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Business white paper

ERICSSON 

HPE and Ericsson work together on a significant benchmarking project



Executive summary

Communication technology specialist Ericsson uses stringent and regular benchmarking to validate the performance of its products and to ensure they keep up with new technologies and changing demands.

Having run previous benchmarks on its flagship billing and customer care system BSCS iX, Ericsson needed to validate the latest version, BSCS iX 4.0, on x86 platforms with increased workloads and more complex billing scenarios.

The choice of platform was crucial so Ericsson turned to its valued partner HPE to provide the necessary hardware. HPE ProLiant servers were combined with HPE StoreServ 3PAR storage and the necessary HPE networking for seven months of rigorous testing carried out at HPE's European Performance Benchmark Centre (EPC) in Böblingen, Germany.



Figure 1. The benchmarking of the Ericsson Billing Solutions was carried out in HPE European Performance Benchmark Center in Böblingen



Figure 2. HPE 3PAR 7400 StoreServ Storage, a key part of the scalability benchmark

The objective was to certify that BSCS iX 4.0 can support 65 million or more subscribers running complex workloads and can also provide a single solution for handling the simultaneous billing and rating workload generated by such subscriber numbers. The further aim was to eliminate any software or hardware limitations that may be discovered in the benchmark. All these objectives were achieved with a wide margin.

Serving a growing market

A recent Ericsson Mobility Report predicts a tenfold growth in mobile data traffic between 2013 and 2019 with the fastest growing segment, video, expected to increase by 13 times. Social networking is expected to grow tenfold by 2019; audio traffic eightfold and Web browsing sixfold. Another growing trend is Machine-to-Machine (M2M) communication and Internet of Things (IoT)—physical objects embedded with electronics that enable them to exchange data with other connected devices. At the end of 2013 there were 200 million cellular M2M devices in active use and this is expected to be three or four times larger by 2019.

Specialised solution

Operators need to profitably monetise the huge growth in traffic by offering greater levels of personalisation and supporting new business models. Convergent charging, billing and customer care systems are critical to be able offer a choice of service packages that suit the consumers’ lifestyle or business needs. This level of growth will only be profitably sustained if these vital back-end business support infrastructures are also in place.

Ericsson answers these needs with its award-winning product, BSCS iX 4.0. It is a significant part of Ericsson’s end-to-end OSS/BSS portfolio and forms a major component in Ericsson’s Charging & Billing in One (CBiO) solution. CBiO offers an end-to-end real-time, rating billing and customer care solution for any type of operator from the fixed, mobile, broadband and TV sectors.

