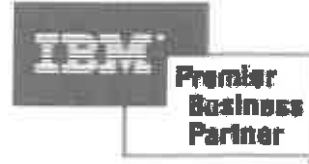




Strategy | Technology | Results

200 Association Drive
Charleston, WV 25311
304 768-1645
304 768-1671 (fax)



Ms. Stephanie Gale
Department of Administration
Purchasing Division
2019 Washington Street, East
Charleston, WV 25305

September 13, 2016

Dear Ms. Gale:

Please find enclosed the SIS response to CRFQ 0210 ISC1700000001 due September 13, 2016. This SIS/IBM solution meets all of the requirements of the solicitation. SIS is proving two responses to satisfy the SharePoint server estimate of 5-15 servers. This response will provide the necessary software for 5 SharePoint servers at both Charleston and Flatwoods. Since the State is not currently backing up SharePoint we thought it would be best to provide a solution for both the low end and the high end estimate.

Thank you for the opportunity to submit the attached responses and we look forward to further discussions

Sincerely,

Charles D. Arnett
Senior Client Executive
carnett@thinksis.com

Enclosures

09/12/16 14:33:05
WV Purchasing Division

| | |
|----------|---|
| 1 | CRFQ 0210 ISC1700000001 Due September 13, 2016 |
|----------|---|

| | |
|----------|-------------------------------|
| 2 | Attachment A - Pricing |
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|----------|--------------------------|
| 3 | Statement of Work |
|----------|--------------------------|

| | |
|----------|-------------------------|
| 4 | Design Schematic |
|----------|-------------------------|

| | |
|----------|--------------------|
| 5 | Data Sheets |
|----------|--------------------|



Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

State of West Virginia
 Request for Quotation
 21 - Info Technology

Proc Folder: 235721

Doc Description: Addendum #5 - Data Backup System

Proc Type: Central Purchase Order

| Date Issued | Solicitation Closes | Solicitation No | Version |
|-------------|------------------------|-------------------------|---------|
| 2016-09-01 | 2016-09-13 13:30:00 | CRFQ 0210 ISC1700000001 | 6 |

RECEIVING LOCATION

BID CLERK
 DEPARTMENT OF ADMINISTRATION
 PURCHASING DIVISION
 2019 WASHINGTON ST E
 CHARLESTON WV 25305
 US

VENDOR

Vendor Name, Address and Telephone Number:

Software Information System, LLC
 200 Association Drive, Suite 210
 Charleston, WV 25311

304 762-1645

FOR INFORMATION CONTACT THE BUYER

Stephanie L Gale
 (304) 558-8801
 stephanie.l.gale@wv.gov

Signature X

FEIN #

61-1371685

DATE

9-13-2016

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMATION:

Addendum #5 issued to:

1. Provide answers to technical questions received prior to the deadline and erroneously omitted from Addendum #3.

End of Addendum #5.

| INVOICE TO | | SHIP TO | |
|--|--|---|--|
| DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US | | IS&C - DATA CENTER MANAGER DEPARTMENT OF ADMINISTRATION BLDG 6 RM B110 1900 KANAWHA BLVD E CHARLESTON WV 25305-0135 US | |

| Line | Comm Ln Desc | Qty | Unit Issue | Unit Price | Total Price |
|------|--|---------|------------|------------|-----------------|
| 1 | Cost of System - Complete Attachment A Pricing Page | 0.00000 | EA | | \$ 1,424,733.21 |

| Comm Code | Manufacturer | Specification | Model # |
|-----------|--------------|---------------|---------|
| 71151106 | | | |

Extended Description :

Vendor/s should not complete Oasis pricing, and should instead submit Attachment A Pricing Page as instructed on 4.1 Contract Award - Pricing Page in the Specifications.

SCHEDULE OF EVENTS

| Line | Event | Event Date |
|------|-------------------------|------------|
| 1 | Technical Questions Due | 2016-08-17 |

ADDENDUM ACKNOWLEDGEMENT FORM
SOLICITATION NO.: _____

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.


Addendum Numbers Received:

(Check the box next to each addendum received)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input checked="" type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input checked="" type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input checked="" type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input checked="" type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

Software Interceptor Systems LLC
Company


Authorized Signature

9-13-2016
Date

NOTE: This addendum acknowledgement should be submitted with the bid to expedite document processing.
Revised 6/8/2012

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Charles D. Arnett Sr. Client Executive
(Name, Title)

(Printed Name and Title)

200 Association Drive, Suite 210

(Address)

304 768-1645 - 304 768-1671

(Phone Number) / (Fax Number)

carnett@thinksis.com

(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Software Information Systems LLC
(Company)

CD Arnett Charles D. Arnett Sr. Client Executive
(Authorized Signature) (Representative Name, Title)

Charles D. Arnett Sr. Client Executive
(Printed Name and Title of Authorized Representative)

9-13-2016
(Date)

304 768-1645 304 768-1671
(Phone Number) (Fax Number)

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (W. Va. Code §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Software Interpretation Systems LLC

Authorized Signature: [Signature] Date: 9-1-16

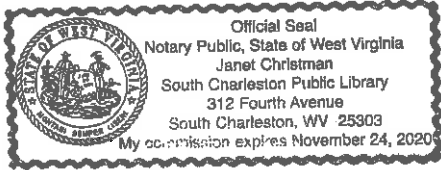
State of West Virginia

County of Kanawha, to-wit:

Taken, subscribed, and sworn to before me this 7 day of Sept., 2016

My Commission expires NOV, 2020

AFFIX SEAL HERE



NOTARY PUBLIC [Signature]

Purchasing Affidavit (Revised 08/01/2015)



Strategy | Technology | Results

200 Association Drive, Suite 210
Charleston, WV 25311
(304) 768-1645
(304) 768-1671 (Fax)

West Virginia Purchasing Division
CRFQ 0210 ISC170000001
Bid Date 9-13-2016



Attachment A - Pricing

| Item # | Part Number | Charleston Solution using 5 SharePoint Servers Description | Qty | Unit Price | Extended Price |
|--------|---------------|--|-----|------------|----------------|
| 1 | 3958-DD6 | TS7650G SERVER | | | |
| 2 | 3958-DD6-AGK2 | 25 METER OM3 FIBER CABLE LC | 1 | \$1,800.00 | \$1,800.00 |
| 3 | 3958-DD6-AGK5 | 8 GB FC HBA | 8 | \$6.38 | \$51.04 |
| 4 | 3958-DD6-AGK6 | VTL CLUSTERED NODE | 1 | \$652.50 | \$652.50 |
| 5 | 3958-DD6-AGKA | SHIPPING AND HANDLING DD6 | 1 | \$1,530.00 | \$1,530.00 |
| 6 | 7014-T42 | 7014-T42 IBM 2.08 METER RACK W/42 EIA'S | 1 | \$55.20 | \$55.20 |
| 7 | 7014-T42-5889 | INTELLIGENT PDU+, BASE OPTION, 1 EIA UNI | 1 | \$2,382.00 | \$2,382.00 |
| 8 | 7014-T42-8069 | FRONT DOOR FOR 2.0 METER RACK (FLAT BLAC | 1 | \$393.00 | \$393.00 |
| 9 | 7014-T42-8098 | SIDE PANEL FOR 1.8 OR 2.0 METER RACK (BL | 1 | \$330.00 | \$330.00 |
| 10 | 7014-T42-8654 | 7188/9188 PDU TO WALL, 4.3M, 24A, NEMA L6-3 | 2 | \$90.00 | \$180.00 |
| 11 | 7014-T42-7109 | INTELLIGENT PDU+, 1 EIA UNIT, UNIVERSAL, | 4 | \$144.00 | \$576.00 |
| 12 | 7014-T42-ESC1 | RACK SHIPPING & HANDLING - A | 3 | \$873.00 | \$2,619.00 |
| 13 | 5639-PTA | IBM SYSTEM STORAGE PROTECTIER ENTERPRISE | 1 | \$240.00 | \$240.00 |
| 14 | 5639-PTA-0001 | PROTECTIER VTL PER STORAGE DEVICE | 1 | \$0.00 | \$0.00 |
| 15 | 5639-PTA-0003 | CAPACITY SUPPORT PER DECIMAL TERABYTES 1 | 2 | \$1,050.00 | \$2,100.00 |
| 16 | 5639-PTA-0004 | CAPACITY SUPPORT PER DECIMAL TERABYTES 1 | 12 | \$498.75 | \$5,985.00 |
| 17 | 5639-PTA-0005 | CAPACITY SUPPORT PER DECIMAL TERABYTES 1 | 20 | \$420.00 | \$8,400.00 |
| 18 | 5639-PTA-0006 | CAPACITY SUPPORT PER DECIMAL TERABYTES 3 | 32 | \$187.50 | \$6,000.00 |
| 19 | 5639-PTA-0007 | CAPACITY SUPPORT PER DECIMAL TERABYTES 6 | 36 | \$97.50 | \$3,510.00 |
| 20 | 5639-PTA-0008 | CAPACITY SUPPORT PER DECIMAL TERABYTES 1 | 150 | \$30.00 | \$4,500.00 |
| 21 | 5639-PTA-0009 | CAPACITY SUPPORT PER 250 DECIMAL TERABYT | 133 | \$7.50 | \$997.50 |
| 22 | 5639-PTA-0010 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 1 | \$1,875.00 | \$1,875.00 |
| 23 | 5639-PTA-0011 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 12 | \$115.88 | \$1,390.56 |
| 24 | 5639-PTA-0012 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 20 | \$97.50 | \$1,950.00 |
| 25 | 5639-PTA-0013 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 32 | \$93.75 | \$3,000.00 |
| 26 | 5639-PTA-0014 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 36 | \$48.75 | \$1,755.00 |
| 27 | 5639-PTA-0015 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 150 | \$15.00 | \$2,250.00 |
| 28 | 5639-PTA-0016 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 133 | \$161.25 | \$21,446.25 |
| 29 | 5639-PTA-0017 | REPLICATION SUPPORT PER DECIMAL TERABYTE | 1 | \$937.50 | \$937.50 |
| 30 | 5639-PTA-0018 | REPLICATION SUPPORT PER DECIMAL TERABYTE | 12 | \$161.25 | \$1,935.00 |
| 31 | 5639-PTA-0019 | REPLICATION SUPPORT PER DECIMAL TERABYTE | 20 | \$35.25 | \$705.00 |
| 32 | 5639-PTA-0020 | REPLICATION SUPPORT PER DECIMAL TERABYTE | 32 | \$17.25 | \$552.00 |
| 33 | 5639-PTA-0021 | REPLICATION SUPPORT PER DECIMAL TERABYTE | 36 | \$13.50 | \$486.00 |
| 34 | 5639-PTA-0022 | REPLICATION SUPPORT PER DECIMAL TERABYTE | 150 | \$9.75 | \$1,462.50 |
| 35 | 5639-PTA-0023 | REPLICATION SUPPORT PER 250 DECIMAL TERA | 133 | \$4.50 | \$598.50 |
| 36 | 5639-XXK | IBM SYSTEM STORAGE PROTECTIER ENT ED 4YR | 1 | \$1,125.00 | \$1,125.00 |
| 37 | 5639-XXK-0001 | PROTECTIER VTL PER SERVER 4YR SWMA REG | 1 | \$0.00 | \$0.00 |
| 38 | 5639-XXK-0002 | CAPACITY SUP PER TB 1-12 4YR SWMA REG | 2 | \$630.00 | \$1,260.00 |
| 39 | 5639-XXK-0003 | CAPACITY SUP PER TB 13-32 4YR SWMA REG | 12 | \$299.25 | \$3,591.00 |
| 40 | 5639-XXK-0004 | CAPACITY SUP PER TB 33-64 4YR SWMA REG | 20 | \$252.00 | \$5,040.00 |
| 41 | 5639-XXK-0005 | CAPACITY SUP PER TB 65-100 4YR SWMA REG | 32 | \$112.50 | \$3,600.00 |
| 42 | 5639-XXK-0006 | CAPACITY SUP PER TB 101-250 4YR SWMA REG | 36 | \$58.50 | \$2,106.00 |
| 43 | 5639-XXK-0007 | CAPACITY SUP PER TB 251+ 4YR SWMA REG | 150 | \$18.00 | \$2,700.00 |
| 44 | 5639-XXK-0008 | CAPACITY SUP PER 250 TB 251+ 4YR SWMA RE | 133 | \$4.50 | \$598.50 |
| 45 | 5639-XXK-0009 | CLUSTER SUP PER TB 1-12 4YR SWMA REG | 1 | \$1,125.00 | \$1,125.00 |
| 46 | 5639-XXK-0010 | CLUSTER SUP PER TB 13-32 4YR SWMA REG | 12 | \$69.53 | \$834.36 |
| 47 | 5639-XXK-0011 | CLUSTER SUP PER TB 33-64 4YR SWMA REG | 20 | \$58.50 | \$1,170.00 |
| 48 | 5639-XXK-0012 | CLUSTER SUP PER TB 65-100 4YR SWMA REG | 32 | \$56.25 | \$1,800.00 |
| 49 | 5639-XXK-0013 | CLUSTER SUP PER TB 101-250 4YR SWMA REG | 36 | \$29.25 | \$1,053.00 |
| 50 | 5639-XXK-0014 | CLUSTER SUP PER TB 251+ 4YR SWMA REG | 150 | \$9.00 | \$1,350.00 |
| 51 | 5639-XXK-0015 | CLUSTER SUP PER 250 TB 251+ 4YR SWMA REG | 133 | \$2.25 | \$299.25 |
| 52 | 5639-XXK-0016 | REPLICATION SUP PER TB 1-12 4YR SWMA REG | 1 | \$562.50 | \$562.50 |
| 53 | 5639-XXK-0017 | REPLICATION SUP PER TB 13-32 4YR SWMA RE | 12 | \$96.75 | \$1,161.00 |
| 54 | 5639-XXK-0018 | REPLICATION SUP PER TB 33-64 4YR SWMA RE | 20 | \$21.15 | \$423.00 |
| 55 | 5639-XXK-0019 | REPLICATION SUP PER TB 65-100 4YR SWMA R | 32 | \$10.35 | \$331.20 |
| 56 | 5639-XXK-0020 | REPLICATION SUP PER TB 101-250 4YR SWMA | 36 | \$8.10 | \$291.60 |
| 57 | 5639-XXK-0021 | REPLICATION SUP PER TB 251+ 4YR SWMA REG | 150 | \$5.85 | \$877.50 |
| 58 | 5639-XXK-0022 | REPLICATION SUP PER 250 TB 251+ 4YR SWMA | 133 | \$2.70 | \$359.10 |
| 59 | 2077-224 | V5020 SFF CONTROL | 1 | \$675.00 | \$675.00 |
| 60 | 2077-224-9730 | POWER CORD - PDU CONNECTION | 1 | \$1,676.40 | \$1,676.40 |
| 61 | 2077-224-AC0B | 16GB FC ADAPTER PAIR | 1 | \$7.37 | \$7.37 |
| 62 | 2077-224-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$1,219.20 | \$1,219.20 |
| 63 | 2077-224-AC8D | 800GB 2.5 INCH FLASH DRIVE | 15 | \$672.85 | \$10,092.75 |
| 64 | 2077-224-ACE3 | ENCRYPTION ENABLEMENT | 9 | \$2,185.42 | \$19,668.78 |
| 65 | 2077-224-ACEC | ENCRYPTION USB DRIVE PACK | 1 | \$1,270.00 | \$1,270.00 |
| 66 | 2077-224-ACSS | 10M OM3 FIBER CABLE (LC) | 1 | \$105.92 | \$105.92 |
| 67 | 2077-224-AGC3 | SHIPPING AND HANDLING 224 | 2 | \$34.80 | \$69.60 |
| 68 | 5639-SV2 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$63.25 | \$63.25 |
| 69 | 5639-SV2-0005 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 70 | 5639-SVQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$1,168.40 | \$1,168.40 |
| | | | 1 | \$0.00 | \$0.00 |

