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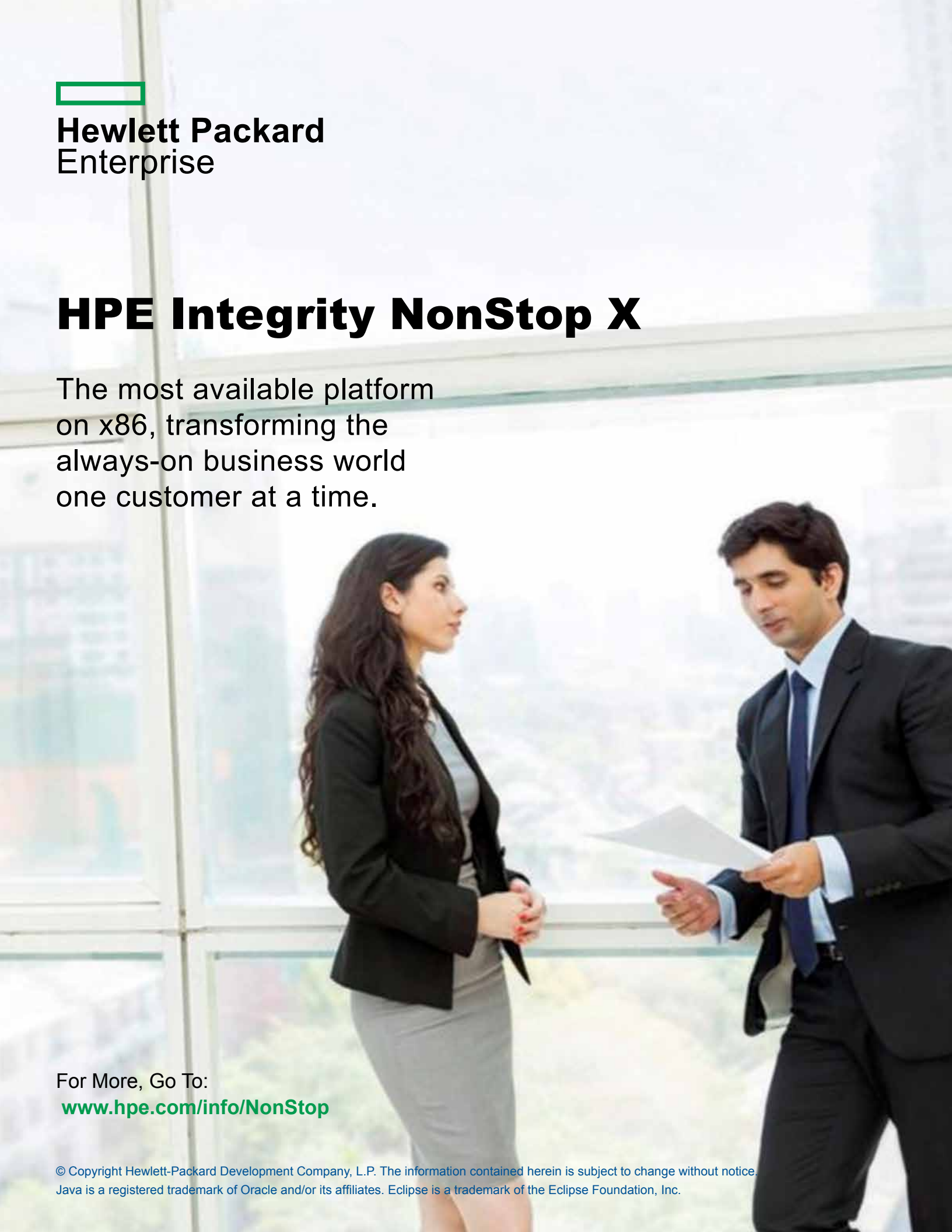

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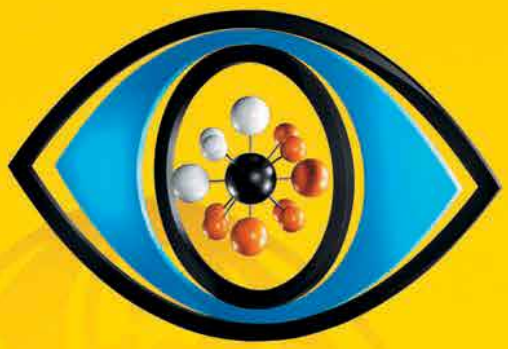

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News from HPE's NonStop Enterprise Division

Welcome to 2016!

The NonStop business ended 2015 with a bang at the Connect NonStop Technical Boot Camp in San Jose and HP DISCOVER 2016 in London. We caused a stir at both events by announcing our new product strategy to expand beyond traditional NonStop environments to hybrid environments and eventually to NonStop virtual environments. What stunned many people was an announcement from Andy Bergholz about recent success in the NonStop Lab, where a virtual NonStop server is already running inside a virtual machine on a Linux industry standard server.

We received overwhelmingly positive feedback from both events with our customers and partners envisioning a new business model for NonStop. Martin Fink joined us at the November event to talk about his history with NonStop and his love of the platform. If you missed the show, you can read about his experience in the article in this edition entitled "Inside NonStop".

The truth is that the NonStop business has been evolving throughout the last 40 years. The transition to x86 and InfiniBand is just the latest manifestation. We are continuing to look to new ways to solve customer business and technical issues and bring the strength of NonStop to new use cases and new types of business.

As anyone running a business knows, changing your enterprise data centers to support new capabilities isn't a clean cut over. You're very unlikely to one day just hit a switch, shut off the old data center and then turn on a whole new data center that operates in a new ways. Logistics aside, dramatic change is difficult for people to absorb and adopt; we can't just throw away everything we've learned and know on a job and start over. And no one wants to depend on an IT team that's new to every single task they need to perform.

Change is best deployed as evolution rather than revolution. Over time, small regular changes can be more easily absorbed by the IT team and the organization and lessen risk compared to massive cutovers. Change then is built upon the expertise of the existing IT team as they embrace new technologies in bite size chunks. Changes in applications and capabilities ripple across a data center, so as new servers, new business needs and new styles of IT are deployed the users of those business processes keep evolving too and the business keeps functioning normally. As time goes by, you look back and see that the whole data center has completely evolved.

We imagine the future evolution of NonStop to be deployed in a similar way - new NonStop environments co-existing with current technologies, alongside older but tried and true technologies and customers rethinking what NonStop can do for them and where it can run to make best use of existing investments. New and coming technologies such as user mode InfiniBand (YUMA) and virtual NonStop servers offer opportunities to both deploy existing solutions more efficiently and extend your NonStop environment to incorporate new solutions.

In transforming your data centers, one of the key areas that IT has to consider is how and where data is stored. From the latest in very fast SSDs, to traditional HDDs, to storing data on virtual drives and archival media, for business the whole point of the data center is to retrieve data when needed and act on it, whether the data is in a traditional server or pulled through a private cloud. In this issue, you'll find articles about the relevance of tape in today's world (see Glenn Garrahan's article) as well as the ways in which storage and the movement of data has evolved (see Richard Buckle's Musings).

Secure systems and protecting data at rest is a constant concern for customers these days. We're excited to be offering the HPE SecureData tokenization solution to NonStop customers this month along with XYPRO's Data Protection product (XDP). XDP provides an intercept library infrastructure for tokenizing sensitive data that minimizes or eliminates the need for customers to modify their applications to adopt tokenization. Together both products offer the means to fully secure sensitive data when it is at rest. We are working to add other products in this area in the future, including comForte's intercept library which works with HPE SecureData as well.

It's an exciting time. It was wonderful at last year's events to see new young faces coming into the business as well as old friends who've been around for many years. Friends like Tom Moylan, who has been working for NonStop or managing the NonStop Americas sales teams for 30+ years. Tom, is retiring later this year and handing the reins over to Jeff Skinner. Tom's close relationships with customers and partners is unparalleled and his enduring optimistic confidence in the product line as being "the best in the world" is contagious. He will be sorely missed by everyone associated with NonStop. But the good news is that we get to continue to stand on the great shoulders of people like Tom who helped us build this business. The wheel of change rolls on, with NonStop technology continuing to evolve into new IT models and be deployed into data centers where we and our customers can depend on it to carry us forward.

Best wishes for success to everyone who works with NonStop in 2016!

Karen

Karen Copeland
Manager, WW NonStop Product Management
Mission Critical Solutions
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Columns...

Special Feature Brought to You by

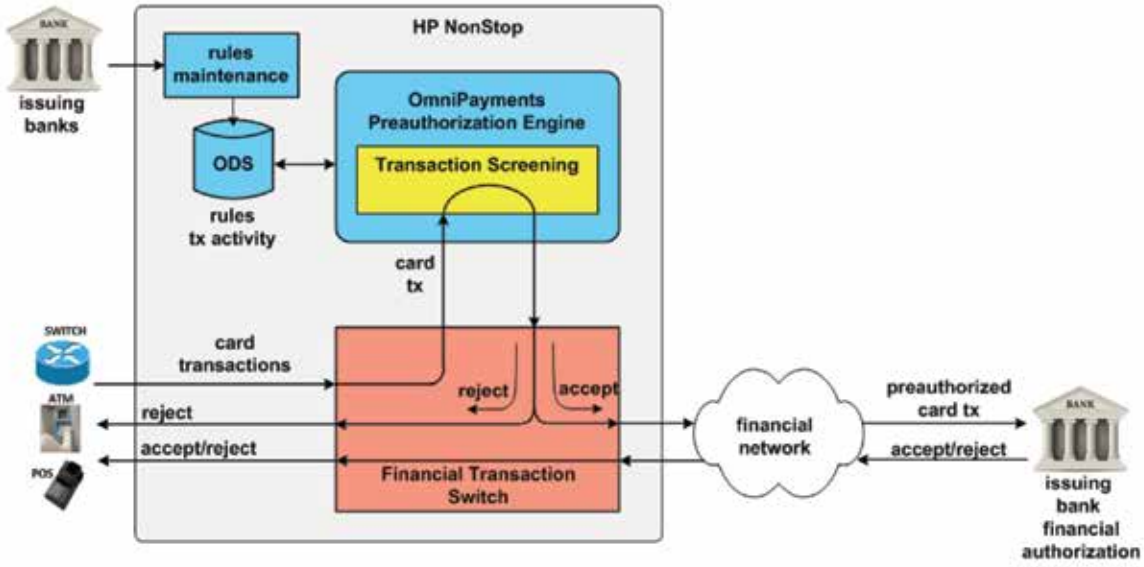
OmniPayments

The financial transaction switch that replaces BASE24

OmniPayments is a switching solution for the financial industry. It is deployed on NonStop for the highest availability and offers all the requisite functionality to manage credit/debit-card transactions. It manages multiple devices, hosts application interfaces, and interoperates with third-party products or other systems if required. OmniPayments easily expands to provide additional functionality when needed and supplies complete security functions for every financial transaction handled. OmniPayments will survive any single fault, requires no downtime for maintenance or upgrades, and supports a range of disaster recovery solutions.

The OmniPayments Preauthorization Engine

Our Customers Call it the Fraud Blocker!



Preauthorization checks have grown popular in light of today's alarming increase in fraudulent activities. The OmniPayments Preauthorization Engine is used by financial institutions in conjunction with the OmniPayments Financial Transaction Switch or as a seamless interface to other providers' switches. Our customers call our Engine the fraud blocker. Modern and easy to manage, it preauthorizes millions of transactions far more effectively than its complex, compute-intensive competitors. Sold separately or as part of the OmniPayments solution.

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OmniPayments Inc. is high capacity. It supports 10,000 TPS throughput. OmniPayments is 99.99999% reliable. OmniPayments guarantees 50% off your current transaction processing costs. OmniCloudX on NonStop X hosts numerous instances of OmniPayments at an attractive, pay-for-use price.

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A Note from Connect Leadership

Hello NonStop friends and colleagues!

On behalf of Connect, I wish you all a boring 2016! May your systems run without incident and all your upgrades go smoothly.

Like user groups worldwide, Connects' purpose is help all of us become better and more effective HP professionals. Connect's focuses on four key areas: Advocacy, community, philanthropy, and education. All I ask of you, is that you tell us what you need in these areas so I can focus Connect's resources to get you what you need. All of this with the purpose of keeping your enterprise running smoothly and ensuring each of us is bringing the maximum value.

Our four key areas have been traditionally focused inward, towards HP and each other. Moving forward, I ask that you take these fundamentals and turn them outwards towards others. Advocate for your platform. Bring others into the community. Tell everyone you know about Connect's scholarship program. Teach someone a NonStop skill.

We have all supported, and benefited, from this platform for much of our careers. Let's ensure that NonStop not only endures, but flourishes in the future. Today's world is more connected than ever. 7x24x365 is something we have considered standard since day one. Now is the perfect time to show others that it IS possible and we have the technology, knowledge and experience to ensure continued operations.

My objective is to provide expertise, guidance, and NonStop fundamentals to enterprises worldwide about what it takes to maintain continuous operations without compromise. I intend to educate every IT professional, CEO, CIO, technical manager and platform advocate I can corner on how we do things in the HP NonStop world. Most won't believe what I have to say at first, but if I can get them to hear how things can be, maybe they will consider what can be.

This is a gargantuan undertaking, but with everyone's help, we just might be able to get others to see.

As a NonStop professional, I know this is an uphill climb. No one really believes what our platform is capable of. You can show them by helping them to understand. Introduce others to the HP NonStop. HP is introducing new technologies in the near future that will further integrate the NonStop into the greater enterprise (think Infiniband) and make this effort even easier.

Please join me in this effort. There is no such thing as "too much NonStop" in any enterprise.

Thanks.

Rob Lesan

Rob Lesan
XYPRO

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The Connection
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Connect
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The 2015 NonStop Technical Boot Camp SIGs

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

The 2015 NonStop Technical Boot Camp was held from November 15th through 18th at the Fairmont Hotel in San Jose, California USA. It was a wonderfully successful gathering of HPE developers and executives, customers, and partners. The four days included almost one-hundred breakout sessions, many of them given by HPE. The vendor pavilion was well-populated with 34 partners, and the use of the pavilion area for breaks and meals ensured plenty of opportunities to visit their booths. Attendance exceeded that of last year's Boot Camp, and all indications are that this trend will continue.

Three SIGs (Special Interest Groups) held meetings at the Boot Camp. They were the SQL SIG, the Open SIG, and the Security and Audit SIG. At the SIG meetings, issues are raised and voted upon. Popular issues are submitted to HPE, which will respond at some later time with a plan to address the issue (which may include not addressing it).

SQL SIG

The SQL SIG was run by Scott Randall of Randall Consulting. The SIG had fourteen attendees. Several issues were discussed, and votes were registered. The top issues and their votes included:

- Materialized Views. *(Controlled Availability for development use now only – unsupported.)* – 8 votes.
- Maintain a repository of queries executing on the system with a unique statement ID, start and end timestamp, query text, etc. – 6 votes.
- MERGE or UPSERT logic. GRANT/REVOKE access to be at the command level, not the different operations underneath. – 3 votes.
- Do not close cursors on commit transaction. – 3 votes.
- Offload MX modules to reduce memory pressure. *(HPE Development is investigating shared query plans per CPU.)* – 2 votes.
- Moving module files to production without SQL compile. (Use MXRPM tool. May need to extend similarity checks.) – 2 votes.
- Perl support. *(DVD/DVI removed due to Linux driver now GA.)* A standard solution for "on platform" still needed via scripting. – 2 votes
- Disallow update of primary key. Change in behavior causing issues, REVOKE doesn't work because the UPDATE becomes an INSERT/UPDATE. Raises questions about the rules for REVOKE & GRANT. – 2 votes.

Issues pending a solution, still being tracked:

- T2 driver should not ignore user credentials. *(On the Roadmap for 2016.)* – 11 votes at the 2014 Boot Camp.

Open SIG

The Open SIG was chaired by Bill Honaker of XID. Prashanth Kamath and Wendy Bartlett attended and represented HPE. Twenty attendees were present, with about 4 or 5 representing end user customers.

Bill gave an update on ITUGLIB. The ITUGLIB team has spent a lot of effort this year to build a foundation to allow contributions from members. That foundation is based on the Distributed VCS, 'git', which was developed by Linus Torvalds. Reference was made to a session given by Randall Becker about git, and Bill encouraged those that missed the session to get the presentation after it is posted by Connect.

Once the foundation is in place, there will be a mechanism to register for updates when ITUGLIB packages get updated. The repository itself will receive critical updates from the external open source teams, for example OpenSSH. The use of 'git' will allow auditors to have complete access to what is running and to who made changes.

Bill mentioned to the HPE attendees that once git is in place, it could also be used by NonStop Software Development as an additional resource to keep OSSUTILS up to date.

There was open discussion on existing issues from the 2014 meeting as well as some new issues. However, there was not a sufficiently large attendance of end users to create a prioritized issues list for publication. The SIG leader (Bill) promised that he'd work towards creating an online forum to allow wider participation and issue prioritization.

