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Reducing the Cost of Electronic Gaming Machine Support with Intel® vPro™ Technology

In recent years, electronic gaming machines have evolved from simple devices with limited functionality into powerful machines running on PC platforms. This change is dictated by major shifts in the industry such as the introduction of networked, server-based and server-supported gaming and the increasing demand for more sophisticated games and functionality from gaming terminals. Intel processors with vPro technology provide the energy-efficient performance and flexibility necessary to drive current and future gaming requirements, while reducing total cost of ownership through optimization of electronic gaming machine management and complexity. Intel vPro technology can also improve the operational excellence, security, and customer intimacy of electronic gaming operations.

Intel® vPro™ technology is a hardware-based set of management features supporting Intel® Core™ 2 and Centrino processors. It provides asset manageability and security capabilities to devices based on Intel processor platforms. This paper illustrates the expected cost savings of deploying this technology to support electronic gaming operations.

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EXECUTIVE SUMMARY

To understand the costs and benefits of deploying Intel® vPro™ technology within gaming organizations, analysts from Wipro's Product Strategy and Architecture (PSA) team conducted interviews with 15 gaming organizations in North America. The data gathered in this research was analyzed and combined with Wipro's existing data and knowledge of Intel vPro technology to assess its impact on electronic gaming.

Wipro analysis concluded that Intel vPro Technology provides significant cost benefits by:

- Decreasing the number of manual field fixes needed for software and hardware malfunctions of Electronic Gaming Machines (EGMs)
- Reducing the complexity of the traditionally diverse EGM infrastructure through standardization on an Intel vPro technology hardware platform
- Lowering electric utility costs of running EGMs through the use of mobile-based energy-efficient Core 2 Duo processors and vPro-compatible motherboards
- Preventing the loss of potential revenue by reducing EGM downtime

To illustrate these benefits, Wipro conducted analysis on two hypothetical gaming operators. Wipro found that Intel vPro technology impacted these organizations in the following ways:

1. A large casino with 2000 slot machines in a single location realizes Net Present Value (NPV) of $238,462 in EGM support cost savings and saves an additional $611,010 over 5 years in electric utility costs.
   - This investment assumes that all of the casino's slot machines are networked and replaced with Intel vPro technology-enabled machines which are deployed according to an existing 5-year refresh cycle[i].
   - 35% of the $238,462 in savings is due to the reduction in management costs associated with supporting a complex EGM infrastructure, while the remainder is attributed to the reduction in manual labor costs for on-site slot machine fixes.
   - Assuming that vPro-enabled EGMs are replacing older EGMs with processor and chipset combinations that consume 100W of energy on average and these EGMs are on all of the time, vPro implementation will result in an additional financial savings of $611,010 over the 5 year refresh period from lower energy consumption, Intel® SpeedStep™ Technology, and reduced air conditioning costs.
2. A state lottery operator with 11,000 lottery terminals dispersed throughout a state achieves a NPV of $841,353 as well as a reduction in electricity usage of 12.4 Million kW hours across the state over 4 years.
   - This investment assumes terminals are replaced with Intel vPro technology-enabled ones over a 4-year refresh cycle[i].
   - Intel vPro technology also provides an additional opportunity cost savings of $945,000 or more by preventing the loss of potential lottery ticket sales through reductions in terminal downtime.

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   - Assuming that vPro-enabled lottery terminals with SpeedStep technology are replacing older ones with processors and chipsets consuming an average of 100W of electricity and these are on for 16 hours per day, the lottery operator can save the state 12.4 Million kW hours in energy consumption over four years, or $1,244,650 in energy spending at the 2008 US average of 10 cents per kW hour.

Aside from financial benefits, Intel vPro technology can have a positive impact on a gaming business by:

- Improving customer intimacy and loyalty. Game operators can securely load multiple games and applications critical to implementing customer loyalty strategies, such as customer analytics programs, onto EGMs with minimal risk of affecting game play. Technologies such as Intel® Virtualization Technology (Intel® VT) and Intel® Trusted Execution Technology (Intel® TXT) enhance a gaming organization's ability to provide a memorable gaming experience to high value customers without worrying about EGM malfunctions. Intel vPro technology also reduces EGM problems that are visible to players through improved remote asset management and remediation.
- Improving the ability to meet IT metrics. Wipro research found that gaming IT organizations use customer satisfaction and time to resolution as the two most important measures of the performance of their EGM support services. Intel vPro technology improves customer satisfaction by reducing the need for managers and customers on the gaming floor to take a proactive role in EGM management. This technology also reduces time to resolution through increased asset visibility and the enhanced ability to fix problems with EGMs remotely.
- Improving security. Intel vPro technology can protect games and sensitive data from malicious software-based attacks by employing the hardware-based protection of Intel® Trusted Execution Technology (Intel TXT), the application isolation capabilities of Intel® Virtualization Technology (Intel VT), and the swift response enabled by Intel® Active Management Technology (Intel AMT).

INTRODUCTION

Wipro Consulting's Product Strategy and Architecture team conducted an assessment of the IT management costs of electronic gaming machines (EGMs), such as slot machines and lottery terminals, in order to understand the potential financial and operational impact of Intel® vPro™ technology. The insights provided by practitioners in casinos, racinos, EGM makers and lottery boards were packaged into an Intel® vPro™ Technology Return On Investment (ROI) Calculator for EGM operators. This whitepaper complements the ROI calculator and illustrates potential savings that a casino operator can expect to see through deployment of Intel vPro technology in their electronic gaming machines.

Electronic gaming devices in North America are becoming increasingly sophisticated in order to capture the attention and patronage of players. Innovations, such as the recent introduction of the Gaming Standards Association's Open Game to System (G2S) and System to System (S2S) standards for networked gaming, are changing the way EGMs are played on and managed. These protocols are poised to transform the contemporary gaming floor into a broadband-enhanced environment with downloadable games, ultimately resulting in a more intimate and exciting experience for patrons while also improving device manageability for operators. While these standards have paved the way for advances in gaming, equipment technology must also evolve for these benefits to come to fruition and an essential component of this ecosystem is the electronic gaming machine.

