The perceived leaders in cloud computing and the perceived leaders in enterprise computing are two different sets of vendors.

Although there is opportunity to show leadership in both, few vendors are well-positioned to do so. "None of the traditional 'Enterprise Software' leaders are emerging as de facto leaders in enterprise adoption of PaaS/SaaS — heralding a significant changing of the guard should this condition not change. So far, with the exception of Microsoft, change is coming perhaps too late for some."
Gartner defines cloud computing as "a style of computing where scalable and elastic IT-enabled capabilities are provided 'as a service' to customers using Internet technologies." It heralds an evolution of business — no less influential than the era of e-business — in positive and negative ways. It has become a hot industry term that has been used in many contradictory ways. Overall, there are very real trends toward cloud platforms and also toward massively scalable processing. Virtualization, service orientation and the Internet have converged to sponsor a phenomenon that enables individuals and businesses to choose how they will acquire or deliver IT services, with reduced emphasis on the constraints of traditional software and hardware licensing models. Services delivered through the "cloud" will foster an economy based on delivery and consumption of everything from storage to computation, to video, to finance deduction management. This presentation defines cloud computing, exposes potential risks and opportunities, and examines the next evolution of business.
Key Issue: What are the effects of cloud computing on the vendor landscape?

Cloud computing services fall into five categories; a sixth deals with control and security. System infrastructure: Virtualized system software on which consumers can run any application. Web-based provisioning via a browser form, programmatic calls or automated response to an application load provides dynamic access to resources. Minimal Web standards are at the system infrastructure layer; provisioning models are usually vendor-specific. Application infrastructure: A set of services that parallels traditional middleware and development technologies. Services must be built to use Web-centric architectures and global-class design. The category of aPaaS is emerging, with vendors providing global-class, Web-centric RAD environments. Applications: Designed for global-class delivery, delivered as a service via Web-centric architectures to a browser or RIA front end; these are cloud application services. This usually requires creation of a multitenant architecture where one application supports many firms but provides a unique view for each. Customizations and extensions, and data, are isolated among tenants and firms by default, but may be selectively shared. Cloud application services should be built with Web architectures and may expose components or interfaces for mashable access, control or extension. Information: Content access and search services or data services delivered as feeds via RSS/ATOM or Web models. Business process: Any BP delivered as a service via the Internet provided via Web-centric interfaces and WOA access mechanisms. Management and security: Services to manage access, use, delivery and service levels of cloud services. These are similar to operation management tools, but the demands of global-class cloud-based applications require more.
Key Issue: What are the effects of cloud computing on the vendor landscape?

Service delivery is not a new concept. In cloud computing, it requires a provider not only to deliver technology but also to delivery good service. This is the same as always — deep relationships with service providers make a chain of service possible. Cloud allows many capabilities to proliferate — but it means you can't just have casual service relationships. Services management costs are 10 times those of technology management costs. Then, when you add in the number and variety of services available to the chain, it can get very dicey.

In the old world, each technology provider delivered technologies to its customers. The difference between old and new is that the underlying premise of delivery is that customers must be satisfied with what the service does instead of what the technology does.

In outsourcing and services businesses, these realities are clear. However, in the cloud world, there are more differences to contend with. Cloud services in the public cloud are commoditized in such a way that all customers get essentially the same service with little customization. This means that very little differentiation can come from each contract. As technology providers discover this truth, they are hard-pressed to be able to generate revenue in the same ways of old.
**Google, Microsoft, VMware, and Amazon: How Cloud Computing Changes the Vendor Landscape**

