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Keeping you informed of the latest ISS technology

Quick tips for differences in energy efficiency between online "double-conversion" technology and online "on-demand" technology

This quick tip first defines online "on-demand" technology and online "double-conversion" technology. It then contrasts the energy efficiency performance delivered by these two technologies, each of which uses a different method to ensure a reliable power source for continuous data center operations.

Online "double-conversion" technology

Online double-conversion is currently the technology that most data centers use for their uninterruptible power supply (UPS) systems. In this type of UPS, the inverter is always on; it continuously converts AC to DC and then DC to AC. This generates a pristine, or very low-distortion, sinusoidal waveform; however, efficiency is significantly lower than with online on-demand.

Online "on-demand" technology…plus double conversion

Online on-demand is an energy efficient technology that allows incoming power to connect directly to the load through protected circuits when the incoming power is within specifications. When the power is not within specifications, the double-conversion technology takes over to regulate the incoming voltage to an acceptable level for the load. Both online on-demand and double-conversion modes protect the critical load from voltage fluctuations and from damaging transients that can originate at the utility. And in the event the power goes out completely, the energy from the battery is converted to provide power to the load until the utility returns service or until a graceful equipment shutdown becomes necessary.

Differences in energy efficiency

From an energy efficiency standpoint, the differences between the two technologies are as follows:

- State-of-the-art, double-conversion UPS models provide 92% to 93% efficiency, while older models range from 88% to 90%.
- Online "on-demand" technology, such as the HP R12000/3, provides a higher efficiency at 97%.

Conclusion

Installing a UPS with an Eco Mode (provided with HP R12000/3) is a good way to save energy in data center applications.

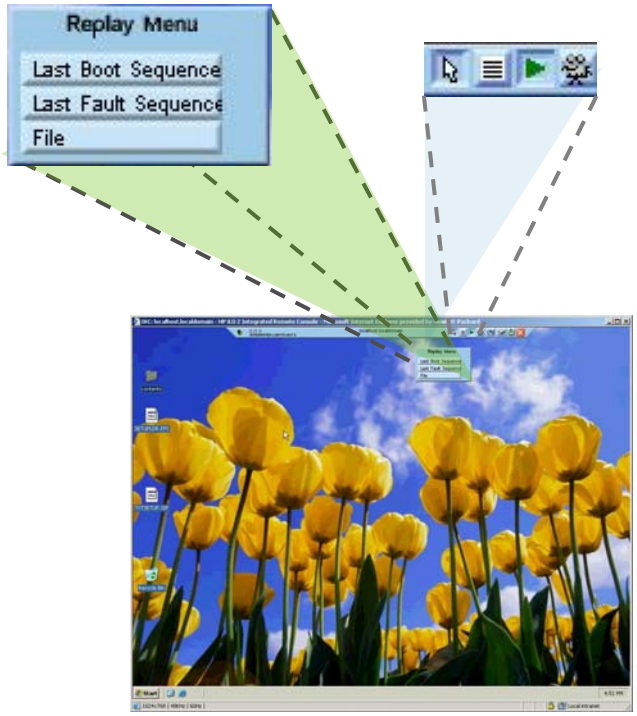
Use iLO Advanced to capture server event video

HP Integrated Lights-Out (iLO 2) is a remote management processor that is integrated into HP ProLiant and BladeSystem servers. Basically, iLO enables full control of data center servers 24 hours a day from anywhere there is access to the network. Although this capability is not new, the fact that HP iLO Advanced Pack automatically captures video footage of the server's boot-up and failure occurrences, and offers "on-demand" video capture capabilities, is indeed something above and beyond basic remote management.

iLO video

iLO video is a significant advance in remote monitoring technology that allows video capture of data center events such as server boot or fault sequences. A replay menu and control buttons built into iLO 2 firmware provide easy selection of the type of video footage to be recorded, where to save video for later viewing, and quick playback (see Figure 1-1).

Figure 1-1. Screen capture showing iLO Advanced Replay Menu and playback buttons



Automatic or on-demand recording

The video feature of iLO Advanced allows powerful remote troubleshooting capabilities with automatic video recording and playback:

- Record and play back the last boot sequence
- Record and play back the last fault sequence

It is also possible to record an event on-demand:

- Bugs can be recorded
- Trainings can be recorded

Flexible storage options

The iLO Advanced videos recorded automatically are stored on the iLO hardware (built into ProLiant servers) or to a Web server, if needed. On-demand videos can be stored anywhere the user chooses, which could be a dedicated storage area or on a local hard drive.

