Trusted performance

IBM DS8880F data systems provide the speed, security and availability blockchain environments demand

Highlights

- Leverage the decades-long relationship between IBM® DS8880F data systems and IBM Z® to build more secure mainframe-based blockchain solutions
- Gain "six-nines" availability in blockchain environments with IBM HyperSwap® technologies
- Scale storage capacity and performance to meet current and future blockchain demands with the IBM DS8880F High-Performance Flash Enclosure Gen2

Perhaps as many as 45,000 cyberattacks occur around the world each day.[1] It's easy to understand why cybersecurity is the number one IT spending priority among businesses large and small, and has been for years.[2] A new technology called *blockchain* offers the capabilities to provide much greater levels of business and data security. A recent World Economic Forum report predicts that by 2025, 10 percent of the world's gross domestic product (GDP) will be stored on blockchains or blockchain-related technology.[3]

Infrastructure matters as much in blockchain solutions as it does in mainframe environments. The DS8880F family of data systems and their predecessors have been deployed to support business-critical environments for nearly two decades.[4] For years, IBM DS8000 has been the number one family of storage systems supporting mainframe-based IT infrastructure.[5] DS8880F is well-positioned to provide the performance, availability and security that blockchain solutions will require.

Blockchain basics

Business ledgers in use today are deficient in many ways. They are inefficient, costly, non-transparent and subject to fraud and misuse. These problems stem from reliance on centralized, trust-based, third-party systems such as financial institutions, clearinghouses and other mediators of existing institutional arrangements. These centralized, trust-based ledger systems lead to bottlenecks and slowdowns of transaction settlements. Lack of transparency, as well as susceptibility to corruption and fraud, lead to disputes. Having to resolve disputes and

possibly reverse transactions or provide insurance for transactions is costly. These risks and uncertainties contribute to missed business opportunities. Furthermore, out-of-sync copies of business ledgers on each network participant's own systems lead to faulty business decisions made on temporary, incorrect data. At best, the ability to make a fully informed decision is delayed while differing copies of the ledgers are resolved.

A blockchain is a tamper-proof, shared digital ledger that records transactions in a public or private peer-to-peer network. Distributed to all member nodes in the network, the ledger permanently records, in blocks, the history of asset exchanges that take place between the peers in the network.

All the confirmed and validated transaction blocks are linked and chained from the beginning of the chain to the most current block, hence the name blockchain. The blockchain thus acts as a single source of truth, and members in a blockchain network can view only those transactions that are relevant to them.

Blockchain solutions are already gaining traction around the world. The IBM Institute for Business Value estimated that in 2017, 33 percent of organizations, on average, across all industries and regions were considering or actively engaged in blockchains.[6]

Blockchain benefits

In legacy business networks, all participants maintain their own ledgers with duplication and discrepancies that result in disputes, increased settlement times and the need for intermediaries with their associated overhead costs. However, by using blockchain-based shared ledgers, where transactions cannot be altered once validated by consensus and written to the ledger, businesses can save time and costs while reducing risks. Blockchain technologies promise improved transparency among willing participants, automation, ledger customization and improved trust in record keeping.

Because contracts being executed on business networks using blockchain technologies are smart, automated and final, businesses benefit from increased speed of execution, reduced costs and less risk with timely settlements of contracts.

Blockchain infrastructure requirements

IBM believes that blockchain is a truly disruptive technology that can transform business.[7] But in order for blockchain solutions to live up to such lofty expectations, the underlying IT infrastructure supporting them must meet key requirements for security, availability, system performance and scalability:

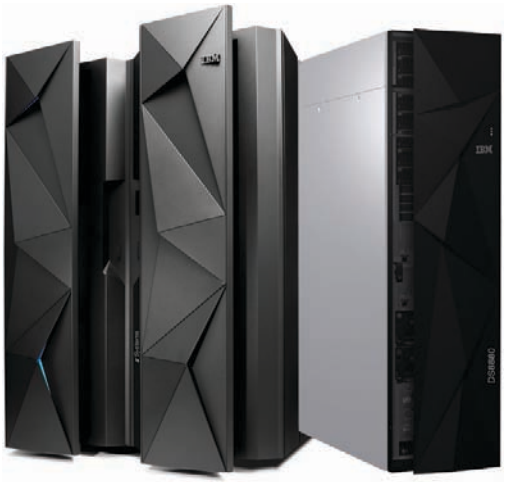
- **Security:** Each participant or node in a blockchain implementation must employ effective data encryption and user authentication to ensure the integrity of their contributions to the blockchain.
- **Availability:** Blockchain solutions are only as useful as they are available. To maintain user confidence and value, each node must utilize infrastructure that ensures very high availability.
- **Performance:** As blockchains grow, low-latency/high-performance storage becomes more and more necessary in order to handle the increasing data traffic generated by hundreds, perhaps thousands, of concurrent users all accessing transaction records and utilizing smart contracts.
- **Scalability:** Both capacity and performance requirements increase as blockchains naturally grow; therefore, IT infrastructure must be able to scale as needed.

