HP-UX 11i v3 Knowledge-on-Demand

HP technical Webcast series: deployment optimization

Technology for better business outcomes
HP-UX 11i v3 Knowledge-on-Demand

- **Objective:** Support developers, deployment personnel and customers in achieving better business outcomes with HP-UX 11i

- **What HP is providing:** A series of technical on-demand training Webcasts
  - Focused on helping people who deploy HP-UX Integrity solutions increase performance through optimizing their installations for HP-UX 11i v3 on HP Integrity servers
  - Available at [www.hp.com/go/kod](http://www.hp.com/go/kod)
HP-UX 11i v3 Knowledge-on-Demand Webcasts – planned topics

- HP-UX 11i v3 operating system optimization
  - Dynamic nPartitions
  - HP-UX 11i v3 tunables
  - I/O optimization
  - System Management Homepage
  - Software Assistant
  - GlancePlus
  - Performance trouble-shooting on v3
- Optimizing high availability configurations
  - Serviceguard configuration and manageability
  - Configuring Serviceguard with Oracle RAC
  - Serviceguard delta training
- Optimizing virtualized configurations
  - Capacity advisor
  - Workload monitoring and management
  - System sizing with HP VM

Additional Webcasts to be published going forward!

Topics subject to change without notice.
Related HP-UX 11i v3 resources

- All deployment resources
  - HP-UX 11i developers content
    www.hp.com/go/hpuxdev
  - HP-UX 11i v3 news, functionality, product download, and services resources
    www.hp.com/go/hpux11i
  - HP Integrity server product information
    www.hp.com/go/integrity
We hope you enjoy this Knowledge-on-Demand topic!

Thank you for taking time to learn about HP-UX 11i v3 and related technologies.

Please provide feedback on today’s topic and/or future topics by using our online HP-UX 11i Knowledge-on-Demand Feedback form: www.hp.com/go/kodfeedback
Introducing today’s speaker

Doug Grumann is an expert on system performance analysis and the HP system performance tools. He worked on the original team that developed Glance on the HP-UX and other unix platforms over 15 years ago, and he has worked in this product domain since then, participating in various aspects of development, support, and marketing.
Contents

• Glance introduction
• Overview of system performance analysis
• Tour of character mode and motif mode user interfaces
• Customization
• Bottleneck analysis example
• Performance Tips
• Data flow and references
Glance at a glance

• Glance answers better than any other tool: “what's going on right now on my system?“ It is the best-in-industry server performance diagnostic!

• Glance supports a drill-down approach to troubleshooting from bottleneck analysis to detailed visualization of over two thousand performance metrics

• Choose from two user interfaces: character mode glance, or the Motif mode (xglance / gpm) GUI
Where does it come from?

• Glance was one of the very first software products ever produced by HP. Since the 1990, Glance has been available on every release of HP-UX. Multivendor unix versions are also available.

• Glance is included with the HP-UX Application Release media: trial bundles are available from that media even if you do not have the product license.

• Glance is included with HP-UX Enterprise and Mission Critical Operating Environment bundles.

• Glance is also available as separate product from HP Software.

• The Glance Pak product bundle includes Glance along with the HP Software Performance Agent (MeasureWare).
Performance tool spectrum

- less specific
  - remote monitoring tools
  - local agents
  - service response probes
- Glance
  - profilers
  - application-specific instrumentation
  - debuggers
- more specific
  - hardware-specific instrumentation

focused on
- multi-system
- system
- application
- program code

HP-UX 11i v3 Training
The art of system performance

“why is our server slow???”

“is the I/O load balanced across disks?”

“what apps are running?”

“should I buy more memory?”

“what’s this program doing?”

“which resources are bottlenecked?”

server systems of all types

heterogeneous OSes and applications
System performance
- no answers without data!

- what is the resource bottlenecked?
- which app is using most CPU?
- why is this process so active?
- what files is the process reading?

- global CPU utilization
- per-process user mode CPU
- service time
- processor queues
- syscall rate
- by-disk I/O rate
- thread list
- application active procs
- virtual memory size
Tips for effective system performance

A resource that is fully utilized and has a queue of processes waiting for it is bottlenecked. High utilization by itself is not necessarily a problem.

DO:
• Figure out what’s “normal” on your systems
• Be willing to do the work to know what you’re doing
• Change one thing at a time
• Keep in mind: It Depends

DO NOT:
• Ignore systems that are currently running well
• Forget to keep historical performance data
• Fix things that ain’t broke
• Assume one solution fits all
Glance tour
Getting started

- Login to your unix server and check to see if /opt/perf/bin/glance is there.
- Version info available via:
  /opt/perf/bin/perfstat –v (consider updating to the latest release - 4.6)
- Glance has a man-page, online help, Release Notes under /opt/perf/ReleaseNotes/, and metrics list under /opt/perf/paperdocs/
- Product info on the Web:
Initial glance screen

Top part of glance screen shows "global" data reflecting overall system status.