Security and Audit SIG

The Security and Audit SIG is still looking for a SIG leader. Wendy Bartlett of HP filled in and ran the SIG. Her opening slide

identified herself and Prashanth Kamath as representing HPE for the SIG and 'TBA' representing Connect. A cartoon balloon cried out for volunteers needed.

Eleven people attended the SIG, five of whom were end users. Wendy had everyone introduce themselves, and she asked each to go back to their companies (and vendors to their customers as well) to attempt to get a volunteer to run the SIG.

Next, Wendy asked the audience for feedback on the security topics that were presented during the Boot Camp. No one responded. Wendy said she assumed that the lack of response was half because the attendees were happy with what was there, and half because people were tired after 3½ days of meetings. She noted that the SIG was scheduled for the last time slot of the Boot Camp.

She discussed the status of the 2014 issues:

- **OSS Audit filter** – product development was still studying how to respond to the request.
- **Sudo support** – Currently there are two alternatives, neither ideal:
  - ITUGLIB (not safeguard-integrated), or
  - XAC (not a one-to-one syntax replacement, making it difficult for people who are used to how Sudo works).
- **Samba upgrade** - on the roadmap but no delivery date available.

She then opened the floor to possible new issues. The only concerns brought up were questions that were addressable by existing 3rd party products. Therefore, no new items were added to the list. It was decided by the group that the list for 2015 would be the same from 2014.

The meeting lasted about a half hour.

Acknowledgement

My thanks to Bill Honaker for attending the SIGs and for providing me the information for the Open SIG and the Security and Audit SIG.

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

Passing the Torch:

HP's Jeff Skinner Steps Up to Replace His Mentor

Gabrielle Guerrera >> NuWave Technologies

I recently had the opportunity to chat with Tom Moylan, Director of Sales for HP NonStop Americas, and his successor, Jeff Skinner, about Tom's upcoming retirement, their unique relationship, and plans for the future of NonStop.

Gabrielle: Tell us about how things have been going while Tom prepares to retire.

Jeff: Tom is retiring at the end of May, so we have him doing special projects and advising as he prepares to leave next year, but I officially moved into the new role on November 1. It's been awesome to have him in the background and be able leverage his experience while I'm growing into it. I'm really lucky to have that.

Gabrielle: So the transition has already taken place?

Jeff: Yeah. The transition really was November 1, which is also the first day of our new fiscal year, so that's how we wanted to tie that together. It's been a natural transition. It wasn't a big shock to the system or anything.

Gabrielle: So it doesn't differ too much, then, from your previous role?

Jeff: No, it's very similar. We're both exclusively NonStop-focused and where I was assigned to the western territory before, now I have all of the Americas. It's very familiar in terms of processes, talent and people. I really feel good about moving into the role and I'm definitely ready for it.

Gabrielle: Could you give us a little bit of information about your background leading into your time at HP?

Jeff: My background with NonStop started in the late 90s, when Tom originally hired me at Tandem. He hired me when I was only a couple of years out of school to manage some of the smaller accounts in the Chicago area. It was a great experience, and Tom took a chance on me by hiring me as a person early in their career. That's what got him and me off on our start together. It was a challenging position at the time, but it was good because it got me in the door.

Tom: At the time it was an experiment on my behalf, back in the early Tandem days, and there was this idea of hiring a lot of younger people. The idea was, even though we really lacked an education program, to try to mentor these young people and open new markets for Tandem. And there are a lot of funny stories that go along with that.

Gabrielle: Could you share one?

Tom: Well, Jeff came in once and he said "I have to go home because my mother was in an accident." He reassured me it was just a small fender bender—nothing serious—but she was a little shaken up. I'm visualizing an elderly woman with white hair hunched over in her car, just peering over the steering wheel going 20mph in a 40mph zone, and I thought, "His poor old mother!" I asked how old she was, and he said, "56;" I was 57 at the time. She was my age! He started laughing and I realized then he was so young. It's just funny when you start getting to sales engagement and you're peers, and then you realize this difference in age.

Jeff: When Compaq acquired Tandem, I went from being focused primarily on NonStop to selling a broader portfolio of products: I sold everything from PCs to Tandem equipment. It became a much broader sales job. Then I left Compaq to join one of Jimmy Treybig's startup companies. It was really ecommerce-focused and online transaction processing (OLTP) focused, which came naturally to me because of my background, as it would be for anyone selling Tandem equipment.

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I did that for a few years, and then I came back to NonStop after HP acquired Compaq, so I came back to work for Tom a second time. I was there for three more years, then left again and went to IBM for five years, where I was focused on financial services. Then for the third and final time, I came back to work for Tom again in 2010/2011. So it's my third tour of duty here, and it's been a long, winding road to get to this point. Tom, without question, has been the most influential person on my career and as a mentor. It's rare that you can even have a mentor for that long, and then have the chance to be able to follow in their footsteps and have them on board as an advisor for six months while you take over their job. I don't know that I have ever heard that happening.

Gabrielle: That's such a great story!

Jeff: It's crazy, really. You never hear anyone say that kind of stuff. Even when I hear myself say it, it's like, "Wow. That is pretty cool!" And the talent we have on this team is amazing. We're a seasoned veteran group for the most part. There are people who have been here for over 30 years, and there's consistent account coverage over that same amount of time. You just don't see that anywhere else. And the camaraderie we have with the group, not only within the HP team, but across the community, everybody knows each other because they have been doing it for a long time. Maybe it's out there in other places, I just haven't seen it.

The people at HP are really unconditional in the way that they approach the job, the customers and the partners. All of that just lends itself to the feeling you would want to have.

Tom: Every time Jeff left, he gained a skill. The biggest was when he left to go to IBM and lead the software marketing group there. He came back with all kinds of wonderful ideas for marketing that we utilize to this day.

Jeff: If you were to ask me five years ago where I would envision myself or what would I want to be doing, I'm doing it. It's a little bit surreal sometimes, but at the same time it's an honor.

Tom: Jeff is such a natural to lead NonStop. One thing that I don't do very well is I don't have the desire to get involved with marketing. It's something I'm just not that interested in, but Jeff is. We are at a very critical and exciting time with NonStop X, where marketing this is going to be absolutely the highest priority. He's the right guy to be able to take NonStop to another level.

Gabrielle: It really is a unique community. I think we are all lucky to be a part of it!

Jeff: Agreed!

Tom: I've worked for eight different computer companies, in different roles and titles, and out of all of them, the best group of people with the best product has always been NonStop. For me, there are four reasons why selling NonStop is so much fun.

The first is that it's a very complex product but it's a fun product. It's a value proposition sell, not a commodity sell.

Secondly, it's a relationship sell because of the nature of the solution. It's the highest mission-critical application within our customer base. If this system doesn't work, these customers could go out of business. So that just screams high-level relationships.

Third, we have unbelievable support. The solution architects within this group are next to none. They have credibility that has been established over the years, and they are clearly team players. They believe in the team concept and they're quick to jump in and help other people.

And the fourth reason is the Tandem culture. What differentiates us from the greater HP is this specific Tandem culture that calls for everyone to go the extra mile. That's why I feel like NonStop is unique. It's the best place to sell and work. It speaks volumes of why we are the way we are.

Gabrielle: Jeff, what was it like to have Tom as your long-time mentor?

Jeff: It's been awesome. Everybody should have a mentor, but it's a two-way street. You can't just say, "I need a mentor." It doesn't work like that. It has to be a two-way relationship, with a person on the other side of it willing to invest the time, energy, and care to really be effective in being a mentor. Tom has been, not only the most influential person in my career, but also one of the most influential people in my life. To have as much respect for someone in their profession as I have for Tom, to get to admire and replicate what they do, and to weave it into your own style is a cool opportunity, but that's only one part of it.

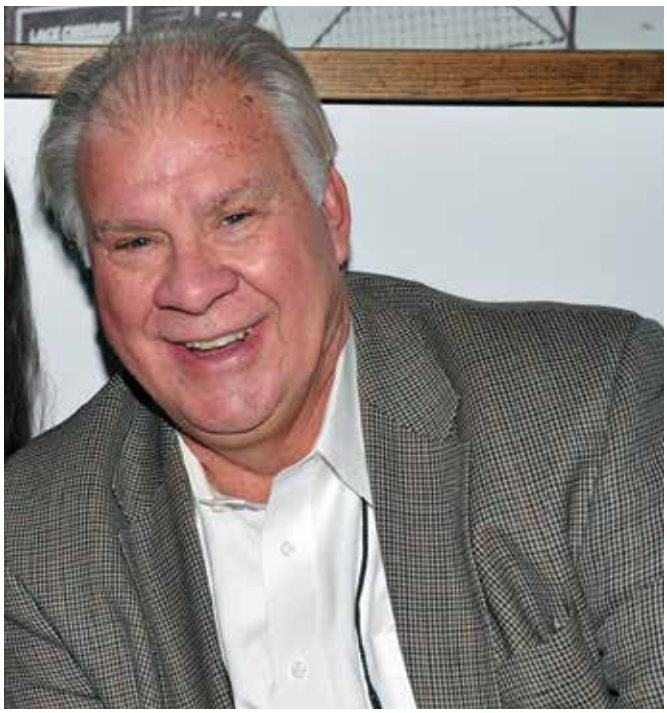
The other part is to see what kind person he is overall and with his family, friends, and the people that he meets. He's the real deal. I've just been really, really lucky to get to spend all that time with him. If you didn't know any better you would think he's a salesman's salesman sometimes because he is so gregarious, outgoing and such a people person, but he is absolutely genuine in who he is and he always follows through with people. I couldn't have asked for a better person to be my mentor.

Gabrielle: Tom, what has it been like, from your perspective, to be Jeff's mentor?

Tom: Jeff was easy! He's very bright and has a wonderful sales personality. It's easy to help people achieve their goals when they have those kinds of traits, and Jeff is clearly one of the best in that area.

A really fun thing for me is to see people grow in a job. I have been very blessed to have been mentoring people who have gone on to do some really wonderful things. It's just something that I enjoy doing more than anything else.

Gabrielle: Tom, was there a mentor who has motivated you to be able to influence people like Jeff?



Tom: Oh yes! I think everyone looks for a mentor, and I'm no exception. One of them was a regional VP of Tandem named Terry Murphy. We met at Data General and he's the one who convinced me to go into sales management, and later he sold me on coming to Tandem. It's a friendship that's gone on for 35 years and we see each other very often. He's one of the smartest men I know and he has great insight into the sales process. To this day he's one of my strongest mentors.

Gabrielle: Jeff, what are some of the ideas you have for the role and for the company moving forward?

Jeff: One thing we have done incredibly well is to sustain our relationship with all of the manufacturers and all of the industries that we touch. I can't imagine doing a much better job in servicing our customers, who are the first priority, always. But what I really want to see us do is take an aggressive approach to growth. Everybody always wants to grow, but I think we are at an inflection point here where we have a window of opportunity to do that, whether that's with existing customers in the financial services and payments space, expanding into different business units within that

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industry, or winning entirely new customers altogether. We have no reason to think we can't do that. So for me, I want to take an aggressive and calculated approach to going after new business, and I also want to make sure the team is having some fun doing it. That's really the message I want to start to get across to our own people, and I want to really energize the entire NonStop community around that thought, too. I know our partners are all excited about our direction with hybrid architectures and the potential of NonStop-as-a-Service down the road. We should all feel really confident about the next few years and our ability to grow top line revenue.

Gabrielle: When Tom leaves in the spring, what's the first order of business once you're flying solo and it's all yours?

Jeff: That's an interesting question because the benefit of having him here for this transition for this six months is that I feel like there won't be a hard line where all of a sudden he's not here anymore. It's kind of strange because I haven't really thought too much about it. I had dinner with Tom and his wife the other night and I told them that on June first, when we have our first staff call and he's not in the virtual room, that's going to be pretty odd. There's not necessarily a first order of business, per se, as it really will be a continuation of what we would have been doing up until that point. I definitely am not waiting until June to really get those messages across that I just mentioned. It's really an empowerment, and the goals are to make Tom proud and to honor what he has done as a career. I know I will have in the back of my mind that I owe it to him to keep the momentum that he's built. It's really just going to be putting work into action.

Gabrielle: It's just kind of a bittersweet moment.

Jeff: Yeah, absolutely, and it's so well-deserved for him. His job has been everything to him, so I really feel like I am succeeding a legend. It's bittersweet because he won't be there day-to-day, but I am so happy for him. It's about not screwing things up, but it's also about leading NonStop into a new chapter.

Gabrielle: Yes, Tom is kind of a legend in the NonStop space.

Jeff: He is. Everybody knows him. Every time I have asked someone, "Do you know Tom Moylan?", even if it was a few degrees of separation, the answer has always been "Yes". And not only yes, but "What a great guy!" He's been the face of this group for a long time.

Gabrielle: Well, it sounds like an interesting opportunity, and at an interesting time!

Jeff: With what we have now with NonStop X and our hybrid direction, it really is an amazing time to be involved with this group. It's got a lot of people energized, and it's not lost on anyone, especially me. I think this will be one of those defining times when you're sitting here five years from now going, "Wow, that was really a pivotal moment for us in our history." It's cool to feel that way, but we just need to deliver on it.

Gabrielle: We wish you the best of luck in your new position, Jeff!

Jeff: Thank you!

Gabrielle: And congratulations on your retirement, Tom!

Tom: Thanks! I am looking forward to it and I know Jeff will do an amazing job.

Gabrielle Guerrera is a co-author of the NonStop Innovations blog, which focuses on the latest products, services, partnerships, and news in the HP NonStop space. Some of the most recent topics on NonStop Innovations were NonStop modernization, takeaways from Boot Camp, and data replication. You can read these articles and more at www.nuwavetech.com/hp-nonstop-innovations.

Storage evolution – what we let spin in the dark seems so 20th century!

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

I recall my earliest days in IT clearly and yet I realize all too quickly that it was a lifetime ago. When I started my computing career that very first day I was introduced to the data center where raised on false flooring were a pair of giant IBM Mainframes – System 360/30s each with 32K of main memory. Their physical presence was rather intimidating to the uninitiated and comprehending what each cabinet did was daunting. Perhaps adding to the drama was the sign on the desk of the data center manager – "If I can't walk through its channels, it's not a computer!"

To interface to peripheral devices, all those decades ago, vendors like IBM provided specialist channel communications computers that offloaded processing from the mainframe, effectively freeing up precious mainframe resources to focus on the task of computing. Depending on the speed characteristics of the peripheral device, different channel communications computers were configured – selector channels for slower transfer speed devices like punch card readers and even paper tape readers whereas multiplexor channels were used for higher transfer speed devices like disk drives. There were no communications processors per se as networking was only just emerging and the pre-SNA front-end processor, effectively another iteration of the channel communications computer, the 2703 Transmission Control Unit, was only just coming to market.

Fast forward to 2016; the evolution of storage has progressed to the point where it would be unrecognizable to anyone instantly teleported into today's data center from the one of half a century ago – finding where storage resides would likely be the first stumbling block. Today, on many blade-centric systems, the ubiquitous black blades that are processors are not that different from the drives with which they share space in the many chassis, populating the racks that are prolific within a modern data center. For me, the distinct splash of yellow visible around the edges of HPE's 3Par storage systems, particularly their external storage units, are about the only clue that storage is present among the racks.

Nowhere have I made any reference to wanting to return to the past, or of writing about these years as being the good old days! Fortunately, today HPE and 3Par are bringing us storage on a massive scale, for literally cents on the megabyte and with an almost endless supply of cheap storage IT is quite different from what anyone could have imagined when I first walked through the doors of the data center. If there truly are good old days, they're right now! Talking to the NonStop community these past couple of weeks has seen conversations develop on the subject of needing to better address business requirements with little to no time given to the mechanics of what is needed to meet these requirements – the degree of independence from all that is physical is providing levels or productivity equally as unimaginable all those decades ago.

DataExpress has been in the business of moving files for a very long time. Talking to the company's management, much of what I have covered above was very familiar. However, the NonStop has become a software solution capable of running on industry-standard blade processors while DataExpress has been a software solution from the beginning. As best as I can tell from recent exchanges, moving files has become a topic less related to the storage itself – where the files are located, or planned to be located – and more about timeliness, security, monitoring and notification. "We may be viewed as the FedEx of storage movement," said Michelle Marost, President of DataExpress, "but that doesn't mean we build and paint the trucks so much as it implies files can be provided to us without us needing to know what 'package' it comes in or what is even inside the package – storage has transitioned to where it's assumed to be accessible and there will be plenty of it."

This is perhaps a foretaste of where any discussion on storage will head – there will be assumptions together with certain expectations that ample storage is on hand but what it looks like and how it's accessed is becoming a moot point to many within IT. Increasingly vendors, whether middleware or solutions, have come to rely less and less on the actual type of storage on hand as they focus on meeting user expectations for a particular feature or property. On the other hand, until the current model of computing is broken – and yes, from what we have all seen in presentations on The Machine, this model could be broken – we continue to observe how the connection between computing and storage remains very important as changes continue to permeate vendor's product roadmaps.