DS8880F data systems

IBM DS8880 data systems are where enterprises, universities and research centers around the globe turn when mission-critical applications require the highest availability and system reliability possible, especially in mainframe environments. DS8880F all-flash arrays provide the storage performance, deep integration with IBM Z encryption at-rest and on-the-fly technologies, and "six-nines"[8] availability required to enable successful blockchain solutions.

The DS8880F family is designed to manage the full spectrum of storage workloads that exist in today's complex data infrastructure and do it while offering the highest performance in their class. The DS8880F family currently includes three members that together provide a broad range of options for addressing business-critical application workloads such as blockchain solutions:

- **IBM DS8884F** is the business-class family member, offering entry-level storage for high-availability environments with all-flash performance delivered within a flexible and space-saving package. DS8884 offers the lowest entry cost for midrange enterprises and yet features two IBM Power Systems™ S822 storage servers with six processor cores each for a robust 256 GB total system DRAM cache and up to 729.6 TB of flash capacity.
- Enterprise-class **IBM DS8886F** is designed with an ideal combination of performance, capacity and cost to support a wide variety of application workloads. It provides higher performance through two IBM Power Systems S824 servers each with 24-core IBM POWER8® processors. DS8886 has a 2 TB DRAM cache, 128 Fibre Channel/IBM FICON® ports, and offers up to 1.4 PB of flash capacity.
- **IBM DS8888F** is an analytics-class storage system offering superior performance and capacity designed to address the most demanding business workload requirements. Its two IBM Power Systems E850 servers with 48-core POWER8 processors provide superior performance, and the systems offer a 2 TB DRAM cache and up to 2.9 PB of flash capacity to handle virtually any analytics or machine learning workload.



Working together

Recently, IBM Z has added innovations such as pervasive encryption that help enterprises implement new blockchain-based solutions. A key value that DS8880F brings to blockchain solutions is the family's deep integration with IBM Z while also supporting Power Systems and distributed systems under a single management point.

At the heart of today's DS8880F systems lies the advanced microcode that has been developed and enhanced in lockstep with the IBM mainframe input/output (I/O) architecture over the past several decades. New DS8880F features are planned and developed in conjunction with the IBM Z team and released in a coordinated manner. That's why DS8880F offers significant added value compared to other storage systems—and why it's the most trusted storage platform for the mainframe systems.[9] Because they are not IBM-designed systems, storage products from other vendors can't access the same IBM internal integration capabilities, cross teaming, testing or design resources.

Enhanced security

IBM Z systems now support real-time audit verification and protect encryption keys with industry-leading, tamper-resistant cryptographic hardware and robust key management. DS8880F Release 8.3 supports all the latest IBM Z security innovations.

Additionally, the apparently unrelenting tide of data breaches is driving increased interest in IBM self-encrypting storage, which automatically secures all information on a drive or tape cartridge when physically removed from a storage system. IBM Full Disk Encryption also provides a simple, cost-effective way to purge sensitive data from systems that are being retired or repurposed through a simple cryptographic erasure. Encryption drives are standard on every DS8880F system and provide support for the Key Management Interoperability Protocol (KMIP). DS8880F has a variety of other security features, such as role-based administration, multi-level authentication, tamper-proof audit logging and support for the Syslog protocol. It also is designed to comply with the US government standards profile for Internet Protocol version 6 (IPv6) and to support updated guidelines on cryptographic functions defined by the US National Institute of Standards and Technology (NIST). It also supports the T10 standard data integrity field (DIF) for SCSI to enable end-to-end data protection from the application or host adapter down to the drives. These and other advanced security capabilities make DS8880F systems an ideal choice to support blockchain implementations.

Extreme availability

DS8880F data systems support online system microcode and hardware upgrades and incorporate redundant, hot-swappable components with sophisticated data integrity features for 24x7 operations. DS8880F offers advanced integration with IBM HyperSwap and IBM Geographically Dispersed Parallel Sysplex™ (GDPS), as well as sophisticated business-continuity solutions based on IBM z/OS® Parallel Sysplex®. The systems also support IBM zHyperwrite™, an innovative technology that combines DS8880F and z/OS enhancements to deliver performance benefits for writing operations to IBM Db2® logs in IBM Metro Mirror environments.

In addition to their exceptionally resilient architecture, DS8880F systems offer an array of advanced functions for data backup, remote mirroring and disaster recovery. IBM FlashCopy® addresses a key requirement for nonstop data availability by quickly and efficiently creating point-in-time copies without impeding application servers. DS8880F also supports Cascading FlashCopy, allowing a target volume or data set in one mapping to be the source volume or data set in another mapping, creating a cascade of copied data. This provides the flexibility to obtain point-in-time copies of data from different places within the cascade.