| | | | | | |
|-----|---------------|--|----|-------------|--------------|
| 71 | 5639-SVQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | | |
| 72 | 2077-24F | V5000 SFF EXPANSION | 1 | \$701.04 | \$701.04 |
| 73 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 74 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 75 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 76 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 77 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 78 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 79 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 80 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 81 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 82 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 83 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 84 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 85 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 86 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 87 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 88 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 89 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 90 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 91 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 92 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 93 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 94 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 95 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 96 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 97 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 98 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 99 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 100 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 101 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 102 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 103 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 104 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 105 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 106 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 107 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 108 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 109 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 110 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 111 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 112 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 113 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 114 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 115 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 116 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 117 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 118 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 119 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 120 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 121 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 122 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 123 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 124 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 125 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 126 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 127 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 128 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 129 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 130 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 131 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 132 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 133 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 134 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 135 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 136 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 137 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 138 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 139 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 140 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 141 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 142 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 143 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 144 | 2077-24F | V5000 SFF EXPANSION | 1 | \$1,016.00 | \$1,016.00 |
| 145 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$609.60 | \$609.60 |
| 146 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 1 | \$7.37 | \$7.37 |
| 147 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 24 | \$672.85 | \$16,148.40 |
| 148 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 2 | \$30.23 | \$60.46 |
| 149 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$63.25 | \$63.25 |
| 150 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$0.00 | \$0.00 |
| 151 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$609.60 | \$609.60 |
| 152 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$0.00 | \$0.00 |
| 153 | | IBM 4 Year 2 Hour Warranty uplift to Essential Support with Account Advocate | 1 | \$1,016.00 | \$1,016.00 |
| | | Subtotal | | \$95,148.53 | \$95,148.53 |
| | | | | | \$412,800.92 |
| 154 | 2498-X24 | IBM SYSTEM NETWORKING SAN24B-5 | 1 | \$0.00 | \$0.00 |
| 155 | 2498-X24-2624 | SAN24B-5 16GBPS SW SFP BUNDLE | 1 | \$7,319.65 | \$7,319.65 |
| 156 | 2498-X24-2803 | SFP+ TRANSCEIVER 8 GBPS SW | 4 | \$321.10 | \$1,284.40 |
| 157 | 2498-X24-5835 | OM3 CABLE LC/LC 5M | 4 | \$29.90 | \$119.60 |
| 158 | 2498-X24-5988 | SAN24B-5 POWER SUPPLY/FAN KIT | 1 | \$1,560.00 | \$1,560.00 |
| 159 | 2498-X24-AGF2 | SHIPPING AND HANDLING X24 | 1 | \$84.50 | \$84.50 |

| 160 | 2498-X24 | IBM SYSTEM NETWORKING SAN24B-5 | 1 | | |
|--------|----------------------------|--|-----|-------------|----------------|
| 161 | 2498-X24-2624 | SAN24B-5 16GBPS SW SFP BUNDLE | 1 | \$0.00 | \$0.00 |
| 162 | 2498-X24-2803 | SFP+ TRANSCEIVER 8 GBPS SW | 1 | \$7,319.65 | \$7,319.65 |
| 163 | 2498-X24-5835 | OM3 CABLE LC/LC 5M | 4 | \$321.10 | \$1,284.40 |
| 164 | 2498-X24-5998 | SAN24B-5 POWER SUPPLY/FAN KIT | 4 | \$29.90 | \$119.60 |
| 165 | 2498-X24-AGF2 | SHIPPING AND HANDLING X24 | 1 | \$1,560.00 | \$1,560.00 |
| 166 | | IBM 4 Year 2 Hour Warranty uplift to Essential Support with Account Advocate | 1 | \$84.50 | \$84.50 |
| | | Subtotal | 1 | \$12,803.40 | \$12,803.40 |
| | | | | | \$33,539.70 |
| 167 | 5464H2U | X3500 M5, XEON 12C E5-2670V3 120W 2.3GHZ | 1 | \$4,200.00 | \$4,200.00 |
| 168 | 81Y7119 | INTEL XEON PROCESSOR E5-2670 V3 12C 2.3G | 1 | \$2,200.00 | \$2,200.00 |
| 169 | 46W0796 | 16GB TRUDDR4 MEMORY (2RX4, 1.2V) PC4-170 | 7 | \$200.00 | \$1,400.00 |
| 170 | 00AL540 | 8X 2.5IN HOT-SWAP SAS/SATA UPGRADE KIT F | 2 | \$525.00 | \$1,050.00 |
| 171 | 00AL541 | 8X 2.5IN HOT-SWAP SAS/SATA UPGRADE KIT F | 1 | \$125.00 | \$125.00 |
| 172 | 00WG685 | 300GB 10K 12GBPS SAS 2.5IN G3HS HDD | 2 | \$250.00 | \$500.00 |
| 173 | 00WG700 | 1.2TB 10K 12GBPS SAS 2.5IN G3HS HDD | 18 | \$650.00 | \$11,700.00 |
| 174 | 00YC325 | INTEL S3710 400GB ENTERPRISE PERFORMANCE | 9 | \$1,000.00 | \$9,000.00 |
| 175 | 00Y3341 | QLOGIC 16GB FC DUAL-PORT HBA | 1 | \$1,850.00 | \$1,850.00 |
| 176 | 49Y7980 | INTEL X520 DUAL PORT 10GBE SFP+ ADAPTER | 1 | \$500.00 | \$500.00 |
| 177 | 46C3447 | SFP+ SR TRANSCEIVER | 2 | \$350.00 | \$700.00 |
| 178 | 90Y3901 | INTEGRATED MANAGEMENT MODULE ADVANCED UP | 1 | \$250.00 | \$250.00 |
| 179 | 00AL566 | SYSTEM X3500 M5 LIGHTPATH UPGRADE KIT | 1 | \$50.00 | \$50.00 |
| 180 | 00AL536 | SYSTEM X 900W HIGH EFFICIENCY PLATINUM A | 1 | \$325.00 | \$325.00 |
| 181 | 00AL538 | SYSTEM X3500 M5 TOWER TO RACK CONVERSION | 1 | \$190.00 | \$190.00 |
| 182 | 00KC334 | SYSTEM X3500 M5 CABLE MANAGEMENT KIT | 1 | \$35.00 | \$35.00 |
| 183 | 39Y7932 | 4.3M, 10A/100-250V, C13 TO IEC 320-C14 R | 2 | \$25.00 | \$50.00 |
| 184 | 00WU074 | 4 YEAR ONSITE REPAIR 24X7 2 HOUR RESPON | 1 | \$1,450.00 | \$1,450.00 |
| 185 | 01ET120 | 4 YR ENTERPRISE SOFTWARE SUPPORT MULTI-OP | 1 | \$1,200.00 | \$1,200.00 |
| 186 | 00YH403 | RHEL SERVER PHYSICAL OR VIRTUAL NODE, 2 | 1 | \$3,200.00 | \$3,200.00 |
| 187 | P177/C3 | INTEGRATION - TIPS# 615586 | 1 | \$300.00 | \$300.00 |
| 188 | ENG-OSI-INTERMEDIATE | ENG-OSI-INTERMEDIATE | 1 | \$225.00 | \$225.00 |
| 189 | | IBM 4 Year 2 Hour Warranty uplift to Essential Support with Account Advocate | 1 | \$8,862.41 | \$8,862.41 |
| | | Subtotal | | | \$49,362.41 |
| 190 | D11MKLL & E0LUKLL | IBM Spectrum Protect Suite SW Subscription License and Support for 48 Months | 159 | \$1,050.00 | \$166,950.00 |
| 191 | DA6 ITM PLT 13 3 MAINT PRM | DocAve 6 Backup and Recovery SW License/5 SharePoint servers for 48 Months | 5 | \$8,000.00 | \$40,000.00 |
| | | Charleston Solution Subtotal | | | \$702,653.03 |
| Item # | Part Number | Flatwoods Solution using 5 SharePoint servers Description | Qty | Unit Price | Extended Price |
| 191 | 3958-DD6 | TS7650G SERVER | 1 | \$1,800.00 | \$1,800.00 |
| 192 | 3958-DD6-AGK2 | 25 METER OM3 FIBER CABLE LC | 8 | \$6.38 | \$51.04 |
| 193 | 3958-DD6-AGK5 | 8 GB FC HBA | 1 | \$652.50 | \$652.50 |
| 194 | 3958-DD6-AGK6 | VTL CLUSTERED NODE | 1 | \$1,530.00 | \$1,530.00 |
| 195 | 3958-DD6-AGKA | SHIPPING AND HANDLING DD6 | 1 | \$55.20 | \$55.20 |
| 196 | 7014-T42 | 7014-T42 IBM 2.08 METER RACK W/42 EIA'S | 1 | \$2,382.00 | \$2,382.00 |
| 197 | 7014-T42-5889 | INTELLIGENT PDU+, BASE OPTION, 1 EIA UNI | 1 | \$393.00 | \$393.00 |
| 198 | 7014-T42-6069 | FRONT DOOR FOR 2.0 METER RACK (FLAT BLAC | 1 | \$330.00 | \$330.00 |
| 199 | 7014-T42-6098 | SIDE PANEL FOR 1.8 OR 2.0 METER RACK (BL | 2 | \$90.00 | \$180.00 |
| 200 | 7014-T42-6654 | 7188/9188 PDU TO WALL 4.3M,24A,NEMA L6-3 | 4 | \$144.00 | \$576.00 |
| 201 | 7014-T42-7109 | INTELLIGENT PDU+, 1 EIA UNIT, UNIVERSAL, | 3 | \$873.00 | \$2,619.00 |
| 202 | 7014-T42-ESC1 | RACK SHIPPING & HANDLING - A | 1 | \$240.00 | \$240.00 |
| 203 | 5639-PTA | IBM SYSTEM STORAGE PROTECTIER ENTERPRISE | 1 | \$0.00 | \$0.00 |
| 204 | 5639-PTA-0001 | PROTECTIER VTL PER STORAGE DEVICE | 2 | \$1,050.00 | \$2,100.00 |
| 205 | 5639-PTA-0003 | CAPACITY SUPPORT PER DECIMAL TERABYTES 1 | 1 | \$498.75 | \$498.75 |
| 206 | 5639-PTA-0010 | CLUSTERING SUPPORT PER DECIMAL TERABYTES | 1 | \$115.88 | \$115.88 |
| 207 | 5639-PTA-0017 | REPLICATION SUPPORT PER DECIMAL TERABYTE | 1 | \$161.25 | \$161.25 |
| 208 | 5639-XXK | IBM SYSTEM STORAGE PROTECTIER ENT ED 4YR | 1 | \$0.00 | \$0.00 |
| 209 | 5639-XXK-0001 | PROTECTIER VTL PER SERVER 4YR SWMA REG | 2 | \$630.00 | \$1,260.00 |
| 210 | 5639-XXK-0002 | CAPACITY SUP PER TB 1-12 4YR SWMA REG | 1 | \$299.25 | \$299.25 |
| 211 | 5639-XXK-0009 | CLUSTER SUP PER TB 1-12 4YR SWMA REG | 1 | \$69.53 | \$69.53 |
| 212 | 5639-XXK-0016 | REPLICATION SUP PER TB 1-12 4YR SWMA REG | 1 | \$96.75 | \$96.75 |
| 213 | 2077-224 | V5020 SFF CONTROL | 1 | \$1,876.40 | \$1,876.40 |
| 214 | 2077-224-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 215 | 2077-224-AC0B | 16GB FC ADAPTER PAIR | 1 | \$1,219.20 | \$1,219.20 |
| 216 | 2077-224-AC6A | 1.8TB 10K 2.5 INCH HDD | 15 | \$672.85 | \$10,092.75 |
| 217 | 2077-224-AC8D | 800GB 2.5 INCH FLASH DRIVE | 9 | \$2,185.42 | \$19,668.78 |
| 218 | 2077-224-ACE3 | ENCRYPTION ENABLEMENT | 1 | \$1,270.00 | \$1,270.00 |
| 219 | 2077-224-ACEC | ENCRYPTION USB DRIVE PACK | 1 | \$105.92 | \$105.92 |
| 220 | 2077-224-ACSS | 10M OM3 FIBER CABLE (LC) | 2 | \$34.80 | \$69.60 |
| 221 | 2077-224-AGC3 | SHIPPING AND HANDLING 224 | 1 | \$63.25 | \$63.25 |
| 222 | 5639-SV2 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 223 | 5639-SV2-0005 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$1,168.40 | \$1,168.40 |
| 224 | 5639-SVQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 225 | 5639-SVQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$701.04 | \$701.04 |
| 226 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 227 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 228 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 229 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 230 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 231 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 232 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 233 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 234 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 235 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 236 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 237 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |

