



**SPC BENCHMARK 1™
EXECUTIVE SUMMARY**

**IBM CORPORATION
IBM XIV STORAGE SYSTEM GEN3 (*VERSION 11.3*)**

SPC-1 V1.14

**Submitted for Review: June 10, 2013
Submission Identifier: A00135**

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
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Auditor	Storage Performance Council – http://www.storageperformance.org Walter E. Baker – AuditService@StoragePerformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

Revision Information and Key Dates	
SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	June 10, 2013
Date the FDR was submitted to the SPC	June 10, 2013
Date the Priced Storage Configuration is available for shipment to customers	June 25, 2013
Date the TSC completed audit certification	April 24, 2013

Tested Storage Product (TSP) Description

XIV is a versatile, high-end disk storage solution with an innovative grid architecture that can provide clients excellent performance and scalability while significantly reducing costs and complexity. XIV includes automated data placement that needs no tuning as application workloads change. Version 11.3 offers flash memory as cache storage (*included in this submission*). Version 11.3 also includes capacity on demand (selection of capacity and price points implemented by software).

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: IBM XIV Storage System Gen3 (Version 11.3)	
Metric	Reported Result
SPC-1 IOPS™	180,020.29
SPC-1 Price-Performance™	\$5.42/SPC-1 IOPS™
Total ASU Capacity	44,358.865 GB
Data Protection Level	Protected 1 (Mirroring)
Total Price	\$976,071.30
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

SPC-1 Price-Performance™ is the ratio of **Total Price** to SPC-1 IOPS™.

Total ASU (Application Storage Unit) Capacity represents the total storage capacity available to be read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of **Protected 1** using **Mirroring** configures two or more identical copies of user data.

***Protected 1:** The single point of failure of any **storage device** in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.*

Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 8.

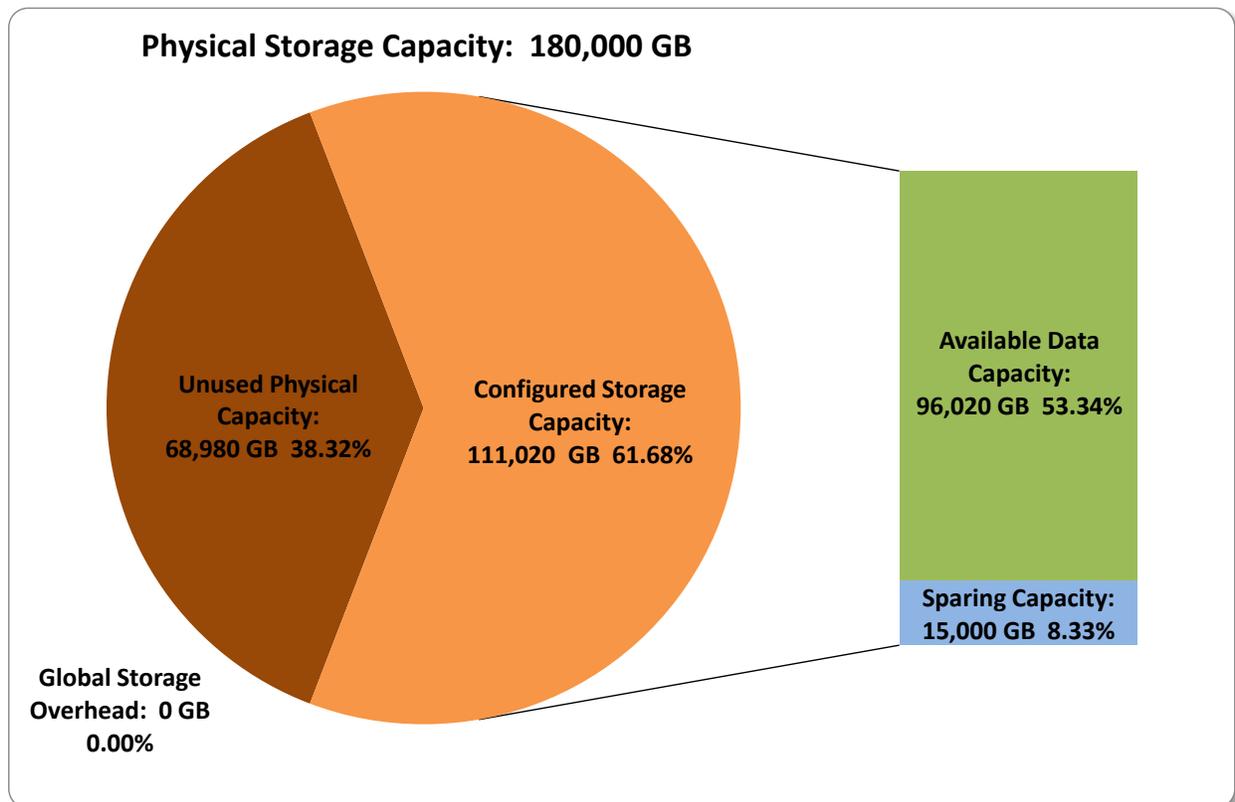
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country (*non-local currency*).