Traditional EGMs are non-networked devices requiring analysis and upgrades through onsite physical service. But, the industry shift led by Gaming Standards Association open standards is driving a rise in demand for server-based and server-supported technology which can be controlled from a centralized, remote management console. With these new systems, players have a greater selection of games that they can play on the same EGM, since games are powered by network software. Aside from improving the player's experience, there is an additional cost benefit to operators because game changes, software updates, and security patches, which were handled through physical retrofits of EGMs, can now be simply pushed "down the wire." Finally, networked EGMs allow for synergy to exist between customer and gaming operators – customer gaming behavior can now be collected and analyzed through the network allowing operators to serve customers in a more tailored way than was previously possible.

This increase in EGM functionality has led to the need for hardware capable of providing the performance, security, and manageability required of the new wave of machines. While EGMs have traditionally run on embedded processors such as RISC processors, companies including IGT, Aristocrat Technologies, WMS Gaming, and Bally Technology have begun implementing Intel system architectures into their gaming systems to take advantage of the power, flexibility, manageability, and security enabled by Intel platforms.

Intel® Core™ 2 processors with vPro™ technology have features that are particularly suited to meeting the current demands and pressures of the gaming industry. This paper will outline how EGMs with Intel vPro technology fit into an EGM deployment roadmap by aligning with cost objectives and organizational values.

WHAT IS INTEL® VPRO™ TECHNOLOGY?

Intel vPro technology is a set of hardware-based capabilities that can be deployed with Intel's current generation of Core 2 processors to deliver IT management enhancement features such as Intel® Active Management Technology (Intel® AMT), Intel® Trusted Execution Technology (Intel® TXT) and Intel® Virtualization Technology (Intel® VT).

Intel vPro technology resides within the motherboard chipset and other core hardware components of a PC platform. Key hardware components that enable Intel vPro technology include:

- Intel Core 2 Duo-based CPU
- Intel vPro-capable chipset
- Intel vPro-capable ethernet controller

Intel vPro technology gives IT departments in gaming organizations and government lotteries the power to manage gaming devices which have been traditionally inaccessible through the network, such as those with unresponsive operating systems or terminals that have been turned off. It also provides security and reliability for gaming applications and platform sub-systems through hardware-based virtualization and protection (visit the Intel vPro site for more details on the technology at http://www.intel.com/technology/vpro/index.htm).

An additional advantage of switching to Intel vPro technology-enabled devices is the reduction in complexity associated with standardizing on the Intel vPro platform.   Wipro has shown that with a simpler IT infrastructure comes a reduction in IT support costs[ii] and this should also be a consideration for organizations considering the implementation of Intel vPro technology to support gaming operations.

Intel® vPro™ Technology for Electronic Gaming Devices

Gaming operators can greatly improve their ability to access, manage, and resolve issues with their electronic gaming assets through the use of Intel vPro technology.   Intel vPro technology accomplishes this by enhancing the performance of gaming IT organizations in the following ways:

- Push software updates and fixes "down the wire" to EGM assets even when they are powered off
- View and diagnose gaming machines even in cases when there are problems with the operating system or the hard drive has failed through the use of BIOS level access from a remote console
- Boot EGM assets from a regulated "gold" image stored somewhere else on the network

The engine behind this functionality is Intel AMT[iii]. With Intel AMT, gaming IT staff and floor operators can utilize a hardware-based, out-of-band communication channel to access, power on, diagnose and repair vPro-enabled assets remotely even when ordinary communication channels are inoperative.

In addition to improving EGM management performance, previous research conducted by Wipro on the corporate IT setting[ii] has identified that this technology can create significant cost savings by reducing the necessity to manually resolve the following events:

- New application deployment failures
- Patch deployment failures
- Audit failures
- Inventory management failures
- Hardware malfunctions
- Software malfunctions
- Security incidents

Along with the benefits of Intel AMT, Intel VT allows for the protection of key gaming applications through application isolation while Intel TXT provides hardware-based defense of critical data located on EGM sub-systems.

FINANCIAL BENEFITS OF INVESTING IN INTEL® VPRO™ TECHNOLOGY FOR EGMS

Building upon the knowledge gained in the financial assessment of Intel vPro technology in corporate IT departments[ii], Wipro PSA interviewed 15 North American gaming organizations to develop a financial calculator that would provide Return on Investment estimates for the gaming sector. The nuances and characteristics of the data obtained from gaming associations were combined with 200 data sets from the prior enterprise IT and embedded systems management studies to create a calculator tailored specifically to the gaming sector. Research by Wipro uncovered the following trends:

- Labor costs to provide support for EGMs are lower than the equivalent labor costs necessary to support PCs.
- Electronic Gaming Machines experience lower rates of hardware and software malfunctions as well as application and patch deployment failures than corporate PCs. This is because EGMs have a defined set of functionalities with limited features and functions compared to a typical business PC, and undergo a rigorous regulatory and certification process, as well as extensive testing.

These findings have been incorporated into the financial model driving the cost benefit calculations used in this report.

To illustrate the savings that Intel vPro technology provides to gaming organizations, this paper explores case studies for two representative companies. The first is a casino operator with 2000 slot machines in one facility and the second is the operator of a state lottery with 11,000 lottery terminals dispersed throughout a state.

Large Casino Operator	State Lottery Operator
2000 slot machines in a single location	11,000 lottery terminals dispersed in various locations throughout the state
5 models of slot machines are deployed per year	4 models of lottery terminals are deployed per year
Life cycle for slot machines is 5 years	Life cycle for lottery terminals is 4 years
0% of slot machines are already Intel vPro technology enabled	0% of terminals are already Intel vPro technology enabled

FIGURE 1. Details of two representative gaming organizations

Reducing IT Support Costs through Intel® vPro™ Technology-Enabled Operational Efficiencies

EGM system maintenance is a major cost driver for gaming IT departments. Wipro's research indicates that it takes approximately $650 per year to support one EGM. A significant component of this cost is due to on-site support services performed in response to software and hardware malfunctions as well as manual management activities such as patch deployments and the loading of games to devices that can't be reached through the network.

The recent trend toward server-based and server-supported gaming has enabled remote resolution for some hardware and software malfunctions. As depicted in Figure 2, many gaming organizations already manage their devices centrally, a model by which devices are supported from a consolidated game management department that can oversee multiple locations as opposed to management departments on location at each gaming floor. Intel vPro technology enhances the ability to remotely fix issues with these centrally managed devices. For the places that manage their EGMs locally, Intel vPro technology machine deployment will create an infrastructure enabling remote management.

