IBM TPC Reporter for Disk

Version 1.0.1 – Process and Report Overview

Bradley R. Harrington

The IBM TPC Reporter for Disk is a Java 2 Platform application that connects remotely to a workstation running IBM's TotalStorage Productivity Center (TPC) software. The TPC Reporter will extract storage subsystem information and hourly performance statistics from the TPC workstation. Extracted statistics are compiled locally, and transcribed into a white-paper style PDF file, which is saved on the local machine. The report will contain information detailing your storage server utilization.

June 30, 2007

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Disclaimer

IBM does not provide program services or technical support for the "TPC Reporter for Disk" utility. Questions can be directed via email to eSizings@us.ibm.com. IBM will endeavor to reply to these questions as expeditiously as possible. Customers are asked to include the words "TPC Reporter for Disk" in the title to insure questions are properly routed.

Because the utility is provided free of charge, there is no warranty for the program, to the extent permitted by applicable law. IBM provides this program "as is" without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Neither IBM nor its suppliers will be liable for any direct or indirect damages, including without limitation, lost profits, lost savings, or any incidental, special, or other economic consequential damages, even if IBM is informed of their possibility.

Executive Summary

In this paper we examine the capabilities of the utility TPC Reporter for Disk. The utility is a free download from IBM, and provides a value-add to TPC for Disk. The utility is a stand alone, turnkey, push-button, easy to use application that connects to the TPC server via its Web API.

In this paper, we take a closer look at subsystem types, components, and metrics reported on by the utility, with an eye towards developing best practices to identify performance bottlenecks and capacity planning.

"Do not plan a bridge capacity by counting the number of people who swim across the river today."

- Heard at a presentation

General

Edition Notice (June 2007)

This is the first edition of this document. This document and other related documents can be obtained from the IBM TPC Reporter for Disk Web page on IBM's Internet at:

http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS2618

Scope

This document is written for IBM Customers, personnel and business partners using IBM's TPC Reporter for Disk utility (henceforth referred to as the Reporter). This document includes more detail than what is provided in Q&A and README documentation. The purpose of this document is to provide experienced System Storage specialists running IBM's TotalStorage Productivity Center (TPC) for Disk with enhanced performance insights.

Acknowledgements

The author would like to thank Jim Dilley, and John Oustalet III, whose trust, guidance and understanding, made this work possible. Also members of IBM's Field Technical Sales Support were particularly helpful in defining requirements and performing field verification testing and feedback, especially Paul Spagnolo, Steve Strutt, and Jodi Noack.

Feedback

Please send all feedback to: bharring@us.ibm.com

Introduction

The IBM TPC Reporter for Disk is a Java 2 Platform application that connects remotely to a workstation running IBM's TotalStorage Productivity Center (TPC) software. The TPC Reporter will extract storage subsystem information and hourly performance statistics from the TPC workstation. Extracted statistics are compiled locally, and transcribed into a white-paper style PDF file, which is saved on the local machine. The report will contain information detailing your storage server utilization.

The Reporter will generate reports for subsystem types DS8000, DS6000, DS4000 SVC, and ESS

The automatically generated report will contain an overview of the subsystem information, basic attributes of each subsystem components, a performance summary of each component, aggregate statistics of each component, and charts detailing information about each component instance. Component types reported are Subsystem, Ports, Arrays, and Volumes. SVC component types reported are Subsystem, I/O Groups, Nodes, MD Groups, and VDisks.

The reports generated by TPC Reporter for Disk are intended as an enhancement to the built in reporting capabilities of TPC.

Overview

Disk Server Performance bottlenecks are difficult to diagnose. A self-contained, turnkey solution was requested to help field technical support personnel to troubleshoot disk servers orchestrated by Tivoli's TotalStorage Productivity Center. A simple, push-button solution utility, generating an intermediate level detail performance report, that is easy to read, would reduce the demands of both customer I/T, and IBM support. Such a report would allow a storage expert to diagnose performance bottlenecks without traveling to the customer site, and would greatly alleviate support personnel workload.

TPC for Disk is an open storage management product designed to aide in efficient utilization of storage subsystems. TPC has built-in automatic performance reporting capabilities, storing a massive

amount of data about each system component within it's own internal database. There are several ways to access this information:

- TPC GUI
- Command Line Interface
- Web API

The underlying data is the same, but the methods for accessing it vary for flexibility. The Reporter for Disk utilizes only the Web API to access a predetermined set of performance metrics, and generates these into a White Paper style report. The API is available via a SOAP network connection over any TCP/IP network that TPC is available on. The kinds of information, and style of interface is similar to that of the Command Line Interface, or TCPTOOL.

Software Installation

Personal Computer Requirements

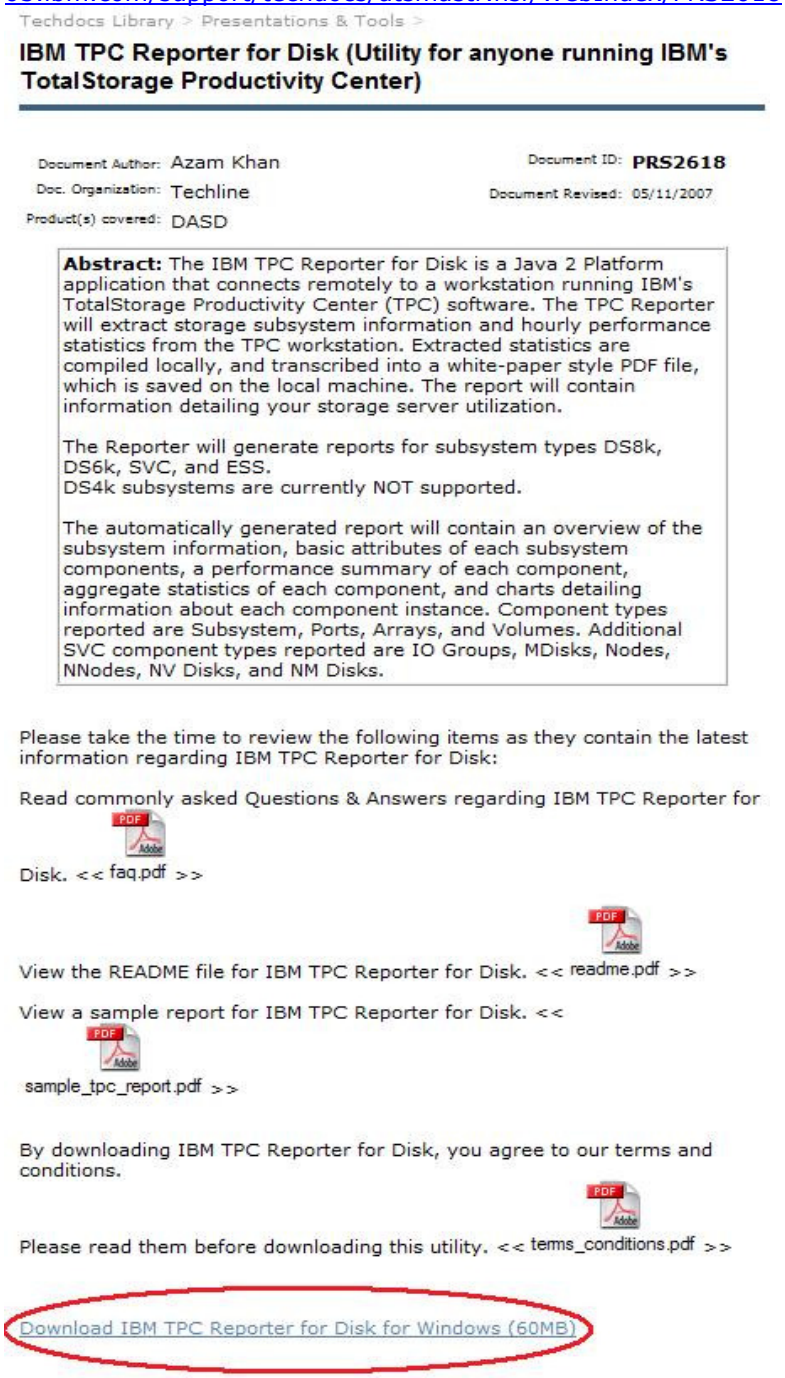
- ✓ An IBM-compatible PC with at least a 1000 MHz Pentium processor and 1GB of RAM.
- ✓ Installation of Windows XP operating system.
- ✓ At least 1GB of free disk space.
- ✓ Network adapter, LAN attached with direct TCP/IP access to TPC for Disk production server.
- ✓ The TCP/IP address or hostname of TPC for Disk production server.

TPC for Disk Requirements

- ✓ At a minimum, the IBM TotalStorage Productivity Center Version 3.1.3.55 Patch should be installed.
- ✓ Network connectivity to Personal Computer running Reporter utility, with firewall access to port 9550 allowed.

DOWNLOAD THE INSTALLER

Step 1: Using a web browser, go to URL: http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/PRS2618



Techdocs Library > Presentations & Tools >

IBM TPC Reporter for Disk (Utility for anyone running IBM's TotalStorage Productivity Center)

Document Author: Azam Khan
Doc. Organization: Techline
Product(s) covered: DASD
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Document Revised: 05/11/2007

Abstract: The IBM TPC Reporter for Disk is a Java 2 Platform application that connects remotely to a workstation running IBM's TotalStorage Productivity Center (TPC) software. The TPC Reporter will extract storage subsystem information and hourly performance statistics from the TPC workstation. Extracted statistics are compiled locally, and transcribed into a white-paper style PDF file, which is saved on the local machine. The report will contain information detailing your storage server utilization.

