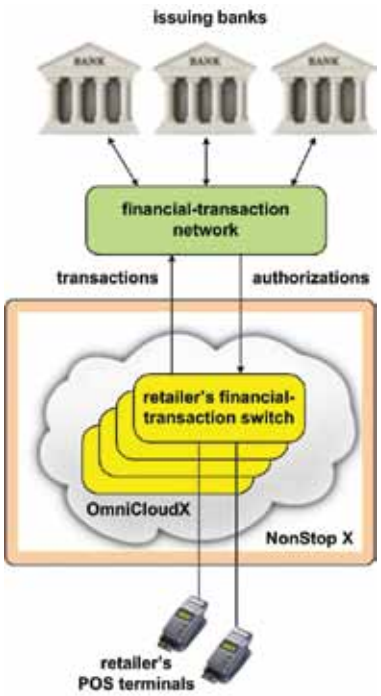
In this issue, you can also read more about what you can do with all that data using HP NonStop SQL. It is the preferred database engine for mission-critical OLTP applications with very large databases, delivering the highest levels of availability, scalability, and performance. Designed for a clustered, massively-parallel system architecture built on industry-standard servers, NonStop SQL is tightly integrated with the shared-nothing HP Integrity NonStop platform and operating system. For more information and the latest developments, see Ajaya Gummadi's article.

Finally, HP Discover Las Vegas is coming up in June. My team and I have a full line-up of Mission Critical Solutions sessions planned, with updates on the new NonStop X and Superdome X, and the latest news on HP-UX. We look forward to seeing you there.

Randy Meyer
VP & GM, Mission Critical Solutions
HP Servers

OMNICLOUDX AND NONSTOP X – PERFECT *and affordable* TOGETHER

It is the perfect blend of technologies. OmniPayments' new NonStop X serves as the foundation for OmniCloudX, the next generation of the popular OmniPayments financial-transaction switch. Combining the blazing speed of the Intel x.86 chip, an open development environment, and NonStop's fault-tolerant operating system ported to commodity blades, NonStop X hosts numerous instances of OmniPayments at a price so attractive that mid-size retailers now can enjoy the benefits of having their own high-capacity transaction switches.



OmniCloudX Financial-Transaction Switch

Starting at only $5,000 per month.

OmniPayments offers a comprehensive solution for retailers to acquire, authenticate, route, switch and authorize transactions across multiple input channels, e.g., ATMs, POS (point-of-sale) terminals, kiosks, IVR (interactive voice response) units, mobile devices, and the Internet. Based on a modern Service Oriented Architecture (SOA), OmniPayments and now OmniCloudX consist of several service components, of which the critical elements are built on NonStop.

Most retailers obtain POS terminals from a bank or bank-associated company with which they maintain merchant accounts. These entities operate financial-transaction switches that connect POS terminals to institutions that issue payment cards (Visa, American Express, Discover, MasterCard, etc.) in order that transactions can be approved or rejected. The transactions aren't free, and many large retailers have opted to purchase their own switches in order to avoid hefty transaction fees. Mid-size retailers rarely can justify the cost and management of HP NonStop servers, a mainstay for financial-transaction switches. OmniCloudX addresses that challenge by delivering affordable OmniPayments switching services on NonStop's legendary mission-critical platform.

OmniCloudX operates on a pay-for-use basis. Each OmniCloudX customer pays only for the amount of CPU resources, storage, and networking that it uses. OmniCloudX provides backup systems so that a system outage will be recoverable immediately by switching the retailer to another system in the cloud. OmniPayments, Inc. supplies the IT staff needed to manage the transaction switches running in its cloud, thereby allowing participating merchants to focus on their core businesses. Also supplied are complete transaction security functions, including encryption-at-rest and encryption-in-flight. OmniCloudX uses tokenization to comply with PCI-DSS specifications. Like OmniPayments, OmniCloudX supports EMV smart-card technology.

OmniCloudX now has been configured to support the needs of "unbanked customers" – those individuals who do not use the services of banking institutions. Via their Tax IDs, Social Security numbers, National IDs, etc., unbanked customers can be paid wages by employers or receive government subsidies via the use of approved OmniCloudX Payment Centers.

OmniCloudX easily expands to provide additional functionality when needed. OmniCloudX also can manage multiple devices, can host application interfaces, and can interoperate with third-party products or other systems if required. OmniCloudX and NonStop X - perfect *and affordable* together. **Starting at only $5,000 per month**. Call us today.

OmniPayments Inc.

1566 La Pradera Drive
Campbell, CA 95008 USA
PHONE: +1 408 364 9915
sales@omnipayments.com
www.omnipayments.com

About Opsol Integrators and OmniPayments

OmniPayments is a switching solution for the financial industry. It is deployed on NonStop for the highest availability and offers customers all the requisite functionality to manage credit/debit-card transactions. OmniPayments is easily expandable to provide additional functionality when needed. It supplies complete security functions for every financial transaction that it handles, including encryption-at-rest and encryption-in-flight. OmniPayments will survive any single fault, requires no downtime for maintenance or upgrades, and supports a range of disaster recovery solutions. Now available on NonStop X and OmniCloudX.

ADVOCACY

Meet Ajaya Gummadi

>> **Dr. Bill Highleyman** >> **Chairman** >> The Connection Technical Review Committee

In the IT Industry, there are lots of trailblazing women. I had the pleasure of interviewing one in our own NonStop world. Ajaya is the Worldwide Product Manager in the NonStop Mission-Critical group focusing on Data and Business Continuity products and strategizing NonStop play in HP Helion Clouds. She is also a contributing author to Connect's magazines and NonStop Blogs and Tweets. Ajaya is doing some cool things at HP and in the community.

"NonStop SQL is the reason why customers buy NonStop!"

It was this very reason that started Ajaya on her successful road to worldwide product management. Her title references global oversight; thus, she works with all of the HP Geos around the world. As the active HP liaison for the NonStop SQL SIG, she is a key part of Connect's Advocacy program.

Ajaya has traveled a long, curved road to her present position as a key NonStop product manager. Usually not afraid to reach outside her comfort zone, there were many times she questioned her own decisions and sanity as she took steps into an unknown world; but she took them anyway. Here is a sneak peek into her journey and her lessons from the road. (Detailed content is being saved for Ajaya's memoirs, to be published eventually.☺)

That she has made it this far is a small miracle. Raised in a small town in India by teacher parents who instilled the value of learning and independent thinking, Ajaya went on to do her Masters in Computer Science at the reputed Birla Institute of Technology & Science, Pilani. In its formative years, BITS hooked up with the Massachusetts Institute of Technology (MIT) in Boston. BITS was the first institute to create linkages with the industries that yielded structured "Practice School" as an integral component of education. She was the only girl in her class, and that had its own privileges and challenges!

That degree earned Ajaya her initial job writing PL/I compilers for Intel 8086 microprocessors for a small startup in India. This is where the first lesson of life was learned – identify the smart people around you, and be always ready to learn from them!

India was just starting a technology journey, and computer networks were the hot buzzword; so Ajaya moved on to her next role at a company working with a team that was installing the first X.25 Packet Switch network in India. She was lucky to work with Dipak Basu, an industry stalwart and her very first role model, someone whom she remembers with great respect. It was with Dipak's reference letter that she intended to join Australian National University (ANU) in Canberra to work on her Ph.D. degree. Instead, she landed a job in New Zealand! Another life-changing detour indeed!

In New Zealand, her first and only assignment was with Databank, an IT service company wholly owned by the major retail banks [ANZ, WestPac, the Bank of New Zealand (BNZ), and the National Bank of New Zealand (NBNZ)]. The banks' shared data center used IBM mainframes and Tandem servers; and Ajaya was assigned to the Tandem group supporting the Merchant Provisioning Application and POS Network Management System, written in TAL and deployed as a Pathway Requester/Server. She had never seen a Tandem system before but received extensive training, something that she cherishes to this day. She still has memories of Les Faby teaching TAL, writing requesters and servers, and configuring serverclasses. Knowledge to last a lifetime! They say teachers have a lasting influence, and Ajaya credits Les for her ongoing love of NonStop servers.

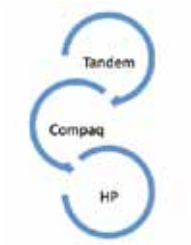
Ajaya lived in New Zealand for four years. Her daughter, Ayushi, was born there. That explains Ajaya's love of Kiwis! Ayushi was raised in a melting pot of cultures and has turned out to be a strong, intelligent woman who makes her Mom feel blessed and proud every day.

The next career step took Ajaya to the U.S. State of Michigan, where she worked for MPACT, a software company with an EDI Solution on Tandem. Her first boss, Steve Doerr, gave her plenty of freedom to design and implement the solution for a problem that he had been hearing from MPACT's customers. Steve was the biggest critic and tester of the final product.

Ajaya's next learning experience came from the General Manager of MPACT when he put her in front of a customer impromptu "Just talk with the engineer!" "The next 15 minutes gave me so much to chew on as to how the product was being used than I would have received in a lifetime of working in a lab," says Ajaya. This valuable lesson is one she carries even today when she encourages fellow developers to be present in customer meetings and to think about customers when they make product-design decisions.

Having been raised in India, Ajaya was unprepared for Michigan's snow, ice, and sleet! Therefore, after just two years or "two long winters," she was happy to move to sunny Silicon Valley, California, where she joined Tandem Computers. She has been with Tandem, Compaq, and HP NonStop ever since. Silicon Valley has been her home for the past 22+ years.

Why Tandem? Ajaya is asked this all the time. "Tandem's culture stems from its founder Jimmy Treybig. Jimmy cared about his customers, and he acted and made decisions based on customer care. Even without long mission and vision statements, this "customer-first" culture permeated throughout the entire company, remnants of which are visible even today in the NonStop Division within HP. This passion was a sure trademark of Jimmy's leadership, and that is what inspired me to become and remain part of Tandem."



Ajaya's first assignment with Tandem was porting Novell's Netware product to Tandem as the IPX/SPX protocol suite. This required working with QIO (Queued message based I/O), SCF (Subsystem Control Facility), and Common Kernel (CMK). All of these projects offered great learning opportunities from then Tandem architects like Paul Isaacson, David Kern, Carl Kauranen, and many others!

Her love of Tandem continued as Ajaya wore different hats within the company. Whether it was automating test libraries to reduce the release time for a Class A IPM from six months to six weeks, or applying Orthogonal defect classification techniques to find quality gaps, or proposing measurement and tracking of Software Corrective Maintenance (CM) rates (it was only done for hardware products until then), or managing internal product development teams, customer programs, or the fastest executed Neoview challenge, each step of the way was executed by her with laser focus and great passion.

"The key lessons that I used to develop my leadership DNA is to recognize who I am, be comfortable with myself, and know that the best ideas come from people who do not think like I do." Ajaya credits a long list of amazing and influential people within the company and the industry for having taught her life's valuable lessons.

During this heavy workload period and coupled with raising a family, Ajaya added to her busy schedule by returning to school. She wanted to understand U.S. business culture, which was different from that of her native India. "It is all about how you are perceived," taught her professor. Coming from a culture of "do your duty and do not be driven by results alone," this was a very hard lesson and the hardest cultural gap to cross over. Ajaya graduated with an Executive MBA degree from Pepperdine University's Graziadio School of Business Management.

Talking about work-life balance, Ajaya mentions how she would go offline from 5pm to 9pm every evening without fail. Then after dinner and after putting her daughter to bed, she would come online again or use this time with her MBA study group. "Was I overworked? Of course! Did I make this choice? Absolutely yes! Did I enjoy it? Of course, and I will do it again in a heartbeat."

Ajaya's next role for Tandem was in the Advanced Technology Center (ATC). She was responsible for the first ZLE implementation, undertaken for a Colombian customer. During this project, she earned the nickname "Ajaya Escobar" for being a trailblazer who delivered the solution against all odds of leading-edge technology and the cultural challenges and geographical risks of working in Colombia. Each new program brought different challenges and opportunities to learn. Starting to learn databases, she enjoyed the next few years managing Neoview "Challenges" with worldwide customers spanning numerous verticals.

About this time, Ajaya's manager, Chris Russell, asked her to go fix NonStop SQL. This seemed to be a strange request. "What's wrong with SQL," she asked. Chris's response? "Go find out." Based on his request, Ajaya became the SQL product manager in 2008. Ajaya listened to diverse inputs from marketing, sales, presales, development, and support personnel. All of these inputs supported the gut feeling that SQL was indeed challenged and needed lots of TLC to regain its position as the differentiating product for NonStop.

With her software engineering background, Ajaya could conceptualize complex issues, break them into smaller pieces, draw mental flowcharts, and start solving them one at a time. Operations savviness came from her numerous years of managing complex internal and customer-facing programs dealing with new unproven technologies and smart teams. Her impatience to deliver brought a sense of urgency. Management skills learned at business school and by managing teams over a period of time helped her communicate this story up and down. All these skills she put to daily use as the SQL Product Manager!

Ajaya created a compelling vision for the SQL product and built execution roadmaps, initially issuing three back-to-back releases to show that SQL was back in business. She did briefings to Database Analysts (TDWI, Bloor Group, etc.) to share her vision and execution plans. Both customers and partners took notice and thankfully have shown support by bringing new applications and new customers into the NonStop SQL world.

Ajaya strongly believes that the key to building a successful product is to have the right people, differentiated strategy, funding, and doing the right thing for your customers and organization. As the product champion, she drives product functionality, collaborates with partners, and takes initiative to try new things. She insists that a continuous learning process is important to strengthen NonStop capabilities.

Ajaya ran her first SQL SIG in 2009 for the Connect Advocacy program. She admits that she was afraid to stand up at this, her first SIG, because of the problems that SQL had been experiencing. Under Ajaya's continuing management, the SQL SIG has become one of the most active and productive of all of the NonStop SIGs.[1]

For the last few years, Ajaya has added more key NonStop products to her portfolio, e.g., business continuity and strategizing NonStop play in Clouds.

She muses about the changing world. When she was a student in India, it was expensive to make a phone call to her parents, some 300 kilometers away. Therefore, she called them only once a month, late at night when the rates were cheap. Today, she can Google Hangout anytime with her 90-year-old dad tucked 10,000 miles away in India. For free!!!

Ajaya's focus next year is to continue the integration of NonStop servers into the Cloud and Big Data arenas. She is leading the Big Data Initiative with the objective of enabling customers to gain rapid business insights by integrating data across all relevant sources. Check out her talk at the 2014 Boot Camp on this very topic (you can find it on the Connect website). Some exciting projects are in progress on integrating NonStop and Big Data. Year 2015 indeed looks promising for Big Data.