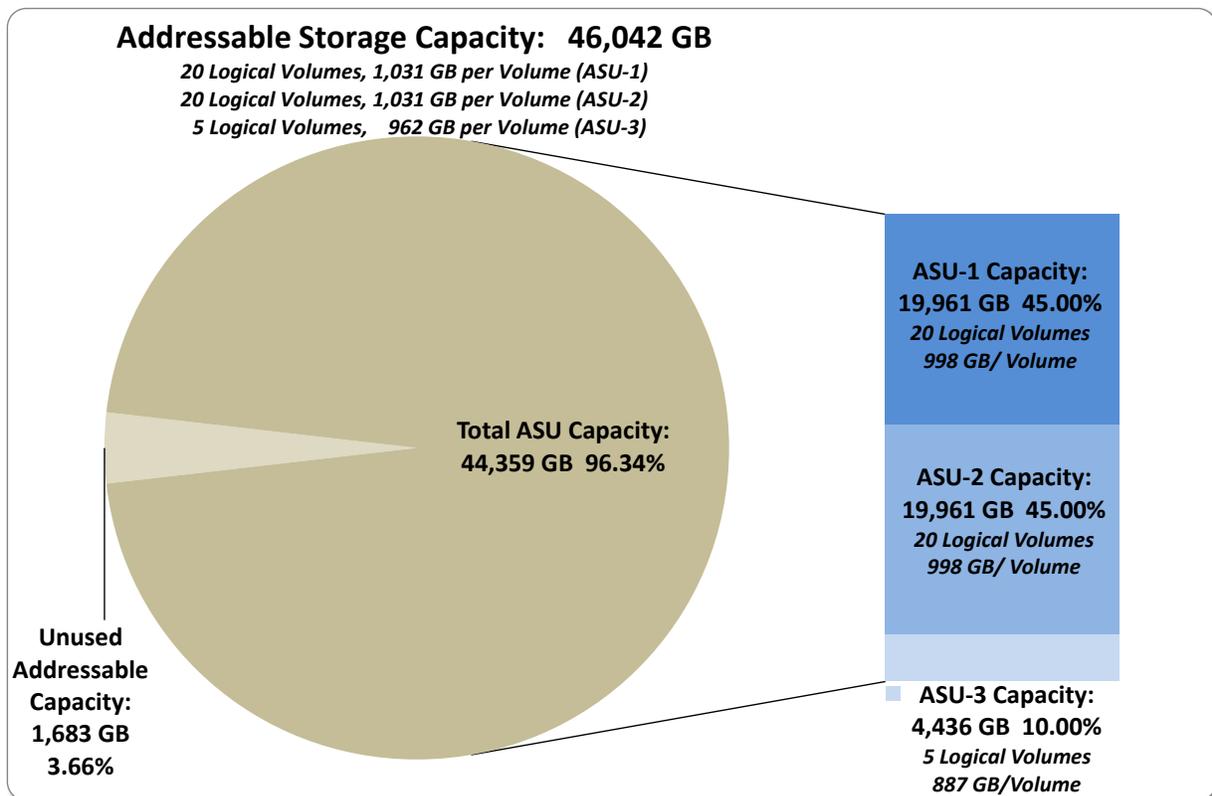
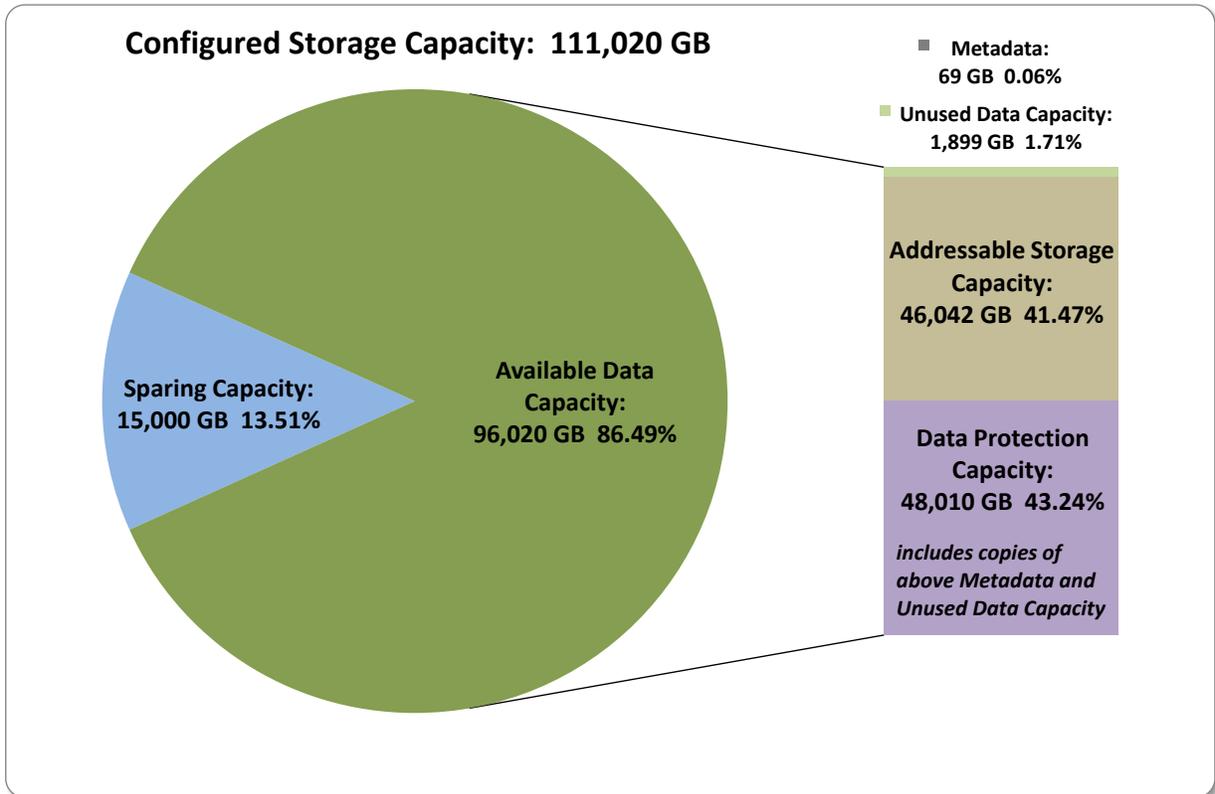
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