The Reporter will generate reports for subsystem types DS8k, DS6k, SVC, and ESS.
DS4k subsystems are currently NOT supported.

The automatically generated report will contain an overview of the subsystem information, basic attributes of each subsystem components, a performance summary of each component, aggregate statistics of each component, and charts detailing information about each component instance. Component types reported are Subsystem, Ports, Arrays, and Volumes. Additional SVC component types reported are IO Groups, MDisks, Nodes, NNodes, NV Disks, and NM Disks.

Please take the time to review the following items as they contain the latest information regarding IBM TPC Reporter for Disk:

Read commonly asked Questions & Answers regarding IBM TPC Reporter for Disk. << faq.pdf >>

View the README file for IBM TPC Reporter for Disk. << readme.pdf >>

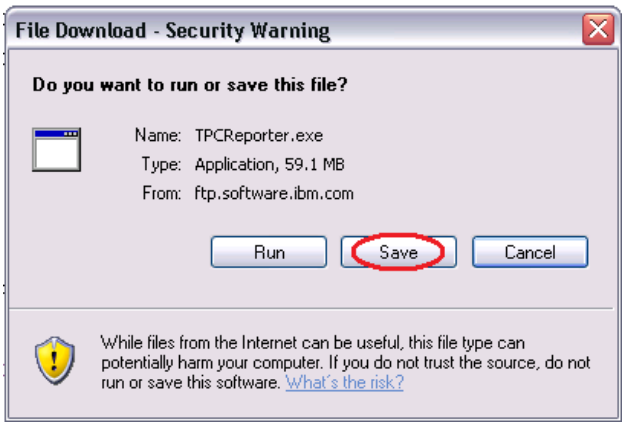
View a sample report for IBM TPC Reporter for Disk. << sample_tpc_report.pdf >>

By downloading IBM TPC Reporter for Disk, you agree to our terms and conditions.

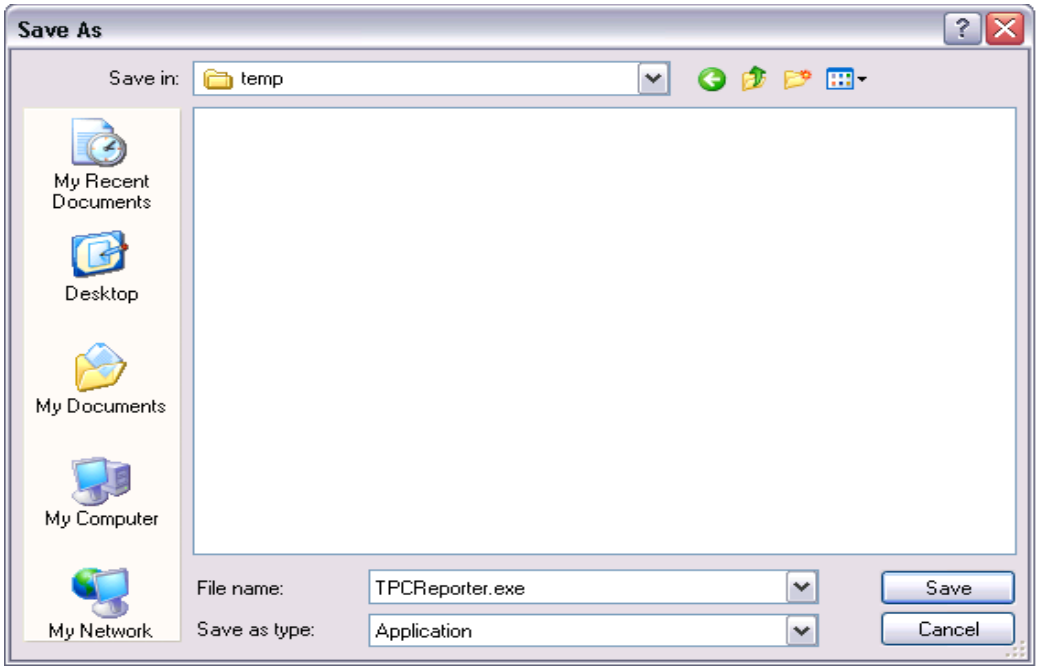
Please read them before downloading this utility. << terms_conditions.pdf >>

Download IBM TPC Reporter for Disk for Windows (60MB)

Step 2: Select the link Download IBM TPC Reporter for Disk for Windows (60MB) to start the file transfer.



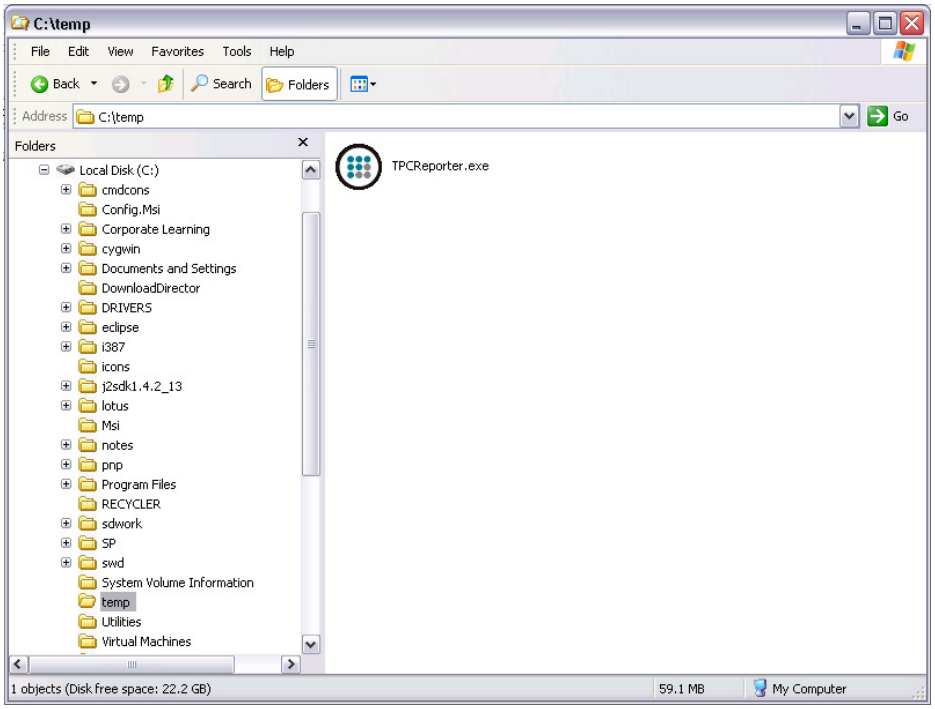
Step 3: Press the "Save" button to download the installer file "TPCReporter.exe" to the disk drive of the PC.



Step 4: Specify the target directory for the download and press the "Save" button.

RUN THE INSTALLER:

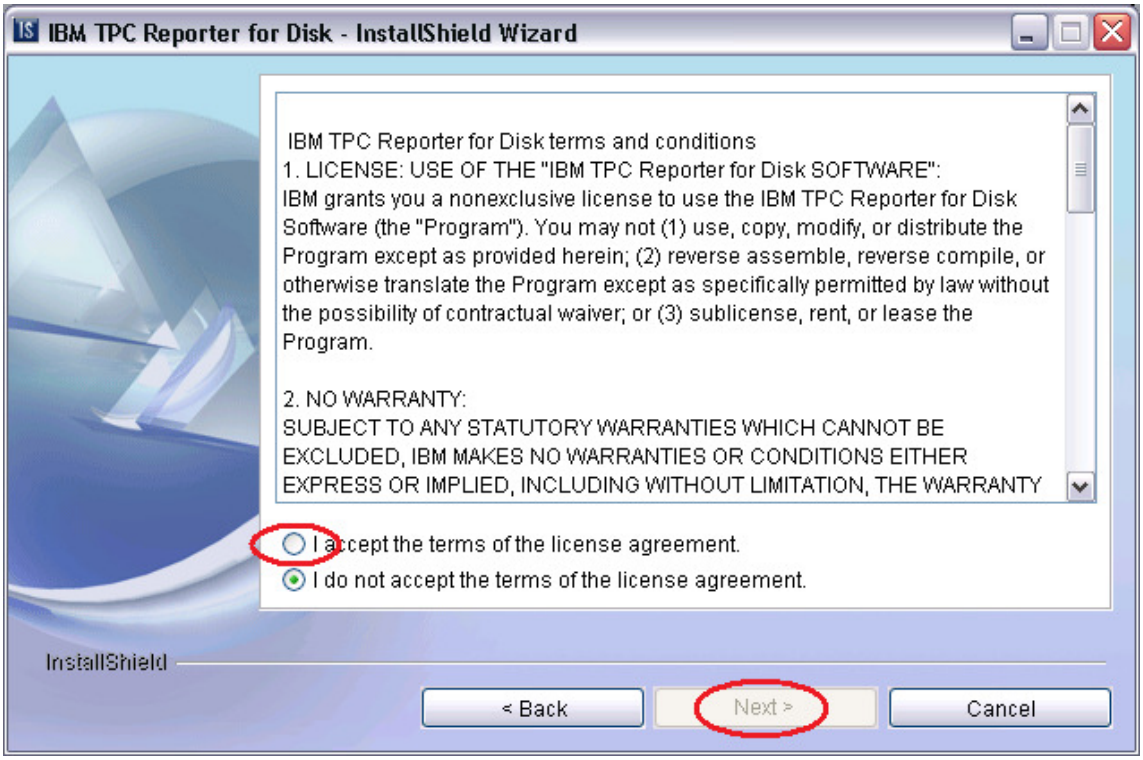
Step 1: Using Windows Explorer, go to the target directory of the download.