Ajaya is an active author in her areas of expertise.[2] She donates hours of her time to non-profit organizations in the Silicon Valley. She has been recognized by HP as part of its "Living Our Values" program for her partnership and leadership

[1] The NonStop Technical Bootcamp is a Growing Success, *The Connection*; January/February 2015.

in the "Global Women in Technology" initiative at HP. Through her consistent and respected insights as a 'technical woman' to these events, she encourages women engineers to participate in technology career paths. As a mentor to young women professionals, her advice is to find sponsors who will speak for them, be the sounding board for their career directions, and help them realize their full potentials. Ajaya also leads an Employee Resource Group (ERG) at HP. She is a strong believer that diverse teams outperform homogeneous teams, even when the homogeneous team is more capable.

Her own life's mantra is to learn something new every day, to try new things, and to be adaptive! Thus, she has taken classes in restaurant management, nutrition, Bollywood dance, Openstack, Python, and is now studying Data Science. She blogs and tweets not only for NonStop but also on nutrition and healthy living under her personal avatar. Having travelled to five continents and 35 countries so far, she intends to continue pursuing this passion and step foot on all six continents. As a gardener-in-training, she promotes tree and rose trimming as the most effective stress buster! Ajaya loves growing her own organic fruits and vegetables and frequently shares a Farm-to-Table experience with her friends and neighbors! Though her Dad and siblings are in India, Ajaya is now firmly rooted in the U.S. with HP NonStop. But when it comes to cricket vs. baseball, cricket always wins! That is why she is rooting for the Indian Team in the World Cup!

Looking back, Ajaya feels lucky and grateful to have been inducted into the Tandem world. There have been both benefits and drawbacks of staying within one company for almost 20 years. She has helped build NonStop SQL as a sustainable database platform. She hopes to be remembered as someone with integrity, who persevered even when things were hard. Ajaya is well-respected by her peers and customers and partners. She has always learned something important from each turn in her life. It has indeed been a fantastic journey!

[2] Only On NonStop: Using NonStop and Partner Manageability to Perform Database Administration with No Database Downtime, *The Magazine*; March 2011.
Only on NonStop: True Database Scalability – get real proof, not promises!, *The Connection*; May 2011.
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Dr. Bill Highleyman is the Managing Editor of The Availability Digest (www.availabilitydigest.com), a monthly, online publication and a resource of information on high- and continuous availability topics. His years of experience in the design and implementation of mission-critical systems have made him a popular seminar speaker and a sought-after technical writer. Dr. Highleyman is a past chairman of ITUG, the former HP NonStop Users' Group, the holder of numerous U.S. patents, the author of Performance Analysis of Transaction Processing Systems, and the co-author of the three-volume series, Breaking the Availability Barrier.

NonStop Innovations Deep Dive:

Network Kinetix Introduces a New Kind of Data: preData (before "real time")

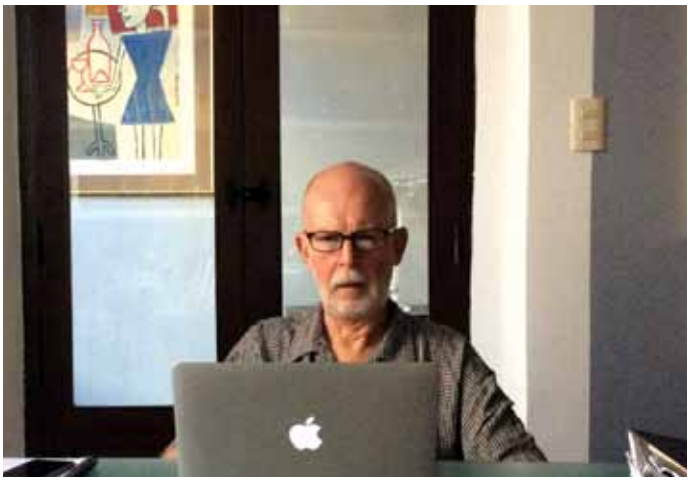
Gabrielle Guerrera >> NuWave Technologies

The HP NonStop partner network is crucial to the NonStop business, and in the last issue of The Connection, we all worked together to get you the best partner-related content, as well as a series of blog articles focused on a single cohesive theme: Welcome to 2015 and NonStop X. On HP's Mission Critical Blog, Karen Copeland listed all of the partner companies that participated in the mass blogging event (NuWave and the NonStop Innovations blog included), and she stated that "partner companies have always played an important role in the NonStop business ecosystem by providing new features, functions, applications and specialized solutions to the platform above and beyond what HP can offer." This article will focus on one company that is not only new to the NonStop space, but can do **above and beyond** what HP and other partners can offer.

And, in the spirit of this big data issue, this piece will focus on something similar to big data: preData. I spoke with Tissa Richards, one of the three founders and the CEO of Network Kinetix (NKX), to learn more about what they've accomplished so far, and where this new technology is headed.

Gabrielle: Hi Tissa, let's start with a history of the company.

Tissa: Network Kinetix is a young company based in Austin, Texas; and also has representative offices in San Francisco, California; Mexico; and Australia. Our founding team consists of three people who have experience in Tandem, enterprise software, telecom, security, and data management. I am one of the founders and I'm based in Austin, where we are headquartered, and manage North America and EMEA. Hari Ramachandran, who heads up our Australia location, has over 25 years of experience in the telecommunications industry, including CIO positions and both BSS and OSS leadership. George McCarthy has extensive experience doing sales and marketing for technology and telecom companies (including Tandem Computers), as well as executive positions at Fortune 500s and start-ups. He is currently located in Mexico leading our business development efforts in Latin America.



George McCarthy, Co-Founder of Network Kinetix.

Our foundation platform is Linux/Xeon (x86), but we've now ported to NonStop Itanium and NonStop X, and are very excited about the additional platforms. The product is fully functional and has been in customer proof of concept deployment during its period of development. We're currently in stealth mode, and as development has progressed, we've rounded out the team and have been focused on ramping up direct sales and establishing channel partners.

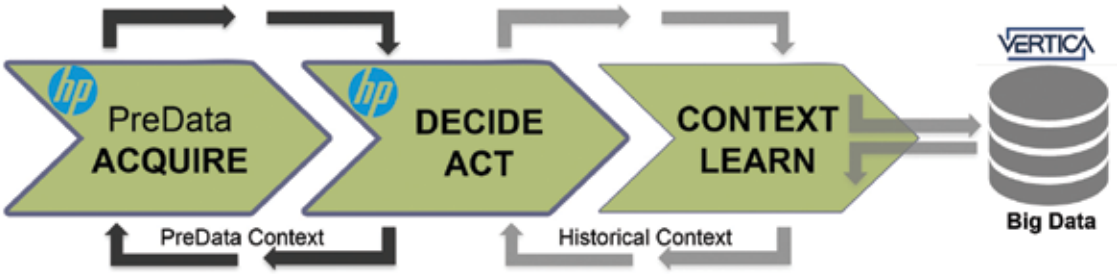
Gabrielle: Can all of your solutions run on NonStop, including the new NonStop X?

Tissa: When we ported over to NonStop Itanium, it was a driving factor to refrain from launching until we had that version ready, and also the version for NonStop X. We're currently testing on NonStop X and are just about ready to finish up and go live on that hardware platform. We'll have a number of applications that will give customers the advantage of deducing and taking action before "real time" occurs. They will be completely available on NonStop X at our launch at Mobile World Congress in Barcelona March 2nd. We'll also have our benchmarks on Itanium and NonStop X available then.

Gabrielle: Could you explain the technology in more detail?

Tissa: Well let me start by explaining what we don't do, and then when I talk about our solutions they'll make more sense in context. Although the amount of data we handle can be very large, we are not what is commonly called a "big data" company, where the focus is on analytics of past events or situations. Our key advantage and differentiation is that we focus on data or situations before they have finalized, while the situation is in its formational development stages and still in transmission within the network. We call this preData. It is information in its formation. It is has not yet left the network as completed data or final information, as in a log record. You're probably familiar with big data and some of the mission-critical software companies that focus on transaction-processing systems. OLTP and OLAP (often called "stream processing" or "real-time" processing) focus on events that have occurred and have exited the network as fixed-outcome events or log records. The events cannot be changed or influenced: they have been finalized, streamed to the edge and have become log files, "big data streams," or transaction streams.

Many tools in this area–real-time analytics or real-time stream processing solutions–help to give companies a look at what's happening in "real time" in their enterprise so they can make decisions and take certain actions. However, what we were seeing was that the term "real time" was being applied to the reaction or the processing of a recent event to provide a timely course of action. The term has no connection with the pre-informational aspects of that event or situation, so real-time data doesn't allow users to affect the outcome of an event that is just beginning to form. It is in the formation of the event or situation



Network Kinetix provides three levels of utilization for their technology: 1) Acquiring preData, 2) Deciding and acting, and 3) Context and learning from historical data (optional)

and the control of an outcome where Network Kinetix works, and we call that area preData, or "before real time". So it follows that real-time applications are not sufficient when you need to get information in time to control or change the outcome of a specific event.

What we do is enable customers to apply business and operations rules to situations and events as they form in the network, before they conclude and exit as fixed-outcome log records or streams. This gives users a unique ability to understand, govern and control activity as it occurs. This capability rapidly lends itself to mission-critical, business assurance, and revenue-generating processes. Use cases include alerting, thwarting fraud or malicious behavior, network security, M2M user access and authentication, mCommerce, personalization and location, and network instrumentation and optimization, as well as IoT applications.

Gabrielle: Who can benefit most from this technology?

Tissa: Our market focus is essentially industry segments that rely on a network as a critical component of their business, like IoT, telecommunications, and mobile commerce. However, any company that relies on a network can benefit from this technology. If you have network traffic that needs to be monitored for situations as they develop, and you want to change the outcome of an event before it is finished, then you can benefit.

As an example, the telecom industry loses an estimated $45 billion/year to fraud. A carrier's traditional fraud management system relies "after the event" on log files (call detail records) that are generated once calls and SMS messages are completed. By the time these logs are created, streamed to the edge, and eventually analyzed, it is too late to catch that particular fraudulent event. The fraudulent activity (example: SMS spam or phishing) has already occurred and the carrier's subscribers have been victimized. And, the carrier absorbs the revenue loss. Our applications analyze the situation as preData with the ability to alert the carrier when a fraudulent event is likely to happen or is happening. The network operations center (NOC) can take immediate action to thwart the fraudulent activity so that it never occurs. The carrier can actually control the outcome the way they want to, resulting in revenue loss prevention and capture. We've developed this "before real time" preData architecture in direct discussion with early adopter mobile carriers, and in integrated tests, the product has shown to detect and thwart fraudulent phone calls and phishing SMS scams that if allowed, would cause revenue loss of millions of dollars each year.

Gabrielle: So there's one core product that can be used in many different ways, in several industries?

Tissa: Yes, we have a data-agnostic platform that preData applications can be applied to as solutions. We provide some applications, and also the ability for our customers to develop their own applications. We also have APIs that are available for customers to leverage on NonStop. The development is open, and the concept is based on our patented "application blade" architecture (not to be confused with NonStop Blades), which allows the customer to have multiple applications on single installations, without doing multiple deployments. So for example, if a customer wants to have a network security application, and they also want to do situational or location-based analytics, the architecture allows multiple application blades on their NonStop by adding another layer of application logic that uses the same data source. This makes the ROI very high, especially for users that have multiple application requirements from a single preData source.

Tissa Richards, CEO and Co-Founder

Gabrielle: Could you give a use case for your IoT solution?

Tissa: If you think about all of the M2M devices that are interconnecting, it's really important to do authentication before they connect to each other. A lot of products can detect them once they are already online and can authenticate after the connection; but what we can do is look at connection, authentication, permissions, and the type of data being transmitted, before any

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permission is given. The preData capability is also important with the abundance of opportunities for location personalization in M2M. We've had some great discussions with customers about connected cars: we can actually determine who's in a car, where they are, where they're going, and what they're passing; so we have the ability to deliver exactly the right thing to that person while it's the most relevant, and also to do that interactively. This personalization and monetization of connected cars is something that we're working on, and we're currently collaborating with the HP sales teams to uncover the best use cases and to deliver the solution. We also have a lot of use cases in smart grid and utilities that HP is actively disseminating into the marketplace.

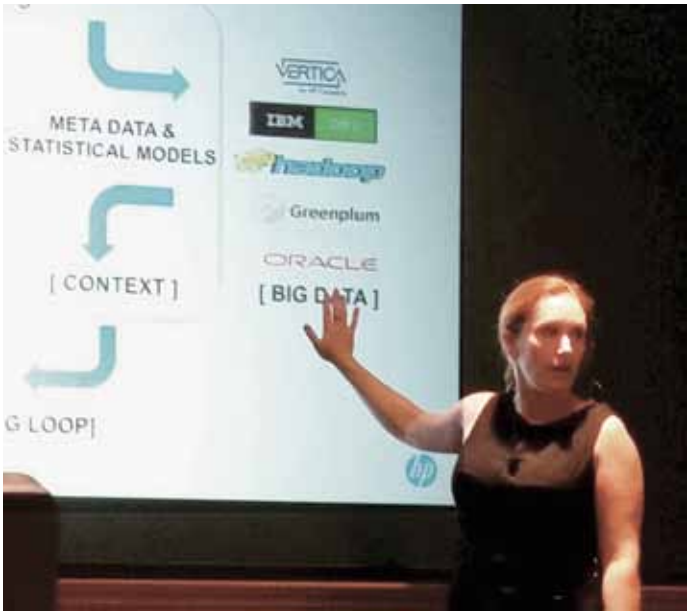
Gabrielle: Could you give me a summary of some of the other solutions?

Tissa: We started gaining traction in telecom first, and have the largest number of customer-facing solutions there. One of our first solutions was for bill shock, or managing customers' usage of their devices, and also to see where a customer is and who they are. This gives carriers the opportunity to charge differently based on time of day, location, how congested the network is, and which mobile applications are being used. We can granularly understand each data session to see how carriers could intelligently charge for contracts. For example, customers could have unlimited data-hogging applications for a certain price, but within or separate from their data limit; or, if a customer has both a corporate account and a personal account (making them a high-value customer), the carrier could decide not to charge them extra if they go over their data limit, so their usage wouldn't get sent to the carrier's billing system. In order for a carrier to capitalize on any of these scenarios, they would need to see what is going on as it's happening, so the data needs to be analyzed from within the network as an event is occurring.

We also have a network optimization and outage planning solution for telecom. As an example, as carriers complete the upgrade of their networks from 3G to 4G, certain towers must be taken down at certain times to complete the transition. Our solution allows carriers to understand which subscribers are where at a given time and where they are going, so the company can plan outages around their customers' movements, and also do very granular, dynamic notifications and offloading. It works out well from a customer satisfaction perspective, but it also helps the carrier to know where their law enforcement customers are, or the customers requiring 100% uptime, so these people in particular don't experience an outage. Unless you're inside the network understanding where your customers are and precisely where they are going, it's too late.

Gabrielle: Are there any other products on the market that can do analysis within the network, and if so, what makes Network Kinetix different?