Bottom part of glance screen shows most active individual processes.

<table>
<thead>
<tr>
<th>Process Name</th>
<th>PID</th>
<th>User</th>
<th>CPU %</th>
<th>Thrd</th>
<th>Disk</th>
<th>Mem</th>
<th>Users= 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>annetest</td>
<td>19662</td>
<td>ptcguest</td>
<td>24.0</td>
<td>1</td>
<td>0.0</td>
<td>476kb</td>
<td>SLEEP</td>
</tr>
<tr>
<td>poole</td>
<td>6212</td>
<td>root</td>
<td>11.4</td>
<td>1</td>
<td>0.0</td>
<td>208kb</td>
<td>SLEEP</td>
</tr>
<tr>
<td>rdr</td>
<td>633</td>
<td>root</td>
<td>10.8</td>
<td>1</td>
<td>0.0</td>
<td>552kb</td>
<td>PRI</td>
</tr>
<tr>
<td>cb</td>
<td>29176</td>
<td>root</td>
<td>6.3</td>
<td>1</td>
<td>0.0</td>
<td>208kb</td>
<td>SLEEP</td>
</tr>
<tr>
<td>moto</td>
<td>24055</td>
<td>ptcguest</td>
<td>3.1</td>
<td>1</td>
<td>0.0</td>
<td>212kb</td>
<td>SLEEP</td>
</tr>
<tr>
<td>vxfsd</td>
<td>86</td>
<td>root</td>
<td>1.5</td>
<td>36</td>
<td>2.9</td>
<td>1.5mb</td>
<td>SLEEP</td>
</tr>
<tr>
<td>java</td>
<td>5542</td>
<td>root</td>
<td>0.9</td>
<td>108</td>
<td>1.7</td>
<td>321.3mb</td>
<td>SLEEP</td>
</tr>
<tr>
<td>bigdog</td>
<td>25563</td>
<td>ptcguest</td>
<td>0.4</td>
<td>1</td>
<td>0.0</td>
<td>970.8mb</td>
<td>SLEEP</td>
</tr>
<tr>
<td>gerryrig</td>
<td>25905</td>
<td>ptcguest</td>
<td>0.2</td>
<td>1</td>
<td>44.2</td>
<td>488kb</td>
<td>SLEEP</td>
</tr>
</tbody>
</table>
Initial glance screen

- Product version
- Interval timestamp
- System info

Bars change size corresponding to current interval utilizations

Cumulative average and high-water marks for utils kept from the point glance was started

Each process identified in a line with CPU, disk, memory and wait-state information

HP-UX 11i v3 Training
Glance help screen

Enter command or function key:


HP-UX 11i v3 Training
Glance online help

Glance online help

from any report, use the ‘h’ key to bring up an online help menu that you can scroll through with arrow keys and select levels by hitting enter — lets you access detailed explanations of all screens and all metrics!

CPU Util Bar

* GBL_CPU_SYS_MODE_UTIL

Percentage of time the CPU was in system mode during the interval.

A process operates in either system mode (also called kernel mode on Unix or privileged mode on Windows) or user mode. When a process requests services from the operating system with a system call, it switches into the machine’s privileged protection mode and runs in system mode.

This metric is a subset of the GBL_CPU_TOTAL_UTIL percentage.

Enter command or function key:

Page 1

F7 or ’e’ for prev menu

Page 1 of 2

One moment please...

Page Forward Page Back hpterm Print Toggle Exit Menu Exit Help

HP-UX 11i v3 Training
Reports on all system resources

example: memory report screen showing paging activity as well as summary data about overall memory utilization on the bottom
Drill down on per-process details

Metrics specific to each process include CPU, I/O, and memory activity: additional drilldowns are available to focus in even more!
xglance / gpm interface

- When you have a X/Motif environment available, Glance’s graphical user interface is useful.
- The xglance interface shows you the same basic reports as in character mode but with more options and more detail.
xglance main window

System resource graphs show CPU, memory paging, disk I/O and networking activity over time.