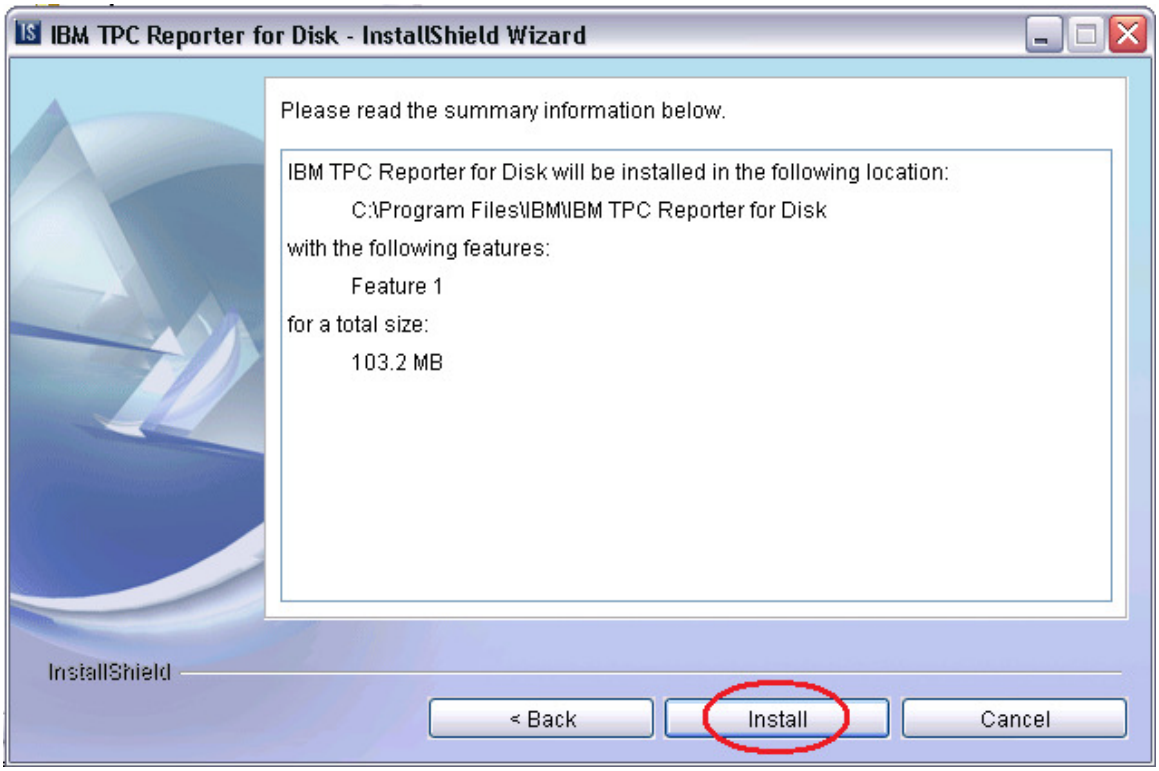
Step 2: Double-click the file "TPCReporter.exe" to launch the installer.

Step 3: If presented with a Windows Security Warning, select "Run" to continue and run the installer.

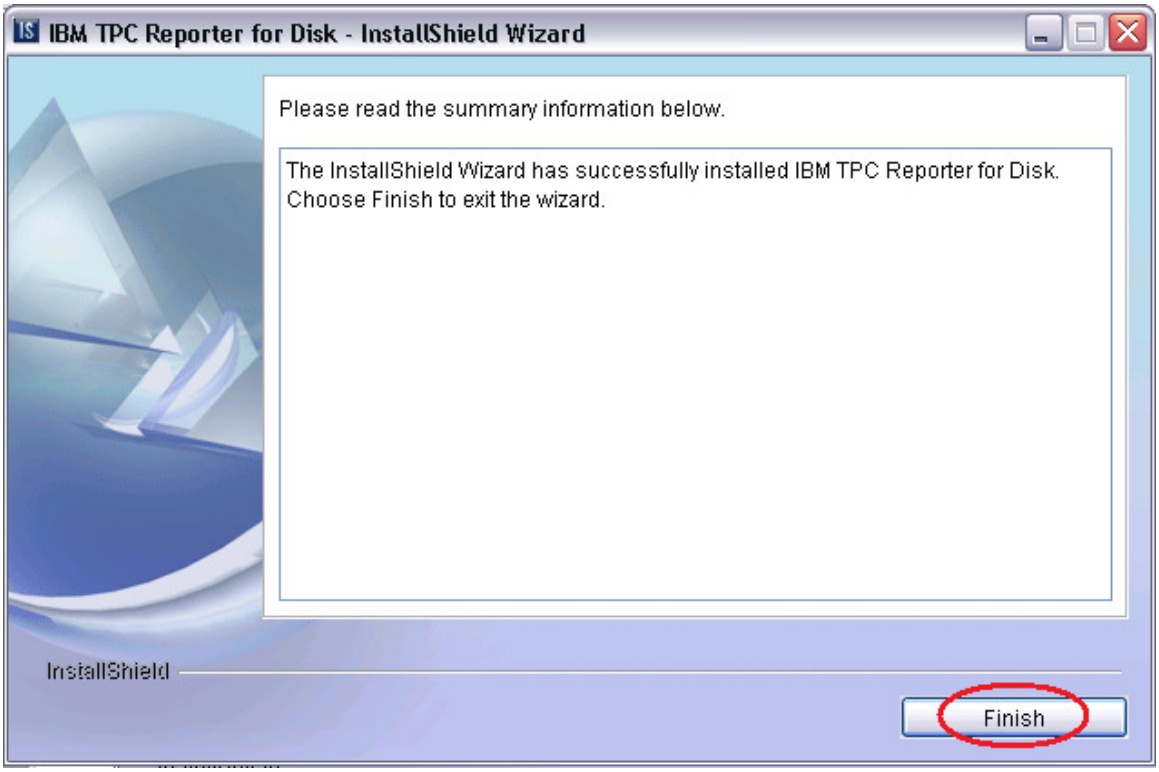
Step 4: When the InstallShield Wizard presents the Welcome Screen, press the "Next" button to continue.



Step 5: Select the "I accept" button to accept the Terms and Conditions of the License Agreement, and then click "Next".



Step 6: Read the list of current settings and press the "Install" button to start copying the Reporter program files to the destination folder.

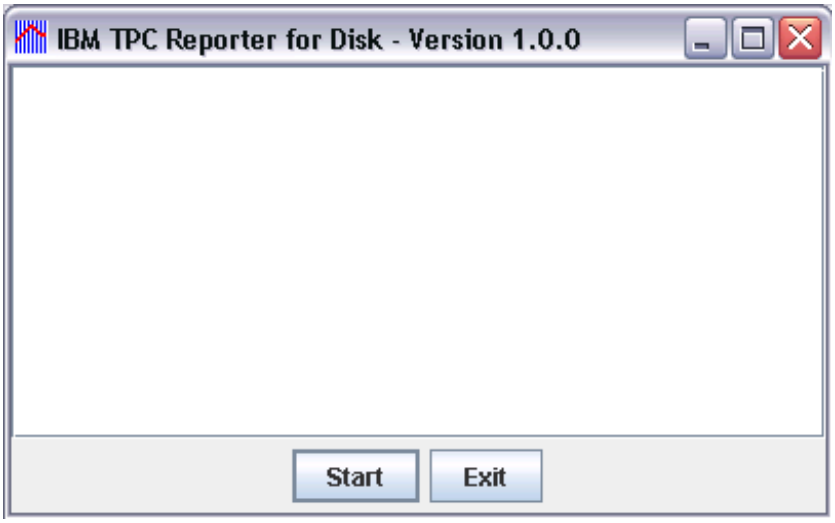


Step 7: Press the "Finish" button to complete the installation.

Running the Utility

RUN THE REPORTER:

Step 1: Launch the TPC Reporter from the Windows Start menu, select Programs -> IBM TPC Reporter for Disk -> TPC Reporter for Disk.

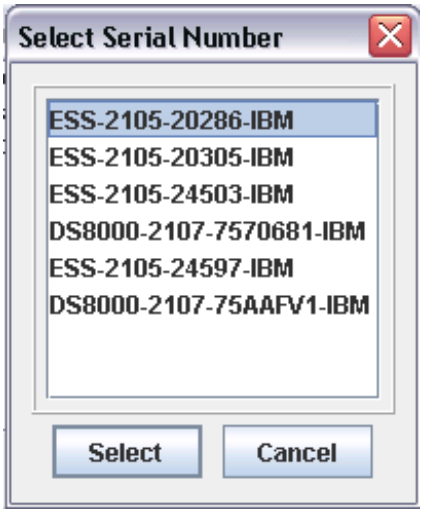


Step 2: Press the "Start" button to launch information wizard.

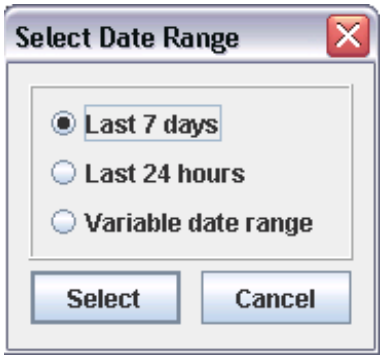
Step 3: Enter TPC for Disk logon information.