Tissa: There are some products out there that have hardline probes that sit within networks; however, a drawback with some of these solutions is that they collect information periodically and batch forward it to the application layer so you have to retroactively analyze terabytes of data at regular intervals. You have to make a decision about whether you want to be able to constantly see your data, in the moment, with the ability to control the outcome of each event, or whether you want to be looking back through it every few minutes. There are also huge CapEx and OpEx commitments for hardline probes, so overall it is more expensive, and these products create a



Tissa presenting at NonStop Boot Camp 2014

physical intrusion in the network because they sit inline; whereas our solutions are software, so they are able to monitor what is going on without being physically intrusive or disruptive. We can also virtualize the solution as carriers move towards network functions virtualization (NFV). A lot of companies that do edge analytics or stream analytics have products that sound similar to ours. However, it appears that their focus is on "real time" with regard to streaming log data, e.g. after the fact, and not on preData, where the data is still in formation and therefore changeable.

Gabrielle: Does NKX have any new partnerships to announce?

Tissa: We're leveraging HP's sales channels very aggressively in every region, and we have our own global sales team. One of our strategies is to make a push into utilities and M2M because we have so many use cases and so much interest from customers in those areas. Connect has also been introducing us to a lot of HP partners so they can either work with us, or sell our solutions. One of them is a payments partner that secures payments in the backend, and we're able to look at use cases at the very start of this transaction, where our solution can monitor the tokenization of online payments and mobile payments. If you think about Apple Pay and similar technologies, there are a lot of challenges with regard to security, personalization, and analytics; but by combining our technology with security products, we can bring their solutions to the very start of a transaction. There are a lot of NonStop partners that have security products that work in the backend, and we can bring them right to the swipe of a credit card or the bump of a phone. Security is a natural fit for us, especially for me since that's my background, and it will be interesting to see how these opportunities play out.

Gabrielle is the author of the NonStop Innovations blog (www.nuwavetech.com/hp-nonstop-innovations), which discusses cutting edge solutions in the NonStop space. She interviews key movers and shakers in the NonStop community, including 3Qube Technologies, Dr. Bill Highleyman, Information Balance (Infobal), Joe Androlowicz (now former Tandem), Justin Simonds, Lusis Payments, and XYPRO. For topic or company requests, email gguerrera@nuwavetech.com.

HP NonStop Business Continuity Product Suite: An Introduction

Protecting Your Data, Your Applications, and Your Business

Ajaya Gummadi >> Product Manager >> HP NonStop Worldwide

In today's global business environment, companies must maintain their business services capabilities 24 hours a day, every day. Any interruption in service can alienate customers and can cost the company customers and thousands of dollars a minute in lost sales. It is imperative that the IT systems that are the backbone of these critical services never fail.

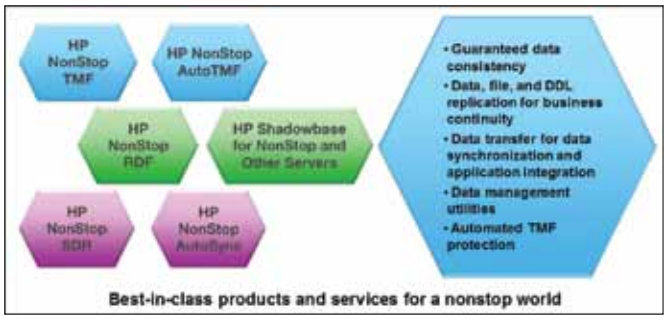
HP NonStop servers deliver this level of reliability. Incorporating a fault tolerant architecture with multiple processors and fully mirrored disks, a NonStop server will survive any single point of failure with no interruption of service. However, a NonStop server can be taken down by catastrophes such as fire, flood, or earthquake, causing an unplanned outage. In addition, planned outages occasionally may be necessary for hardware or software maintenance and upgrades.

The only protection against a system outage is to have another system, a backup system, ready to take over the provision of IT services if the primary system fails. To provide this capability, the backup system must be kept synchronized with the primary system so that the backup system always has the same application state as the primary system and can therefore continue processing from where the primary system leaves off.

In transaction-processing systems, the application state is represented by the contents of the application's database. Therefore, for business continuity purposes, it is important to keep the application databases of the primary and backup systems synchronized. This is accomplished via data replication. Whenever a change is made to the primary database, that change is immediately replicated to the backup system to keep its database synchronized.

The HP NonStop data replication software suite supplies several key products to synchronize application databases and other essential application files across multiple systems, thereby ensuring continued service availability in the event of a planned or unplanned system outage. The product suite comprises:

- *HP NonStop Transaction Management Facility (TMF)*
- *HP NonStop AutoTMF*
- *HP NonStop RDF*
- *HP Shadowbase for NonStop and Other Servers*
- *HP Nonstop SQL Data Definition Language Replicator (SDR)*
- *HP NonStop AutoSYNC*

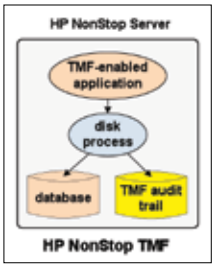


In addition, Pathway domains implemented by HP NonStop TS/MP allow applications to be replicated across multiple systems, maintaining Pathway application availability in the event of a system outage.

The power of data replication is not limited to ensuring business continuity. It is also valuable to integrate disparate databases and applications. Database changes in a system can be transformed and replicated to another database or sent as events to be processed in real time by an application running on another system.

HP NonStop Transaction Management Facility (TMF)

The HP NonStop TMF transaction manager is the foundation for building fault-tolerant and disaster-tolerant applications on HP NonStop servers. For applications that are TMF-enabled, TMF guarantees the consistency and the correctness of the Enscribe and NonStop SQL databases maintained by the applications. It accomplishes this ability by ensuring that either all of the operations included in the application's transactions are applied to the database, or none are.



Transactions are durable, surviving any fault in a NonStop server, by safe-storing all changes to the database in a mirrored, disk-based audit trail. The TMF audit trail is the heart of TMF. An application is not informed of the completion of a transaction until its changes have been safe-stored in the audit trail. After a system recovers from a failure, the audit trail's contents are used to roll back any incomplete transactions. The audit trail can be used to restore files that have been corrupted or that have been accidentally deleted.

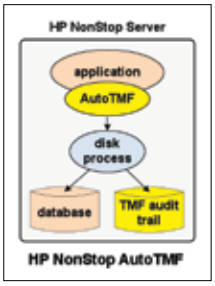
TMF allows databases to be reorganized online. Backups can be written to physical or virtual tape without application downtime. Archived audit trails can be accessed to restore corrupted or deleted files while the system is fully operational.

Because transaction durability is guaranteed by the audit trail, the actual data in the databases does not have to be written to disk immediately. Instead, updated data blocks can be batched and written to disk at the convenience of the operating system. Thus, application processing capacity and response times are significantly enhanced by TMF.

TMF provides an interface which allows it to support the management of transactions distributed across a heterogeneous network of other systems.

As will be described in upcoming sections, the TMF audit trail plays a key role in many of the HP NonStop data replication facilities. It provides a log of all database changes to be replicated to other systems.

HP NonStop AutoTMF



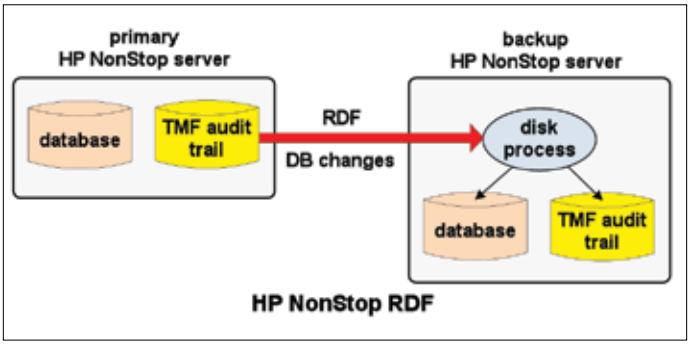
Many legacy applications have been written without using the HP NonStop TMF transaction manager. In such instances, HP NonStop AutoTMF supports existing application unaudited Enscribe files, allowing applications to be TMF-protected without the need for coding changes or recompiling. AutoTMF permits such applications to take advantage of the TMF transaction protection of audited databases and to benefit from the performance improvements delivered by TMF.

AutoTMF can be configured to audit only one or any subset of applications or files. Once a file is placed under AutoTMF protection, AutoTMF will dynamically determine effective and efficient transaction boundaries within the application. These delineated transactions are then written to the database under the TMF transaction manager.

By instrumenting an application with AutoTMF, changes to unaudited files are written to a TMF audit trail. This is a requirement for replicating the data in unaudited files to other databases.

HP NonStop Remote Database Facility (RDF)

HP NonStop RDF extends the NonStop server's fault tolerance to disaster recovery. Using the audit trail generated by NonStop TMF and operating-system level services, RDF instantly replicates audited database changes to identical target databases on one or more target systems. Thus, in the event of a failure of a primary system, the application can be recovered to a backup system within minutes and with minimal data loss. RDF will back out any incomplete transactions on the target system when the target system takes over processing.



RDF can be configured to protect individual audited files or tables, the contents of one or more subvolumes, or entire disk volumes. It can replicate changes to one or more target systems. Alternatively, it can replicate changes from many source databases to a single target database to provide a single backup for multiple production systems.

RDF is useful for upgrading hardware and software with no application downtime. The backup system is taken offline and upgraded. Application processing is then redirected to the upgraded backup system, and the other system is upgraded.

Though applications on the target system cannot open databases for write access that are being replicated by RDF, they can read the target databases. On the target system, other applications can be running, replicating their database changes to other target systems. If the backup system has to take over processing, the backup applications open the application databases for write access before continuing application processing.

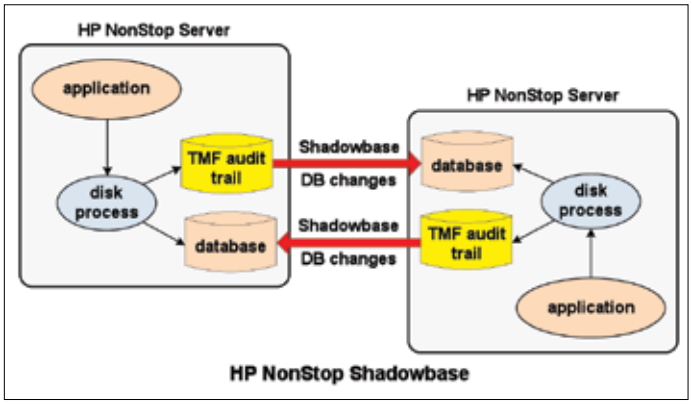
There is a small time latency between when transactions are executed on the source system and when they have been successfully replicated to the target system. Thus, transactions in the replication pipeline may be lost due to a primary system failure. If this loss is unacceptable, RDF implements a Zero Lost Transaction (ZLT) feature. With ZLT, the audit trail disk mirrors are split; and one mirror is located up to 100 kilometers from the production system. No transaction completes until it has been successfully written to the remote mirror. The remote mirror is available to a backup system if the backup system needs to take over processing with no lost transactions.

HP Shadowbase for NonStop and Other Servers

Similar in nature to RDF, HP NonStop Shadowbase replicates audited database changes that have been recorded in the database's TMF audit trail to one or more remote target databases. However, Shadowbase brings many additional advantages to data replication.

Shadowbase allows a target database to be opened for read/write access by applications on the target system. Consequently, Shadowbase supports bi-directional replication. An application can be running on more than one NonStop server, each server updating its own copy of the application database. The databases are kept synchronized via Shadowbase data replication. Whenever a change is made to one copy of the database, that change is immediately replicated to the other databases in the application network. Thus, all nodes in the application network are actively processing transactions and are sharing the transaction load amongst themselves. *This is called an active/active network.*

Besides load sharing, an important characteristic of Shadowbase active/active networks is that recovery time from a node failure is nearly instantaneous (and in a two node configuration, half the users do not even notice an outage at all). If a node fails, then transactions are rerouted from the failed node to one or more surviving nodes. There are no failover faults because it is known that nodes being used for recovery are operating properly – after all, they are themselves currently processing transactions.



If the structure of an application is such that it cannot run in a distributed environment, the Shadowbase active/active architecture can be applied to a *sizzling-hot-takeover* (SZT) configuration. In this mode, applications are up and running in two nodes; but all transactions are routed to only one node. If that node fails,

then transactions are routed instantly to the surviving node. SZT offers the same rapid recovery that an active/active configuration provides, but without the problems facing a fully active/active application (i.e., the possibility of data collisions).

With its rapid and reliable failover capabilities, Shadowbase offers Zero Downtime Migration (ZDM). If an application, operating system, or hardware needs to be upgraded, all one has to do is to take one node offline, perform the upgrade, and then return it online. The process is then repeated on the other nodes in the application network. Because node outages can be recovered with little or no user impact, this upgrade process eliminates planned downtime while nodes are being switched in and out of the application network for maintenance.

Shadowbase does not require the source and target databases to have the same structure nor that the source and target systems be running the same operating system. In fact, the source and target databases can be from different vendors running on different operating systems. Shadowbase supports powerful data transformation capabilities to modify source database changes that meet the requirements of the target database. Thus, Shadowbase supports highly heterogeneous application networks.

Supported databases include NonStop Enscribe, NonStop SQL, Oracle, Microsoft SQL Server, Sybase, IBM DB2, MySQL, among others. These databases may be running under the NonStop Kernel OS, NonStop OSS, HP-UX, Microsoft Windows, Red Hat Linux, or Oracle Sun Solaris operating systems.

The heterogeneous capabilities of Shadowbase allow it to offer important functionalities beyond data replication. Predominant among these other capabilities are data integration and application integration. Changes to one or more source databases can be added to target databases that are used for entirely different purposes but which need to be kept current with the data generated by other applications. This is data integration. Likewise, changes to a source database can be sent by Shadowbase directly to remote applications for real-time event processing. This is application integration.

Shadowbase also offers data management utilities necessary for managing distributed data environments. The utilities include:

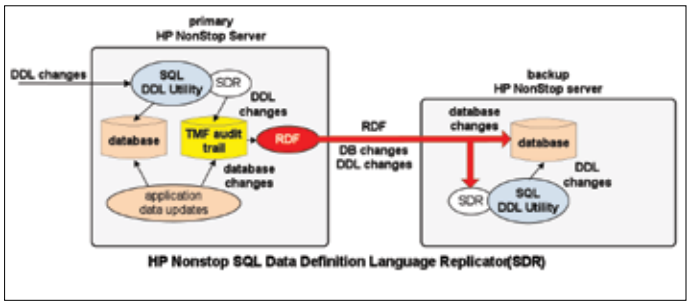
- UNDO: Database "rewind" utility to undo changes made to a set of source files and/or tables while the database remains online and available to applications.
- REDO: Rolls forward selected database changes onto an earlier (typically saved/restored) copy of the database to recover the database to a prior, correct version, after various forms of database corruption occur.
- SAL (Shadowbase Audit Log): Creates a searchable archival database of NonStop transactional activity (inserts, updates, and deletes) on a reporting database for application change data-auditing purposes (for NonStop Enscribe, NonStop SQL/MP, and NonStop SQL/MX, as source databases).
- SAR (Shadowbase Audit Reader): Analyzes and displays all audited database activities, using the NonStop TMF audit trail files, and optionally reads "foreign" audit (audit produced on another system).

