Epic EHR and IBM POWER9

Highlights

- IBM® Power Systems™ Healthcare Solution Editions are competitively priced and configured specifically for the needs of Epic environments
- Scalability: IBM POWER9™ servers are optimized specifically for Epic workloads, and have demonstrated a new high-water mark for growth on Epic workloads
- Simplicity: With POWER9, most organizations can run their entire Epic workload using a simpler, more cost-efficient symmetric multiprocessing (SMP) configuration
- Reliability: POWER9 has a number of RAS improvements over previous IBM servers, including error avoidance and self-healing capabilities, and is part of an IBM server family that has consistently demonstrated industry-leading reliability
- Availability: Among mainstream servers, IBM POWER8 and IBM POWER9 platforms delivered the highest levels of uptime according to 2019 ITIC's 2019 Global Server survey[1]
- POWER9 integrates with IBM Flash Storage technology to create the ideal platform for running Epic workloads

The global adoption and optimization of electronic health records (EHRs) in recent years are pressuring many healthcare organizations to reevaluate their IT infrastructures. As healthcare networks grow larger and more complex, the IT infrastructure, with server platforms at the core, that may have worked fine in the past are now being stretched to their limits.

IBM Power Systems has an extensive track record of providing the server infrastructure needed to support EHRs. For over 10 years, IBM has collaborated with Epic, a leading healthcare software vendor, to help customers better manage their healthcare environments. Now, healthcare customers can take advantage of POWER9-based servers, the most advanced high-performance Power Systems offering to-date.

POWER9 servers are, by-design, built for the most data-intensive and demanding workloads. Whether it's AI, cloud infrastructure or the ability to run mission-critical applications, like EHR, with ease, Power Systems is the platform-of-choice.

More specifically, the new POWER9 Healthcare Solution Editions are well positioned to help healthcare organizations manage the new generation of healthcare requirements, offering the scalability, simplicity, and reliability that today's Epic workloads demand. The Healthcare Solution Editions are an important symbol of IBM's dedication to helping our customers succeed, as demonstrated by our #1 ranking in the IDC Health Insights HealthTech Rankings Enterprise Top 25.[2]

To strengthen the Epic IT environment, integrating IBM FlashSystem Storage technology with POWER9 Healthcare Solution Editions helps create an even stronger IT infrastructure for running Epic workloads. Data storage with a unified set of software, APIs and tools can be greatly simplified.

IBM FlashSystem family (which now includes products formerly known as Storwize) addresses the entire range of storage needs with one data platform.

Power Systems Solution Editions for Healthcare

With IBM Power Systems Solution Editions for Healthcare, organizations can take advantage of Power Systems configurations built specifically for the needs of EPIC EHR clients.

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The Solution Editions are priced to compete, and come prepackaged with IBM Power Systems software, making them quick and simple to deploy. In addition, they are all configured to meet the documented requirements of Epic solutions, helping your Epic environment run to its full potential.

The Power Systems Solution Editions for Healthcare include:

- Power S924
- Power E950
- Power E980

POWER9-based architecture optimized for Epic

An IBM team of engineers for POWER9 servers work with Epic, as well as InterSystems, the developer of Caché (the Epic operational database) to develop enhancements to the POWER9 architecture that are specifically designed to optimize Epic workloads. As a result, POWER9 servers offer unsurpassed scalability for Epic deployments, provide excellent configuration flexibility and deliver system growth potential.

In addition to the performance improvements illustrated in the table below (Figure 1), here are additional examples of enhancements the IBM team developed specifically to handle Epic workloads better:

- Balanced processor speed and inter-processor communications bandwidth
- Reduced the maximum number of "hops" required for communication between any two processors
- Increased both memory capacity and memory bandwidth
- Collaborated with InterSystems to enhance the design of Caché for faster processing

Scalability

Epic reigns supreme in the 500-bed category with 58% share of the market vs 27% by Cerner according to the 2019 KLAS Research Study.[3] Mergers, acquisitions and standardization to a single EHR are defining the healthcare industry.[3]

These industry trends, together with business goals to sustain market leadership, put pressure on Epic EHR clients — ranging from small hospitals to fully integrated regional healthcare networks that serve millions of patients — to implement a scalable IT infrastructure. The ability to scale, support growth and stay ahead of competition while delivering quality patient care is a top priority.