- ✓ Enter the hostname of the TPC for Disk server.
- ✓ Enter the Port number (default of 9550 is pre-filled).
- ✓ Enter the TPC for Disk user name and password.

Press the "Next" button to connect to TPC for Disk.

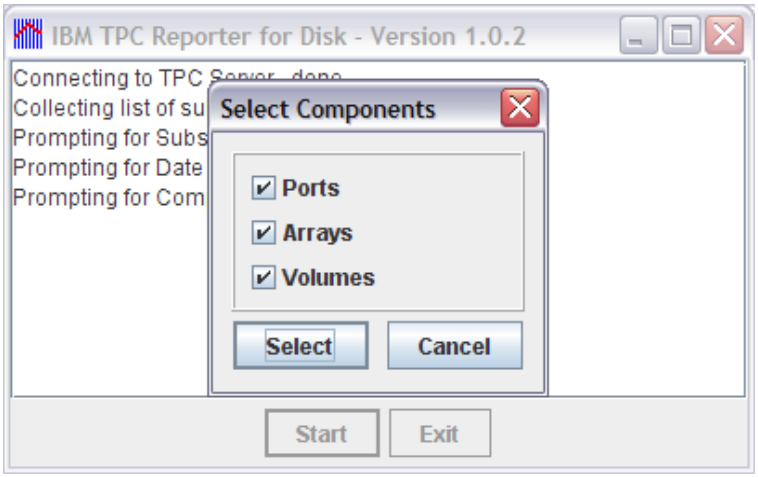


Step 4: The dialog will present a list of storage subsystems, managed by TPC for Disk, that have valid performance data. Select one subsystem to report on. Press the "Next" button to continue.

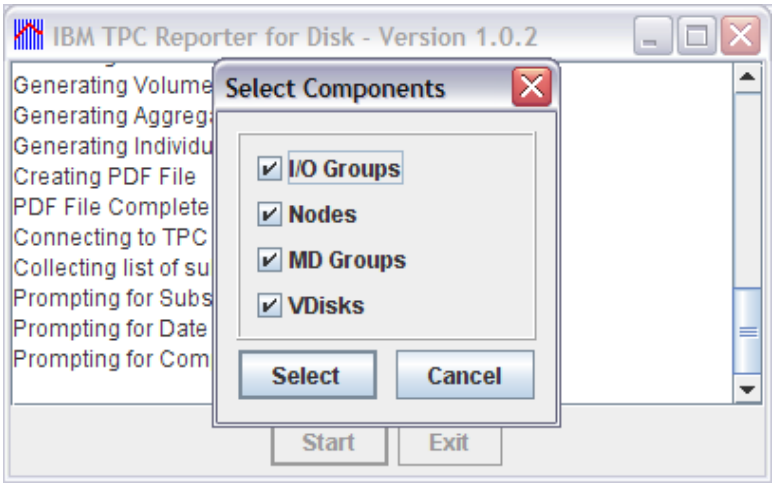


Step 5: Specify the Date range to report on. It is recommended to generate a report every 7 days.

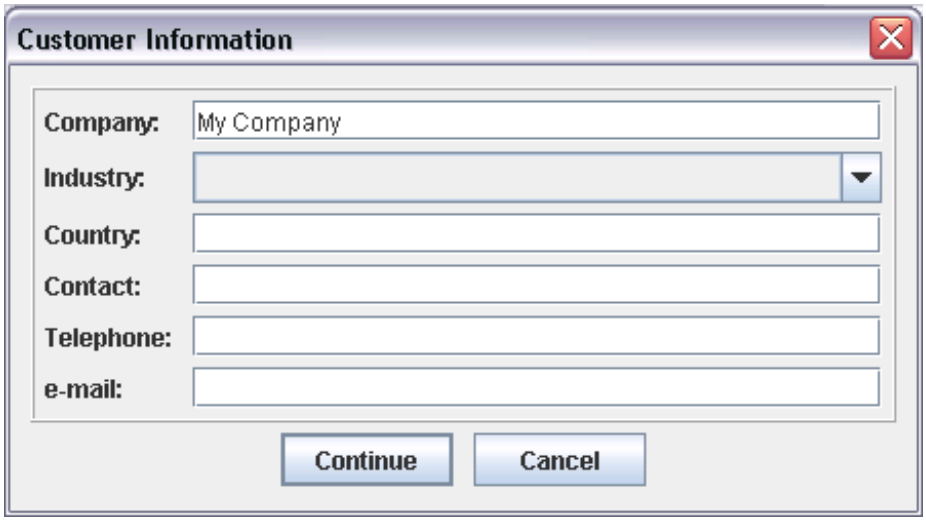
Step 6 (Optional): If "Variable date range" is selected, then a custom date and time can be chosen with the Date Range dialog. Any chosen time period should have valid performance data, otherwise the report will not contain any performance data at all.



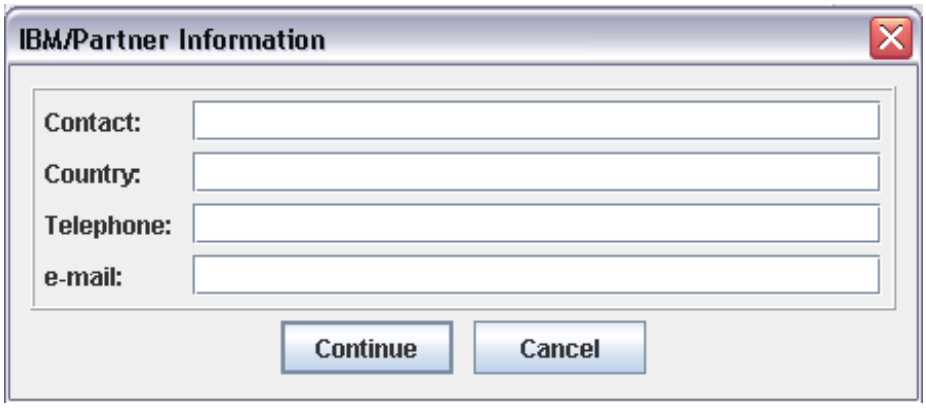
Step 7a: Select the subsystem component types for ESS & DS type subsystems, that will be included in the report. All of the components are selected by default, so this is an opportunity to skip one. For example, some systems have very large numbers of volumes, which may cause the report to become too large.



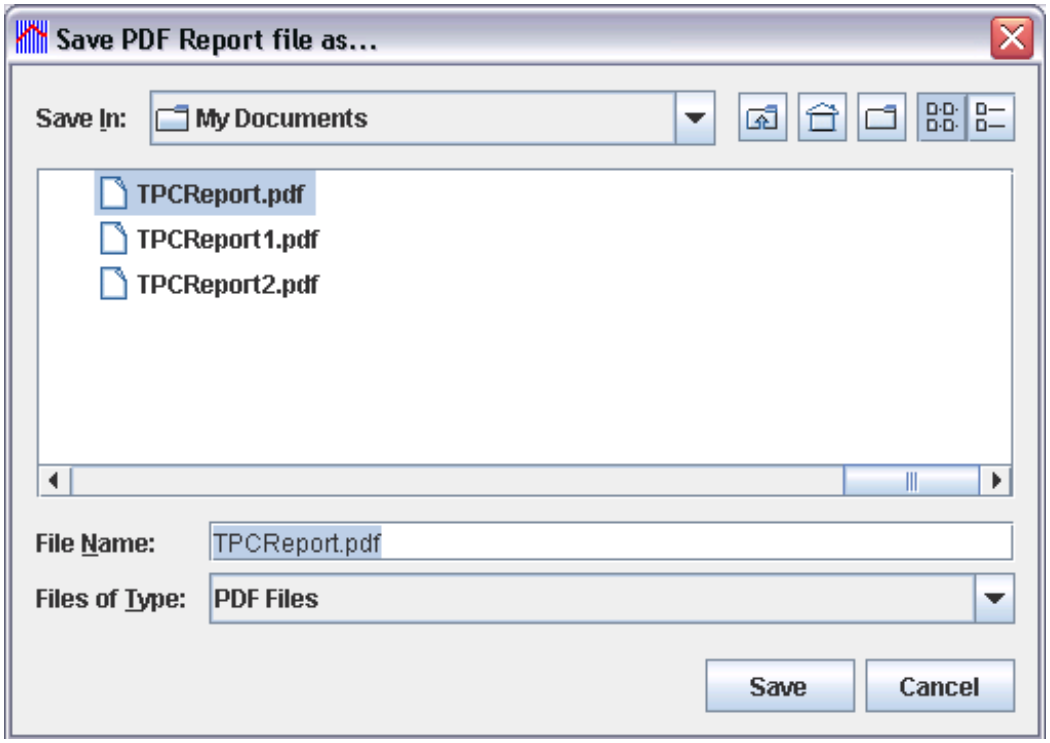
Step 7b: Select the subsystem component types for SVC type systems.