HP Nonstop SQL Data Definition Language Replicator (SDR)

The structure of NonStop SQL databases occasionally needs a change. IT staff enters data definition language (DDL) operations, such as creating a table, adding a column, or moving a partition. DDL operations normally are not replicated by RDF, as they do not appear in the audit trail. HP NonStop SDR handles this role. It replicates DDL operations made to SQL/MP databases to backup target databases via RDF.

Without SDR, the IT staff must down TMF and RDF on both the primary and backup systems, invoke the DDL operation on both systems, and then restart the systems. The result is a planned outage that typically must be scheduled for off hours. It is a manual process and thus is subject to human error. It must be performed identically on both the primary and backup systems. Otherwise, the structure of the primary and backup databases will be different, and subsequent RDF data replication will fail.

When SDR is used, DDL statements are intercepted on the primary system and are inserted into the TMF audit trail, from where they are then replicated by RDF. The DDL statements are applied to the backup database by RDF via SDR in the proper order with respect to the stream of database changes. Therefore, no downtime is required to restructure an application database; and the possibility of an RDF failure due to manual errors is eliminated. As an option, DDL operations on unaudited SQL tables can be replicated by SDR.

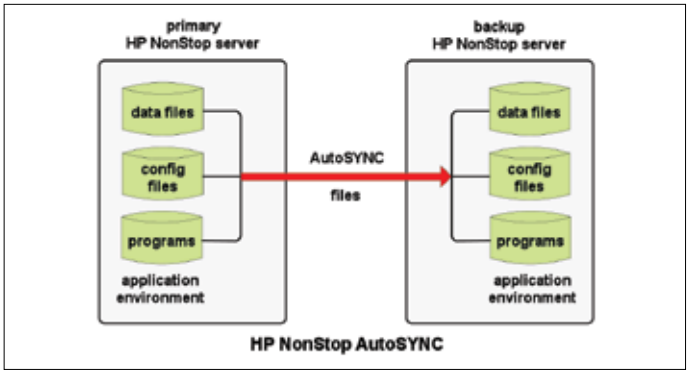


HP NonStop AutoSYNC

From a disaster-recovery viewpoint, the role of RDF and Shadowbase is to maintain an accurate and current image of audited databases on a backup system. However, this role is not sufficient to ensure reliable takeover by a backup system if the primary system fails. There are numerous other files that define the application environment, and these files must all be mapped accurately to the backup system. They include unaudited data files, configuration files, and program executables.

Typically, when a critical file is changed on the primary system, manual operations must be executed to move a copy of the file to the backup system. This procedure is subject to human error and can lead to *configuration drift*. If the configuration of the backup system is not identical to that of the primary system, a failover fault is likely if the primary system fails. The backup system may refuse to come up or be restarted with an incorrect version of software.

HP AutoSYNC addresses this challenge. It automatically ensures that the application environment on the backup system is identical to that of the primary system. Using a configured list of files that are important to the application environment, AutoSYNC monitors these files on the primary system and immediately replicates changed files to the backup system. The backup system configuration is therefore always synchronized with the primary system, thereby guaranteeing a successful failover. AutoSYNC can be configured to replicate files to any number of target systems.



HP NonStop AutoSYNC

Virtually all file types are supported, including audited and unaudited NonStop SQL tables; audited and unaudited structured files; unstructured files such as edit files, OSS files, and directories; and partitioned files. Files necessary to start and maintain applications also are handled by AutoSYNC. Included are configuration files, batch files, object/source files, OSS files, BLOBs, TACL macros, and Obey files.

AutoSYNC supports triggers that can initiate any function whenever a file is changed. Triggered functions can include executing a TACL command, compiling a SQL program, or starting a program such as a batch job. AutoSYNC also supports automatic software distribution and can be used to initially load systems being brought online by synchronizing the files of the new systems with those of a primary system.

HP NonStop TS/MP and Pathway Domains

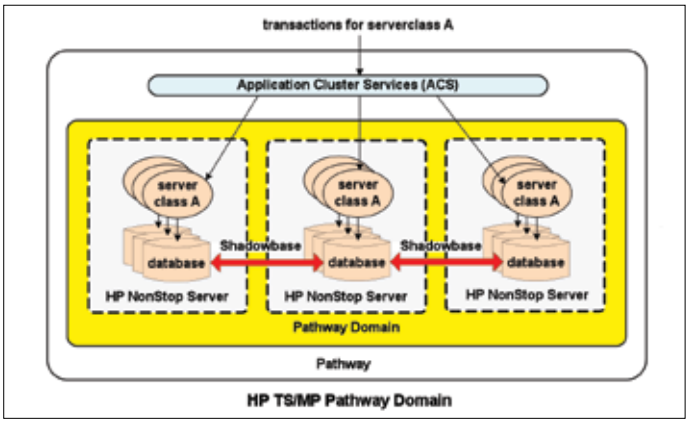
Maintaining a copy of the application database on remote systems is only one requirement for disaster recovery. The application must be resident on the remote systems as well. Equally important is that the applications and the application environment be identical (or at least similar) on all systems in order to avoid failover faults. This requirement adds to the complexity of managing active/backup configurations and exposes these systems to human error.

HP NonStop TS/MP offers an elegant solution to this conundrum, Pathway domains. In a single NonStop system, Pathway provides an environment (PATHMON) that implements application scalability by distributing workloads across dynamic pools of application server processes (serverclasses). A serverclass spans multiple processors within the NonStop system. The number of servers in a serverclass can be dynamically scaled up or down to meet existing transaction loads. Pathway's Application Cluster Services (ACS) distributes transactions to servers in a serverclass to maintain load balancing.

If a processor fails in a NonStop server, ACS distributes transactions to application servers residing on surviving processors. Thus, recovery from a processor failure in a NonStop system is virtually instantaneous. PATHMONs are a fundamental mechanism of the fault-tolerant capabilities of NonStop servers.

PATHMONs can be distributed across multiple NonStop servers in an application network. Such a set of distributed PATHMONs is called a *Pathway domain*. In a Pathway domain, serverclasses are distributed not only among processors within a NonStop node but also among NonStop nodes in an application network.

Pathway domains furnish three important advantages for business continuity. The system administrator, when configuring the domains, can ensure that all processes in a server class across all domains are derived from a common executable. Consequently, the application processes are automatically consistent across all NonStop nodes, thus eliminating failover faults. Another advantage is that if a NonStop system fails, further transactions are routed instantly by ACS to application processes running in surviving nodes. Thus, recovery from a system failure is instantaneous. Finally, since all of the domains in a Pathway domain are independently configured, upgrades may be made with zero downtime by taking down a domain, upgrading it, returning it to service, and rolling the upgrade through the other domains one at a time.



HP TS/MP Pathway Domain

To avoid a single point of failure, that portion of each serverclass resident in a NonStop server node should have its own local application database. These databases must be kept synchronized so that the applications in each node have the same view of the application database. It is a function satisfied by the use of Shadowbase active/active replication. Shadowbase ensures that an update to any one database is immediately reflected in all of the application's distributed databases.

Summary

HP NonStop servers achieve an extraordinary level of business continuity by providing a fault-tolerant environment in which applications can run. HP NonStop's suite of replication products extends the NonStop server fault-tolerant capabilities to geographically distributed networks of NonStop servers, thus protecting against the total failure of a single NonStop system.

Data replication begins with HP NonStop TMF and HP NonStop AutoTMF audit trails, which supply a queue of database changes for replication to remote target databases. RDF uses operating-system level services to deliver nearly instantaneous uni-directional data replication of audited databases. Shadowbase supports bi-directional data replication of audited databases. With Shadowbase, active/active systems can be configured so that all nodes are actively processing transactions for a specific application. Recovery from a node fault is nearly instantaneous with active/active systems. Shadowbase also supports sizzling-hot-takeover, which provides almost the same levels of availability of active/active systems, but without the headache of data collisions.

The RDF and Shadowbase data replication products are augmented by HP NonStop SDR and HP NonStop AutoSYNC. SDR provides replication of DDL changes made to NonStop SQL

Continued on pg. 35

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Winning the Battle Against Internet Banking Fraud by Leveraging Real-Time Data Integration

Keith Evans >> Shadowbase Product Management >> Gravic, Inc.

Who among us has never received an email purporting to come from a bank or other financial institution, stating that due to "suspicious activity" or some such subterfuge, our account has been frozen until we click the URL in the message to "reset" our account? Of course, this will require divulging personal information such as our user ID, password, home address, etc. That information is then used by crooks to steal money or obtain further personal information, such as account numbers. This, of course, is an example of phishing, and it is a very lucrative enterprise too. In the UK alone, internet banking fraud in the first six months of 2014 cost £29.3M.[1] Globally, the cost is measured in the tens of billions of dollars annually. Email phishing is just one avenue; phone calls purporting to be from agents of your bank and computer viruses are other ways this information is obtained. Simply buying it is also an option. Cybersecurity firm Hold Security revealed recently that it discovered stolen credentials from some 360 million accounts available for sale on the underground internet.

With the information necessary to access online bank accounts so readily available, how is a bank to defend itself (and us) against this ever increasing threat? And not just to defeat the fraud itself, but do so in such a way that enables prosecution and conviction of the perpetrators so they cannot just do it again? This article describes how this goal has been successfully achieved by a major European retail bank.

One Bank's Internet Banking Fraud Detection System

In the bank's home country, the laws regarding fraud and what constitutes a crime are very specific. Stealing a user ID and password, and then using that information to log in to a customer's internet banking account, while exhibiting an intent to commit fraud, is not necessarily criminal in and of itself. It is necessary that an actual act of fraud be perpetrated, such as transferring money from the customer's account to another account.

This fact necessitated the bank to design and implement its internet banking application in a very specific way: to detect and prevent fraud, yet still enable the authorities to pursue a conviction against the actual actions committed. For example, simply denying a suspicious logon, while protecting the bank, would not provide sufficient grounds for prosecution.

The basic structure of the bank's internet banking and real-time fraud detection system is shown in Figure 1. The internet banking application runs on HP NonStop servers. Changes made by that application to the banking database (primarily implemented using HP NonStop SQL), are read from the HP NonStop TMF audit trail by the Shadowbase® data replication product from Gravic, Inc.[2]

The changes are fed by the Shadowbase replication engine from the HP NonStop server via a TCP/IP connection to Shadowbase processes running on a Linux system. From there, customized user exit procedures running inside the Shadowbase processes structure the changes into an architected message format (similar to a CSV file), and feed those messages via TCP/IP into a RiskShield® fraud detection application.[3] To facilitate low latency yet improve overall efficiency, the changes are batch fed 50 at a time into RiskShield, or whenever a timer expires if 50 changes are not received within that timeframe.

The RiskShield application contains a knowledgebase which allows it to detect and flag potentially fraudulent transactions (for example, User IDs whose credentials are known to have been compromised, known target accounts for fraudulent money transfers, etc.). Having analyzed the input messages (customer ID, source account, target account, amount, etc.), the RiskShield application returns a response to the internet banking application via a private connection, indicating whether or not the transaction is suspicious. The internet banking application then proceeds accordingly.

What is very clever about this system is the way in which it is architected to serve both the needs of the bank in preventing fraudulent transactions from completing, and in allowing the online activities of the criminals to proceed, to the point where an actual act of fraud is committed, for which they can then be prosecuted. To accomplish this, the system splits the internet banking business activity into a series of steps (Figure 1), with each step comprising a separate TMF transaction, up to a final step which will complete the business activity.

For example, when a criminal intends to transfer money from another account to their own account, the first step is the user authentication process. The user ID and password information are captured by the internet banking application and are logged

[1] Source: Financial Fraud Action UK.
[2] For more information, please visit www.gravic.com/shadowbase.
[3] For more information, visit www.inform-software.com/products/riskshield.

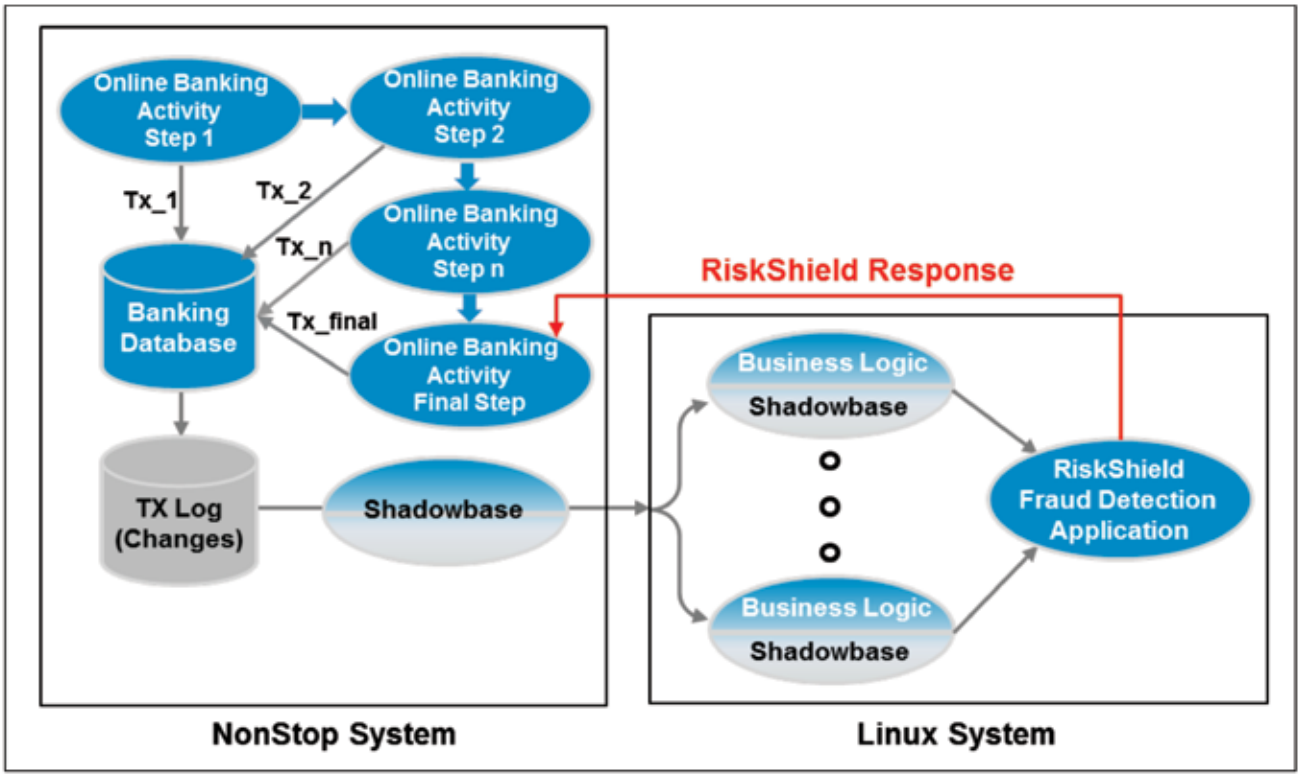

Figure 1 – Internet Banking Fraud Detection System

in the banking database via a TMF transaction. This information is read by Shadowbase replication from the TMF audit trail and via the process described above would quickly be delivered to the RiskShield application, which could then begin its analysis. Even if an immediate response was returned by the RiskShield application flagging the transaction as suspicious, the bank would allow the activity to proceed, since an actual criminal act has not yet been committed. Meanwhile, the next step of the internet banking activity proceeds, which might be to validate whether there are sufficient funds in the source account to satisfy the transfer. Likewise this transaction would be logged and delivered to the RiskShield application. For some accounts, rules may have been established which limit the amount of transfers, especially if they are destined for overseas accounts.