Breakdown of EGM Management Model Used (n=15)

20% Locally managed

20%

80% Centrally managed

80%
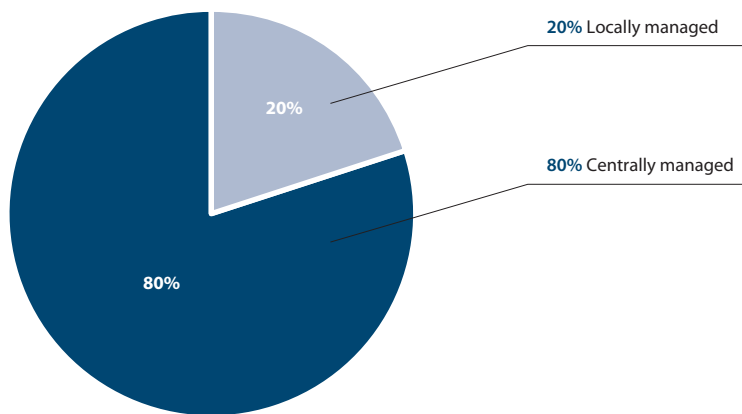
FIGURE 2. **A majority of gaming organizations manage EGMs centrally**

Implementing Intel vPro technology-enabled EGM gaming floors will reduce the number of manual, on-site break-fixes. This will lower associated labor expenses and improve the efficiency of IT personnel as more time is spent on other critical IT operations. Since the vast majority of US gaming organizations conduct break-fixes using internal IT staff as shown by Wipro research summarized in Figure 3, the reduction in the number of manual break-fixes that need to be performed directly reduces gaming organizations' operational expenditures related to the support of EGMs.

Breakdown of Who Conducts On-Site Break-Fixes (n=15)

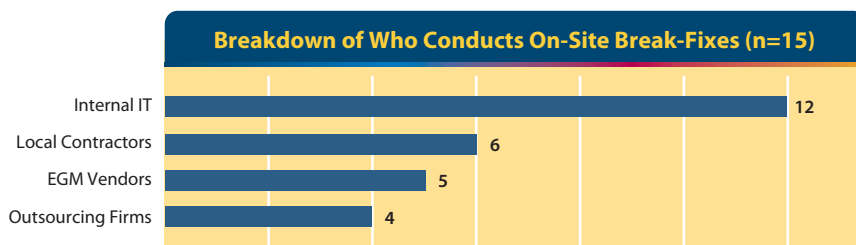|	
Internal IT	12
Local Contractors	6
EGM Vendors	5
Outsourcing Firms	4

FIGURE 3. Most gaming organizations use internal IT to conduct field fixes of broken EGMs

Aside from a reduction in on-site visits, Intel vPro technology enables cost savings by expanding the ability to remotely manage EGMs. The efficiencies gained by performing software deployments, audits, inventory taking, and security actions through network communication channels allow gaming operators to perform these actions more often, with less effort, and ultimately at a lower cost.

To quantify the financial benefits of Intel vPro technology implementation for the two representative gaming organizations, Wipro applied the characteristics of each company to the Intel vPro Technology ROI Calculator for EGM operators developed by Wipro analysts. In the single-facility casino operator use case where 2000 EGMs are replaced with Intel vPro-enabled gaming machines, the investment provides an estimated net present value of $238,462 at a discount rate of 12% (see Figure 5 for NPV calculations at various discount rates). This calculation assumes that the life of a slot machine is 5 years and that the Intel vPro technology enabled EGM deployment takes place according to the existing refresh cycle. By year 5, the casino operator saves $75.69 per machine per year in manual support costs. This amounts to approximately 12% of the $650 found to be the average amount that gaming IT organizations spend annually to support one EGM. Averaged over the 5 year vPro implementation period, the casino will save $38.35 per EGM per year, or 6% of the average cost to serve an EGM.

Casino Operator

- Single Facility with 2000 EGMs

- EGMs on a 5 year refresh cycle with an expected 5 models deployed per year

- Investing in Intel vPro technology for all EGMs will save an average of $38 per EGM per year in support costs ($75 per EGM in year 5)

- The NPV of the investment is $238,462 assuming a 12% discount rate

FIGURE 4. Financial Benefits of vPro for Casino Operator Example

Discount Rate	NPV for Casino Operator
6%	$300,396
8%	$277,757
10%	$257,188
12%	$238,462

FIGURE 5. Estimated NPV of vPro Implementation for 2000 EGM Casino at Various Discount Rates

For the state lottery operator managing 11,000 gaming terminals across a wide geographic region, replacing all of their lottery terminals with Intel vPro technology enabled devices over the refresh cycle of 4 years realizes an estimated NPV of $841,353[i]. Broken down by individual lottery terminal, this equates to an annual savings of up to $46.71, or 7% of the current average cost to serve an EGM of $650. Savings per device averaged over the 4 year period of the refresh cycle is $27.18 per terminal and amounts to 4% of the current average support cost.

State Lottery Operator

- 11,000 geographically distributed lottery terminals
- EGMs on a 4 year refresh cycle with 4 new models deployed per year
- Investing in Intel vPro technology for all EGMs will save $27.18 per EGM per year in servicing costs ($46.71 per EGM in year 4)
- The NPV of the investment is $841,353 assuming a 12% discount rate.

FIGURE 6. Financial Benefits of vPro for Lottery Operator Example

Discount Rate	NPV for Lottery Operator
6%	$996,860
8%	$940,832
10%	$889,135
12%	$841,354

FIGURE 7. Estimated NPV of vPro Implementation 11,000 EGM Lottery Operator at Various Discount Rates

Reducing the Cost of Complexity in EGM Infrastructure

A significant driver of the cost savings highlighted previously is due to a reduction in cost associated with the simplification of the EGM fleets in the two companies. Previous studies have shown that there is a significant IT cost due to complexity of supporting a large number of hardware and software configurations throughout the IT infrastructure of an organization[iv]. New models added to existing EGM fleets incrementally contribute to a rise in hardware-related support costs as well as software qualification and deployment costs.

The cost of this complexity is acutely felt in the gaming sector because of long EGM life cycles and demand for game variety. Wipro's research shows that EGM life cycles are in the range of four to five years, and typical gaming organizations deploy between four to five models from multiple vendors every year.