An HP exclusive

iLO Advanced video technology is available exclusively from HP. A new viewer (iLO Video Player) is currently in development and scheduled for release in December 2008; customers will be able to download it from http://www.hp.com/go/iLO.

Summary

In summary, HP iLO Advanced offers innovative technology that enables convenient remote viewing of video from data center events. It also allows users to record scenarios on demand for troubleshooting, training, and quality assurance purposes.

Additional resources

For additional information on the topics discussed in this article, visit the following links:

Resource	URL
Overview	www.hp.com/go/iLO
Quick Specs	http://h18013.www1.hp.com/products/quickspecs/12362_div/12362_div.html
User Guide	http://bizsupport.austin.hp.com/bc/docs/support/SupportManual/c00553302/c00553302.pdf

HP Industry Standard Servers - a leader in industry standards for storage

HP is involved in numerous industry standards bodies relating to server storage. Industry standards increase interoperability between past, current, and future products.

Serial Attached SCSI (SAS)

HP (Compaq) initiated the development of SAS in 2001, inviting LSI Logic, Seagate, and Maxtor to join together to define a replacement for parallel SCSI that supports both enterprise-class SAS drives and desktop-class SATA drives. HP has been heavily involved in the INCITS T10 (SCSI) standards committee, and has served as the editor for the SAS-1, SAS-1.1, and SAS-2 standards. HP is also a Sponsor member of the SCSI Trade Association, which has marketed SAS since its inception. T10 is currently finishing the definition of 6 gigabit per second (Gbps) SAS and zoning, and is starting work on active/optical cable support, power management features, and 12 Gbps. Visit http://www.t10.org/index.html for more information.

Serial ATA (SATA)

HP sits on the Serial ATA International Organization Board of Directors, defining the industry's leading disk drive interface. HP founded and chaired the Interoperability Committee, which defines test cases and runs plugfests to ensure that Serial ATA products work correctly together. SATA-IO is finishing the definition of 6 Gbps. HP also participates in the INCITS T13 (ATA) standards committee, which defines the command set for SATA disk drives. T13 has been adding security features and improving solid-state disk (SSD) support. Visit www.serialata.org for more information.

Fibre Channel (FC)

HP is a Principal member of the Fibre Channel Industry Association, defining the roadmap for Fibre Channel and guiding the introduction of Fibre Channel over Ethernet (FCoE). HP participates in the INCITS T11 (Fibre Channel) standards committee, which is starting work on 16GFC and defining FCoE. Visit http://www.fibrechannel.org for more information.

iSCSI

HP participated in the Internet Engineering Task Force (IETF) IP Storage Working Group, co-editing the iSCSI standard and authoring several supplementary specifications. The IP Storage Working Group is currently dormant, having completed all its work. HP is also involved in the definition and promotion of IPv6, leading the IPv6 Forum's CTO Executive Committee.

Universal Serial Bus (USB)

HP is on the USB Implementers Forum Board of Directors and is a USB 3.0 Promoter. USB 3.0 (SuperSpeed USB) will provide a 10x performance increase over USB 2.0 (5 gigabits/sec versus 480 megabytes/sec). USB-IF and INCITS T10 are collaborating on a new storage protocol to improve the performance of USB-attached storage devices. Visit http://www.usb.org for more information.

Small Computer System Interface (SCSI)

HP is heavily involved in the INCITS T10 (SCSI) committee for development of SCSI command set standards, defining the features implemented by disk drives, disk drive enclosures, tape drives, tape libraries, and optical drives. These command set definitions apply across all the SCSI protocols (SAS, FC, iSCSI, and USB). Recently, T10 has been adding security features to many of its standards, such as encrypting LTO4 tape drives. Visit http://www.t10.org/index.html for more information.

SFF Committee

HP participates in the SFF Committee, which defines connectors, form factors, and physical layer test procedures used by SAS, SATA, Ethernet, and other storage interfaces. Visit http://www.sffcommittee.org/ie/index.html for more information.