| | | | | | |
|------|---------------|--|----|-------------|---------------------|
| 238 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 239 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 240 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 241 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 242 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 243 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 244 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 245 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 246 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 247 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 248 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 249 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 250 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 251 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 252 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 253 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 254 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 255 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 256 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 257 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 258 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 259 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 260 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 261 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 262 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 263 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 264 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 265 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 266 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 267 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 268 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 269 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 270 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 271 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 272 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 273 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 274 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 275 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 276 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 277 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 278 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 279 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 280 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 281 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 282 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 283 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 284 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 285 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 286 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 287 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 288 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 289 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 290 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 291 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 292 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 293 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 294 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 295 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 296 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 297 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 298 | 2077-24F | V5000 SFF EXPANSION | 1 | \$609.60 | \$609.60 |
| 299 | 2077-24F-9730 | POWER CORD - PDU CONNECTION | 1 | \$7.37 | \$7.37 |
| 300 | 2077-24F-AC6A | 1.8TB 10K 2.5 INCH HDD | 24 | \$672.85 | \$16,148.40 |
| 301 | 2077-24F-ACUA | 0.6M 12GB SAS CABLE(MSAS HD) | 2 | \$30.23 | \$60.46 |
| 302 | 2077-24F-AGC7 | SHIPPING AND HANDLING 24F | 1 | \$63.25 | \$63.25 |
| 303 | 5639-SSQ | SPECTRUM VIRTUALIZE SOFTWARE FOR STORWIZ | 1 | \$0.00 | \$0.00 |
| 304 | 5639-SSQ-0005 | BASE PER STORAGE DEVICE SW MAINT WITH 4 | 1 | \$1,168.40 | \$1,168.40 |
| 305 | 5639-SV4 | IBM SPECTRUM VIRTUALIZE SOFTWARE FOR STO | 1 | \$0.00 | \$0.00 |
| 306 | 5639-SV4-0001 | BASE PER STORAGE DEVICE WITH 1 YEAR SW M | 1 | \$701.04 | \$701.04 |
| 307 | | IBM 4 Year 2 Hour Warranty uplift to Essential Support with Account Advocate | 1 | \$95,148.53 | \$95,148.53 |
| | | Subtotal | | | \$315,428.07 |
| 308 | 2498-X24 | IBM SYSTEM NETWORKING SAN24B-5 | 1 | \$0.00 | \$0.00 |
| 309 | 2498-X24-2624 | SAN24B-5 16GBPS SW SFP BUNDLE | 1 | \$7,319.65 | \$7,319.65 |
| 310 | 2498-X24-2803 | SFP+ TRANSCEIVER 8 GBPS SW | 4 | \$321.10 | \$1,284.40 |
| 311 | 2498-X24-5835 | OM3 CABLE LC/LC 5M | 4 | \$29.90 | \$119.60 |
| 312 | 2498-X24-5998 | SAN24B-5 POWER SUPPLY/FAN KIT | 1 | \$1,560.00 | \$1,560.00 |
| 313 | 2498-X24-AGF2 | SHIPPING AND HANDLING X24 | 1 | \$84.50 | \$84.50 |
| 314 | 2498-X24 | IBM SYSTEM NETWORKING SAN24B-5 | 1 | \$0.00 | \$0.00 |
| 315 | 2498-X24-2624 | SAN24B-5 16GBPS SW SFP BUNDLE | 1 | \$7,319.65 | \$7,319.65 |
| 316 | 2498-X24-2803 | SFP+ TRANSCEIVER 8 GBPS SW | 4 | \$321.10 | \$1,284.40 |
| 317 | 2498-X24-5835 | OM3 CABLE LC/LC 5M | 4 | \$29.90 | \$119.60 |
| 318 | 2498-X24-5998 | SAN24B-5 POWER SUPPLY/FAN KIT | 1 | \$1,560.00 | \$1,560.00 |
| 319 | 2498-X24-AGF2 | SHIPPING AND HANDLING X24 | 1 | \$84.50 | \$84.50 |
| 320 | | IBM 4 Year 2 Hour Warranty uplift to Essential Support with Account Advocate | 1 | \$12,803.40 | \$12,803.40 |
| | | Subtotal | | | \$33,539.70 |
| 3321 | 5464H2U | X3500 M5, XEON 12C E5-2670V3 120W 2.3GHZ | 1 | \$4,200.00 | \$4,200.00 |
| 322 | 81Y7119 | INTEL XEON PROCESSOR E5-2670 V3 12C 2.3G | 1 | \$2,200.00 | \$2,200.00 |
| 323 | 46W0796 | 16GB TRUDDR4 MEMORY (2RX4, 1.2V) PC4-170 | 7 | \$200.00 | \$1,400.00 |
| 324 | 00AL540 | 8X 2.5IN HOT-SWAP SAS/SATA UPGRADE KIT F | 2 | \$525.00 | \$1,050.00 |

| | | | | | | |
|--|----------------------------|--|-----|--------------------|------------|-----------------------|
| 325 | 00AL541 | 8X 2.5IN HOT-SWAP SAS/SATA UPGRADE KIT F | 1 | | \$125.00 | \$125.00 |
| 326 | 00WG685 | 300GB 10K 12GBPS SAS 2.5IN G3HS HDD | 2 | | \$250.00 | \$500.00 |
| 327 | 00WG700 | 1.2TB 10K 12GBPS SAS 2.5IN G3HS HDD | 18 | | \$650.00 | \$11,700.00 |
| 328 | 00YC325 | INTEL S3710 400GB ENTERPRISE PERFORMANCE | 9 | | \$1,000.00 | \$9,000.00 |
| 329 | 00Y3341 | QLOGIC 16GB FC DUAL-PORT HBA | 1 | | \$1,850.00 | \$1,850.00 |
| 330 | 49Y7960 | INTEL X520 DUAL PORT 10GBE SFP+ ADAPTER | 1 | | \$500.00 | \$500.00 |
| 331 | 46C3447 | SFP+ SR TRANSCEIVER | 2 | | \$350.00 | \$700.00 |
| 332 | 90Y3901 | INTEGRATED MANAGEMENT MODULE ADVANCED UP | 1 | | \$250.00 | \$250.00 |
| 333 | 00AL566 | SYSTEM X3500 M5 LIGHTPATH UPGRADE KIT | 1 | | \$50.00 | \$50.00 |
| 334 | 00AL536 | SYSTEM X 900W HIGH EFFICIENCY PLATINUM A | 1 | | \$325.00 | \$325.00 |
| 335 | 00AL538 | SYSTEM X3500 M5 TOWER TO RACK CONVERSION | 1 | | \$190.00 | \$190.00 |
| 336 | 00K3334 | SYSTEM X3500 M5 CABLE MANAGEMENT KIT | 1 | | \$35.00 | \$35.00 |
| 337 | 39Y7932 | 4.3M, 10A/100-250V, C13 TO IEC 320-C14 R | 2 | | \$25.00 | \$50.00 |
| 338 | 00WU074 | 4 YEAR ONSITE REPAIR 24X7 4 HOUR RESPONS | 1 | | \$1,450.00 | \$1,450.00 |
| 339 | 01ET120 | 4 YR ENTERPRISE SOFTWARE SUPPORT MULTI-OP | 1 | | \$1,200.00 | \$1,200.00 |
| 340 | 00YH403 | RHEL SERVER PHYSICAL OR VIRTUAL NODE, 2 | 1 | | \$3,200.00 | \$3,200.00 |
| 341 | P177/C3 | INTEGRATION - TIPS# 615586 | 1 | | \$300.00 | \$300.00 |
| 342 | ENG-OSI-INTERMEDIATE | ENG-OSI-INTERMEDIATE | 1 | | \$225.00 | \$225.00 |
| 343 | | IBM 4 Year 2 Hour Warranty uplift to Essential Support with Account Advocate | 1 | | \$8,862.41 | \$8,862.41 |
| | | Subtotal | | | | \$49,362.41 |
| 344 | D11MKLL & E0LUKLL | IBM Spectrum Protect Suite SW Subscription License and Support for 48 Months | 159 | | \$1,050.00 | \$166,950.00 |
| 345 | DA6 ITM PLT 13 3 MAINT PRM | DocVue 6 Backup and Recovery SW License/5 SharePoint servers for 48 Months | 5 | | \$8,000.00 | \$40,000.00 |
| | | Flatwoods Solution Subtotal | | | | \$605,280.18 |
| RECAP | | | | | | |
| | | Charleston Solution Subtotal | | | | \$702,653.03 |
| | | Flatwoods Solution Subtotal | | | | \$605,280.18 |
| | | Charleston & Flatwoods Subtotal | | | | \$1,307,933.21 |
| | | Training per Specification 3.1.16 | | | | \$17,000.00 |
| | | SIS Services Statement of Work for both locations | | | | \$82,800.00 |
| | | Data erasure/destruction per Specification 3.1.4 for both locations | | | | \$17,000.00 |
| | | | | Grand Total | | \$1,424,733.21 |
| Special Note: This quote includes all components and all services and all training per the RFQ for both locations. Because of how IBM quotes its products, there are items (Protectier) listed in the Charleston section that will be implemented in Flatwoods. This grouping provided additional savings to the State. But this quote includes all necessary hardware and software to meet the specifications for both locations. Both locations will be equal when implemented. I have listed below the recalculated subtotal for both Charleston and Flatwoods. The total remains the same. | | | | | | |
| RECAP | | | | | | |
| | | Charleston Solution Subtotal | | | | \$653,966.61 |
| | | Flatwoods Solution Subtotal | | | | \$653,966.60 |
| | | Charleston & Flatwoods Subtotal | | | | \$1,307,933.21 |
| | | Training per Specification 3.1.16 | | | | \$17,000.00 |
| | | SIS Services Statement of Work for both locations | | | | \$82,800.00 |
| | | Data erasure/destruction per Specification 3.1.4 for both locations | | | | \$17,000.00 |
| | | | | Grand Total | | \$1,424,733.21 |



Strategy | Technology | Results



State of West Virginia

TSM Server Installation – Statement of Work

August 29, 2016

Any and all changes to hardware configuration, services requested, or scope of the project in timeframe or deliverables will constitute a review and potential adjustment both in services performed and total cost of what is quoted herein. Any changes to the aforementioned without a review and approval by SIS Technical or Consulting Services will void this document.