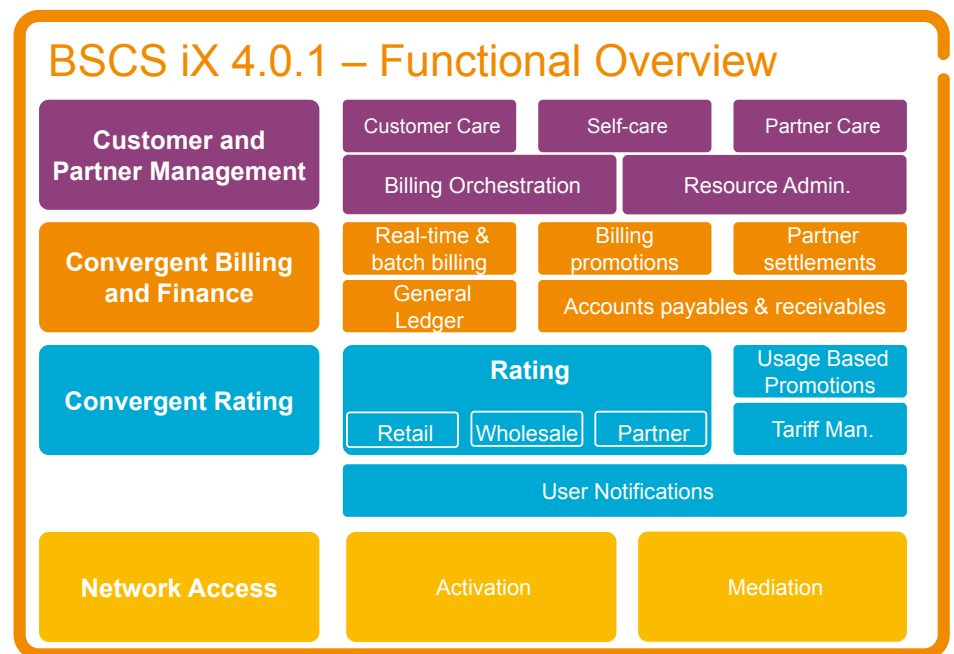


Figure 3. Functional Overview of the BSCS solution

BSCS has been continually evolved over more than 20 years to reflect operators’ changing needs and Ericsson’s deep industry knowledge and with over 150 installations in more than 80 countries, it now supports well over 350 million subscribers.

Built from modular components, BSCS iX is designed as a cost-effective way to meet telecom operators’ end-to-end business billing needs. It can handle any type of customer or partner and incorporates multi-tenancy capabilities for handling Mobile Virtual Network Operators (MVNOs) and businesses with many subsidiaries.

BSCS iX combines out-of-the box features with high configurability and the agility to rapidly adapt to business change.

Its industry-leading feature set includes:

- **Customer and partner management.** which delivers support for convergent prepaid and postpaid services in one contract and convergent handling of services from different markets and technologies. All customer and partner administration uses one common database with a common set of functionality and a rich set of billing functionality.
- **Convergent billing and finances.** BSCS iX offers flexible on-demand billing with configurable tax, multi-currency support, promotion management, configurable rounding algorithms and open interfaces. The billing module can gather all charges, instantaneously, relating to any service for a current settlement period—including those provided by MVNOs, content providers, subsidiaries and others. It supports both batch and on-demand billing modes for customer and partner documents and its split-billing capabilities allow separation of corporate and private invoices with different charging events based on flexible criteria.
- **Rating.** BSCS iX 4.0 incorporates a rating engine that can rate any type of usage from any network technology. The system can perform rating for retail subscriber usage or usage by any kind of business partner, including roaming partners, service and content providers, inter-connect carriers and external carriers. The assigned tariff models for all types of products can be configured and used to rate traffic and content usage and price usage-independent charges.

Need for validation

“The success of our software is strongly dependent on the hardware it runs on,” explains Ignacio Condado of Ericsson’s Product Management Organisation. “Because we are purely a software vendor, we don’t supply the hardware to run this particular solution but we do make recommendations on what hardware to use. Based on the testing and validation we have performed, we are able to tell our customers what level of hardware, number of processors and amount of memory is needed to reach a certain level of performance, for example, to support a certain number of subscribers. Storage is the most critical aspect of and BSCS iX deployment and as such it is important to make sure that this is right.”

In the past, Ericsson has tried to simplify its offering by selling turnkey solutions using standard hardware configurations for a standard price but in reality, customer requirements are too individual for this approach to succeed. The sheer configurability of BSCS iX combined with the complexity of the job is huge and that is why turnkey solutions are not suitable. To start with, the system has to be primed with the individual deals offered to customers such as the number of free calls, data limitations, family and friends calls and features like call waiting and call identification. Their credit has to be checked then once their ID is created, all their specific notifications have to be set up on the network. If the subscriber is roaming then information on call duration has to be collected from different antennae and everything has to be consolidated into one single record. This is checked with the caller ID and then the appropriate tariffs, discounts or promotions are applied.

Corporate accounts are also difficult as Condado explains: “large companies can have complex hierarchical structures with all their different departments. There may be different prices for each one, managers may get special deals or phones or there may be restrictions such as a limit on number of international calls. There is also the possibility of employees being able to create packages for their families.”

Storage and archiving are other critical variables. Different countries have different laws concerning the length of time data must be retained and these can vary from a few months up to many years. If every single call, download or SMS event needs to be saved for millions of people for many years, this has an influence on storage requirements.

“Considering the size and the dimension of the solution, we decide which hardware will be needed”, adds Condado. “We take into account dimension guides and the parameters which may be, for example, the need to support five million subscribers with 50 services, each with 50 transactions per day. This shows the number of CPUs needed, the memory, the storage and so on and the only way we can make those calculations is use data from hardware benchmarks.”

