Quick User Guide for Iometer Rev.2003.12.16

This guide is a quick introduction to Iometer, what it is and how to use it.

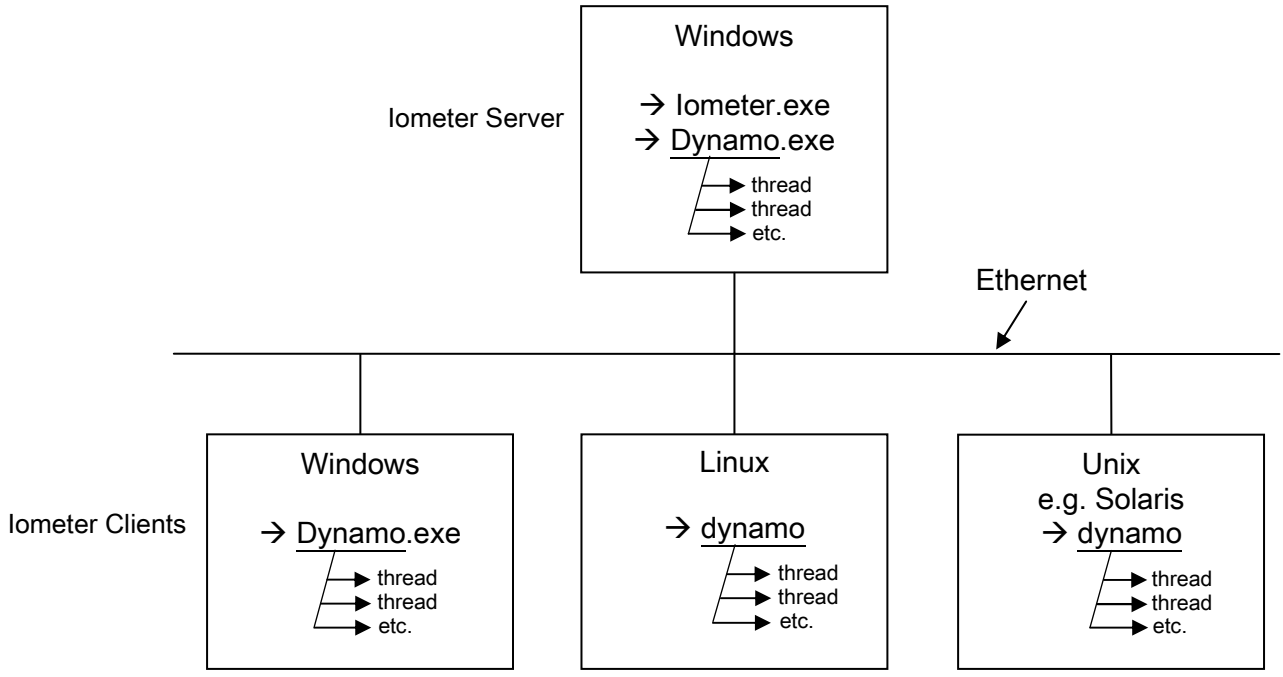
1 About Iometer

Iometer is a workload generator and measurement tool for Windows, Unix(s), and Linux. It can be used to test disk and network performance and the test results can be saved for further analysis. A more detailed explanation can be found in the *Iometer User's Guide*. For the latest information, downloads, known issues, etc. check out *www.iometer.org*.

Iometer consists of two programs, Iometer and Dynamo

- *Iometer* is the controlling program. Using Iometer's graphical user interface, you configure the workload, set operating parameters, and start and stop tests. Iometer tells Dynamo what to do, collects the resulting data, and summarizes the results in output files. Only one copy of Iometer should be running at a time; it is typically run on the server machine.
- *Dynamo* is the workload generator. It has no user interface. At Iometer's command, Dynamo performs I/O operations and records performance information, then returns the data to Iometer. There can be more than one copy of Dynamo running at a time; typically one copy runs on the server machine and one additional copy runs on each client machine. Dynamo is multithreaded; each copy can simulate the workload of multiple client programs. Each running copy of Dynamo is called a *manager*; each thread within a copy of Dynamo is called a *worker*.