The information included in this document is the property of Software Information Systems, LLC ("SIS"), and shall not be used or disclosed in whole or in part for any purpose other than to evaluate SIS as a service provider for the engagement defined within this document.

- CONSTRUCTION
- CORPORATE
- EDUCATION
- ENTERTAINMENT
- FINANCIAL
- GOVERNMENT
- HEALTHCARE
- HIGH TECH
- NON-PROFIT
- TRANSPORTATION



PROJECT SPECIFICATION

Title of Project: TSM Server Installation
Customer Name: State of West Virginia ("WV")
Customer Contact Name: Brian Pratt
Customer Contact Number: (304) 957-6886
Customer Contact Email: brian.J.pratt@wv.gov
Client Representative: Charlie Arnett
SOW Expiration Date: 10/29/2016
Document Number: 3062v2

SUMMARY

SIS will assist the State of West Virginia with the building and Implementation of a TSM server. This will include work efforts for two physical sites (Charleston & Flatwoods), as well as site replication, onboarding, and necessary training.

SCOPE OF WORK

SIS will provide experienced Consultants to perform the following:

Charleston facility:

- SAN Switches
 - Rack SAN switches
 - Configure SAN switches to network management
 - ZONE SAN switches for PROTECTIER, storage, and Host.
- ProtecTIER
 - Rack ProtecTIER gateway
 - Cable ProtecTIER gateway to SAN
 - Configure ProtecTIER storage and VTL logical devices
- IBM V5020 disk subsystem
 - Rack V5020
 - Cable V5020
 - Configure disk arrays for ProtecTIER
- Server Hardware
 - TSM Server Hardware installation
 - TSM Server Hardware setup
 - TSM Server OS installation
 - TSM Server software setup
- Server DB and LOGS
 - TSM DB disk subsystem installation
 - TSM DB disk subsystem setup
 - TSM DB disk configuration in TSM
- Server Storage (VTL)
 - TSM Tape Library installation



- TSM Tape Library setup
- TSM Tape Library configuration in TSM

Flatwoods Facility:

- SAN Switches
 - Rack SAN switches
 - Configure SAN switches to network management
 - ZONE SAN switches for PROTECTIER, storage, and Host.
- ProtecTIER
 - Rack ProtecTIER gateway
 - Cable ProtecTIER gateway to SAN
 - Configure ProtecTIER storage and VTL logical devices
- IBM V5020 disk subsystem
 - Rack V5020
 - Cable V5020
 - Configure disk arrays for ProtecTIER
- Server Hardware
 - TSM Server Hardware installation
 - TSM Server Hardware setup
 - TSM Server OS installation
 - TSM Server software setup
- Server DB and LOGS
 - TSM DB disk subsystem installation
 - TSM DB disk subsystem setup
 - TSM DB disk configuration in TSM
- Server Storage (VTL)
 - TSM Tape Library installation
 - TSM Tape Library setup
 - TSM Tape Library configuration in TSM

Site replication, client onboarding, and training.

- Setup VTL replication
 - Configure Charleston site to replicate to Flatwoods
 - Configure Flatwoods site to replicate to Charleston
- Client Setup – Knowledge transfer (40 hours)
 - Perform setup of TSM file-based clients (Up to 10)
 - Windows
 - AIX
 - Linux
 - NDMP setup
 - Application clients (Oracle/SQL/Sharepoint)
- Virtualization backup Server setup
 - Install and config of one vStorage backup server (Windows)
 - Install and config of TWO Data Movers (Windows)
 - Configuration of TSM server for Virtualization
 - Knowledge Transfer on VMware setup
- Training and Knowledge Transfer



- Training to be provided via IBM training
- Remote support assistance during client migration transition
 - Provide remote support assistance
 - Answer questions and provide direction for troubleshooting
 - Assist with IBM PMRs, as needed.

DELIVERABLES

- As-Built Documentation

ASSUMPTIONS AND RISKS

- **WV** will identify a Point of Contact with overall responsibility for the project. This person will act as the primary contact for SIS and will have decision-making authority regarding management of this project.
- **WV** will provide responses to requests for information within the mutually agreed upon timeframes. Failure to do so may impact the timely completion of this project.
- **WV** will provide timely access to personnel for their required tasks, knowledge of existing systems and collaboration.
- **WV** will provide access to all necessary facilities, hardware, software and licenses to SIS at the commencement of this engagement.
- **WV** will provide required/appropriate access levels to all environments required to complete the scope of work.
- **WV** will handle any Network or Firewall Configuration.
- SIS may perform some work remotely, where applicable and appropriate.
- SIS will return all customer supplied documentation, software, and other materials to **WV** at completion of project.
- **WV** is responsible for the validity of any required backups they have taken and to make sure that they are complete. SIS cannot be held responsible for loss of data on customer's systems.
- If task assignment requires SIS to work directly with a third party, effort spent facilitating communication with that party is considered billable work. SIS cannot be responsible for the timeliness of responses from a third party.
- **WV** may terminate this Statement of Work at any time by notifying SIS in writing. All actual hours worked prior to receiving that notification will be due and payable.
- Any effort associated with implementing changes to SIS's environment to support specific customer requests (such as VPN connection or creation of a development environment) is considered to be billable work. Any expense associated with such a request will be handled as an additional project expense.
- Once this Statement of Work is approved, any changes to the Scope of Services will be managed through SIS' Scope Change Request (SCR) process.

OUT OF SCOPE

- Integration with Third Party Application Solutions
- Remediation of any deficiencies within the current environment discovered during this engagement
- Other Deliverables, installation of hardware or software, or configuration of applications that are not specifically listed within this document

If further services are necessary outside of the boundaries of this scope, a SCR form or an additional scope of work will be provided and mutually agreed upon by **WV** and SIS prior to execution.

INVESTMENT

Invoicing and Payment

SIS proposes to invoice for this project as a Fixed Price based on our previous experience with similar Projects.

Fixed Price: SIS provides a total price for the project scope based on a best effort estimate, plus a risk factor based on the project’s complexity. **WV** is invoiced for the total project amount. Any changes in scope must be documented and agreed to in the form of a Scope Change Request.

| Service(s) | Price |
|-----------------------------------|--------------------|
| TSM Server Build & Implementation | \$82,800.00 |
| Project Total | \$82,800.00 |

SCOPE CHANGE REQUEST PROCEDURE

The following steps provide a detailed process to follow if a change to this Statement of Work is required:

- A Scope Change Request (SCR) will be the vehicle for communicating the change. The SCR must describe the change, the rationale for the change, and the effect the change will have on the project.
- **WV's** Point of Contact will review the proposed change with the SIS Project Manager and approve it for further investigation or reject it. The investigation will determine the effect that the implementation of the SCR change will have on price, schedule and other terms and conditions of the Agreement.
- A written Change Authorization must be signed by both parties to authorize implementation of the investigated changes.

TERMS AND CONDITIONS

The Services provided under this SOW shall be governed by the terms of the SIS Master Services Agreement which can be found at <http://cdn2.hubspot.net/hubfs/586160/legal/Master-Services-Agreement-2015-Online-Terms-10-2015-1.pdf?t=1447698330447> . By signing this SOW, **WV** agrees to be bound by the aforementioned online terms and conditions.

CONTRACT TERM AND TERMINATION

Once executed, this Statement of Work will be valid until services outlined in the above scope have been completed, or until 120 consecutive days from date of execution, after which point this Statement of Work shall be considered terminated. Any additional work requested after such contract term has been reached must be addressed in an additional Statement of Work or a Scope Change Request. All work performed prior to completion of contract term shall be due and payable.

PROJECT AUTHORIZATION AND ACCEPTANCE

Document ID: 3062v2

Expiration Date: 10/29/2016

We look forward to working with you on this engagement. **Please initial at the bottom of each page, sign the acceptance section below, and return the entire document to initiate the project.** All services provided under this Statement of Work are subject to the terms and conditions of the SIS Master Services Agreement.

The information included in this Statement of Work is the property of SIS, LLC and shall not be used or disclosed in whole or in part for any purpose other than to evaluate SIS, LLC as a technology partner for WV.

State of West Virginia

By _____

Name _____

Title _____

Date _____

Software Information Systems, LLC

By _____

Name _____

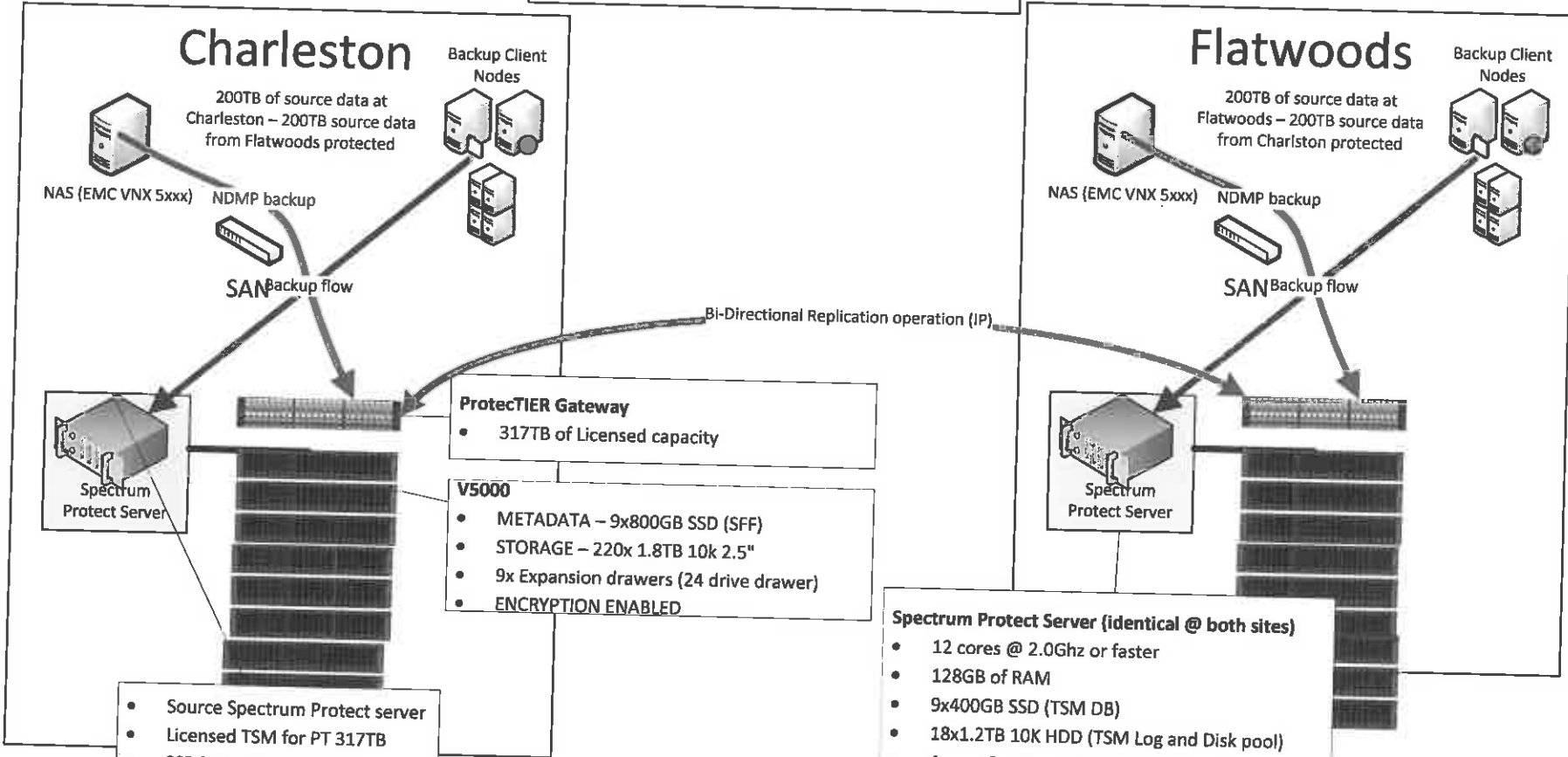
Title _____

Date _____

Please return this completed form to your SIS Sales Representative, **Charlie Arnett**. Mail: Software Information Systems, 165 Barr Street, Lexington, KY 40507; E-mail: carnett@thinksis.com; Fax: 859-977-4750.