Institute of Electrical and Electronics Engineers (IEEE)

HP participates in several IEEE 802.1 and 802.3 Ethernet (the underlying transport for iSCSI and FCoE) working groups. Work is underway defining 40 Gbps and 100 Gbps Ethernet, Data Center Ethernet (lossless features critical for FCoE), and Energy Efficient Ethernet (power down idle links). Visit http://standards.ieee.org/getieee802/ for more information.

HP also participates in the IEEE 1619 Security in Storage working group defining data-at-rest encryption standards for disks and tapes. The group is currently focused on standard key management protocols.

Storage Networking Industry Association (SNIA)

HP is a founding member of SNIA, which defined the Storage Management Interface (SMI-S) between storage management software and storage devices. SNIA runs the leading industry storage trade show, Storage Networking World (SNW). SNIA's Green Storage Initiative is exploring energy efficiency for storage systems. HP and SNIA also work with the Distributed Management Task Force (DMTF) to ensure server and storage management consistency. Visit http://www.snia.org for more information.

JEDEC Solid State Technology Association

HP is part of the JEDEC, working to define high-speed DRAM interfaces like DDR2 and DDR3 (used in RAID controllers) and NAND flash chip interfaces (used in solid state disk drives). Visit http://www.jedec.org/ for more information.

Trusted Computing Group (TCG)

An HP representative recently served as president of the TCG, which defines the Trusted Platform Module (TPM) chip that can be used as the root-of-trust for security software such as Microsoft BitLocker Full Drive Encryption. HP chairs several working groups including the Server WG. Visit https://www.trustedcomputinggroup.org/groups/tpm/ for more information.

International Committee for Information Technology Standards (INCITS)

HP chairs INCITS, the parent committee for T10, T11, T13, and numerous other standards committees. INCITS also represents the United States in the ISO/IEC international standards committees. Visit http://www.incits.org/ for more information.

Additional resources

For additional information on the topics discussed in this article, visit:

Resource	URL
Energy Efficient Ethernet	http://grouper.ieee.org/groups/802/3/az/public/index.html

Meet the Expert—Mark Fletcher (confessions of an ISS "hitman")

Mark Fletcher is an HP Industry Standard Server (ISS) systems engineer who supports hardware platform teams by solving problems that normally occur during development and test cycles. That's the answer Mark would give if you asked him what he does. If you asked Kevin Depew, Mark's manager, he would say that "Mark is the key technical resource in solving difficult issues on both in-production and new development platforms. Mark has the broad knowledge of hardware, firmware, and software necessary to investigate and determine the root cause of the toughest problems."

Whenever a major product issue arises and the debug effort appears difficult, engineering teams call in Mark Fletcher. Mark has led debug efforts on countless critical issues over the last several years. He works closely with other engineers and with HP's development partners, such as Intel and Broadcom, to resolve the most complex issues. According to Kevin, "Mark can always be counted on to find the root cause of any issue because he always pushes for a complete understanding of the problem rather than accepting a quick or incomplete work-around. In addition, Mark applies his knowledge and experience in dealing with complex issues to assist the development teams in making wise architecture decisions for new products. Mark's knowledge and expertise are important resources that allow HP to ship and support its ProLiant server products.

Mark and his wife Elizabeth have been married for 10 years. His hobbies include building radio-controlled (RC) model planes, cycling, photography, coffee roasting, and dog training. Below are excerpts from an interview with Mark.

Name: Mark Fletcher
Title: ISS Systems Engineer
Years at HP: 14
University/Degree

- Angelo State University, BS Applied Physics, 1986
- University of Texas at El Paso, MS Electrical Engineering, 1990

U.S. Patent:

- Patent # 6311217: Method and apparatus for improved cluster administration. Ehlinger; Early David (Houston, TX), Fletcher; Mark F. (Houston, TX)

Technical Paper:
Solving impossible problems in the 21st century-debug requirements for the future

The way Kevin described your skills, you could be considered an ISS hitman. Do you confess?

Mark: If I told you, I would have to …

Why did you decide to become an engineer?

Mark: Growing up, I was always interested in puzzles and logic problems, so I have always loved the challenge of working through complicated problems. As a teenager, I started working on cars out of necessity. That led to a profession as an auto mechanic (ASE certified Master technician-1986), which I did full time throughout most of my college career. Engineering was something that just seemed to be a natural fit.

