Gartner

Research

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Key Issues for Cloud-Enabled Application Infrastructure, 2009

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Application infrastructure enables the execution of business applications. In the emerging era of cloud computing, cloud-enabled application infrastructure is a technical enabling foundation for "in the cloud" applications.

STRATEGIC PLANNING ASSUMPTION(S)

By 2014, more than 20% of midsize businesses and large enterprises will use cloud-based application infrastructure technology, up from less than 3% in 2009.

ANALYSIS

Topic Definition and Scope

Gartner defines "application infrastructure" as enabling technology for delivering business applications (see "A Summary of Magic Quadrants for Application Infrastructure"). The term application infrastructure, when applied to runtime technologies, is synonymous to middleware. The field includes technologies that are required to support the runtime execution and integration of business applications (for example, application servers, enterprise service bus [ESB] suites, composite application frameworks, business process management [BPM] technologies, message-oriented middleware, and multienterprise and service-oriented architecture [SOA] infrastructure technologies). Development tools that support these runtime capabilities are also part of the application infrastructure layer, but are considered here only in a supporting role and are covered by Gartner fully in our Web and cloud application development research agenda.

In 2007, Gartner initiated research coverage of cloud-enabled application infrastructure, a new use pattern where the application infrastructure technology is designed to be deployed in the cloud. This model of software use is sometimes referred to as "software-as-a-service (SaaS)-enabled," "on-demand," "off-premises" or "as a service" — all related, but not exactly equal, notions. The cloud computing use pattern for application infrastructure continues to emerge and evolve. Some patterns are offered as products for cloud service providers, some are deployed in the cloud by the providers and offered as a service to service consumers, and some are used to enable higher-level (application) cloud services, and as such are running in the cloud but are not offered as a service.

Although the function of an application infrastructure product offered on-premises or off-premises is conceptually the same, there can be significant technical and business differences demanded by the different patterns of execution in the two models. Cloud-enabled application infrastructure includes capabilities specifically demanded by the cloud-computing use patterns, including support for:

- Multitenant model of elastic resource allocation
- Tenant-aware, fine-grained control of computing resources
- Tenant-aware, fine-grained tracking and billing for resource use
- Extreme transaction processing (XTP)-grade performance characteristics
- Global-class interoperability and access models
- Tenant-aware provisioning, management, monitoring and error recovery procedures
- Tenant-aware protections of security, privacy, integrity and service-level agreement levels
- Tenant-aware configuration, customization and version control

Elasticity of computing resources is fundamental to cloud computing. A system with no resource elasticity is not a cloud system. Computing resources are elastic if they are allocated to applications on-demand and in required quantities, then deallocated as the need subsides, and reallocated to other applications as requested. An application uses (and pays for) only the resources it needs and is assured, within reason, to scale up as far as circumstances demand.

Traditional application infrastructure technology designed for on-premises, single-tenant deployment with no provisions for elasticity can, nevertheless, be used in some cloud deployments. In such cases, other layers of the technology stack are used to provide the essential cloud elasticity of computing resources. Particularly notable is the shared-hardware model of cloud computing, such as Amazon EC2, which uses dynamic virtualization of hardware on behalf of multiple tenants (see "Reference Architecture for Multitenancy: Enterprise Computing 'in the Cloud'").

Simply running an application on an external cloud system infrastructure (such as Amazon EC2) without developing global-class characteristics in business applications (see "Global Class: The Inspiration for Cloud Computing") does not ensure that the resulting application is optimized for the cloud. Building, deploying and managing cloud business solutions will require new tools, skills and best IT practices. The development tools for cloud application projects is a key related area on the Gartner research agenda.

Key Issues in Cloud Application Infrastructure Core Topic

To provide advice and guidance to users and producers of IT solutions as they apply to the evolution of cloud-related application infrastructure, Gartner will address the following Key Issues:

- Which vendors will emerge as the leading solution providers of cloud-enabled application infrastructure and application-infrastructure-as-a-service solutions?
- What will be the prevailing user adoption practices for cloud-enabled application infrastructure technologies and application-infrastructure-as-a-service services?
- How will vendor ecosystems be affected by the transition of application infrastructure to cloud computing?
- How will organizations decide which application infrastructure components to draw from the cloud and which to retain on-premises?
- How will application server technologies, vendors and use patterns be affected by the emergence of application-platform-as-a-service (APaaS) offerings?
- How will integration technologies (ESB, B2B, managed file transfer and data integration), vendors and use patterns be affected by the emergence of integration-as-a-service (IaaS) offerings?
- How are BPM technologies and disciplines affecting cloud services, and how can users apply BPM technologies to improve business processes in the cloud?
- How will XTP technologies, vendors and use patterns be affected by the emergence of XTP-as-a-service options?
- How will database management system (DBMS) technologies, vendors and use patterns be affected by the emergence of DBMS-as-a-service options?

