

WHITE PAPER

Evolving SOA with IBM WebSphere

Sponsored by: IBM Corporation

Sandra Rogers

February 2008

The SOA Generation: IT Comes of Age in a Connected World

The world of computing is now at a tremendous inflection point. The unprecedented level at and speed with which systems, businesses, and individuals are now able to interact are fueling tremendous innovation and change across the globe. Untethered from previous constraints of physical boundaries and aided by the ubiquitous reach of the Internet and the adoption of industry standards, the application of techniques such as Service oriented architecture (SOA), virtualization, and media convergence is contributing to advancing this shift. Understanding how to best harness and manage this power to the benefit of both the individual and the collective, whatever that represents — an enterprise, a supply chain, an industry, or humankind — is the opportunity at hand to navigate and unleash.

The pressing need for organizations to readily adapt to ever-changing market demands and provide new products and services in a more timely manner is becoming a prerequisite to survive in their respective industries. The ability to automatically integrate and leverage capabilities from a wide spectrum of resources has been an evolving aspiration, but now is a must, as is the need to design IT capabilities in a fashion more aligned with the business for greater speed, agility, and differentiation.

Over the past decade, the IT industry has made major advances in standardizing messaging protocols and information schemas and formats to be leveraged across many tiers of the computing stack. However, creating a universal communication paradigm is but a first step in the journey toward enablement. Gaining understanding and agreement among stakeholders on how to define and address business services and processes and create all the critical links is often challenging, let alone managing change across this ever-increasing web of information and systems.

With an SOA approach, the underpinnings of individual components of a system or application can remain varied, while at a more virtual interface level, a common ground can be established. Separating the interface of the service from its actual implementation allows for each service to perform its function autonomously yet must provide enough information for the collective to navigate and engage each service based on proper policies and context. This construct can lead to tremendous flexibility; however, it does require a strong platform and well-managed coordination at higher levels.

The SOA Platform: Providing a Strong Foundation for Transformation

The widespread emphasis on SOA in the marketplace can easily overwhelm someone who is trying to understand the most pertinent aspects on which to focus — whether business and IT alignment, process automation, designing services for agility and reuse, SOA governance, service life-cycle and runtime management, skills building, or implementation of core infrastructure. Many come to realize that the infrastructure is a critical vehicle to facilitate the proper visibility and automated enforcement of behaviors that aid and optimize all of these other facets associated with SOA-based initiatives.

SOA is indeed an architecture, and thus the ability to enable particular capabilities and patterns of computing can influence its flexibility and strength to support an enterprise's requirements over a period of time. IDC research indicates that reliability remains the top consideration when looking at any architecture and is a top priority to address for IT systems in general. Organizations have also continually looked for high availability and performance, but increasingly they must produce outcomes dependably in a more volatile and distributed computing paradigm. Recently interviewed regarding its decision to implement a robust SOA platform, one business measures performance not necessarily based on the ability to scale in volume but more so on the optimized handling of a critical transaction and the impact it has on the business. This translates to aspects of quality and timeliness with which the transaction is processed and an ability to adapt to variable and demanding customer expectations.

Unlike the large, monolithic applications of the past, SOA-based solutions consist of autonomous services and processes that can be invoked dynamically. Thus, to support SOA, organizations need to balance a more flexible, lighter-weight development and deployment paradigm with a strong, foundational underpinning that ensures robust performance, security, and 24 x 7 availability.

Breaking Down SOA to Core, Fundamental Capabilities

SOAs are highly network-intensive solutions, based on the interaction between logically combined services that are contextually associated via messages and document artifacts and governed by policies and contracts. Most enterprises typically require transport and event services for routing and mediation between service providers and consumers. The ability to navigate and support multiple protocols, perform information and message transformation, and orchestrate services and business process workflows is a critical element of this environment.

Other technologies to define, manage, and monitor individual service and systems assets and how they interact continue to evolve. The goal is to bring increased levels of visibility and control beyond the container to the discrete service, message exchange, and document levels as well as aggregate composite application and process views. In addition, technologies and practices are advancing to address the complex and collaborative nature of service life-cycle management.