What is your favorite project or research?

Mark: For the last several months, I have been driving and defining requirements to processor vendors to add specific debug capabilities into future platforms. This could give us the capability to do low-level debugs, such as bus trace analysis, to determine the root causes of difficult issues.

Are you an advocate for customers in the design of HP products?

Mark: Yes, I believe that every server feature we offer can be tied back to customer feedback at one time or another. It is important that we ask ourselves what benefits the customers will receive for every single step of our development processes. Ultimately, we should only add features that directly impact customers.

Kevin: Mark is a constant advocate for designing products to meet our customers' needs. Mark has worked numerous customer issues and understands the customer dissatisfaction caused by quality issues and the associated costs to customers in terms of downtime. Mark pushes for the highest levels of quality. He influences the design teams to go the extra mile to ensure quality.

What must HP do to remain the leader in industry-standard servers?

Mark: As product development methodologies change, HP needs to continue to reassess its development processes to sustain the quality levels that customers have come to expect.

Common SM CLP scripting commands for ProLiant server management, Part 2

This is the second in a series of articles that discuss common SM CLP (Server Management Command Line Protocol) scripting commands. SM CLP is one of the communication, or access, protocols that can be used with the Systems Management Architecture for Server Hardware (SMASH).

Some customers want to use scripts to perform basic target operations on ProLiant servers (for instance, powering on or powering off the server, or obtaining event logs). From a Windows or Linux client, administrators can use SM CLP to remotely interrogate and control servers using the Integrated Lights-Out 2 (iLO 2) processor.

SM CLP is accessed using Secure Shell (SSH). SSH can be interactive (as in a shell) or it can execute in a "command" mode by processing a single command at a time suitable for scripting. The following examples use SSH command mode, using a Windows utility (plink) that provides SSH command line support. Plink and PuTTY executables, source code, and license terms are freely distributed on the web. Other SSH command line utilities should support this functionality in a similar manner.

The following examples specify user credentials on the command line. If user credentials are not specified, iLO 2 prompts for account credentials, interrupting the process. iLO 2 also supports SSH key-based authentication.

Turn on the user ID light

```
C:\putty>plink -ssh -l admin -pw password ilo2system.corp.net start system1/led1
start system1/led1
status=0
status_tag=COMMAND COMPLETED
Unit Id On.
```

Turn off the user ID light

```
C:\putty>plink -ssh -l admin -pw password ilo2system.corp.net stop system1/led1
stop system1/led1
status=0
status_tag=COMMAND COMPLETED
Unit Id off.
```

Retrieve event logs

The "`show system1/log1 -all`" command returns all of the events in sequential (not necessarily chronological) order. To clear the event log, use the "`delete system1/log1`" command.

```
C:\Program Files\putty>plink -ssh -l admin -pw password ilo2system.corp.net show
system1/log1 –all
show system1/log1 -all
status=0
status_tag=COMMAND COMPLETED

/system1/log1
```

```
    Targets
      record1
        Properties
          number=1
          severity=Informational
          date=01/29/2008
          time=14:32
          description=IML Cleared (iLO 2 user:Administrator)

   <screen output edited for readability>

      record3
        Properties
          number=3
          severity=NonCritical
          date=04/01/2008
          time=14:38
          description=POST Error: 1794-Drive Array - Array Accelerator Battery Charge Low
        Verbs
          cd version exit show set
    Properties
    Verbs
      cd version exit show delete set

  </>hpiLO->
```

Retrieve the system health from all sensors

The "`show system1 -all`" command retrieves information about all the properties of system1, including the health status. Administrators can use `grep` to filter the results, showing only health-related status.

```
C:\Program Files\putty>plink -ssh -l admin -pw password ilo2system.corp.net show system1
-all | grep -i health
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
        HealthState=Ok
```