- Considerations:**
- Backups occur locally at each site, and are available locally, if WAN links are offline.
 - VTL Replication for TSM storage pools (NDMP and FILE/app data)
 - Bi-directional Replication via ProtecTIER VTL
 - 400 TB total protected data, replicated site-to-site
 - Each Site contains primary data for itself, and copy of alternate site's data.



- Source Spectrum Protect server
- Licensed TSM for PT 317TB
- SSD TSM DB and local LOGS
- DB backed up to ProtecTIER

| | | | | | |
|--|----------------|-------|---------|--------|--------|
| Backup Solution Design – WV State Government | | | | | |
| DRAWN | Jeremy Brovage | SIZE | FSCM NO | DWG NO | REV |
| ISSUED | | SCALE | 1 : 1 | SHEET | 1 OF 2 |



Highlights

- Simplify backup and recovery with a self-service restore portal and interfaces for VMware administrators
 - Reduce backup infrastructure costs by up to 53 percent¹ with proven, built-in efficiency capabilities
 - Choose the right mix of storage media to optimize backups, including disk, cloud, tape and object storage
 - Optimize data protection for virtual and software-defined environments, core applications and critical workstations
 - Protect data with policy-based multi-site replication and flexible restore capabilities
-

IBM Spectrum Protect

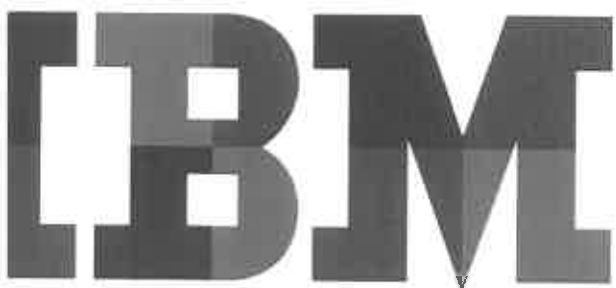
Trusted backup and recovery software solutions

It can be challenging for organizations to manage the cost, complexity and capabilities of their backup systems, especially when they collect, process and store more information than ever before. Backup administrators are also feeling the pressure of increasingly stringent compliance demands, growing backup infrastructure complexity and flat IT budgets.

IBM® Spectrum Protect™, formerly IBM Tivoli® Storage Manager family, can simplify data protection, whether data is hosted in physical, virtual, software-defined or cloud environments. With IBM Spectrum Protect, organizations can choose the right software to manage and protect their data—while also simplifying backup administration, improving efficiency, delivering scalable capacity and enabling advanced capabilities.

Simplified backup administration

Backups can be managed by IBM Spectrum Protect Operations Center, VMware vSphere Client or third-party software. IBM Spectrum Protect Operations Center delivers breakthrough visibility and ease of use for backup administrators, reducing the level of expertise required.



Server administrators can restore individual virtual machines from the VMware vSphere Client or launch the IBM Spectrum Protect VMware graphical user interface to schedule, monitor and perform backups.

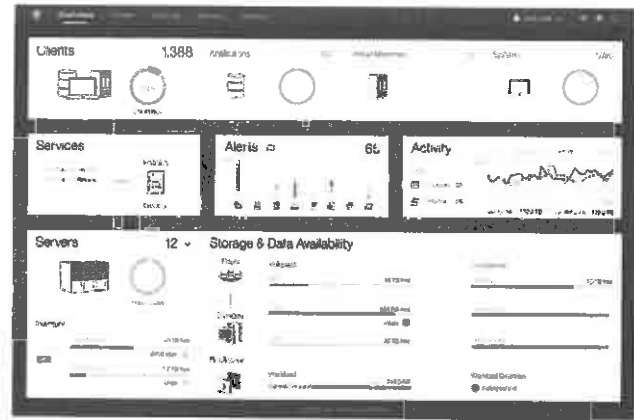
IBM Spectrum Protect blueprints and configuration scripts are designed to help reduce deployment time and guesswork by automating deployment steps and integrating best practices for small, mid-sized and large environments.

Simplified solution bundles—such as IBM Spectrum Protect Suite and IBM Spectrum Storage™ Suite—help clients get up and running fast with easy-to-manage licensing for IBM Spectrum Protect that includes snapshots and popular backup agents for virtual environments, databases, email and enterprise resource planning.

Built-in cloud integration

Backup to the cloud or backup in the cloud is simple, secure and cost-effective with IBM Spectrum Protect. IBM Spectrum Protect container storage pools enable external cloud and object storage without additional hardware or gateways. These container storage pools include in-line deduplication for efficient use of space and bandwidth as well as encryption to ensure that your data is secure.

IBM Spectrum Protect also provides Representational State Transfer (REST) application programming interfaces (APIs) and OpenStack backup drivers. Front-safe portal software, available from IBM, enables multi-tenancy, on-boarding and billing for IBM Spectrum Protect. IBM Resiliency Services and IBM Business Partners offer a number of cloud-based data protection solutions.²



IBM Spectrum Protect Operations Center provides an advanced visual dashboard, built-in analytics and integrated workflow automation features to dramatically simplify backup administration.

Reduced backup infrastructure costs

IBM Spectrum Protect can help users save up to 53 percent¹ in backup infrastructure costs. Savings are typically found in storage media, backup servers, data center floor space, power and cooling. IBM Spectrum Protect high-performance deduplication, compression and incremental forever capabilities work together to reduce backup storage requirements.

IBM Spectrum Protect efficiency capabilities are enabled entirely in software. Additional hardware-based appliances aren't needed for deduplication, encryption, network acceleration or cloud access.

For maximum cost flexibility, IBM Spectrum Protect enables a broad choice of storage options for backup data, including flash, disk, tape, object stores and public clouds.

Scalable performance

Organizations of all sizes need advanced data-protection capabilities. Organizations with fewer than 50 managed servers or less than 100 terabytes of backup data can choose specially priced IBM Spectrum Protect entry-level solution bundles.

IBM Spectrum Protect servers can expand to manage billions of objects per server, so there is less disruption and complexity as backup workloads grow.

As data grows, IBM Spectrum Protect backups can be augmented with advanced agents and snapshots that can reduce backup and restore times for large applications and virtual machines. For example, IBM Spectrum Protect Snapshot can back up 500 VMware virtual machine images in as little as seven minutes.³

Backup information can also be replicated between IBM Spectrum Protect servers, either on-premises or hosted in the cloud. IBM Spectrum Protect Extended Edition includes policy-driven remote replication, which can significantly reduce storage space requirements at primary backup sites. Organizations needing faster data transfer can enable the IBM Spectrum Protect High Speed Data Transfer option, which uses patented IBM Fast, Adaptive and Secure Protocol (IBM FASP®) technology to transfer data faster than TCP over high-latency or high-loss networks.

“It’s a common expression that people don’t want to back up their data—they want to restore. We can deliver both rapid backups and lightning-fast restore times—and all at a compelling price point.”

—Richard Spurlock, CEO, Cobalt Iron

Optimized data protection

IBM Spectrum Protect is a complete solution. It enables advanced data protection for current and next-generation environments, including cloud, virtualized and software-defined environments; core applications; and remote facilities. Data managed by IBM Spectrum Protect is easily replicated to off-site recovery facilities for safekeeping.

Backups are important, but restores are essential. IBM Spectrum Protect solutions enable fast, flexible restores from primary and remote recovery sites. IBM Spectrum Protect helps recover individual items, complex systems and entire data centers. Recovery simulators provide assurance that systems can be recovered as expected.

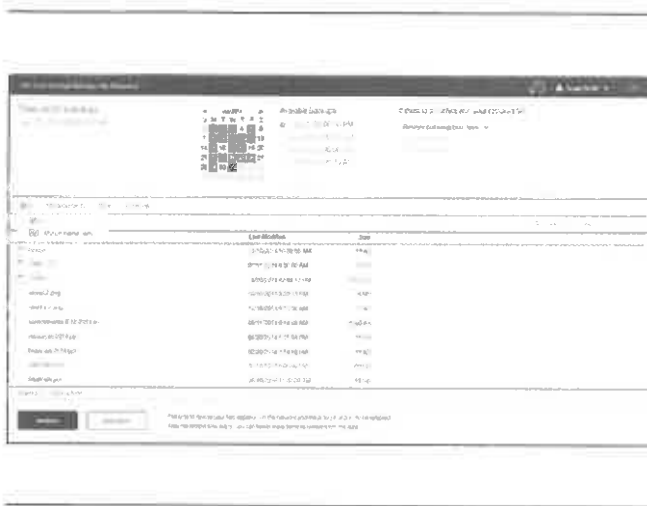
Advantages of IBM data protection for virtual machines

| Feature | Benefits | VMware | Hyper-V |
|--|---|--------|---------|
| Auto-discovery of new virtual machines | Helps ensure that all data in the virtualized environment is protected | • | • |
| Self-service restore portal | Enables data, server and application owners to easily recover their data | • | |
| Item-level recovery | Enables fast recovery of individual files, Microsoft Exchange mailboxes, emails, and Microsoft SQL Server databases | • | • |
| Application-consistent backup and recovery | Helps ensure complete application backups and simplifies restore processes | • | • |
| Copy management | Enables a single virtual-machine snapshot to be used for data recovery, testing, development, etc. | • | • |
| Integration with hardware snapshots | Enables faster snapshots with less impact on application performance | • | |
| Incremental "forever" backups | Reduces the need for extra backup system capacity | • | • |
| Data deduplication | Enables high-performance space reduction on the virtual machine or backup server | • | • |
| Nondisruptive, single-pass backups | Help increase application performance during backups | • | • |
| Agentless support | Helps simplify deployment | • | • |
| Tape support | Helps reduce costs for long-term storage | • | • |
| Instant access/instant restore | Helps reduce the user impact during virtual machine restores | • | |
| Single-pass, full datastore recovery | Provides near-instant recovery of an entire datastore, including all virtual machines* | • | |

* Near-instant recovery for virtual machines is enabled by IBM Spectrum Protect for Virtual Environments; near-instant recovery for Windows desktops and laptops is enabled by IBM Spectrum Protect for Workstations.

IBM integration with VMware tools and APIs

| Feature | Benefits |
|-----------------------------------|---|
| VMware vSphere web client support | Allows VMware administrators to easily perform data protection and recovery operations, powered by IBM Spectrum Protect, and launched within the familiar vSphere interface |
| VMware vCenter integration | Enables VMware administrators to easily configure, schedule, and monitor backups and snapshots |
| VMware vStorage API support | Helps reduce compute, storage and network overhead |



A self-service restore portal enables data, server and application owners to easily recover their data.

Virtualized, software-defined infrastructures

IBM Spectrum Protect for Virtual Environments and IBM Spectrum Protect Snapshot can back up and restore data residing in virtual, software-defined environments without negatively impacting applications and operations that share the underlying physical resources. IBM offers a choice in data protection options, including incremental “forever” backups and hardware-assisted snapshots.

Flexible restores

Flexible recovery options in IBM Spectrum Protect are designed to simplify common restore requests, including:

- Self-service restore portal, initially for VMware data
- Individual item, database, volume-level, and data store restores from snapshots
- Near-instant access to backup data for Microsoft Windows and Linux Intel-based servers and Windows workstations

- Snapshot copying, browsing and recovery
- Automatic restores from an alternate backup server, if the primary backup server is unavailable
- Simplified disaster-recovery audits, recovery simulators and guided recovery from disasters

Multi-site replication

IBM Spectrum Protect Extended Edition enables backup data to be replicated on an incremental, scheduled or per-client basis from one IBM Spectrum Protect server to another. Replication is policy-driven, so on-site and off-site retention policies can be different. Plus, replication can be performed with deduplicated data, which improves network efficiency. It can also be scheduled during relatively quiet times to help reduce the impact on production applications.

In replicated environments, a remote IBM Spectrum Protect server can be used as a hot standby. Alternatively, two active IBM Spectrum Protect servers can replicate to each other. A single replication target can be used to consolidate data from multiple active IBM Spectrum Protect backup servers.

Why IBM?

IBM data protection solutions offer a simplified user experience that helps deliver superior business outcomes. IBM is using applied analytics to make backup and storage management software more intelligent, so users can deliver global data availability. IBM continues to innovate, bringing first-to-market capabilities—built on a solid foundation of trusted technology—to increasingly complex backup and recovery environments.