The RiskShield application includes this additional information with that already received and continues its analysis. The next step for the internet banking application is to validate the target account for the transfer. Again, the banking database is updated with this information, which is forwarded by Shadowbase technology in real-time to the RiskShield application, which adds yet another piece of information to the puzzle.

Finally, the criminal is presented with a confirmation screen by the internet banking application, showing the FROM and TO account information, the amount to be transferred, and is asked if the information is correct to click an "Execute Transfer" button. When that is done, the final phase of the business activity and the final TMF transaction is started by the internet banking application. If by this time a response has been received from the RiskShield application indicating that the activity is suspicious, the final TMF transaction will be aborted, the money transfer is not performed, and the fraud is prevented.

The bank will then take further steps as appropriate, for example, notifying the actual account holder that their credentials have been compromised, and suspending the account (just like the phishing example above!). But most importantly, because the criminal activity was allowed to proceed to the point where an actual crime was committed (the attempt to fraudulently transfer money from one account to another in this example), the bank will contact the authorities and provide them with all of the details captured by the internet banking and RiskShield applications, enabling them to pursue an investigation and possible criminal prosecution.

There is a very interesting point to note with the operation of this fraud detection system. If the response from the RiskShield application is not received by the internet banking application by the time of the final step in the activity (by the time the "Execute Transfer" button is clicked in our example), the bank may nevertheless complete the activity (perform the transfer in this case). If subsequently the RiskShield response indicates possible fraud, the bank will then take the necessary steps retroactively. While not ideal from the fraud prevention perspective, this approach can be taken because the bank does not necessarily want to delay a user transaction every time the fraud response is unacceptably "slow" in order to catch the few (by comparison) fraudulent activities. The internet banking application is optimized for the normal, non-fraudulent case, with reasonable time limits for response time. This approach illustrates the tension between the bank's need to prevent fraud, while not negatively affecting normal business or customer service.

Another interesting facet of this application is that there are aspects of big data analytics, application integration, and real-time business intelligence (RTBI) involved.[4] There can be as

[4] For more information, please see these white papers: Shadowbase Solutions in a Big Data World, Shadowbase Streams for Application Integration, and The Evolution of Real-Time Business Intelligence and How to Achieve it Using Shadowbase.

many as 5,000-6,000 transactions per second moving through this system, which requires the reading and distribution of a very large amount of data by Shadowbase replication, between heterogeneous applications (running on HP NonStop and Linux systems), as well as analysis of this data by the RiskShield application – all in real-time and with the addition of minimal latency and overhead.

Conclusion

Fortunately, the system is working! Figure 2 shows the cost of internet banking fraud in the bank's home country over the past few years. While it had been increasing exponentially until 2011, since then – due to the implementation by banks of more and more sophisticated fraud prevention schemes, such as the one described here – the cost of internet banking fraud in this country has declined significantly, dropping by 72% between 2012 and 2013.

This example provides a powerful demonstration of what can be achieved by clever application design, coupled with a Shadowbase high-speed/high-throughput heterogeneous data distribution fabric, to deliver large amounts of data in real-time to a data analytics engine. The result is a system which provides critical functionality and produces tangible positive results for the business. In this case the application is used to prevent internet banking fraud, and has resulted in a significant decrease in the cost of such fraud to the bank, and prosecution of the perpetrators. There are of course many other applications of such technologies to enable businesses, not only to detect and defeat criminal activity, but also to gain other competitive advantages in other markets and industries.

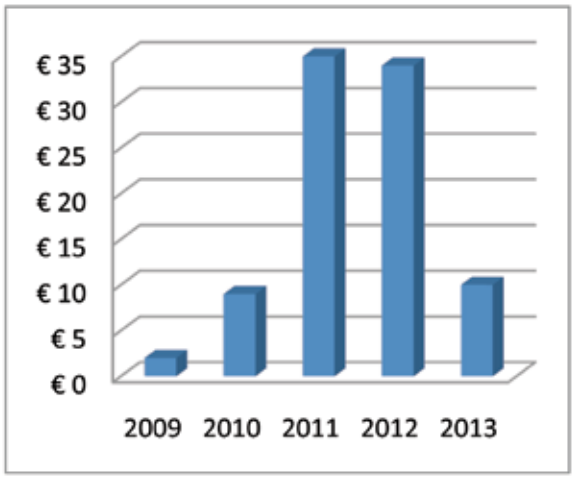

Figure 2 – Cost of Internet Banking Fraud in Bank's Home Country (€M)[5]

The Shadowbase Data Replication Product Suite

The Shadowbase solution suite comprises several products addressing business continuity, data replication, data and application integration, zero downtime migration, and other utilities to deliver a true 24x7 "nonstop" enterprise. Shadowbase Streams change data capture technology allows companies to build real-time business intelligence systems to immediately analyze and process events as they occur in their organization, using an efficient event-driven architecture (EDA). As shown in this article, it allows disparate applications to interoperate in real-time at the data level, avoiding the need for expensive programming and middleware adapters. Shadowbase sales and support is now directly available from your HP NonStop account team, or contact Gravic, Inc. for more information.

[5] Source: NVB, 2013.

Keith B. Evans works on Shadowbase business development and product management for Shadowbase synchronous replication products, a significant and unique differentiating technology. Asynchronous data replication suffers from certain limitations such as data loss when outages occur, and data collisions in an active/active architecture. Synchronous replication removes these limitations, resulting in zero data loss when outages occur, and no possibility of data collisions in an active/active environment. Shadowbase synchronous replication can therefore be used for the most demanding of mission-critical applications, where the costs associated with any amount of downtime or lost data cannot be tolerated.

SQLXPress

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NonStop SQL Database Management

Rob Lesan >> XYPRO Technology

I have always been, and always will be, what has been referred to as a "command line cowboy". I go through keyboards faster than most people go through mobile phones. I know how to type and I prefer to. I write macros and scripts day in and day out. I can extract data from my NonStop databases in EBCDIC or ASCII and I can update statistics or repartition with the best of them. So what am I whining about? The fact that these database administrator operations not only require me to be sitting at the keyboard, but each and every one of them requires custom work and intimate knowledge of everything I am touching, the somewhat cryptic syntax for every operation and a LOT of work. Scripts must be written and tested, formats decided on, security updated and who knows what else.

Furthermore, I am often at odds with the security administration team and way out of compliance to corporate security policy which mandates the capture and recording of all actions taken against sensitive database data, whether it be Enscribe, NonStop SQL/MP, or NonStop SQL/MX.

As a Database Administrator (DBA), it can become overwhelming to think of all of the tasks I am responsible for; designing databases, extracting data, managing performance (both programs and tables), not to mention I have to do all of this manually. If your job is anything like mine, you know a DBA is always being pushed to do more in less time which makes for stressful days.

Challenges of being a DBA

Let's talk about a few of the challenges that all DBAs face day in and day out.

- Repartition
  - Reviewing and updating key values
  - Merging partitions
- Reuse partitions
- Update statistics
  - Gathering SQL/MX statistics
  - Copy statistics from one table (or system) to another
- Index maintenance
  - Create
  - Populate
  - Drop
  - Alter
- Specifying access privileges
  - grant/revoke
- Query performance and tuning
- Building and deploying standard queries
- Data load/unload
  - Moving data from MP to MX for testing

Is there a Solution for us and those we work with?

While there are a few Database management tools offered from HP such as NSM/web or MXDM, I believe I have found the ideal solution for all DBA's, developers, testers and QA analysts and users. Merlon Software Corporation has developed an extensive set of database solutions for SQL/MP and SQL/MX to allow anyone who needs access to NonStop hosted data, regardless of your NonStop knowledge, to manage, manipulate, view, query, and optimize data and the programs that interact with it. Not everyone has the same knowledge of a NonStop server, but everyone needs to access the vast data stores of the NonStop. Using Merlon's software makes this possible with minimal effort.

What can a modern SQL solution do for my databases?

New database tools and technologies allow you to do more in less time, reduce your error rates, eliminate the need to remember the exact syntax to accomplish rare operations and you can automate those repetitive, tedious and complex tasks.

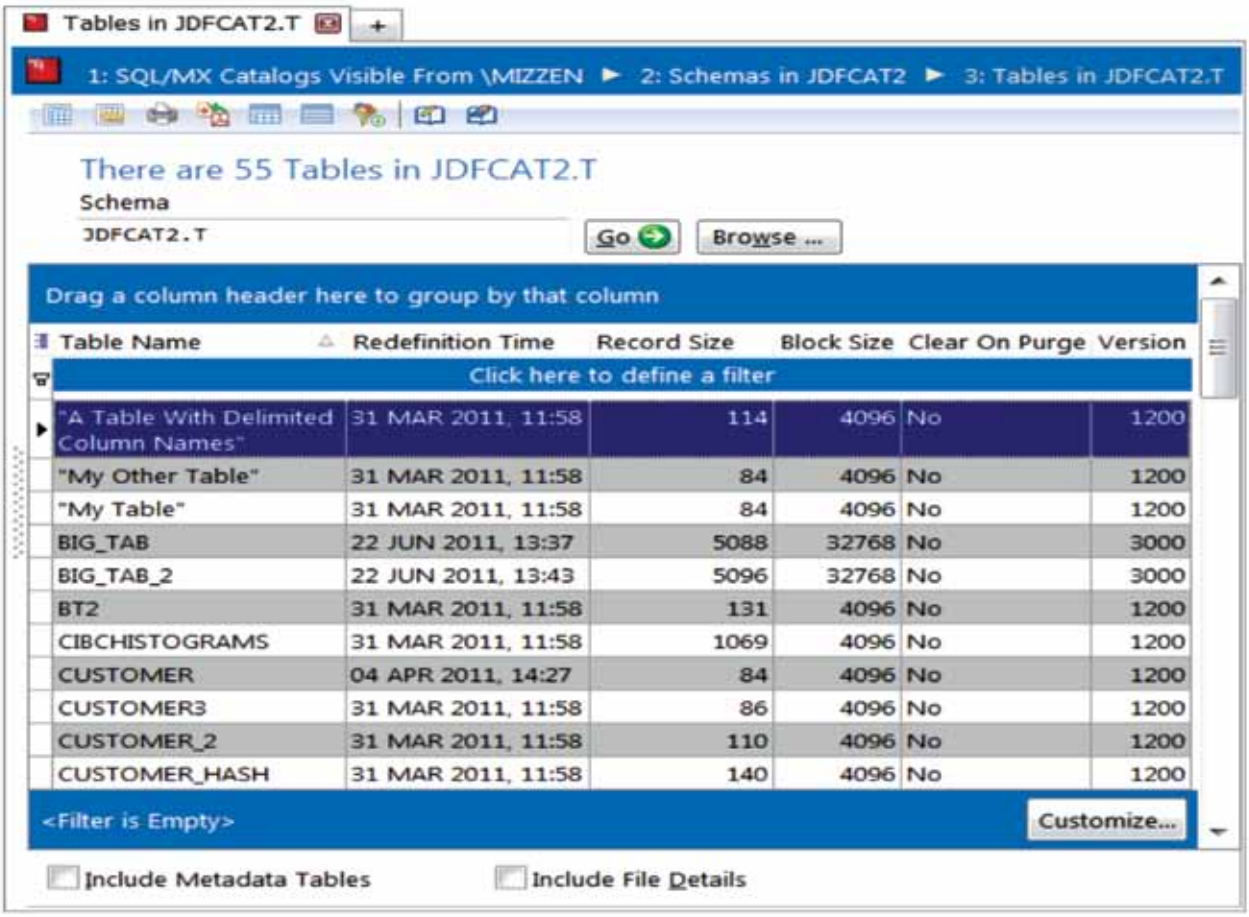
SQXLPress

The main management solution in the Merlon database toolkit, SQLXPress, is the Swiss Army Knife® of utilities. It is a Microsoft Windows (because who doesn't use Windows these days) GUI that includes just about everything you need to keep your NonStop databases in top shape. It supports both SQL/MP and SQL/MX and includes its own easy to use scripting language while easily integrates into any batch solution. No secondary utilities are required. On top of all this, the auditors and security police can satisfy their need for accountability as every session can be audited and include logon/logoffs, SQL statements, scripted activities such as SQLCI and MXCI commands, OSS program launched, and more.

With SQLXPress you can pull down as much data as you need in a single query and sort and order any way you like with the same dataset! One query, drag and drop, or click your way to data discovery. Table data or metadata, whatever you need. This feature alone saves hours of work.

Once you have extracted what you need, SQLXPress has made it easy to export your data to any number of useful, consumable formats such as PDF, EXCEL, other databases, etc. Or just print what you need and move on.

One of the best features of NonStop SQL (both MP and MX) is the ability to perform DDL operations on active databases. Partitions get full, access requirements change. Performance can suffer over time. We need to keep up with how our systems are behaving on a regular basis. Sometimes things need to be moved around. This kind of work can take a wide view of large amounts



of data. Most of us would rather do this off peak to minimize performance issues, but we can do the difficult work up front. Analyzing keys and partition placement can be a daunting task even for small databases. SQLXPress takes the guesswork out of this by giving you the ability to run multiple analyses using very fast sampling to minimize impact and it can make recommendations based on data distribution AND query plan analysis.

I have found so many great features in SQLXPress that it is not possible to tell you all of them right now, but there is one that I simply cannot go without mentioning. The Merlon software provides the ability to develop and deploy user queries. Consumers often know what they want but have no idea what goes into what they are asking for, it is our job to decode their requests and provide them with a safe and secure way to get the data they need. Using SQLXPress, any DBA can write a query that only allows users to plug in data only in the fields relevant to the user.