Large casinos are particularly susceptible to having very high complexity in their EGM infrastructure due to the need to give patrons a diverse selection of games to play. Rights to popular games are often held by particular vendors. This results in a need to support machines from multiple vendors. The complexity is further compounded by the hardware incompatibility between EGMs from different vendors as well as the software needed to manage them. There is a large cost associated with maintaining technical support to this multitude of different systems.

This scenario makes a very good case for standardizing on flexible, Intel vPro platforms. A closer look at the representative casino model reveals nominal savings of $490,360 prior to accounting for implementation costs. 36% of this ($174,815) is generated from the simplification of the EGM infrastructure.
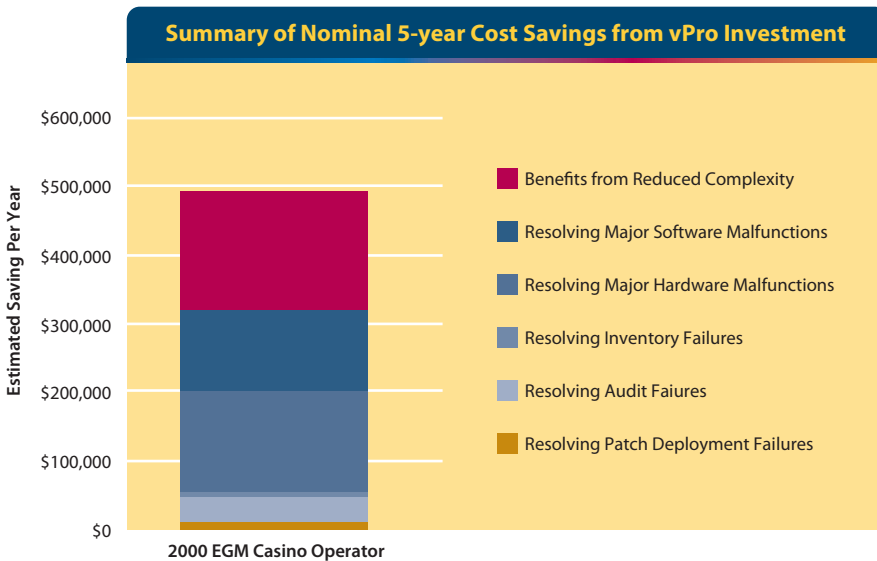

FIGURE 8. Reducing the cost of EGM management complexity through standardization on the vPro platform can provide significant cost savings

Reducing Electric Utility Costs with Energy Efficient Intel® Core™2 Duo Processors with vPro

In addition to the cost of EGM support and management, casinos incur substantial energy utility costs from operating these devices. Casinos are open and running their gaming devices constantly, and changes in the power consumption of the EGM fleet can dramatically alter the amount of electricity used by the gaming floor over the period of a year. By refreshing older EGMs with EGMs using energy efficient Intel® Core™2 Duo Processors with vPro, the casino operator can significantly lower annual energy utility costs.

Take the case of a 2000 EGM casino that is currently using machines with processors and chipsets that dissipate 100W, a typical value for a processor platform that is 3-5+ years old. Assuming the casino runs its EGMs 24/7, replacing these existing systems with machines using low power Intel® Core™2 Duo Processors with vPro drawing 35W of power results in the reduction in power consumption of 569kW hours per year. Using the 2008 national average price of electricity[viii], the reduction in energy consumption of 569kW hours per year translates to a reduction in energy cost of $57 per EGM per year[ix]. By applying this energy savings to the entire vPro refresh plan, the casino will save an estimated $341,640 in energy costs over 5 years.

Further savings of electricity consumption can be realized through the use of Intel® SpeedStep™ Technology found in vPro-compatible Intel components. When EGMs with SpeedStep are not being used for gaming, the processors and other components are placed in an "idle" state that draws a further 25W less power[xi]. If the 2000 EGMs in the representative casino example are being actively utilized for gaming by customers for an average of 50% of the time, the casino operator can reduce power consumption by an additional 110 kW hours annually for each EGM[xii]. The total savings from Intel® Core™2 Duo Processors using Speedstep across the organization amounts to $65,700 over 5 years.

Aside from the reduction in the amount of energy drawn by the processor components inside of EGMs, there is an associated reduction in the amount of energy required to cool the air inside the casino room to counteract all of the heat being vented by the systems. Assuming that a casino floor with many gaming machines looks like a conventional server data center in terms of its thermal needs and energy consumption, the overhead energy costs for air conditioning to cool the gaming floor are equivalent to approximately 50% of hardware energy consumption[xiii]. Following this ratio, a reduction in EGM power consumption of 4 Million kW hours through the use of low-power processors and Speedstep technology would allow the casino operator to reduce air conditioning energy use by 2 Million kW hours over 5 years[xiv]. The result is a savings of $203,670 in overhead energy costs over this period.

The three power savings sum to a combined $611,010 reduction in electric utility expenses for the casino operator with 2000 EGMs. This significantly increases savings enabled by Intel® Core™2 Duo Processors with vPro as can be seen in Figure 9.
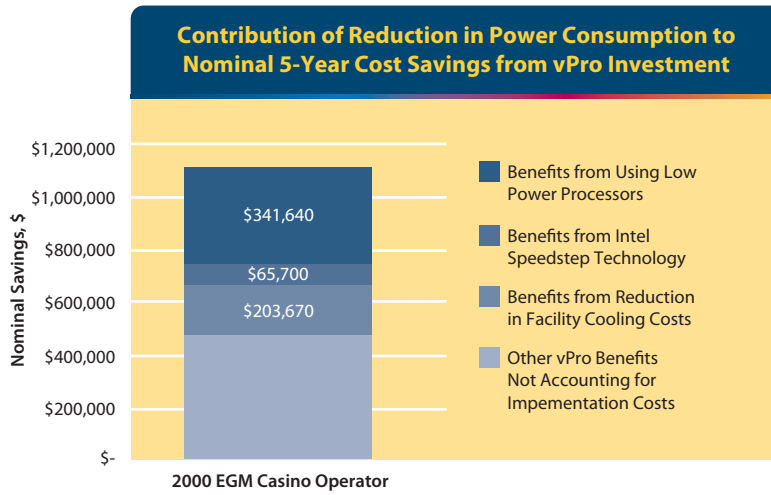
FIGURE 9. Reduction in Power Consumption by using Energy Efficient Intel® Core™2 Duo Processors with vPro Increases vPro-enabled Savings Significantly