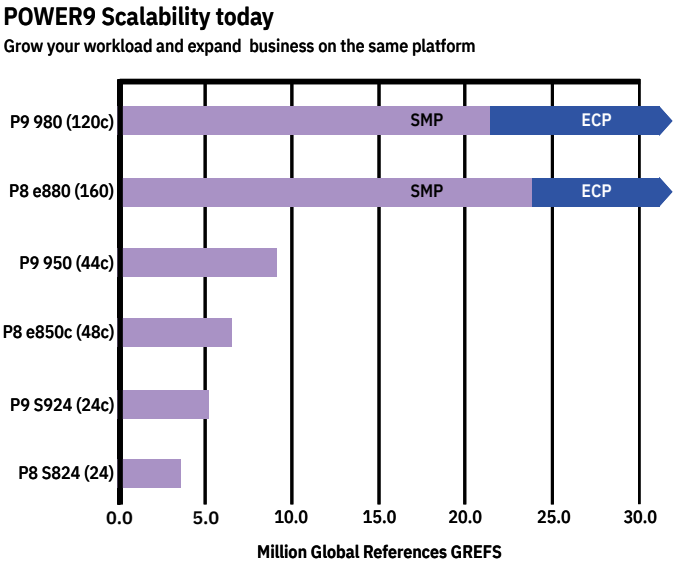

Figure 2: POWER8 and POWER9 servers will scale greater than 30M GRefs.

Epic measures application scalability using a metric known as Global References per second (GRefs), which represents the number of times per second that the database is referenced. Epic rates platforms based on the number of GRefs they can perform without degradation of response time. The graph in Figure 2 illustrates how POWER9 servers will scale to more than 30M GRefs.

Machine type	POWER8 S824 (24 cores)	POWER9 S924 (22 cores)	POWER8 E850 (48 cores)	POWER9 E950 (44 cores)
SMP GRefs	3.6 million	4.7 million	6.9 million	9.1 million
Performance Improvement	32%		32%	

Figure 1: Recent tests showed performance improvement from POWER8 to POWER9 servers.

Regardless of industry, IT installations need servers that stay ahead of workload challenges, new data sources and compute demands. It is popular knowledge that IBM POWER9 server platforms drive the world's largest super computers. That is the same processor that is ready to accelerate any enterprise and provide superior scalability.

Recent test results demonstrate the increased performance and scalability of POWER9 for Epic workloads. As shown by the table above (Figure 1), POWER9 servers achieved improved levels of scalability and performance compared to POWER8 servers while using less number of cores — performance increase for the compared scale-out systems is 32 percent and also 32 percent for the compared enterprise systems.

Performance

Built to scale data-intensive workloads and optimized for performance, IBM Power Systems delivers superior price-performance over many x86 competitors. With Power Systems, clients can take advantage of superior core performance and memory bandwidth to deliver both performance and price-performance advantages. Review the IBM Power Systems performance claims and proof points.

As examples of superior performance, POWER9 servers offer increased performance and value with 1.5x performance improvement and 2x more memory vs. POWER9[4] and 1.8x more memory bandwidth per socket and up to 57% lower solution cost vs. x86.[5,6]

Simplicity and agility

POWER9 provides the simple yet agile infrastructure foundation for a future-looking organization that is ready to meet today's business challenges and tomorrow's advancements. By updating your foundation with the latest POWER9-based servers, you can effectively run your mission-critical Epic EHR application requirements alongside modern, data-intensive workloads.

Simplicity is also offered with the backward compatibility of Power Systems. IBM clients with Epic EHR running on POWER7 or POWER8 servers have a simple straight-forward migration path to a future-forward POWER9 server and achieve their full business potential.

The Epic EHR application can be deployed using one of two different architectural topographies, as illustrated below (Figure 3).

SMP: In a symmetric multiprocessing (SMP) environment, multiple end-users share and access the main production database server directly with our intermediary processors. This is a simpler implementation and leverages POWER9 servers' increased scalability within the same platform.