Recently, adding more weight to the above observation, storage devices are no longer simply spinning around in dark

places – enter Solid State Disks (SSDs)! At the user events I attended late 2015, NonStop product management did an excellent job of reviewing their NonStop product roadmaps where they covered SSDs – it was clear from their upbeat presentation that the prospects of further sales of SSDs to the NonStop community were highly likely. For coverage of what product management had to say at MATUG, turn to the post of October 2, 2015, to the NonStop community blog, Real Time View, ***How many DBAs does it take to change a light-bulb should it not be NonStop?*** I particularly like the addition of SSDs to NonStop systems as they provide choice and there will be numerous solutions that will benefit from having access to SSDs. This is not lost among the vendor community – middleware and solutions vendors alike – and NonStop product management needs to be thanked for taking the steps necessary to bring SSDs to market.

Following MATUG I had an opportunity for a brief follow-on email exchange with Paul J. Holenstein, Executive Vice President, Gravic, Inc. "I personally like the 3Par technology; the SSD's are very helpful to improve (reduce) things like latency on disk flushes, etc.," said Holenstein. Marketed today as affordable with enterprise-class features "forged in the world's harshest data centers" according to HPE marketing, and with usable Gigabytes (GBs) priced as low as US$150 (and beginning to close the gap with traditional disk drive pricing), HPE Mission Critical Systems group where NonStop systems reside is beginning to see an upswing of interest. "Priced today as they are, it all helps critical NonStop subsystems, such as TMF, run 'faster' - and that is a good thing for us," Holenstein remarked.

As I look at what applications many NonStop systems are used to support, processing transactions for the most part, these dramatic changes in storage options and yes, pricing, are only part of the story. Arguments are traded back and forth on just how much storage NonStop systems need today; if all the application needs is a simple yes or no, and the only information retained is an account number and an amount, surely storage requirements are minimal? But this too is only part of the story. And it all comes back to the interest now in the data about the data – yes, metadata. This has made headlines over the past couple of years following the revelation about just how much information is being captured and then stored by one country's government agency or another – such revelation in the U.S. came with the acknowledgement of there being Yottabytes of storage in place, a number few in IT really could grasp.

"Fundamentally, OmniPayments is a payments solution that leverages the value of everything that comes with NonStop. From processors to development tools, from networking to storage, from SQL to SOA – whatever is on offer from HPE in support of NonStop, the OmniPayments solution will capitalize on every capability on offer to the benefit of our customers," said OmniPayments, Inc. CEO, Yash Kapadia, on broaching the topic of storage with him a short time ago. "When it comes to storage, we see advantages of the low-cost traditional storage options but with new solid state disks (SSDs) beginning to gain traction, there will be occasions where we will opt to support them – the performance gains are significant and more than offset the extra costs involved. Supporting SSDs requires no additional support from OmniPayments and we have already tested on SSDs to great effect and anticipate wider usage in the near term. Just as importantly for customers and prospects alike, there will be no additional charges from us for running OmniPayments on SSDs as this isn't where we will differentiate pricewise."

NonStop systems processing transactions are at the heart of some very critical applications for many enterprises. Whether it's the detection of potential fraudulent activity, possible covert texting by terrorists or criminals, the NonStop systems are looking to better comprehend changes in behavior. In order to do this, NonStop systems of today are adding storage capacity – the presence on NonStop systems of NonStop SQL has climbed over the past couple of years with NS SQL/MX the preferred option – and this benefits greatly from there being SSDs present, as Gravic's Holenstein observed. However, even with NS SQL deployed, together with a need to see everything to do with possible changes in behavior, is it economically viable to simply keep adding storage in support of data that may never be reviewed? Isn't it worth it though given how cheap disk storage has become?

"For many years we've operated with the mindset of keeping all the data around as cost of storage plummeted. Before the advent of Big Data, intrinsically valuable data was being captured; business transactions, customer interactions, supply chain activity and alike, said Sami Akbay, Cofounder at WebAction, Inc. "Today we capture anything and everything that can be instrumented without regard to its value. Analysis before persistence is a 'must have' so that signal is separated from noise. Especially for real-time mission-critical systems where storage isn't cheap and time is money - and yes, this is the premise for us developing the Striim Platform that today allows you to do just that." No, it's never worth it to simply store data for the sake of it as there will always be a cost and the more I looked at the capabilities of Striim, the more I come to see how storage, practically limitless for some applications, still needs to be approached with a healthy amount of common sense.

When the first spinning disks arrived with a "fixed head" option it was only available for a couple of tracks. With such a fixed head in place, the seek times came down and latency was, by the standards of the day, nonexistent. But what to do with these fixed heads? There wasn't enough capacity to load up a file, or was there? In time, the benefits of having fixed heads over tracks where indexes resided or even, over paged data needed by the new virtual operating systems (OSs) proved highly beneficial. Looking at mixtures of traditional spinning disks together with SSDs, much the same opportunity exists. Instead of purchasing only SSDs, having SSDs in place for key tables and files but not everything represents a simple yet effective first step towards storage that's all-flash and a way to "get your feet wet" when it comes to technology that's completely new for many in the NonStop community.

No article on storage would be complete without some reference to tape. We all know the value of tape when it comes to archiving, with some estimates going so far as to conclude that 90% of all data ever created originated in the previous 12 months. In fact, it was ***IDC's Digital Universe Survey*** that is estimating a massive 40 zettabytes (or 40 billion terabytes) of data will be created by 2020, up from only 3 zettabytes in 2012. Where to put this avalanche of data for the long haul?

Tape! The above comes from a contribution that appears in this issue of The Connection, ***Tape: Absolutely Relevant Today and Tomorrow*** by Glenn Garrahan, Director of HP Business for Tributary Systems. Garrahan also notes that when it comes to the age old argument, Disk is faster than tape" he goes on to add, "It depends. Performance is affected not only by the magnetic media type, but also the speed of the disk system and the autoloader/library. Disk will generally be faster with random access reads/writes, but for sequential reads/writes, tape will more often than not outperform HDD's, making tape the media of choice for backups, archiving, and big data."

As for what we can expect next with storage, we all remember the closing scenes from the film 2001: A Space Odyssey. Filmed all the way back in 1968, it shows astronaut, Dr. Dave Bowman, disabling the HAL 9000 computer by pulling out what looks a lot like flash memory cards. No spinning disks, no cables running to anything traditional at all, simply a collection of cards. In their November, 2015, report ***New Rules of the Road for Memory and Storage in Large-Scale Computing*** IDC "sees the role of storage as a distinct architectural building block likely undergoing significant changes in reaction to emerging and evolving high-performance data analytics (HPDA) requirements," according to Bob Sorensen, research vice president, Technical Computing, IDC. "Ultimately, the distinction between computational and storage servers may dissolve as each loses its individual mission and becomes more blurred in an overall scheme of data management and processing."

If this starts sounding a lot like what Martin Fink, EVP & CTO, HPE, describes The Machine to be like, then that's no accident. In his initial presentation on The Machine during the 2014 HP Discover in Las Vegas, Fink explained how in the labs, they were developing "universal memory – memory that collapses the memory/storage hierarchy by fusing the two functions in one hyper-efficient package." At some point, disks and tapes will likely go the way of punched cards and paper tape – but not yet, for a long time. For those in the NonStop community evaluating an imminent purchase of the latest NonStop X system, the likely introduction of universal memory are well beyond any expected working lifespan of these latest iterations of NonStop systems. Only at that time will some of us rethink, once again, the merits of those good old days you know, in the mid-2010s!

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.

Security Hardening Expertise at Your Fingertips with CSP-Wiki

Henry Fonseca >> Computer Security Products, Inc.

What is Security Hardening?

In simple terms, security hardening describes the implementation of a series of measures designed to make a system less vulnerable to attacks. A hardened system has a reduced number of attack points making it more difficult to be compromised.

Obvious security recommendations, such as the use of strong passwords, are helpful measures when trying to prevent breaches or hacks. But the implementation of stronger defenses, such as ensuring strong OSS access permissions, can be more challenging to carry out without correct guidance. And unfortunately, information regarding security hardening practices tends to be scattered, difficult to analyze and implement.

Security hardening should be considered as an ongoing project that will require continuing attention and updating. Companies must constantly look for the latest methods, rules and best practices to ensure that system data and services are protected.

Why is Security Hardening Important?

A system which has not been properly hardened against an attack is increasingly a tangible and quantifiable risk.

A recent Insider Threat Report reveals that:

- 62 percent of security professionals surveyed say insider threats have become more frequent in the last 12 months.
- Less than 50 percent of organizations have appropriate controls in place to prevent insider attacks.
- More than 60 percent of respondents say that insider attacks are far more difficult to find and prevent than external attacks.

With cybercriminals using ever more sophisticated methods to attack systems, security breaches that result in stolen personal data such as credit card information have become a daily occurrence.

In the last few years, the cost of cybercrime has increased dramatically. A Ponemon Institute study reveals that:

- In the past 6 years, the financial impact of cyber crime has increased by 82%. The average time to resolve a cyber attack now takes 46 days (once it's detected!) with a cost of $43,327 per day.
- Cyber crimes continue to be very costly: The average annualized cost of cybercrime in the U.S. was $15.4 million per organization, with a range of $1.9 million to $65 million each year per company; an increase of 19% or $2.3 million over the average cost reported in 2014.
- Cyber crimes are intrusive and common: Since this research began there has been a 220% increase in the number of cyber attacks, with an average of 160 successful attacks per week, compared to 50 attacks per week in 2010.
- The most costly cyber crimes are those caused by denial of services, malicious insiders and malicious code: These crimes account for more than 50% of all cyber crime costs per organization on an annual basis.

In an effort to combat cybercrime, new laws continue to be passed and existing standards such as PCI DSS and HIPAA are being tightened. The ability to demonstrate compliance with regulations and security standards has become a major aspect of security management.

With the introduction of NonStop X and the move to the x86 hardware platform, more applications will be ported to OSS, and the use of open source tools will increase substantially. How these tools and applications work and what their security needs and exposures are must be fully understood and addressed to ensure that a system is properly hardened.

While the use of out-of-the-box security settings may suffice for development environments, the more rigorous approach of security hardening is required to protect production environments.

In addition to confidentiality, systems must also be protected for integrity and availability. A hardened system will help prevent internal users from making unintended mistakes that can cause loss or damage.

Maintaining a hardened system will also help avert the "drift and decay" of security settings. Drift and decay occurs when security settings that had been applied in accordance with corporate and legal policies were changed over time for various reasons but were not reset to their intended values. This means that a system that was once secure might now have vulnerabilities ranging from orphan files and orphan users to file and directory settings that are no longer compliant with policy.

Even if an OSS environment is limited to IBM MQ or SQL/MX, for example, creating and applying a general OSS security policy is strongly recommended given that OSS system environments which have not been properly secured can easily be compromised.

As an example, if the BIN folder in OSS is not properly secured and a user changes the security on these files, the system can be brought to a halt surprisingly fast.

It is fair to say that the demand for OSS security knowledge is very high but the expertise is scattered and difficult to evaluate.

While there is an abundance of information regarding NonStop security hardening available, finding information that is specific to an individual concern is easier said than done. When the information is found, the challenge then becomes determining how to implement any necessary changes.

In order to address these challenges, CSP engaged in significant research and built a database of NonStop security hardening knowledge named CSP-Wiki.

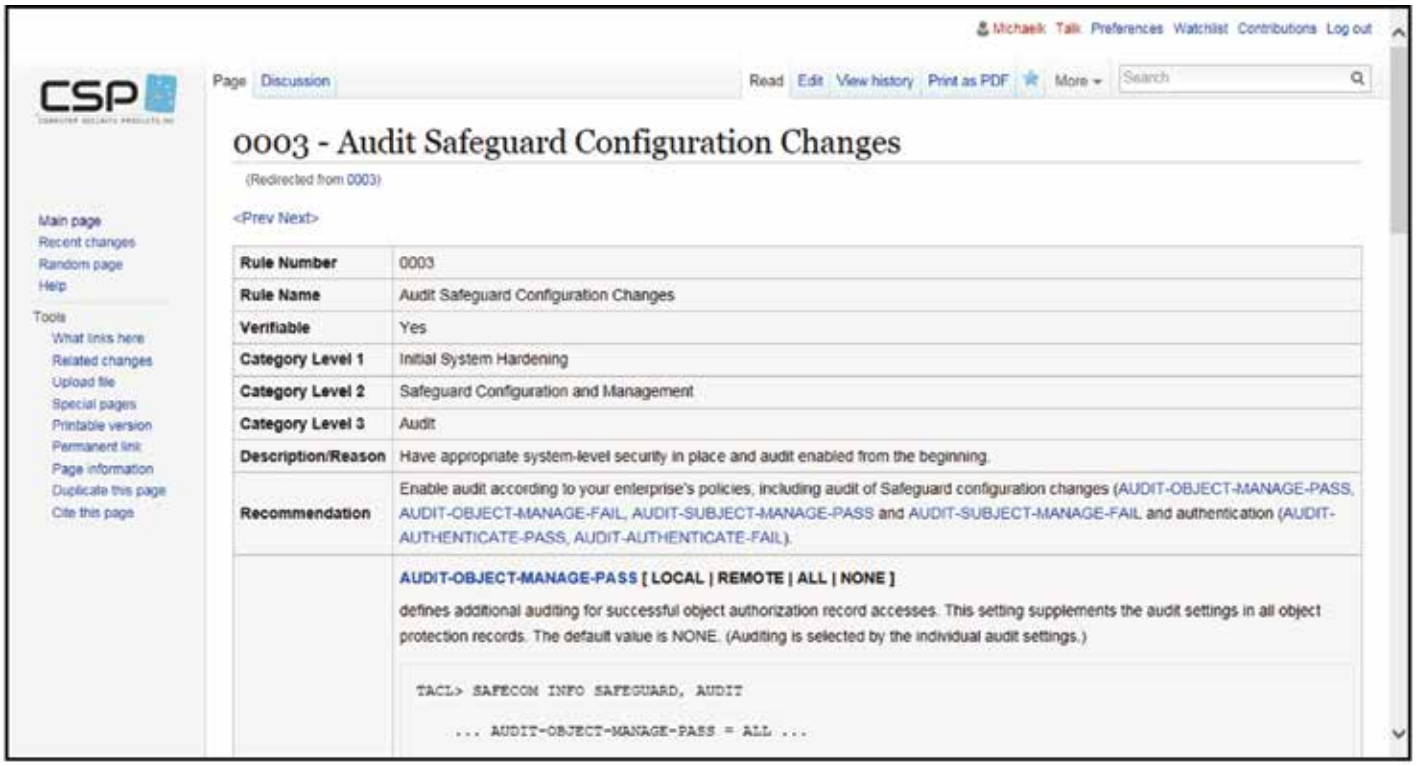

Figure 1: A Sample Rule

What is CSP-Wiki?

CSP-Wiki is an extensive web-based repository of NonStop security hardening knowledge which includes some of the most detailed OSS security information available anywhere.

CSP-Wiki was born out of the need to make available world-class NonStop system hardening knowledge in a centralized manner and at no cost.

To create this database CSP conducted extensive research, studied countless publicly available documents, gathered analysis from experts and received input from some of its largest customers, integrating all collected information into a one-of-a-kind wiki.

CSP-Wiki is a constantly evolving database, updated and maintained regularly to reflect changes in technology, legislation, input from customers and from the NonStop community. CSP-Wiki is also being updated to include Linux hardening knowledge.

How Does CSP-Wiki Provide Security Hardening Expertise?

CSP-Wiki contains over 500 security rules that provide recommendations and best practices for both Safeguard and OSS security hardening. Each rule includes a description, recommendation and technical notes which include instructions on how to implement it on a NonStop system. *(See Figure 1 above)*

How are the CSP-Wiki Rules Organized?

CSP-Wiki rules are organized by category and subcategories. This classification of rules allows users to select a general area of interest and browse all rules contained within a specific category, using the category tree on the main page. *(See Figure 2 below)*

The categories to which each rule is a member can be found

Figure 2: The CSP-Wiki Main Page

Figure 3: The Rule Discussion Page

at the bottom of every rule page. Click on any category link to open the corresponding category page.

Rules can also be stepped through one at a time using the previous rule and next rule links near the top of the page.

Can CSP-Wiki Content be Searched?

Use the Search field located in the top right-hand corner of the page to perform content searches. Simply enter the word or value you wish to search for, and then click the magnifying glass search icon. A search result page will be displayed, containing a list of every occurrence of the search criteria entered.

Can I Comment on Rule Content?

CSP-Wiki users are invited to engage in discussion of any of the rules using the discussion page associated with each rule page.

To post comments regarding a rule, navigate to the rule that you wish to discuss, and click on the Discussion tab beside the Page tab in the top left-hand corner of the page.

