Performance Management for Power Systems: Interactive Graphing Support for Linux

www.ibm.com/systems/power/support/perfmgmt/
All entitled graphs are accessible by the end user customer via secure IBM Internet ID and password.

End users are provided a ‘registration’ key when the server or partition first transmits data. Visit the PM Getting Started tour on the PM for Power Systems home page for more information. http://www.ibm.com/systems/power/support/perfmgmt

PM for Power Systems graphs in support of Linux® are at the partition level, not at the total system level (unless there is no partitioning on the system).
Management Summary Graphs

This data is available for no additional charge if the system is using IBM Electronic Service Agent or an IBM management console with the call home functions enabled.

The individual graphs are accessed interactively by the user and are then printable as Individual graphs. A pdf version is also available.

The user does have the ability to go 'backwards in time' to select the month of interest. (up to 24 mos.)

Management Summary Graphs

This graphic uses the colors to indicate the current status of the resource and the projected status for the next 12 months.

• Green bar – resource utilization is within good performance guidelines
• Yellow bar – resource utilization is marginal, you may be experiencing intermittent performance degradation due to the resource
• Red bar – resource utilization is critical, the resource utilization is beyond the guidelines for good performance and corrective action should be taken.

In this example we see that the average processor usage will be marginal within 3.5 months and critical within 4.5 months, while the peak processor usage will be marginal within 2.5 months and critical within 3.5 months.

Note that 'peak' processor usage is the average of the 2 busiest hours for a shift.

PM for Power Systems Management Summary Graphs are at the partition level, not at the total system level (unless there is no partitioning on the system).
The following reports are available for servers/LPARs that are entitled at the Full Function level of PM for Power Systems.

Contact IBM or and IBM Business Partner for terms and conditions in your country.

The Full Function detailed reports available from PM for Power Systems are packaged differently by country. Contact your local IBM Representative or an IBM Business Partner for more information.

Additional country contact information is available on the ‘contacts’ page at the main PM for Power Systems home page
http://www.ibm.com/systems/power/support/perfmgmt

For more information on all graphs, visit the PM for Power Systems Graph Reference Document on the PM home page at
http://www.ibm.com/systems/power/support/perfmgmt

PM or Power Systems graphs are at the partition level by default. Total system views and processor pool views are not available at this time. The exception to this would be if there was no partitioning on the Linux system, then the reports would represent a total system view.
Interactive Graphing

- Detailed reports are available on most graph types with the full function option of PM for Power Systems (and on the Management Summary graph which is entitled with the no additional charge offering).

- You are able to view monthly, daily, and hourly level reports.

- At the hourly level, you can customize a graph view down to a single day.

- The following graphs are examples of the reports that are available. You will notice that in many cases the performance guidelines are depicted on the graph.
**Guidelines for Total Processor Utilization**

<table>
<thead>
<tr>
<th>Number of processors</th>
<th>Average marginal</th>
<th>Average critical</th>
<th>Peak marginal</th>
<th>Peak critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80%</td>
<td>90%</td>
<td>85%</td>
<td>94%</td>
</tr>
<tr>
<td>2</td>
<td>85%</td>
<td>93%</td>
<td>88%</td>
<td>96%</td>
</tr>
<tr>
<td>3</td>
<td>87%</td>
<td>94%</td>
<td>90%</td>
<td>97%</td>
</tr>
<tr>
<td>4</td>
<td>89%</td>
<td>95%</td>
<td>92%</td>
<td>98%</td>
</tr>
<tr>
<td>&gt;4</td>
<td>93%</td>
<td>97%</td>
<td>95%</td>
<td>99%</td>
</tr>
</tbody>
</table>

These thresholds determine whether a resource is within guideline, marginal or critical in the following processor utilization reports.

These are the processor utilization guidelines. They are based on the number of processors that are configured for the server/LPAR.

These are the thresholds that trigger whether a constraint is normal, marginal or critical.
**Processor Utilization by the Hour graph (partition level)**

The Processor Utilization by Hour graph shows the hourly processor utilization average during the last 30-day period, based on the system's current configuration. This allows you to see how the workload changes during a day.

The time indication, 08 for example, represents the time range 08:00 through 08:59.

The crosshatch area (green) indicates system jobs (e.g. OS)

The forward slash (red) area indicates user (non-system) jobs.

The blue line shows the busiest hour of total peak CPU utilization for that hour during the last 30 day period. It is likely that your system experienced a degradation of throughput on some day during the period, if this percentage is high during a long period.
Processor Utilization by the Day (partition level)

Average Processor Utilization in %, per Day graph

This graph shows the average processor usage for up to 93 days by shift. It shows:

The left hand y axis shows processor seconds that correspond to the respective number of cores (right hand y axis).