The use of common Web services standards is key to enabling interoperability between services and all the supporting infrastructure. Additional standards have been designed to address quality of service (QoS), reliable messaging, policy management, system semantics, security, and management. Furthermore, the ability to facilitate transparency and trust among services providers and consumers is crucial. Although physical barriers are removed, the logical associations between working elements require more open sharing of critical metadata and models, providing a structure to aid in overall system oversight and governance. Thus, managing information about the services and system itself (metadata) and coordinating information access across information sources are important parts of an SOA foundation.

As SOA environments expand to accommodate more complex processes and applications, the need arises to manage across an enterprise-scale architecture and technology foundation. In response, platform vendors are quickly ramping up their capabilities to provide integrated functionality and support for varied deployment options, such as virtualization, for many of these dimensions.

IBM WebSphere: An Engine for SOA

IBM has a rich heritage in offering solutions that have paved the way for this next generation of technology to unfold. Having focused on addressing the application development, deployment, and integration space for years, the company has a deep understanding of not only the fundamental requirements but also the critical demands of enterprises that require reliability, scalability, and interoperability in their systems. The company has a long history of providing transactional integrity at high volumes and continues to advance its offerings at the various layers that compose end-to-end business processes.

Over the past few years, IBM has evolved its go-to-market strategy to adapt to the needs of the market and the evolution of services-oriented computing. The company developed what it calls the "5 Entry Points to SOA" (comprising "Connectivity," "Process," "Reuse," "Information," and "People") to describe common goals to apply SOA principles and help enterprises embark on building out their capabilities to address targeted solutions and evolve toward an overall SOA foundation. Taking this concept further is what IBM refers to as "Smart SOA," which emphasizes that organizations capitalize on and adopt SOA at a level or rate that best suits their business needs, anywhere on a continuum from a more basic or "simple" approach to "advanced" implementations that demand more complex levels of functionality.

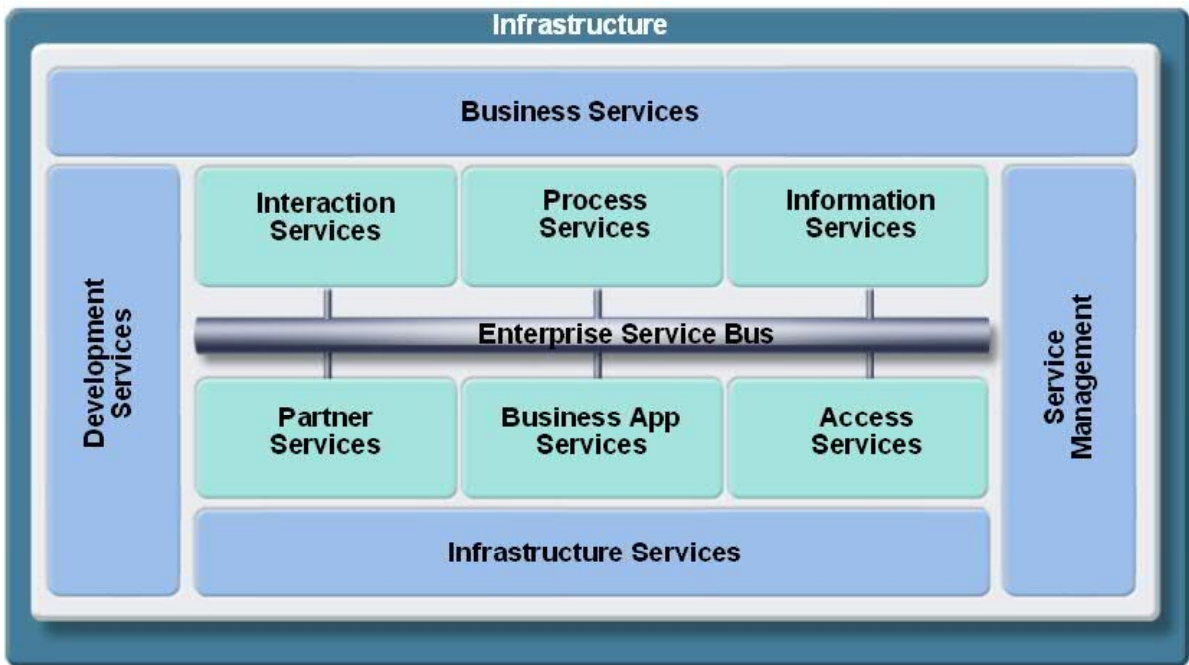
IBM WebSphere provides a broad portfolio of products that together account for much of the core functionality needed to enable SOA, including technologies for service composition, messaging and transformation, service mediation and protocol translation, services registry and repository, service provisioning, portal infrastructure, integration facilities and adapters for application and system connectivity, XML processing optimization and security, and business process management (BPM), modeling, and monitoring.