Have a look at this picture:



The picture shows that only the Iometer Server requires *Iometer.exe.*
All Iometer Clients only need *dynamo* running.

2 Installing Iometer

- **General**

  If Iometer runs across multiple systems make sure that they can ping each other.
  All required Iometer files can be downloaded from *www.iometer.org*.

- **Windows**
  - ☞ Iometer Server → just copy *Iometer.exe* and *Dynamo.exe* into the same directory. There are two versions available, one in the *Release* directory and in the *Debug* directory. The debug version is much bigger. For normal use choose the one in the *Release* directory. For debugging Iometer problems choose the other one.
  - ☞ Iometer Client → only requires *Dynamo.exe*.

- **Solaris**

  What you need to do here depends on whether there is an already compiled executable file *dynamo* available or not.
  - ☞ *dynamo* is available. Copy *dynamo* to */usr/bin* and if there is a lib file with it copy this to */usr/lib*.
  - ☞ *dynamo* is not (yet) available. Compilation of the source code is required. See Chapter 5 for details.

- **Linux (Red Hat 9)**

  Download from www.iometer.org *iometer-2003.12.16.linux-bin.tar.gz* into e.g. */space*.
  If the file is to be copied from a CD and the CD does not automount because it is in UDF format then mount the CD manually by typing:

  ```
  mount /dev/cdrom -t udf /mnt/cdrom
  ```

  then continue with:

  ```
  cp /mnt/cdrom/iometer-2003.12.16.linux-bin.tar.gz /space
  cd /space
  gunzip iometer-2003.12.16.linux-bin.tar.gz
  tar -xvf iometer-2003.12.16.linux-bin.tar
  cd iometer-2003.12.16/src
  cp dynamo /usr/bin
  ```

  - ☞ *Segmentation fault issue with Red Hat 9:*
    Running Dynamo on a Linux machine with a glibc (GNU libc) version 2.3 or higher (having NPTL support) - Red Hat 9 for instance - comes to a segmentation fault after ending a test.
    Workaround: Before starting the Dynamo you have to run the following command:
    `export LD_ASSUME_KERNEL=2.4.1`

3 Running Iometer

To test disk performance:

- Double-click on Iometer.exe. The Iometer main window appears, and a Dynamo workload generator is automatically launched on the local computer.
- If applicable start Dynamo on other machines by typing:
  - ☞ Windows & Solaris: `dynamo <IP Addr of Iometer Server>`
  - ☞ Linux: `dynamo -i <IP Addr of Iometer Server> -m <own IP Addr>`
  - ☞ Check that they properley log into the Iometer Server.
- Click on a *manager* (the name of the local computer) in the Topology panel on the left side of the Iometer window. The manager's available disk drives appear in the Disk Targets tab. Blue icons represent physical drives; they are only shown if they have no partitions on them. Yellow icons represent logical (mounted) drives; they are only shown if they are writable. A yellow icon with a red slash through it means that the drive needs to be *prepared* before the test starts; see the Disk Targets section in the Iometer User's Guide for more information on preparation.