While savings from reduced EGM power consumption translates to financial gain for the casino operator, this story is different for the state lottery operator example where the terminals are distributed thinly across many locations that the lottery organization does not own or operate. Wipro research has also shown that lottery terminals are powered on for an average of 16 hours per day, providing less opportunity for power savings than casino gaming machines which are powered on more. As a result, replacing older, power hungry lottery terminals with newer vPro-enabled ones and enabling Intel SpeedStep technology will realize small power savings benefits for individual storefronts where the terminals are located. However, replacing 11,000 lottery terminals can collectively save the state 12.4 Million kW hours in energy consumption over four years. If the cost of 1 kW hour is 10 cents as was the national average price of electricity in 2008, the lottery operator can create $1,244,650 in energy cost savings across the state through the use of low power, vPro-enabled EGMs.

Reducing Potential Revenue Lost from EGM Malfunctions through Intel® vPro™ Technology-Enabled Asset Visibility and Operational Excellence

As the point-of-sale devices for gaming organizations, EGMs serve as critical interfaces to provide entertainment to customers and collect revenue in return. A malfunctioning EGM cannot entertain customers or collect revenue, and there is an opportunity cost associated with downtime in these machines in the form of lost revenue or even lost customers. The advanced management capabilities of Intel vPro Technology can directly address this scenario.

Wipro's research shows that an average lottery terminal has approximately 6 hours of annual downtime while slot machines average 27 hours per year. For the state lottery operator use-case, this translates to 66,000 hours of annual downtime across the entire lottery system. With each of these hours of downtime, there are potential transactions that could be taking place which are prevented due to malfunctioning terminals. If we apply the assumption that a lottery terminal earns an average of $24 per hour[v], the total potential loss of revenue due to terminal downtime is $1.575 Million per year. Naturally the earnings of a terminal vary greatly by time of day and proximity to the draw; should a terminal break down during peak demand, losses could be significantly higher.

Intel vPro technology can reduce this opportunity cost through increased asset visibility and the ability to efficiently resolve many issues down the wire. With Intel vPro technology-enabled terminals, the lottery operator is able to monitor the health of its assets, even if these terminals have hardware or software problems, allowing faster responses to terminal malfunctions. Operators can further reduce terminal downtime by querying the terminals and taking remedial action down the wire. Even if the terminal cannot be fixed remotely, the field technician will be equipped with specific knowledge on the problem from the remote, Intel vPro technology-enabled diagnostics.

Prior studies on Intel vPro technology have shown that Intel vPro technology can reduce asset downtime by at least 60%[iv]. With this increase in asset visibility and the ability to fix more lottery terminals remotely, $945,000 in potential revenue loss can be eliminated.

State Lottery Operator	
Total Annual Revenue from Lottery Tickets	$2.3 Billion
Hours of Operation	24 hours, 365 days per year
Potential Revenue Loss per Hour	$24
Average Hours of Downtime per EGM per Year	19 hours
Total Revenue Loss for Lottery Terminal Operators per Year	$1.575 Million
Reduction in Revenue Loss through Elimination in 60% Downtime through vPro Implementation	$945,000

FIGURE 10. **vPro can significantly reduce opportunity costs associated with EGM downtime**

ALIGNING INTEL® VPRO™ TECHNOLOGY WITH CORPORATE VALUES FOUND IN THE GAMING SECTOR

While the financial benefits of Intel vPro technology are easy to assimilate into business plans, it is important to note that there are additional benefits of Intel vPro technology enabled EGMs which can be of significant value to gaming organizations. Wipro PSA interviewed gaming organizations on the important criteria in making EGM investment decisions and found that customer satisfaction through personalized gaming was the most important factor. Also rated highly were increased flexibility through remote provisioning, improved uptime, and increased asset visibility and security. Wipro has mapped these statements to the following values that gaming organizations adhere to:

- Customer loyalty through customer satisfaction and customer intimacy
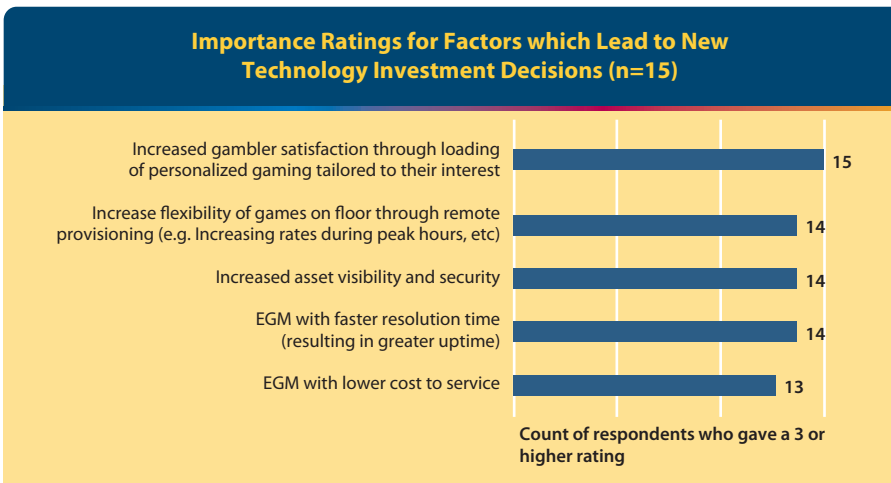- Operational excellence
- Security

Importance Ratings for Factors which Lead to New Technology Investment Decisions (n=15)

Factor	Count
Increased gambler satisfaction through loading of personalized gaming tailored to their interest	15
Increase flexibility of games on floor through remote provisioning (e.g. Increasing rates during peak hours, etc)	14
Increased asset visibility and security	14
EGM with faster resolution time (resulting in greater uptime)	14
EGM with lower cost to service	13

Count of respondents who gave a 3 or higher rating

FIGURE 11. Customer satisfaction, operational excellence and security are all important considerations for gaming organizations when making new technology investments (factors are rated on a scale of 1-5 where: 1 – no influence on decision, 2 – slight influence on decision, 3 – significant influence on decision, 4 – a lot of influence on decision, 5 – most important factor in decision)

Intel vPro technology can be a basic building block of a gaming operator's roadmap to enhance the performance of these three key attributes.

