IBM® FlashSystem™ FAQ

General Questions:

- **What is IBM® FlashSystem™ 900?**
  - IBM FlashSystem 900 is an all-flash array that is data center optimized to provide extreme performance with IBM MicroLatency™ technology, flexible capacity, total system protection and macro efficiency.
  - FlashSystem 900 comes in a 2U rackmount enclosure.
  - Capacity can scale from 2.4TB to 57TB usable capacity with RAID 5 for data protection.
  - FlashSystem 900 supports 8Gb and 16Gb Fibre Channel, 10Gb FCoE, 10Gb iSCSI and 40Gb QDR InfiniBand.
  - Additionally, it offers data-at-rest encryption features available with local key management.

  Data Sheet: IBM FlashSystem 900

- **What value does IBM FlashSystem 900 bring to clients?**
  - Extreme Performance with IBM MicroLatency™ - enable business to unleash the power of performance, scale, and insight with microsecond response times for applications to drive services and products to market fast
  - Macro Efficiency - enables consolidation of hardware and software, deployment speed, efficient use of IT staff, and power and cooling savings
  - Enterprise Reliability - durable and reliable purpose-built architecture incorporating enterprise grade flash and patented data protection technology
  - IBM FlashCore Technology - includes Hardware Accelerated I/O, IBM MicroLatency Modules and Advanced Flash Management. FlashCore Technology is at the heart of every FlashSystem solution.

  Visit our IBM FlashCore™ technology page for more information.

- **Why should clients care about latency more than 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 (I/Os per second) 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.

- **Can you provide scenarios where FlashSystem products might be used?**
  - FlashSystem products are used to solve business problems and reduce complexity by providing faster data access than traditional storage solutions.
  - FlashSystem products provide low latency and extremely high bandwidth without requiring large amounts of power or physical space.
  - 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. Such applications include everything from video transcoding to enterprise resource planning (ERP) systems to high-performance computing (HPC) environments in organizations around the world.

- **What are some new things FlashSystem 900 can do that competing products cannot do?**
  - Write and read data with industry-leading IBM MicroLatency (as low as 90/155 microseconds)
  - Load and apply firmware updates non-disruptively while the system is actively being used (concurrent code load)
  - Complete maintenance on non-passive components non-disruptively while the system is actively being used (concurrent maintenance)
  - Complete maintenance actions without removing the chassis lid
  - Encrypt data at rest with no performance impacts
  - Administer the system through an intuitive, easy to use GUI
  - Administer multiple systems through the same management interface
  - Create LUN as small as 1MB or as large as 57TB and dynamically resize
  - Read data at 1.1 million random IOPS
  - Read data at 10GB per second

- **What capacity options are available for FlashSystem 900?**
  - FlashSystem 900 is available with usable capacities of 2.4TB, 4.8TB, 7.2TB, 9.6TB, 11.6TB, 12TB, 17.4TB, 22.8TB, 23.2TB, 29TB, 34.2TB, 45.6TB and 57TB. Usable capacity includes all overheads for data protection and overprovisioning; raw capacity is higher.
  - FlashSystem 900 supports the installation of 4, 6, 8, 10, or 12 flash modules, which are available in 1.2, 2.9TB or 5.7TB capacities. Module types cannot be mixed. These capacity options provide optimal price-performance balance.

- **What flash technology is used in FlashSystem 900?**
  - FlashSystem 900 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.

- **Does the FlashSystem 900 use SSDs?**
  No. FlashSystem 900 uses IBM MicroLatency Modules. The MicroLatency Modules, which are used in all FlashSystem solutions, are custom architected with our own data path and data protection capabilities to be used in enterprise storage systems. When compared to SSDs, IBM MicroLatency Modules provide the lowest possible latency, highest IOPS, highest bandwidth, highest density and lowest price per capacity.