Developers, Testers/QA analysts and Users

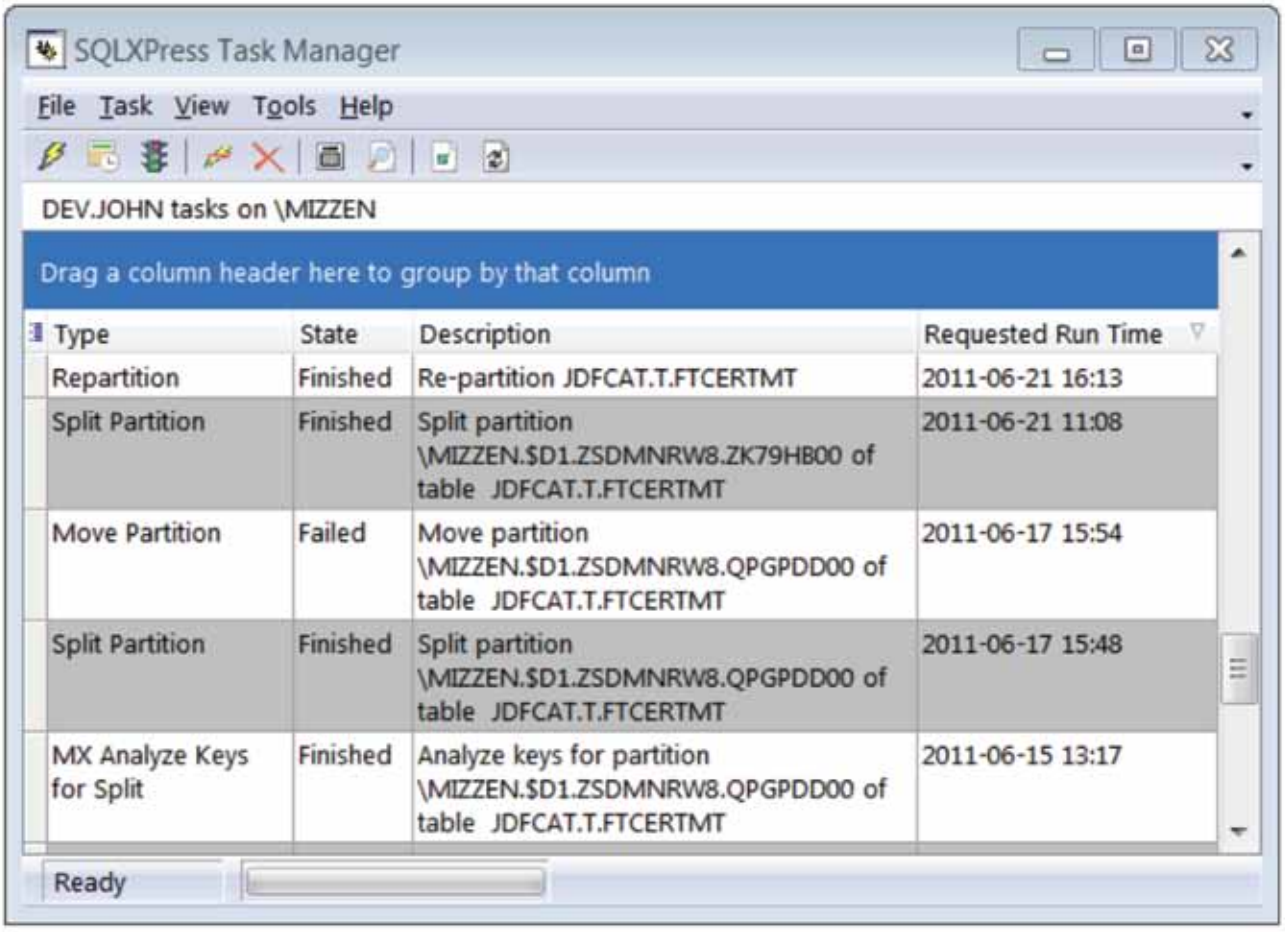
As mentioned before, others we work with can benefit from SQLXPress as well. Many of the same features and functions that benefit the database team are really useful for everyone:

- Build, test, and optimize queries
- Build scripts
- Explore database dependencies
- Create and manage test environments
- Compare schemas
- Compare data
- Generate test data
- Browse data
- XPressView provides read-only access to database queries and tables
- Run queries designed by DBA
- Build using a visual query builder
- Print data
- Export data

Considering the size and complexity of NonStop data, the last thing you want is users in your database. By giving them the GUI and controlling (and auditing!) what they do, you can grant them the freedom to access the data while maintaining control over what data they can see and how they can access it. They won't know, or care, if the data is MP or MX, all they will know is that is available and their queries complete in record time.

A lot of users have a need for subsets of data. The development, test and QA teams are notorious for making requests for production data that often cannot be exported for security, privacy or legal reasons. SQLXPress, once again, has an answer for that. When someone needs representative data for testing, SQLXPress just needs to know what data you are looking for and how much. Whether you need 500 rows or a million rows that look like your production customer database all you need is SQLXPress to clone the database in question then ask it to generate a sample of a given size. These time consuming tasks will become easy for the development, test and QA teams making everyone's lives less stressful.

The toolset is quite amazing. Do the Oracle kids make fun of you for your green screen? Does the MySQL dude over the wall ask you how long it takes you to get through your request queue? Do they



simply not understand that this stuff takes work? Turn the tables. Ask them how many concurrent users THEY can support. Ask them what they think big data is. Tell them we have been doing it all for years without downtime. Then show them SQLXPress and laugh back.

Back again to security, because high-availability and fault tolerant systems need strong security, SQLXPress addresses these needs in many ways. In addition to its new auditing capabilities, SQLXPress also integrates seamlessly with XYGATE Access Control for the added comfort of limiting access on a need to know basis and having full individual user accountability, even when using shared or privileged ID.

Moreover, your copy of XYGATE Merged audit will soon be able to extract all this valuable security audit for centralized reporting, alerting, and for streaming off to your enterprise SIEM.

Continue to watch this space. Next time I will talk about database maintenance (reorgs)! The excitement continues!

Rob Lesan is a Senior Solutions Architect with the Professional Services division of XYPRO. He has been a NonStop professional for over 20 years supporting the NonStop as a systems programmer, application developer, database administrator and security professional. Before joining XYPRO, Rob managed the authentication and authorization infrastructure for AOL. He has an extensive background in disaster recovery, data replication, and systems availability. His main focus today is helping the NonStop community meet PCI compliance through authentication, auditing and encryption.

Node.js and NonStop SQL

Neil Coleman >> CTO >> Infrasoft **Richard Buckle** >> CEO >> Pyalla Technologies, LLC

The news is out that with NonStop X there will be the opportunity to leverage yet another modern platform – Node.js. To address the technical focus of this month's "The Connection" issue of "Database/Business Processing Solutions", we should take a closer look at the level of support offered via Node.js for relational databases in general, and support for NonStop SQL in particular.

For those who are unfamiliar, Node.js is a cross-platform runtime environment that enables fast (compiled – not interpreted), scalable JavaScript applications to be executed on the server. It is built around Google's V8 JavaScript engine, and uses an event-driven, non-blocking I/O architecture that makes it ideal for data-intensive applications that need to support concurrent access from multiple distributed devices.

Node.js usage continues to expand, with deployments at large companies including Bank of America / Merrill Lynch, Target, Cigna, Bloomberg, Wells Fargo, Macy's and DirecTV. On February 10 2015, Joyent announced *"that it will move to establish a formal open governance model for Node.js with the creation of an independent foundation. Joyent will join forces with IBM, PayPal, Microsoft Corp, Fidelity and The Linux Foundation to establish the Node.js Foundation, which will be committed to the continued growth and evolution of Node.js, while maintaining a collaborative environment to benefit all users."*[1].

Infrasoft's soon-to-be-released bomBora product embodies a "deep port" of Node.js to the NSK operating system. While supporting Node.js applications that run on other OS platforms, without requiring any application changes, bomBora also significantly extends the Node.js runtime by utilizing NSK fundamentals and by integrating with existing NSK subsystems to provide the attributes expected of enterprise-level software. The above-mentioned integration of diverse software components, which is enabled by the NSK message / file system, lends itself to the promise of a powerful Node.js ecosystem on the NonStop Server – and NonStop SQL is just one component of that ecosystem. If you have not done so already, you may want to review the article "Node.js on the NonStop Server" in the November/December 2014 edition of "The Connection".

As proposed in the above-mentioned article, the Node.js architecture *"may have almost been dictated by the fundamental concepts of writing a high-performance OLTP application running on the NSK operating system."*

The availability of Node.js on the NonStop Server is coming at a time when the development model has to accommodate the explosion in usage of mobile devices with their need for information to be displayed simply and with just a few additional options – the wealth of information previously provided via terminals is of little use to today's users. With its origins in the presentation client side of development, the support of JavaScript on the server gives developers everywhere the option to use exactly the same programming model on both the client and the server – this too hasn't been lost on those needing to extend the features of solutions already running on NonStop.

Node.js says "YES" to SQL

Despite the profile that NoSQL databases (such as MongoDB and CouchDB) have enjoyed over the last year or two, the proven performance and reliability of relational databases for OLTP and the sheer volume of applications that rely on them means that relational databases aren't going to disappear any time soon.

Further, the highly subjective claims by NoSQL proponents that *"When compared to relational databases, NoSQL databases are more scalable and provide superior performance"* [2], ideally should be challenged by IT analysts and commentators, rather than repeated verbatim and suggesting that it is a common belief among developers. In reality, the suitability of NoSQL database vs. relational database usage depends on the proposed application.

It was HP Master Technologist Justin Simonds who recently commented about the price of NonStop to a discussion on the LinkedIn group, Tandem User Group, that *"It is a common belief that Nonstop is expensive. Common does not always mean accurate."* [3] When it comes to relational databases, it is perhaps more accurate to state that, for mission-critical transactional applications, such relational databases more than hold their own against any alternative.

Returning to Node.js, perusal of the available Node.js packages (see www.npmjs.com) which are aimed at enabling database access from JavaScript applications reveals significant support for both NoSQL databases and relational databases. In terms of relational databases supported, users will readily find Node.js packages that provide "drivers" including those for Oracle, IBM DB2, Microsoft SQL Server, MySQL, and PostgreSQL. It is of particular interest that although a Node.js package for Oracle has existed for some time (see https://github.com/joeferner/node-oracle), on January 20 2015, Oracle themselves announced the preview release of a new Node.js package named node-oracledb [4].

Currently, we cannot point to "JSDBC" – that is, something akin to JDBC's API for Java access to a database. Perhaps that is something that we will see evolve over time. In the meantime, many existing Node.js application frameworks provide an abstraction layer to shield the application code from driver API differences.

Why is NonStop SQL support so important anyway?

In general a strong case can be made favouring enhancing and extending what we now have versus looking for what is new. In this age of mobility and information, the core of what we need to do as a business has been done, for the most part, leaving the tweaking of processing and presentation to better serve customers on the

move – yes, the always-on world is forcing a modernization of our applications. NonStop system users need to find ways to support existing application enhancement even as the age of mobility and information blossom further.

It would be highly unlikely for any modernization project today for NonStop Server applications to better support mobility and the greater access to information without somewhere relying on JavaScript Object Notation (JSON). As a lightweight data interchange protocol, JSON is easy to use and efficient with respect to bandwidth requirements. JSON is already available for HP NonStop via several products which interface with existing Pathway servers via Pathsend and which typically push the presentation layer solely to the client. bomBora takes a different approach – by enabling JavaScript, with its native support of JSON, to execute on the HP NonStop and combined with its inbuilt interfaces to NSK subsystems and services – bomBora users will be able to write JavaScript applications that can integrate with any other NSK-based applications. The flexibility and power of JavaScript means that via a simple script, users can apply additional logic as required - this is particularly relevant for newer Mobile and Big Data frameworks written in JavaScript.

With respect to NonStop SQL, the requirements for modernization, enhancement, and extension mentioned above suggest that the demand to leverage the significant investment that already exists in business processing centred around relational databases can only increase. Enabling simple, JSON-friendly integration with NonStop SQL-based components will help meet that demand.

What will bomBora's NonStop SQL support look like?

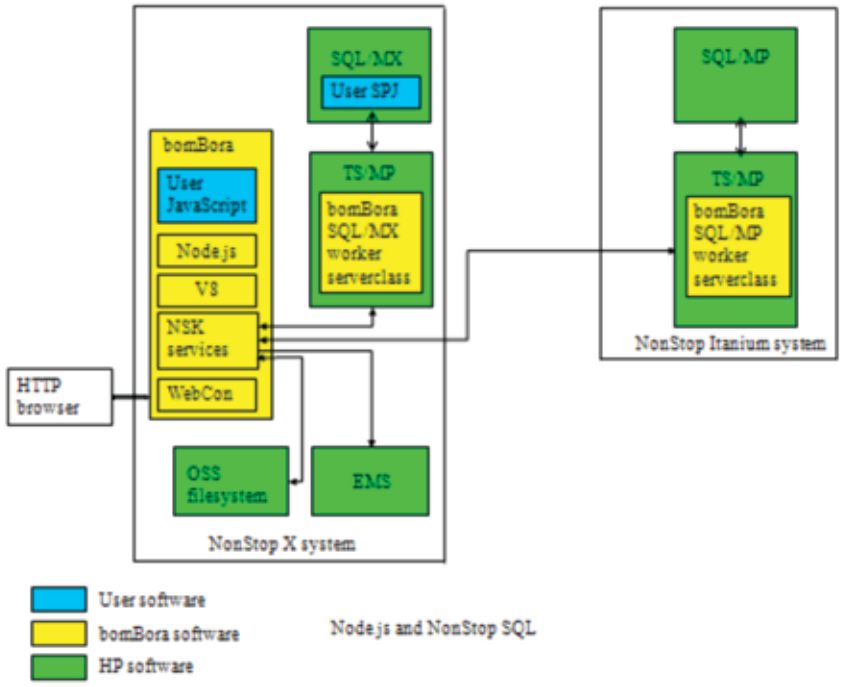
In a typical Node.js environment running on a system supporting SMP, access to a database is achieved using "worker threads". Under the covers, in addition to the main thread which operates as an event-based dispatcher, Node.js maintains a thread-pool for use for blocked I/O (asynchronous SQL operations are not supported by all relational databases). Once the database work is complete, the JavaScript application's callback function is eventually invoked. From the application's point of view, the work is still asynchronous and the application is free to service other requests concurrently. Importantly, from the application programmer's point of view – threads are not exposed.

On the NonStop Server, instead of relying on "worker threads", bomBora takes advantage of the TS/MP subsystem. A set of "bomBora workers" offers support for a range of functionality. The core bomBora process itself, which embodies the V8 JavaScript engine, uses NSK Pathsend calls to pass work requests to the appropriate bomBora worker. bomBora workers run as members of a TS/MP serverclass, with different worker types represented via different serverclasses. From the application's point of view, the work is still asynchronous and the application is free to service other requests concurrently. Importantly, from the application programmer's point of view – the TS/MP serverclasses are not exposed.

With respect to NonStop SQL, the "bomBora SQL/MX worker" and the "bomBora SQL/MP worker" provide access to those respective databases. As a side note, although the core bomBora process will only run on NonStop X systems, the bomBora workers may run on either the same system or any other NonStop Server connected via Expand/IP. The core bomBora process and the bomBora SQL/MX worker both run as OSS processes. The bomBora SQL/MP worker runs as a Guardian process.