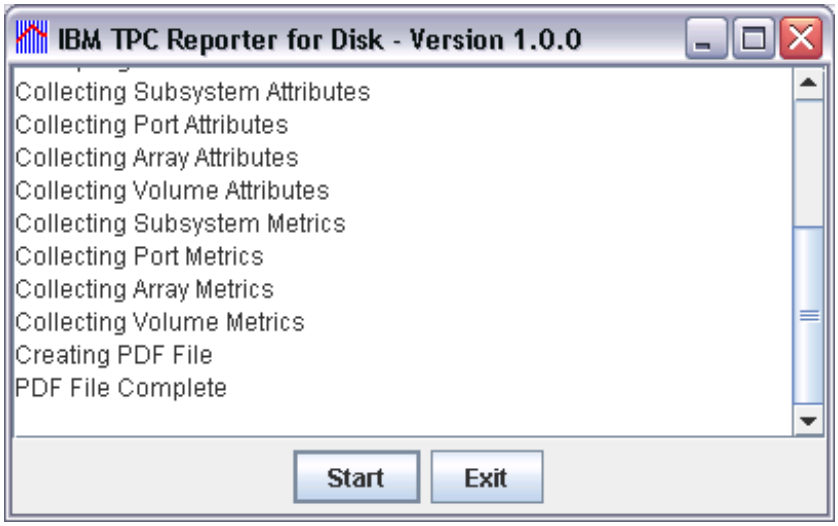
Step 8: Enter the Company name, select the industry and enter the country, contact name, telephone number, and email. This information will be saved and retrieved the next time the reporter is run. All fields are optional except company name.



Step 9: Enter the IBM contact name, country, telephone number, and email address. This information will be saved and retrieved the next time the reporter is run. All fields are optional.



Step 10: Select a filename and directory to save the generated report to. The default directory is "My Documents" and the default filename is TPCReport.pdf.



Step 11: Once the filename has been selected, the reporter will collect information from TPC for Disk, and generate the pdf report file. The steps to create the report are shown in the window. The "Exit" button will become available when the report has been generated.

Collect Performance Data

TPC for Disk Performance Data

It is necessary to set up TPC to periodically probe the subsystem for any configuration changes. If there are configuration changes made to the storage subsystem without updating the probe inforation, then any generated reports may be incorrect. To verify that configuration changes are automatically detected, in TPC for Disk, select Discovery->CIMOM. In the 'When to Run' tab, ensure that the 'Run Repeatedly' radio box is selected. For more detailed instructions, please refer to TPC for Disk documentation.

It is also necessary to select a timeframe with valid performance data to report on. If the time period selected does not contain any performance data, then the report will still be generated but will only contain configuration information.

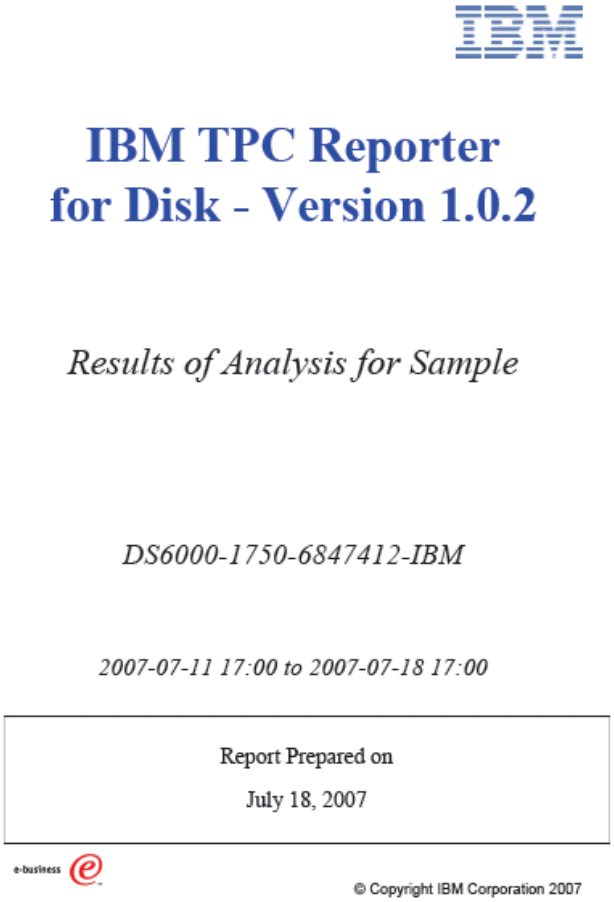
It is necessary to configure TPC for Disk to collect and store performance statistics for a given subsystem. To do so, select 'IBM TotalStorage Productivity Center'->Monitoring->Probes. Under the 'What to Probe' tab, select 'Storage Subsystems', and then select the subsystem to collect performance statistics for. Note that the hourly reporting rate for the Reporter is always 1-hour intervals. For more detailed instructions, please refer to TPC for Disk documentation.

Report Details

DS/8000, DS/6000, DS/4000 & ESS

The Report gives the same details for DS/8000, DS/6000, and ESS systems. The following is a brief description of each section of the report for these system types.

TITLE PAGE



The title includes the name of the report and the version of the reporter utility that created the report. The subtitle "Results of Analysis for Customer" contains the name of the *Company* field

from the *Customer Information* dialog box, where "Customer" is the value of the field.

The next line contains the name of the subsystem, "ESS-2105-29082-IBM" in this case. Afterwards is the year, month, day and hour of the beginning and end of performance information contained in the report, in the local time zone. Lastly, the phrase "Report Prepared on" is followed by the date that the utility created the report, in the local time zone.

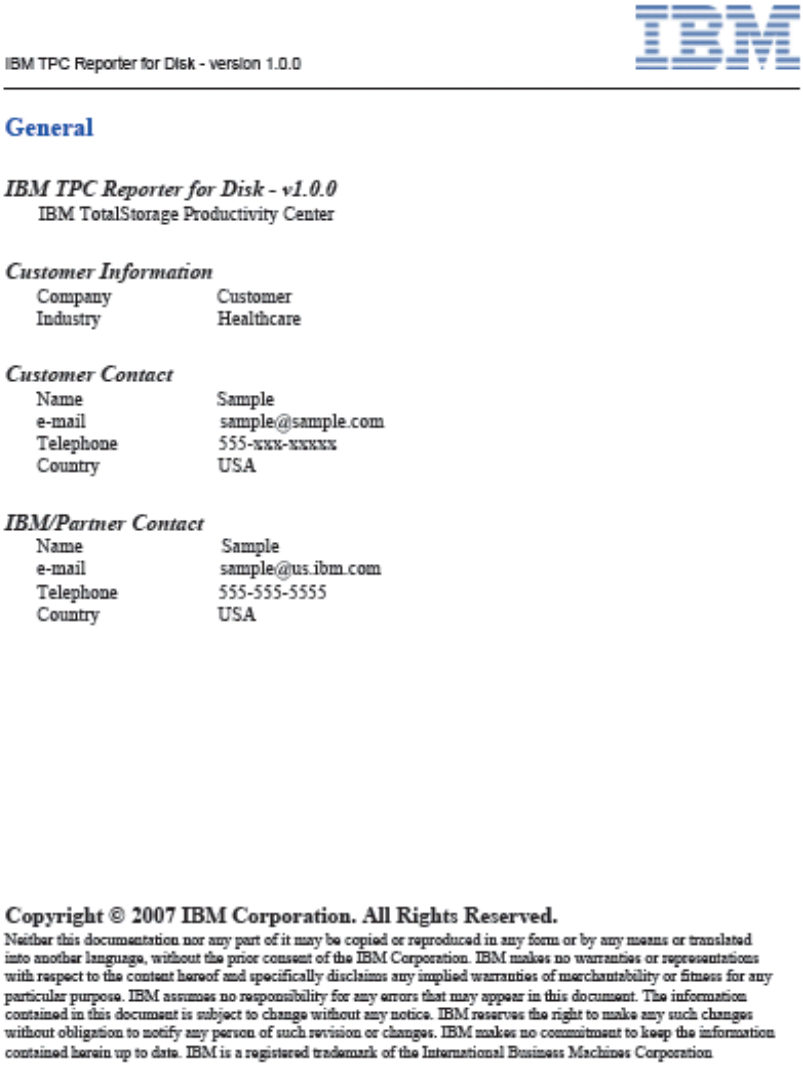
TABLE OF CONTENTS


IBM TPC Reporter for Disk - version 1.0.0

Table of Contents

The second page contains the beginning of the Table of Contents. The table is clickable, such that selecting an line with a mouse will change to that page. The first entry is the General page, followed by an overall description page for the subsystem type. Followed by the performance summary, statistics page, and metric definitions of each component type.