To edit a discussion page, click on the discussion page's "Edit" tab. The discussion page will be displayed in edit mode. The Wikitext tab displays the wikitext used to generate discussion page, while the Preview tab displays the final version of the discussion page that will be generated using the wikitext.

Please add any comments using the sample format displayed, which includes the date, your Username, and your comments.

To submit your comments, click the Publish button in the top right-hand corner of the page. The discussion page will be updated and an email notification of the update will be sent to support@cspsecurity.com.

If you do not wish to save your comments, click on the Cancel button in the top right-hand corner of the Edit page. Any changes made in the current editing session will be discarded.

CSP Technical Support will receive notification of all discussion page updates, and each comment will be reviewed and responded to. As an alternative to posting comments on the discussion pages, comments can also be emailed to CSP Technical Support at support@cspsecurity.com.

Please refrain from modifying or deleting any comments made by others. Note that CSP reserves the right to remove any content at its discretion.

How Can I Access CSP-Wiki?

Using any PC web browser or mobile device, CSP-Wiki can be accessed at: wiki.cspsecurity.com.

Becoming a CSP-Wiki user is easy and best of all its completely free. To join, simply go to wiki.cspsecurity.com and click on "request an account".

What's Next: Hardening Automation with Protect-X®

CSP-Wiki's rules form the foundation of CSP's web-enabled security hardening solution, Protect-X®.

Using HTML-5 protocol, Protect-X® simplifies the task of hardening a system by comparing a system's security to accepted security rules and best practices. Any unauthorized variance can generate a security change request, handled by a unique workflow process that includes multi-level change approval. Protect-X® can also allow the authorized user to perform many simple security tasks, such as changing a password, from any mobile device.

About CSP:

Now in its 28th year, CSP is the preferred provider of security management and compliance software to major NonStop customers in 27 countries across the globe. In concert with HP's move to modernization of the NonStop platform, CSP continues to modernize its product offerings for both the NonStop and Linux markets.

To find out more about CSP's security solutions for NonStop systems please visit www.cspsecurity.com.

Henry Fonseca is a business professional with a background in branding, market development, customer relations and financial management. He is a recent addition to the CSP team but has already managed a successful repositioning & rebranding of the company's digital properties. As CSP's Marketing and Partnership Manager, Henry continues to develop an integrated marketing and business strategy.

HPE NonStop:

Martin Fink's Insider View of NonStop

Martin Fink >> EVP and CTO >> Hewlett Packard Enterprise

I often tell people that the most fun I've ever had in my career at HP is when I had the privilege to run the NonStop business. That's why I was excited to recently give the Keynote at the Connect NonStop Technical Boot Camp in November and talk about NonStop almost exactly 10 years after I started that adventure. Be assured that I have continued to pay close attention to the NonStop business since then.

In this article, I'm going to recap my talk and give you the insider view to the NonStop strategy we've been running for the past 10 years, and then a view into the future and why I think that the same strategy, adapted to current market conditions, has at least 10 years ahead as well. In the process, I'm going to give you some insight into how the original strategy was developed and maybe a few tips along the way that you can use in your environment.

I joined the NonStop team in April 2005, with a specific assignment: Fix it, or exit.

In April 2005, the NonStop business was not doing well at all. I won't tell you the extent of it, but the business couldn't continue on its current path. It wasn't sustainable.

There I was, a newly minted General Manager, anxious to prove myself. While "Exit" was a scenario, it was one I never really contemplated. But, at the time I knew I had to move fast, and I had a HUGE amount to learn. At this point, all I had was a cursory knowledge of NonStop mostly derived from the industry awareness of Tandem Computers.

I needed a plan. I needed a strategy. For me, there are seven parts to strategy. Let's start with the first rule:

Rule 1: Be selfish

You might be surprised that the first rule isn't some version of "focus on the customer". Let me explain:

When I started at HP about 30 years ago, all of us were indoctrinated into the HP way and the top corporate objectives. I'll give you a couple of items that really stuck with me.

Number one on Bill Hewlett and Dave Packard's list of corporate objectives was "Profit". This surprised a lot of people, including me. HP was well known as a great company that contributed to society, was loved by employees, built great products and yes, was well respected by customers. Why would "profit" be first, and not one of those other things? The answer was simple:

If the company wasn't making a profit, none of those other things were possible.

In order for all of us in the NonStop team to be able to continue to do great things for all of you, we needed to make sure we had a great business.

The second rule represents the soul of what the HP Way really means:

Rule 2: Make a contribution

Those are three VERY powerful words with a very rich and deep meaning to them. It means not following tail lights. It means not just copying, but truly inventing. It means giving back to world we live in.

Those three words have driven my entire career at Hewlett Packard. It's what motivates me to win, to make a difference, and bring to market products that are truly great. I don't want to just compete, I don't want to just win. I want to make a contribution.

Now, we get to the place in the strategy development where we think about all of you.

Rule 3: Observe the customer

I chose these words very carefully. In order to develop a strategy, we have to observe your behaviors. This is not about listening to what you say, it's about observing your actions.

One of the key market segments for the NonStop business when I joined was Stock Exchanges. We were passionate about this because the exchanges were one of the first segments to value and deploy NonStop systems decades earlier. But, we seemed to be losing this segment and it was important to understand why.

I went on the road and met with many CIOs of the exchanges. Whenever I asked questions about what we could do better, I would typically get some version of feature requests for NonStop.

But then, I took a step back and watched what they were doing. They seemed to be deploying Linux servers to run the trading engines. How could this be? The team had done its best to deliver the features requested, but it didn't seem to matter. The group of customers that had put NonStop on the map didn't seem to value what we were delivering.

I'll get back to this story, but here is an important strategic lesson:

Observing the customer is a strategic activity.

Listening to the customer is a tactical activity

Both are important but you need to know your context. Before we go back to the stock exchange story, let's look at the next rule of strategy. It's important here because it was apparent that some exchanges no longer valued what we had. So the fourth rule is:

Rule 4: Know your value proposition

I needed to be clear on what our value proposition was in order to understand the customer behavior I was witnessing. Here I was given an immeasurable gift by my predecessors in NonStop and Tandem.

Every single employee in the NonStop business could recite the NonStop value proposition by heart. It didn't matter if it was an executive, a sales person or a factory worker. Everybody knew it and could recite it on command. It was:

Data Integrity, Scalability and Fault Tolerance

Now, back to the exchanges. While data integrity was one of the core elements that got them on the platform, they now seemed to value something different: Transaction latency. Now that Tandem was part of HP, we could deliver on that value proposition. It just wasn't with NonStop.

Something wasn't right. For some reason, we had a disconnect in our value proposition. To understand what the problem was I needed to get into the details of how NonStop systems really worked. This brings us to the fifth rule:

Rule 5: Understand the technology at a very deep level

Strategies are built differently depending on your industry. It should come as no surprise that in the technology industry, we need to focus on technology.

I went through dozens of technology reviews because I wanted to understand how Tandem worked. One of my earliest discoveries – and this was a shock to me, was that the lock-step processors on a Tandem system had nothing to do with fault tolerance. Lock-stepping was a *data integrity* feature. If the instructions that ran in parallel through two processors didn't yield an identical result, the compute module halted, and a take-over occurred. It took me a day or two to recover from this discovery. But, in the end, it proved crucial.

By the time I arrived at the NonStop business, the team was just finishing the move of NonStop to Itanium processors. But, Itanium didn't support lock-stepping, and so the team developed a very innovative voter system to accomplish this. While this was innovative, something didn't quite sit right with me.

In this part of the story we come to an Itanium-related hardware issue. I had been with HP for a while and had worked in other businesses and also had been involved in some of the early days of Itanium. One of the very little known features of Itanium that ended up being "the thing" that caused the most transformative event in NonStop's history was:.

Radiation-Hardened Latches

Yes, we've now entered geek land. How could something so esoteric have such a transformative effect?

Let's go back to the mid-90's to one of the most difficult product escalations in the industry's history. All of us were seeing something we called random bit flips in our processors. It took two years to isolate the cause, but it came down to gamma radiation causing random errors to occur. Itanium was just beginning its development at that time and so the engineers decided to deal with this issue by making the latches (or gates) in the processor immune to radiation.

I asked one of our scientists to go do some mathematical modeling to understand the probability of a data integrity failure in an Itanium processor now that it had radiation-hardened latches. After much work, the answer came back:

One failure might occur in 6 Billion years!

By that time the sun will be a red giant and just about to swallow the earth!

So a new strategy for NonStop began to come into focus. From the inception of Tandem, it had identified itself as a hardware company. It sold specialized computers to specific industries that valued the three enshrined in the value proposition: data integrity, scalability and fault tolerance.

The interesting thing was that technology had evolved to the point where data integrity was no longer valued as special. It was expected. It was a given.

But the only reason NonStop needed specialized hardware was to deliver that one feature. Everything else was software. As a result, radiation-hardened latches gave focus to the strategy that has since largely remained unchanged.

NonStop should transform from a hardware business to a software business

You cannot under-estimate the transformative nature of this statement. HP already had great hardware. I knew we were in development of an industry changing blade infrastructure. But, an entire organization that identified itself as a hardware entity needed to form a new identity. No small feat.

The next phase of my education was understanding exactly how the NonStop software ecosystem worked and at the core was the NonStop Kernel (NSK) Operating System.

I'll spare you the details of what was lots and lots of reviews with the team, but my other discovery was that NSK had fallen behind the times. NSK was a single-core, non-preemptive, cooperative multi-tasking operating system living in a multi-core, multi-threaded world.

This had to change. There was no way we could be a leading, modern software platform for Java, Corba, Pathway, and all the other infrastructure. We also couldn't take advantage of the power of the processors that would become available to us in the future without software investment.

We launched programs to make NSK a modern operating system. Adding things like multi-core support had a huge impact on performance by allowing the OS to spread work across cores or IPUs within each instance of the OS running in the CPU. In keeping with our fault tolerance fundamental, we also enabled customers to upgrade cores from 2 cores, to 4 cores to 6 cores without any downtime.

This is a great example of the 5th rule of strategy. By taking the time to really understand the depth of how the technology works, you can make decisions that have an enormous positive upside.

When I communicated to the organization that we were going to exit hardware and use the great stuff HP already had, it would have been easy for them to fight back, or not get on board. But, once we went through the detail, and explained the logic, not only did the team get onboard, they became re-energized and excited.

About 12 months later, the most

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successful NonStop in history came to market, and that was NonStop BladeSystems, the first NonStop product line to make significant steps to move away from propriety hardware.

But, you can't just say "this is my strategy" and expect good things to happen. Thus rule six:

Rule 6: Structure follows strategy

I had to transfer the hardware development team to other parts of HP and double down on software. The NonStop team was now either focused on Software, or integrating our software on NonStop blades.

We were now well on our way with a software-first strategy. The structure of the team was in place. But, the change was transformative. For 30 years, NonStop was a hardware company. Every part of the organization was tuned to deliver hardware first. This brings us to the last rule of strategy:

Rule 7: Know your business model

We now needed to evolve our business model. Everything from how we sourced the standard hardware we were using, compensation models for our field teams, how we provided support and hard things like recognition all changed. It wasn't enough to say we were a software business, we had to evolve every single one of our business processes to support it.

A cataclysmic event

In 2011, we learned that Itanium processors would no longer be supported by Oracle. As a result, we had some decisions to make. Note that out of all of our Itanium businesses, NonStop was the only one we ported to x86. Why? Because the value of NonStop couldn't be replicated anywhere else. We needed a new destination. The most logical direction was to move to x86, but to successfully move, we needed to solve the Endian problem.

"Endian-ness" refers to byte ordering and one of the biggest unsolved problems in our industry is migrating from "Big Endian" systems like SPARC, Power, and PA-RISC to "Little Endian" systems, like x86. For the curious, Itanium can do both, but was used as Big Endian for NonStop.

The crack team of NonStop architects and engineers devised a solution by making key modifications in our compilers. Once we solved the Endian problem, we embarked on a five-year journey to migrate the entire NonStop software ecosystem to x86 – no small feat.

With the introduction of NonStop X this year, we have realized the final stage of our strategy to make our server fabric based on open, industry standard hardware.

NonStop X is the culmination of executing a focused strategy over a 10 year period. I couldn't be more proud of the team that got this done. That's why, if I was the marketing guy (which I'm not), the tag line I'd use is:

NonStop X – The best software platform on the planet!

What's next for NonStop?

Now the question is "do we need a new strategy?" I don't think so. I think we need to take our software strategy to the mainstream. The mainstream software world today tends to revolve around 4 things:

Linux, Virtualization, Open source and Cloud.

The team is already hard at work here. In the labs, they have NonStop running in a VM on Linux. It's not ready to be a product, but it's a proof point that we can get there. Wouldn't it be great to bring the scale and fault tolerance of NonStop to the world of Linux?

Also, being on x86 and using Infiniband interconnects allows us to build incredible hybrid systems that combine Linux and Windows with NonStop. A very powerful combination.

Open source is a business choice, not a technology choice. I think there are some really special technologies in NonStop that might be good candidates to bring to the open source ecosystem. This has to be done very carefully. In many cases we might want to enhance existing projects using some of our technologies. In other cases, we might want to create new open source projects. This will take a lot of work. And, don't forget the 1st rule of building a strategy.

We need to make sure we have a sustainable business model to make sure we have a vibrant NonStop business for our customers.

Cloud is the area that gives me the most heartache. In my mind, bringing NonStop to cloud means downgrading NonStop.

The cloud aspires to what NonStop already is.

I'd rather use Linux, virtualization and open source to find a way to upgrade the cloud to what NonStop is today, and not take a step back.

The cloud is a distributed scale-out system. Sound familiar? But, as the world has moved from scale-up to scale-out, the responsibility for resilience moved from the infrastructure to the application. This means that resiliency is the responsibility of the developer. To build in software functions to handle fault tolerance and resiliency in every application – that is really hard.

In NonStop, we have the best of both worlds: The applications are resilient automatically and they can deliver cloud-scaling right away.

I also believe that we can start to make NonStop available as a service. The mixed-mode NonStop SQL/MX engine could be offered as a service that delivers a database engine that's currently unmatched in performance, capabilities, scalability and resilience.

I don't know the detailed answer yet on how we deliver on upgrading the cloud. But, I think that Hewlett Packard Enterprise, and the NonStop team have an opportunity to make a contribution that makes the cloud so much better than it is today!

I hope you enjoyed this journey through the inside story of NonStop. We couldn't be happier with the state of the business. The opportunities for NonStop are endless.

Martin Fink is CTO and Director of HP Labs. Fink's research team at HP Labs, the company's exploratory and advanced research group, is responsible for anticipating IT trends to address the complex issues that will face our customers and society over the next decades. Working closely with HP's strategy teams and the business group research and development teams, Fink is focused on commercializing the company's intellectual property to drive and accelerate the innovation agenda for the company.

Fink has an MBA from Colorado State University, graduating Beta Gamma Sigma, and is listed as co-inventor on two patents related to online e-commerce. He is also the author of The Business and Economics of Linux and Open Source, published by Prentice Hall. He graduated in electronics engineering from Loyalist College in Ontario, Canada.

Protecting Big Data – Erasure Coding

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

Big Data has changed the landscape of data storage. A company's data is always precious, and the loss of any of it can be devastating to the IT functions upon which the company depends. With Big Data being stored on hundreds or even thousands of disks, how does one protect that data from loss? Erasure codes are the answer.

Until recently, RAID storage satisfied most needs for data protection. RAID storage stripes data across several disks with additional parity information so that should a disk fail, the data the failed disk contained can be reconstructed on the fly from the data and parity information on the surviving disks. RAID 6 even allows two disks to fail without losing any data. A typical RAID system stripes data across five or six disks.

RAID systems still can provide sufficient protection for hundreds of terabytes of storage. However, with the advent of Big Data, the amount of storage required now far exceeds that possible with even the largest RAID systems. In many cases, the amount of Big Data storage required is measured in exabytes – a million times greater than the capabilities of the largest RAID systems. Big Data can require hundreds or even thousands of disks for storage. In a storage system so large, even with the most reliable disks industry has to offer, there almost always will be several disks in failure.

Erasure Coding

When a disk fails, it is said to be *erased*. Similar to RAID, erasure coding provides forward error-correcting codes on a set of additional disks. However, the error-recovery capabilities of erasure coding are far more powerful than RAID. An erasure-coded system can be structured so that data recovery can be achieved for any number of disk failures, a capability needed by the large number of disks in a Big Data storage system.

kilobyte	10^3	bytes
Megabyte	10^6	bytes
Gigabyte	10^9	bytes
Terabyte	10^{12}	bytes
Petabyte	10^{15}	bytes
Exabytes	10^{18}	bytes
Zettabyte	10^{21}	bytes
Yottabyte	10^{24}	bytes
Lottsabytes	$>10^{27}$	bytes

The core technology for erasure codes extends back over five decades. It has been in use in communication systems for that long, but is just now being applied to storage systems.

