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How Modern Manageability Reduces Downtime and Financial Risk

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Enterprises rely on digital technologies to optimize nearly every aspect of the business to deliver goods and services to customers, partners, and employees. Most modern-day businesses are increasingly relying on digital technologies with customers expecting positive digital experiences anytime, anywhere. Companies ranging from multinational manufacturers and healthcare networks to global transportation systems rely on resilient technologies for managing unexpected disruptions and ensuring continued, reliable services.

Dynamic business conditions, constantly changing technology, and ever-higher customer expectations require us to reexamine and redefine the operational excellence our businesses must deliver. This redefinition must embrace the concept of digital resilience, the ability of systems to withstand unforeseen faults or security threats with no service degradation, maintaining a minimum level of service until the root cause is determined and remediation is implemented.

A resilience strategy itself is not static and must be designed for change. Today's systems and technologies that provide business resilience are under constant change as we introduce new technologies, such as AI, to improve efficiencies and business growth.

This white paper covers case studies involving two hypothetical large airline companies where downtime can lead to large-scale consequences for their customers and business. Our scenario focuses not on one specific outage but on the implications of having or lacking the necessary manageability technology stack to deal with localized service disruptions or a widespread outage. One airline utilizes the Intel vPro® Platform to manage its end devices, including the remote management of Windows systems even when they fail to boot. The other airline has not enabled such a technology.

We also examine the capabilities of Intel vPro and Intel® Active Management Technology (Intel® AMT) and the advantages they provide to help increase systems' resilience and operational integrity under day-to-day and critical situations such as a widespread outage.

Outage Scenario

Our scenario involves two large airlines, NEWAIR and SAL-AIR, and their contrasting experiences during a major outage. Both airlines were hit by the same widespread software update issue, impacting critical systems such as check-in kiosks, gate displays, baggage handling, and gate scheduling at most airport locations they serve.

The severity of the updated software distribution caused Windows systems to crash during boot-up. Recovering from the failed software patch, distributed shortly after the outage began, required removing and replacing the errant files for the Windows operating system to boot. NEWAIR previously activated Intel AMT on their Intel vPro devices, while SAL-AIR did not.

Timeframe	NEWAIR Activated Intel AMT	SAL-AIR Did Not Activate Intel AMT
Day 1	**Initial Response** - Rapid assessment and remote diagnosis of affected devices. Intel support was contacted for collaboration. **Recovery Efforts** - Using Intel vPro, the majority of devices (95%) were recovered remotely within 7 hours. To accommodate the increased load of remediating a widespread outage, remote support made server-side adjustments to optimize performance. This optimization was only necessary due to the scale of the outage.	**Initial Response** - Limited remote access hindered diagnosis. On-site technicians were dispatched, but progress was impacted due to travel delays and many sites and computers requiring remediation. **Recovery Efforts** - Sporadic and gradual arrival of technicians on-site. Additional technical staff and contractors were brought in to reach as many sites as quickly as possible. Manual troubleshooting and recovery efforts were hampered by onsite travel delays due to physical access to devices. Additionally, some required multiple reboots to recover. A portion of devices (10%) recovered in the first 24 hours.
Day 2	Intel assisted in identifying the remaining devices requiring additional attention. Full recovery achieved by the end of Day 2.	Recovery efforts continued through the weekend to identify and physically update all remaining devices, with technicians working extended hours.
Day 3+	Returned to normal operations.	Continued patch remediation as technicians could reach sites and then traveled to the affected locations.
Full Operational Capacity	Fully restored by the end of Day 2. The standard post-mortem was conducted.	Not fully restored until the end of Week 2. The standard post-mortem was conducted.

Impact: ***Over the two-week period following the global outage, NEWAIR canceled approximately 1% of their flights. In contrast, SAL-AIR experienced a significantly higher impact, canceling over 5% of their flights during the same timeframe.***

This disparity highlights the varying degrees of operational resilience between these airlines when faced with unexpected technological disruptions.

NEWAIR Post-Mortem

A widespread issue in an external vendor's software caused critical Windows systems to crash. The affected systems could not successfully reboot to run Windows, rendering them non-operational (blue-screen) without applying some type of fix. This issue impacted various operations, including check-in kiosks, gate displays, baggage-handling systems, and employee computers. Consequently, the outage led to flight cancellations, passenger delays, and operational chaos on the first day.

Considering the size and impact of the outage, the ability to fully recover and return to full operations by the second day was considered a success. The outcome of the situation could have been much worse, costing the company several hundred million dollars and damaging its reputation with customers.

