HP security technology for racks and power

technology brief

Abstract

Data centers not only contain valuable computer hardware, but the data in the machines is usually worth exponentially more than the equipment costs, and the costs of downtime can be even higher. As a result, physical security of the data center has become a critical element.

HP has developed technology to help IT administrators protect against intrusion and monitor environmental variables such as temperature, high humidity, fire, or smoke. This technology brief will describe the technology implemented in the HP Console Management Controller and explain how it helps to protect critical IT components.

Introduction

In the highly competitive world of enterprise computing, security has become an intricate and critical element. With the overall growth of computing, particularly networked and inter-networked computing, more resources and information are at risk than ever before, with new threats emerging daily.

With the increasing importance of information in today's society, it is critical that computing equipment be physically secure. For example, a server with hot-plug drives placed in an unlocked server cabinet could be an easy target for someone with mischievous or malicious intent. Someone with malicious intent could steal the drives, which may hold highly confidential information, or they might simply attack the components to cause costly downtime to critical applications. In either situation, the costs could be high and information irreplaceable.

Customers with rack-mounted, data center environments or remote locations require the highest levels of control and security for 24 x 7 availability. In addition to intrusion, customers need to monitor against disasters, such as flooding, high humidity, and smoke or fire.

HP has developed technology to improve the physical security of computing equipment. The security technology within the HP Console Management Controller (CMC) provides an extra layer of physical security through intrusion sensors, shock and vibration sensors, and electronic door locks.

The CMC and software allow for remote monitoring, configuration, and management of rack environments. The CMC can help protect equipment by taking actions such as turning on fans, sending a message if smoke is detected, or sending a page if unauthorized persons try to enter the rack. The CMC can also reduce overhead costs by providing remote monitoring capability and by turning off fans when they are not needed.

What is the CMC?

The CMC is HP's first environmental monitoring hardware in a 1U form factor. Designed to monitor one or two racks in a remote environment, the CMC offers intrusion detection, environmental monitoring, and the ability to control optional fans. It also facilitates unattended remote monitoring and has the ability to take action on events. With the proper setup, the CMC can:

- Monitor temperature within the rack
- Monitor humidity levels within the rack
- Monitor voltage within the rack
- Detect smoke within the rack
- Detect whether rack doors are open or closed
- Detect (from vibration) someone tampering with the rack
- Remotely lock and unlock the rack doors

When configured with adequate alarm thresholds, the CMC can protect equipment by sending alerts or by taking action based on those alerts. For example, the CMC can be programmed to turn on the rack fans when the rack temperature exceeds the maximum threshold or to turn off the rack fans if smoke is detected. Should an unauthorized person attempt to enter the rack, the system may sound an audible alarm, send an alert message to a management console such as Insight Manager 7, send an e-mail message, send a page, or activate an alarm relay switch connected to a user-programmable alarm device.

The CMC is a key component for intelligent rack environmental monitoring and controlling. The CMC can be mounted in a 1U configuration and includes an easy-to-use software program that allows users to monitor and manage rack environments with Internet Explorer.

How the CMC works

The CMC accepts sensor input to monitor temperature, humidity, smoke, mechanical shock and vibration, and the security of the rack systems being monitored. The administrator sets tolerance parameters and actions in software. When a condition exceeds the parameters set by the administrator, the CMC can send notification through email, page the administrator, send an SNMP trap, take a predetermined action, or perform a combination of these.

Typical conditions that are monitored include:

- Input voltage for the CMC
- Temperature
- Humidity
- Smoke
- Mechanical shock and vibration
- Intrusion

The administrator defines the condition parameters that will activate a response or trigger an event alarm. For example, if the temperature exceeds the condition set by the administrator, the fan may power on. If the temperature reaches the next threshold, an audible alarm may sound and a technician may be paged.

Input voltage

The CMC has an AC voltage input that is separate from the CMC power input. The source can be any 100 to 240 volt AC source such as the rack main power source. If rack fans are installed, the CMC will monitor the fan source voltage.

This voltage input monitors the voltage source connected by the user. If the voltage exceeds the user's preset highest or lowest settings, then an alert is generated. The user can determine what response should occur, such as a message, e-mail, or page.

Monitoring the input voltage allows administrators to ensure that the rack is receiving enough power to maintain availability. It also helps protect the components from intrusion. For example, if an intruder attempted to bypass the electronic door locks by cutting the power to the rack, the CMC management software would send an alert or take another predetermined action to prevent the intrusion or notify personnel.

Temperature and humidity

The CMC includes an internal temperature sensor or up to two external probes. If the second external temperature probe is not connected, the CMC will monitor the temperature inside the CMC itself. An optional humidity sensor allows the humidity levels within the rack to be monitored.

Using the humidity sensors in conjunction with the temperature sensors allows administrators to recognize problems that may otherwise be difficult to detect. For example, a simultaneous rise in temperature and humidity may indicate an air conditioning failure, which may require alerts to the administrator or building facility supervisor.

Monitoring the temperature and humidity on a 24 x 7 basis, the CMC displays the information to a computer screen and maintains a log file of alerts. The CMC also has the ability to:

- Display the temperature and humidity on a computer screen
- Set off an alarm when temperature or humidity is too high or too low, as defined by the user
- Display temperature readings in Celsius range or Fahrenheit range
- Send alerts to a console

The CMC has the ability to control active cooling methods, such as turning on a fan. It includes two fan outputs, enabling the user to control fan assemblies in two racks with a single CMC.