Currently, the SQL/MX worker will allow access to SQL/MX using dynamic SQL or via calls to Java Stored Procedures (SPJs); the SQL/MP worker will allow access to SQL/MP using dynamic SQL.

The usage of SPJs allows an organisation to avoid building applications that require database structure knowledge – that means increased security because less information is exposed at higher levels "up the stack", increased application reliability because database structure changes do not necessarily mandate application changes, and increased consistency across applications or application components because common logic is re-used. Further, SPJs offer portability across different databases. bomBora allows Node.js JavaScript code to join the participants taking advantage of SPJ benefits. Let's take a look how…



Node.js and NonStop SQL

Using one of the sample SPJs from the "HP NonStop SQL/MX Release 3.2.1 Guide to Stored Procedures in Java" [5], here is the Java method for the MONTHLYORDERS Stored Procedure…

```
public static void numMonthlyOrders(int month,
                                    int[] numOrders)
  throws SQLException
{
  if ( month < 1 || month > 12 )
  {
      throw new
          SQLException ("Invalid value for month. " +
                        "Retry the CALL statement " +
                        "using a number from 1 to 12 " +
                        "to represent the month.", "38001" );
  }

  Connection conn = DriverManager.getConnection("jdbc:default:connection");

  PreparedStatement getNumOrders =
      conn.prepareStatement("SELECT COUNT(month(order_date)) "+
                            "FROM samdbcat.sales.orders " +
                            "WHERE month(order_date) = ?");

  getNumOrders.setInt(1, month);
  ResultSet rs = getNumOrders.executeQuery();
  rs.next();
  numOrders[0] = rs.getInt(1);
  rs.close();
  conn.close();
}
```

Here is the CREATE PROCEDURE statement…

```
CREATE PROCEDURE samdbcat.sales.monthlyorders(IN INT, OUT number INT)
EXTERNAL NAME 'Sales.numMonthlyOrders'
EXTERNAL PATH '/usr/mydir/myclasses'
LANGUAGE JAVA
PARAMETER STYLE JAVA
READS SQL DATA;
```

Here is how the SPJ is invoked via MXCI…

```
CALL samdbcat.sales.monthlyorders(3,?);
```

Here is some sample (annotated) JavaScript to invoke the same SPJ…

```
// Load the module that enables SQL/MX access
var sqlmx = require('sqlmx');


// Configuration information is passed via a JavaScript object.
// The catalog and schema properties can be empty strings, in which case
//   system defaults would be used
// The Pathway system is on the same NSK system as ourselves, and for
//   example purposes is assumed to be running with the 'SQLMXWorker'
//   Serverclass (which uses the bomBora SQL/MX Worker software) started
```

```
var config = {
  catalog: 'samdbcat',
  schema: 'sales',
  workerPathmon: '$BOMP',
  workerServerclass: 'SQLMXWorker'
};


// Parameter information that is used for SPJ invocation (see below)
// The parameter names must match those used on the JavaScript execute
//   method but these do not need to match the names used on the SPJ
//   itself. However, we are doing so here for clarity.
// OUT parameters do not need a value property.
var paramsSPJ = {
  month: { mode: sqlmx.MODE_IN, type: sqlmx.DT_INT, value: 3 },
  numOrders: { mode: sqlmx.MODE_OUT, type: sqlmx.DT_INT }
};


// Create an object to represent a new connection to use to access the
//   Database – completes synchronously. No I/O operations are issued
//   by bomBora.
// Note that the configuration information as declared above, is passed.
var myConnection = new sqlmx.Connection(config);


// Open the connection to use to access the Database – completes
//   asynchronously.
// bomBora attempts to begin a TS/MP dialog with the specified Serverclass
//   which in this case is 'SQLMXWorker' running under '$BOMP'
myConnection.open(function(error) {
  if (error) {
    console.log(error);
  }
  else {
    // Invoke the SPJ known as 'monthlyorders' – completes asynchronously.
    // Note that we pass the JavaScript object named 'paramsSPJ' which
    //   provides information required regarding the parameters
    // The TS/MP dialog is used to pass enough information to the
    //   SQLMXworker Serverclass instance to let it issue a CALL
    //   to the SPJ and return results
    myConnection.execute(monthlyorders(month, numOrders),
                         paramsSPJ,
                         function(error, result) {
      if (error) {
        console.log(error);
        myConnection.close();
      }
      else {
        // result is a JavaScript object that will look like…
        // { numOrders: 4 }

        // Terminate the TS/MP dialog and release any used resources
        myConnection.close();
      }
    });
  }
});
```

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If the SPJ call is successful, the application has available to it a JavaScript object which can then easily be worked on. Referring back to the subject of simple, JSON-based integration, an example may be to serialize to a JSON string using the JSON. stringify() method, and then sending that to another application / application component running either locally or on another platform.

Conclusion

The impending availability of the Node.js platform on the HP NonStop X systems means a lot more than just running JavaScript on your server. It also means that NonStop Servers will be eligible to be considered to host any number of the large range of available Node.js packages – in a way that offers unmatched reliability and scalability. The vehicle via which Node.js support will be made available on the NonStop Server – the bomBora software – will enable integration with key NonStop subsystems. NonStop SQL is one of those. Hopefully this article provides a glimpse of the many upcoming possibilities.

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[4] https://blogs.oracle.com/opal/entry/introducing_node_oracledb_a_node

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Neil Coleman is CTO, Infrasoft. Coleman has over 30 years of designing and developing software for NonStop systems, with an emphasis on high performance middle-ware. He has worked at customer sites and at ISV's on a variety of projects and products. Coleman is a co-founder of Infrasoft Pty Ltd.

Richard Buckle is the founder and CEO of Pyalla Technologies, LLC. He has enjoyed a long association with the IT industry as a user, vendor, and more recently, as an industry commentator. Richard has over 25 years of research experience with HP's NonStop platform, including eight years working at Tandem Computers, followed by just as many years at InSession Inc. and ACI Worldwide.

Well known to the user communities of HP and IBM, Richard served as a Director of ITUG (2000- 2006), as its Chairman (2004-2005), and as the Director of Marketing of the IBM user group, SHARE, (2007-2008). Richard provides industry commentary and opinions through his community blog and you can follow him at www.itug-connection. blogspot.com, as well as through his industry association and vendor blogs, web publications and eNewsletters.

The quotes come from some of Richard's clients including HP, Integrated Research, comForte, DataExpress, WebAction, Inc., InfraSoft, and OmniPayments, Inc.

The Darknet

Dr. Bill Highleyman >> Managing Editor >> Availability Digest

Where have all the credit cards gone?
Long time passing.
Where have all the credit cards gone?
Long time ago.
Where have all the credit cards gone?
Gone to Darknet, every one.
Oh, when will we ever learn?
Oh, when will we ever learn?

– Pete Seeger (paraphrased)

Over the 2013 Christmas holidays, Target[1] was hit with a massive theft of credit-card information. More recently, it appears that Home Depot suffered a similar fate.

But what use is this stolen information? Do the hackers use forged credit cards to make a lot of purchases? No, they sell the information on the Darknet, often for millions of dollars.

Nonstop systems are involved in most payment-card transaction systems. It is important that NonStop developers and users understand the implications of the Darknet. We explore the Darknet in this article.

Recent Hacks

The Target hack occurred over a three-week period prior to the 2013 holiday season. POS (point-of-sale) terminals in its U.S. stores were infected with malicious software that skimmed the magnetic-stripe data from cards that were swiped in its terminals. The data was then sent to the attacker. Personal information from 110 million cards was stolen.

The recent Home Depot hack may even surpass the Target hack. As with the Target hack, it also appears that magnetic-stripe data was captured in the POS terminals by malicious software and was forwarded to the attacker. In the case of Home Depot, the attack may have been ongoing for up to four months before it was discovered.

How Were the Breaches Detected?

In neither instance was the breach discovered by the victim company. In the case of Target, credit-card companies were faced suddenly with a large number of fraudulent purchases. Upon investigation, they found that batches of stolen cards had shown up on an underground web site that deals in stolen personal information. The card companies purchased some batches and analyzed recent activities of the cards. In every occurrence, the common denominator was Target Stores. From the card samples, it was determined by the credit-card companies that the Target breach occurred over a three-week period prior to Christmas 2013.

With respect to Home Depot, the scenario was somewhat different. On Tuesday, September 2nd, new batches of stolen card information suddenly appeared on the same underground web site. Analysis of these cards pointed to Home Depot as being the common source. Evidently, the Home Depot hack had been ongoing since April or May. By delaying the sale of the stolen data to September, the hackers were able to accumulate much more stolen data before detection.

Interestingly, in the Home Depot situation, batches of stolen cards from U.S. banks were labeled "American Sanctions." Card batches issued by European banks were labeled "European Sanctions." Was the Home Depot attack possibly in retribution for sanctions imposed against Russia for its Ukraine activities?

Infecting POS Terminals

The U.S. Secret Service has been investigating a POS terminal malware infection called Backoff[2] since October, 2013. It is unclear if this is the malware that infected the Target and Home Depot terminals, but that is a possibility.

Unfortunately, Backoff was not recognized by antivirus software until August 2014. Seven POS system vendors have confirmed that multiples of their clients have been affected by the malware. The U.S. Department of Homeland Security estimates that perhaps 1,000 U.S. businesses have been infected and not know it.

[1] Target Compromises Millions of Payment Cards, *The Availability Digest*; January 2014. http://www.availabilitydigest.com/public_articles/0901/target.pdf

[2] Backoff Point-of-Sale Malware, *U.S. Cert*; August 27, 2014.

The Darknet

Where does all this stolen information go? To the Darknet, where it is put up for sale.

The Darknet is a private network where connections are made only between trusted peers. It is structured to maintain the anonymity of its users. A person can access a Darknet web site only if he has been approved by other members of the web site. For instance, if you want to get onto a hacker's web site, you have to prove to the current members that you are a legitimate hacker.

The Darknet actually originated quite legally under the auspices of ARPANET (Advanced Research Projects Agency Network), the predecessor to the Internet. Launched in 2002, a project called Tor was set up by the U.S. Naval Research Laboratory with the purpose of protecting U.S. intelligence communications. It allowed groups of people using the Internet to maintain complete anonymity.

Tor is an acronym for a project originally called The Onion Router because of its many layers of protection. Tor directs Internet traffic through a worldwide, volunteer network of more than 5,000 relays to conceal a user's location and usage from anyone conducting network surveillance. Tor is currently supported by the non-profit Tor Project (www.torproject.com) and is heavily used legitimately by groups of people who need to keep their communications absolutely private.[3]

Unfortunately, privacy is also required by purveyors of illegal products such as stolen information in order to advertise their wares. Any illegal use of the Tor network is now known as the Darknet. Most of the unlawful use of the Darknet can be traced to sources in Russia and Eastern Europe.

Hackers dealing in stolen payment-card information on the Darknet are known as "carders." Carders even have their own blogging web site that can be found at www.cardersforum.se. Included on this web site is a Bitcoin exchange. Bitcoins are typically used for transactions in the Darknet because, like the Darknet, Bitcoin ownership is completely anonymous.[4]

Typical offers on the Darknet include U.S. stolen identities for $25 USD each, European stolen identities for $40 USD each, and credentials for bank accounts with balances between $70,000 USD and $150,000 USD for $300 USD.

How Carders Make Money?

How do carders make money from stolen credit cards? The process involves numerous steps. The first step is for attackers to sell their stolen information to brokers who buy in bulk. The brokers then break the stolen information into smaller batches and sell the batches to carders. The carders have several ways to make money off of the stolen payment-card information.

One technique is to purchase prepaid cards with the stolen cards. These prepaid cards are then used to buy gift cards issued by stores such as Amazon. The gift cards are used to purchase high-value items such as computers, smart phones, and game consoles.

The carder has the purchased items sent to a "mule." A mule is an innocent and unsuspecting person who has been recruited through legitimate channels such as Angie's List with the promise of "easy work-at-home jobs." The mule reships the items for a fee to a location specified by the carder, who then assembles the items into packages for resale overseas or on auction sites at significant discounts. By frequently changing shipping addresses used by the mules (often to unoccupied houses or offices), a carder can escape discovery.

The carders have discovered another way to make money. They scam spammers. A carder will sign up as an affiliate of a spam campaign – for instance, an online pharmacy. However, instead of sending out junk email, the carder uses the stolen credit cards to purchase items promoted by the spammer. The carder earns a cut of 40% to 50% for everything it "sells." It is not until a card company detects that a sale is fraudulent that the spammer gets a chargeback and often higher merchant fees because of the large number of fraudulent sales. The spammer loses the money on its sale but has already paid the carder, who no longer is anywhere to be found.

What to Do?

Law-enforcement agencies around the world are attempting to track criminal rings that deal in stolen information. Fifty-six members of a Russian-centered card-fraud ring that stole information from Visa, MasterCard, Discover, and American Express have been sentenced.

Of course, law enforcement all too often occurs after-the-fact. The key solution to fraudulent card transactions is to prevent card-information theft in the first place. This can best be accomplished by encrypting information from the payment card as it is being read by the POS terminal and then by using only the encrypted information to authorize the payment. Smart cards, prevalent in Europe, do just this. Using a computer chip embedded within it, a smart card sends its card number to the issuing bank in encrypted form. The POS terminal never sees the card number in plain text, so no malware can intercept it.[5]

Converting to Chip Cards

The United States is a mecca for carders because it is one of the last countries (and the largest source of payment-card transactions) to adopt smart-card technology.

However, this is about to change. The U.S. payment-card industry has mandated that all merchants be smart-card compatible by October 2015 (except for gas stations, which have until 2017) or face a "liability shift." If a merchant does not process at least 75% of its transactions through a smart-card-enabled terminal (whether via chip-cards or magnetic-stripe cards) and accepts a disputed or fraudulent card payment, the merchant will be liable for the transaction rather than the issuer.

Similar attacks to those launched against Target and Home Depot are likely to continue until magnetic stripes

[3] In June 2013, whistleblower Edward Snowden used Tor to send information to the *Washington Post and The Guardian*.

[4] Mt. Gox, Largest Bitcoin Exchange, Goes Belly Up, *Availability Digest*; March 2014. http://www.availabilitydigest.com/public_articles/0903/bitcoins.pdf

[5] Yash Kapadia, The Smarts Behind EMV Smart Cards: Part 1 – Online Transaction Processing, *The Connection*; September/October 2014. Yash Kapadia, The Smarts Behind EMV Smart Cards: Part 2 – Offline Transaction Processing, *The Connection*; November/December 2014.

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have been completely phased out. For the time being, smart cards continue to be adorned with magnetic stripes in many countries so that they can be used in magnetic-stripe POS terminals. However, once all payment cards have been converted to smart cards and all POS terminals have been replaced with those that will read smart cards, magnetic stripes will disappear. This may take a while (perhaps a decade), but its time is coming.