Referring to Figure 1, the number of disks used to store data is denoted by k. An additional m disks are provided for error-recovery coding. Thus, the total number of disks, n, is $n = m + k$. A measure of the redundancy of the system is called the encoding rate, r, and is $r = m/n$. That is, r is the proportion of all disks in the system dedicated to redundancy. If $r = 0$, there is no redundancy. In summary,

k is the number of data disks.
m is the number of error-recovery disks.
n is the total number of disks.
r is the encoding rate m/n.

The power of erasure coding is that the data in the storage system is available even if m of the disks in the storage system should fail.

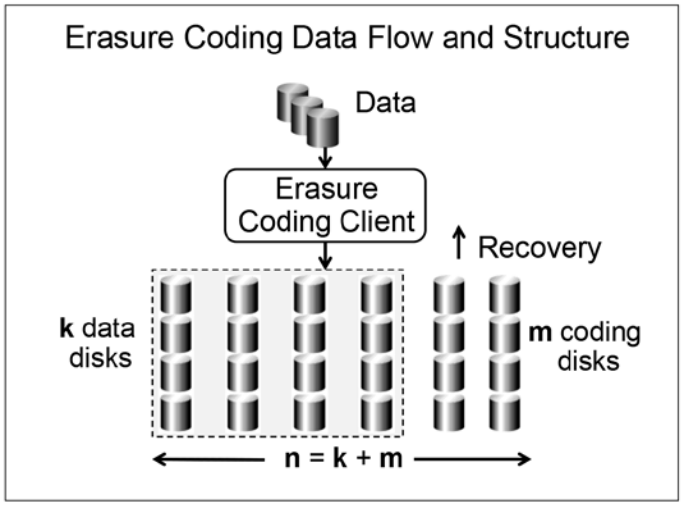

Figure 1: Erasure Coding Data Flow and Disk Configuration

How Does Erasure Coding Work?

The mathematics behind erasure coding is complex. However, as a simple statement, it depends upon a polynomial relationship between the data of all of the disks. If a disk should fail, its data can be reconstructed by solving the polynomial for the missing data using the data of the surviving disks.

A simple example is a parity check. In this case, there is one error disk (k = 1). The disk contains the parity check for the set of data disks.

As an example, consider four data disks and a table stored on these disks in which each row has four fields, with one field contained on each data disk. The values for one particular row in this table are 3, 7, 2, 4. We define a parity value as being the negative of the sum of the data values. Thus, the parity value is -16; and the sum of the data and parity values is zero.

Now let us assume that we lose disk 2 (the value of 7). We can reconstruct the value contained on that disk by combining the values on the surviving disks with the parity value:

Missing value = 16 – 3 – 2 – 4 = 7

In this case, our polynomial is the one-dimensional relationship:

$$d_0 = -\sum_{i=1}^{4} d_i$$

where the data values are d_1, d_2, d_3, and d_4, and the parity value is d_0.

A more interesting example is found in Wikipedia under "Erasure Code." Though it is a communications-oriented example, it suffices to show the next step – the use of a two-dimensional polynomial. The example is called "err-mail."

Err-mail works like e-mail except that about half of all mail gets lost, and messages longer than five characters are illegal.

Alice wants to send her telephone number, 555629, to Bob. Since she can only send up to five characters in each message, she breaks her telephone number into two parts and sends it as 555 followed by 629.

However, she knows that there is a good chance that one or both messages will be lost. So, in concert with Bob, she constructs a two-dimensional linear polynomial of the form:

$$f(i) = a + (b - a)(i - 1)$$

Setting $a = 555$ and $b = 629$, she has for her telephone number

$$f(i) = 555 + 74(i - 1)$$

Thus, $f(1) = 555$ and $f(2) = 629$. We will call these messages A and B.

Alice also computes $f(3) = 703$ (message C), $f(4) = 777$ (message D), and $f(5) = 851$ (message E). She sends all five messages to Bob.

Bob receives messages A, B, and C garbled but receives messages D and E properly. Using the agreed-upon polynomial function, Bob can solve for messages A and B and recover Alice's telephone number:

$$777 = a + 3(b - a)$$
$$851 = a + 4(b - a)$$

Solving this pair of polynomials yields a = 555 and b = 629. Thus, Bob is able to recreate Alice's telephone number even though three out of five of the err-mail messages were lost.

Erasure coding extends this use of polynomials to multi-dimensional polynomials that can protect entire disks and recover data even if *m* disks are lost.

How Powerful is Erasure Coding?

Let us compare erasure coding to a common way to protect data – mirroring. With mirroring (also known as RAID 1), the entire data set is duplicated. Thus, if any one disk is lost, the data is still available on its mirror. In fact, data can be recovered in the event of multiple disk failures so long as both mirrors of a single disk are not lost.

Mirroring

Let us take the case of eight data disks and eight coding disks. In the case of mirroring, the eight coding disks are copies of the eight data disks. The number of ways that one disk can fail in one set of eight disks and the same disk can fail in the other set of eight disks is 8.

Let us assume that the failure probability of a disk is 10^{-3} = .001. Its availability (the proportion of time that it is up) is then .999, or three 9s (note that the number of nines of availability is equal to the exponent of the failure probability). The probability that two disks will fail is $(10^{-3})^2 = 10^{-6}$. Since there are eight ways that dual disk failures will result in data loss, the probability that data will be lost is $8*10^{-6}$:

probability of data loss for the mirrored system = $8*10^{-6}$

Erasure Coding

Now instead of mirroring, let us use erasure coding on eight data disks and eight coding disks. That means that we can lose any eight disks in the storage subsystem and still not lose any data. In order to lose data, we will have to lose nine disks.

The number of ways that *k* disks out of *n* disks can fail is given by the relationship for combinations (i.e., how many ways can *k* items be chosen from n items when the order of the *k* items doesn't matter). The number of combinations of *k* items out of *n* items is

$$\frac{n!}{k!(n-k)!}$$

In our case, we want to know how many ways m+1 disks can fail out of n disks. This is what is required for data loss, and is

$$\frac{n!}{(m+1)!(n-m-1)!}$$

In our case example, $m = 8$ and $n = 16$. Thus, the number of ways that nine systems out of sixteen can fail is

$$\frac{16!}{9!*7!} = 11{,}440$$

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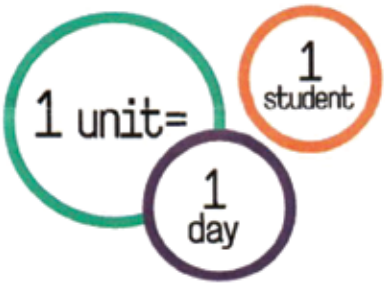

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The probability that nine systems will fail is $(.001)^9 = 10^{-27}$. There are 11,440 ways in which nine systems out of sixteen can fail. Thus, the probability of data loss for the erasure coded system is $11{,}440*10^{-27} = 1.144*10^{-23}$:

probability of data loss for the example erasure coded system = $1.144*10^{-23}$

The general form for this relationship is

Probability of data loss for an erasure coded system =

$$\frac{n!}{(m+1)!(n-m-1)!} f^{m+1}$$

where

n is the total number of disks in the storage subsystem
m is the number of encoding disks
f is the probability of failure of a disk

Comparison of Mirroring and Erasure Coding

Based on the exponent of the failure probability, mirroring provides about six 9s of availability for this example. Erasure coding provides about twenty-three 9s of availability. Erasure coding is 10^{17} times more reliable than mirroring (100 quadrillion times more reliable)!

Substantial reliability using erasure coding can be achieved in this case with many fewer coding disks. For example, using only two coding disks instead of eight for a total of ten disks yields an availability of about nine 9s, a thousand times more reliable than mirroring with sixteen disks.

Further References

An in-depth discussion of erasure codes and the mathematics behind them can be found in Dr. Terry Critchley's excellent book on high availability, "High Availability IT Services." See the reference in the Acknowledgements section below.

A major researcher in erasure codes is James Plank, a professor in the University of Tennessee's Electrical Engineering and Computer Sciences Department. Papers presented by him can be found at http://web.eecs.utk.edu/~plank/plank/papers/FAST-2013-Tutorial.html.

Panasas (www.panasas.com) is a company specializing in very large storage systems. It promotes the use of erasure coding and notes that, with erasure coding, reliability can actually increase with scale. Material from the blog of Geoffrey Noer, Vice President of Product Management at Panasas, was used in part for this article. His blog reference is given in the Acknowledgements section below.

Summary

Big Data presents a significant challenge for storage vendors. Data at the exabyte level may be spread over hundreds or thousands of disks. At any point in time, many of these disks are liable to be out of service. How does a company maintain access to its Big Data in the presence of continual multiple disk failures?

The answer is erasure coding. By adding a set of coding disks that can be used to reconstruct data from downed disks, extremely high reliabilities can be obtained at a moderate cost. Erasure coding provides reliabilities that are orders of magnitude greater than more traditional methods such as mirroring or RAID.

Acknowledgements

Information for this article was taken from the following sources:

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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.

Modernization through Integration:

Using Middleware to Connect Minecraft™ and Other Applications to NonStop

Gabrielle Guerrera >> NuWave Technologies

As NonStop users, we know that our systems generally run in silos, separated from the rest of our data centers because of an inability to exchange information with other platforms. Though older middleware, like remote procedure call middleware, has been long been available; its complexity, cost and interoperability problems have severely limited its appeal. More recently, middleware based on modern standards like SOAP and REST have made sending data to and from NonStop systems much easier, more reliable and far less costly.

In this article, we'll explore some different types of middleware and present an unusual use case in which a developer integrated the popular computer game Minecraft with NonStop.

Middleware = Integration

There is more than one way to integrate HPE NonStop with other platforms, but the easiest way is with *middleware*. If, like many people, you aren't certain what middleware is, think of it as a bridge. Middleware is software that connects two applications, typically over a network, so it allows you to integrate with other platforms, applications, and Web services (at NuWave, we call this PAWS). These disparate applications can then exchange information or perform remote operations. Some middleware is designed for a specific purpose, such as ODBC middleware for database access; whereas general-purpose middleware supports either 1) *peer-to-peer* (P2P) *connectivity, where each application consumes and provides services,* or 2) *client-server connectivity*, where the client requests information from a server, which returns a response.

Middleware allows you to integrate applications on virtually any platform—including a mobile device—with data housed on your NonStop server. This makes your HPE NonStop data more valuable because it becomes easier to access, visualize and understand. Middleware also allows you to integrate data from external sources into your NonStop applications. These two capabilities give your NonStop servers increased functionality, value, and staying power at your organization.

Several common off-the-shelf (COTS) middleware products are available for NonStop systems, but despite this, some organizations have attempted to implement in-house solutions in order to save money. The problem with homegrown solutions is that when a complete accounting is made of the initial development costs, testing and ongoing maintenance, the "savings" are hard to find. On top of that, there's the opportunity cost, because while your developers are reinventing the wheel, they could have been working on solutions that provide real value to your customers. Unfortunately, even after doing all the work to complete an in-house solution, some companies still end up purchasing a COTS product to have the increased functionality and support.

How to Find the Right Middleware

When you're looking for a middleware product, you should know the answers to the following questions:

1. Do I need the server piece or the client piece?
2. Do I need SOAP or JSON technology?

To answer the first question, you obviously need to know the difference between a server and a client. I'll explain this in more detail in the next section, but basically, the server piece allows you to expose your NonStop applications as Web services, so you can send NonStop data to other platforms and applications. The client piece allows your applications to *consume* Web services, so you can bring data into your NonStop applications.

Server-side solutions for NonStop include the following:

- **NuWave SOAPam Server**
- **NuWave LightWave Server**
- HPE NonStop SOAP
- comForte CSL
- ACI Webgate

Some of the client-side solutions available for NonStop are as follows:

- **NuWave SOAPam Client**
- HPE NonStop SOAP
- ACI Webgate

The second step, determining whether you need SOAP or Javascript Object Notation (JSON) technology, might require you to do a little bit of research. If you've already figured out that you need a *client*-side solution, then you just need to find out whether the Web service you want to access is a SOAP or JSON Web service.

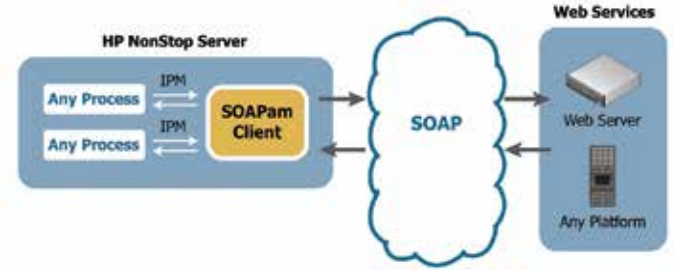
Alternatively, if you need a *server*-side solution, then you need to know if the client can make SOAP or JSON requests, or both. If you have a client that can only send SOAP requests, then you'll probably want something like NuWave SOAPam Server. If you have a client that can only send JSON requests, then you'll need NuWave LightWave Server or a similar product. (There are also some middleware options that use neither SOAP nor JSON, and instead use proprietary messaging protocols or ODBC.)

"NonStop as Client" (Client-Side) Middleware

Client-side solutions allow your NonStop applications to leverage data from public and private Web services via the internet or your intranet. These Web services could come from within your own organization, from a business partner, or from a commercial Web service provider like Paypal. For example, if

you use one of your NonStop applications to generate price quotes for your international customers, you might access a public Web service to obtain currency exchange rates. Another example would be to access your supplier's private Web service to check your order status.

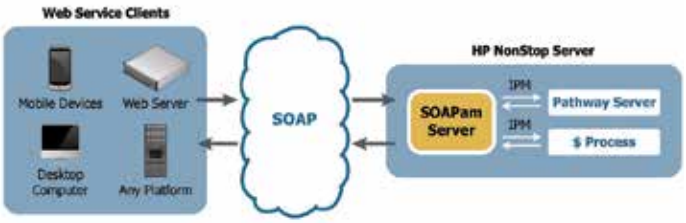
With NuWave SOAPam® Client, your NonStop application simply sends a formatted interprocess message (IPM) to SOAPam Client, which converts the IPM into a SOAP request and sends it to the Web service. The Web service returns a SOAP response with the requested information, and then SOAPam Client parses the response into a reply IPM and returns that to your NonStop application (see the diagram below, reading from left to right).



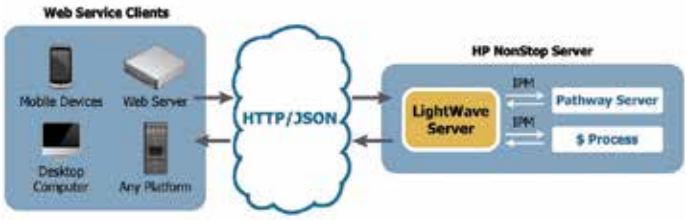
"NonStop as Server" (Server-Side) Middleware

Server-side middleware exposes NonStop applications as Web services, so they can be accessed from virtually any platform, including Linux-, Unix-, and Windows-based platforms, allowing your coworkers, customers, or business partners to retrieve information from your NonStop server. You might use server-side middleware to share data within your enterprise or with your business partners around the world. You could even allow customers to check your inventory or place an order.

NuWave SOAPam Server works in a similar way to SOAPam Client, except that the process goes in the opposite direction. In this case, a Web service client on another platform (like a Unix or Linux server, a PC, or a mobile device) sends a SOAP request to SOAPam Server on NonStop, which converts that into a request IPM and sends it to your backend NonStop application. The NonStop application returns the data in an IPM to SOAPam Server, which the product converts back into a SOAP message and sends to the external application (read from left to right below).



NuWave LightWave Server™ also allows other platforms to request your NonStop data, but it uses JSON and REST technology, so you have a REST client—usually a web or mobile application—sending a JSON request via a RESTful API to LightWave Server on NonStop. LightWave Server sends an IPM to your backend NonStop application or process, the process returns a reply, and then LightWave Server converts that into a JSON response and sends it back to the client via a RESTful API (see below).



Minecraft™

So middleware allows you to send and receive information from your HPE NonStop applications, but what if you want to send NonStop data to a different kind of client application, like a computer game? A friend of NuWave's, Damian Ward of Vocalink, wanted to integrate his favorite computer game with his favorite enterprise platform; so he used LightWave Server to create a data visualization of NonStop CPU utilization within the game of Minecraft.

For those of you who aren't familiar with Minecraft, here's a summary of its awesomeness. When Minecraft was launched in 2009, it started out as a game of breaking and placing blocks, as well as mining raw materials and creating tools in a virtual world to create buildings and landscapes for its users to explore. Since then, however, it has become more of a game framework and has sold over 22 million copies. There are currently over 30,000 single-player and multi-player Minecraft servers running worldwide.

In this game, you can create stunning worlds and structures, which are only limited by your imagination.

