Intel® Virtual Gateway

Improve IT operation efficiency with health management
Overview
What is Health Management?

Health Management Cycle

- Monitoring
- Remediation
- Diagnostic
- Analytic
Data Center Challenge: How to Prevent/Minimize Unplanned Downtime?

Data Requires Advanced RAS

Cost of Hourly Down Time for Large Enterprises

<table>
<thead>
<tr>
<th>Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;$5M</td>
<td>3%</td>
</tr>
<tr>
<td>$2M to $5M</td>
<td>3%</td>
</tr>
<tr>
<td>$1M to $2M</td>
<td>5%</td>
</tr>
<tr>
<td>$501,000 to $1 Million</td>
<td>11%</td>
</tr>
<tr>
<td>$401,000 to $500,000</td>
<td>10%</td>
</tr>
<tr>
<td>$301,000 to $400,000</td>
<td>18%</td>
</tr>
<tr>
<td>$201,000 to $300,000</td>
<td>21%</td>
</tr>
<tr>
<td>$101,000 to $200,000</td>
<td>24%</td>
</tr>
<tr>
<td>$50,000 to $100,000</td>
<td>4%</td>
</tr>
<tr>
<td>$10,000 to $50,000</td>
<td>1%</td>
</tr>
<tr>
<td>Up to $10,000</td>
<td>0%</td>
</tr>
</tbody>
</table>

50% >$300K/hr

Source: Information Technology Intelligence Consulting Corp. (ITIC) Global Server Reliability Survey, July 2013

Correctable Fault

System UP

Fatal

Unplanned System DOWN Undesirable

Time
How to Improve Data Center Health Management?

In 2015 what issues have the most negative impact on reliability & downtime for server HW and OS platforms? (Select all that Apply)

<table>
<thead>
<tr>
<th>Issue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human error</td>
<td>49%</td>
</tr>
<tr>
<td>Security flaws</td>
<td>42%</td>
</tr>
<tr>
<td>Bugs/flaws in server OS</td>
<td>33%</td>
</tr>
<tr>
<td>IT dept. is understaffed/overworked</td>
<td>30%</td>
</tr>
<tr>
<td>Server hardware too old/inadequate</td>
<td>22%</td>
</tr>
<tr>
<td>Instability of server hardware</td>
<td>18%</td>
</tr>
<tr>
<td>Server OS too old to run new compute...</td>
<td>16%</td>
</tr>
<tr>
<td>Integration/interoperability issues</td>
<td>15%</td>
</tr>
<tr>
<td>BYOD</td>
<td>15%</td>
</tr>
<tr>
<td>Vendors too slow to issue patches</td>
<td>15%</td>
</tr>
<tr>
<td>N/A We don't track reliability</td>
<td>13%</td>
</tr>
<tr>
<td>Lack of documentation</td>
<td>11%</td>
</tr>
<tr>
<td>Configuration complexity</td>
<td>10%</td>
</tr>
<tr>
<td>Poor vendor tech support</td>
<td>9%</td>
</tr>
<tr>
<td>IT managers lack training</td>
<td>8%</td>
</tr>
<tr>
<td>Lack of support for crucial apps</td>
<td>8%</td>
</tr>
<tr>
<td>Mobility</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: ITIC 2015
Intel® Virtual Gateway

Health Management Cycle for DC

Central Management Console and SDK API

- Remote power on/off
- Remote vMedia

- Remote vKVM access
- Integrated in-band access thru RDP, VNC, and SSH
- Down to components level health details

- Monitoring
  - Automated server health monitoring
  - Failure alerting
  - Health dashboard
  - OS and server vendor agnostic

- Remediation
- Analytic
  - Root cause with health details
  - Failure device report
  - Severity indication
  - Health history for further analysis

- Diagnostic

Health Management Cycle
Intel® Virtual Gateway Architecture

IT/Facility Management Solution

Intel® Virtual Gateway Central Management

Remote Web Launcher (applet) (VGTW, SSH, RDP, VNC)