The Glance “adviser” functionality runs continuously, detecting bottleneck conditions and alerting you to the area of concern by changing colors.
Reports available

you can adjust fonts, measurement intervals, graph duration, limits and other display options from the main window you can drill down into any system resources or bottleneck focus areas including applications, processes, and thread detail in various reports...
select what reports you want to drill down into based on your interest: you want to get a feel for what's "normal" on your system and, when the system is behaving badly, you want to be able to quickly navigate to the resources or processes that are of concern.

Symptom history shows bottleneck information from the glance adviser.

Drill down into any area (for example here, CPU queue length and CPU breakdown per-processor). 

System table report showing key configuration parameters, their usage and high-water marks.

System calls report lists the kernel requests processes are making – you can change the sort field to focus on the highest syscall rate or total CPU time spent in that call...
More!

- All windows give access to an extensive online help subsystem, and on-item help for any metric or screen. Be sure to explore configuration options for choosing and filtering metrics. Note that your customizations are saved in a "$HOME/.gpm-sys" file and restored next time you run xglance.

- Configure and list applications (logical groups of processes) to track combined resource usage.

- More! Process list shows "interesting" processes, highlights resources of concern, and you can select processes by clicking on them to drill into additional detail screens.

- See what resources your important processes are waiting for.

- Memory region detail list for any selected process: data (heap) growing may be a symptom of an application memory leak.
Customizing Glance
xglance main graph limits

Graph limits rise to track high water level seen by glance - and may become too high over time.
from any row/column display, can change what metrics are used to sort the rows, can re-arrange columns, apply filters and choose alternate metrics – over 500 available at the individual process level!

A “?” on-item help button will bring up help when cursor is clicked on a metric or window.

HP-UX 11i v3 Training
Application grouping in the parm file

You can use the /var/opt/perf/parm file to bucket groups of related processes into applications you define and then monitor performance of the application as a whole. To test revised parm file application definitions, save your modified parm file to $HOME/.parm and look at how processes are bucketed via the application list in Glance.

To verify, you can then select an application to see what processes are included in each.
Adviser customizations

character-mode glance reads its adviser rules for bottleneck definitions from the adviser.syntax file, xglance or gpm keeps its adviser syntax in a binary format and you need to edit that inside the tool itself

- in either case, you can change the adviser rules to suit your unique needs

```
/var/opt/perf/adviser.syntax

# The following symptoms are used by the default Alarm Window
# Bottleneck alarms. They are re-evaluated every interval and
# the probabilities are summed. These summed probabilities are
# checked by the bottleneck alarms. The buttons on the gpm
# main window will turn yellow when a probability exceeds 50%
# For an interval, and red when a probability exceeds 90% for
# an interval. You may edit these rules to suit your environment:

symptom CPU_Bottleneck type=CPU
  rule GBL_CPU_TOTAL_UTIL  >  75  prob 25
  rule GBL_CPU_TOTAL_UTIL  >  85  prob 25
  rule GBL_CPU_TOTAL_UTIL  >  90  prob 25
  rule GBL_PRI_QUEUE       >  3   prob 25

symptom Disk_Bottleneck type=DISK
  rule GBL_DISK_UTIL_PEAK  >  50  prob GBL_DISK_UTIL_PEAK
  rule GBL_DISK_SUBSYSTEM_QUEUE > 3   prob 25

symptom Memory_Bottleneck type=MEMORY
  rule GBL_MEM_QUEUE       >  2   prob 20
  rule GBL_MEM_PAGEOUT_RATE >  5   prob 20
  rule GBL_MEM_PAGEOUT_RATE >  50  prob 20
  rule GBL_DISK_VM_WRITE_RATE > 5   prob 20

"/var/opt/perf/adviser.syntax" [Read only] 203 lines, 7281 characters
```
“Programming” the adviser

The character-mode glance has runtime options to just run the adviser against the syntax file you created, updating at an interval of your choice. “Batch processing” for custom performance monitoring!
Bottleneck Analysis
Example and Tips
Performance scenario

You manage a HP Virtual Machine server running four guest OSes. You have Glance and the Performance Agent (PA) installed on the server and the guests as well.

```
20:05  ALARM [5] START WARNING: HPVM CPU Bottleneck probability= 75%
20:10  ALARM [9] START CRITICAL: cld application response time >5s
```

Performance alarms may be generated by PA or Smart PlugIns into Operations Manager, or they may arise via remote service probes. User complaints about application performance may come in via your IT service desk saying response has gone bad as well. Regardless of the origin of an alarm, the process of analyzing the root cause starts with an examination of key performance metrics. In this example, the application resides on your HPVM guests so your first step is to see what may be unusual about their behavior.
PM is a good place to start analysis. You can use prepackaged templates or create your own. To see what "normal" looks like on your system, draw a week's worth of historical data from the Performance Agent. PM lets you zoom in to more detail for the most recent timeframe – the spike in CPU utilization for the 'hpux1131' guest is clear. PM can zoom graphically or in table form.
Glance running on the HPVM server shows the same metrics being reported from PA into PM. Glance provides the realtime detail. The CPU issue is still happening. Glance has many reports concerning all aspects of system performance – starting with version 4.6 it has a HPVM-specific list of logical system (guest) activity.