- In the Disk Targets tab, select a disk or disks to use in the test (use Shift-click and Control-click to select multiple disks). The selected disks will be automatically distributed among the manager's *workers* (threads).
- Switch to the Access Specifications tab. Double-click on "Default" in the Global Access Specifications list (the one with the globe icon). The Edit Access Specification dialog appears.
- The Edit Access Specification dialog shows you how the disk will be accessed. The default is 2-Kilobyte random I/Os with a mix of 67% reads and 33% writes, which represents a typical database workload. You can leave it alone or change it. Or remove it completely and add a different Access Specification. Press OK to close the dialog when you are through.
  - For maximum throughput (Megabytes per second), try changing the Transfer Request Size to 64K, the Percent Read/Write Distribution to 100% Read, and the Percent Random/Sequential Distribution to 100% Sequential.
  - For the maximum I/O rate (I/O operations per second), try changing the Transfer Request Size to 512 bytes, the Percent Read/Write Distribution to 100% Read, and the Percent Random/Sequential Distribution to 100% Sequential.
- Switch to the Results Display tab. Set the Update Frequency to 10 seconds.
- Press the Start Tests button (green flag). A standard Save File dialog appears. Select a file to store the test results (default *results.csv*).
- After 10 seconds the first test results appear in the Results Display tab, and they are updated every 10 seconds after that. Press the button to the left of each bar chart for a menu of the different results you can display. You can also drag a worker or manager from the Topology panel to a bar chart to see the results of just that worker or manager.
- Press the Stop Test button (stop sign). The test stops and the final results are saved in the *results.csv* file. This is a comma-separated text file that can be viewed in any text editor or imported into a data base and/or spreadsheet.

To test network performance between two computers (A and B):

- On computer A, double-click on *Iometer.exe*. The Iometer main window appears and a Dynamo workload generator is automatically launched on computer A.
- On computer B, open an MS-DOS Command Prompt window and execute Dynamo, specifying computer A's IP address as a command line argument. For example:
  `C:\> dynamo <IP Addr computer_A>`
- On computer A again, note that computer B has appeared as a new manager in the Topology panel. Click on it and note that its disk drives appear in the Disk Targets tab.
- With computer B selected in the Topology panel, press the Start Network Worker button (picture of network cables). This creates a network server on computer B.
- With computer B still selected in the Topology panel, switch to the Network Targets tab, which shows the two computers and their network interfaces. Select one of computer A's network interfaces from the list. This creates a network client on computer A and connects the client and server together.
- Switch to the Access Specifications tab. Double-click on "Default" in the Global Access Specifications list. In the Edit Access Specification dialog, specify a Transfer Request Size of 512 bytes. Press OK to close the dialog.
- Switch to the Results Display tab. Set the Update Frequency to 10 seconds.
- Press the Start Tests button. Select a file to store the test results. If you specify an existing file, the new results will be appended to the existing ones.
- Watch the results in the Results Display tab.
- Press the Stop Test button to stop the test and save the results.

Import test results into Microsoft Access database

- Double-click on Wizard.mdb (delivered with the Windows version of Iometer) to open Access. (If you use Access 2000, you will be notified that the database is not in Access 2000 format. It does not have to be in order to perform the import, just continue and convert the database) The first page of the wizard appears.
- Specify the results file to import. Use the Browse button to locate it if it isn't in the same directory as the Wizard.mdb file. Press Next.
- Select the test(s) from the file that you want to import. Press Next.
- Select "Create a new database." Press Next.
- Specify the new .mdb file to import into. This must be a different file from Wizard.mdb. Press Next.
- Review your settings and press Finish. The results are imported into the specified database.

Make a graph using Microsoft Excel

- Open Wizard.mdb in Access, if necessary.
- Click the Graph Data button.
- Specify the database file that contains your imported data. This must be a database produced by the Import Wizard. Press Next.
- Select the test(s) from the database that you want to graph. Press Next.
- This list shows predefined graph types that you can use. Press New to define a new graph type.
- Select the "# Disks" database field to graph on the X axis. Press Next.
- Type a name to label the X axis, or accept the field name as the default. Press Next.
- Check "Allow multiple Y values." Select the "IOps" and "MBps" database fields to graph on the Y axis. Press Next.
- Click on the MBps field and press "Edit selected label." Click "Right axis" to graph this field on the right axis of the graph. Change the name to be displayed on the Y axis label if you like. Press OK, then Next.
- The grouping criterion can be used to group the data into several distinct lines on the graph. For now, leave "None" selected. Press Next.
- Leave the grouping criterion label blank. Press Next.
- Type a name for the graph type you have just defined, or accept the default. Press Next.
- You have now defined a new graph type that you can edit or re-use in the future. Select it from the list (if it isn't already selected). Press Next.
- Specify an .xls file to receive the graph. This can be a new or existing file; if the file exists, the graph will be added to it. Press Next.
- Review your settings and press Finish. The graph is created in the specified spreadsheet. (If you just imported the results from one or two tests, it is probably a very boring graph with only one or two points! The Graph Wizard is most useful in graphing the results of multiple tests against each other.)