- What sales and pricing strategies will emerge to best reflect the differentiated business environment of cloud-enabled application infrastructure and application infrastructure as a service?

(The research will come from many research communities, because cloud and application infrastructure issues are covered across many research agendas at Gartner. Cloud application infrastructure is a cross-discipline topic for the users of technology and for Gartner.)

Topic Storyline

Leading vendors in application infrastructure markets (such as IBM, Microsoft and Oracle) are also the leading vendors in the software industry. The market is consolidated (the acquisition last year of BEA Systems by Oracle further solidified this trend) and appears poised for long-term stability after years of disruptive changes. Yet, the emerging cloud computing phenomenon threatens to reshuffle the market.

Applications deployed in the cloud run on application infrastructure, the best-fit of which is designed natively to operate in an elastic multitenant cloud-style environment. The current leading application infrastructure products are not designed that way, and the change can be discontinuous. Programming models, tools and support libraries likely will change to accommodate the demands of cloud multitenancy and elasticity.

Native support of cloud computing requires vendors to rearchitect their software and to empower their users to create cloud-optimized applications and services. Combined with the need for new skills, architectures and tools, the emerging cloud computing sets the conditions for a potential market disruption and vendor realignment.

The challenge for software industry giants is to preserve their established businesses, while pursuing leadership in cloud computing. The challenge to newcomers (small or large) is to develop a competitive and sustainable market presence in the face of the massive installed base of the established enterprise software leaders. Technology buyers will resolve this tension over time by choosing between competing cloud-based technologies for their software projects. Making these choices and balancing the many business and technical requirements of these projects will be a challenge.

Typically, traditional application server vendors initially choose the backward-compatible shared-hardware model of cloud computing (see "Reference Architecture for Multitenancy: Enterprise Computing in the Cloud") to preserve their installed base, but the new generation of vendors (including salesforce.com, Google and Relationals) offer the discontinuous, but highly productive and efficient shared-everything, model. The battle between these two approaches to offer application platforms in the cloud will define the competitive evolution of this segment in the next two years, exposing users to the risk of following an unproven technology direction or the risk of underpowering their cloud computing solutions.

BPM suite (BPMS) vendors are embedding their software in external service providers' cloud service offerings, and are working with independent software vendors to cloud-enable their offerings. Companies are just beginning to grasp the need to manage end-to-end business processes that span on-premises solutions, partners and cloud service providers. Cloud BPM technologies will provide a mechanism for making cloud processes visible (and therefore changeable) to workers, partners, suppliers and service providers. BPM technologies in the form of process modeling and automation of collaborative processes are increasingly available via the cloud. They offer opportunities for increasing process efficiencies in a cost-effective delivery model.

Integration moved into the cloud years ago as traditional electronic data interchange value-added networks joined more contemporary IT providers to deliver IaaS. Early IaaS solutions focused on IaaS for traditional e-commerce scenarios (for example, supply chain integration), but contemporary offerings are focused on solving integration problems more directly related to SaaS and other cloud scenarios (for example, cloud service to cloud service, or cloud service to on-premises service integration). For companies that don't want to be bothered with SaaS integration, IaaS is a viable alternative to on-premises B2B software or complex Web application programming interfaces to integrate SaaS functionality with on-premises software. B2B gateway software vendors have traditionally targeted their solutions to companies implementing e-commerce projects. However, this same software, enhanced with multitenant and other cloud capabilities, is finding its way into the data centers of SaaS and cloud computing providers.

Many software vendors providing XTP-oriented application platforms have identified cloud computing as a natural evolution from, and a market warranting providers more visibility than, the ultra-high-end transaction processing niche. This is driven by the natural synergy between the gridlike architecture of many XTP platforms and the elastic scalability requirements of cloud computing. The distributed in-memory caching technology used in many XTP architectures can easily enable a number of cloud computing scenarios. Service providers will use XTP technology to develop cloud services such as SaaS or APaaS, but will not manifest explicitly to cloud service users. However, some XTP platforms will be provided as cloud services, typically in the form of an APaaS, which users will be able to leverage to build transaction processing applications in the cloud. XTP technology and the cloud will increasingly cross-fertilize each other. Some XTP vendors will compete with pure-play and established megavendors in the application infrastructure for the cloud computing market.

Cloud computing will require enablement of the full spectrum of security disciplines, such as identity and access management; network security, endpoint protection; and application security to protect all parties of the cloud computing model. Cloud will bring to life security services. Vendors already offer services capable of applications' remote security testing at development and operation phases, network and database vulnerability analysis, and security intelligence. Many security technologies and services are Internet-based, scalable and rapidly evolving to be cloud-elastic offerings.