GENERAL PAGE



IBM TPC Reporter for Disk - version 1.0.0

General

IBM TPC Reporter for Disk - v1.0.0
IBM TotalStorage Productivity Center

Customer Information

Company	Customer
Industry	Healthcare

Customer Contact

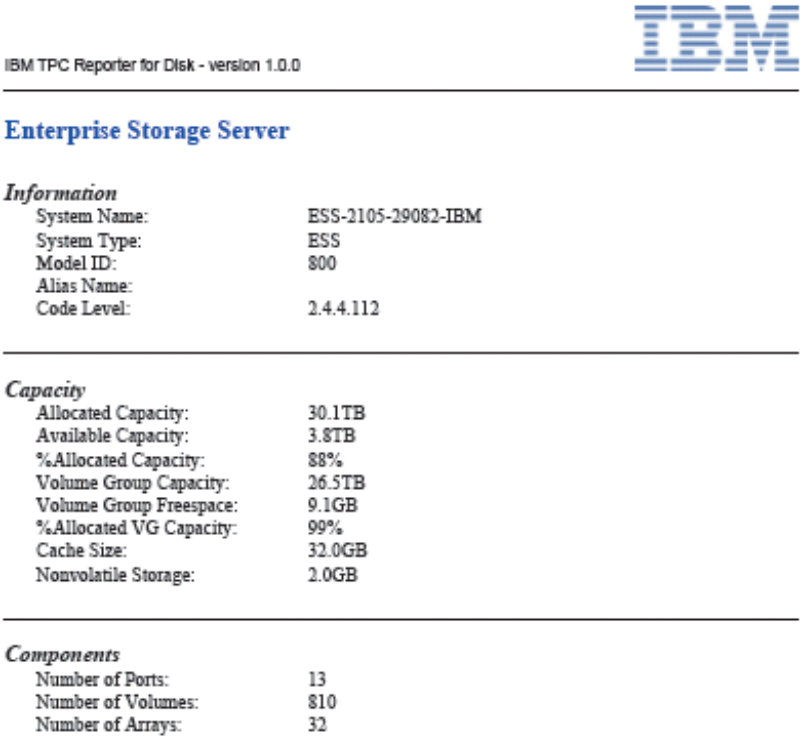
Name	Sample
e-mail	sample@sample.com
Telephone	555-xxx-xxxx
Country	USA

IBM/Partner Contact

Name	Sample
e-mail	sample@us.ibm.com
Telephone	555-555-5555
Country	USA

The General page contains the name of the utility and the version of the utility that created the report. The "Customer Information" section contains the value of the Company and Industry fields from the *Customer Information* dialog. The "Customer Contact" section contains the name, e-mail, telephone and country fields from the *Customer Information* dialog. The "IBM/Partner Contact" section contains the name, e-mail, telephone and country fields from the *IBM/Partner Information* dialog. At the bottom of the page is the IBM copyright statement with the current year.

SUBSYSTEM INFORMATION PAGE



IBM TPC Reporter for Disk - version 1.0.0

Enterprise Storage Server

Information

System Name:	ESS-2105-29082-IBM
System Type:	ESS
Model ID:	800
Alias Name:	
Code Level:	2.4.4.112

Capacity

Allocated Capacity:	30.1TB
Available Capacity:	3.8TB
%Allocated Capacity:	88%
Volume Group Capacity:	26.5TB
Volume Group Freespace:	9.1GB
%Allocated VG Capacity:	99%
Cache Size:	32.0GB
Nonvolatile Storage:	2.0GB

Components

Number of Ports:	13
Number of Volumes:	810
Number of Arrays:	32

The subsystem information page begins with the type of storage subsystem, followed by the "Information" section, which contains the subsystem name, type, corresponding model ID, alias name (if any), and the microcode level running.

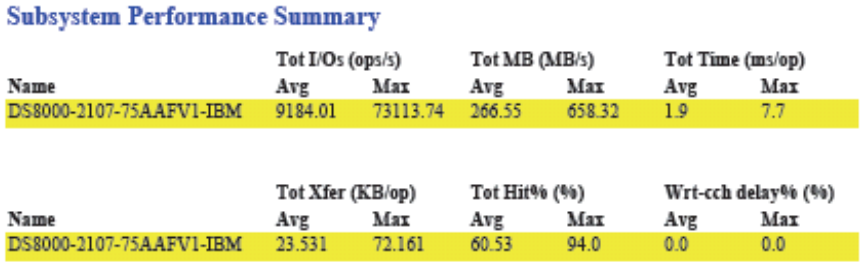
The "Capacity" section lists the *Allocated Capacity*, which is the total physical storage capacity of the subsystem. *Available Capacity* is the amount of unused physical capacity. The *percent Allocated Capacity* is the fraction of the amount of physical capacity used.

The *Volume Group Capacity* lists the total combined storage available from all Extent Pools. *Volume Group Freespace* lists the available combined storage from all Extent Pools, and *percent Allocated VG Capacity* list the fraction of the Extent Pool capacity used.

The *Cache Size* is the amount of memory in the storage subsystem dedicated to caching reads and writes. The *Nonvolatile Storage* is the amount of memory dedicated to caching writes.

The "Components" section lists the number of ports, extent pools, and volumes in the subsystem, as determined by the most recent subsystem probe.

SUBSYSTEM PERFORMANCE SUMMARY



Subsystem Performance Summary

	Tot I/Os (ops/s)		Tot MB (MB/s)		Tot Time (ms/op)	
Name	Avg	Max	Avg	Max	Avg	Max
DS8000-2107-75AAFV1-IBM	9184.01	73113.74	266.55	658.32	1.9	7.7

	Tot Xfer (KB/op)		Tot Hit% (%)		Wrt-cch delay% (%)	
Name	Avg	Max	Avg	Max	Avg	Max
DS8000-2107-75AAFV1-IBM	23.531	72.161	60.53	94.0	0.0	0.0

The subsystem performance summary page lists the average and maximum value of all metrics reported at the subsystem level. These metrics are as follows.

Total I/O Rate (ops/s)

The total I/O rate describes the average number of reads and writes operations per second (both sequential and non-sequential) over the time reporting interval (hourly), to all volumes in the subsystem.

Total Data Rate (MB/s)

The total data rate describes the average number of megabytes read and written per second over the hourly reporting time interval to all volumes in the subsystem.

Overall Response Time (ms/op)

The overall response time describes the average number of milliseconds it takes to complete each read and write operation over the hourly reporting time interval, to all volumes in the subsystem.

Overall Transfer Size (KB/op)

The overall transfer size describes the average number of kilobytes per read and write operation over the hourly reporting time interval, to all volumes in the subsystem.

Total Cache Hits Percentage

The total cache hits percentage describes the overall percentage of read and write operations that succeed from the cache, without waiting for a response from the volumes, over the hourly reporting interval. Write operations typically hit the cache 100% of the time, unless there are an enormous amount of writes at once.

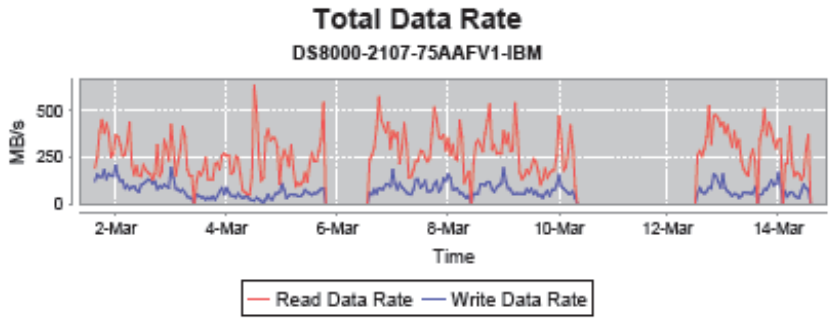
CPU Utilization Percentage

The CPU utilization percentage describes the workload of the processor of the storage subsystem. This value is often not reported.

Write-cache Delay Percentage

The write-cache delay percentage describes the portion of write operations that are delayed due to nonvolatile storage being full or other reasons, over the hourly reporting interval.

Line Charts



Each metric will subsequently be represented by a timeline chart, showing the read and write values for the subsystem, simultaneously when possible. Positions on the graph where the lines fall to zero, represent time periods with no performance data available. Each line chart is drawn to its own scale, depending on the value of its performance data. This allows each chart to have the maximum amount of detail, at the cost of making comparisons between graphs more difficult. The presence of the bar charts, discussed later, is meant to alleviate this issue.

PORTS

Port Information

Name	Speed	Type	Port No.
U1300.001.JJ04118-P1-C4-T0	2 Gbps	11	
U1300.001.JJ04118-P1-C4-T1	2 Gbps	11	
U1300.001.JJ04118-P1-C4-T2	2 Gbps	11	
U1300.001.JJ04118-P1-C4-T3	2 Gbps	11	
U1300.001.JJ04120-P1-C1-T0	2 Gbps	11	
U1300.001.JJ04120-P1-C1-T1	2 Gbps	11	
U1300.001.JJ04120-P1-C1-T2	2 Gbps	11	

The Port Information section, lists all ports in the subsystem discovered by the CIMOM, and their corresponding speed, type and port number. In this example, the speed of each port is 2 gigabits per second. The type of each port is 11, which corresponds to the SMI-S definition of port type "NL" (Node Port supporting FC arbitrated loop). The port number is not reported by the CIMOM in this case, and is not presented in the report.

Port Performance Summary

	Tot Port I/Os (ops/s)		Tot Port MBs (MB/s)	
Name	Avg	Max	Avg	Max
Aggregate	313.92	2917.0	10.44	133.85
U1300.001.JJ06958-P1-C4-T0	1149.03	2917.0	37.35	133.85
U1300.001.JJ06958-P1-C4-T1	786.04	1869.51	27.05	90.97
U1300.001.JJ06958-P1-C4-T2	922.16	2457.71	32.27	116.51
U1300.001.JJ06958-P1-C4-T3	914.56	2191.01	28.85	88.19
U1300.001.JJ07019-P1-C1-T0	1145.01	2913.25	37.21	133.24
U1300.001.JJ07019-P1-C1-T1	782.6	1857.03	26.93	90.99
U1300.001.JJ07019-P1-C1-T2	920.25	2462.04	32.13	98.03
U1300.001.JJ07019-P1-C1-T3	914.44	2195.11	28.75	88.34

The port performance summary page lists the average and maximum value of all metrics reported at the port level, including the overall maximum and average for all the ports (aggregate) for each metric. These metrics are as follows.