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After completing this course, you will be able to describe the purpose and features, list the major components and describe the steps to sign up for OpenStack® development. You will learn HP's involvement with OpenStack® and be able to identify the interfaces for engaging OpenStack® services, describe the architecture and provide an overview of OpenStack® code development and testing methods.

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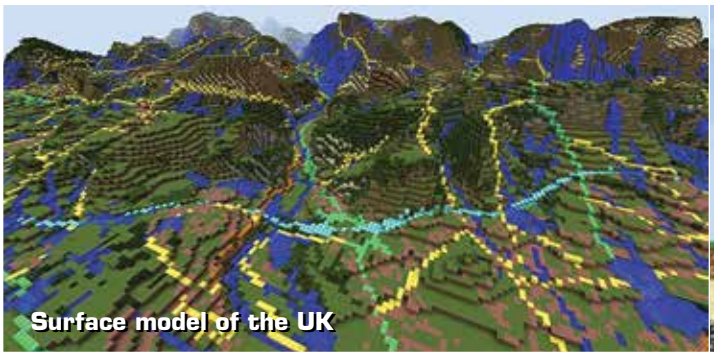
Since Minecraft has such a strong framework, the game is now being used for real-world applications. One example is in the UK, where survey data has been inputted into Minecraft to inexpensively create a surface model of the UK for use by their government agencies (see the images below). The image on the right illustrates how the geology blocks (representing different minerals and deposits) are repeated from the bedrock layer up to the elevation model height and grass block. Inspired by the Ordnance Survey (OS), the British Geological Survey (BGS) has reproduced the 2D geology of mainland Great Britain and the surrounding islands within the world of Minecraft, and they are working on a 3D geological model as well.

Minecraft, at its core, is basically a simple and inexpensive 3D rendering engine, but it is designed to support, and encourage, user extension plugins known as "mods". Plugins can add features or modify game behavior and are coded in Java. Damian and his daughter are both huge fans of the game; so one day, Damian came up with the idea to use a mod to create a 3D rendering of NonStop CPU utilization within the world of Minecraft. He developed a plugin that uses one of LightWave Server's RESTful APIs to connect Minecraft to a NonStop Pathway server that returns CPU status. Since the REST APIs are based on HTTP and JSON, communicating with the CPU status server using LightWave Server was simple.

With Damian's new plugin installed, Minecraft can display the NonStop server's real-time CPU utilization graphically, as bars of different heights and colors, within his Minecraft world (see image below). How cool is that?

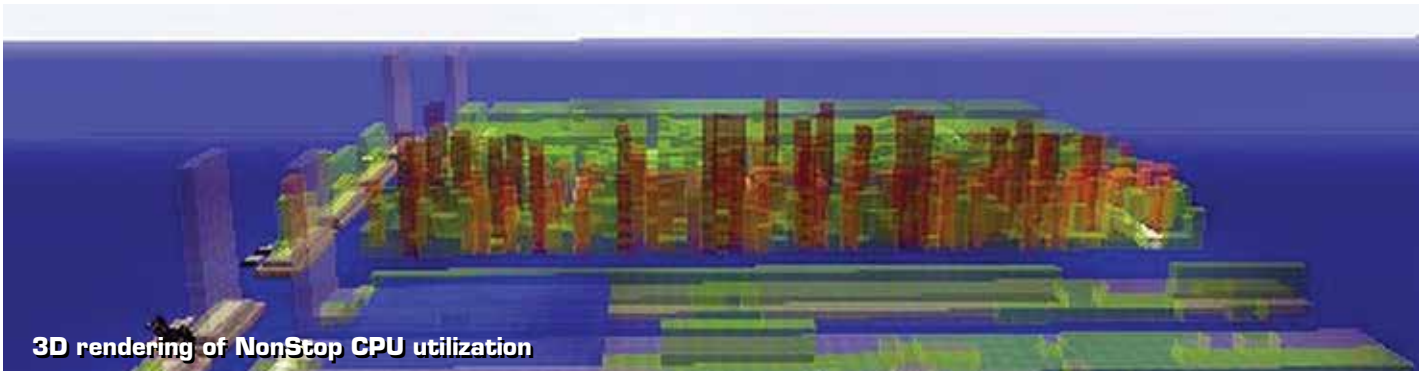
So whether you want to increase the value and functionality of your HPE NonStop servers, or you just want to impress your kids, there is a middleware solution that can get the job done. And if you need a middleware product that has a small footprint and can get you up and running quickly and affordably, that's where NuWave comes in.

To learn more about our solutions, visit www.nuwavetech.com, and stay tuned for other interesting use cases like this one!



Surface model of the UK

Geology of Great Britain, from the grass layer to the bedrock



3D rendering of NonStop CPU utilization

Gabrielle Guerrera is the director of business development for NuWave Technologies, a company that specializes in HP NonStop middleware and services. Her father, Ernie Guerrera, founded the company in 1999 (back when he was young) and initially brought Gabrielle on to do marketing for NuWave in 2008. She can be reached at gguerrera@nuwavetech.com.

Do You Know the Way to San Jose? NonStop Technical Bootcamp 2015

Andrew Price >> **VP Technology** >> XYPRO Technology Corporation

Another NonStop Technical Bootcamp is behind us, and it's time to reflect on what was an energetic, and very positive event. For the first time since the old ITUG days we were back in Downtown San Jose, and it really felt like we were coming home. After outgrowing two previous venues in the last two years, the Fairmont definitely gave us the space we needed!

This years' event maintained the tried and true format from the last few years, with pre-conference technical sessions on the Sunday, followed by a packed agenda from Sunday night through Wednesday lunchtime.

Sunday started off early with XYPRO's Dave Teal taking a full room of eager HPE NonStop security students through a detailed review of XYGATE Merged Audit (XMA) and XYGATE User Authentication (XUA) – two products now included with all new NonStop servers. Dave's updates and recommendations ensure that customers can get the most out of these two valuable solution suites. Following Dave's session, XYPRO's Rob Lesan gave a DBA's view of NonStop database administration using the Merlon suite of database management solutions. Both sessions were well attended, with great feedback from attendees indicating that the level of information provided was extremely helpful. Sunday afternoon saw a new type of session – an IT Managers network meeting, which by all accounts was also a great success.

Sunday night, and the conference proper kicked off with a traditional beer bust held on the tradeshow floor with various choices of brew poured into flashing XYPRO beer mugs to add to the fun. This year, all meals and two evening events, were held right in the middle of the tradeshow, and from both customer and vendor perspectives this was a great improvement over previous years. We had many useful, impromptu conversations with customers and friends in this relaxed atmosphere – hopefully this format will be maintained for future shows.

Monday morning came early, particularly for those of us who kicked on the night before, with breakfast on the tradeshow floor and an immediate start to the breakout sessions. The agenda this year was so full that six parallel tracks were offered through most of the conference, which sometimes made it difficult to choose what session to attend! Some of the more popular sessions were repeated, which helped a lot. At XYPRO we had a number of attendees from our engineering organization, and careful pre-conference coordination ensured that we were able to have attendees at those sessions that were of most interest to us.

Wendy Bartlett was joined for the first time by Prashanth Kamath, HPE NED Product Manager, and their joint Security update was content-rich and extremely informative, as usual. Wendy spent some time discussing XYPRO's partner product HPE SecureData, and highlighting the advantages that format preserving encryption and tokenization offer NonStop customers. John Weald from HPE Security (formerly Voltage Security) followed that in the next session with a summary of data-centric security and key management for NonStop X.

After a quick break the first general session started. Hosted by XYPRO's Rob Lesan, a number of Connect awards were given, and then the guest of honor was introduced. Martin Fink, known to many long-term NonStop folks, is now the CTO and Director of HPE Labs, but ten years ago he was tasked with the long term product strategy for HP NonStop Enterprise Division. Martin took us through a fascinating review of the execution of that strategy, from a line of servers that retained some proprietary hardware back in the mid-2000s, to the latest NonStop X, where the NonStop differentiation is all about the software offered. A really interesting general session.

After lunch we returned to the breakout sessions, and a full afternoon for all attendees! The 1:00pm session was the forum for a major new product announcement from XYPRO, introduced by our CEO Lisa Partridge, and covered in detail by our CISO and Product Manager Steve Tcherchian.

XYGATE SecurityOneTM is an all new Security Analytics and Intelligence platform. The result of a number of years of significant R&D, and featuring patent-pending technology, XYGATE SecurityOne provides NonStop users the ability to cut through the noise (typical and expected security information) produced by many applications, subsystems and security solutions to identify "low and slow" (not-so-typical and unexpected security information) activity which is often the precursor to significant breaches. For the first time NonStop security administrators can link and contextualize disparate security events to quickly identify important and potentially costly incidents. This session unveiled SecurityOne, and announced our plans to work with select beta partners in the coming months. Post-presentation, interest in the beta program was extremely high.

The rest of the conference continued in the same lively vein. XYPRO folks co-presented in two different sessions with Prashanth Kamath, the NED Security Product Manager. A highlight here was the announcement of XYGATE Data Protection (XDP) now being sold and supported through HPE, and a great deal of customer interest and discussion was triggered by that information.

We also had two of our customers presenting on their usage of XYGATE products, and the value those products provide to their organizations. Tanya Jones, Senior Manager Information Security

at Discover Financial Services gave a great overview of Discover's Enterprise Identity and Access Management (IAM) implementation which uses XYPRO partner product IdentityForge to integrate the NonStop with the rest of the Discover IAM environment.

Later in the conference Sheri Radomsky, Technical Support Manager at Accenture, discussed how Accenture has implemented XYGATE User Authentication (XUA) to integrate NonStop authentication with their enterprise LDAP environment. This simple integration of XUA has greatly reduced user and password administration in addition to meeting corporate security policy requirements for Accenture – in Sheri's words "any time you are doing user authentication you should be using XUA". We couldn't have said it better ourselves, Sheri!

Other XYPRO folks were also kept well occupied with presentation responsibilities. Rob Lesan, again performing multiple roles including Connect President, presented solutions from our partner Merlon. Barry Forbes, XYPRO's VP of Sales and Marketing, gave a customer-centric presentation showing how our customers typically deploy XOS to fully secure their NonStop environments.

We also had countless valuable discussions throughout the show with customers. As in past years, security was a major focus for the show, and the announcement of our SecurityOne product, along with the increased profile of XDP courtesy of HPE and our "traditional" NonStop security products, ensured that there was a consistent flow of customers through our booth and the surrounding tables.

The evening schedule was just as hectic. On Monday night XYPRO co-sponsored the vendor pub night at the "old favorite" venue of Gordon Biersch. Immediately following that we also hosted a large get-together of our customers and friends at SP2 Communal Bar and Grill – 130 people enjoyed excellent food and a few quiet (and in some cases not-so-quiet) drinks to unwind after a busy day. Tuesday night was the Bootcamp evening reception in the tradeshow area, along with numerous customer dinners. And on Wednesday night XYPRO was pleased to be able to host a dinner with our customers and partners from Japan.

Now it's back home to close out a big year. If you would like more information on any of the products mentioned here, please contact your XYPRO sales representative or email info@xypro.com. You can also find the XYPRO presentations at www.nonstopbootcamp.com.

We're all looking forward to seeing everyone again in November next year!

Andrew Price is VP of Technology at XYPRO. He joined XYPRO in 2011, and has over 25 years' experience in the mission-critical IT industry. Prior to joining XYPRO, Andrew was with ACI Worldwide for over 11 years, where he held roles in Product Management, Development and Architecture. At XYPRO, Andrew has engineering and product management responsibility for the XYGATE suite of products, ensuring that they continue to meet XYGATE users' stringent requirements for security and compliance on the HP NonStop. He can be reached at andrew.price@xypro.com

Applying Predictive Analytics to Power Backup

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

According to a 2013 study by the Ponemon Institute,[1] the leading cause of datacenter outages is battery UPS failures following a power outage. UPS failures account for 24% of all datacenter crashes. Another 7% of outages are caused by generator failures, in which the generator doesn't start or fails during the power outage. These causes account for almost a third of all datacenter outages.

Given the amount of detailed data that UPS and generator-monitoring facilities can provide, a field of mathematics known as predictive analytics can be put to good use to detect pending failures and to correct faults before they cause a datacenter incident.

What Is Predictive Analytics?

Predictive analytics is an area of data mining that exploits patterns found in historical data to predict risks or opportunities. It provides a predictive probability that some event will happen. Often, the unknown event of interest is in the future. Examples of the use of predictive analytics are credit-scoring (the probability that a person will pay his bills) and credit-card fraud (the probability that a transaction is fraudulent).

Predictive models associate the specific performance of a unit in a sample with multiple, measurable attributes of that unit. The objective of the model is to assess the likelihood that a similar unit in a different sample will exhibit the same performance given a similar set of attributes.

The available units with known attributes and known performance are the "training sample." The units with known attributes but unknown performance are the "out-of-training sample." Based on the relationships of attributes and performance in a training sample, predictive analytics attempts to assign a probability to different outcomes of an out-of-sample unit based on its known attributes.

Many analytical techniques are encompassed by predictive analytics. One of interest in computing systems is survival analysis. Survival analysis estimates the time to failure of a component based on the current value of certain attributes of that component. This is the form of predictive analytics that is of interest in this article.

Historically, using predictive analytics tools required advanced skills. However, as increasingly more organizations added predictive analytics to their decision-making processes, vendors responded by creating software tools that removed the mathematical complexity and that provided user-friendly interfaces.

According to the Rexer Analytics 2013 Data Miner Survey, the most popular commercial packages are IBM SPSS Modeler, SAS Enterprise Miner, and Dell Statistica.

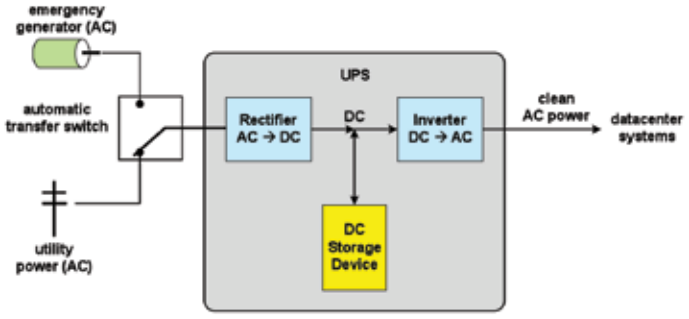
Applying Predictive Analytics to Battery UPS Systems

What Is a UPS System

Power reliability is addressed in modern-day data centers with backup generators. However, it takes several seconds for a generator to start up and come online. During this time, a power loss occurs unless there is another source of power that can come online instantly for a time long enough for the generators to begin supplying power.

This other source of power is an Uninterruptible Power Supply (UPS) system. As shown in Figure 1, a UPS contains a rechargeable energy source that is thrown into service when the primary utility power is lost. It provides power to the data center until the backup generators come into service. Should there be a generator failure, the UPS system provides power for a long enough period of time to support an orderly shutdown of the systems in the data center.

A typical UPS system is shown in Figure 1. Its first job is to clean utility power to the standards required by the data center. "Clean power" is a constant voltage at a constant frequency (60 hertz in the United States). As power is transmitted from the generating plants



A UPS System
Figure 1

[1] 2013 Cost of Data Center Outages, Ponemon Institute; December 2013.
http://www.emersonnetworkpower.com/documentation/en-us/brands/liebert/documents/white%20papers/2013_emerson_data_center_cost_downtime_sl-24680.pdf

to the consumers, it can become "dirty." Voltages can fluctuate depending upon the power being consumed by other end users. High-frequency noise can be induced into the power feed by appliances. This dirty power can cause problems in a data center.

To clean the dirty utility power, the potentially dirty utility power is fed to a rectifier in the UPS system. The rectifier converts the AC (alternating current) utility power to DC (direct current). This relatively clean power is then converted back to AC by an inverter in the UPS system to provide clean power to the data center.

In the event of a utility power failure, an automatic transfer switch detects the power loss and rapidly connects the UPS rectifier to the emergency generator system. The UPS generates the controls to start the generator, and power is restored to the data center.

One problem with this approach is that there will be a several second outage to the data center, and it likely will be disastrous. This is where the 'uninterruptible' in "UPS" comes in. Connected to the DC bus from the rectifier to the inverter in the UPS is a device that stores energy in DC form. When the output of the rectifier fails, the energy from the DC storage device feeds the inverter and keeps power flowing to the data center until the emergency generators can come online. This is typically a time measured in seconds.

In addition to this delay, the automatic transfer switch is often designed not to switch to the backup generator for a few seconds so that brief utility power outages do not deplete the DC energy source for starting the generators. Eighty percent of power outages last less than two seconds, and 98% last less than ten seconds.

The predominant form of DC storage devices in use today are strings of batteries. However, batteries have several challenges that can make the battery strings unreliable.

Disadvantages of Battery Systems

Battery storage systems have not proven to be reliable. The Ponemon study referenced above found that 55% of respondents blamed battery failure as the root cause of a datacenter outage due to a primary power failure. Human error came in second.