“When we make claims about our software to the market they need to be qualified. We cannot make statements about speed and performance without relating it to a specific hardware platform.”

When Ericsson makes recommendations on what hardware to use, it must be confident that the hardware platform will support the performance claims made for the software and that means putting it through stringent benchmark verification.

Hardware selection

One of the most rigorous benchmark projects was recently carried out on an HPE hardware platform. This was done not only to establish the scalability of HPE BSCS iX 4.0 but also to verify its performance on newer and more cost effective x86 platforms.

So, since the software is hardware agnostic, why was HPE selected?

“It’s not just hardware and software working together but also people working together with a shared enthusiasm to make this a success,” says Condado. “We choose to work with HPE because we’ve had a successful relationship with them for over 15 years.”

The benchmark tests were carried out over a seven month period at HPE’s Performance Benchmark Centre in Böblingen, Germany. It featured a mix of available x86 HPE ProLiant servers, HPE 3PAR StoreServ Storage and HPE Networking switches.



Figure 4. HPE BladeSystem c7000 enclosure with server blades + DL580 Gen8 rackmount server

In total, 12 DL ProLiant servers of various models, four BL ProLiant blade servers and three HPE StoreServ 3PAR Storage units were used along with HPE Networking Ethernet and StoreFabric switches. The server platform included DL980 Gen7s, the three largest of which had 4TB of RAM; some smaller DL 580 Gen8, and DL380 Gen8 machines and sixteen BL460c Gen 8 blades.

From the outset, the tests were over-provisioned with servers but vital storage was added incrementally as workloads were ramped up. It started with one 3PAR with 200TB capacity then added a second with 50TB then a final one with a further 200TB.

The platform was designed to take account of the fact that, in addition to Input/Output Operations per Second (IOPS), bandwidth and low latency are important for BSCS. The application generates large I/O sizes which quickly eat up the available bandwidth and also generates some small block I/O. The key to good BSCS iX performance is to be able to keep the latencies down despite of this I/O mix. That is where HPE 3PAR excels with its separation of I/O command path (always small blocks) and data paths (all sorts of block sizes), multi-layer virtualisation/wide striping and other advanced technologies that strengthen I/O performance and fight latency.

Having received the request from Ericsson in mid-March, 2014, the HPE benchmark hardware was assembled by mid-April.

“Ericsson called this a scalability exercise,” says HPE’s solution architect, Eero Laurila. “They wanted to turn up the volume on their billing system to see how far they could scale the application and that would enable them to go after larger deployments than they could before. Because the software had gone through various platform evolutions over the years, they wanted to validate new claims that could be made when running the solution on the latest HPE hardware and storage. The largest production installation currently in the field was around 10 million subscribers so that was the established baseline.”

“Centre stage was the storage I/O performance because everything that happens in the billing domain has to be auditable and connected to the database. It has to be persistent and you cannot afford to lose any of the input data, such as invoicing information. Everything has to be posted into permanent storage. The bigger the system gets, the more the storage sub-system is going to be stretched. If the storage sub-system cannot perform, the whole thing will not perform so that is why the storage is so important in billing.”

One of HPE’s challenges was to convey an understanding of the modern storage architecture to Ericsson engineers who were used to legacy architectures. They were surprised at how much easier their work would be with HPE 3PAR which eliminates the need for tasks such as allocating disk spindles, sector sizes and aligning I/Os. The HPE team also had to ensure that they had enough fibre channel bandwidth between the servers and storage to cope with the level of traffic enabled by the latest storage. In addition to the three storage units, the entire set-up consisted of some 25 servers and more than 100 fibre channel ports to be wired up and zoned in an optimal fashion.

The platform was then made available to the Ericsson team who were to conduct the testing but HPE specialists continued to be on hand to add additional storage and make changes to hardware configurations required by technologies such as HPE 3PAR Peer Motion and Remote Copy.

Validation of the software

“The hardware vendors have been going to x86 architecture with the Intel family of processors that are much better value so hardware prices can be brought down,” says Condado.

“Also, even though faster and more efficient x86 and Intel technology is used, we have had to establish a new baseline to validate performance with heavier workloads, the evolved version of BSCS iX and current servers and storage. With that in mind, we wanted this benchmark to show that we could comfortably support 65 million subscribers on the relatively affordable processors.”