Lessons Learned

Pros: Overall, business continuity and a return to full operations took two days, though most flights (65%) returned to operational status by the end of Day 1. With assistance from Intel support, IT Operations were able to return all impacted devices to full operational status without requiring "truck rolls" to sites before the beginning of Day 3.

On Day 1, the management systems detected the outage, and the vendor responded with a patch within 2 hours. The QA team tested the patch. After manually applying the patch to a few computers, central support could begin remote steps to fix the reboot issue and return Windows computers to boot the operating system successfully. After contacting Intel support, whose Intel AMT hardware is utilized by IT Operations, both organizations worked together to create an automation script that enabled remote computers to boot into Windows successfully. All remaining computers were resolved in this manner.

Cons: During the outage, IT operations and support were unfamiliar with some of the Intel vPro capabilities that aided in recovery during this outage. Members of the staff are now scheduled for further education and red team testing.

SAL-AIR Post-Mortem

A SEVERITY-1 condition occurred due to a 3rd-party software bug that caused critical Windows systems to crash across most (almost all) operations sites. The affected systems would not boot to Windows, resulting in Windows "blue-screen". This issue impacted various operations, including check-in kiosks, gate displays, baggage handling systems, and employee computers. Consequently, the outage led to flight cancellations, passenger delays, and operational chaos over several days.

The vendor's software patch was received within 2 hours and then tested and approved by the internal QA team. The fix required a manual reboot of Windows systems after replacing corrupted files, preventing the systems from booting into Windows. All available IT support and technical staff began deploying to initial sites; the initial sites were required to be within driving distance of a technician due to the flights' inability to take off. A few flights (less than 5%) returned to operation by the second day, but most were not operational. Once flights came online, some technicians could be dispatched via air travel; this was the exception for several days.

Lessons Learned

Pros: Monitoring systems detected the outage quickly, the vendor provided a patch within 2 hours, QA quickly tested the software patch, and technicians and remote staff were heroic in their response to get systems operating again despite many days of travel and very long hours.

Cons: Business continuity and a return to full operations cannot depend on "truck rolls," the deployment of HQ, and remote staff needing to be onsite with hands-on to remediate devices. A solution is required immediately to avoid any outage, large or small.

Examination of Intel vPro

As part of this engagement, Signal65 took a deeper look into the capabilities, benefits, and implementation requirements of the Intel vPro Platform. The examination of Intel vPro is primarily in the context of improving enterprise IT resilience and its general capabilities.

Resilience, the ability to withstand unforeseen faults or security threats with no or limited service degradation, requires modern-day device and fleet management systems to encompass a challenging array of capabilities. Those capabilities include device manageability, performance, security, stability, and return to service of desktops, laptops, and servers.

Devices can be deployed for any number of business-class, mission-critical use cases, including end-user computing, remote and edge devices, remote offices, displays, kiosks, checkout and payment systems, etc.

It is important to understand that the Intel vPro Platform comprises multiple products and capabilities: Intel AMT, Intel® Trusted Execution Technology (Intel® TXT), Intel CPUs, including the Intel® Core™ Ultra processor series, and supporting onboard chipset hardware. Closely associated with the Intel vPro Platform is the Intel® Endpoint Management Assistant (Intel® EMA). While not strictly a part of the platform, the monitoring and management of devices is a critical element that ties into the capabilities of Intel vPro. Intel, of course, has an entire library of product literature and specification sheets covering all the details of the Intel vPro Platform and related offerings.

While the Intel vPro Platform has a wide range of capabilities beyond the scope of this whitepaper, our focus is on examining the following as it applies to resilience.

Monitoring and Management: Resilience requires more than being alerted when outages occur. Faults can occur at the hardware level and can be vexing with remote devices, particularly when faults occur at the hardware level. Examples of faults include drive and memory failures, chipset and controller failures, BIOS corruption, boot failures, overheating issues, and system hangs.

Intel has a distinct advantage, particularly at the hardware level. Specifically, Intel AMT monitors reports onboard chipsets and firmware for failures or impending failures. It also maintains its own persistent event logging, which is accessible whether the device is operating or fails to boot. With its hardware-level capabilities, Intel AMT has a strong advantage in boosting resilience by detecting and alerting about issues that may lead to failures, enabling remediation before device malfunction.

Remote Power and Out-of-Band Management: In the airline scenario, out-of-band management was a critical failure point for SAL-AIR, requiring the airline equivalent of truck rolls to remote sites to access and troubleshoot devices that failed their boot sequence.