**Key Issue: How will cloud computing be defined and evolve?**

**SaaS:** The basic scenario represented in 2009's forecast remains in place — *application functionality delivered as a cloud service is establishing itself as the new norm for the software industry*. The forecast growth rate has been reduced marginally from last year's report to reflect slightly more sluggish spending on all aspects of IT during the next few years. The scale of application deployments is growing; multithousand-seat deals are increasingly common. One of the largest — if not the largest — SaaS sales was a 420,000 seat deal SuccessFactors won with Siemens IT managers are beginning to think strategically; this was highly unusual a year ago. **PaaS:** Application infrastructure consists of two types of offering — application platform as a service (aPaaS) and integration as a service (IaaS). Platform infrastructure is an increasingly high-profile area, rapidly assuming a central role in the broader conversation about cloud computing. Salesforce.com, VMware and Microsoft are adding credibility and clout; however, it is still an early-stage market. IaaS is gaining traction — witness the IBM acquisition of Cast Iron. **IaaS:** Gartner has increased its sizing and forecast for cloud compute services, reflecting greater interest among our client base than had been expected. We expect the 2013 market to be worth $8 billion (up from the $6.8 billion forecast last year), and the 2014 market to be worth $10 billion. Starting in 2012, enterprises will see building new applications on cloud compute infrastructure as the de facto norm.

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Key Issue: What are the effects of cloud computing on the vendor landscape?

There are two relative dimensions that determine how "private" or how "public" a cloud service really is:

- **Ownership, control and operation of the implementation:** There are two ends of a spectrum here — complete ownership, control and operation of the implementation (the enterprise private cloud) and complete lack of ownership, control or operation of implementation (the public cloud). However, there will be many examples in between of partial control, shared ownership and others. The more the model tends toward a public cloud model, the more the consumer benefits by leveraging the innovation and scale of the provider. The more the model tends toward a private cloud model, the better the consumer will be able to manage some risks.

- **Service access:** There are two ends to this spectrum — at one end, usage is extremely exclusive, while at the other end, anyone who chooses can access the service. Again, there will be many examples in between of limited access, industry-only access, controlled partner access and others.

Many of the cloud services that will emerge during the next few years will fall somewhere in the middle (consider the customers choosing Exchange Online Dedicated or paying for Reserved Instances from Amazon.com). Understanding the trade-offs and options is critical.
Gartner defines cloud computing as "a style of computing where scalable and elastic IT-enabled capabilities are provided ‘as a service’ to customers using Internet technologies.” It heralds an evolution of business — no less influential than the era of e-business — in positive and negative ways. It has become a hot industry term that has been used in many contradictory ways. Overall, there are very real trends toward cloud platforms and also toward massively scalable processing. Virtualization, service orientation and the Internet have converged to sponsor a phenomenon that enables individuals and businesses to choose how they will acquire or deliver IT services, with reduced emphasis on the constraints of traditional software and hardware licensing models. Services delivered through the "cloud" will foster an economy based on delivery and consumption of everything from storage to computation, to video, to finance deduction management. This presentation defines cloud computing, exposes potential risks and opportunities, and examines the next evolution of business.
Google, Microsoft, VMware, and Amazon: How Cloud Computing Changes the Vendor Landscape

Strategic Planning Assumption: Through 2013, Amazon EC2 will remain as the de facto "standard" cloud system infrastructure provider for new startup cloud application infrastructure providers, as well as for many new Web technologies startups.

Key Issue: What are the strategies of the major cloud computing vendors?

