Executive Snapshot

Production server virtualization impact on IT service management procedures and controls

Research Report Summary

This executive snapshot is a summary of the *IT Process Institute server virtualization maturity study*. Recommendations in the research report are based on a post-implementation analysis of data from 323 IT organizations. The study's goal was to better understand the impact of virtualization on datacenter operating practices. Analysis and resulting recommendations are not product focused. The research report identifies baseline maturity procedures and controls that should be considered to reduce risk as organizations virtualize business critical systems. The report also highlights higher maturity procedures and controls recommended for organizations moving beyond consolidation objectives.

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Advancing the Science of IT Management

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About the Author

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About the IT Process Institute

The IT Process Institute is an independent research organization that exists to advance IT management science through independent research, benchmarking, and development of prescriptive guidance. Our vision is to identify practices that are proven to improve the performance of IT organizations. www.itpi.org

Introduction

The use of server virtualization has moved beyond test and development environments. Many IT organizations are aggressively consolidating production systems to reduce server footprint and related power and cooling costs. Those that are now comfortable with the technology are virtualizing business critical systems, and are consolidating as many servers as is feasible. They are now looking to leverage their investment in technology and expertise to achieve other virtualization related objectives such as high availability, disaster recovery, as well as building dynamic computing environments to optimize resource utilization and increase business agility. Gaining experience with the rules, policies, and automation that enable a dynamic virtual resource pool is also a step toward tapping cloud computing resources in a dynamic environment.

The IT Process Institute conducted a study of server virtualization practices and controls to find out what procedural changes IT organizations make to optimize benefit and reduce risk in production datacenter environments.

We conducted 15 executive interviews to identify what procedures and controls were modified to manage virtualized servers. Interviews revealed a range of production procedural changes from; a) not much changed due to a strong existing foundation of production controls, to b) controls were added in a number of areas in order to get comfortable virtualizing business critical systems. Other organizations have not yet moved into production in part due to concerns about a lack of operational best practices.

In general, IT executives felt that heavy use of virtualization was the "new normal" state of datacenter management, and were curious about what other organizations have done to optimize benefit and minimize risk of this powerful technology.

Those who have not yet virtualized business critical systems in production asked "What operational procedures should we implement to get comfortable moving virtualization into production?" Those aggressively pursuing consolidation objectives asked "What changes to operating procedures and controls should I consider as we pursue higher maturity objectives and use virtualization in a more dynamic environment?"

To determine what virtualization procedures and controls are frequently implemented to manage the technology, we developed a web-based survey based on what we heard in the interviews, and collected data from 323 IT organizations primarily based in North America in October 2008.

We found that 72% of study participants are aggressively virtualizing production servers. The other 28% are virtualizing servers outside production environment, with 44% of them tentatively deployed in production.

Those aggressively virtualizing production servers are pursuing a mix of objectives including server consolidation (19%), high availability and disaster recovery (22%) and dynamic resource optimization (31%).

Of the 72% of study population aggressively pursuing production virtualization, 58% had at one point paused adoption to review security and operating risks, in order to get comfortable with new technology in the production environment. Now, 64% of those aggressively pursuing virtualization initiatives are comfortable virtualizing business critical systems. In fact, 69% have virtualized systems "in scope" for compliance and control audit.

Recommended server virtualization practices

We identified recommended virtualization practices based on statistically significant differences in frequency of use of 8 categories of 51 server virtualization practices between 1) those not yet in production, 2) those pursuing consolidation objectives, and 3) those pursuing higher maturity objectives.

- **Not yet in production** – organizations not aggressively virtualizing production servers average 41% of the 51 tested practices in use.
- **Baseline maturity** – organizations aggressively consolidating production servers average 45% of tested practices in use.
- **High maturity** – organizations that have consolidated servers and are now pursuing high availability, disaster recovery, and dynamic resource objectives, average 69% of tested practices in use.

When we divided the high maturity group into two separate uses cases, we found additional differences in use of procedures and controls.

- **High maturity static** – those organizations pursuing high availability objectives and disaster recovery objectives, where virtualized resource changes are made as an exception to an otherwise static deployment. Failover and disaster recovery responses are initiated manually, or based on policies and rules that trigger move or re-provisioning of virtualized systems.
- **High maturity dynamic** – those organizations pursuing dynamic resource objectives, where policies and rules trigger virtualized resource cloning and moving as an automated response to normal expected operating conditions.

Analysis of the differences in frequency of use of various virtualization procedures and controls between different maturity groups reveals recommended server virtualization practices:

- **Baseline maturity practices** – 11 practices recommended for those organizations consolidating servers and virtualizing business critical systems in the production environment.

Due to the ease and speed of virtual server provisioning, change process discipline should be strengthened. Provisioning processes should be defined and enforced, and use standardized build images. Due to increased potential impact of host configuration changes, host administrator access and maintenance procedures should be standardized and enforced. And more comprehensive performance and capacity management measures should be implemented to manage service levels of multiple virtual machines and applications consolidated on a single host.

- **High maturity static practices** – 25 recommended practices for those organizations expanding beyond server consolidation to high availability and disaster recovery objectives. Virtual environments are still primarily static when pursuing these objectives.

