IBM FlashSystem® V9000 FAQ

1. **What is IBM FlashSystem V9000?**
   IBM's fully integrated, flexible, feature-rich all-flash storage delivering scalable capacity and fully integrated management to the enterprise data center. FlashSystem V9000 can scale to 2.2PB effective capacity with IBM Real-time Compression™. Each building block provides up to 57TB usable capacity before compression. FlashSystem V9000 can scale out to 4 building blocks and scale up to four additional 57TB storage enclosures.
   Data Sheet: IBM FlashSystem V9000

2. **When will the IBM FlashSystem V9000 be available?**
   FlashSystem V9000 was announced on February 19, 2015 and reached GA on April 24, 2015. FlashSystem V9000 Software V7.5 will be available August 31, 2015.

3. **Why did the name change to FlashSystem V9000?**
   The product is named FlashSystem V9000 because it is a new product line, not just a follow-on to FlashSystem V840. While its heritage is based on FlashSystem V840, it expands on its industry leadership with unified management capabilities and provides a platform for continued functional and performance enhancements.

4. **What is included with FlashSystem Software V7.5?**
   FlashSystem Software V7.5 includes HyperSwap® capability, FlashCopy bitmap space increase, direct 16Gb Fibre Channel support (except with AIX), and Microsoft Offloaded Data Transfer (ODX) support.

5. **What is HyperSwap?**
   HyperSwap capability in FlashSystem Software V7.5 delivers high availability and disaster recovery in one solution by enabling each volume to be presented by two I/O groups. The configuration will tolerate combinations of node and site failures, using a flexible choice of host multipathing driver interoperability. HyperSwap reuses capital investments in order to achieve a range of recovery and management options which are transparent to host operations.
   Video: Extreme High Availability with IBM HyperSwap

6. **What value does IBM FlashSystem V9000 bring to clients?**
   FlashSystem V9000 accelerates applications while making storage environments easier to manage and preserving investments in legacy storage with these built-in capabilities:
   - **Scalable Performance**
     Allows flash capacity to be added (scaled up) to support multiple applications, the controllers to be expanded (scaled out) to support higher IOPS (input/output operations per second) and bandwidth, or the solution to be simultaneously scaled up and out to improve capacity, IOPS and bandwidth while maintaining IBM MicroLatency™.
   - **Enduring Economics**
     Flash for less than the cost of performance disk. Reduce the effective cost/capacity of flash by up to 80 percent with Real-time Compression; unlike inline data deduplication, Real-time Compression is effective on active data sets such as online transaction-processing and analytics data sets. Real-time Compression can be used with virtualized storage connected to the FlashSystem V9000.

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- **Agile Integration**
  Helps you manage FlashSystem V9000, other IBM, or third-party storage arrays with thin provisioning, Real-time Compression, Easy Tier®, copy services and disaster-recovery tools, such as data replication; and non-disruptive data migration.

7. What is the FlashSystem Tier 1 Guarantee?

- Performance: IBM MicroLatency performance
- Data Reduction: Guaranteed up to 5:1 data reduction using compression
  Savings of up to 5:1, based on Comprestimator results, within the guarantee period
- Endurance: Flash memory will be covered for wear endurance as long as you are under warranty or maintenance
- 7 year 24 x 7 Support: Up to 7 years support available with optional price protection and flash media retention offerings
- Peace of Mind: No charge, complimentary IBM services for Tier 1 solutions
  40 hours for 228+TB solutions up to 556TB, or 80 hours for 556+TB solutions

8. What is different between the FlashSystem V840 and the FlashSystem V9000?

- A single integrated user interface to manage the controllers and storage enclosures, simplifying the user experience as the system scales up and scales out.
- FlashSystem V9000 can now scale up to an effective capacity of 2.2PB (a 40% increase in capacity versus FlashSystem V840).
- Each FlashSystem V9000 storage enclosure provides up to 57TB of usable capacity (before data reduction).
- New integrated physical design and enhanced serviceability.
- New software licensing and pricing model for externally virtualized storage.
- Fully integrated with IBM System Storage Software, including Tivoli® Storage Productivity Center (TPC), IBM Storage Integration Server (IBM SIS), and other software for end-to-end storage management.