It is important to note that smart-card technology is an important aspect in improving payment security. It does prevent card skimming. But the industry will have to do more than this to prevent all payment-card fraud. For instance, smart cards do not protect against card-not-present fraud when a stolen card is used to purchase items over the Internet.

Summary

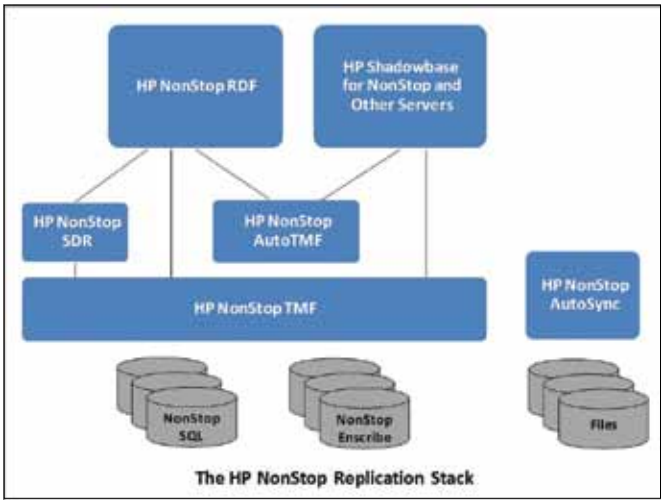
The magnetic-stripe information on payment cards can be stolen via malware installed on POS terminals or installed in the servers that manage the POS terminals. This data can then be sold in bulk by the hackers to brokers, who in turn sell smaller batches to carders. Transactions between hackers, brokers, and carders all take place on the Darknet, a highly anonymous Internet subnet that is available only to those who have been approved and authorized by the other members of the Darknet. The carders have several means to make money quickly from the stolen cards before the theft of the cards has been detected – a process that often takes months.

The only way to stop card theft is through the adoption of smart cards using computer chips embedded in the cards. Smart cards have been adopted worldwide except for the United States, where most theft now occurs. However, U.S. merchants will start accepting smart cards in 2015. When smart cards are fully employed and the magnetic stripe has disappeared, stealing payment-card data should become a thing of the past (except, of course, that it seems that hackers are always smarter than us).

Dr. Bill Highleyman is the Managing Editor of The Availability Digest (www.availabilitydigest.com), a monthly, online publication and a resource of information on high- and continuous availability topics. His years of experience in the design and implementation of mission-critical systems have made him a popular seminar speaker and a sought-after technical writer. Dr. Highleyman is a past chairman of ITUG, the former HP NonStop Users' Group, the holder of numerous U.S. patents, the author of Performance Analysis of Transaction Processing Systems, and the co-author of the three-volume series, Breaking the Availability Barrier.

HP NonStop Business Continuity Product Suite: An Introduction

Continued from pg. 17



The HP NonStop Replication Stack

databases. AutoSYNC implements replication of unaudited files to ensure that the application environment is consistent across all nodes, a necessary condition for reliable failover in the event of the outage of a primary system.

Pathway domains extend the data replication capabilities of the HP replication suite to include application replication. Pathway domains can be configured to maintain Pathway application availability when a node outage occurs.

With its extensive heterogeneous capabilities, the Shadowbase data replication engine also implements data integration and application integration. For data integration, the changes to a source database can be replicated as modifications to data stored in other databases, thereby allowing disparate databases being used for other purposes to maintain data synchronization with the source database. For application integration, Shadowbase can replicate changes being made to a source database to other applications, allowing those applications to process events in real time.

Today's HP NonStop servers are the culmination of more than 40 years of continuous availability expertise. No other platform provides such a comprehensive and powerful processing architecture as the NonStop server, the best choice for enterprises that cannot risk data loss or service downtime.

Ajaya Gummadi is currently the Worldwide Product Manager with HP's Mission-Critical NonStop Servers Business Unit. In this role, she is responsible for driving the database and cloud product strategy for NonStop servers, managing NonStop ecosystem, and working with NonStop R&D developers on delivering product innovations that enable HP customers to create scalable and always available applications for their business needs. She has an EMBA from GSBM, Pepperdine University, and a Master's degree in Computer Science from BITS Pilani, India.

Back for More...

Richard Buckle >> CEO >> Pyalla Technologies, LLC.

By the time this column makes its way into print and lands on your desk I will have been to Las Vegas three times in the last three months. Not by design, mind you, but in response to conferences and events that are of interest to me as they feature applications that, for many, run on HP NonStop systems. Payments still run on NonStop and with the general availability of NonStop X, I sense that the viability of NonStop to all FIs, and not just the top tier, will become obvious. The architecture of NonStop systems, even as it supports the Intel x86 architecture, continues to be as NonStop as it was in the past, and for an affordable price it's bound to make it onto the short-list of those companies looking to upgrade the very core of their IT infrastructure.

In last month's column I wrote of how it's always been incongruous to me that you could even think about building a better fault tolerant system by adding more components. Just as it's difficult for me to believe that something can be bolted-on to a working system that will improve its reliability. During the system's operation, I observed, you cannot add something to ensure longer uptime, you can only remove something, and this is lost on many systems architects even today. However, on the other hand, experienced NonStop developers are beginning to look at how to take the knowledge they have accumulated from developing solutions on NonStop and add components that bridge some of the gap between their solutions running on NonStop and what they have running on Linux / Unix / Windows (LUW).

I am not suggesting for a moment that the LUW package itself can be made fault tolerant, but rather, there's structural changes to the underpinning infrastructure and framework that can be made by those with a working knowledge of NonStop that improve the availability of their applications on LUW systems. Among my client base almost all are expanding their product offerings to include systems apart from NonStop, and from my perspective, this is a wise business decision for them to take. I would rather have a healthy population of vendors deriving income from multiple system offerings that a weak population of NonStop vendors barely getting by. This is particularly important for the NonStop community as it not only ensures sustained development, but with every indication that HP will soon be providing hybrid systems featuring NonStop, experience on systems apart from NonStop will become very important.

To drive home this point, I was pleasantly surprised to find that this was well understood in the vendor community. Having a common code base that would allow deployment on systems apart from NonStop seemed a smart move. From day one, the framework implemented by InfraSoft, for instance, hides the underlying system where use of libraries tailors supported capabilities according to the system in place at run time. Even issues of endianness are hidden behind a framework, and while companies will never be swayed to buy a product based on the framework used, with the increasing dependence on open source that situation may change.

But can you really fake-out high availability? Can you put in place infrastructure that gives an application similar uptime to what you would expect from a NonStop system? For years IBM has argued that with access to knowledgeable staff and with a big enough budget, you can make IBM mainframes almost fault tolerant via their Parallel Sysplex options. Notice, though, it's not a property that comes out of the box; it requires considerable expertise to implement and each customer's deployment is likely to be different. However, taking a second look at a NonStop product and then offering configuration options to improve availability of systems apart from NonStop should be welcome news to the NonStop community.

Such was the direction taken by DataExpress, as revealed during a recent email exchange. This company has both a DataExpress for NonStop (DXNS) product as well as a DataExpress for Open Platform product (DXOP) – essentially the LUW systems referenced earlier. "DXNS implicitly enjoys the system / power / network etc. redundancy from residing on the NonStop platform," DataExpress CEO, Billy Whittington wrote. "DXOP primarily lived on a windows platform; should Windows become strangled – down went your primo FT platform. That was unacceptable and because we had a big brother version that would never fail, it constantly prodded us to think of how to provide the same resilience to the Open Platform." What DataExpress now provides, by NonStop community standards, may not be "100% redundant," said Whittington, "I think you can always pick holes in it but we believe it would stand up under fire. Obviously where I stated Windows above, we have now got this on a common code base across Linux, Unix, Windows and we are even looking at OSS (for NonStop X) in the near future."

As I wrapped up last issue column, I closed with the observation that the resilience of NonStop, as an architecture, had come through loud and clear during the presentations at the then just-held NonStop Boot Camp. What we can all agree upon, I wrote, is that the "simplicity and lightness" of NonStop is inescapable and even today, remains without peer. Having said that however, I am not going to ignore what NonStop vendors are pursuing today to better differentiate their product offerings from their competitors, and if leveraging decades of accumulated knowledge from solely focusing on NonStop can be beneficial to the company, then why not I ask? After all, when it comes to NonStop today and the potential for hybrids featuring NonStop, we too may be suggesting in the words of that former Oldsmobile commercial, "This isn't your father's NonStop system" and that, with all the efforts being expended by NonStop vendors, should make us all very proud, indeed!

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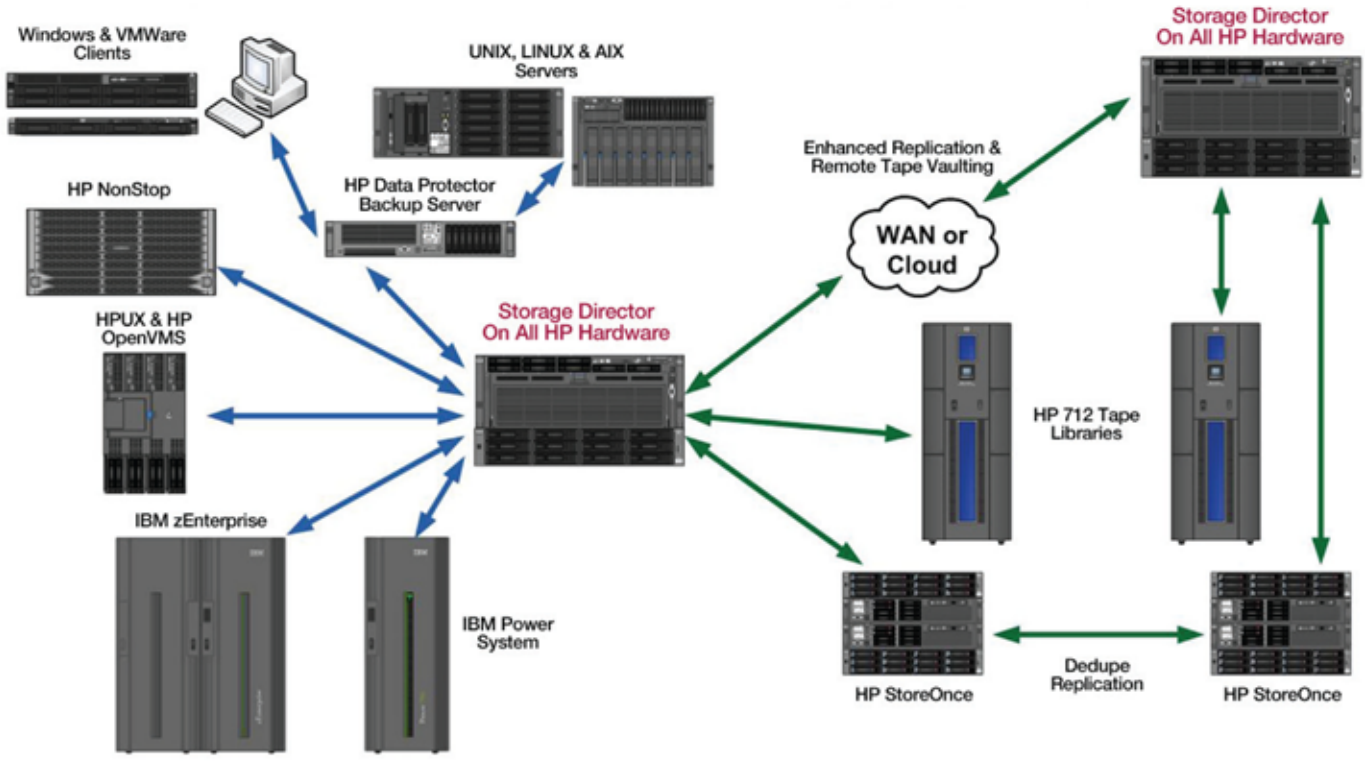

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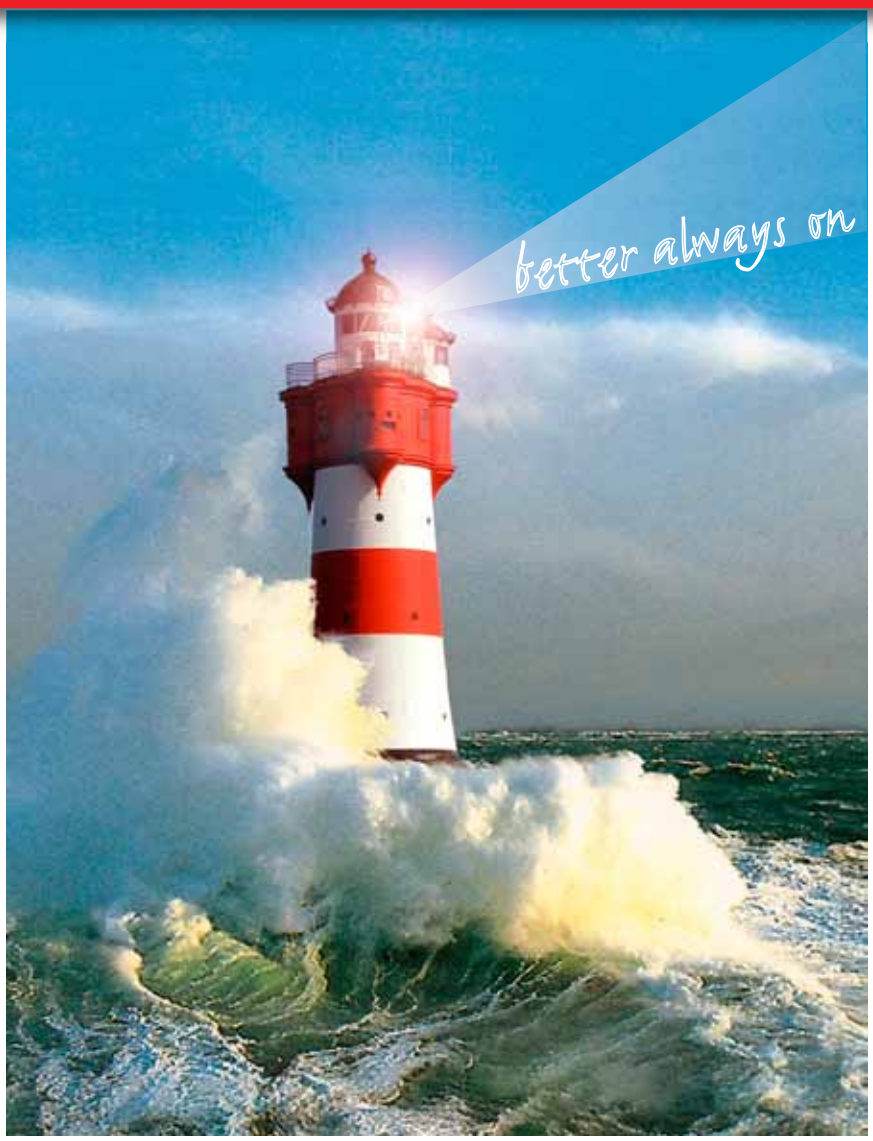

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