IBM Spectrum Protect at a glance

Backup server components

- **IBM Spectrum Protect**—Automates data backup and restore functions, supports a broad range of platforms and storage devices, reduces the data storage footprint and maintains a catalog of protected data
 - **IBM Spectrum Protect Extended Edition**—Adds disaster-recovery management, node replication, network data management protocol (NDMP) backup and large tape library support
 - **IBM Spectrum Protect Operations Center**—Provides an at-a-glance view of the IBM Spectrum Protect environment, which simplifies reporting and enables faster problem resolution; included with IBM Spectrum Protect
 - **IBM Spectrum Protect High Speed Data Transfer**—Improves throughput over high latency, high-packet-loss wide area networks
 - **IBM Spectrum Protect for Data Retention**—Enables long-term record retention with flexible hold and release processing. Formerly called IBM System Storage® Archive Manager
 - **IBM Spectrum Protect for SAN**—Enables SAN-attached IBM Spectrum Protect servers and user systems to use Fibre Channel connections to storage systems for data backup
 - **Front-safe Cloud Portal**—Enables multi-tenancy, on-boarding, and billing for IBM Spectrum Protect
 - **Rocket Servergraph Professional**—Provides real-time information about multi-vendor backup environments with reports, alerts and monitoring
-

Backup agent for virtual environments and core applications—Enables high-performance, online backups and flexible restores, which can increase application availability

- **IBM Spectrum Protect for Virtual Environments**—Works with VMware and Microsoft Hyper-V virtual servers and hosted applications
 - **IBM Spectrum Protect for Mail**—Works with IBM Domino® and Microsoft Exchange
 - **IBM Spectrum Protect for Databases**—Works with Oracle and Microsoft SQL Server; IBM DB2® and IBM Informix® include IBM Spectrum Protect backup agents
 - **IBM Spectrum Protect for Enterprise Resource Planning**—Works with SAP and SAP HANA
 - **DocAve Backup and Restore for Microsoft SharePoint Backup**—Works with Microsoft SharePoint
 - **OpenStack IBM Tivoli Storage Manager backup driver**—Included in OpenStack distribution
-

Snapshot management

- **IBM Spectrum Protect Snapshot**—Enables application-aware, virtual machine-aware, hardware-assisted snapshot backup and recovery management for most major IBM and non-IBM storage systems
 - **Rocket Device Adapter Pack for IBM Tivoli Storage FlashCopy® Manager**—Expands IBM Spectrum Protect Snapshot platform support to include several EMC, Hitachi and HP storage devices and NetApp clusters connected to UNIX servers
-

Bare machine recovery and recovery simulators

- **IBM Tivoli Storage Manager for System Backup and Recovery**—Offers a comprehensive system backup, restore and reinstallation tool with bare-metal restore capabilities for IBM AIX®
 - **Cristie Bare Machine Recovery software for Tivoli Storage Manager, TBMR**—Provides rapid recovery from IBM Spectrum Protect backups, without having to perform any other backup of the operating system files
 - **Recovery Simulator for TBMR**—Tests whether a machine can be successfully recovered from backups created by Cristie TBMR and IBM Spectrum Protect
 - **Recovery Simulator for Tivoli Storage Manager for Virtual Environments**—Tests whether a machine can be successfully recovered from backups created by Cristie TBMR and IBM Spectrum Protect for Virtual Environments
-

Continuous data protection

- **IBM Spectrum Protect for Workstations**—Provides continuous, automated backup of desktop and laptop workstations running Windows operating systems
-

Hierarchical space management (HSM)—Enables policy-based migration of inactive data to tape, leaving the directory structure on disk so users don't have to change the way they access their files

- **IBM Spectrum Protect HSM for Windows**—Works with Windows data
 - **IBM Spectrum Protect for Space Management**—Works with AIX and Linux data
-

IBM Spectrum Protect solution bundles at a glance

| | IBM Spectrum Protect Entry | IBM Spectrum Protect Suite – Front End | IBM Spectrum Protect Suite |
|---|--|---|---|
| Available components | | | |
| IBM Spectrum Protect | Standard Edition | Extended Edition | Extended Edition |
| IBM Spectrum Protect Snapshot | | ✓ | ✓ |
| IBM Spectrum Protect for Virtual Environments | ✓ | ✓ | ✓ |
| IBM Spectrum Protect for Mail | ✓ | ✓ | ✓ |
| IBM Spectrum Protect for Databases | ✓ | ✓ | ✓ |
| IBM Spectrum Protect for Enterprise Resource Planning | ✓ | ✓ | ✓ |
| IBM Spectrum Protect backup-archive client for file systems | ✓ | ✓ | ✓ |
| IBM Spectrum Protect for Storage Area Networks | ✓ | ✓ | ✓ |
| IBM Spectrum Protect for Space Management | | ✓ | ✓ |
| Entry option | ✓ | ✓ | ✓ |
| Archive option | | | ✓ |
| IBM ProtecTIER® option | | | ✓ |
| License plan | | | |
| Per component | License each component installed per protected server, virtual or physical | Unlimited | Unlimited |
| By capacity | Unlimited | License by capacity protected by the products in the bundle | License by capacity used for managed backup data, measured after deduplication and other efficiency features are used |
| Entry offerings (some restrictions apply) | | | |
| | IBM Spectrum Protect Entry | IBM Spectrum Protect Suite Entry – Front End | IBM Spectrum Protect Suite Entry |
| Capacity | Up to 50 managed servers per enterprise, of which up to five can be virtual-host servers | 100 TB of managed backup data, measured by capacity protected by the products in the bundle | 100 TB of managed backup data, measured after deduplication and other efficiency features are used |
| Backup servers | Windows, Linux x86 or Linux on IBM Power® platforms only | Two IBM Spectrum Protect servers per enterprise | Two IBM Spectrum Protect servers per enterprise |

For more information

To learn more about IBM Spectrum Protect, including platforms supported and system requirements, contact your IBM representative or IBM Business Partner, or visit: ibm.com/software/tivoli/products/storage-mgr



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IBM Systems
Route 100
Somers, NY 10589

Produced in the United States of America
June 2016

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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.

¹ Based on IBM assessments using Butterfly Software.

² IBM Cloud Managed Backup services can be found here: ibm.com/services/us/en/it-services/business-continuity/cloud-managed-backup; IBM Business Partners offering IBM Spectrum Protect-based cloud services can be found here: ibm.com/partnerworld/wps/servlet/ContentHandler/isv_com_dvm_techval_tivoli_BackupByTSM

³ Performance based on IBM measurements in a controlled environment.



Please Recycle

IBM System Storage TS7650G ProtecTIER Deduplication Gateway

Powerful data deduplication for improved backup and disaster recovery operations



Highlights

- Improves backup and recovery and simplifies disaster recovery operations
 - Lowers operational costs and energy usage
 - Manages more data with less infrastructure
-

The IBM® System Storage® TS7650G ProtecTIER® Deduplication Gateway is designed to meet the disk-based data protection needs of the enterprise data center while enabling significant infrastructure cost reductions. The solution offers industry-leading inline deduplication performance and scalability up to 1 petabyte (PB) of physical storage capacity per system that can provide up to 25 PB or more backup storage capacity. Combined with IBM or third-party storage, the ProtecTIER Gateway provides a powerful disk-based repository to improve the performance, retention and availability of backup and archive data.

The TS7650G ProtecTIER Deduplication Gateway provides:

- High-speed backups: Up to 2000 MB/sec or more (7.2 TB/hr) sustained inline deduplication backup performance
- Even faster restores: Up to 2800 MB/sec or more (10 TB/hr) sustained recovery performance
- Capacity: Easily scalable to provide up to 25 PB or more backup storage capacity
- Data Integrity: Nonhash-based approach avoids the possibility of data loss due to a hash collision
- Nondisruption: Inline approach ensures backup windows are met and existing operations are not disrupted
- Symantec OpenStorage (OST) support: Simplifies administration of backup, restore and replication operations
- Production proven: Tested and proven in thousands of production environments around the globe since 2005



ProtecTIER's native replication technology enables the automated electronic replication of backup data between one or more data centers, remote office and offsite storage locations for enhanced disaster recovery and business continuity. By eliminating the need to transport actual tape cartridges, data can be recovered faster and more reliably enabling systems to get back online quicker in the event of a disaster or major system outage. It also lowers the total cost of ownership of backup and recovery by eliminating the costs associated with moving and storing physical tape cartridges.

ProtecTIER deduplication with native replication technology provides:

- One-to-one replication for enhanced disaster recovery operations
- Many-to-one replication for improved remote office data protection
- Many-to-many replication for multiple data center environments
- Enterprise-class data integrity level at all sites
- The ability for a remote site to become primary site during disaster recovery
- Replication that can occur concurrently with backup and inline deduplication
- Easy-to-use GUI-based management and monitoring tools



Deploying a TS7650G ProtecTIER Deduplication Gateway solution can help organizations protect their corporate data on disk-based storage more efficiently while helping them manage the exponential growth of new data through reduction or elimination of duplicate data in their backups.

IBM System Storage TS7650G ProtecTIER Deduplication Gateway hardware at a glance

| | |
|-------------------------------|---|
| Form factor/height | Rack/4U per chassis |
| Base unit | x3850 X5/x3950 X5 Base |
| Processors | Four Intel Eight Core Xeon Processor X7560 (2.26 GHz 24 MB cache)/1066 MHz memory access 130w (32 processors total) |
| Memory | Sixteen 4 GB PC3-8500 CL7 ECC DDR3 1066 MHz LP RDIMMs (64 GB memory total) |
| Memory expansion cards | Eight x3850 X5/x3950 X5 Memory Expansion Cards |
| Hard drives | Two 300 GB 10 K 6 Gbps SAS 2.5 in. SFF Slim-HS HDDs |
| Bay fillers | Six 2.5-inch HDD Filler Bezel |
| Optical drive | UltraSlim Enhanced SATA DVD-ROM |
| Network interface | Integrated dual Gigabit Ethernet w/TCP-IP offload engine |
| Power supply | Dual redundant 1975 W Power Supplies |
| RAID controller | ServeRAID M5015 SAS/SATA Controller |
| RAID configuration | ServeRAID Mirror SAS set (RAID1) |
| RAID battery | ServeRAID M5000 Series Battery Assembly |
| Expansion cards (a) | PRO/1000 PT Quad Port Server Adapter |
| Expansion cards (b) | Two QLogic 8 GB FC Dual-port HBAs for IBM System x |

For more information

To learn more about the IBM System Storage TS7650G ProtecTIER Deduplication Gateway, please contact your IBM marketing representative or IBM Business Partner, or visit the following websites:

- ibm.com/systems/storage/tape/ts7650g
- ibm.com/systems/storage/tape/protectier

Additionally, IBM Global Financing can tailor financing solutions to your specific IT needs. For more information on great rates, flexible payment plans and loans, and asset buyback and disposal, visit: ibm.com/financing



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Please Recycle

LENOVO SYSTEM x3500 M5

All-in-one business-critical two-socket tower or rack-mountable server

Lenovo™



BIG PERFORMANCE

The new Lenovo System x3500 M5 delivers big performance and storage flexibility in a small footprint. Choose from models with up to 32 2.5-inch or 12 3.5-inch drives. Leverage tiered storage with a combination of fast-access 2.5-inch and low-cost-per-terabyte 3.5-inch drives in the same server.

Deploy up to two Intel® Xeon® processors E5-2600 v3 series for up to 36 cores per server. Accelerate your graphics applications with up to two optional GPUs. With twice the memory, up to 131 percent greater performance,¹ and 50 percent more cores and cache than the previous generation, the x3500 M5 lets your workloads fly.

SECURITY, RELIABILITY

The x3500 M5 integrates industry-leading security and reliability. System x Trusted Platform Assurance establishes a solid security foundation for your workloads—from infrastructure to analytics. You can also deploy self-encrypting drives with optional key management software.

Lenovo servers achieved the highest reliability of any x86 server.² Diagnostic tools such as Predictive Failure Analysis proactively monitor server sub-components to help reduce downtime and costs.

INNOVATIVE DESIGN

The x3500 M5 can keep your business running in extended operating temperatures for optimal performance in office and data center environments.

To further reduce energy costs, the x3500 M5 can run ample low-voltage TruDDR4 Memory modules along with available high-efficiency 80 PLUS® Titanium power supplies that deliver up to 96 percent efficiency.

Select configurations of the x3500 M5 are part of the TopSeller Portfolio, designed to meet the needs of small and midsized businesses. Easy to manage, TopSeller models vary by country.