Other IBM product lines complement and integrate with WebSphere to provide additional SOA support, including development and life-cycle tools from Rational; information access, integration, and federation services from Information Server; composite application management facilities from Tivoli; user workplace capabilities from Lotus; and data management optimized for SOA from DB2.

IBM's SOA reference architecture, highlighted in Figure 1, shows at a high level how the company positions its offerings vis-à-vis key aspects of an SOA environment.

FIGURE 1

IBM's SOA Reference Architecture



Source: IBM, 2008

Support for a Dynamic and Evolving SOA Platform

IBM's portfolio is far reaching and would take a substantial amount of time to review at length, as would covering all the capabilities necessary to support an SOA. The following sections identify some notable areas tied to the success of SOA initiatives as organizations seek to optimize efforts and expand their enterprise implementations.

Flexible Connectivity

A key task for any SOA is coordinating activities between service providers and consumers. This includes automating and mediating the interaction among multiple types of systems and sources (including legacy systems), accommodating synchronous and asynchronous message streams, addressing contextual and state awareness at both granular service and composite levels, supporting multiple transport and document types and protocols, and addressing a mix of centralized and federated topologies and deployment models. Support for event-based messaging patterns, including the ability to assess conditions and respond to and correlate events, trigger activities, and interject logic based on business rules, is becoming increasingly important for real-time computing needs. Throughout all these activities is the need to ensure processing integrity and security, especially as services are increasingly combined across system domains and organizational boundaries.

If one looks at some of IBM's offerings related to connectivity in tiers, the core message transport capabilities are provided by IBM's WebSphere MQ with three styles of enterprise service bus (ESB) products plugging into that backbone. WebSphere ESB is designed for Web services processing and integration, while WebSphere Message Broker further combines Web services and non-Web services with multiprotocol support. In addition, WebSphere DataPower XI50 is an appliance designed to handle high throughput and offloading of XML processing and security to a device on the network. According to IBM, one can define and deploy common transformation routines across all three of these styles of ESB. IBM also provides a range of adapters to integrate third-party enterprise applications and technologies, which are included with two of the ESB offerings.

Maximizing Service Use and Efficiency

Service interfaces should be well aligned with the business and remain as stable as possible, abstracted from lower-level technology changes and designed in a fashion for consuming services or systems to not require knowledge of any specific deployment attributes. In an SOA, services must also be constantly available and accessible. Therefore, a robust SOA infrastructure must be at the ready to support dynamically changing workloads and allow for easy on-ramping of services. It is critical for such infrastructures to ease general configuration processes for service providers to address operability, efficiency, and speed-to-market concerns.

The IBM WebSphere Application Server (WAS) family offers a choice of runtime deployment models for hosting and running applications and services. IBM promotes that the core foundation behind all of its WAS family should allow organizations portability of services and other SOA artifacts for a seamless transition if they desire to evolve and scale out their SOA environments over time or select varied levels of support for specific scenarios.

IBM promotes WAS with a range of features such as simplified installation and administration with wizards and default configurations, along with documentation and sample code. This platform can be scaled to handle high-volume transaction processing capabilities, clustering with dynamic workload balancing, failure bypass, prioritization, and overload protection. Advanced runtime virtualization is available to

help optimize application performance and thus allow systems to respond more readily to changing business demands. The WebSphere Extended Deployment offering adds features to optimize provisioning and workload performance and help manage increased information processing demands.

In addition, IBM offers the WAS Community Edition, a free, open source-based JEE5-certified application server targeted at enterprises seeking to reduce the costs of tactical deployments where able to leverage basic application server provisioning and deployment functionality.

Dynamic Process Configuration and Management

The vision of many organizations is to increasingly automate both system and human interactions and streamline operations across the enterprise. Compliance and regulatory mandates are contributing to an increased interest in the business process management and auditing arena. Automating processes in a more coordinated fashion can help enforce desired consistency and subsequently allow one to overlay the necessary monitoring of process performance vis-à-vis goals and provide critical workflows to manage exceptions. There is also a keen desire to further integrate intelligence into critical steps of certain processes to create more insightful and timely responses to business conditions.