Amazon is primarily an IaaS provider offering compute (elastic compute cloud [EC2], Amazon Elastic MapReduce, Auto Scaling), storage (Simple storage service [S3], Elastic Block Storage [EBS], AWS import/export), networking (Route 53, Virtual Private Cloud [VPC], Elastic Load Balancing), and content delivery via CloudFront. It also offers a monitoring service called CloudWatch and various premium support levels. Amazon has developed a strong ecosystem of partners, including some that provide the more sophisticated automatic elasticity for EC2 (such as Elastra and RightScale). Other partners provide platform services (such as Red Hat JBoss) or database management system (DBMS) services (such as Oracle and Sun Microsystems MySQL). Users are also free to obtain infrastructure services from Amazon, and license a traditional application platform from familiar vendors (such as IBM WebSphere application server or Oracle WebLogic Application Server). In most cases, the user faces both the variable costs of cloud system infrastructure services and the fixed costs of a traditionally licensed application platform. Above the IaaS layer Amazon's primary path to PaaS is through partners such as Tibco that provide PaaS environments on Amazon IaaS. However it does offer an expanding portfolio of individual PaaS services including database (simpleDB, Amazon Relational Database Service [RDS]), deployment management (AWS Elastic Beanstalk, AWS CloudFormation) and messaging (Simple Queue Service [SQS], Simple Notification Service [SNS]). Amazon also relies on third party partners at the application, information and business process layers. The exception is in providing services to support their traditional e-commerce business and their e-commerce partners. Amazon services at these levels include Amazon flexible payments service (FPS) for online payment and billing, Alexa Web information service and top sites service to track Web traffic and simple e-mail service (SES) for bulk and transactional e-mail sending. They also provide Amazon Mechanical Turk to facilitate access to a cloud-sourced workforce and the Amazon Fulfillment Web Service (FWS) to provide access to Amazon real-world pick, pack and ship capabilities.
Key Issue: What are the strategies of the major cloud computing vendors?

Salesforce.com is the undisputed early leader in the aPaaS space. Its offering, Force.com, is largely based on the programmable foundation of salesforce.com — the company’s CRM application that enjoys over 35,000 user organizations and more than 900,000 named users. The experience of supporting and perfecting the platform for such a massive and increasingly complex installed base has helped salesforce.com to offer a highly scalable and well-thought-through application platform. In its first version, the platform is multitenant, offers elastic scalability, fault tolerance, performance, Java-like programmability and rolling versioning. Salesforce.com competitors are small and experimental players, which is a challenge to its growth: To take aPaaS seriously, the mainstream users must see a vibrant market, including familiar software players. Salesforce.com's own strategy is not without challenges: Its programming and runtime environments are proprietary, most of its users are small businesses, and it is struggling to break out of the market niche of a CRM vendor. An early leader, salesforce.com may be attractive as an acquisition target by a better diversified major software industry player. Whatever the endgame, salesforce.com will likely help lead the industry out of the enterprise closet and into the open and agile era of cloud computing. Users can expect high productivity and scalability when using Force.com or Force-based business applications.
Google's CEO, Eric Schmidt, is occasionally credited with coining the term "cloud computing," so it is not surprising that the company has many offerings in the categories that comprise the term. More than two dozen vendors compete with one another in the cloud-based application infrastructure market. Google's cloud strategy consists of offerings that are primarily at the level of application infrastructure services and above in Gartner's cloud services taxonomy.

Google App Engine (GAE) is the company's aPaaS offering. The core value proposition of GAE for developers is that it will enable them to write and test code on a local machine, then upload it to Google's servers.

As with many cloud offerings, Google's do not necessarily layer neatly together — for example, with some exceptions (such as Google Moderator), many Google Apps are not written using GAE. Google Apps (consisting of Google Docs, Spreadsheets, Gmail and more) comprise most of the application service offerings. Most of Google's revenue derives from advertising, which is purchased from Google as a service.
Google, Microsoft, VMware, and Amazon: How Cloud Computing Changes the Vendor Landscape

**Strategic Planning Assumption:** By 2012, Microsoft will have an offering in the shared-everything aPaaS space (in addition to its virtualization-based shared-hardware and other application infrastructure offerings).

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**Key Issue: What are the strategies of the major cloud computing vendors?**

Azure shows a shift in Microsoft strategy to the Web and cloud computing. This is visionary and pragmatic, expanding Microsoft's "software plus services" approach to all offerings and affecting all Microsoft products for the next decade. Rather than a vision that reduces client and on-premises solutions requiring new developer tools and languages, it focuses on bringing .NET developers to the new paradigm and blending on-premises solutions with the cloud. We believe Azure architecture will influence future on-premises Windows Server environments. Microsoft will provide cloud services in three key areas: (1) System infrastructure — Windows Azure is a modified version of Windows Server 2008 and a modified Hyper-V with cross-system "fabric controller" software designed to host and scale cloud-based applications and services, and to provide computing and storage as a service; (2) application infrastructure services — Including renamed BizTalk services and expanded SQL services, workflow services and identity framework; and (3) application services — This features applications as a service, many designed to be consumed by people (Office Live Work Space, Exchange Online, SharePoint Online, Microsoft Dynamics CRM Online). Microsoft calls these "finished applications" built on the Azure Services Platform. Programmatic extension is also possible. Users should note that Exchange and SharePoint hosted services available in 2008 are not built on the Azure Services Platform, but may still offer significant cost savings.
Google, Microsoft, VMware, and Amazon: How Cloud Computing Changes the Vendor Landscape