9. Does the FlashSystem V9000 use SSDs?

No. FlashSystem V9000 does not use Solid State Drives (SSDs). SSDs are slower, less reliable and more costly than the IBM MicroLatency modules. IBM engineers and designs our own flash modules to provide better response time, throughput, resiliency, and cost over SSDs. This is just one element of IBM FlashCore™ technology that differentiates IBM FlashSystem versus our competitors.
Webpage: IBM FlashCore technology

10. What flash technology is used in FlashSystem V9000?

FlashSystem V9000 uses IBM enhanced MLC flash technology. Through collaboration with Micron and development of IBM's FlashCore technology, IBM is able to offer a solution with the capacity and price benefits of MLC while maintaining the performance, reliability and lifespan enterprise customers have come to expect from IBM FlashSystem products.
Video: IBM FlashCore technology overview

11. Are there special warranty terms and conditions covering flash modules?

No. If a MicroLatency module experiences a failure or wear out condition while the system is under a warranty or maintenance agreement, the part is covered.

12. Can I upgrade a FlashSystem V840 to a FlashSystem V9000?
IBM intends to provide the capability to upgrade FlashSystem V840 AC1/AE1 based systems to provide the integrated management capabilities of the FlashSystem V9000.

13. Can the FlashSystem V9000 incorporate a FlashSystem 840?
Yes, but the FlashSystem 840 will be managed as externally virtualized storage, unlike the FlashSystem V9000 Storage Enclosures. FlashSystem V9000 cannot provide a single point of configuration for an externally virtualized FlashSystem 840, as it can for its own Storage Enclosure(s).

14. Can the FlashSystem V9000 incorporate a pre-existing FlashSystem 900?
Yes, but the FlashSystem 900 will be managed as externally virtualized storage, unlike the FlashSystem V9000 Storage Enclosures. FlashSystem V9000 cannot provide a single point of configuration for an externally virtualized FlashSystem 900, as it can for its own Storage Enclosure(s).

15. Can I upgrade a SAN Volume Controller (SVC) to a FlashSystem V9000?
No. SVC can externally virtualize a FlashSystem 900 but is not designed to be upgraded to a FlashSystem V9000. FlashSystem V9000 is a brand new product line that does not replace the SVC.

16. Can the FlashSystem V9000 cluster with a SVC?
No. FlashSystem V9000 can cluster up to four FlashSystem V9000 building blocks (four pairs of controllers). FlashSystem V9000 is not designed to be clustered with SVC controllers.

17. Can the FlashSystem V9000 remote mirror to an SVC?
Yes. FlashSystem V9000 includes both synchronous and asynchronous replication. The target can be another FlashSystem V9000, FlashSystem V840, SVC, or Storwize V7000.

18. Can the FlashSystem V9000 be deployed in a stretch cluster?
No. FlashSystem V9000 does not support stretched cluster deployments.

19. Can you provide scenarios where FlashSystem V9000 might be used?
- Typical FlashSystem deployments involve accelerating virtualization platforms (server virtualization or desktop virtualization), databases (transactional/OLTP or batch/analytical workloads), or storage infrastructure (file systems or general metadata) so critical business applications can run faster and wait less.
- FlashSystem V9000 can take the place of multiple racks of HDDs—lowering power, space and cooling costs.
- It can increase server efficiency, which can further cut power and cooling costs while reducing your software licensing expenses.
- FlashSystem V9000 can increase the effective capacity of your flash storage up to 5 times using IBM Real-time Compression.

20. What is the difference between a fixed building block and a scalable building block?
A fixed building block consists of a redundant pair of FlashSystem V9000 Control Enclosures directly cabled to one FlashSystem V9000 Storage Enclosure.

A scalable building block leverages Fibre Channel switches to provide scalability up to four FlashSystem V9000 building blocks and four additional FlashSystem Storage Enclosures to be clustered into a single storage system. Adding additional Storage Enclosures or FlashSystem V9000 building blocks to a scalable system is non-disruptive. With FlashSystem V9000 the entire configuration can be managed from a single user interface.

21. What capacity options are available for FlashSystem V9000?

FlashSystem V9000 Storage Enclosures are available with usable capacities of 2.2TB, 4.5TB, 6.8TB, 9.1TB, 11.4TB, 17.1TB, 22.8, 28.5TB, 34.2TB, 45.6 and 57TB. Usable capacity accounts for data protection and overprovisioning overhead. FlashSystem V9000 supports the installation of 4, 6, 8, 10, or 12 IBM MicroLatency modules, which are available in 1.2TB, 2.9TB or 5.7TB capacities. With Real-time Compression, effective capacity ranges from 12TB to 285TB per building block. When scaled out with eight Storage Enclosures, the system can scale as high as 2.2PB effective capacity.