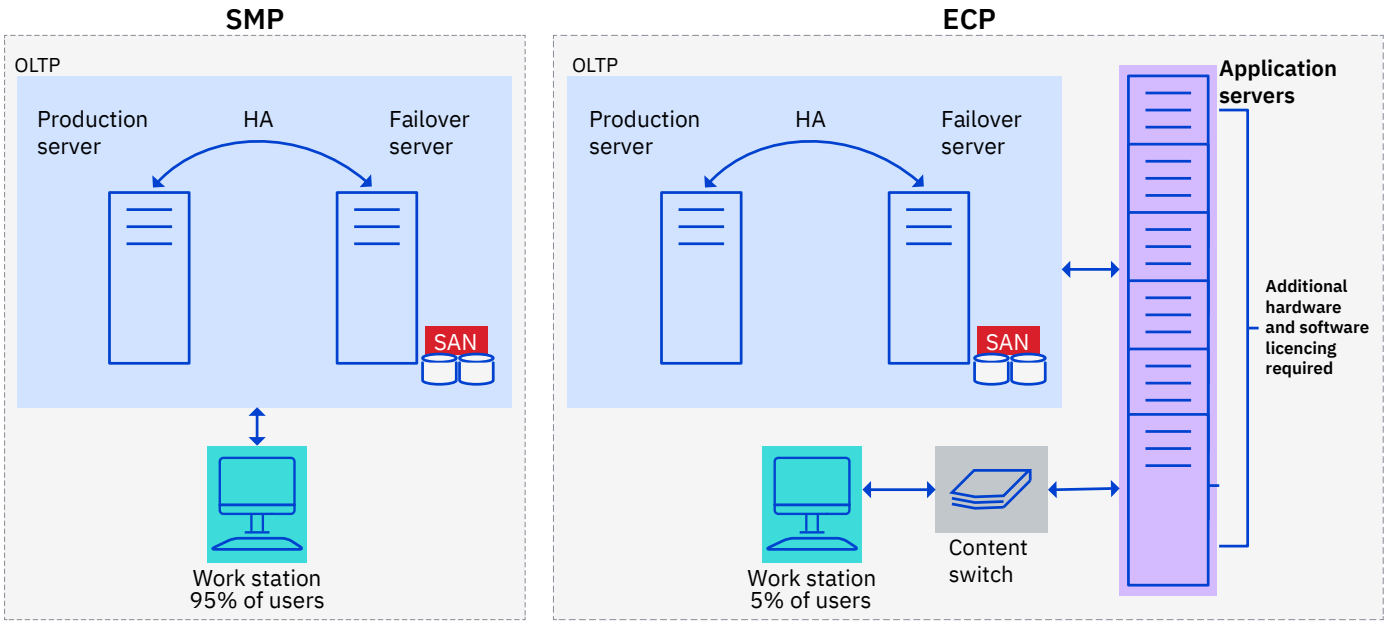

Figure 3: Two (2) typical architectural configurations for an Epic EHR deployment.

Positive results in business can often trigger a growth in IT infrastructure to cope with increased demand. Using an enterprise-class system, like POWER9 servers, many companies who support business growth with the same server platform maintain their total cost of ownership (TCO), which includes not only the cost of the machine, its hardware and software, but the cost to run it.

ECP: In an Enterprise Caché Protocol, a distributed data caching architecture manages the distribution of data among a heterogeneous network of server systems. Application servers act as intermediary, offloading some of the processing from the main production database. By distributing the workload across multiple servers to relieve applications that are computationally-bound, the ECP topography allows these environments to achieve the level of incremental scalability needed to serve many Epic users at once.

Furthermore, ECP topography enables data centers to expand, contract, and modify their infrastructure quickly and with minimal effort. It is comparable to a scale-out infrastructure that allows boundless incremental scalability of processors and storage requirements.

ECP topology also offers high availability when it is well-architected by utilizing any one of the systems failover strategies by InterSystems.®

Along side benefits of ECP are also the drawbacks including managing a more complex IT environment and increased operational cost like additional licenses for each of the Application Servers.

Reliability and availability

High reliability, uptime, and availability are imperative for today's "always on" digital networks but most especially with with EHR applications like Epic as it's the foundation of quality of patient care.