  Moving or re-provisioning virtual resources in response to exceptional conditions is often manual, or may be automated based on policies and rules. However, quickly responding to performance impacting events requires a higher degree of configuration standardization and control. Speed and standardization require higher levels of virtualization training and process control. Provisioning processes should be standardized using an access controlled library of approved build components. Builds should be tested to verify that virtual machines can be re-provisioned consistently. However, a "trust but verify" approach should be used to ensure change process is followed, and to ensure configuration compliance.

- **High maturity dynamic practices** – 12 recommended practices for those organizations pursuing dynamic resource management objectives. Incremental controls primarily in the area of configuration discovery and tracking, change management, and capacity management.

  Automating the movement of virtual resources within a cluster increases the complexity of considerations needed to codify rules and policies. Targeting criteria, configuration compliance, patch schedule and other considerations should be added to the standard change review process. Changes related to expected virtual environment moves should be added to list of pre-approved changes. Discovery and configuration item tracking requirements are expanded to manage more frequent automated movement of resources and applications. Overall, a level of standardization and high process control and maturity is required to support higher levels of automation.

Overall, these practices should be considered by IT executives pursuing various virtualization objectives. These practices should also be reviewed by IT audit as part of governance risk and compliance evaluation of virtualization impact on IT control requirements.

Impact on performance

Analysis of soft outcomes measures reveals that both baseline and high maturity groups score very high on the measure that indicates virtualization making production quality and service management efforts easier.

More specifically, those organizations that have moved beyond consolidation objectives have higher levels of performance in key areas of reduced sprawl and configuration variance, increased use of automation, and reduced operational risk.

Those pursuing dynamic resource objectives have significantly higher performance in the areas of, increased speed and agility, fewer "war room" responses to service outages, as well as reduced audit effort.

Analysis of hard performance measures reveals a statistically significant correlation between use of recommended practices and various hard outcome measures.

- Baseline maturity group – the use of host access controls predicts higher levels of availability as measured by minutes of downtime per month. Host configuration changes are a potential single point of failure for multiple virtualized systems. Controlling access and clearly documenting maintenance procedures helps insure availability of virtualized systems.

- High maturity group – the use of provisioning automation and discovery practices predicts lower release rollback rate. Ensuring that systems are in a known configuration state helps ensure release procedures work as intended. Data also suggest the use of capacity management practices predicts better service support performance with measures such as the rate of incidents resolved within service level agreement limits, and mean time to repair large outages.

- High maturity dynamic – the use of provisioning automation and configuration discovery practices predicts a higher rate of production systems that match target configuration. Configuration compliance with desired configuration state helps ensure automated provisioning and resource expansion work as intended.

Other environmental factors

High maturity organizations measure a higher percentage of changes tested before release (average 81%), and more frequent use of a build library and automated provisioning. These measures suggest that effectively managed provisioning, either manually or automated, helps achieve a more tightly consistent environment.

Baseline and high maturity organizations measure similar percentage of servers virtualized as part of hardware refresh (average 51%), rate of incidents escalated to L2/L3 virtualization specialists (10%), and percent of datacenter assets tracked with a unique identification number (75%). There was no significant variation among other measures such as patch frequency, discovery scanning frequency, planned maintenance hours.

Recommendations

The benefits of server virtualization are significant. However, moving server virtualization in production environments requires changes to operating procedures and controls in order to optimize benefits and manage operational risk.

Those organizations with a solid foundation of operating best practices such as ITIL, may only need minor modifications to existing procedures and controls to aggressively pursue server consolidation objectives. Those organizations that don't have a strong set of operational controls should consider implementing or strengthening key IT processes as part of server consolidation initiatives.

Those organizations moving beyond initial consolidation efforts to high availability and disaster recover objectives, should consider additional procedures and controls that incrementally improve a wide range of operating best practices.

Those organizations using virtualization to pursue dynamic resource management objectives, have the most comprehensive procedure and control requirements. However, the expanded requirements generally represent a level of mastery of lower maturity practices, with increased process consistency and more adoption of automation.

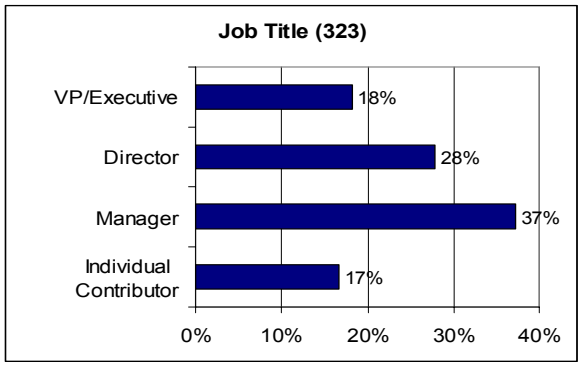
Overall, those responsible for datacenter operations and performance should work with server administrators and virtualization specialists to consider implementing the recommended practices that match their server virtualization objectives.

IT audit can also use these lists to evaluate the impact of production virtualization on the audit checklist, as part a governance risk and compliance review process.

Study demographics

Data was collected from 323 IT organizations by custom research firm HANSA/GCR. A web-based survey, based on findings from 15 executive interviews, was used to collect data in October 2008. The survey respondents were invited from HANSA/GCR North American IT executive interview panels.

46% of survey respondents are IT Executive, Vice President or Director level job titles.



A broad range of company revenues (or operating budgets if public agency) are represented:

- 26% less than $500M
- 18% between $500M and $1B
- 27% $1B and $5B
- 29% from companies with revenue >$5B.