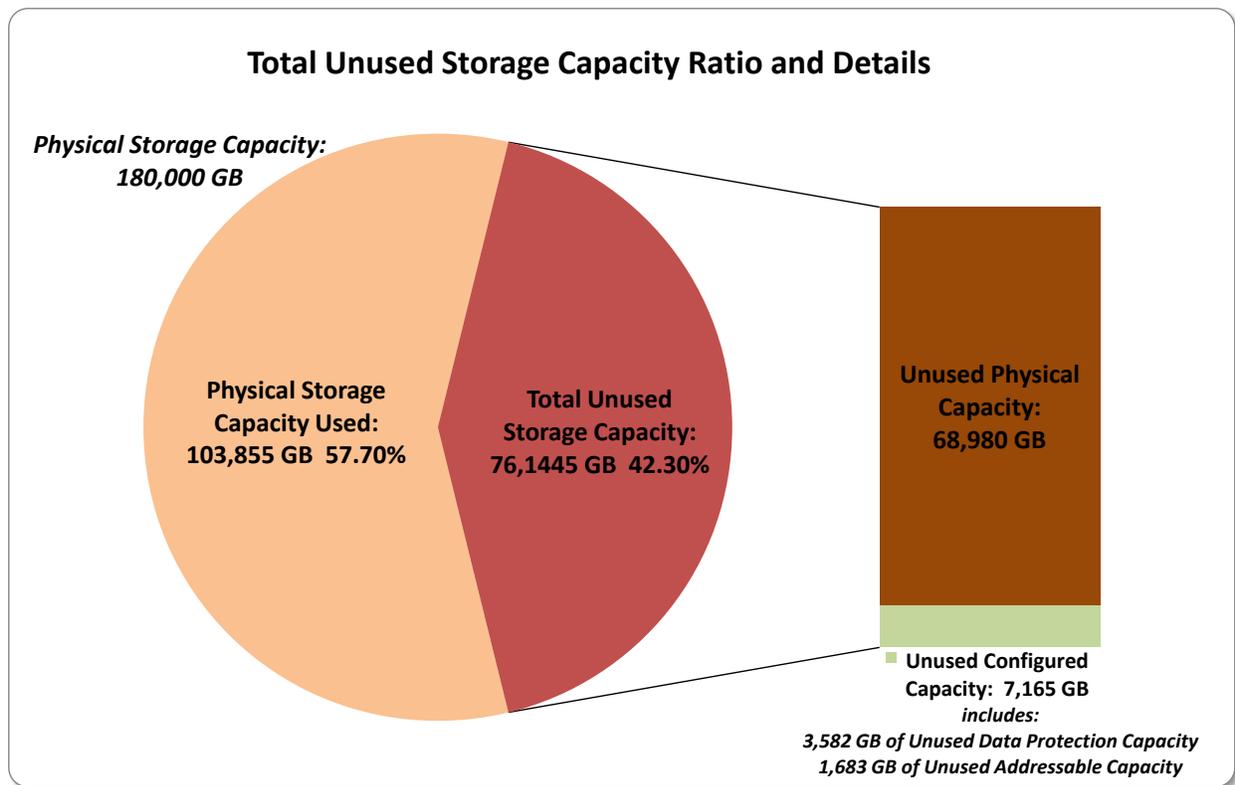
Storage Capacities, Relationships, and Utilization