- **Is the FlashSystem 900 designed to support hard disk drives?**
  No. The FlashSystem 900 is an evolution of 30 years of engineering on low latency, high IOPS and high throughput solid state storage systems.

- **Why doesn't the FlashSystem 900 include advanced storage services like data reduction, replication and snapshots?**
  - FlashSystem 900 is designed to run at extreme performance all-flash array. As such, we have avoided any additions which significantly impact peak IOPS, bandwidth, or latency.
  - As software-defined functionality like IBM SAN Volume Controller virtualization or virtual SAN environments becomes more common in enterprises, clients don't want to pay for duplicative software features within their backend storage devices.
  - IBM has developed the FlashSystem V9000 product line for clients who do require advanced storage services within their storage arrays.
- **What are the warranty/maintenance length options for FlashSystem 900?**
  - FlashSystem 900 is available with 1-year and 3-year standard warranty lengths.
  - Both warranty options provide a 24x7 service level, subject to certain terms and conditions.
  - Optional maintenance agreements are available for purchase with varying service levels up to a total of 7 years of coverage.

- **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.

- **When is IBM FlashSystem 900 available?**
  - FlashSystem 900 will be announced February 19, 2015.
  - FlashSystem 900 will be available to order starting February 23, 2015.
  - FlashSystem 900 is expected to begin shipping to customers starting March 20, 2015.

- **How long is IBM planning to continue selling FlashSystem 840?**
  We will manage the transition process for FlashSystem products based on market demand. The existing FlashSystem products are expected to remain available for sale and/or upgrade through the end of 2015. Exact time of product and upgrade withdrawal is subject to change based on market demand and product supply.

- **Where can I find more information?**
  Visit the IBM FlashSystem web site for more information.

Technical Questions:

- **What are the RAS characteristics of FlashSystem 900?**
  - FlashSystem 900 maximizes business uptime with a fully redundant architecture with no single points of failure, independent data and control paths, and a full set of hot-swappable components, including MicroLatency Modules, batteries, canisters, power supplies and fan modules. FlashSystem 900 offers non-disruptive code upgrades and hardware maintenance.
  - MicroLatency Modules and batteries are front-accessible, while power supplies, fan modules, and canisters (containing I/O interfaces, RAID controllers, and management controllers) are serviceable from the rear, eliminating the need to remove the enclosure out of the rack.
  - With a single click of a button, FlashSystem 900 can determine if there is a new firmware level available.
  - FlashSystem 900 utilizes patented IBM Variable Stripe RAID™ technology in conjunction with Two-Dimensional RAID (2D RAID) to provide two layers of data protection across flash chips and MicroLatency Modules. This nested protection provides better resiliency and reduced maintenance activity for common flash failures, as opposed to traditional RAID systems designed for hard drives.

- **Can FlashSystem be deployed without SVC or V7000?**
  Yes. FlashSystem 900 can be used without storage-based data services, offering flexibility so clients can either choose to solve specific application performance problems with a narrow focus, or embrace the flash economic tipping point (the point where deploying all-flash solutions to replace performance-optimized HDD is economically practical) on an enterprise-wide scale.

- **Can FlashSystem 900 MicroLatency Modules be used in the FlashSystem 840?**
  No. FlashSystem 900 MicroLatency Modules are not designed for use in FlashSystem 840.

- **Can FlashSystem 900 capacity be upgraded in the field?**
  Yes, but users must adhere to the following upgrade rules to preserve data during capacity upgrades:

  - Data must be backed up prior to capacity upgrades as the system will need to re-stripe across all modules for the additional capacity to be usable.
  - Mixing flash modules with different capacities (e.g. 2.9TB and 5.7TB modules in the same box) is not allowed.

- **If I need to send back a MicroLatency Module can IBM ensure that the data on the device is removed before it is returned?**
  Yes, IBM has a process for secure data destruction, which has been verified by Kroll Ontrack. Clients can run the process themselves or engage IBM Lab Services to provide audited data destruction services. IBM also offers optional media retention services, allowing clients to retain failed storage components.