22. What are the connection options for FlashSystem V9000?

FlashSystem V9000 offers 8 Gbit or 16 Gbit Fibre Channel, 10 Gbit iSCSI, or 10 Gbit Fibre Channel over Ethernet (FCoE) host/frontend connectivity. Backend/internal connectivity is Fibre Channel based--either directly attached with fixed building blocks, or connected via a switch in scalable configurations.

23. What I/O interfaces are supported on FlashSystem V9000?

Each building block offers one of the following options:

- Up to 8 ports of 16 Gbit Fibre Channel
- Up to 16 ports of 8 Gbit Fibre Channel
- Up to 8 ports of 10 Gbit FCoE or iSCSI

Scaled configurations with 8 Gbit or 16 Gbit Fibre Channel connectivity also have the option of performing an IP Mirror leveraging 10 Gbit Ethernet, which will halve the number of available FC ports.

24. What features are included in the base software license?

FlashSystem V9000 base software license includes: IBM FlashCopy®, Easy Tier, Real-time Compression and mirroring. This licensing is per FlashSystem V9000 Storage Enclosure and is all-inclusive regardless of the capacity of the enclosure. This licensing does not apply to externally virtualized storage – i.e. anything that is not a FlashSystem V9000 Storage Enclosure.

FlashSystem V9000 uses per-capacity licenses for any externally virtualized storage it manages, including externally virtualized FlashSystem 840 or 900 systems, giving client's flexibility about which features they wish to enable for their externally virtualized storage. FlashSystem V9000 can also use Virtual Storage Center (5608-AE1) licenses for externally virtualized storage.

25. Can I use existing SVC licenses (5641-VC7) for the FlashSystem V9000 storage enclosure?

No. FlashSystem V9000 requires its own base software license (5639-RB7) per enclosure. SVC capacity-based licenses cannot be applied toward the base software requirement.

26. If I plan to use Real-time Compression, is there any additional hardware included to accelerate compression performance?

Yes. Two Compression Accelerators should be ordered (Feature Code AH1A) for each FlashSystem V9000 Control Enclosure in the configuration.

27. Can I use Real-time Compression on some volumes and leave others uncompressed?

Yes. Real-time Compression can be used where it makes sense for the workload. It can be used on some workloads and not on others, with a per-volume granularity.

28. Is FlashSystem compression better than the compression offered by competitors?

Yes. IBM has dozens of patents and years of research on the compression technology included in the FlashSystem V9000 (and other IBM storage solutions). Our compression algorithm, in client testing, demonstrates a higher compression ratio (resulting in more savings for our clients) and a lower latency than competing solutions.

Redpaper: Accelerate with IBM FlashSystem V840 Real-time Compression

29. Can FlashSystem V9000 I/O interfaces be upgraded?

FlashSystem V9000 is sold with a full set of interface cards, so there is no room to add additional interfaces.

30. Does FlashSystem V9000 support data encryption?

Yes. FlashSystem V9000 supports AES-XTS 256-bit data-at-rest encryption with local key management. Encryption is an optional feature. There is no performance penalty for FlashSystem data-at-rest encryption.

31. Does FlashSystem V9000 data-at-rest encryption affect performance?

There is no performance penalty for FlashSystem data-at-rest encryption, because it is performed at line speed using dedicated hardware.

32. Can FlashSystem 900 be deployed *without* FlashSystem V9000?

Yes. FlashSystem 900 can be deployed as a standalone product. FlashSystem 900 can also be deployed with FlashSystem V9000, IBM SAN Volume Controller, or other platforms to provide advanced data services.

33. What advanced storage services are available with FlashSystem V9000?

FlashSystem V9000 provides IBM Real-time Compression, IBM Easy Tier, IBM FlashCopy, thin provisioning, mirroring and copy services, external virtualization, snapshots and broader host support that enriches any storage environment. These capabilities can be applied to internal and virtualized storage.

34. Is FlashSystem V9000 compatible with IBM SmartCloud® Virtual Storage Center (VSC)?

- Yes. FlashSystem V9000 is compatible with Virtual Storage Center 5.2.3, which can be purchased as an option. VSC includes support for IBM Tivoli Storage Productivity Center (TPC), FlashCopy Manager and IBM Storage Analytics Engine.
- If VSC is used, either VSC (5608-AE1) or VSC for IBM Storwize® (5608-ACL) licenses may be used for FlashSystem V9000 Storage Enclosures; externally virtualized storage requires VSC (5608-AE1).