Local Administrator

Legend:
- 3rd Party
- Intel Comps

Proxy thru VGTW

VGTW Proxy

API – WS, JSON

Virtual Gateway

Device Mgmt
HTTP Parser
VGTW Engine
Event
Data Logging

OOB Device Connector
OOB VGTW Driver Lib

OOB Device Management
IPMI/SSH /etc.
KVM Session Management

Http/Https

VGTW Traffic
Vendors’ Proprietary Protocol

Device/Credential

iDRAC/CMC
Dell

iLO/OA
HP

IMM/AMM
IBM

BMC
Intel/EPSD

ILOM/ALOM
Sun

UCS
Cisco

BMC
Fujitsu

Server Health
Power On/Off
What are Your Benefits with Intel® Virtual Gateway?

### Health Management Benefits in Data Center

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Saving</td>
<td></td>
</tr>
<tr>
<td>IT Efficiency/Reliability Improvements</td>
<td></td>
</tr>
<tr>
<td>Prevent/Minimize Server Downtime</td>
<td></td>
</tr>
<tr>
<td>Heterogeneous Env. Management</td>
<td></td>
</tr>
<tr>
<td>One-to-Many Solution</td>
<td></td>
</tr>
<tr>
<td>No HW Required</td>
<td></td>
</tr>
<tr>
<td>Remote Power Cycling</td>
<td></td>
</tr>
<tr>
<td>Support In-Band &amp; Out-of-Band Management</td>
<td></td>
</tr>
<tr>
<td>Integrated with DCIM Solutions or Available As Stand Alone Package</td>
<td></td>
</tr>
</tbody>
</table>
Target Implementation: Where & Who?

Hybrid Retrofit Data Centers
- Lower initial cost
- Easier to install than hardware KVMs
- No power, cooling or space required

New Data Centers
- Lower initial cost
- Lower deployment costs
- Lower operating costs

IT & Facility Managers
- Need access/control of the IT layer
- One-to-many remote access
- Management heterogeneous DC environment
- Notification of failures
- Automation of server health monitoring
Intel® Virtual Gateway Deployment Options
# Intel® Virtual Gateway Case Studies

<table>
<thead>
<tr>
<th>Use</th>
<th>Remote Management</th>
<th>Power On/Off</th>
<th>Server Health Management</th>
<th>Ease of Use</th>
<th>Security/Auditing (Future)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customers</strong></td>
<td>Intel IT</td>
<td>Yihua Fund</td>
<td>Large Gaming Company</td>
<td>SGRI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Successful server access via vGTW POC. Able to replace expensive HW KVM.</td>
<td>Able to automate remote power on/off controls through out entire internal DC.</td>
<td>IT staff time saving by automating time consuming server health LED checks. Achieved 40% MTTR reduction.</td>
<td>Deployed vGTW to 1,500+ servers in just 10 minutes.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yihua Fund</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large Japanese CSP</td>
<td>CNCP</td>
<td>Large Energy Enterprise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Able to create offering for remote physical server access as a service using vGTW SDK.</td>
<td>Successful POC showing savings in remote DC administrator by automating power on/off.</td>
<td>Reduced time to track down server instability from hours to minutes by leveraging vGTW component failure insights.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large Gaming Company</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large Energy Enterprise</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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**SGRI**

- Deployed vGTW to 1,500+ servers in just 10 minutes.
Health Management in Data Center
Data Center Health Challenges

- How can I know when my server's components fail?
- Do we really need Jose to walk around and manually check the LEDs?
- How soon can I expect my fans to fail?
- How can I get a failure report for my data center?
- How do I figure out when I need to make service calls to my remote DCs?
- I'm paying contractors to troubleshoot my remote servers, how do I know what he's really doing when he's on them?
- I spend a lot of $$$ on hardware KVMs for my servers...
- I have thousands of heterogeneous servers in my data center and I need a tool to control and access them to maintain full availability.
Health Management Overview

- Overview of Environment
- Per Device Health
- Device and Component Report
- Component Overview
Remote Server Management

- Server diagnostics and troubleshooting
- Checking BIOS settings and BIOS configuration
- Analyze server logs
- Configuration changes or verification
- Remote power cycling
What Can You Do with Intel® Virtual Gateway?