Although expensive to deploy in every use case, remote power-up capabilities have long been provided by remotely managed power strips, enabling the power cycling of connected devices. Some problems can only be resolved by power cycling a device. Devices can enter a power-off state for a variety of reasons, including system crashes, overheating, power supply issues, and power disruption. An essential capability of Intel vPro is Intel AMT's ability to remotely power on and off devices, including when they are in a power-off state.

Out-of-band management becomes critical when devices do not reach a successful boot state, whether due to hardware, software, or power issues. Intel AMT's out-of-band management provides access to devices via Intel AMT capabilities onboard the device. Intel AMT maintains its own secure network TCP stack, independent of the operating system or onboard network hardware. Out-of-band management also does not require KVM (Keyboard, Video, and Mouse) remote control, which is part of Intel vPro and is available when the device successfully reaches a powered-on state.

Remote Troubleshooting, Repair, and Security Patching: Utilizing the remote power and out-of-band management and the onboard persistent event-logging capabilities, IT administrators and technicians can fully troubleshoot power, hardware, booting, operating system, and software issues. Security issues, such as those requiring a patch or configuration change, can also be addressed without physically accessing the device. Troubleshooting and repairs can be performed while also monitoring the device's state through cloud-based Intel EMA.

In our airline scenario, the devices failing to boot successfully could be remotely diagnosed and repaired, removing the errant file that caused the OS boot to fail. Devices could also be power-cycled remotely to ensure they are in full working order, again improving the overall resilience of devices, no matter their location.

In summary, Signal65 examined capabilities encompassed within the Intel vPro platform that help reduce downtime, address stability, performance, and security, and alleviate the need for truck rolls. Those covered in this white paper stand out due to the unique strengths of Intel and how they specifically contribute to improving resiliency.

Analyst Take - Why Resilience Is Not Just Prevention

The adage “if it can happen, it will” increasingly applies to IT systems, applications, cloud vendors, SaaS applications, and more. As complexity continues to increase, so does the reliance on third parties. While still essential, operational metrics and goals such as uptime, mean time to repair or remediate, and contractual SLAs with limited liability are stretched thin and are not enough. The above scenario can just as quickly happen in any industry and to companies of any size.

Companies invested significantly to reduce the costly and time-consuming truck rolls needed to make repairs on-site. However, as seen in this white paper’s scenario, this cannot be done quickly and at scale, resulting in severe damage to customers and businesses. Today’s reliance on technology makes investing in recovery, shortening outage scope, and length and intervals equally crucial to preventing them.

Executives and the boardroom are continuously asked to invest in new technologies to prevent and respond to failures. But often, those investment discussions fall short of addressing the resiliency requirements leaders and customers alike expect from the business. Leaders must specifically ask the tough questions of what happens when worst-case scenarios occur and how the business can bounce back quickly or, better yet, experience some degradation without systems failing. The most critical question is how this can be achieved at scale.

Remote management and large-scale out-of-band recovery are crucial to providing resilient operations. The level of resilience businesses require cannot be obtained without these remote capabilities. Companies may not survive a catastrophic, system-wide outage, making this business-technology leadership discussion essential. The boardroom wants to know if we are prepared, what prevention measures are in place, and if we can respond at the speed the business requires. If not, what does it take to get there?

Intel’s vPro Platform presents businesses with unique abilities few other technology providers can offer. Whether many existing deployed devices or those that are part of technology refresh cycles, Intel-based and Intel vPro-equipped devices bring with them new levels of resilience difficult to achieve any other way.

Important Information About this Report

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Hypothetical scenarios are fictional and depicted here for illustrative purposes only.

All versions of the Intel vPro® platform require an eligible Intel processor, a supported operating system, Intel LAN and/or WLAN silicon, firmware enhancements, and other hardware and software necessary to deliver the manageability use cases, security features, system performance and stability that define the platform. See intel.com/performance-vpro for details.

Remote management requires a network connection; must be a known network for Wi-Fi out-of-band management. See www.intel.com/Performance-vPro for details. Results may vary.

Performance varies by use, configuration, and other factors. Learn more at intel.com/performanceindex.

No product or component can be absolutely secure.

Your costs and results may vary.

Intel technologies may require enabled hardware, software or service activation.

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ABOUT SIGNAL65

Signal65 is an independent research, analysis, and advisory firm, focused on digital innovation and market-disrupting technologies and trends. Every day our analysts, researchers, and advisors help business leaders from around the world anticipate tectonic shifts in their industries and leverage disruptive innovation to either gain or maintain a competitive advantage in their markets.

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