Announcement Letter: License compatibility with SmartCloud Virtual Storage Center

35. Why don't you offer data deduplication with FlashSystem V9000?

Despite claims to the contrary, we believe other competitors who implement full-time inline deduplication sacrifice latency, peak IOPS, and peak bandwidth – while at the same time usually providing fewer benefits versus compression on workloads where data reduction is appropriate. IBM research has shown that inline deduplication does not provide significant benefits for the kind of active data sets that are best accelerated by all-flash arrays, such as database workloads. For workloads that do require dedupe, IBM is now reselling Atlantis ILIO™ software to provide host-based data deduplication, and is also partnering with Permabit to offer SANblox™ deduplication appliances.

FlashSystem EcoSystem: Atlantis Computing

FlashSystem EcoSystem: Permabit Technology Corporation

36. Does FlashSystem V9000 support integration with VMware®?

Yes, FlashSystem V9000 can integrate with VMware using vSphere® Storage APIs for Array Integration (VAAI) including vMotion®. There is also a vCenter™ plug-in for the Control Enclosures.

Redpaper: Deploying IBM FlashSystem V840 Storage in a VMware and Cloud Environment

37. Where is the FlashSystem interoperability matrix?

Visit the IBM System Storage Interoperability Center for interoperability information.

38. Does FlashSystem V9000 use two-dimensional (2D) Flash RAID like other FlashSystem products?

Yes. FlashSystem V9000 uses the two-dimensional (2D) Flash RAID and other IBM FlashCore technologies such as hardware accelerated I/O, IBM MicroLatency modules and advanced flash management which make the IBM products excel at low latency data transfers.

39. Why is the latency for the FlashSystem V9000 higher than just the FlashSystem 900?

The software defined storage layer adds some latency versus direct access. But the impact is quite small relative to the overall improvement to the client's experience versus other storage technologies. Our testing indicates that the combination still generally performs better and more efficiently than competing solutions due to optimizations in our software and hardware layers.

40. Why should clients care about latency more than they care about IOPS?

From an application perspective, storage system performance is mainly a question of "how fast does the storage provide access to data". Latency (response time) is a measure of the speed of individual requests, while IOPS is a measure of how many requests can be done in total per second. It is similar to the difference between the speed of water in a pipe and the pipe's diameter. Big pipes don't necessarily deliver water to the tap any faster. Similarly, high IOPS ratings don't address how quickly individual requests are satisfied – it is possible to construct a million-IOPS solution using a lot of disk, but each request will still be satisfied at least an order of magnitude more slowly than a flash-based solution. While scalability metrics like IOPS are important, latency still has the biggest direct impact on application performance for our clients. Focus on IOPS alone has led to a problem many enterprise clients face today: using large quantities of hard drives not because large capacity is needed, but rather because high IOPS are needed. FlashSystem offers a combination of higher IOPS and lower latency that delivers strong performance and economic benefits for clients versus such systems.

Website: IBM FlashSystem Case Studies
Video: IBM FlashSystem is designed to harness the power of data
Analyst Paper: Wikibon - Flash and Hyperscale Changing Database and System Design Forever

41. Is FlashSystem V9000 performance linear for scale-up and scale-out implementations?

FlashSystem V9000 performance scales approximately linearly in scale-out configurations with each additional building block that is added. Scale-up configurations – adding Storage Enclosures without adding Control Enclosures - provide additional capacity but do not add performance. In either case, latency will remain consistently low and predictable as the system is scaled up and out.

42. Why does FlashSystem V9000 achieve lower IOPS with compression?

Real-time Compression involves complex algorithms that require significant control enclosure resources, so maximum performance capabilities are reduced when it is enabled. However, given that a system implementing Real-time Compression can provide up to 300,000 random 4K read IOPS per building block (or up to 1.2 million IOPS total), the capability of the FlashSystem still exceeds what is required for many client use cases and is more than our competitors provide. Unlike many all-flash competitors, IBM believes it is important to offer clients flexibility to determine if the cost benefits of compression outweigh the performance overhead.

43. What is the Comprestimator tool?

Comprestimator is a freely available IBM utility that provides a mathematical estimate of the anticipated compression benefit for FlashSystem V9000. Its estimate is used to provide compression guarantees to clients.
Comprestimator Utility Tool

44. Where can I find more information?

a. IBM Flash Page
b. **NEW** FlashSystem V9000 Page
c. FlashSystem EcoSystem Page
d. IBM FlashSystem YouTube Channel
e. IBM Storage Experience Tumblr Page