Health Management Cycle
- Monitoring
- Analytic
- Diagnostic
- Remediation
Health Monitoring

- Automated health status collection
- High level server health all the way down to component level (CPU, memory, storage, fan, temperature, battery, power supply, voltage)
- Ability to receive notifications (email, SNMP, browser) when components fail on your hardware
- Can predict more accurately when components will need to be replaced by looking at hardware failure trends
- See overall health of environment and breakdown of failures by component or urgency
Analytic

- Discover the cause of failures down to the component level
- Failure device report with severity and failure details
- Can better predict when components will need to be replaced by looking at hardware failure trends
- Failure rate and MTTR analysis (per server model, components, etc.) – future
- Server failure predication - future
Diagnostic

- Server diagnostics and troubleshooting
- Checking BIOS settings and BIOS configuration
- Analyze server logs
- Configuration changes or verification
- Use both OOB (KVM) and IB (SSH, RDP, VNC)
Remediation

- Remotely power servers on and off
- Ability to create groups of servers and then deploy power tasks to them
- Can schedule and automate an individual or group power task
- vMedia for remote OS provisioning and installation
- Link server failures to workload and/or workflow management system for IT
More Benefits

- No hardware deployment required
- Automated discovery of devices in environment
- Heterogeneous support for all makes and models
- Users can also see the server power status via the Console
- Find out what's failing on your devices as it happens with no monitoring setup required
- Security/auditing (future)
  - Ability to record KVM sessions and user interaction for later review
  - Video recording of screens and comprehensive log of mouse and keyboard activity
  - Can audit user or session info for security compliance or government regulator laws
ROI Cases
Hardware KVM Replacement (Case I)

- No hardware deployment required
- VGTW per node cost is 50% of the cost of hardware dongle
- 1/3-1/4 overall cost of traditional hardware KVM
- Heterogeneous support for all makes and models means no additional equipment required for support
- Automate server health monitoring and avoid time-consuming human server health round check – save of human resource
- Savings involved in speeding up recovering/fix process by notification of events when they happen and pin point

<table>
<thead>
<tr>
<th>Hardware KVM</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>KVM (64 nodes)</td>
<td>$12,699.00</td>
</tr>
<tr>
<td>Dongles (64)</td>
<td>$9,280.00</td>
</tr>
<tr>
<td>Support (4 years)</td>
<td>$3,175.00</td>
</tr>
<tr>
<td>Total cost</td>
<td>$25,154.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VGTW</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>VGTW (64 nodes)</td>
<td>$2,880.00</td>
</tr>
<tr>
<td>Support (4 years)</td>
<td>$2,304.00</td>
</tr>
<tr>
<td>Total cost</td>
<td>$5,184.00</td>
</tr>
</tbody>
</table>
Prevent/Minimize DC Downtime (Case II)

45% server MTTR reduction

250 hours unplanned server downtime saving on reduction of critical business discontinuity for 1,000 servers per annum

- Improve DC reliability and save the cost of critical business discontinuity
  - Automated server failure detection
  - Easy to track down failure cause by holistic health monitoring down to component level
  - Alert on HW failure before trigger to app/service level impact

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>a) 1,000 servers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b) Unplanned downtime per server/per annum in minutes: 20 minutes*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditions**</th>
<th>Before: server MTTR = 5.5 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>After: server MTTR = 3.5 hours</td>
</tr>
<tr>
<td></td>
<td>MTTR: mean time to recovery</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ROI</th>
<th>Server MTTR reduction: (5.5 – 3.0) / 5.5 = 45%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual server downtime saving: 20/60 x 1000 x 45% = 250 hours/per annum</td>
</tr>
</tbody>
</table>

* Information Technology Intelligence Consulting Corp. (ITIC) Global Server Hardware, Server OS Reliability Report, July 2015
** A Better Management to Datacenter Health. May 2016
## Operation Efficiency Improvement (Case III)