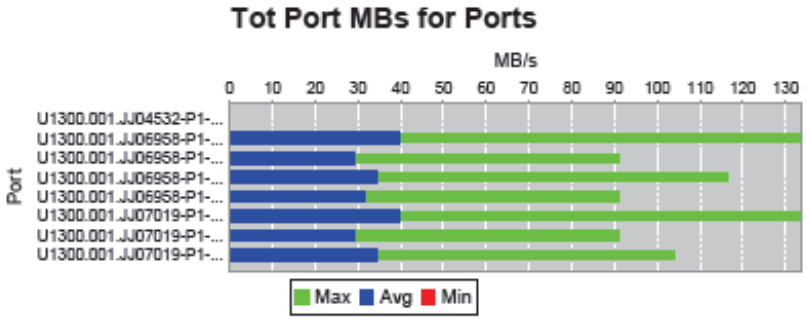
Total Port I/O Rate (ops/s)

The total port i/o rate describes the total number of reads and write operations that pass through a given port, over the hourly reporting interval.

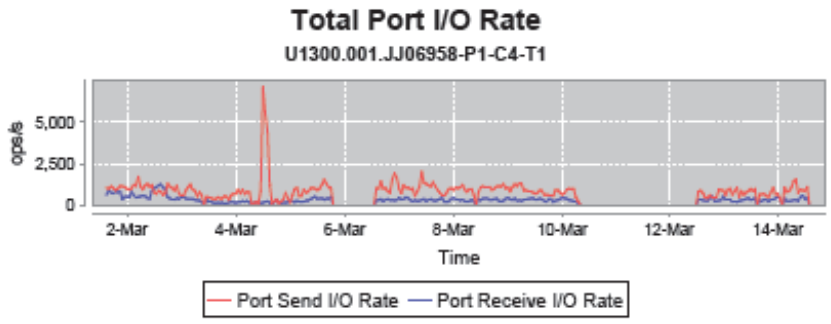
Total Port Data Rate (MB/s)

The total port data rate describes the average number of megabytes per second from reads and writes, that pass through a given port, over the hourly reporting interval.

Charts



A series of bar charts show a side-by-side comparison of all ports for each metric. There are no more than 8 ports per bar chart, however, each grouping of charts is drawn to the same scale to ensure a quick and easy comparison.



A line chart for each metric will be displayed for each port.

Definitions

Subsystem Definitions

Name	Abbrev	Definition
Read I/O Rate (overall)	Reads	Average number of read operations per second (both sequential and non-sequential, if applicable), for a particular component over a particular time interval.
Write I/O Rate (overall)	Writes	Average number of write operations per second (both sequential and non-sequential, if applicable), for a particular component over a particular time interval.
Total I/O Rate (overall)	Tot I/Os	Average number of all read and write I/O operations per second (both sequential and non-sequential), for a particular component over a particular time interval.
Read Cache Hits Percentage (overall)	Read Hit%	Percentage of cache hits for read operations (both sequential and non-sequential, if applicable), for a particular component over a particular time interval.
Write Cache Hits Percentage (overall)	Write Hit%	Percentage of cache hits for write operations (both sequential and non-sequential, if applicable), for a particular component over a particular time interval.
Total Cache Hits Percentage (overall)	Tot Hit%	Percentage of cache hits for read and write operations (both sequential and non-sequential, if applicable), for a particular component over a particular time interval.

Following each set of graphs is a definitions section, defining each metric, and it's corresponding abbreviation.

ARRAYS

Storage (Extent) Pool Information

Name	Tot. Space	Rem. Space	No. Vols.	RAID Level	LSS	Rank Group	% Alloc.
R00_P00_S0	2.3TB	763.0GB	27	raid5	0	0	67
R01_P01_S1	2.3TB	775.0GB	28	raid5	0	1	66
R02_P02_S0	2.3TB	866.0GB	30	raid5	0	0	62
R03_P03_S1	2.3TB	772.0GB	26	raid5	0	1	66
R04_P04_S0	2.3TB	773.0GB	29	raid5	0	0	66
R05_P05_S1	2.3TB	747.0GB	32	raid5	0	1	68
R06_P06_S0	2.3TB	764.0GB	29	raid5	0	0	67
R07_P07_S1	2.3TB	765.0GB	28	raid5	0	1	67
R08_P08_S0	2.3TB	768.0GB	27	raid5	0	0	67

The Extent Pool Information section describes all pools in the subsystem. An extent pool is a collection of arrays. The information section describes the capacity of each pool, as well as the number of volumes in the pool, the associated logical subsystem (LSS) and Rank Group.

Array Performance Summary

Name	Tot I/Os (ops/s) Avg	Tot I/Os (ops/s) Max	Tot MB (MB/s) Avg	Tot MB (MB/s) Max	Tot Time (ms/op) Avg	Tot Time (ms/op) Max
Aggregate	98.07	1567.4	3.36	52.27	1.2	10.8
2107.75AAFV1-1	176.76	517.79	6.24	28.92	1.6	7.8
2107.75AAFV1-2	167.02	749.94	7.83	33.09	1.8	8.5
2107.75AAFV1-3	0.0	0.0	0.0	0.0	0.0	0.0
2107.75AAFV1-4	116.69	437.02	4.58	24.99	2.3	9.1
2107.75AAFV1-5	156.54	1167.0	4.85	30.21	2.2	10.8
2107.75AAFV1-6	0.0	0.0	0.0	0.0	0.0	0.0
2107.75AAFV1-7	147.79	601.19	7.52	52.27	2.1	9.2
2107.75AAFV1-8	184.51	841.33	6.2	34.63	1.7	7.1
2107.75AAFV1-9	118.26	425.24	4.81	30.89	2.1	10.2
2107.75AAFV1-10	120.81	477.13	4.58	23.84	2.1	10.1

Array Performance Summary -- cont'd

Name	Tot Disk I/Os (ops/s) Avg	Tot Disk I/Os (ops/s) Max	Tot Disk MB (MB/s) Avg	Tot Disk MB (MB/s) Max	Tot Disk Time (ms/op) Avg	Tot Disk Time (ms/op) Max
Aggregate	102.72	631.29	4.71	33.72	8.4	64.9
2107.75AAFV1-1	114.96	511.98	5.94	29.56	10.1	36.7
2107.75AAFV1-2	109.31	530.4	5.77	30.28	9.8	38.0
2107.75AAFV1-3	120.42	556.76	5.39	29.76	9.2	32.5
2107.75AAFV1-4	111.7	564.02	5.0	28.62	7.0	28.3
2107.75AAFV1-5	114.64	621.5	5.14	33.72	7.4	24.6
2107.75AAFV1-6	123.44	631.29	6.11	32.29	7.7	28.3
2107.75AAFV1-7	109.49	519.53	5.03	27.58	6.9	22.6
2107.75AAFV1-8	117.54	585.04	5.28	30.89	8.1	28.1
2107.75AAFV1-9	105.47	525.25	4.77	27.64	6.9	26.2
2107.75AAFV1-10	108.13	512.62	4.84	26.91	6.9	25.6

The array performance summary page lists the average and maximum value of all metrics reported at the array component level, including the overall maximum and average for all the arrays (aggregate) for each metric. These metrics are as follows.

Total I/O Rate (ops/s)

The total I/O rate describes the average number of read and write operations per second over the hourly reporting interval, to each array in the subsystem.

Total Data Rate (MB/s)

The total data rate describes the average number of megabytes read and written per second over the hourly reporting time interval to each array in the subsystem.

Overall Response Time (ms/op)

The overall response time describes the average number of milliseconds it takes to complete each read and write operation over the hourly reporting time interval, to each array in the subsystem.

Total Backend I/O Rate (ops/s)

The total backend I/O rate describes the average number of read and write operations per second over the hourly reporting interval, to the disks in an array, from the array cache.

Total Backend Data Rate (MB/s)

The total backend data rate describes the average number of megabytes read and written per second over the hourly reporting time interval to the disks in an array, from the array cache.

Overall Backend Response Time (ms/op)

The overall backend response time describes the average number of milliseconds it takes to complete each read and write operation over the hourly reporting time interval, to the disks in an array, from the array cache.

VOLUMES

Volume Information

Name	Capacity	Pool ID	LSS	Vol. No.	Unique ID
bsux0002_0001 (ID:0001)	240.0GB	6051368	0	1	75aafv1/0001
bsux0002_0020 (ID:0020)	100.0GB	6051368	0	32	75aafv1/0020
bsux0002_0101 (ID:0101)	240.0GB	6051328	1	1	75aafv1/0101
bsux0002_0102 (ID:0102)	32.0GB	6051328	1	2	75aafv1/0102
bsux0002_0120 (ID:0120)	100.0GB	6051328	1	32	75aafv1/0120
bsux0002_0201 (ID:0201)	240.0GB	6051235	2	1	75aafv1/0201
bsux0002_0202 (ID:0202)	32.0GB	6051235	2	2	75aafv1/0202
bsux0002_0301 (ID:0301)	240.0GB	6051087	3	1	75aafv1/0301
bsux0002_0302 (ID:0302)	32.0GB	6051087	3	2	75aafv1/0302
bsux0002_0320 (ID:0320)	100.0GB	6051087	3	32	75aafv1/0320

The Volume Information section describes each volume in the subsystem. Listing capacity and identifying characteristics. A volume is a logical entity that may be a portion of a disk, or span multiple disks.