A typical data center operating on one megawatt of power will have about five strings of 40 batteries each. This is a total of 200 batteries. The failure of any one battery will take its string out of service. With one string out, there may not be enough backup energy to provide datacenter power for the time it takes to get the generators online. This will cause a datacenter outage. Statistics show that 70% of UPS service calls are the result of bad batteries. 40% of cases where power was lost to a critical load were the result of battery failures.

As a battery ages, its internal resistance goes up. This prevents the battery from delivering its rated power. In many cases, the pending failure of a battery cannot be detected until the battery is called upon to deliver power.

Predicting Battery String Failures

Battery-monitoring systems can produce a massive amount of data points. However, rarely do these monitoring systems have the intelligence to manipulate the data to provide actionable insights. This is where predictive analytics comes in. It can offer clear, actionable alerts for intervention, maintenance, and preemptive repairs.

The first step, of course, is to install an effective monitoring system. Ensure that the contractor installing the monitoring system takes into consideration servicing access to the batteries.

It would be much simpler if every battery had one simple set of parameters. However, these parameters vary with battery manufacturer and battery model. Parameters can include, among others, string voltage, unit voltage, battery impedance, ambient temperature, unit temperature, ripple, and unit discharge. These alarms have different priorities, so which ones are important? If you are using predictive analytics to predict failures, all are important.

Increasing availability is what predictive analytics can do for a facility. For instance, it can help predict when a battery in a string is nearing end-of-life so that the battery can be replaced before it causes a string failure and a potential UPS failure.

Applying Predictive Analytics to Electrical Generators

Predictive analytics also can be applied to the generators. Data centers may be considered the "brain" of a company, but it is the generators that are key to keeping that brain running and reliable in the face of a power outage. A generator is arguably the most critical piece of equipment in a mission-critical facility. Nevertheless, generator failures play a major role in unplanned datacenter outages.

In order to have visibility into potential failures, sophisticated monitoring systems collect data via sensors in the data center's power generating systems. Typically, the data gets reviewed; but most of it is not used for immediate actions. Further analysis would enable facility managers to extract meaningful, actionable insights. By examining this sensor data post-collection with predictive analytics, information can be provided that will help data centers ensure uptime by predicting equipment failures before they happen, especially with regard to generators.

Currently, facility managers monitor their sensor information in real time to check the current status of their generating systems. Are they getting too hot? Are they still running? However, the true value of this mass of data points comes from storing the data and analyzing it from a historic viewpoint. Analyzing the performance over time enables a facility manager to determine patterns that can be used to predict outages before they happen. This is the role that predictive analytics plays.

An Alternative for Battery UPS Systems

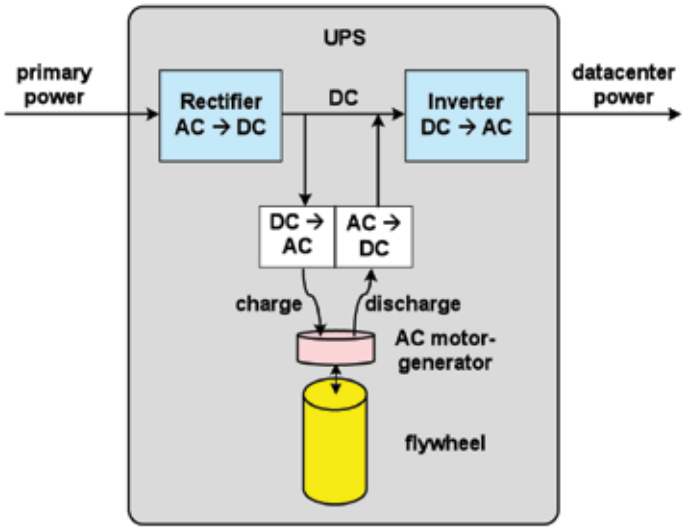
So far as battery systems are concerned, there is now available a useful alternative – flywheels.

A flywheel solves many of the problems associated with batteries. A flywheel can store energy just like a battery. The primary difference is that a flywheel stores kinetic energy whereas a battery stores electrical energy.

A flywheel is a disk that is spun up to a very high speed, typically in a vacuum to reduce drag. Once it reaches its operating speed, it takes very little additional energy to maintain the speed. Current flywheel technology results in flywheel UPSs that are up to 98% efficient. That is, it takes only about 2% of the delivered power of the UPS to maintain the speed of a flywheel (in battery terminology, to keep it fully charged).

The flywheel is connected to the DC bus via a generator. Should the main power fail, the generator driven by the flywheel continues to deliver DC energy to the inverter and maintain the datacenter power until the backup generators can come online. In battery terminology, this is the discharge of energy from the flywheel.

In principle, a DC motor-generator is employed. However, DC motor-generators require brushes and commutators that are subject to wear and require maintenance. To address this challenge, an



A Flywheel UPS
Figure 2

AC motor-generator, which does not have these problems, is often utilized, as shown in Figure 2. To interface the AC motor-generator to the DC bus of the UPS, an inverter converts the UPS DC bus voltage to AC, which drives the AC motor-generator working as a motor to charge the flywheel. If the primary power fails, the energy in the flywheel drives the AC motor-generator as a generator. Its AC output is converted to DC via a rectifier and powers the datacenter until the generators can be brought online.

The amount of energy stored in a flywheel is proportional to the mass of the flywheel and to the square of its speed. Doubling the mass of the flywheel doubles its stored energy. Doubling the speed of the flywheel quadruples its stored energy. Therefore, it makes engineering sense to trade mass for speed. Early flywheel UPSs used steel disks and rotated at speeds in the order of 7,000 rpm. Newer flywheels use relatively light-weight carbon filaments that have a great deal more tensile strength than steel. These flywheels are spun at tens of thousands of rpms.

Equally important, the light mass of fiber filament flywheels means that they can be suspended by magnetic bearings, as opposed to the mechanical bearings of older flywheels. The older mechanical bearings required periodic maintenance and replacement. Magnetic bearings are maintenance-free.

Most flywheel systems come with a remote monitoring capability. As opposed to batteries, it is easy to measure the charge stored in a flywheel system. It is basically just the speed of rotation.

A single flywheel system can deliver several hundred kilowatts of power. In fact, some existing commercial systems provide over a megawatt of power. Think about it – 200 batteries can be replaced with one flywheel system!

This power can be delivered for times ranging from seconds to minutes depending upon how much power must be delivered by the flywheel compared to its capacity.

Summary

In today's data centers, protection from primary power outages is typically provided by backup generators and UPS systems that supply power until the generator can be started and brought online. The failure of a generator or a UPS system is one of the major causes of datacenter outages.

Generators and UPS systems typically are monitored by extensive monitoring systems. However, most of the data generated by these monitoring systems is unused for any actionable purpose. By analyzing the data in real time using predictive analytics, actionable insights can be generated for intervention and maintenance before a failure occurs. This can improve the availability of a data center significantly.

Acknowledgements

Information for this article was taken from the following sources:

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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.

Data-Centric Security for the Internet of Things

Reiner K. Kappenberger >> Global Product Management >> HPE Security – Data Security

The Internet of things (IoT) creates new, critical security challenges in the escalating fight against cyber-crime, in two key areas:

- Securing data from theft as it is generated, collected and analyzed
- Protecting IoT devices from potential use for physical attack

Big Data and IoT–Expanded Ecosystem Expands Security Risks

As top use cases for data science/Big Data projects include real-time analytics for operational insights, and centralized data acquisition or staging for other systems, these projects can include massive quantities of sensitive payment card, personally identifiable and protected health information (PCI, PII and PHI). These projects alone hold major risk and now, with the advent of IoT, sensor data from devices adds to the sensitivity, risk factors and urgency.

The risk of data breach is high. The first step attackers take is to build a map laying out the network of the target organization to identify which systems are located where. Their goal is to set up mechanisms to acquire data over as long a run as possible and monetize it. When an enterprise builds a Big Data environment, the target has already done a lot of work for the attacker. With Big data the enterprise has created a single collection location for the data assets the attackers are seeking.

While perimeter security is important, it is also increasingly insufficient. It takes, on average, over 200 days before a data breach is detected and fixed[1], leaving the most sensitive data assets exposed while attackers funnel data out of their target, with the scale of the breach growing every day.

With IoT connected devices, physical risk is added to the data breach risk. For example, there are Internet-connected devices that allow consumers to open and close the door to their homes from their cell phones. What prevents the attacker from doing the same thing? Imagine an HVAC system, gas appliance or medical device. If an attacker can control these systems, it becomes an attack on the individual, where the attacker can sit anywhere in the world. This is why everyone needs to be concerned about security in the IoT age.

With IoT devices there are multiple attack vectors such as impersonation of the device user, or of the service provider. These vectors can be protected against by the use of SSL technology, 2-factor authentication, and certificates pinning, so that SSL certificates only enable the device to connect to a server when the certificate matches certain criteria and can be trusted. IoT devices can be designed not to accept inbound connections directly, but rather to accept a request to "call me now" for connection to the genuine service provider. Device software security can be enabled though best practices in the application development process.

Data-Centric Protection From The Device To The Big Data Platform

To protect sensitive data assets, a new approach is needed – one that actually protects the data itself. Consider the most advanced payment security technologies to protect credit card data. Strong encryption is implemented inside the card reader to protect data as it enters this hardened device and before it ever gets to the Point-of-Sale (POS) terminal. Data passes from the card reader to the POS terminal is thus not usable by attackers.

A similar approach is needed in IoT. Since each device is different in terms of the data it collects and sends to the backend server, it is important to understand what data is sensitive. With that understood, it is best practice to use data-centric, field-level encryption to protect individual data fields. This should be done through a special form of encryption referred to as Format-Preserving Encryption (PFE), implemented throughout the ecosystem–in the devices, the communications channels and the Big Data platform.

FPE is proven and in the process of being recognized by key standards bodies such as NIST (publication SP800-38G). It is a form os AES encryption that has been in use for some time–but unlike AES, which encrypts data into a large block of random numbers and letters, FPE encrypts the original value into something that looks like the original, so that, for example, a credit card number. Sub-fields can be preserved so that the inherent value of this information can be maintained for analytical purposes. Analytics can almost always be done with the protected data, securing sensitive data from both insider risk and external attack.

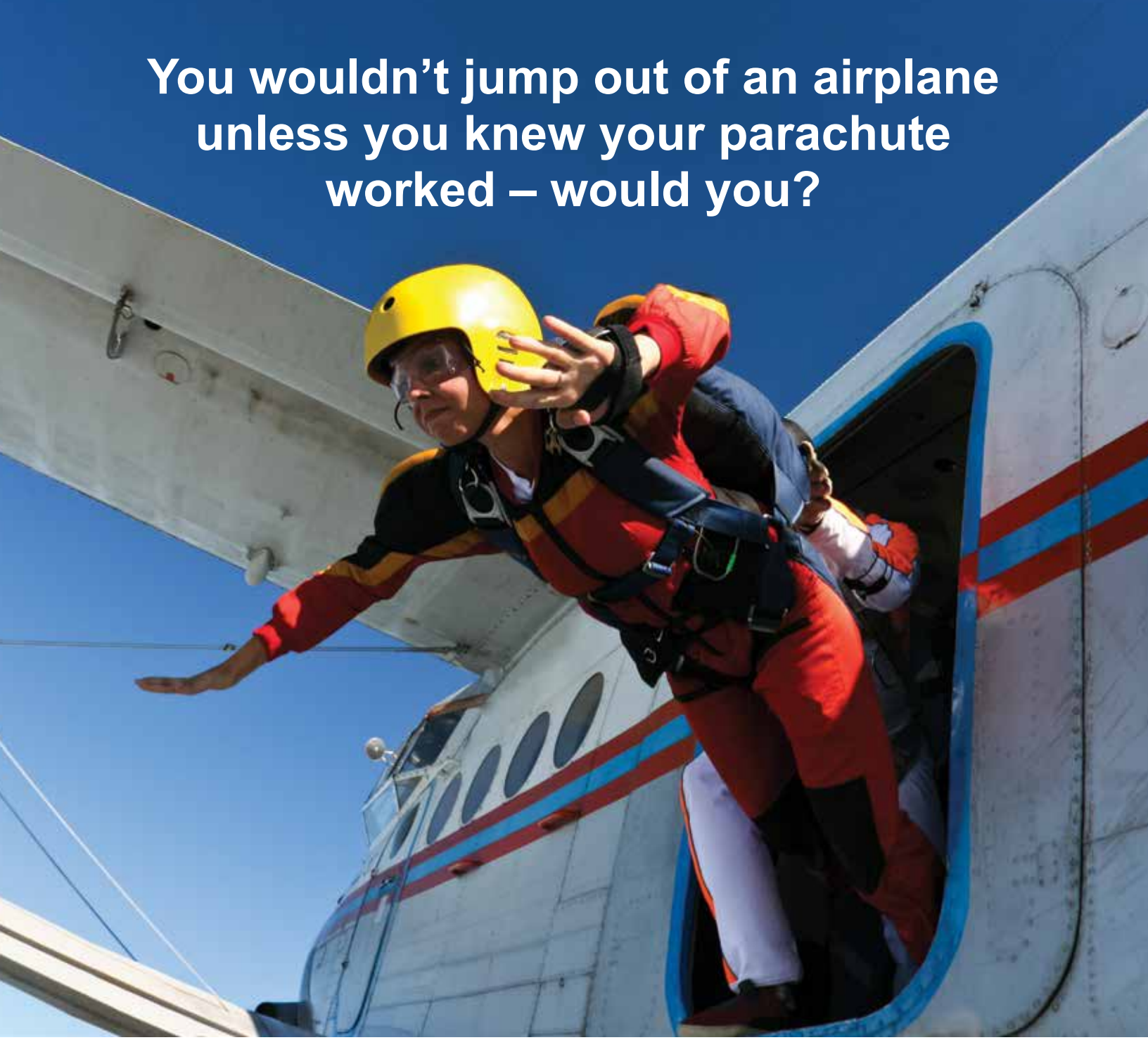
Conclusion

The Internet of Things, with double-digit growth and billions of devices, creates great new opportunities but also new levels of risk for companies and consumers. Traditional security measures alone are not enough. Enterprises implementing IoT strategies need to apply a data-centric security solution end-to-end from the big data platform to the IoT infrastructure. Using FPE to encrypt data values on a field level, from the device to the infrastructure and remote control element, removes risk and enables protection against remote takeover of an IoT device–the biggest threat to IoT security.

Reiner Kappenberger is Global Product Manager, Big Data/Hadoop, at HPE Security – Data Security, with over 20 years of computer software industry experience focusing on encryption and security for Big Data environments. His background ranges from device management in the telecommunications sector to GIS and database systems. He holds a Diploma from the FH Regensburg, Germany in computer science.

[1] "Improve your data security and keep the hackers out" –Dick Bussiere, Tenable Network Security http://intheblack.com/articles/2015/06/01/improve-your-data-security-and-keep-the-hackers-out

You wouldn't jump out of an airplane unless you knew your parachute worked – would you?



No, of course you wouldn't. But that's effectively what many companies do when they rely on active/passive or tape-based business continuity solutions. Many companies never complete a practice failover exercise because these solutions are difficult to test. They later find out the hard way that their recovery plan doesn't work when they really need it.

HPE Shadowbase data replication software supports advanced business continuity architectures that overcome the uncertainties of active/passive or tape-based solutions. You wouldn't jump out of an airplane without a working parachute, so don't rely on inadequate recovery solutions to maintain critical IT services when the time comes.

With HPE Shadowbase software, you'll know your parachute will open – every time.

Find out how **HPE Shadowbase** can help you be ready for anything.
Visit www.shadowbasesoftware.com and www.hp.com/go/nonstopcontinuity.

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Tape: Absolutely Relevant Today and Tomorrow

Glenn Garrahan >> **Director of HP Business** >> Tributary Systems

"The reports of my death have been greatly exaggerated"
Samuel Clemens (Mark Twain)

Except for the fact that it was made over a century ago, Mark Twain's tongue-in-check comment on the reports of his own demise could have been made today about the state of tape, and particularly LTO, in the enterprise.

Periodically we all read articles or newsletters predicting the end of tape based storage, but the facts just don't seem to bear this out, life support just isn't required any time soon.

Magnetic Tape- a little historical context:

Magnetic tape for audio recording was first invented by Fritz Pfeumer, a German engineer, in 1928. Pfeumer's system used a ferric oxide coating on a long strip of paper. Improvements came quickly, with AEG manufacturing the recording hardware, and BASF developing the actual tape media. By the early 1940's, audio recording using magnetic tape had improved to such a degree that it was kept classified by the German government. In fact tape was used to record leadership speeches, which were then broadcast simultaneously in various locales. The quality was so good that Allied military planners couldn't determine where the original speech was given, allowing the German leadership to avoid being bombed during a speech. You might say this was the first instance of tape being used for disaster avoidance.

At the end of the Second World War, the allies discovered the German advances in audio recording with magnetic tape, and in the ensuing years companies like Ampex and Sony developed the technology for both audio and then later video recording.