WWW.LENOVO.COM

SPECIFICATIONS

| | |
|-----------------------------|--|
| FORM FACTOR/HEIGHT | Tower (5U rack-mountable) |
| PROCESSOR (MAX) | Up to two 18-core Intel® Xeon® processors E5-2600 v3 series: support for up to two 300 W GPUs |
| MEMORY (MAX) | Up to 1.5 TB with 64 GB TruDDR4™ Memory LRDIMMs, up to 45 MB cache |
| DISK BAYS | Up to 32 2.5-inch hot-swap hard disk drives (HDDs) or solid-state drives (SSDs), or up to 12 3.5-inch hot-swap HDDs or 6 3.5-inch simple-swap HDDs, or a combination of up to 16 2.5-inch hot-swap HDDs/SSDs with up to 6 3.5-inch hot-swap HDDs |
| MEDIA BAYS | DVD-ROM and optional tape drive |
| NETWORK INTERFACE | Quad-port Gigabit Ethernet and single-port IMM2 standard; optional 10 GbE PCIe adapters |
| POWER SUPPLY (STD/MAX) | 1/2 HS redundant 550/750/900 W, 80 PLUS Platinum or 750 W 80 PLUS Titanium |
| HOT-SWAP COMPONENTS | Power supplies, fans and HDDs/SSDs |
| RAID SUPPORT | Up to two 12 Gbps hardware RAID adapters -0, -1, -10 with RAID-5, -50, -6, -60 upgrades |
| SYSTEMS MANAGEMENT | IMM2 with dedicated management port (optional remote presence); Predictive Failure Analysis, Diagnostic LEDs, Lenovo XClarity |
| OPERATING SYSTEMS SUPPORTED | Microsoft Windows Server, Red Hat Enterprise Linux, SUSE Linux Enterprise, VMware vSphere - (optional USB Key or SD Media Adapter) |
| LIMITED WARRANTY | 3-year customer replaceable unit and onsite limited warranty, next business day 9x5, service upgrades available |

¹ Up to 131 percent performance boost based on internal measurements as of June 2014 for representative Java-based workloads, Intel Xeon E5-2699 v3 (18C, 2.3 GHz, 145W) vs. Intel Xeon E5-2697 v2 (12C, 2.7 GHz, 130W)

² ITC 2014 Reliability Survey: IBM Servers Most Reliable for Sixth Straight Year <http://www.lenovo.com/images/products/system-x/pdfs/analyst-reports/XSL03126USEN.PDF>

OPTIONS

| | | |
|--|--|---|
| 64 GB TruDDR4 Memory (4Rx4, 1.2V) PC4-17000 CL15 2133 MHz LP RDIMM 95Y4812 Add more TruDDR4 Memory to improve the performance of all your workloads. | 6 TB 7.2K NL SATA 512e HDDs and 6 TB 7.2K NL SAS 512e HDDs and SEDs 00FN173, 00FN228 and 00FN258 Optimize storage with high density and low cost per GB hard drives. | ServeRAID M5210 and SAS/SATA Controllers 46C9110 12Gbps data transfer rates with MegaRAID SafeStore support for self-encryption drive services. |
|--|--|---|

For a complete list of options, visit lenovoquickpick.com

FOR MORE INFORMATION

To learn more about the Lenovo System x3500 M5, contact your Lenovo Business Partner, or visit: lenovo.com/systems/servers

NEED STORAGE?

Learn more about Lenovo Storage
lenovo.com/systems/storage

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Learn more about Lenovo Services
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IBM System Networking SAN24B-5 switch

Flexible, easy-to-use, entry-level SAN switch for private cloud storage



Highlights

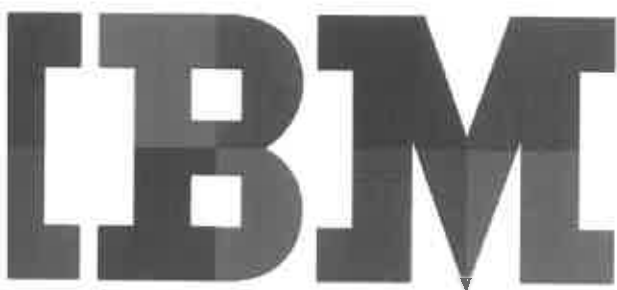
- Gain flexibility, simplicity and enterprise-class functionality in a 24-port, 1U form factor entry-level switch
 - Scale from 12 to 24 ports using Ports on Demand (PoD) capabilities
 - Leverage Fabric Vision technology¹ and IBM® Network Advisor² dashboards to simplify administration, increase uptime and reduce costs
 - Maximize resiliency with nondisruptive software upgrades and redundant power supply option
 - Simplify deployment with the EZSwitchSetup wizard and support high-performance fabrics by using ClearLink Diagnostic Ports (D_Ports)
-

The IBM System Networking SAN24B-5 switch features both Gen 5 Fibre Channel and Fabric Vision technologies—providing outstanding price to performance value in an entry-level switch. SAN24B-5 gives organizations the flexibility, simplicity and enterprise-class functionality they need to unleash the full potential of high-density server virtualization, cloud architectures and next-generation storage. The switch is configurable in 12 or 24 ports and supports 2, 4, 8 or 16 Gbps speeds in an efficiently designed 1U form factor. It comes with a single power supply and integrated fans. A second optional power supply provides additional redundancy for increased resiliency.

SAN24B-5 provides a critical building block for today's highly virtualized, private cloud storage environments. It can simplify server virtualization and virtual desktop infrastructure management while meeting the high-throughput demands of solid-state disks. SAN24B-5 supports multi-tenancy in cloud environments through quality-of-service (QoS) and fabric-based zoning features. It can also help minimize downtime in mission-critical environments by delivering high reliability, availability and serviceability.

Enterprise-class features in an entry-level switch

SAN24B-5 features advanced monitoring, diagnostics, reliability, availability, serviceability and redundancy capabilities in an entry-level switch to maximize availability, optimize performance and simplify



administration. Its enterprise-class features include critical diagnostic and monitoring capabilities, non-intrusive and non-disruptive monitoring on every port, forward error correction, additional buffers, real-time bandwidth consumption by hosts and applications on inter-switch links (ISLs), and a second optional power supply.

Flexible, simple and easy-to-use industry-leading technology

SAN24B-5 delivers industry-leading Gen 5 Fibre Channel technology within a flexible, simple and easy-to-use solution. The base configuration includes 12 activated ports, with up to 24 ports on demand. In addition to providing best-in-class scalability, SAN24B-5 is easy to deploy with the EZSwitchSetup wizard and the ClearLink diagnostics (D_Ports) feature, which can help streamline setup.

SAN24B-5 can be deployed as a full-fabric switch or as an access gateway, which simplifies fabric topologies and heterogeneous fabric connectivity (the default mode setting is a switch). Organizations can easily enable Access Gateway Mode via the IBM Network Advisor² or a command-line interface.

Fabric operating system and management software

The Fabric Operating System (FOS), which is included with each SAN24B-5, contains all the functions necessary to operate a base system. The Gen 5 Fibre Channel base systems require FOS v7.0.1 or later, which allows organizations to take advantage of the advanced functions delivered through Fabric Vision technology.¹

The Advanced Web Tools, Advanced Zoning, Full Fabric and Enhanced Group Management features are part of the base FOS and do not require a separate license. When using FOS v7.2 or later, organizations can also access additional base functions such as Server Application Optimization and Adaptive Networking.



Entry-level SAN switch for private cloud storage

To enable advanced capabilities, several optional licenses are available, including: ISL Trunking, Extended Fabrics, 12-port SW Upgrade, Fabric Vision and the Enterprise Bundle.³

IBM Network Advisor software,² which is the base management software for SAN24B-5, simplifies Gen 5 Fibre Channel management and helps users proactively diagnose and resolve issues to maximize uptime, increase operational efficiency and reduce costs. IBM Network Advisor v12.0 or later is required for managing cloud environments.

Simplified management and robust network analytics

SAN24B-5 with Fabric Vision technology,¹ an extension of Gen 5 Fibre Channel, provides a breakthrough hardware and software solution that helps simplify monitoring, maximize network availability and dramatically reduce costs. Featuring innovative monitoring, management and diagnostic capabilities, Fabric Vision technology enables administrators to avoid problems before they impact operations, helping organizations meet service level agreements (SLAs). Some key advantages of SAN24B-5 with Fabric Vision⁴ include:

- Simplified monitoring:
 - Deploy 15 years of storage area network (SAN) best practices in one click to simplify performance monitoring with pre-defined, threshold-based rules, actions and policies
 - Instantly identify latency and congestion issues in the fabric through increased instrumentation and granularity
 - Gain comprehensive visibility into network health and performance using browser-accessible dashboards with drill-down capabilities

- Dramatically reduced costs:
 - Help eliminate the need for expensive third-party tools through built-in monitoring and diagnostics
 - Use automated testing and diagnostic tools to validate the health, reliability and performance of the network prior to deployment
 - Leverage specialized tools for pre-testing and validating IT infrastructure to accelerate deployment, simplify support and reduce operational costs
- Increased availability:
 - Avoid a high percentage of common network problems with proactive monitoring and advanced diagnostic tools that address problems before they impact operations
 - Identify hot spots and network problems before they impact application performance through intuitive reporting and trend analysis
 - Minimize downtime and accelerate troubleshooting with live monitoring, integrated diagnostics and point-in-time playback

Outstanding price and performance for growing SAN workloads

SAN24B-5 offers low-cost access to industry-leading Gen 5 Fibre Channel technology while providing “pay-as-you-grow” scalability to meet the needs of evolving storage environments. It also provides a low total cost of ownership (TCO) due to its 12-port base configuration, easy administration, 1U footprint and low energy consumption.

Why IBM?

To stay competitive in the global marketplace, employees need to have access to the right information at the right time, to help them be effective, creative and highly innovative. For today’s

smarter planet, where organizations and networks are more instrumented, interconnected and intelligent than ever before, IBM provides flexible, scalable, and open standards-based business-class and global enterprise-class storage networking solutions.

The IBM System Networking SAN24B-5 SAN switch is designed to provide outstanding price and performance, combining flexibility, simplicity and enterprise-class functionality in a 24-port, 1U form factor entry-level switch.

| IBM System Networking SAN24B-5 at a glance | |
|---|--|
| Product number | 2498-X24 |
| Hot-swap components | Power supplies, fan modules, small form-factor pluggables (SFPs) |
| Warranty | One-year; customer-replaceable unit (CRU) and on-site, 9x5 next-business-day response; warranty service upgrades are available |
| Optional features | Please refer to the SAN24B-5 Redbooks Product Guide to review most current optional features |
| Size | 43.8 cm (17.24 in.) W x 4.3 cm (1.7 in.) D x 44.3 cm (17.44 in.) H |
| Weight | 7.82 kg (17.25 lb) with one power supply, without transceivers |

For more information

To learn more about the IBM System Networking SAN24B-5 switch, contact your IBM representative or IBM Business Partner, or visit: ibm.com/systems/storage/san/b-type/san24b-5

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¹ For most current information, please refer to the Fabric Vision Technology solution brief.

² For more information, please refer to the IBM Network Advisor datasheet.

³ The Enterprise Bundle includes one license for each of the following: ISL Trunking, Fabric Watch, Advanced Performance Monitor, Adaptive Networking, Server Application Optimization and Fabric Vision.

⁴ For more information, please refer to the SAN24B-5 Redbooks Product Guide.



Please Recycle



IBM Storwize V5000

Designed to drive innovation and greater flexibility

Highlights

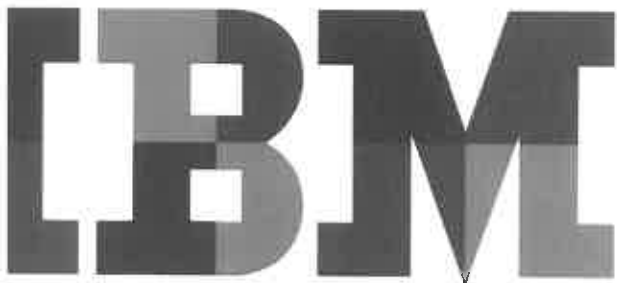
- Customize your storage system with flexible software and hardware options
 - Optimize performance with flash storage and automated tiering
 - Store up to five times more data on your existing storage with IBM compression technology¹
 - Consolidate and provide IBM® Storwize® V5000 capabilities to existing storage infrastructures using optional external virtualization
 - Implement configurations for high availability and data mobility
 - Simplify management with an industry-leading graphical user interface
-

The enterprise data storage marketplace is changing at a rapid pace. Organizations of all sizes are experiencing new business and IT operational challenges. Businesses now need greater data collaboration, agility and cost efficiency to stay ahead of the competition. Today, data is more important than ever for making highly informed decisions in real time. Security teams need data to recognize and prevent fraud before it happens. Call centers need data to help accelerate customer service. Most important, top executives need data to develop strategic insights for battling the competition.