Historically, many processes often have been deeply embedded in rigid code or have been dependent on the collective knowledge of a few individuals and are not formalized or documented, let alone automated. This symptom has been exacerbated as self-service, Web-based, forms-centric solutions have grown in popularity over recent years. Having the flexible connectivity infrastructure mentioned earlier enables more services to be readily available to engage in these processes. In an SOA, abstracting process and business rules into models away from core service logic becomes a key enabler to help businesses adapt to change more readily.

The ability to navigate long-running and more comprehensive, multistep processes will likely require support for varied messaging scenarios that guarantee end-to-end transactional and process integrity. Business process automation and management tools that focus on modeling, service orchestration, and monitoring are advancing in capabilities, although further work on standards, functionality, and usability for multiple roles and skill sets has yet to unfold.

IBM's WebSphere Business Modeler is a modeling, simulation, and process design tool focused on facilitating the creation and documentation of business processes. It provides organizations with the ability to capture and formalize a business process and refine it as needed, with facilities to perform what-if scenarios and understand the business impact of proposed changes against key performance indicators. WebSphere Integration Developer (WID) can facilitate the creation and orchestration of services as part of an executable business process, whether involving human-centric workflows or systematic process automation. WebSphere Process Server (WPS) then executes processes based on sets of rules and configurations defined in WID or by other process modeling tools via its support of industry standards such as UML, BPEL, and BPMN.

WebSphere Business Monitor is designed to monitor and measure business process performance to ensure proper functioning and associate results of processes to KPIs and SLAs. It provides a business dashboard for visibility into specific process instances to track status and provide insight as to when and why thresholds are being breached.

In addition, IBM offers a variety of industry frameworks to help businesses accelerate the implementation of solutions and processes. These frameworks provide an architectural blueprint and set of technology assets designed for a specific industry or functional cross-industry application domain, supporting key standards relevant to meet those particular business requirements. These preconfigured framework technology assets can be subsequently leveraged in conjunction with other WebSphere offerings, such as process models to use with the WebSphere Business Modeler or data models to complement IBM's Information Server capabilities. Examples include the Retail Integration Framework to support retail institutions building out customer-oriented solutions, the Service Provider Delivery Environment for telecommunications firms' service delivery systems, and the Product Development Integration Framework for manufacturing companies' design process solution scenarios. Other examples of architectural assets from IBM include the Insurance Application Architecture (IAA), the Information Framework (IFW) with process and service models for banking, as well as a number of Industry Content Packs that support solutions that leverage the WebSphere Services Fabric product. While IBM can assist enterprises with professional services expertise to help implement and customize these solutions, the company is also focused on building out its ecosystem of ISV, technology, and service partners to support these industry frameworks to further extend and add value to these efforts.

The Information Equation

Enabling a unified view of information across distributed, disparate data sources is a key requirement for most enterprises. Technologies that can pull together the relevant information, support integration and transformation of the information, and ensure this information is clean and accurate can be important to a more dynamic and diverse SOA environment. It is also important to ensure that services that need to share common context within a composite service or process are addressing information in a consistent manner.

Processing overhead can also be minimized by streamlining information access and processing with federated query and caching and by creating a data services tier to optimize tasks and protect source systems from inappropriate use or overuse. Utilities performed on data can be designed and called upon as services themselves to address these processing steps in real time. For those enterprises that need to be able to maintain key referential information for master information such as products, accounts and customers across systems and business services can leverage these data services as part of an overall master data management solution and information architecture.

IBM emphasizes the ability of WebSphere to integrate with its information management offerings such as IBM Information Server, IBM Master Data Management Server, WebSphere Product Center, and FileNet Content Manager.

The People Quotient

Today's business environment demands an ability to efficiently unify applications and information and facilitate instant communication and coordination of resources for interaction and collaboration. While enterprise portal infrastructure has been available for some time now, with SOA, organizations are beginning to more readily incorporate services and process workflows into application and information access points and implement a more consistent user experience. With the rapid adoption of AJAX and tools to facilitate rich Internet application development, and advancements on the mobile and VoIP technology front, a reevaluation of the end-user experience and the last mile of service consumption by systems users is taking place.

IBM offers WebSphere Portal for tooling and infrastructure to provide secure role-based access to personalized services-based content, composite applications and content mashups, and process or application interaction points.