- **What are the upgrade paths for different capacity points?**
  Capacity can be upgraded by purchasing sets of 1.2TB, 2.9TB or 5.7TB MicroLatency Module feature codes as upgrades. Different sizes of MicroLatency Modules cannot be intermixed in a single FlashSystem 900.

- **What I/O interfaces are supported on FlashSystem 900?**
  - 8 ports of 16 Gbit Fibre Channel
  - 8 ports of 40 Gbit QDR InfiniBand
  - 16 ports of 8 Gbit Fibre Channel
  - 16 ports of 10 Gbit FCoE or iSCSI
  - 8Gb/16Gb FC and 10Gb FCoE/iSCSI interfaces can NOT be combined in the same system.

- **Does FlashSystem 900 support data encryption?**
  FlashSystem 900 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.

- **Does FlashSystem 900 data-at-rest encryption affect performance?**
  There is no tangible performance penalty for FlashSystem data-at-rest encryption, because it is performed at line speed using dedicated hardware.

- **Where is the FlashSystem interoperability matrix?**
  Visit IBM System Storage Interoperability Center for interoperability information.

- **What happened to eMLC flash in FlashSystem 900?**
  We have shifted to IBM Enhanced MLC NAND flash chip technology which increases our system density. We were able to make this shift through continued investment in IBM FlashCore Technology. IBM FlashCore enables us to switch from eMLC NAND flash to IBM Enhanced MLC NAND flash and preserve the systems performance and reliability. IBM still guarantees flash wear while the system is under warranty and maintenance.

- **Does FlashSystem 900 use two-dimensional Flash RAID like prior FlashSystem generations?**
  Yes. FlashSystem 900 continues to use IBM MicroLatency Modules which include patented IBM Variable Stripe RAID™ data protection, as well as RAID 5 that protects data at the system level; together, these protections form our 2D RAID technology. While competing products mostly include some form of system level RAID, they do not generally include module-level protections like IBM Variable Stripe RAID. As a result, these competing products, which are nearly all based on third-party SSDs, are likely to experience more SSD failures and require more SSD replacements over their usable lifespans.

- **Has the GUI changed for FlashSystem 900?**
  No. FlashSystem 900 includes a GUI similar to the FlashSystem 840.

- **Is RAID 5 with a hot spare the only RAID layout option for FlashSystem 900?**
  Yes, at the system level. Each MicroLatency module also always has IBM Variable Stripe RAID™ enabled, which adds another layer of data protection that assists in common failure scenarios, including concurrent flash failures. FlashSystem 900, unlike traditional disk-based systems, does not benefit from the creation of multiple RAID groups of various types. In most scenarios, multiple RAID groups are designed to isolate data hot spots. FlashSystem 900 offers such high IOPS and low latency that this technique is not required.

- **Is RAID striped across all modules?**
  Yes. FlashSystem system-level RAID 5 is configured as N + 1 +1 (parity + hot spare).

- **Is there an upgrade path from previous FlashSystem products to FlashSystem 900?**
  Clients can deploy FlashSystem 900 next to previous FlashSystem products, but there is no path to directly turn previous FlashSystem products into FlashSystem 900 equivalents.

- **Does FlashSystem 900 have hot spare modules like FlashSystem 840?**
  Yes.

- **Is FlashSystem 900 performance linear based on the number of MicroLatency modules?**
  Latency is maintained independently of the quantity of MicroLatency modules. Peak IOPS and peak bandwidth are affected by the number and size of MicroLatency modules), but the impact is not linear.

- **Does FlashSystem 900 have VMware integration?**
  Yes. VAAI (VMware vSphere® Storage APIs – Array Integration) UNMAP and VASA (VMware APIs for Storage Awareness), through IBM Storage Integration Server, are now supported with the FlashSystem 900.