The first use of tape for recoding computer data was in 1951, in conjunction with the UNIVAC 1. The media was a one-half inch wide thin metallic strip, with a recording density of 128 characters per inch on eight tracks. Ironically, the modern LTO media is also one-half inch in width, but the density is somewhat higher!

Many early tape drives were floor-standing reel-to-real units that used vacuum columns to physically buffer long U-shaped loops of tape. The two tape reels visibly fed tape through the columns, intermittently spinning the reels in rapid, unsynchronized bursts, resulting in visually striking action. Stock shots of such vacuum-column tape drives in motion, along with randomly blinking colored lights, were widely used to represent "the computer" in movies and television of the 1950's thru the 1970's.

Modern cartridge style media began to gain popularity in the 1980's, and it wasn't long before this media type displaced the open reel-to-reel units, due to the ease of use, simplicity of archiving cartridge based media, and reduced possibility of media damage when manually reloading large reels of loose tape. Cartridges have been available in several formats, modern types include DAT DDC, DLT, and of course the most ubiquitous format of all, Linear Tape Open, or LTO.

Why tape?

Archiving- As we all are aware, data is growing at an ever accelerating rate, estimates are that 90% of all data ever created originated in the previous 12 months. IDC's Digital Universe survey is estimating a massive 40 zettabytes (or 40 billion terabytes) of data will be created by 2020, up from only 3 zettabytes in 2012. Where to put this avalanche of data for the long haul? Tape! With its density and economies of scale, and an estimated 15-30 years of on-the-shelf lifespan, tape is and will remain an excellent backup and/or archival choice.

Portability- Tape media is the simplest way to move large amounts of data offsite for Disaster Recovery. Attempting to move HDD's offsite could very well result in mechanical failure of the disk due to mishandling, while a tape cartridge is extremely robust.

Dependability- LTO tape has proven more reliable than disk, especially low cost disk. The National Energy Research Scientific Computing Center (NERSC) estimates that tape cartridges are up to four orders of magnitude more reliable that SATA disk.

Sales- HP stated in their 2014 Whitepaper" The Future Direction of Tape Media" that in its first 18 months LTO 6 had surpassed its predecessor LTO 5 in terms of adoption rates. HP further stated that since the introduction of LTO in 2000, over 69 million HP MP (Metal Particle) tape cartridges have shipped to customers, and that's just HP! Why the popularity? Cost-per-terabyte of course! A 1.5 TB Native LTO 5 tape cartridge, for example, averages about $20 each. With a very realistic 2:1 compression, you're talking about a cost of only $6.70 per terabyte. Enterprise class HDD's cannot come anywhere near that number.

Performance- "Disk is faster than tape"- well, it depends. Performance is affected not only by the magnetic media type, but also the speed of the disk system and the autoloader/library. Disk will generally be faster with random access reads/writes, but for sequential reads/writes, tape will more often than not outperform HDD's, making tape the media of choice for backups, archiving, and big data.

Cloud Compatibility- Tape in the "Cloud"- why not? Many cloud data centers own massive tape libraries for long-term economic data storage. Scientific users combining cloud and tape include CERN, the Argonne National Laboratory, and NASA. In broadcasting, where absolutely massive amounts of digital film and television data require archiving, The Discovery Network is a top

Media/Drive	LTO1	LTO2	LTO3	LTO4	LTO5	LTO6	LTO7
Ultrium1 RW Media	Read/Write	Read/Write	Read Only	Not Supported	Not Supported	Not Supported	Not Supported
Ultrium2 RW Media	N/A	Read/Write	Read/Write	Read Only	Not Supported	Not Supported	Not Supported
Ultrium3 RW & WORM Media	N/A	N/A	Read/Write	Read/Write	Read Only	Not Supported	Not Supported
Ultrium4 RW & WORM Media	N/A	N/A	N/A	Read/Write	Read/Write	Read Only	Not Supported
Ultrium5 RW & WORM Media	N/A	N/A	N/A	N/A	Read/Write	Read/Write	Read Only
Ultrium6 RW & WORM Media	N/A	N/A	N/A	N/A	N/A	Read/Write	Read/Write
Ultrium7 RW & WORM Media	N/A	N/A	N/A	N/A	N/A	N/A	Read/Write
UCC	Yes	Yes	Yes	Yes	Yes	Yes	Yes

example. In education, USC (University of Southern California) uses tape-based storage to archive digital holdings in the cloud. Importantly, tape allows reduced size of Cloud data repositories by allowing "cold" data to be move off more expensive disk. Tape and "Cloud" are partners, not adversaries….

Hmmm, doesn't seem that tape needs the resuscitator just yet...

About LTO

LTO Ultrium tape was first made available to the marketplace in 2000. Developed and controlled by a consortium of companies, Hewlett-Packard, IBM, and Quantum, LTO quickly became the dominate enterprise tape drive type, competing favorably DAT, DLT, AIT, and all other mid-range devices. Actually, both DLT and AIT are no longer in production, having been entirely displaced by LTO.

Currently LTO is in its sixth generation, with LTO 6 initially introduced in 2012. LTO 7, the next iteration, is just on the horizon, with FCS imminent. LTO 7 media will provide a native capacity of 6.4 TB per cartridge at a cost of pennies per gigabyte. Each generation of LTO has enhanced both media capacity and speed, while allowing for media compatibility with previous generations. Protection of customer investment in LTO was a major criterion of the product line, thus the compatibility requirement: *(see above)*

All generations of LTO, from LTO 3 onward, can read and write to the current and the previous generation of media, and can read-only back two generations.

The LTO Roadmap

The LTO consortium has released a tentative roadmap confirming that at this time 3 additional generations of LTO, beyond LTO 7, are planned, again protecting that all important customer investment in LTO tape well into the 2020's: *(see next page)*

LTO Specifically for HPE NonStop Customers

HP NonStop first introduced LTO 2 for attachment to NonStop servers in 2003. Since then, all subsequent generations of LTO have been qualified by HPE NonStop. For the past 12 years, LTO tape drives have proven to be extremely reliable and robust while managing big data for the world's most demanding customers. Today, LTO is the only tape technology HP NonStop continues to employ in mission critical server applications.

LTO 6 Tape Technology is available to NonStop customers, including those with the latest NonStop X Servers!

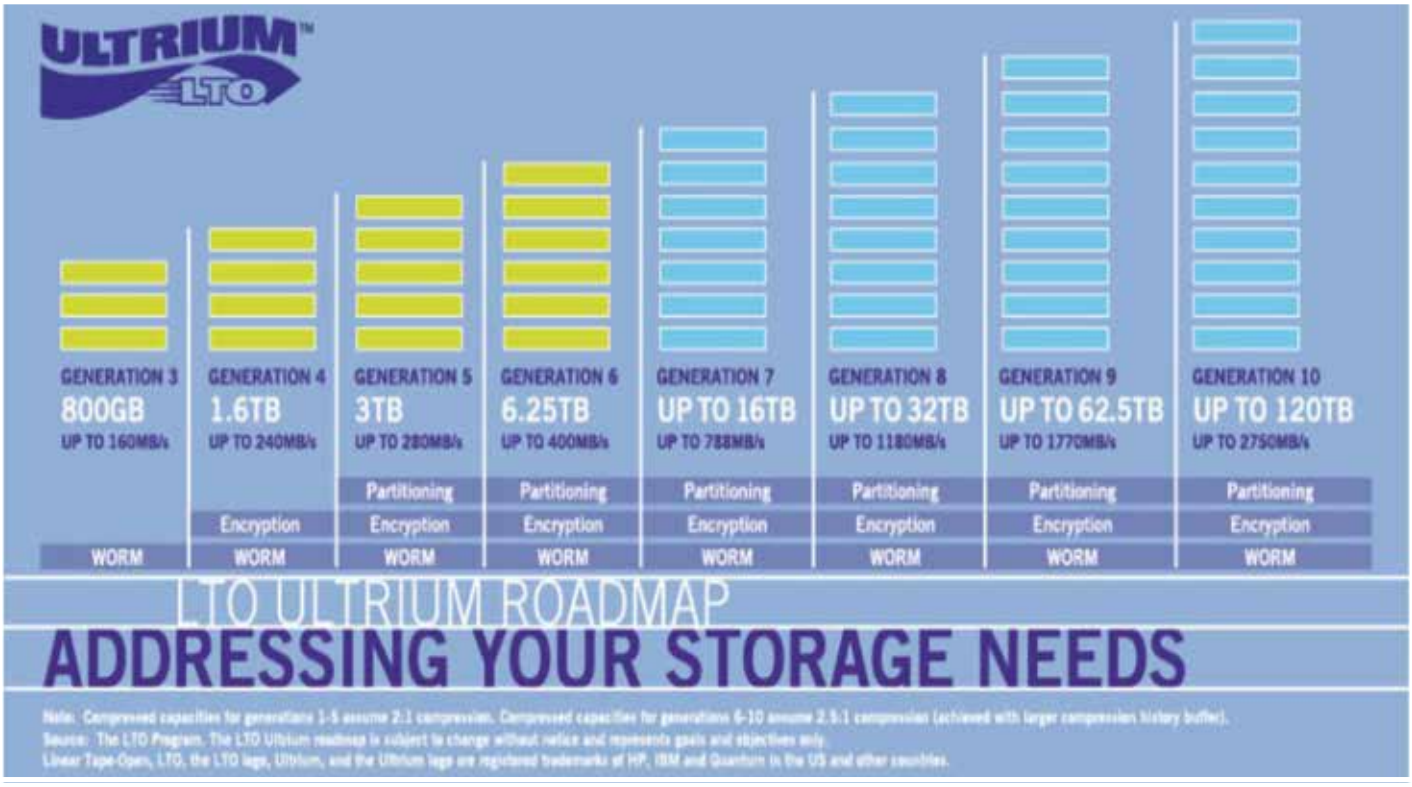
LTO 6 Tape Devices are offered for NonStop NS and NB systems running the J-Series operating system, and for the new NonStop X systems employing the L-Series operating system.

The LTO 6 is available in three models:

- **M8801A** Rack Mount 24 Cartridge ACL w/FC interface
- **M8802A** Table Top 24 Cartridge ACL w/FC interface
- **M8805A** Table Top Single Cartridge w/SAS interface

Important features LTO 6 Tape Drives offer include:

- **Dependability:** Sets new standards for data integrity and reliability with a simple and robust design based on inherently reliable Linear Tape Open (LTO) time proven technology
- **High Capacity:** Stores up to 6.25 TB per LTO 6 data cartridge assuming 2.5:1 compression
- **Reliability:** Protects your data with a simple, high integrity, data path including read and write dynamic random access memory
- **Security:** Fully supports ESKM (Enterprise Secure Key Manager) versions 2.1 and 3.0
- **Compatibility:** LTO 6 drives read and write to LTO 6 and LTO 5 media, and read-only LTO 4 media
- **Speed:** Minimizes interruptions with high speed and data rate matching that squeezes optimal performance from your NonStop Server
- **Cost:** Recall that LTO 6 drives can read and write to economical LTO 5 cartridges, offering a dollar per terabyte archiving cost that no VTL can match
- **RVU Requirements:** J06.18 or later, all L-Series OS releases



If reading NonStop formatted LTO 3 Tape Cartridges is still a requirement, LTO 5 drives continue to be offered by Tributary Systems

The LTO 5 is available in three models:

- **M8701A** Rack Mount 24 Cartridge ACL w/FC interface
- **M8702A** Table Top 24 Cartridge ACL w/FC interface
- **M8705A** Table Top Single Cartridge w/SAS interface

LTO 5 features are similar to LTO 6 with the following exceptions:

- **Capacity:** Stores up to 3.0 TB per LTO 5 data cartridge assuming 2.0:1 compression, or 72 TB with the full 24 cartridge capacity of the M8701A/M8702A.
- **Compatibility:** LTO 5 drives read and write to LTO 5 and LTO 4 media, and read-only LTO 3 media
- **Lowest Cost:** LTO 5 cartridges average $20 each, or $480 in media to completely populate the M8701A or M8702A ACL drives. There's no lower cost method to store 72 TB of data, only $6.70 in media cost per TB! No VTL can match the low cost of LTO when it comes to data archiving.
- **RVU Requirements:** H06.25/J06.14 or later; not supported with L-series OS releases.

And remember, the LTO consortium of HP, IBM and Quantum has announced that this technology will continue at least through LTO 10, to be released sometime in the 2020's, so the LTO Tape Roadmap looks healthy and robust for many years to come!

Glenn is currently Director of HP Business for Tributary Systems. Prior to that, Glenn spent 17 years as a Program and Product Manager at Tandem, Compaq, and finally HP, always with NonStop.

Back for More...

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

Among my many commitments to writing perhaps my association with The Connection predates all else. Looking back through past issues I came across the July – August, 2006, issue of The Connection where the Editor's Note (by then Managing Editor, Carrie Durnell) welcomed, "the inaugural issue for a new column … 'Real Time View.'" Who would have guessed that this simple undertaking almost ten years ago would have allowed me to continue providing commentaries and posts as I now do!

It was just eighteen months later, in January, 2008, that I submitted my first "Musings on NonStop" to the editor of the e/Newsletter, Tandemworld, Dave Barnes. The not too surprising thing about these early commitments has been that they came at a time of great transition taking place across the world of media. While Tandemworld only exists in electronic form and The Connection remains in print, they both continue to deliver updates and story lines we can all be very thankful for – particularly now that NonStop systems seem to be taking more of the spotlight within Hewlett Packard Enterprise (HPE).

It is with considerable respect of The Connection team that I congratulate all involved even as the magazine continues to be available in print form – like many, I am also now a reader of Connect Converge (C2) that shares the same editor with The Connection – and I congratulate too the many NonStop vendors who support this form of outreach through their advertising support. Let it continue, by all means and for those vendors still undecided, this is too good a publication to suffer in any fashion from lack of funding so yes, take a look at your marketing budgets and find whatever ways you can to support The Connection.

In that first Real Time View column of July – August, 2006, I wrote of how my immediate focus would be on the data center, covering many combinations of server platforms and infrastructure we all rely on to support our business. A little deeper into the column, I noted how today, the data center is a very complex place – we have primary, secondary and even tertiary locations. We also have specialize serves supporting databases, separate servers handling applications, and even different configurations in support of anything connected to the Web servicing up Web pages. I concluded with the observation nearly a decade ago, writing of how today (2006), we have a heterogeneous data center where almost nothing from the past has survived.

Combinations of server platforms and infrastructure; data centers, as very complex places; and, by way of observation, heterogeneous data centers! For the most part, those observations remain true today even as we throw additional spotlights on transformation and even containers and composability. Those of our community fortunate to be able to attend the 2015 HP Discover event of December, 2015, held in London, would have heard the remarks of Martin Fink, EVP and CTO of HPE. His keynote presentation is now available on You Tube – look for the video of Martin, ***HPE Discover London - Wednesday General Session - Martin Fink***. It's 25 minutes of really good viewing and yes, it's one time where watching the pictures tells a much bigger story.

According to Martin, HPE is making huge bets on the combination of existing data center solutions along with private cloud deployments. Furthermore, transformation is a key message even as hybrid computing represents a key element in HPE's execution, but there is a lot more being said as well. Even as we have heard so much about transformation, what may be news to some is that transformation areas themselves are not static – they are evolving as well. Yes, transformation is on the move!

Martin then reveals how it's not just the introduction of new technology or even private clouds so much as it is recognition that there are other parameters in play. The new issue with transformation quickly becomes one of scale – as you start with transformation to a hybrid (including cloud) you quickly run into the problem of scale. As your business continues to demand faster insights from more data, Martin suggests, then clearly there will be more data and with more data there are more apps and this ends up meaning there is more infrastructure to where eventually you need more people. Ideal? Well, not exactly!

All this is by way of introducing what comes next. As Martin states in the video, at HPE there is a belief that the path to a transformed hybrid infrastructure is composability, but not just at a systems level or even infrastructure, but in support of applications as well. In fact it is the goal to have composable apps which drive composability deeper down the stack and in order to better equip developers and administrators to do this, containers enters the discussion. Those present at July 2015 HP Discover Las Vegas will have heard more than one HPE executive talking about containers, but it turns out HPE isn't talking about conventional containers but rather something new – a ContainerOS. HPE's solution to virtualization? Quite probably – and yes, here's the really neat thing. As I look out another ten years to 2026 I see NonStop running as a standalone system, atop a ContainerOS, actually providing value to the ContainerOS.

Consider this a teaser for what is to come from me in future columns, musings, commentaries and posts. Look too for webinars sponsored by clients where I will go much deeper into what I see coming from HPE in the near term as well as further out. NonStop properties of availability and scale remain as important today as they ever have been, but increasingly so not just for NonStop users but HPE itself. Differentiating ContainerOS projects with superior availability and yes, that all important scalability, has to be a windfall for HPE and with that, expect to read even more from all involved in the media.

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