Increasing Customer Loyalty and Satisfaction through Intel® vPro™ Technology

Gaming organizations are focused on establishing and retaining customer loyalty. Many use analytic tools to study customers' habits in a drive to identify and better serve these customers. Wipro's research found that nine out of fifteen gaming organizations currently use analytics while a further 5 planned to implement some form of customer analytics within the next 12-18 months.
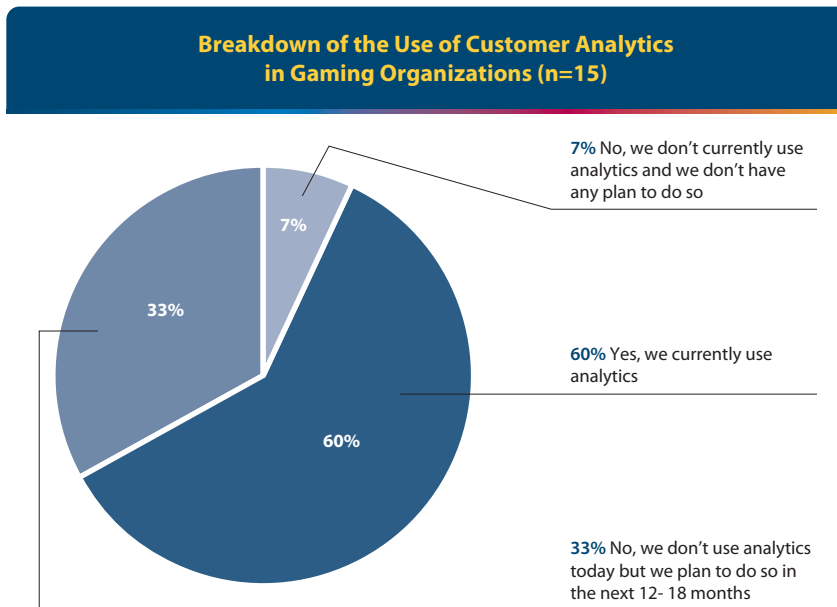
**Breakdown of the Use of Customer Analytics
in Gaming Organizations (n=15)**

7% No, we don't currently use analytics and we don't have any plan to do so

7%

33%

60% Yes, we currently use analytics

60%

33% No, we don't use analytics today but we plan to do so in the next 12- 18 months

FIGURE 12. **Almost all gaming organizations surveyed already use or plan to
use customer analytics in the near future**

By using EGMs with Intel vPro technology, gaming organizations can give customers cutting edge entertainment while reducing visible problems and downtime. This technology also allows operators to run the many customer-centric applications that need to be run on EGMs, such as multiple games and customer analytics applications, with reduced risk of machine malfunctions that can have negative effects on the customers' gameplay experience.

Today's server-based and server-supported EGMs have the ability to load multiple games to meet customer needs while giving operators the ability to create a flexible gaming floor that can easily be controlled from a management console. Consequently, gaming floors can be configured in response to customer demands eliminating the need for manual machine retrofitting. The enhanced EGM management capabilities of Intel AMT allows operators to push software changes down the wire, resulting in an improvement in management efficiencies as well as a more sophisticated and engaging gaming experience for players.

Intel VT empowers electronic gaming machines to run multiple applications with increased reliability. Intel VT allows for simultaneous execution of multiple applications in silos, isolating game applications from other essential applications such as accounting and customer analytic software. Through this isolation, gaming applications can continue to run and provide entertainment to customers even if other applications have malfunctioned, ensuring a happier customer experience and enabling operators to run applications such as customer analytics with more confidence.

Standardization on Intel vPro technology also allows for remote diagnosis and service of EGMs, regardless of the geographic location of the delinquent asset. For gaming organizations with multiple facilities, the benefits that Intel vPro technology can provide to the customer experience can be applied across all of their vPro-enabled facilities.

Intel® vPro™ Technology Improves IT Performance through Operational Excellence

Aside from TCO benefits, Intel vPro technology allows companies to meet and exceed the performance expectations set for IT departments. As shown in Figure 13, participants in Wipro's research identified "time to resolution" and "customer satisfaction" as the top two important metrics used to gauge their support services.
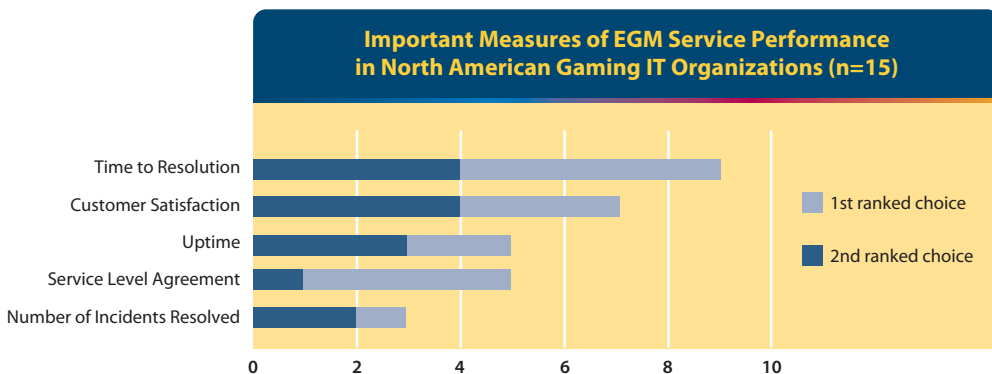
Important Measures of EGM Service Performance in North American Gaming IT Organizations (n=15)

FIGURE 13. Time to Resolution and Customer Satisfaction are the two most important performance metrics for Gaming IT organizations

Reducing Time to Resolution

Intel vPro technology-enabled EGM fleets can reduce "time to resolution" for hardware and software failures over traditional EGMs. This is due to Intel vPro technology's ability to use the out of band communication channel to remotely test and repair these assets. Even if a manual field fix is required, technicians can more efficiently resolve issues with problematic machines because they will be armed with the results of Intel vPro technology-enabled remote diagnostic tests. Furthermore, this operational efficiency can translate into material value for the gaming organization by reducing the need to over-provision for electronic gaming machines.