“We started with one storage unit and an overblown compute layer and the storage capacity requirement rose as the project progressed. We took this approach because our BSCS iX vanilla deployment is not optimised when it goes into testing so it was an iterative performance process for us, basically squeezing as much as we could from our software in terms of scalability and tuning.”

“HPE supported us by providing all the hardware on demand so we only stopped when we had completely saturated all the compute nodes on billing and rating.”

For the rating element of the system there was a KPI of 500 million usage records an hour with 800 million duplicated records to be processed in an hour. The KPI was based on 65 million subscribers making 50 calls, SMS or other events per day but the final test bed was 15 million deactivated and 65 million activated contracts, meaning that 15 million were billed without call records and 65 million with call records. This resulted in approximately three billion rated records in the system in eight hours, or 90TB of rated records per month. On occasions, the system was able to rate between five and six billion usage records in a daily period. The rating throughput started with 40 million records per hour and ended up with 500 million rated records per hour.

For billing, the KPI was to bill two million customers which meant processing three billion rated records every day in a window of six to eight hours with around six hours of bill time. In fact, the system was able to bill two million customers with three billion rated records in three hours—1 billion records per hour. This meant that the KPI was exceeded by two to three times and to bring the simulations in line with a real situation, this was achieved while billing was being run in parallel with rating. To be precise, billing time was dependent on the number of records to be billed, thus 90 billion records could be billed in 90 hours or 3.75 days. The actual KPI was 7.5 to 10 days so this was exceeded by 2.7 times.

“These kinds of figures had never been reached before in BSCS history. In average, we ended up billing at a rate of 1 billion calls per hour”, adds Ericsson solution architect, Igor Kersic.

Results

“Based on the benchmarks we have performed we have proven scalability for over 65 million subscribers on HPE hardware. So with an affordable hardware platform using the latest technology in terms of hardware and billing software has allowed us to prove that the BSCS iX system can scale to manage the massive volumes of data generated by huge operators” says Condado.

Ericsson’s current strategy is that, HPE is the preferred platform for BSCS iX 4.0 and when customers know what hardware has been validated they usually buy in line with that blueprint.

The tests not only verified the hardware platform but also the highlighted improvements which can be made to the software.

“With the benchmark, we not only stretched the system to the maximum for billing, rating and customer care but we also did everything in parallel, like a normal operator would do,” adds Kersic. “When you do this kind of mixed workload you have a lot of contentions, not only from a hardware point of view but also from a software point of view. The testing has helped us identify a lot of internal design changes that will enable our product to be much more scalable than before. We triggered many change requests as a result of this benchmark.”

The future-proof scalability of the solution is also important. Ericsson software is constantly being adapted to address the perceived need of customers up to 2020, taking account of growing traffic caused by such things as M2M and IoT technology.

Since data storage is such a crucial element, performance and functionality of the HPE StoreServ 3PAR units was important.