The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.

The capacity values in each of the following four charts may be listed as an integer value, for readability.







SPC-1 Storage Capacity Utilization	
Application Utilization	24.64%
Protected Application Utilization	49.33%
Unused Storage Ratio	42.30%

Application Utilization:

Application Utilization: Total ASU Capacity (44,358.865 GB) divided by Physical Storage Capacity (180,000.000 GB)

Protected Application Utilization: Total ASU Capacity (44,358.865 GB) plus total Data Protection Capacity (48,010.000 GB) minus unused Data Protection Capacity (3,582.416 GB) divided by Physical Storage Capacity (180,000.000 GB)

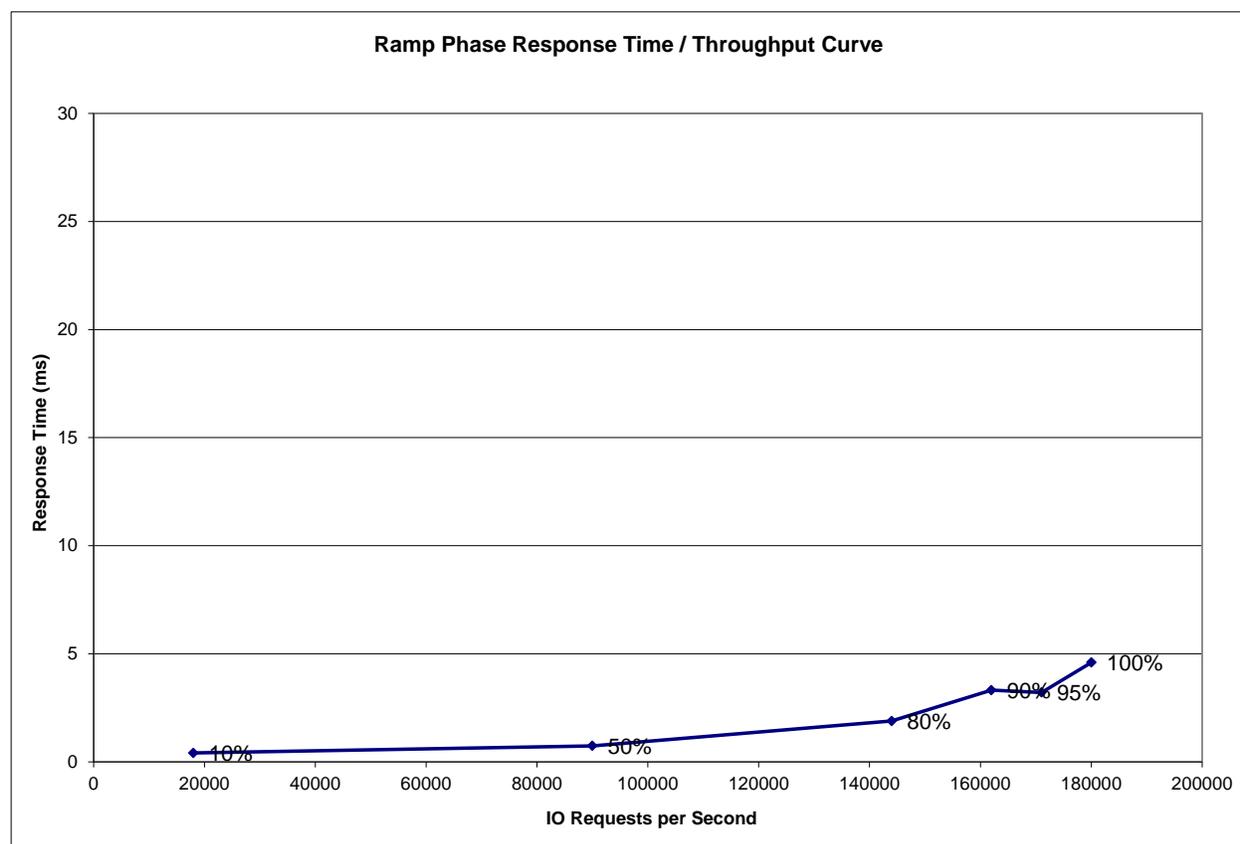
Unused Storage Ratio: Total Unused Capacity (76,144.832 GB) divided by Physical Storage Capacity (180,000.000 GB) and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 21-22 in the Full Disclosure Report.

Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	17,995.66	89,984.16	143,993.46	161,987.42	171,030.43	180,020.29
Average Response Time (ms):						
All ASUs	0.41	0.74	1.89	3.32	3.21	4.60
ASU-1	0.41	0.78	1.81	3.51	3.25	5.05
ASU-2	0.51	1.26	5.46	8.74	9.12	11.65
ASU-3	0.37	0.42	0.49	0.53	0.52	0.56
Reads	0.51	1.27	4.08	7.17	7.38	10.85
Writes	0.34	0.39	0.45	0.81	0.49	0.52

Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

There were no differences between the TSC and the Priced Storage Configuration.