The reliability and availability of IBM servers have been recognized by industry analysts. The 2019 ITIC Global Reliability Survey rates IBM Power Systems as delivering the highest reliability, for the 11th year in a row.[1]

The ITIC report looks at several different aspects of reliability and availability. In the chart below (Figure 4), the report compares x86 vendors vs. UNIX/RISC based systems and shows that both IBM AIX on Power Systems as well as several Linux distributions running on Power Systems had the lowest

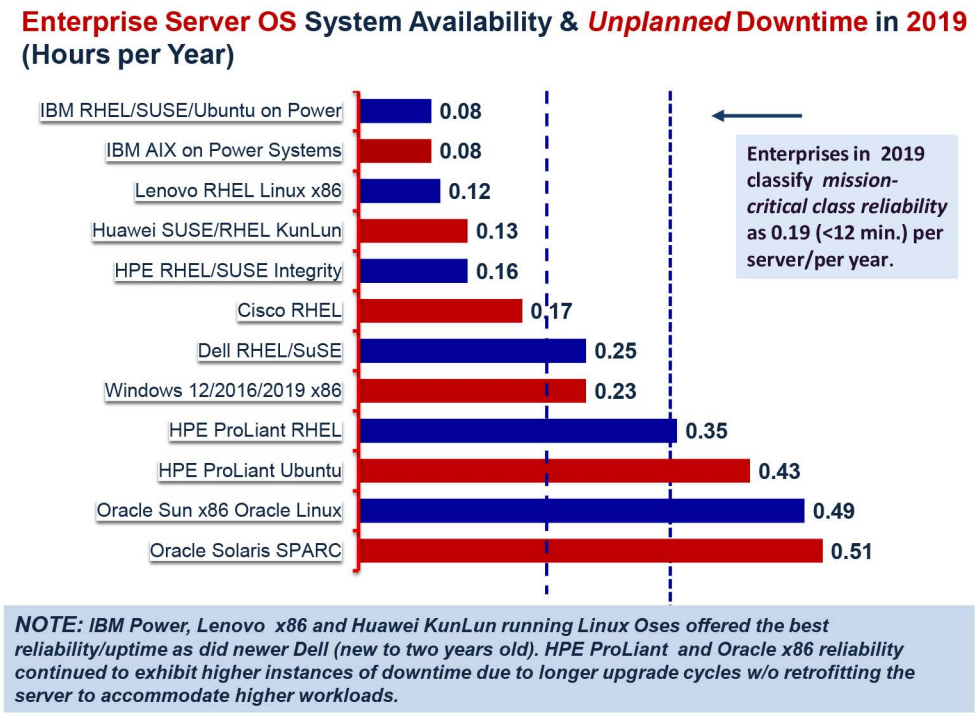

Figure 4: Ranked Number 1 in every major reliability category by ITIC

unplanned downtime of any vendor/OS combination they looked at — only 0.08 hours (less than 5 minutes) of unplanned downtime per year.

That is in stark contrast to solutions offered by Dell, HP, and Oracle, whose unplanned downtime ranged from 0.16 to 0.51 hours per year per server[1]. Enterprise clients in the survey consider 0.19 hours to be the cut-off for acceptable mission critical reliability (represented by the left-most dashed blue line in the previous chart, Figure 4).

Another impressive finding of the study is that among mainstream servers, IBM POWER8 and IBM POWER9 delivered the highest levels of uptime.[7] In addition, IBM Power Systems (and IBM Z) provided the highest levels of server, application and service availability[1].

IBM POWER9 servers are specifically designed with reliability, availability and serviceability in mind. POWER9 systems incorporate more cores, as well as threading and cache capacity enhancements. This increased capacity can improve overall server reliability by doing more work per processor socket.

When compared to POWER8 servers, POWER9[7] features a more integrated design that also contributes to greater reliability. A number of components that were located outside the processor in POWER8 have now been integrated into the POWER9 design, resulting in fewer separate modules.

POWER9 also includes numerous advancements in RAS design and technology, such as increased soft error avoidance, self-healing capabilities, and error recovery and mitigation.

To learn more about POWER9's RAS improvements, read the POWER RAS white paper.

In addition, to enhance its inherent RAS capabilities, Power Systems users can take advantage of Custom Technical Support (CTS) from IBM to supplement their basic hardware and software support. CTS can help increase reliability by providing rapid response to problems, as well as proactive support to prevent problems before they occur.

Finally, IBM PowerHA® SystemMirror for AIX can help Power Systems users experience 24/7 availability during all outage types, including software maintenance. With industry-exclusive features such as automated resource-optimized high availability and simplified management on a single pane of glass, PowerHA gives IT administrators everything they need to feel confident their Power Systems environment will be available when its needed.

Security for data protection and compliance

When a healthcare company is hacked, criminals gain access not only to health information, but also to demographic and financial data that could compromise patients' privacy and financial security — social security numbers, credit card numbers, names, birth dates and other personal identifiers.