Save IT labor cost $35K - $100K USD per hour for 1,000 servers

Automated server health monitoring reduces human errors

<table>
<thead>
<tr>
<th></th>
<th>Scenario 1: Typical IPDC</th>
<th>Scenario 2: High Maturity DC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assumptions</strong></td>
<td>a) 1,000 servers</td>
<td>a) 1,000 servers</td>
</tr>
<tr>
<td></td>
<td>b) 3 technician per 1,000 servers</td>
<td>b) 1 technician per 1,000 servers</td>
</tr>
<tr>
<td></td>
<td>c) IT labor cost: $25 USD per hour</td>
<td>c) IT labor cost: $50 USD per hour</td>
</tr>
<tr>
<td><strong>Conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Before: Total server maintenance consumed 8,000 man-hours per year</td>
<td>Before: 1,500 hours for health management per annum</td>
</tr>
<tr>
<td></td>
<td>After: Total server maintenance cost was reduced to 4,000 man-hours per year*</td>
<td>After: 800 hours for server health management per annum**</td>
</tr>
<tr>
<td></td>
<td>Note: total IT server maintenance includes health monitoring, failure detection, troubleshooting, fixing, etc.</td>
<td></td>
</tr>
<tr>
<td><strong>ROI</strong></td>
<td>Labor cost saving: (8,000 - 4,000) x $25 = $100K USD per annum</td>
<td>Labor cost saving: (1,500 – 800) x $50 = $35K USD per annum</td>
</tr>
</tbody>
</table>

* Information Technology Intelligence Consulting Corp. (ITIC) Global Server Hardware, Server OS Reliability Report, July 2015
** A Better Management to Datacenter Health, May 2016
** Estimation base on Intel IT large DC
In Development
(Next Two Releases)
Intel® Virtual Gateway Future Features

- KVM Session Recording
  - Record interactions for auditing or security purposes

- Component MTTR Analysis
  - Improve It efficacy / reliability through server component analysis

- Historical Failure Trending by Device
  - Gather insight into DC failure trends

- Network Storage Health Monitoring
  - Full IT device coverage for health management in DC

- Health Failure Prediction and Diagnostic
  - Know when components will fail before they do
ISV value add
In the SDK, But Not In Console Yet

Comprehensive Failure Report Analysis

- Link server failures to workload/workflow for IT
- MTTR analysis and report (per server model, components, etc.)
- Server failure statistic report and analysis

![Graph showing failure rate and resolved number for various components over the last 90 days.]
In the SDK, But Not In Console Yet

Comprehensive Failure Report Analysis

- Link server failures to workload/workflow for IT
- MTTR analysis and report (per server model, components, etc.)
- Server failure statistic report and analysis

Last 30 Days: 2015.12.15 - 2016.03.15

<table>
<thead>
<tr>
<th>Server</th>
<th>Resolved Number</th>
<th>Unresolved Failure Number</th>
<th>MTTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell R930</td>
<td>2h</td>
<td>2h</td>
<td>2h</td>
</tr>
<tr>
<td>HP DL360</td>
<td>2.8h</td>
<td>2.8h</td>
<td>2.8h</td>
</tr>
<tr>
<td>Dell M620</td>
<td>3.2h</td>
<td>3.2h</td>
<td>3.2h</td>
</tr>
<tr>
<td>Dell R720</td>
<td>5h</td>
<td>5h</td>
<td>5h</td>
</tr>
<tr>
<td>Lenovo RD550</td>
<td>1h</td>
<td>1h</td>
<td>1h</td>
</tr>
<tr>
<td>Intel S2600CP</td>
<td>1h</td>
<td>1h</td>
<td>1h</td>
</tr>
<tr>
<td>Cisco C220</td>
<td>7.6h</td>
<td>7.6h</td>
<td>7.6h</td>
</tr>
<tr>
<td>Inspur NF5280M4</td>
<td>3.4h</td>
<td>3.4h</td>
<td>3.4h</td>
</tr>
</tbody>
</table>
Summary

A new approach at health management!

- Intel® Virtual Gateway is used for diagnosing and troubleshooting data center hardware across platforms. It is a natural complement to data center power management.

- IT managers can now securely configure or fix compatible components (e.g., servers, network switches and storage devices) remotely, in a “one-to-many” solution.
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