With the rise of new applications that demand the integration of big-data analytics, mobility and social platforms, organizations require additional storage capacity, performance, advanced functionality and flexibility. IT must deliver more services faster and more efficiently, enable real-time insight and support more customer interaction. The right infrastructure allows clients to share information, secure transactions and drive real-time insights.

To enter the new era of business, organizations need robust storage solutions such as Storwize V5000 to provide comprehensive storage services, extraordinary scale and simplified management with all-flash or hybrid-flash options—all designed to support key business initiatives.

Three Storwize V5000 hybrid models—IBM Storwize V5030, IBM Storwize V5020 and IBM Storwize V5010—provide the flexibility to start small and keep growing while leveraging existing storage investments. And, to enable organizations with mid-sized workloads to achieve advanced performance, IBM Storwize V5030F provides an all-flash solution at an affordable price.



Utilizing IBM Spectrum Virtualize™ software at its core, Storwize V5000 is designed to optimize performance, providing virtualization capabilities and greater flexibility. It includes built-in functions such as IBM Real-time Compression™ and IBM Easy Tier® technology to deliver extraordinary levels of efficiency and high performance. Storwize solutions achieve up to 5:1 data compression ratios, require less storage administration, and can provide up to three times more performance with only five percent flash storage.¹ Available in different models, Storwize V5000 delivers enterprise capabilities at entry-level pricing to help handle business-critical applications while controlling costs for growing organizations.

Multiply your possibilities. New Storwize V5000 models provide the flexibility to start small and keep growing, while leveraging existing storage investments.

IBM Storwize also helps organizations achieve better data economics to support the traditional and new mobile, social and analytics workloads that are critical for success. The shift to cloud computing requires a fundamental shift in how organizations consume and support IT.

Storwize V5000 is intended to deliver more of what you need from storage with greater flexibility—while using fewer resources. Using innovative IBM technology, a single Storwize V5000 system can scale up to 504 drives per system (and up to 1,008 drives with two-way clustered systems), or can store up to 2 PB per system (and 4 PB with two-way clustered systems).



Encompassing Storwize family functions

Storwize V5000 leverages proven Storwize family functions, management and interoperability features.

Virtualize external storage

Built with IBM Spectrum Virtualize software, Storwize V5000 enables applications to run without disruption, even when changes are made to the storage infrastructure.

Available in the larger model, Storwize V5030 also extends data virtualization to other storage systems. When virtualized, data in a storage system becomes part of the Storwize solution, and it can be managed in the same way as internal drives. Data in external systems inherits all the Storwize functional richness and ease-of-use features, including advanced replication, high-performance thin provisioning, encryption, Real-time Compression and Easy Tier.

Virtualizing external storage helps improve administrator productivity and boosts storage utilization while also enhancing and extending the value of existing storage investments.

IBM Spectrum Virtualize software in the three Storwize V5000 models provides advanced storage functions that enable VMware vSphere Virtual Volumes (VVOL) and support the latest capabilities in key operating environments including Microsoft ODX and VMware vSphere v6.

Transform the economics of data with Real-time Compression

Real-time Compression in Storwize V5030 is designed to enable storing up to five times as much data in the same physical disk space by compressing data as much as 80 percent.²

Unlike other approaches to compression, Real-time Compression is designed to be used with active primary data such as production databases and email systems, which dramatically expands the range of candidate data that can benefit from compression. Real-time Compression operates immediately as data is written to disk, meaning that no space is wasted storing uncompressed data awaiting post-processing. When combined with external data virtualization, Real-time Compression can significantly enhance the usable capacity of existing storage systems, extending their useful life even further.

Enhance storage access with Easy Tier

Easy Tier provides automatic migration of frequently accessed data to high-performing flash storage, enhancing usage efficiencies. Operating at a fine-grained granularity, the optional Easy Tier function automatically repositions different data types to the appropriate class of drives based on input/output (I/O) patterns and drive characteristics, requiring no administrative interaction. Using Easy Tier, you can increase performance up to three times using only five percent flash storage.²

Protect your most valuable asset—your data

To help protect sensitive data from unauthorized users, Storwize V5030 and Storwize V5020 give IT teams the full power of storage encryption. In addition to placing encryption inside hardware arrays—which protects only against a subset of data security risks—IBM Spectrum Virtualize software includes encryption capabilities in its management layer. This enables organizations to add encryption across their existing heterogeneous storage arrays, while leveraging a single point of control for encryption throughout the storage layer.

Storwize V5000 offers an optional IBM FlashCopy® function designed to create an almost-instant copy of active data, which can be used for backup purposes or for parallel-processing activities.

Should a catastrophic event occur at a data center, Storwize V5000 supports remote mirroring to create copies of data for use at a second location. Metro Mirror supports synchronous replication at distances up to 300 km (186 miles), whereas Global Mirror supports asynchronous replication at distances up to 8,000 km (4,970 miles). Replication can occur between any Storwize family offerings, and can include any supported virtualized storage. With IP networking, Storwize V5000 supports 1 GbE and 10 GbE connections, and uses innovative Bridgeworks WANrockIT technology to optimize the use of network bandwidth. As a result, the networking infrastructure may require lower speeds (and thus, lower costs), or users may be able to improve the accuracy of remote data through shorter replication cycles.

In addition, the IBM HyperSwap® function enables a single Storwize V5030 system to support servers in two data centers. In this configuration, the solution enables servers at both data centers to access data concurrently. When combined with server data mobility functions such as VMware vMotion or IBM PowerVM® Live Partition Mobility, this configuration enables nondisruptive storage and virtual machine mobility between the two data centers.

Storwize V5000 also helps improve data availability with its support for Distributed RAID. The system allows data to be distributed across a large number of physical drives that are used simultaneously, achieving faster rebuild time. What's more, Distributed RAID can also deliver increased performance since data can be read from/written to more drives for a given I/O.

Avoid disruptions with dynamic migration

Moving data is one of the most common causes of planned downtime. Storwize V5000 includes a dynamic data migration function that is designed to move data from existing storage into a new system or between arrays in a Storwize V5000 system, while maintaining user access to data. The data migration function might be used, for example, when replacing older storage with newer storage, as part of load-balancing work or when moving data in a tiered storage infrastructure.

Nondisruptive migration can speed time-to-value from weeks or months to days, minimize downtime for migration, eliminate the cost of add-on migration tools, and may help avoid penalties and additional maintenance charges for lease extensions. The result can be real cost savings to your business.

Take advantage of additional features

In addition, Storwize V5000 includes:

- Innovative management capabilities, to ease storage management
- Dual clustering for Storwize V5030, to enable growth from smaller configurations
- Support for OpenStack Cinder driver, which helps automate storage provisioning and volume management for organizations by combining the efficiency of Storwize V5000 with the OpenStack compute cloud platform

Leveraging proven independent software vendor solutions

IBM is committed to continuous improvement and smooth application integration to optimize business results and minimize time-to-value. Our commitment is evident through our ongoing work and enduring partnerships with independent software vendors (ISVs) such as Microsoft, Oracle, SAP, Symantec and VMware.

IBM Storwize V5000 at a glance

| | | | |
|----------------------------------|--|--|--|
| Software | IBM Spectrum Virtualize software for Storwize V5030 | IBM Spectrum Virtualize software for Storwize V5020 | IBM Spectrum Virtualize software for Storwize V5010 |
| User interface | Web-based graphical user interface (GUI) | Web-based GUI | Web-based GUI |
| Single or dual controller | Dual | Dual | Dual |
| Connectivity (standard) | 10 Gb iSCSI 1 Gb iSCSI | 12 Gb SAS 1 Gb iSCSI | 1 Gb iSCSI |
| Connectivity (optional) | 16 Gb Fibre Channel 12 Gb SAS 10 Gb iSCSI / Fibre Channel over Ethernet (FCoE) 1 Gb iSCSI | 16 Gb Fibre Channel 12 Gb SAS 10 Gb iSCSI / FCoE 1 Gb iSCSI | 16 Gb Fibre Channel 12 Gb SAS 10 Gb iSCSI / FCoE 1 Gb iSCSI |
| Cache (per system) | 32 GB or 64 GB | 16 GB or 32 GB | 16 GB |

IBM Storwize V5000 at a glance

| | | | |
|--|--|--|--|
| <p>Drives supported</p> | <p>Small form-factor 2.5-inch disk drives:</p> <ul style="list-style-type: none"> • 300 GB, 600 GB @ 15k rpm • 900 GB, 1.2 TB, 1.8 TB @ 10k rpm • 1 TB*, 2 TB @ 7.2k rpm SAS nearline <p>Large form-factor 3.5-inch disk drives:</p> <ul style="list-style-type: none"> • 300 GB, 600 GB @ 15k rpm, SAS (2.5-inch drive in a 3.5-inch drive carrier) • 900 GB, 1.2 TB, 1.8 TB @ 10k rpm, SAS (2.5-inch drive in a 3.5-inch drive carrier) • 2 TB*, 3 TB*, 4 TB, 6 TB, 8 TB @ 7.2k rpm <p>Solid-state drive (SSD) 2.5-inch drives:</p> <ul style="list-style-type: none"> • 200 GB*, 400 GB, 800 GB, 1.6 TB, 1.92 TB, 3.2 TB and 3.84 TB | <p>Small form-factor 2.5-inch disk drives:</p> <ul style="list-style-type: none"> • 300 GB, 600 GB @ 15k rpm • 900 GB, 1.2 TB, 1.8 TB @ 10k rpm • 1 TB*, 2 TB @ 7.2k rpm SAS nearline <p>Large form-factor 3.5-inch disk drives:</p> <ul style="list-style-type: none"> • 300 GB, 600 GB @ 15k rpm, SAS (2.5-inch drive in a 3.5-inch drive carrier) • 900 GB, 1.2 TB, 1.8 TB @ 10k rpm, SAS (2.5-inch drive in a 3.5-inch drive carrier) • 2 TB*, 3 TB*, 4 TB, 6 TB, 8 TB @ 7.2k rpm <p>SSD 2.5-inch drives:</p> <ul style="list-style-type: none"> • 200 GB*, 400 GB, 800 GB, 1.6 TB, 1.92 TB, 3.2 TB and 3.84 TB | <p>Small form-factor 2.5-inch disk drives:</p> <ul style="list-style-type: none"> • 300 GB, 600 GB @ 15k rpm • 900 GB, 1.2 TB, 1.8 TB @ 10k rpm • 1 TB*, 2 TB @ 7.2k rpm SAS nearline <p>Large form-factor 3.5-inch disk drives:</p> <ul style="list-style-type: none"> • 300 GB, 600 GB @ 15k rpm, SAS (2.5-inch drive in a 3.5-inch drive carrier) • 900 GB, 1.2 TB, 1.8 TB @ 10k rpm, SAS (2.5-inch drive in a 3.5-inch drive carrier) • 2 TB*, 3 TB*, 4 TB, 6 TB, 8 TB @ 7.2k rpm <p>SSD 2.5-inch drives:</p> <ul style="list-style-type: none"> • 200 GB*, 400 GB, 800 GB, 1.6 TB, 1.92 TB, 3.2 TB and 3.84 TB |
| <p>Maximum drives supported</p> | <p>Maximum of 504 drives per system with 20 expansion enclosures and 1,008 drives in two-way clustered:</p> <ul style="list-style-type: none"> • Small form-factor enclosure: 24 x 2.5-inch drives • Large form-factor enclosure: 12 x 3.5-inch drives | <p>Maximum of 264 drives per system with 10 expansion enclosures:</p> <ul style="list-style-type: none"> • Small form-factor enclosure: 24 x 2.5-inch drives • Large form-factor enclosure: 12 x 3.5-inch drives | <p>Maximum of 264 drives per system with 10 expansion enclosures:</p> <ul style="list-style-type: none"> • Small form-factor enclosure: 24 x 2.5-inch drives • Large form-factor enclosure: 12 x 3.5-inch drives |



Take the next step. Click here.
 See the full list of specifications.

Why IBM?

The Storwize family of products from IBM, a recognized leader in the storage industry, is known for providing efficiency and high-performance storage for almost any type of workload. IBM storage offerings customized for small, mid-sized and large organizations are designed to deliver performance in stream-lined packages that are easy to buy, deploy and manage.

Offered in a wide range of storage systems, the Storwize family delivers sophisticated capabilities that help control costs for growing businesses.

For more information

To learn more about IBM Storwize V5000, please contact your IBM representative or IBM Business Partner, or visit: ibm.com/storage/storwizev5000

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* Available only in Storwize V5000 generation 1.

¹ IBM lab measurements – April 2012.

² IBM lab measurements – August 2010.



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