Providing Service Insight and Governance

In an SOA, a service registry can be used for publishing and discovery of services from design through runtime. Registries can be combined with broader repository capabilities to help further manage artifacts and policies associated with services, analyze service dependencies, and address service life-cycle processes. Providing this layer of common metadata not only promotes the potential for better reuse of service assets but also aids in change management and governance activities. The ability to federate between multiple repositories will likely be a common requirement for more distributed IT environments and organizations.

From a services life-cycle and governance perspective, in addition to IBM's Rational Asset Manager (RAM) product to help manage overall application and service development activities, IBM supplies its WebSphere Service Registry and Repository (WSRR). This software offering is designed to provide overall organization and governance of services assets for deployment. In addition, RAM can be combined with Rational Method Composer (RMC) to provide organizations with a tool to customize development processes as part of their SOA governance programs.

Open Computing and Standards

In the adoption of SOA, standardization is critical — close attention must be paid to determining enterprise-level reference architectures, schemas and syntax, common message formats, information models, and more. For efficiency and interoperability, it is imperative to create a standardized internal environment, and for external purposes, it becomes an even greater concern to accommodate industry-accepted and regulated standards. More vendors than ever before have embraced their responsibilities in supporting and driving particular protocols and standards to advance the market and cut down on the complexities of weaving solutions together. It is, however, still an evolving mission to address the many concerns across the computing stack. Reliable messaging, security, policy, and other QoS standards are imperative for an open system and mission-critical environment. Beyond basic Web services standards, a recent movement by vendors to design a further abstracted programming model based on service component architecture (SCA) standards is starting to see some traction.

IBM has embraced the world of open computing — through its leadership and support of industry standards, its investment in open source models and communities, and its architectural and business strategy to enable SOA. It has spearheaded far-reaching initiatives across the Web services continuum, donating code and running pervasive open source initiatives such as the Eclipse foundation. The amount of resources the company has extended into and continues to invest in these efforts is unmatched in the industry.

When one thinks about open computing, one must also think of open "choice," which means the ability to embrace and support varied options. The ability to offer companies choice, on anything from multiple protocol support to different deployment models and suites of functionality, is important. For example, with IBM's WebSphere Service Broker offering, the choice to leverage either Web services and non-Web services patterns or HTTP versus JMS protocols has proven to be advantageous for certain firms. To select between wire and document formats and process these natively saves on transformation activities at the edge and between service workflows. As well, many companies with preexisting messaging middleware such as WebSphere MQ also desire a seamless connection to those solutions. Mixing legacy and other technologies into the SOA environment, especially those that may well be entrenched at customer sites, is critical to also support.

Challenges and Opportunities

IBM is in a perpetual cycle of invention and optimization and must balance between offering a breadth of solutions and the need to reduce complexity for its customers. This issue is exacerbated by the many acquisitions the company has assimilated over recent years. As most organizations are seeking more streamlined IT environments, it remains an imperative for IBM to further simplify the use, configuration, and integration of its many solutions and provide a more coordinated metadata underpinning. Based on interviews with select individuals, it appears that IBM is continually making strides in R&D to improve both product functionality and usability. One architect interviewed regarding his experience working with IBM's MQ technology noted that it was easy to understand and configure.

Further integration of IBM's SOA offerings will be necessary to create a true "platform" for those that require a completely optimized and integrated stack. Most large enterprises often prefer to compose their own foundations and already may have large investments in place; therefore, it behooves all vendors to not create solutions that presume other elements of their own stack will be in place. Even if an organization desires to consolidate on one vendor's offerings, it still wants to leave the door open by making wise decisions around architecture and adopting technology based on popular standards to help mitigate risk and allow for future change.

IBM's WebSphere Service Registry and Repository, while not natively built on UDDI, can synchronize with any UDDI V3-compliant registry implementation for standards-based interoperability. The company also offers more than one repository, separating development (via Rational Asset Manager) from the WSRR runtime and governance solution. Although IDC believes that a federated repository model provides heightened degrees of flexibility, the market is in a nascent stage in understanding how to synchronize and manage multiple repositories and address more pervasive

service life-cycle procedures. Additionally, how these technologies will complement IBM's Tivoli CMDB and Composite Application Manager products is for the most part still to unfold, although WSRR does provide integration with Composite Application Manager for SOA. IBM should work toward simplifying and further integrating automated life-cycle and change management process capabilities across its SOA governance offerings and beefing up its service management functionality.