In order to accommodate for breakdowns of gaming devices during times of peak demand, many gaming operators overprovision gaming devices. Wipro's research found that organizations deploy around 12% extra gaming devices to account for these breakdowns. Referring back to our representative casino example, this means that approximately 220 devices out of the total of 2000 have been over-provisioned. If we estimate that the footprint of a single EGM is 21" by 25"[vi], the over-provisioning accounts for approximately 800 square feet of gaming floor space. While previous studies on Intel vPro technology have shown at least 60% reduction in asset downtime is due to software and hardware issues in an enterprise IT environment, assuming that vPro-enabled EGMs can reduce the number of over-provisioned EGMs by a modest 10% gives the casino the ability to provision 22 fewer EGMs and utilize 80 square feet of the gaming floor as space for other forms of revenue generation. Assuming that an average EGM costs $10,000, this means that a casino can save $220,000 in EGM capital expenditures[vii] without seeing any reduction in gaming revenues; indeed it may see additional revenue from alternative utilization of the extra floorspace.

Increasing Customer Satisfaction

With Intel vPro technology, active management of EGMs can occur without input from the gaming floor and may increase satisfaction amongst stakeholders in the EGM eco-system. For example, Intel vPro technology allows gaming organizations to take proactive measures to protect their gaming systems with AMT-enabled alerts that identify issues before they escalate into major problems.

Another example is the ability of IT organizations to increase stakeholder satisfaction by remotely powering down EGMs. Lottery operators see particular value in this. Lottery terminals are placed in many retail stores, and can only be used when the retailer is open for business. However, the retailer typically cannot power down a lottery terminal.

Wipro's research discovered that at times retailers unplug the terminals from their power sources in order to save on electricity. This is detrimental for both lottery operator and retailer. The lottery operator cannot remotely access lottery terminals when it is unplugged to install security patches and updates and the retailer must go to the length of pulling the plug on a lottery terminal every night in order to minimize the waste of electricity. By deploying Intel vPro technology enabled lottery terminals, lottery operators can remotely power down lottery terminals during closed hours, ensuring that all terminals are properly updated to avoid bugs and breaches. Concurrently, retailers can keep the terminals from drawing power when the retailer is closed.

Improving EGM Security with Intel® vPro™ Technology

The three major components of Intel vPro technology all provide security features to maintain the integrity and reliability of electronic gaming machines.

Intel AMT makes it possible for gaming IT departments to take preventative action by keeping systems current with the latest security updates. Intel AMT's out-of-band communication capabilities make it possible for security patches to be deployed even to systems that are turned off or those with malfunctioning software elements. In the actual event of a security incident such as a worm or virus attack, Intel vPro technology enables gaming IT staff to reconfigure the ports and network connectivity of the compromised EGM, isolate it from the network, take steps to remotely resolve the issue, and then bring it back onto the network. Without Intel AMT, this process involves significant manual effort, but with the technology IT organizations can respond quickly and effectively from a remote management console.

There is a lot of pressure placed on gaming IT departments to maintain the integrity and security of sensitive, customer-related information stored on their electronic gaming devices. When EGMs with Intel TXT are powered on, the configuration in which they are launched is measured and can be verified from a remote management console, ensuring that there has been no tampering of EGM subsystems.

The multi-level operation capabilities provided by Intel TXT and the virtualization capabilities of Intel VT allow for the separation and strict communication management between applications for modern EGMs that run many applications simultaneously. The compartmentalization of various applications allows for any security incidents that may be occurring in one application from corrupting the execution of other programs.

CONCLUSION

In recent years, gaming organizations have come under pressure to offer electronic gaming machines with increasing sophistication to satisfy player needs. By deploying gaming machines based on Intel® Core™ 2 Duo platforms with Intel® vPro™, gaming IT departments can leverage specific technology features and functionality to minimize total cost of ownership while providing an optimal gaming experience to customers. Wipro's analysis of the impact of deploying Intel vPro technology enabled systems concluded that a breadth of financial and operational benefits accompanying an Intel vPro deployment far outweigh the costs.

To create concrete cost savings, prevent loss of potential revenue, and increase the performance of EGM support services, IT executives within gaming organizations should consider the deployment of gaming machines based on Intel vPro platforms as a core component of their EGM refresh roadmap.

APPENDIX

Methodology

This study builds on previous work conducted by Wipro PSA consultants to assess the financial and business impacts of Intel vPro technology.

In 2006 and 2007, Wipro PSA consultants and technical architects interviewed CIOs, IT directors, and senior IT managers at 160 companies in North America, Europe and Asia. Wipro PSA selected companies to represent a full spectrum of industries, management practices and user distributions, and a good mix of desktop and notebook systems. Based on the aggregate findings, Wipro PSA created the algorithms for an ROI model (available at http://www.intel.com/business/business-pc/roi/demo.htm).

In 2008 Wipro PSA consultants gathered data from IT decision makers and practitioners in 15 gaming IT organizations to understand how costs and activities of managing EGM environments differ from that of enterprise IT departments, and then adapted the impact of deploying Intel vPro technology accordingly. The environment that EGMs operate in, their security requirements, the applications they run, and the use they are put to differs significantly from enterprise IT environments. This whitepaper and the ROI model for gaming organizations is therefore targeted specifically to calculate the ROI of investing in Intel vPro technology enabled EGM systems, and the costs and benefits are specific to gaming segments.

In order to get a complete picture of the EGM management eco-system, Wipro targeted the following segments in their assessment of the impact of vPro technology on the gaming sector:

- Casino operators (Harrah's Entertainment, Pinnacle Entertainment, etc.)
- Racetrack casinos (Monticello Raceway, Saratoga Gaming & Raceway, etc.)
- Lottery operators (GTECH, Intralot, etc.)
- State gaming commissions (Missouri Gaming Commission, etc.)
- Gaming system vendors who provide support to electronic gaming machines (Aristocrat, etc.)