Power Systems Security Architecture

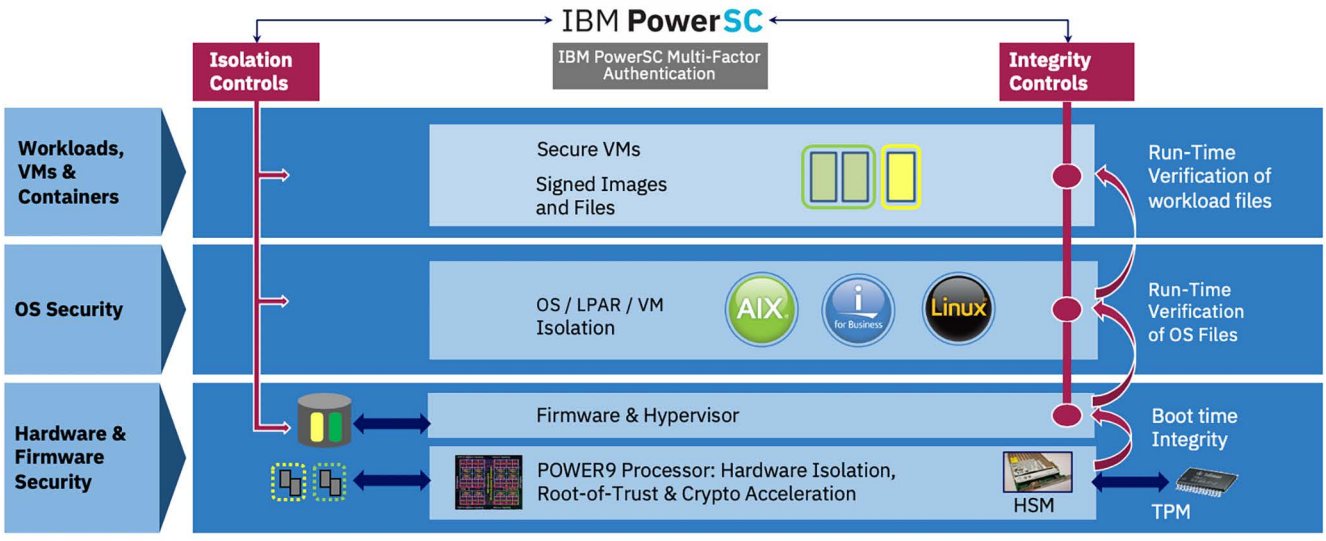

Figure 5: A multi-layered approach to security with POWER9™. Seamlessly secure and optimize your IT infrastructure.

According to a 2019 Trustwave Global Security Report a healthcare record may be valued at up to $250 per record on the black market, compared to $5.40 for the next highest value record (a payment card).[8] Taking steps to safeguard patient information is an imperative not only by Epic users but by all Healthare IT Professionals.

IBM Power Systems has security built-in at all layers, from the processor through the firmware, to the OS, to the management applications sitting on top and everything else in between — to deliver end-to-end security. See Figure 5 in the previous page for the illustration of the multi-layer security architecture of Power Systems.

- The POWER9 processor holds twice as many cryptographic engines as its POWER8® predecessor. You can encrypt data at rest or in motion at double the speed or faster across all layers of the stack.
- POWER9 boasts on-chip accelerators that compress and decom press GZIP files much faster than software. You can quickly compress and encrypt entire VMs and securely move them across the network.
- IBM PowerVM® enterprise hypervisor, has an excellent security track record when compared against major competitors, so you can confidently secure your virtual machines (VMs) and cloud environments.
- IBM Power Systems offers a wide range of leading security capabilities by its operating systems IBM AIX®, IBM i and Linux®. Features vary depending on the OS, but examples of these capabilities include being able to (a)Encrypt file-level data through individual key stores (b) Carry encryption across an entire drive (c) Measure and verify every file before it runs or opens for the requesting use.

Building on three decades of security leadership, IBM Power Systems brings with it extensive partnerships with other organizations in and outside of IBM that further deepen and broaden its security expertise. Safeguard your patient's data and privacy. Leverage POWER9 servers to protect your business with multi-layered security capabilities that scale.

Learn how you can secure your IT infrastructure for today and tomorrow's security challenges with IBM Power Systems. Download "A multi-layered approach to security with POWER9" e-book to discover more.