Volume Performance Summary

	Tot I/Os (ops/s)		Tot MB (MB/s)		Tot Time (ms/op)	
Name	Avg	Max	Avg	Max	Avg	Max
Aggregate	10.88	1312.46	0.36	44.79	2.3	96.0
bsux0002_0001 (ID:0001)	82.51	373.81	3.34	22.36	1.8	7.2
bsux0002_0020 (ID:0020)	1.68	13.55	0.08	1.67	1.5	9.6
bsux0002_0101 (ID:0101)	75.58	255.4	3.26	22.11	1.7	7.0
bsux0002_0102 (ID:0102)	3.08	18.2	0.37	2.12	2.3	7.6
bsux0002_0120 (ID:0120)	0.9	13.86	0.07	1.73	2.6	40.0
bsux0002_0201 (ID:0201)	57.37	223.79	2.49	17.4	2.1	8.3
bsux0002_0202 (ID:0202)	3.12	16.37	0.4	2.13	3.2	10.4
bsux0002_0301 (ID:0301)	37.41	207.2	2.07	16.61	2.4	7.5
bsux0002_0302 (ID:0302)	3.82	15.11	0.44	2.09	3.2	8.9
bsux0002_0320 (ID:0320)	1.24	10.03	0.07	1.14	1.5	7.3
bsux0002_0401 (ID:0401)	35.58	189.78	2.0	16.65	2.7	8.9

The volume performance summary page lists the average and maximum value of all metrics reported at the volume component level, including the overall maximum and average for all the volumes (aggregate) for each metric. These metrics are as follows.

Total I/O Rate (ops/s)

The total I/O rate describes the average number of reads and writes operations per second over the time reporting interval (hourly), to each volume.

Total Data Rate (MB/s)

The total data rate describes the average number of megabytes read and written per second over the hourly reporting time interval to each volume.

Overall Response Time (ms/op)

The overall response time describes the average number of milliseconds it takes to complete each read and write operation over the hourly reporting time interval, to each volume.

Charts

Only bar charts are displayed for volumes, due to size constraints.

SAN Volume Controller

The Report gives similar details for SAN Volume Controllers, whereas the component types are slightly different. The following is

a brief description of each section of the report for these system types.

SUBSYSTEM

The subsystem section is nearly identical to the DS/8000, DS/6000 & ESS report. The statistics here present an overall view of the entire SVC, and can give a good idea of overall performance, but due to the architecture of the SVC, are not useful for localizing performance bottlenecks.

The metrics provided are identical to the subsystem statistics for other subsystem types.

NODES

SVC Node Performance Summary

	Tot I/Os (ops/s)		Tot MB (MB/s)		Tot Hit% (%)	
Name	Avg	Max	Avg	Max	Avg	Max
Aggregate	12.52	321.63	0.57	19.86	93.23	100.0
node1	22.39	321.63	0.46	9.22	94.04	100.0
node2	10.1	201.78	0.85	19.83	89.7	100.0
node3	9.68	196.64	0.86	19.86	89.78	100.0
node4	7.92	78.71	0.12	2.81	99.39	100.0

SVC Node Performance Summary -- cont'd

	Tot Time (ms/op)	
Name	Avg	Max
Aggregate	0.8	4.0
node1	1.3	1.9
node2	0.9	4.0
node3	0.6	3.4
node4	0.3	0.5

There is no Node Information Section, as the information is not provided by TPC. An SVC node is a single processing unit, possibly a 1U System x rack, which processes reads and writes to extents in the storage array network.

The Node Performance Summary section, lists all nodes in the SVC, and their corresponding performance statistics, including the overall maximum and average for all nodes (aggregate) for each metric.

Total I/O Rate (ops/s)

The total I/O rate describes the average number of read and write operations per second over the hourly reporting interval, for each SVC node.

Total Data Rate (MB/s)

The total data rate describes the average number of megabytes read and written per second over the hourly reporting time interval for each SVC node.

Total Cache Hits Percentage

The total cache hits percentage describes the overall percentage of read and write operations that succeed from the cache, without waiting for a response from the volumes, over the hourly reporting interval for each SVC node. Write operations typically hit the cache 100% of the time.

Overall Response Time (ms/op)

The overall response time describes the average number of milliseconds it takes to complete each read and write operation over the hourly reporting time interval, for each SVC node.

I/O Group

SVC I/O Group Performance Summary

	Tot I/Os (ops/s)		Tot MB (MB/s)	
Name	Avg	Max	Avg	Max
Aggregate	25.05	391.93	1.15	19.97
io_grp0	32.5	391.93	1.31	19.97
io_grp1	17.6	202.46	0.98	19.89

There is no I/O Group Information Section, as the information is not provided by TPC. An I/O Group consists of pair of nodes, to duplicate each I/O operation.

The I/O Group Performance Summary, lists all I/O groups in the SVC, and their corresponding performance statistics, including the overall maximum and average for all the I/O groups (aggregate) for each metric. These metrics are as follows.

Total I/O Rate (ops/s)

The total I/O rate describes the average number of read and write operations per second over the hourly reporting interval, for each I/O Group.

Total Data Rate (MB/s)

The total data rate describes the average number of megabytes read and written per second over the hourly reporting time interval for each I/O Group.

MD Group

SVC MD Group Information

Name	Tot. Space	Rem. Space	No. Vols.	RAID Level	LSS	% Alloc.
mdg_5a	5.1TB	2.2TB	50		0	57
mdg_5b	5.1TB	2.2TB	45		0	56
mdg_10a	2.5TB	788.1GB	18		0	69
mdg_10b	2.5TB	409.0GB	29		0	84
mdg_10j	518.0GB	218.0GB	3		0	57

The MD Group Information section describes the characteristics of all the managed disk groups (MDG) in the SVC. In the report we describe the total space, remaining space and percent allocated, as well as the number of managed disks in each group, the RAID Level, and the associated logical subsystem (LSS), for each MDG. A MDG is a collection of virtual disks, similar to how an array is a collection of volumes on DS-type systems.

SVC MD Group Performance Summary

	Tot I/Os (ops/s)		Tot MB (MB/s)		Tot Time (ms/op)	
Name	Avg	Max	Avg	Max	Avg	Max
Aggregate	10.02	537.52	0.46	39.7	1.1	14.8
mdg_5a	29.87	537.52	0.76	17.48	1.1	2.1
mdg_5b	19.9	400.7	1.53	39.7	0.6	3.1
mdg_10a	0.02	0.02	0.0	0.0	3.5	14.8
mdg_10b	0.3	0.47	0.0	0.0	0.3	2.4
mdg_10j	0.0	0.0	0.0	0.0	0.0	0.0

SVC MD Group Performance Summary -- cont'd

Name	Tot Disk I/Os (ops/s) Avg	Max	Tot Disk MB (MB/s) Avg	Max	Tot Disk Time (ms/op) Avg	Max
Aggregate	13.4	1313.6	0.37	37.81	0.7	66.7
mdg_5a	17.15	397.95	0.39	8.92	1.4	12.8
mdg_5b	49.83	1313.6	1.44	37.81	1.7	66.7
mdg_10a	0.0	0.02	0.0	0.0	0.2	5.0
mdg_10b	0.01	0.81	0.0	0.03	0.0	3.0
mdg_10j	0.0	0.0	0.0	0.0	0.0	0.0

The MD Group Performance Summary lists all MD groups in the SVC, and their corresponding performance statistics, including the overall maximum and average for all the groups (aggregate) for each metric. These metrics reported are the same as those reported for arrays in DS-type subsystems.

VIRTUAL DISKS

VDisk Information

Name	Capacity	Pool ID	LSS	Vol. No.	Unique ID
aixecha1_rtvg1	20.0GB	1529	0	0	9081bd/000004
aixepic1_rtvg1	40.0GB	1529	0	0	9081bd/000080
aixerel1_rtvg1	20.0GB	1529	0	0	9081bd/000002
aixesha2_rtvg1	40.0GB	1465	0	0	9081bd/000003
aixetrn2_rtvg1	20.0GB	1465	0	0	9081bd/000001
aixetst2_rtvg1	20.0GB	1465	0	0	9081bd/000005
aixtems2_rtvg1	20.0GB	1529	0	0	9081bd/000006
aixtsm02_rtvg1	20.0GB	1465	0	0	9081bd/000007
echa1_local_1	20.0GB	1465	0	0	9081bd/00006a
echa_apphb_1	300.0MB	1529	0	0	9081bd/00007e
echa_appvg_01	40.0GB	1584	0	0	9081bd/000069
epic1_local_1	20.0GB	1529	0	0	9081bd/00001e

The VDisk Information section describes each virtual disk in the SVC, listing capacity and identifying characteristics. A virtual disk is a logical entity made up from extents from an extent pool.

VDisk Performance Summary

Name	Tot I/Os (ops/s) Avg	Max	Tot MB (MB/s) Avg	Max	Tot Time (ms/op) Avg	Max
Aggregate	0.34	244.39	0.02	19.85	0.2	2221.0
aixecha1_rtvg1	0.0	0.0	0.0	0.0	0.0	0.0
aixepic1_rtvg1	0.19	0.23	0.0	0.0	0.6	4.5
aixerel1_rtvg1	1.08	2.41	0.01	0.02	0.5	1.8
aixesha2_rtvg1	0.19	0.23	0.0	0.0	0.2	1.2
aixetrn2_rtvg1	1.3	2.49	0.01	0.02	0.2	0.6
aixetst2_rtvg1	0.19	0.23	0.0	0.0	0.2	1.5
aixtems2_rtvg1	0.18	0.22	0.0	0.0	0.7	3.5
aixtsm02_rtvg1	0.18	0.22	0.0	0.0	0.2	1.6
echa1_local_1	0.0	0.0	0.0	0.0	0.0	0.0

The VDisk Performance Summary, lists all virtual disks in the SVC, and their corresponding performance statistics, including the overall maximum and average for all the disks (aggregate) for each metric. These metrics described are the same as the Volume metrics in the DS report type.