Glance’s list of guests confirms the ‘hpux1131’ guest is still consuming a lot of CPU... 2.98 processor’s worth of allocation for a guest with maximum of 3 processors configured.
Glance on the guest

The process list highlights the top CPU consumers... in this case being run by the “daveg” user. You can either go talk to Dave, or drill down on his processes to find out more.
Dave’s tld process seems to be looping in user mode (no I/O, very few system calls).

Dave’s rdz process is doing system calls, but no disk I/O.

System call details on a specific process can give insight into the internal program behavior - in this case, Dave’s program is doing nothing but making over 200,000 read calls every second. Probably a mistake!
Tips for CPU bottlenecks

- When CPU is running higher than normal, and there is a queue (run queue or processes blocked on Priority), look for activity different from normal.
- Look at what applications and processes are doing (user / system mode CPU), and what they are waiting for (stop reasons).
- If you eliminate CPU hogs and runaways, look to adding horsepower to the system, or load balancing (psets, partitioning, PRM, WLM).
- Memory and I/O bottlenecks can masquerade as System CPU bottlenecks.
Tips for Memory bottlenecks

• High memory utilization along with pageout activity are signs of a memory bottleneck.

• Sort the glance process list by Virtual Set Size to catch “hogs”: watch for growth of DATA memory regions (heap growth).

• Prior to HP-UX 11.31, do not let Buffer Cache use too much memory. On HP-UX 11.31, monitor the File Cache (it is included in User Memory). Neither of these should ever be allowed to cause paging.

• More memory is often a wise investment for performance!
Tips for I/O bottlenecks

- In the Disk List, look for the busiest disks (over 50% busy utilization). In xglance, choose metrics to add the newer Service Time metrics. Consider changing configuration to offload “hot” devices.

- New for HP-UX 11.31 Glance: Investigate I/O by “HBA” (I/O Channel).

- Sort processes in Glance by Physical I/O rate to see top consumers. Drill down into their Open Files and see what System Calls are most active. Consider application tuning methods.
Transition Slide

Dataflow and References

Performance Manager
- on-demand performance graphs & tables for usage trend analysis and correlation
- connects to agent for near real-time data

GlancePlus
- real-time, single-system performance monitoring
- customizable rules-based adviser for bottleneck analysis

Performance Agent
- data collection, storage & alarm generation
- performance, resource, and end-to-end transaction response time measurements
- measures any source on the system

Operations Agent
- Event/Action component

Reporter / Performance Insight
- scheduled summarized performance reports for management analysis
- stores gathered data in DB

Central Management System

Managed Node

Smart Plug-In
- Application metrics
Glance and PA dataflow

- Performance Manager
- Reporter or Performance Insight
- Operations Manager
- Node Manager
- Datacomm
- Data Collection and Management (scopeux)
- Data Source Integration
- Alarming
- Local export (extract)
- Arm
- Measurement Interface (midaemon)
- Glance (charmode)
- xglance (Motif mode)

- OS performance instrumentation
- Instrumented applications

HP-UX 11i v3 Training
Common measurement technology

- Both Glance and Performance Agent share common measurement software component ("nums" and midaemon)
  - shared metric set
  - cross-platform consistency
  - common bottleneck definitions
  - common parm file for application definitions
  - similar alarm syntax and default alarms
- On HP-UX we have unique performance measurement technology superior to all other system vendors in depth and efficiency
Glance and PA strengths

- Installed base larger than any performance tool competitor (over 1 million licenses sold, and >80% penetration rate on HP-UX servers).
- Available on major server platforms including HP-UX, Linux, Windows (PA-only), Solaris, AIX.
- Superior metrics both in depth (detail), usability (relevance), reliability (accuracy), and meaning (definitions).
- “Software Durability”; providing customer value for nearly two decades with >60 update releases on 6 platforms.
- Integration with HP management software ecosystem.
External web references

- Performance Manager and Agent: http://managementsoftware.hp.com/products/ovperf/
- Consolidated event and Performance Management: http://managementsoftware.hp.com/solutions/ev_prf/
- Product docs: http://ovweb.external.hp.com/lp/doc_serv