Customers can interpret utilization percentage by visualizing the height of the green and red area compared to total processor seconds available.

• System CPU (forward slash, green)
• User CPU (backward slash, red)

The black line indicates the peak average utilization. (i.e. average for two busiest hours)

The graph will display the percent of processor usage based on the system’s (or logical partitions) current configuration.

This view can be customized to fewer than 90 days by clicking on the ‘Customize Graph’ link. Additionally, if the data are available, an extended backward view of the graph is available for up to 24 months. This customization capability is true of many of the graphs in the PM for Power Systems interactive graphing function.
Peak Processor Utilization Total, with Trend Projection graph

The Peak Processor Utilization graph shows the average total peak CPU utilization per month for the last 13 months, and it also provides you with a growth trend. It also shows you how the workload changes during a year.

The symbols used on this graph are explained as follows:
The height of the columns represents the CPU resource available in seconds during the month.
The forward slash (green) in the bottom of the graph shows the CPU utilization that is acceptable.
The crosshatch (yellow) in the middle of the graph shows the CPU utilization that is marginal.
The backward slash (red) at the top of the graph shows the CPU utilization that is critical.
The black diamond shows the average of the two busiest hours per shift in seconds during the month.

The trend months project the processor utilization for the next three months. On the trend months, which are the three months represented on the right side of the graph, the backward slash (green) in the bottom shows the peak CPU utilization that is acceptable.

On the trend months:
The pink diamond shows the calculated peak CPU utilization and projected growth based on the last three months utilization.
The blue square shows the calculated peak CPU utilization and projected growth based on the last six months utilization.
The yellow star shows the calculated peak CPU utilization and projected growth based on the last 12 months of utilization.

The advantage of processor seconds is that processor seconds is a normalized unit of work independent of the resources allocated to the server/LPAR. This means that the black diamonds on the graph represent the workload trend independent of the resources allocated to the server/LPAR.

Not shown:
Under the Facts, the number of months until the guideline is reached is a projection, based on current utilization and growth data, of the number of month’s growth remaining until the respective resource reaches guideline. If greater than or equal to 12 months, it is shown as 12 months.
Percent of Time RunQ over the Limit Per Day

This graphic shows the percentage of time that the RunQ is greater than the Limit.

The RunQ over the Limit metric represents the percentage of time the number of jobs in the run queue is greater than 5 times the number of processors in the partition. The minimum value for the number of processors is 1. Partial processors assigned to the partition are treated as 1 processor.

The recommended threshold for Run Q over the Limit is 20%. If the RUNQ over the Limit percentage is consistently above this 20% guideline, then corrective action should be taken.

Corrective actions could include increasing the processor resource and memory resource allocated to a partition.
Percent of Time RunQ Over the Limit, Per Hour

This is the hourly profile for the RunQ Over the Limit metric, for the interval specified.

The RunQ over the Limit metric represents the percentage of time the number of jobs in the run queue is greater than 5 times the number of processors in the partition. The minimum value for the number of processors is 1. Partial processors assigned to the partition are treated as 1.

The recommended threshold for Run Q over the Limit is 20%. If the RUNQ over the Limit percentage is consistently above this 20% guideline, then corrective action should be taken.

The black line represents the highest RunQ > Limit percentage for the hour during the period specified.
Memory Usage in %, Per Day (partition level)

Average Memory Usage in %, Per Day

Average Memory Utilization in %, Per Day graph

Represents memory utilization for the last 90 days as reported by topas for the memory assigned to the partition.

The green shaded portion shows actual use.

The buffered and cached shaded areas represent potential opportunity to free up memory.
Memory Utilization, Per Hour  (partition level)

Average Memory Utilization per Hour

Starting Time of Each Hour is Indicated

- Memory Used
- Peak
- In Buffer
- In Cache

Average Memory Utilization in %, Per Hour graph

Represents memory utilization as reported by topas for the memory assigned to the partition. Average utilization is shown by hour for the last 30 days.

The green shaded portion shows actual use.

The buffered and cached shaded areas represent potential opportunity to free up memory.
**Peak Disk Arm Utilization in % - Per Day** (partition level)

This graph displays the average of the **two** peak hours for disk arm utilization, for each day during the last three months, or the period you choose. The information under the Facts heading at the bottom of the graph states the recommended guidelines for marginal and critical peak utilization and the months calculated to reach this guideline with your percent usage.

**Note for systems with SAN-based storage:** Each server/LPAR’s graph for disk arms will reflect utilization of the portion of the SAN which is accessed by that server/LPAR. In rare cases, multiple servers using storage on the same SAN unit may result in a slight increase in displayed disk arm utilization.