Priced Storage Configuration Pricing

Description	Quantity	Unit Price	Discount	Extended price with Discount
2812-214 IBM XIV Storage System Model 214, all HW includes 3 year warranty.	1	\$ 187,195.00	70%	\$ 56,158.50
Interface/Data modules, w/ 12 x 1 TB disk option.	15	\$ 101,250.00	70%	\$ 455,625.00
SSD cache (6TB)	1	\$ 405,000.00	70%	\$ 121,500.00
5639-YYB XIV Software	1	\$ 516,750.00	60%	\$ 206,700.00
5639-XX3 XIV Software Support (3 years)	1	\$ 206,700.00	60%	\$ 82,680.00
IBM SAN24B-5 8Gb FC Switch	1	\$ 33,503.00	20%	\$ 26,802.40
Warranty extension for switch (add 2x1 year)	2	\$ 2,330.00	20%	\$ 3,728.00
Short wave 25m Fibre Channel cable	24	\$ 189.00	20%	\$ 3,628.80
8Gbps Dual Port FC adapter (HBA)	6	\$ 4,583.00	30%	\$ 19,248.60
Total Price				\$ 976,071.30

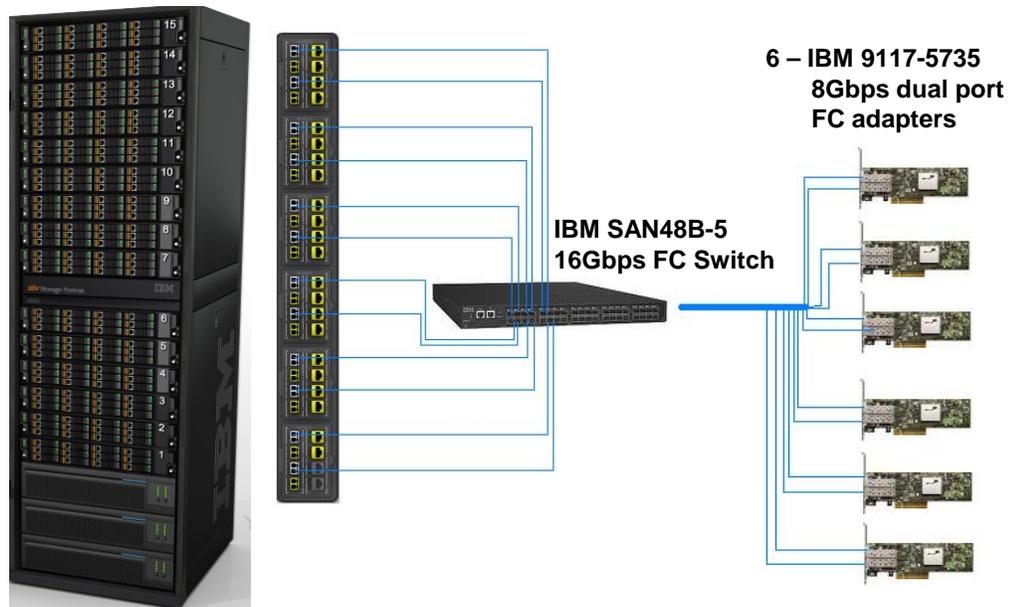
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems with four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

Priced Storage Configuration Diagram

IBM XIV® System Storage Gen3 (Version 11.3)

- 6 – 2TB Interface Modules
- 9 – 2TB Data Modules
- 180 – 2 TB 7200 RPM SAS disk drives
(12 – disk drives per module)



Priced Storage Configuration Components

Priced Storage Configuration
8 – IBM 9117-5735 8 Gbps dual-port FC adapters
IBM XIV® Storage System Gen3 (Version 11.3) 360 GiB RAM memory/cache 6,000 GB Flash cache (15 – 400 GB Flash modules) 6 – 2 TB Interface Modules 9 – 2 TB Data Modules 24 – 8 Gbps FC front-end connections (12 used) 30 – 4x6 Gbps SAS backend connections (30 used)
180 – 2 TB 7200 RPM SAS disk drive (12 per interface and data module)
1 – IBM SAN48B-5 16Gbps FC switch
24 – Short Wave 25m fibre channel cables