DS8880F supports advanced multi-site business-continuity capabilities built on HyperSwap technology to give organizations implementing blockchain solutions confidence that business-critical data will be available during planned and unplanned outages. HyperSwap leverages IBM Metro/Global Mirror replication technologies and combines high availability and business continuity into one solution with a range of recovery and management options that are transparent to host operations. HyperSwap provides up to 99.9999 percent availability with cross-system, cross-data center, active-active storage without extra licensing or special hardware. With HyperSwap, protected workloads are not disrupted through most storage, network, server, application and site failures and disasters. HyperSwap also supports live migration of virtual machines using VMware vMotion across VMware vCenter servers, as well as data centers that are protected by VMware Site Recovery Manager 6.1 and up.

HyperSwap enables enterprise IT systems to automatically fail over within seconds, providing metro-distance high availability to protect against loss of access to mission-critical data. This capability is now available across the IBM Storage portfolio. In the event of a regional outage, IBM customers can deploy IBM Global Mirror, which migrates copies of data to remote facilities more than 100 kilometers away. The Metro/Global Mirror option combines these two capabilities to support various multisite configurations for added protection.

And with Multiple Target Peer-to-Peer Remote Copy (MT-PPRC) capabilities, blockchain implementations can have two secondary mirror systems with different configuration options for world-class disaster recovery and less than 32 seconds of unplanned downtime per year.[10]

All-flash performance

Designed to provide extraordinary performance for mission-critical applications, DS8880F systems are based on the same fundamental system architecture as IBM Watson™ solutions. DS8880F uses this to form the three-tiered architecture that balances system resources for optimal throughput. Intelligent caching algorithms accelerate performance even more, and by adding High-Performance Flash Enclosure Gen2 to the system, blockchain users can feel confident that high-end acceleration will be there when they need it with microsecond response time.[6] The Gen2 enclosures deliver exceptional throughput and extremely low application response times for real-time analytics, cognitive computing, and I/O-intensive workloads where speed is most important.

The need for low latency in business-critical mainframe transaction environments has driven the adoption of high-I/O technologies such as IBM FICON Express16S, Super Parallel Access Volume (Super PAV), IBM High Performance FICON (zHPF), and now zHyperLink.

DS8880F performance features include advanced integration with zHPF and the new zHyperLink connectivity that delivers extremely low application response times. zHyperLink dramatically accelerates access to data by reducing application performance time by 90 percent and cuts the elapsed time of Db2 transactions in half.[6]

DS8880F also delivers excellent integration with IBM Power® servers running in IBM AIX®, IBM i, and Linux environments, where much of the current blockchain development is occurring. The systems accelerate application performance by enabling host adapters on the storage system to give preferential treatment to higher-priority database I/O with Db2 software.

Efficient scalability

By their very nature, blockchain implementations inevitably grow as new records are added. The ability of IT infrastructure supporting these solutions to efficiently scale both capacity and performance is a core requirement. Also, easy scalability helps enterprises implementing blockchain solutions to control costs, because the infrastructure needed when these solutions are first implemented typically will be much less than needed later.

Enhanced flash enclosures available with DS8880F models push the boundaries of flash performance. High-Performance Flash Enclosure Gen2 can accommodate 16, 32 or 48 2.5-inch flash cards for a maximum raw capacity of 153.6 TB per enclosure. The enhanced enclosures offer great flexibility with flash drives in 400 GB, 800 GB, 1.6 TB, 3.2 TB and 3.8 TB sizes in a 4U form factor for storage consolidation and high data volume workloads. Along with greater individual enclosure capacity comes much higher scalability, all the way to 2.9 PB under a single management console. The new enclosures also use RAID 6 data protection as default for superior business continuity where integrity is critical.

Performance follows the same trajectory, with each Gen2 flash enclosure offering 570K I/O operations per second (IOPS) and the ability to be deployed on existing DS8880 systems by adding the flash RAID adapter bundled with the solution. Now, both new and existing DS8880 implementations can gain the performance, efficiency and operational cost benefits of flash storage at even lower cost-per-gigabyte capital investments.

DS8880F includes powerful management capabilities that can help IT administrators more effectively control their storage environments as capacity grows. DS8880F Storage Manager includes intuitive navigation, streamlined configuration processes and helpful links to video tutorials. DS8880F also supports a command-line interface and a Storage Management Initiative Specification (SMI-S)-conformant application programming interface (API).

For more information

To learn more about IBM DS8880F data systems, please contact your IBM representative or IBM Business Partner, or visit: **ibm.com**/us-en/marketplace/ds8000f

Additionally, IBM Global Financing provides numerous payment options to help you acquire the technology you need to grow your business. We provide full lifecycle management of IT products and services, from acquisition to disposition. For more information, visit: **ibm.com**/financing

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Actual available storage capacity may be reported for both uncompressed and compressed data and will vary and may be less than stated.

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[10] Six-nines is a term used to denote that a piece of equipment is functioning with 99.9999 percent availability (31.5 seconds of downtime per year), on average.

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