ROI Calculator Assumptions and Algorithms

Savings Generated by Intel vPro Technology

In this study, Wipro analysts compared the standard set of support capabilities and related IT activities against the capabilities and activities associated with EGM systems with Intel vPro technology. Based on this comparison, researchers concluded that Intel vPro technology can mitigate the cost and labor requirements required to investigate and resolve:

- EGM deployment failures
- Application deployment failures
- Patch management failures
- Audit failures
- Inventory failures
- Major hardware malfunctions
- Major software malfunctions
- Security incidents

Effort and costs are reduced by:

- Eliminating and minimizing manual tasks, such as gaming floor visits
- Reducing indirect IT support costs due to the lowering of overall EGM complexity, realized by migrating to Intel vPro processor technology-enabled EGM systems. We have found that there are two complexity factors which are taken into account by the ROI calculator
    - REFRESH FACTOR - In the ROI model, we account for the refresh cycle impact on failure rates. Longer refresh cycles mean markedly higher failure rates for both major and minor application deployments. EGM systems which are often kept for more than 4 years are subject to higher maintenance costs as software and hardware failure rates increase, and compatibility with newer applications decreases.
    - HARDWARE CONFIGURATION FACTOR –Previous Wipro/Intel research has shown that there is a correlation between IT costs, and the number of hardware configurations being managed.   Simply put, there is a price to be paid in support costs for having multiple EGM systems from multiple vendors, and an efficiency saving to be gained from reducing the number of hardware configurations.
- Increasing the capabilities provided by automated desktop management and security software

The projected net benefits of deploying EGM systems with Intel v Pro technology was obtained by balancing the one-time and per-EGM system implementation costs against yearly savings. We model EGM upgrades on a standard refresh cycle rather than a forklift upgrade at one time, hence the yearly savings increase as the refresh cycle proceeds.

Implementation Costs

Both one-time and per-EGM implementation costs have been included in our analysis:

One time implementation costs are incurred during the first year of a gaming organization moving to Intel vPro enabled EGM systems and include:

- The cost of training IT staff to take advantage of vPro including staff and trainer costs
- The cost of staff and consultants associated with re-engineering IT installation and support processes with Intel vPro specific activities
- Engineering costs to integrate Intel vPro technology features and capabilities with existing EGM management tools

Per-EGM system implementation costs are incurred as the EGM systems are deployed and include:

- OEM Intel vPro technology charge – additional premium charged by OEMs for Intel vPro technology-based EGM systems
- Configuration cost – additional cost of configuring EGM systems with Intel vPro technology

It is assumed that there is no additional license charge by Independent Software Vendors for EGM system management / security software to support EGM systems with Intel vPro technology, as this support will be included in their normal release updates, although if such costs are incurred the ROI calculator can capture those costs and include them in the analysis.

GLOSSARY OF TERMS

Term	Definition
Electronic Gaming Machines (EGMs)	Any mechanical or electrical game of chance such as slot machines, lottery terminals, video bingo, video pull-tabs and video poker machines.
Slot Machine	Any mechanical or electronic device in which outcomes are determined by a random-number generator located inside the terminal. For the purposes of this survey, slot machines encompass bingo, pull-tab and poker machines as well.
Lottery Terminals	A game of chance played on a terminal that is networked and can be monitored, controlled, and audited via a lottery network.
Racino	A combination of a race track and casino. Racinos usually only offer slot machines as part of its casino.

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i   NPV calculation assumes a 12% discount rate

ii   See Wipro whitepapers *Measuring the Value of Intel® Core™ 2 Processor with vPro™ Technology in the Enterprise* and *The Benefits of Intel® Centrino Pro Processor Technology in the Enterprise*, available for download from Intel.com/vPro

iii   For more detailed information on Intel AMT, visit www.intel.com/technology/platform-technology/intel-amt/ and http://developer.intel.com/technology/advanced_comm/index.htm?iid=nc+iaptcea

iv   See *Measuring the Value of Intel® Core™ 2 Processor with vPro™ Technology in the Enterprise* available for download from www.intel.com/vpro

v   Average earnings of $24 per hour was based on the Michigan State Lottery which has approximately 11,000 terminals generating $2.3 Bn annually in lottery ticket sales. $24 per hour was calculated by assuming that each terminal operates 24 hours per day, 365 days per year and averaging the total lottery revenue across total annual selling hours for all terminals (# of terminals * 365 days * 24 hours). For more financial information on the Michigan State Lottery, see Com prehensive Annual Financial Report which can be found at http://www.michigan.gov/documents/lottery/BSL-L-CAFR2008_260107_7.pdf

vi   Based on specifications of IGT's REELdepth S MLD model

vii Based on an average price of $10,000 per EGM gathered through anecdotal evidence during Wipro PSA primary research of North American gaming organizations

viii Average national price of electricity is 10 cents per kWhour and is based on data from The Energy Information Administration found at http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

ix Mobile processor based Intel vPro Technology enabled energy savings for EGMs is calculated using the following formula: [(Energy consumption of EGMs being replaced in kW)-(Energy consumption of vPro EGM in kW)] * (average number of hours that EGMs are powered per day) * (average number of open days per year) * (cost of electricity in kW hours). This paper assumes that energy efficient vPro CPU and Motherboards consume 35W of electricity, the components in the older EGMs being replaced consume 100W, slot machines in the casino are on for 24 hours per day for 365 days per year, and the cost of electric utility is $.10 per kW hour.

[x] For more detailed information on Intel SpeedStep Technology, visit www.intel.com/technology/product/demos/eist/demo.htm

[xi] Power Consumption for Intel vPro components in SpeedStep "idle" state based on specifications found at http://download.intel.com/design/mobile/datashts/32012001.pdf as well as data provided by Intel

[xii] Reduction in power consumption from SpeedStep induced "idle" state assumes that prior EGMs do not have an "idle" state for processors and motherboard components that provide significantly lower energy usage. SpeedStep savings per EGM is calculated using the following formula: [(Energy consumption of vPro EGM in kW)-(Energy consumption of vPro EGM in SpeedStep "idle" in kW)] * (average number of hours that EGMs are powered per day) * (average number of open days per year) * (cost of electricity in kW hours).

[xiii] The Natural Edge Project (July 2007), Whole System Design Suite: Taking a whole system approach to achieving sustainable design outcomes, Engineering Sustainable Solutions Program, Australia. http://www.naturaledgeproject.net/documents/ESSP/TDP/WSDS/ESSP%20WSDS%20-%20Unit%208%20Electronics%20and%20Computer%20Systems%20(Worked%20Example).doc

[xiv] 2 Million kW hours in air conditioning energy savings is 50% of the sum of 3.4 Million kW hours in reduced EGM power consumption using low power vPro components and 650,000 kW hours in reduced EGM power consumption from SpeedStep enabled "idle" states