Smoke

With an input for smoke detection equipment, the CMC is able to monitor its surrounding environment for smoke that might be harmful to systems and to detect system thermal events that take place within the rack. Providing notice through local alerts and through a terminal, the CMC can provide early fire detection for the rack system.

The optical smoke sensor detects smoke (particulate matter) passing by the sampling tube and uses an intake fan to draw the smoke from the sampling tube into the smoke sensor. If smoke is detected, the smoke sensor intake fan will automatically shut off.

Intrusion

An intrusion sensor (Figure 1) consists of two parts: a magnet and an electrical reed switch (Figure 2). The reed switch consists of two ferromagnetic contacts. When the magnet portion of the sensor is in close proximity to the reed switch portion (right side of Figure 2), the magnetic field causes the two contacts in the reed switch to close (the rack door is closed). When the magnetic field is removed (as when someone opens the door of the rack), the intrusion sensor detects the reed switch opening and the CMC sends an alert identifying the open door.
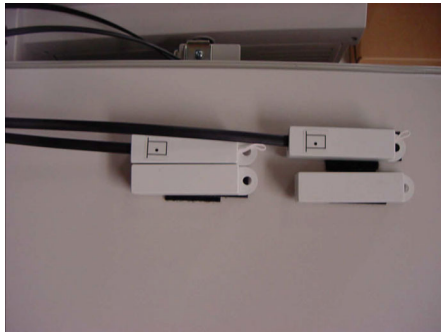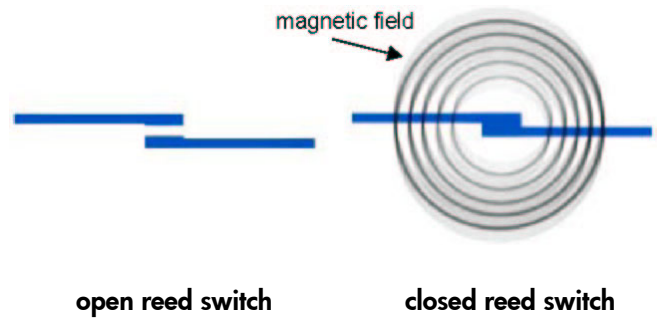
Figure 1. CMC intrusion sensor

Figure 2. Schematic illustrating that the reed switch closes when a magnetic field is nearby

open reed switch   closed reed switch

Mechanical shock and vibration

The mechanical shock and vibration sensor can alert system administrators when a rack has been bumped or struck. This sensor will allow users to detect if an intruder is trying to forcibly remove side panels or trying to knock the rack down. Of course, an earthquake or other natural disaster can also trip the shock and vibration sensor.

Using the vibration sensor in conjunction with the intrusion sensors can allow administrators to gather additional security information. For example, if the CMC sends an alert that the vibration sensor has tripped, but no door alert has been sent, then an earthquake might be occurring. If, on the other hand, the CMC sends alerts for both the vibration and the intrusion sensors, then an intruder may be trying to access the equipment in the rack and the administrator should take appropriate action. For example, if the administrator has configured the software to turn on the auxiliary outputs, a user-provided alarm or siren connected to the auxiliary outputs can be sounded.

Electronic door locks

The optional electronic door locking kit allows an administrator to lock and unlock the rack doors remotely. This permits authorized on-site personnel to access the rack for specific purposes, without giving them unlimited access to the rack. Electronic door locks eliminate the possibility that an intruder who has stolen keys to the racks can actually access the rack with those keys.

An emergency concealed door release can be installed in an out-of-the-way location to enable someone to access the rack when no administrator is available to unlock the doors remotely. For example, the cable release could be placed at the upper back of the rack where it can be reached by inserting a stylus through the perforated rack doors.

The administrator can also establish the response of the electronic door lock to specific conditions, such as:

- Power failure
- Low battery condition on the door lock
- Network failure
- Direct communication failure between the lock kit and the CMC

For example, to prevent an intruder from circumventing the CMC by disconnecting the network connection or power to the CMC, the administrator can set the CMC so that the rack doors are kept locked in the case of power failure or network failure.

Auxiliary inputs

Two auxiliary input ports can be used to connect additional intrusion sensors or a user-defined sensor, such as a light or siren. These ports provide added flexibility for customers deploying the CMC.

Alerting capabilities

The CMC can send alerts based on the threshold parameters established for each sensor. Depending on how the administrator configures the software, an alert can trigger any or all of these actions:

- Activate relay switch #1
- Activate relay switch #2
- Audible alarm
- E-mail alert
- Pager alert (through e-mail)
- SNMP trap
- Broadcast message

The two user-programmable alarm switch relays can be used to connect strobe lights, audible alarms, or similar devices that can indicate an alarm situation. The alarm switch relay provides a means to alert local personnel of conditions in the computing room. For example, if someone tries to open a rack door that is monitored by an intrusion sensor, the CMC can activate an audible alarm and page the system administrator.

Conclusion

The security technology in the CMC helps administrators ensure the safety of rack-mounted computing equipment. Sensors in the CMC allow administrators to monitor environmental conditions such as voltage input, temperature, smoke, shock, and vibration. In addition, the sensors enable access to be monitored and doors to be locked to prevent intrusion. By implementing the technology in the CMC, companies can increase the security of their data and prevent loss from intrusion or hazard.

For more information

For more information on the CMC, refer to the CMC web page at
http://h18004.www1.hp.com/products/servers/proliantstorage/rack-options/cmc/index.html. More
information on deploying the CMC can be found in the best practices paper titled *Deploying the
Console Management Controller* at
ftp://ftp.compaq.com/pub/supportinformation/papers/tc030404bp_rev0_us.pdf.

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