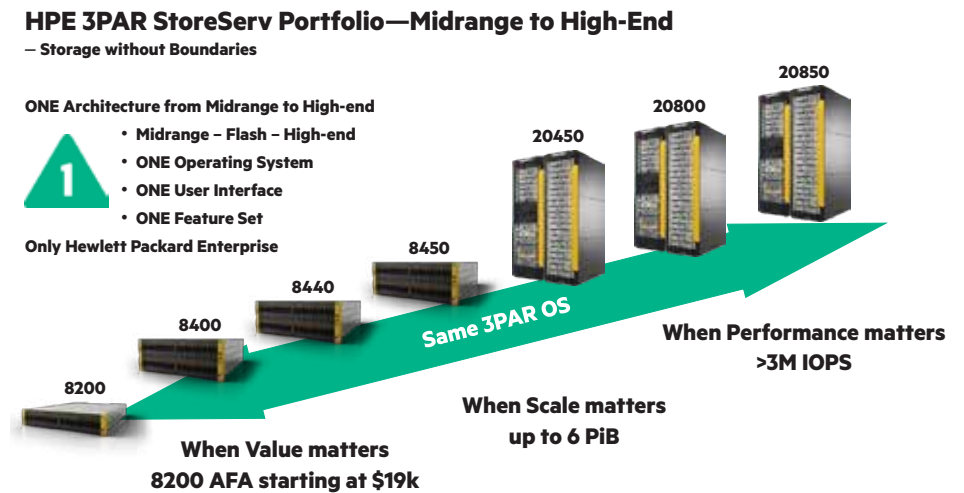


Figure 5. HPE 3PAR Product Family

“Using HPE 3PAR enabled us to see the bottlenecks in our applications,” says Ericsson senior business solutions consultant, Lazar Nakinov. “The 3PAR storage was so fast that our applications were waiting to be executed on the machine side so we had to do some changes and optimisations on our side to ensure they could work in sync. This has enabled us to upgrade the quality of our product.”

The Ericsson team was also impressed by HPE 3PAR’s Adaptive Optimisation functionality which is a granular, policy-driven, autonomic storage tiering solution. As Condado explains: “this means we can provide a layered offering when we sell. If you are second tier we can give you a cheaper solution and be more competitive on the market with this feature but still be sufficiently performant.”

HPE 3PAR’s Quality of Service (QoS) is another key feature of benefit to Ericsson.

“Users who want to do something on our system can do it, even if it’s third party or add-on so we didn’t have any quality control of the I/O workload. Basically, this was sucking up our performance capacity by running non-Ericsson apps or ad-hoc SQL queries against our databases. We were then being blamed for inadequate performance which meant we were losing KPIs and SLA fulfilment but we could never prove this,” says Condado. “SLAs failed and we couldn’t commit to them because we couldn’t black box BSCS. Now, with the QoS in 3PAR, we are able to create precise BSCS I/O boundaries so we can vouch for our SLA KPIs and that’s a major thing for us. We can now fulfil our SLAs because we can segment third party systems.”

The elasticity of virtualised storage also means that the Ericsson offering is now more competitive, reducing customers’ CAPEX and risk because they know that their initial decisions are not cast in concrete. Previously, customers had to over-engineer to allow for future expansion but now, they can buy for present needs then seamlessly add more storage when required. This versatility is also supported by HPE 3PAR’s adaptive optimisation and Peer Motion functionality.

“Now, if customers call after two years and say they need more storage, we just glue on another box when before it could take up to six months. The speed and risk lowering are unbelievable,” adds Kersic. “The best part is that all of these features and all of this technology are simple to use. There’s no need for expensive training. With 3PAR we just had two or three sessions and in a couple of minutes we had everything up and running. We were amazed at how easy it is to configure. The ease of use, set up and management is unmatched and is something we have never seen before.”

Nakinov adds: “we set up 3PAR’s adaptive optimisation on one LUN and after 45 minutes, you could immediately see the KPI improving. It was like magic. Also, during the benchmark, we were overwhelmed by the overall co-operation of the HPE Performance Center. We’ve never seen such quick response times or quality of service from any other partner that we have done benchmarking with before. We would make a phone call and ask for something and after a couple of minutes it was done. It was a push button service and in fact, sometimes we were holding back, not wanting to ask for too much.”

And a final word from Condado: “following the benchmark we now have the confidence to offer our service to customers with 65 million subscribers or more because we have proved it on HPE hardware. The potential reduction in their TCO is unbelievable and their ability to drive operational efficiency is huge.”

Key takeaways

- It has been proven that BSCS iX 4.0 running on ProLiant x86 servers, HPE Networking and SAN switches with HPE 3PAR storage, can support over 65 million subscribers—a future-proof scalability that can be used by the Ericsson's customers
- The rating element of BSCS iX 4.0 can cope with 500 million rated records per hour
- The system was able to bill two million subscribers with three billion rated records in 2 hours
- HPE 3PAR excels as BSCS storage with advanced technologies improving I/O performance and killing latencies
- The speed of HPE 3PAR highlighted bottlenecks in the software which led to product quality enhancements and improved performance
- Ericsson can now confidently reach and safeguard their SLAs and KPIs because of HPE 3PAR's Quality of Service (QoS) functionality allows fine-grained IO performance allocation to the solution elements that need it
- The elasticity of virtualised storage enables Ericsson customers to reduce CAPEX by only buying for today and not overspending to meet anticipated future needs
- With ease of management and configuration, customer TCO goes down while operational efficiency grows



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