Selling infrastructure remains a difficult internal sale for many enterprises. Several organizations may harbor the mentality of "good enough" or opt for homegrown approaches, which can stifle opportunities for IBM and others. Showing value in concrete, measurable results associated with business metrics will help internal proponents with their appeals for funding support. IBM does provide a substantial amount of guidance regarding best practices and key metrics, but along with all vendors, it continues to need to "connect the dots" between technology and discrete business value.

According to IDC research, the number 1 challenge for investing in or advancing SOA initiatives is the lack of skilled resources. Thus, it behooves vendors such as IBM to pass on skills and understanding of reference implementations and tooling to aid organizations in their abilities to develop and expand their own SOA environments. The company is heavily investing in educational programs to build business and technical expertise in SOA with its university initiative along with additional developer, architect, and work-based initiatives; however, more must be done by the industry to move organizations progressively forward.

Making SOA Investments Count

Just as SOA forces organizations to approach architecture in a more holistic manner, one should look at the entire spectrum of resource impact on supporting technology decisions. The following are a few examples of such considerations:

- ☒ **Prepare to scale.** Make sure at the proof-of-concept (POC) stage that technologies are put through rigorous systems tests reflecting real-world and demanding conditions. These tests should not only assess variable workload demands but also ensure the integrity of discrete messages as well as composite processes and applications.
- ☒ **Determine enterprise standards and look for interoperability proof points.** Implementations can vary among vendors; thus, it is still critical to ensure interoperability among critical components of one's SOA environment.
- ☒ **Address legacy environments.** For most enterprises, the need to embrace a hybrid of old and new technologies will remain for some time to come. One should prepare and implement needed technology to integrate whatever generations of systems into the SOA fold.
- ☒ **Understand licensing and packaging.** Be sure to understand specific licensing constraints, especially regarding the inclusion or exclusion of supporting technologies such as databases and the ability to support a distributed model, which is often needed with SOA. Weigh the ability to scale with varied deployment models, such as in the case of appliances.

- ☒ **Assemble solution support and expertise.** Most enterprises need to build up and evolve their SOA skills and best practices, which can take time. Quality of vendor support and availability of workers skilled in the particular offerings can be key considerations.
- ☒ **Implement monitoring and metrics.** SOA requires visibility on multiple fronts — from an operational point of view to one providing critical information regarding impact on business goals. Those that implement such capabilities up front can more readily provide insight into where to apply future development efforts and measure the overall value of the initiative to garner further cooperation or funding.

As one senior IT architect eloquently stated, "SOA is as complex as you make it." He proceeded to note, "You definitely need to have someone, or a group, riding herd on it" to ensure that the complexity does not overtake and compromise the value of such an initiative. But striving for simplicity also does not necessarily mean one should sacrifice functionality. The perceived costs associated with procuring a solution may be offset by tremendous savings and flexibility with required manpower, shortened work cycles, risk mitigation, and a whole host of other variables when one evaluates the entire ownership model. The architect cited above also highlighted that by investing in the infrastructure and the SOA model, his organization can now leverage resources with more general application development and business-oriented skills. However, he went on to note that using infrastructure for efforts that had previously required custom work by developers is a large organizational behavioral shift and can take some time for individuals to get on board with this new approach.

In addition to the quality of support, enterprises also prefer that vendors have compatible road maps and be committed to advancing their solutions with further investments in R&D. In interviews with select individuals, these considerations were called out as additional strengths that IBM brought to the table and were determining factors in their selection process.

What SOA really boils down to is an architecture and approach to designing and implementing a more abstracted and agile componentized systems environment, one that leverages a foundation of reusable business and system services. It also requires one to build an atmosphere of trust — trust in the integrity of the underlying services themselves, the processes, and the supporting infrastructure. When looking at architecture and SOA investment decisions, organizations are taking a more future-oriented view because it will impact the path on which they plan to take their businesses and systems for years to come, and thus they want to ensure that their vendors can support their evolving needs.

Copyright Notice

External Publication of IDC Information and Data — Any IDC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate IDC Vice President or Country Manager. A draft of the proposed document should accompany any such request. IDC reserves the right to deny approval of external usage for any reason.

Copyright 2008 IDC. Reproduction without written permission is completely forbidden.