Strategic Planning Assumption: Through 2013, VMware will remain primarily focused on enabling, rather than directly providing cloud services.

Key Issue: What are the strategies of the major cloud computing vendors?

The long-term vision of VMware leadership for its future is very ambitious. It sees the cloud aPaaS market as fundamental to its growth and to its future place in the market. To pursue these ambitions, the company has acquired SpringSource, RabbitMQ, GemStone Systems, Zimbra, and other innovative application and application infrastructure vendors, absorbing not only some important technology, but also some advanced middleware engineering talent.

The company is led (since July 2008) by its CEO, Paul Maritz — formerly a top executive at Microsoft, responsible there for platform strategy among other things. The partnership with salesforce.com must be seen in this context — as part of a larger, platform-related vision, and not as an isolated act.

VMware is trying leverage its enterprises strength in enabling IaaS and private clouds into the next level up in the cloud software stack — PaaS. Its strategy is to assert leadership in cloud portability using Java, specifically the Spring framework. Through technologies that VMware acquired from SpringSource, it has begun to drive Spring as a viable way to develop Java apps for the cloud. The Google/VMware effort is part of a larger cloud platform market dynamic that is being led by VMware. This effort spans not only the new version of Google App Engine (for business), but also its recently announced VMforce joint venture with salesforce.com, as well as private clouds running vSphere and other public clouds running vCloud.
IBM is among few firms able to create a massive cloud computing platform and ecosystem to deliver cloud computing services at multiple levels, with expertise in hardware and data centers, infrastructure software and outsourcing that could be used to create this environment. However, IBM's business focuses on mainstream enterprise clients and core systems, areas where cloud computing is least mature. Thus, it has moved cautiously to meld cloud computing into its business. While pragmatic, not taking an aggressive approach could give Microsoft, Amazon and Google a chance to lead in cloud computing partner ecosystems.

IBM's cloud computing is on four paths: (1) deliver a portfolio of IBM cloud computing services; (2) offer professional services to help independent software vendors (ISVs) design, build and deliver cloud application services; (3) offer professional services to help end-user firms integrate cloud services; and (4) deliver varied cloud-enabling technologies to providers or firms to create private cloud environments. IBM's near-term focus was on enabling technologies and professional services to help others create cloud platforms. IBM created a few special practices in its professional services firm, targeting ISVs and firms that wish to exploit cloud computing, but most practices focus on traditional enterprise hardware/software and outsourcing models. IBM has a computing-on-demand service for high-performance computing, but its cloud computing centers are partnerships, most with government and academic groups, to create independent, regional and cobranded cloud platforms. IBM created special software for provisioning system infrastructure in cloud centers, but mainstream Tivoli, WebSphere, Rational, DB2 and other components have not been changed to optimize cloud computing, or guide developers in creating cloud-centric solutions. IBM is moving to create cloud-based multitenant versions of Lotus apps, but plans for other software are unclear, and there are no apparent plans to shift business process outsourcing (BPO) offerings to a cloud-based model. IBM has an Infrastructure On-Demand offering with virtualized infrastructure, but this offering and the broader IBM outsourcing business seems disconnected from cloud-computing initiatives.
**HP — Getting the Cloud Religion**

**Enabler vs. Provider**
- Enabler: Converged infrastructure, I&O software, CSA
- Enabler: Professional services for building cloud implementations
- Provider: IaaS (compute),
- PaaS and marketplace via development & acquisitions