4 Workload configuration examples

In the *Edit Access Specification* tab you can modify, add, or delete access rules (=workload type). One rule, *Default*, represents a typical Database Access Pattern. You may want to create other Access Patterns to emulate a typical File Server or a Workstation workload. Refer to the following tables for the numbers.

Typical ***Workstation*** Access Pattern (as defined by StorageReview.com)

% of Access Specification	Transfer Size Request	% Reads	%Random
100%	8 KB	80%	80%

Typical ***Database*** Access Pattern (as defined by Intel/StorageReview.com)

% of Access Specification	Transfer Size Request	% Reads	%Random
100%	8 KB	67%	100%

- The name of this Access Specification in Iometer is *Default*

Typical ***File Server*** Access Pattern (as defined by Intel)

% of Access Specification	Transfer Size Request	% Reads	%Random
10%	0.5 KB	80%	100%
5%	1 KB	80%	100%
5%	2 KB	80%	100%
60%	4 KB	80%	100%
2%	8 KB	80%	100%
4%	16 KB	80%	100%
4%	32 KB	80%	100%
10%	64 KB	80%	100%

5 Miscellaneous

Compiling Iometer for Solaris 8

If the C++ compiler is not already installed it needs to be downloaded from Sun.
Also the Iometer source files need to be downloaded from Iometer.org.
So… go to:
www.sun.com → downloads → Operating Systems → Solaris Operating Environment/Solaris 8 Software Companion (freeware) → Solaris 8 2/02 Companion Software individual packages download → bottom: Solaris 8 Companion Software, SPARC Platform Edition → User Name + Password → Accept+Continue → download the following packages to e.g. the */export/home* directory:
gcmn 1.0 *(gcmn-1.0-pkg.zip)* and gcc 2.95.3 *(gcc-2.95.3-pkg.zip)*
In a terminal window type:

```
cd /export/home
unzip gcmn-1.0-pkg.zip                  #generates SFWgcmn
unzip gcc-2.95.3-pkg.zip                #generates SFWgcc
pkgadd -d SFWgcmn                       #will install gcmn in /opt/sfw
```

when asked press Enter to select all

```
pkgadd -d SFWgcc                        #will install gcc in /opt/sfw
```

when asked press Enter to select all

```
ln -s /opt/sfw/bin/g++ /bin/g++         #allows execution from any directory
```

now download from *www.iometer.com* the archived and compressed source files *iometer-2003.12.16.common-src.tar.gz* into /export/home.
while in */export/home* type:

```
gunzip iometer-2003.12.16.common-src.tar.gz
tar -xvf iometer-2003.12.16.common-src.tar
cd iometer-2003.12.16/src               #holds all Iometer source files
cp Makefile-Solaris.SPARC makefile
/usr/ccs/bin/make dynamo                #will build executable dynamo
```

check that *dynamo* has been created just now (correct time stamp, size= 186508 bytes)

```
cp dynamo /usr/bin
cp /opt/sfw/lib/libstdc++.so.2.10.0 /usr/lib
```

dynamo can now be executed from any directory; type:

```
dynamo <IP Addr of Iometer Server>
```

Using the compiled files on other Solaris 8 systems.

- *dynamo* goes into */usr/bin*

  ```
  cd /usr/bin
  ```

  check the attributes of *dynamo*, execution should possible; if not:

  ```
  chmod 555 dynamo                      #to allow execution
  ```

- *libstdc++.so.2.10.0* goes into */usr/lib*

Start up sequence

Before executing *dynamo* on an Iometer client start *Iometer.exe* on the Iometer Server.

Compatibility

Dynamo on a client and Iometer.exe on the Iometer Server *must* be the same revision.