Integration with IBM FlashSystem family

In order to get the best results possible for Epic workloads, healthcare organizations can use POWER9 servers together with offerings from the IBM FlashSystem — one flash storage platform to simplify your hybrid multicloud. IBM FlashSystem family and Power Systems complement one another to form the ideal platform for running Epic workloads. EHRs are one area where managing exponential data growth is key. EHRs give providers rapid access to patient data when and where they need it, but only if they are supported by an effective data storage solution. To help healthcare organizations achieve continuous access to EHR data, IBM works closely with Epic, a leading provider of EHR solutions, to ensure that IBM FlashSystem offerings can easily support current and anticipated Epic workload requirements.

The IBM FlashSystem family simplifies storage for hybrid multicloud. With a unified set of software, tools and API's, hybrid flash and all flash storage array storage address the entire range of storage needs, all from one data platform that extends enterprise functionality throughout your storage estate.

Since Epic EHR deployments span all shapes and sizes of healthcare environments, this diversity of offerings is key in our ability to support as many different Epic users as possible.

For over 10 years, IBM has collaborated with Epic to help healthcare organizations optimize their IT environments. The close technical working relationship that IBM and Epic have cultivated provides fully optimized healthcare IT solutions for our joint customers.

To learn more about how IBM FlashSystem can help you get the best results from your Epic solutions, read the Electronic Health Records with Epic and IBM FlashSystem 9200 Blueprint.

IBM FlashSystem 9200 combines the performance of flash and NVM Express (NVMe) with the reliability and innovation of IBM FlashCore®technology and the rich feature set of IBM Spectrum®Virtualize in one powerful new storage platform.

About IBM Healthcare solutions

IBM is committed to helping build smarter health ecosystems. This means working with you to help you achieve simpler processes, better care insights, faster breakthroughs and improved experiences for people around the world. IBM has supported health organizations and professionals for more than a century, boasting more than 600 patents in the life sciences, healthcare and medical device fields as we marked our 27th consecutive year of U.S. patent leadership with a record 9,262 patents in 2019. Given the security breaches across all industries, IBM proudly helps secure 95% of the Fortune Global 500 and manages more than 70 billion security events every day.

For more information

To learn more about IBM Power Systems, please contact your IBM representative or IBM Business Partner or visit ibm.com/power. To learn more about IBM's work in healthcare, visit ibm.com/industries/healthcare.

1. Information Technology Intelligence Consulting, *"ITIC 2019 Global Server Hardware, Server OS Reliability Report."* March 2019. (winpro.com.sg/wp-content uploads/2019/12/itic-2019-global-server-hardware-server-os-reliability-report.pdf)

2. IDC, *"IDC Health Insights Announces Winners of the 2017 HealthTech Rankings Top 50 & Enterprise Top 25."* (idc. com/prodserv/insights/#health-healthtech_rankings)

3. KLAS Research. *"US HOSPITAL EMR MARKET SHARE 2019."* April 30, 2019. klasresearch.com/resources/blogs/2019/04/30/us-hospital-emr-market-share-2019-report

4. Solution cost is based on a comparison of IBM Power L922 (20-core, 512GB) vs. Intel Xeon SP based 2-socket server (48-core, 512GB) and using a solution cost for 3 nodes (Server + RHEL OS + Virtualization + Db2 @ $12,800* per core). Db2 Warehouse pricing based upon US$ regional perpetual license costs where certain discounts can apply.

5. Source: *IBM Power Systems Performance Report: POWER9, POWER8 and POWER7 Results*, April 17, 2018. 01.ibm.com/common/ssi/cgi-bin/ssialias?htmlfid=POO03017USEN

6. 1.8X bandwidth is based on 230 GB/sec per socket for POWER9 and 128GB/sec per socket for x86 Scalable Platform *Intel product brief:* intel.com/content/dam/www/public/us/en/documents/product-briefs/xeon-scalable-platform-brief.pdf?asset=14606

7. ITIC in the News, *"IBM Power Systems, Lenovo System x and ThinkSystem, HPE Integrity and Huawei KunLun Top ITIC 2019 Server Reliability Poll."* March 2019. (itic-corp.com/blog/2019/03/ibm-power-systems-lenovo-system-x-and-thinksystem-hpe-integrity-and-huawei-kunlun-top-itic-2019-server-reliability-poll)

8. Trustwave Research Report. *"2019 Trustwave Global Security Report."* (trustwave.com/en-us/resources/library/documents/2019-trustwave-global-security-report/)

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