**Scope (Public vs. Private)**
- Emphasize hybrid cloud with private anchor point
- CloudSystem to build public or private cloud environments
- Cloud service automation & cloud maps for deploy & manage
- Expanding cloud services across IaaS, PaaS, SaaS
- Planning to offer a cloud “marketplace” & governance services

[Image of HP - Getting the Cloud Religion diagram]
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Oracle — 360-Degree Turn on Cloud

**Enabler vs. Provider**
- Primary focus on enabling technologies
  - Exalgin
  - Enabling PaaS offerings
  - Oracle Platform for SaaS

**"PaaS"**

**Oracle**

**Scope (Public vs. Private)**
- Private cloud emphasis
- Slow and disjointed extension into public via SaaS

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Strategic Planning Assumption: Through 2012, SAP will remain focused on hosting and augmenting its core enterprise products with adjunct cloud offerings.

Key Issue: What are the strategies of the major cloud computing vendors?

SAP's current on-demand offerings (Business ByDesign, CRM On-Demand, Business Intelligence OnDemand and Information OnDemand) have had limited commercial success; some are priced above-market and seem to indicate a lack of a companywide, cohesive vision of cloud/SaaS business and computing models. Thus far, the company's strategy has been focused on augmentation of its core enterprise offerings with adjunct SaaS offerings. There has also been a recent focus on partnering with Amazon for hosted SAP on AWS.

In 2009, SAP gained technology and useful in-house skills for its SaaS projects, such as Business ByDesign and CRM OnDemand, which require exactly the kind of know-how (and technology) that it acquired with Coghead. Potentially, this acquisition is also an opportunity for SAP to not only enhance its SaaS application offerings, but also offer an independent platform for cloud software development — an aPaaS. This would constitute a leap forward in cloud computing for SAP. Of SAP's largest competitors, only salesforce.com has an aPaaS offering (Force.com), while IBM and Oracle are invested in the "shared hardware," virtualization-based form of cloud computing.
Key Issue: What are the strategies of the major cloud computing vendors?

Cisco, as a leading Internet company, has the opportunity to leverage that leadership into the cloud. Thus far, it has focused its efforts in two areas:

1. Being a provider of SaaS in the Unified Communications and Collaboration (UCC) space through its acquisition of WebEx and its focus on other cloud offerings such as TelePresence.

2. Being an enabler of others to deliver IaaS, through its focus on its Unified Computing System (UCS). UCS tightly integrates server and networking functions around an enterprise-class, blade-based platform. Cisco aggressively drives its UCS strategy in accounts where it is influential. Success partly depends on the company’s ability to build alliances with independent software vendors (ISVs), integrators and channel partners to overcome server consumers' tendency to buy from incumbents HP, IBM and Dell.
Google, Microsoft, VMware, and Amazon: How Cloud Computing Changes the Vendor Landscape

Strategic Imperative: Align your vendor selection criteria so that what you are looking for matches with the emphasis the vendor has.

Key Issue: How can organizations best leverage evolving offerings from vendors in the cloud computing space?

What is your relationship with the vendor you are considering? Besides sticking with a set of tools and languages that you already know, discounting and hybrid licensing arrangements may be possible if you leverage the existing relationship.

Who is the vendor partnering with? Is there a rich ecosystem of ISVs building third-party apps and components or are you all alone? Are there system integrators ready and able to deliver consulting services, should you need them? Is there an active customer community where you can tap into, and contribute to, the knowledge of your peers?

What is the vendor's financial condition? Assuming you can negotiate an SLA that provides a comfortable level of risk mitigation, is the vendor in a position to pay? Look at the balance sheet, examine the cash flow statement, and be aware of other businesses that the vendor may operate. A large company has a marked advantage over a startup in this area.

Can the vendor deliver? Besides any SI partners that may exist, can the vendor provide professional services to help with implementation, integration and customization? Do they have an established track record of success with enterprises in your industry? Do they have customer references to share?