An abnormality might call for the full output (without the use of `grep`). The example below has been edited for brevity.

```
C:\Program Files\putty>plink -ssh -l admin -pw password ilo2system.corp.net show system1
-all
show system1 -all
status=0
status_tag=COMMAND COMPLETED
```

```
/system1
  Targets
    firmware
      Properties
        version=P56
        date=05/21/2006
      Verbs
        cd version exit show set
    bootconfig1
      Targets
        bootsource1
          Properties
            bootorder=1
        bootsource2
          Properties
            bootorder=2
        bootsource3
          Properties
            bootorder=3
          Verbs
            cd version exit show set
      Verbs
        cd version exit show set
    log1
      Targets
        record1
          Properties
            number=1
            severity=Informational
            date=05/08/2008
            time=18:23
            description=IML Cleared (iLO 2 user:admin)
          Verbs
            cd version exit show set
      Verbs
        cd version exit show delete set
    led1
      Properties
        enabledstate=disabled
      Verbs
        cd version exit show set start stop
    oemhp_vsp1
      Properties
        enabledstate=disabled
      Verbs
        cd version exit show set start
    cpu1
      Properties
        speed=3733MHz
        cachememory1=32KB
        cachememory2=4096KB
        cachememory3=0KB
    cpu2
      Properties
        speed=3733MHz
        cachememory1=32KB
        cachememory2=4096KB
        cachememory3=0KB
      Verbs
```

```
          cd version exit show set
        Targets
          logical_processor1
            Properties
              current_pstate=1
              pstate0_avg=9.5
              pstate1_avg=90.5
              pstate2_avg=0.0
              pstate3_avg=0.0
              pstate4_avg=0.0
              pstate5_avg=0.0
              pstate6_avg=0.0
              pstate7_avg=0.0

            <screen output edited for readability>

       logical_processor4
            Properties
              current_pstate=1
              pstate0_avg=11.1
              pstate1_avg=88.9
              pstate2_avg=0.0
              pstate3_avg=0.0
              pstate4_avg=0.0
              pstate5_avg=0.0
              pstate6_avg=0.0
              pstate7_avg=0.0
            Verbs
              cd version exit show set
        Properties
        Verbs
          cd version exit show set
      memory1
        Properties
          size=512MB
          speed=667MHz
          location=DIMM 1A
      memory2
        Properties
          size=not installed
          speed=not installed
          location=DIMM 2C

  <screen output edited for readability>

      memory8
        Properties
          size=not installed
          speed=not installed
          location=DIMM 8D
        Verbs
          cd version exit show set
      slot1
        Properties
          type=PCI Express
          width=4x

  <screen output edited for readability>
      slot5
```

```
        Properties
          type=PCI Express
          width=8x
        Verbs
          cd version exit show set
      fan1
        Properties
          DeviceID=Fan 1
          ElementName=I/O Board
          OperationalStatus=Ok
          VariableSpeed=Yes
          DesiredSpeed=45
          HealthState=Ok
      fan2
        Properties
          DeviceID=Fan 2
          ElementName=I/O Board
          OperationalStatus=Ok
          VariableSpeed=Yes
          DesiredSpeed=45
          HealthState=Ok

  <screen output edited for readability>

      fan12
        Properties
          DeviceID=Fan 12
          ElementName=CPU
          OperationalStatus=Ok
          VariableSpeed=Yes
          DesiredSpeed=36
          HealthState=Ok
        Verbs
          cd version exit show set
      sensor1
        Properties
          DeviceID=VRM 1
          ElementName=CPU 1
          OperationalStatus=Ok
          RateUnits=Volts
          CurrentReading=N/A
          SensorType=Voltage
          HealthState=Ok
          oemhp_CautionValue=0
          oemhp_CriticalValue=0
      sensor2
        Properties
          DeviceID=VRM 2
          ElementName=CPU 2
          OperationalStatus=Ok
          RateUnits=Volts
          CurrentReading=N/A
          SensorType=Voltage
          HealthState=Ok
          oemhp_CautionValue=0
          oemhp_CriticalValue=0
```

Additional resources

For additional information on the topics discussed in this article, visit:

Resource	URL
HP Integrated Lights-Out	www.hp.com/go/ilo
DMTF SMASH information	www.dmtf.org/standards/mgmt/smash/
PuTTY and Plink	www.google.com/search?q=PuTTY

Recently published industry standard server technology papers

Title	URL
"Drive technology overview, 2nd edition" technology brief	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c01071496/c01071496.pdf
"HP Integrated Lights-Out security, 6th edition" technology brief	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00212796/c00212796.pdf

Industry-standard server technical papers can be found at www.hp.com/servers/technology.

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