<table>
<thead>
<tr>
<th>Facts</th>
<th>Peak Margin</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended guideline in %</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Number of months until the guideline is reached</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>
Disk Arm Utilization by Hour

The Disk Arm by Hour graph shows the average disk arm utilization by hour for the last month, or the month you select. The Peak Max line denotes the disk arm activity for the single highest hour during the period.

The information under the Facts heading at the bottom of the graph states the recommended guidelines for marginal and critical peak utilization.

**Note for systems with SAN-based storage:** Each server/LPAR’s graph for disk arms will reflect utilization of the portion of the SAN which is accessed by that server/LPAR. In rare cases, multiple servers using storage on the same SAN unit may result in a slight increase in displayed disk arm utilization.
Peak Disk Arm Utilization in % (3 Month Trend)

This graph shows the average peak disk arm utilization for up to 13 months, and a three-month trend projection for the two busiest hours per measured day during the period. The trend projects the disk arm utilization for the next three months. The trend months are the three last months shown.

Because each displayed value is an average, the actual values during each month can be higher or lower than what is indicated on the graph.

**Note for systems with SAN-based storage:** Each server/LPAR’s graph for disk arms will reflect utilization of the portion of the SAN which is accessed by that server/LPAR. In rare cases, multiple servers using storage on the same SAN unit may result in a slight increase in displayed disk arm utilization.
Disk Space Usage in % - Per Day  (partition level)

Disk Space Usage in %, per Day

The Disk Space Usage in % per Day graph shows the disk space utilization for the last three months or the period you choose.

This graph measures against the total disk assigned to the partition.

It shows:
• Total Disk usage (blue)
• File System usage (red) – Note that this metric can exceed 100%

Guidelines for disk space usage are 75% for Marginal, and 85% for Critical.
Disk Space Usage in MB – with Trend Projections

This graph shows the monthly disk space utilization for the specified range, up to twelve months. It will also display the projected usage for the following three months based on usage trends over the last 3, 6, and 12 months.

Guidelines for disk space usage are 75% for Marginal, and 85% for Critical.
File System Usage in MB – with Trend Projections

This graph shows the monthly file system utilization for the specified range, up to twelve months. It will also display the projected usage for the following three months based on usage trends over the last 3, 6, and 12 months.

Guidelines for file system usage are 75% for Marginal, and 85% for Critical.
Top 10 File Systems with Most Growth  (partition level)

This graph provides the history of the detail file systems with the most growth. These file systems are a subset of the total combined file system graph.

This is a graph of the file systems in the respective partition. The colors denote the respective file system for the respective month.

Limited to the top ten file systems per partition.
**Disk I/O Per Second for User Jobs (partition level)**

This graph displays the average of I/O rates per second during each hour for the specified period. This will allow you to evaluate if your workload is I/O intensive or processor intensive by comparing this graph to the Processor Per I/O graph.
Processor Seconds per I/O for User Jobs

This graph displays the processor usage per I/O during each hour for the specified period.
### System Resources Summary

This report displays the average, average peak, and maximum values for Total processor utilization, Disk usage, File System usage, and Memory utilization for the specified period. The number of months until each metric is projected to reach the respective guideline is also displayed.

<table>
<thead>
<tr>
<th>System Resources Summary</th>
<th>Utilization in %</th>
<th>Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg %</td>
<td>27.97</td>
<td>12</td>
</tr>
<tr>
<td>Peak</td>
<td>31.08</td>
<td>12</td>
</tr>
<tr>
<td>Max</td>
<td>43.49</td>
<td></td>
</tr>
<tr>
<td>Disk Space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg %</td>
<td>69.56</td>
<td>4</td>
</tr>
<tr>
<td>Max</td>
<td>69.81</td>
<td></td>
</tr>
<tr>
<td>File System Usage in MB - with Trend Projections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg %</td>
<td>65.42</td>
<td>12</td>
</tr>
<tr>
<td>Max</td>
<td>65.42</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg %</td>
<td>96.44</td>
<td>0</td>
</tr>
<tr>
<td>Peak</td>
<td>97.11</td>
<td>0</td>
</tr>
<tr>
<td>Max</td>
<td>99.95</td>
<td>0</td>
</tr>
</tbody>
</table>

---

**System Resources Summary**

This report displays the average, average peak, and maximum values for Total processor utilization, Disk usage, File System usage, and Memory utilization for the specified period. The number of months until each metric is projected to reach the respective guideline is also displayed.
For More Information

- See the Graph Reference Document at:
  http://www.ibm.com/systems/power/support/perfmgmt