DBMS, portals, SOA governance, data integration and many other segments of application infrastructure will continue to emerge in the cloud as more enterprise budgets are directed there, and as the cloud application requirements advance. As is the case for on-premises, large cloud solution providers will attempt to offer a comprehensive end-to-end application infrastructure suite, while smaller innovators will devise leading-edge, differentiated specialized cloud services.

Users will be challenged and served by these technology trends. Most will find a mix of on-premises application infrastructure and cloud application infrastructure services to be the best answer. However, the proportion of the two approaches will differ among users, industries and geographies. It will also change over time. Companies must be prepared to increase the scope of opportunities and evaluate the more difficult technology choices they will face in the next five years. By 2014, more than 20% of midsize businesses and large enterprises will use cloud-based application infrastructure technology, up from less than 3% in 2009.

Gartner research in cloud-enabled application infrastructure and application infrastructure as a service will help organizations that are addressing these challenges identify the most critical industry and technology trends. We will continue to analyze vendor strategies, provide product evaluations and investigate best practices. The research will address the agenda and interests of multiple key roles in IT organizations (see Note 1). This research also will have strong links to a number of other Gartner research agendas (see Note 2).

Highlights of Planned Research

Research in platform middleware will continue to focus on technology trends, vendor strategies, product evaluation strategies and the adoption of best practices, with a particular focus on:

- Analysis of internal architecture and functional requirements that are essential or best practices in delivering cloud-enabled versions of application infrastructure offerings — products or services.
- Who's who reviews of key players and emerging startups in the relevant markets.
- Cost control issues in the context of cloud application infrastructure.
- Emerging trends in architecture and best-use practices of cloud application infrastructure.
- Vendor strategies and user case studies in each of the segments of the cloud application infrastructure, including APaaS, BPMS as a service, IaaS, portals as a service and others.
- Determining how global-class application design impacts various areas of application infrastructure.

Additional research provided by Jess Thompson, Daniel Sholler, Roy Schulte and David Mitchell Smith.

RECOMMENDED READING

The following is a list of relevant research published in various related Core Topic areas in the last 12 months:

"Cloud Computing Services: A Model for Categorizing and Characterizing Capabilities Delivered From the Cloud"

"Key Attributes Distinguish Cloud Computing Services"

"Key Issues in Enterprise Portals, 2009"

"Predicts 2009: Platforms and Integration Middleware Move Into the Cloud"

"Predicts 2009: Cloud Computing Beckons"

"Predicts 2009: Software as a Service Gains Traction"

"The Role of ESB Suites in Implementing and Integrating With Cloud-Based Application"

"Reference Architecture for Multitenancy: Enterprise Computing 'in the Cloud'"

"Windows Azure Completes the Microsoft Platform Triangle"

"Q&A for FTP Replacement and Enhancement"

"SaaS Integration: How to Choose the Best Approach"

"Seeding the Cloud: B2B Flexibility Drives SaaS Adoption"

"GigaSpaces Aims XTP at the Masses and the Cloud With XAP 6.6"

"Diving Deeper Into the MFT Suite Market, Market Segments and Scenarios"

"Magic Quadrant for Horizontal Portal Products"

"Impact of SaaS in Business Process Management, 2008"

"Case Study: Japan Post Improves Customer Service Effectiveness With SaaS and APaaS"

"Cloud, SaaS, Hosting and Other Off-Premises Computing Models"

"The Impact of SaaS on Application Servers and Platforms"

"Magic Quadrant for Managed File Transfer"

"Enabling Transactions 'in the Cloud' Through Extreme Transaction Processing"

"Enterprise Portals in the Cloud"

"Lombardi Makes BPM More Consumable"

"Introducing SaaS-Enabled Application Platforms: Features, Roles and Futures"

Note 1
IT Organization Roles Targeted by Cloud-Enabled Application Infrastructure Core Topic Research

- CIOs
- IT architects and planners
- Members of SOA excellence centers, including the metadata repository and service registry administrators
- Web engagement planners and managers
- Application managers/directors of applications
- Application development managers
- Integration managers/integration competency center managers
- Multienterprise (B2B) architects, managers and planners
- Packaged application implementation managers
- Application architects
- Integration architects
- Application developers
- Integration specialists
- Database administrators and data architects
- Other roles involved in application development, packaged application deployments, platform migrations or software platform strategic deployments

Note 2
Links to Related Key Issue Research

Platform middleware research relates to the following topics:

- Application development tools
- Integration middleware
- Platform middleware
- Multienterprise (B2B)
- SaaS
- Cloud computing
- Utility computing
- Portals
- Open source
- Application markets and ecosystems
- SOA, event-driven architecture and Web-oriented architecture
- Web 2.0
- Storage as a service
- Composite applications and mashups

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