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### Cool Vendors

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<thead>
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<th>Category</th>
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<th>2011</th>
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<td><strong>PaaS</strong></td>
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<td>CloudBees, NetEDI, Thru, TrackVia, Wolf Frameworks, Joyent,</td>
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#### Key Issue: What are the strategies of the major cloud computing vendors?

Much innovation in emerging markets such as cloud computing occurs within smaller vendors. Gartner has published two Cool Vendors reports on related cloud computing vendors: application platform as a service, and cloud management.

Innovation in application platforms for cloud computing continues across technology platforms and languages. The growing variety of options builds a foundation for a broad set of adoption scenarios, increasing both opportunities and risks for newcomers.

Much innovation in the application platform space focuses on cloud computing. Vendors look to offer a bridge between the programming practices of familiar application servers (platforms) and the new realities of cloud deployment using an application platform as a service (aPaaS).

There is rising interest among infrastructure and operations professionals in building private clouds or using the public cloud for overdraft or virtual private clouds. However, investment in management technology is required to deliver service quality, security and availability.

Many innovative products offer the potential to simplify the complexities of cloud computing management. However, users should temper their enthusiasm for innovative new technology by considering the risks associated with investing strategically in small vendors.
Google, Microsoft, VMware, and Amazon: How Cloud Computing Changes the Vendor Landscape

Strategic Planning Assumption: By 2012, more than 80% of traditional hardware and software vendors will have offerings that either enable, expand or exploit cloud computing.

Key Issue: What are the strategies of the major cloud computing vendors?

Software vendors across the spectrum of specialties are acutely aware of the emerging phenomenon of cloud computing. Although it is not entirely new (SaaS-style applications have been offered in some business contexts for years, and some levels of infrastructure utility support — for storage and other purposes — have also been in use for a long time), the entry of new visionary and powerful vendors into the space makes all the difference.

As in the data center — in the cloud, too — technology architecture is multilayered and complex. The basic hosting offerings (from IBM, Dell, Rackspace, OpSource and others) compete with the utility offerings from Amazon, Xdrive, MediaMax and others. The applications from Workday, NetSuite, RightNow and salesforce.com run over their own platforms, but many smaller and newer application ISVs build on the growing availability of development and runtime environments for the cloud, including Force.com, Rollbase, LongJump, Bungee Connect and others. With time, this variety of offerings will likely consolidate, but not in the immediate future, where we expect a continuing emergence of new innovative players and offerings.
Cloud ecosystems exist where an entity not only delivers services to end consumers, but also provides an environment that facilitates the business of other service providers. The facilitation can be provided as: (1) infrastructure, platform, management and security services, which serve as a foundation for the creation and delivery of a cloud application, information or business process service; or (2) brokerage services that facilitate the delivery and consumption of the service.

Where the ecosystem providers (EP) foundation services are used as part of a service providers (SP) implementation, but hidden from the consumer, the underlying service is considered part of the providers supply chain. In this case, the SP takes responsibility for and may elect to move from one EP to another without the consumer being aware of or impacted by the move. In other cases, the consumer will have a direct relationship with both the SP and EP and therefore have more direct visibility to and control of the underlying infrastructure or platform services.

In a cloud brokerage situation, a broker acts as a third party that sits between the cloud service providers and the service consumer to add value to the service being consumed. The third party may or may not have a direct commercial relationship with the providers of services. The CSB may provide value to the service provider, the service consumer or both. As brokerages deliver their solutions, they create market demand for the original cloud services and add demand for the customized capabilities. The value added can take many forms to make it less expensive, easier, safer or faster to navigate, consume, extend or integrate cloud-based services. A broker may manage access to the services, providing greater security or even creating completely new services by extending or combining existing services. However, in a brokerage situation, the consumer has awareness of and may interact with the original service. CSBs will emerge from many markets including: B2B, B2C, C2C, system integration (traditional and cloud focused), telecommunication carrier, business process outsourcing, integration services and software, application development, managed file transfer, SOA and governance.
Google, Microsoft, VMware, and Amazon: How Cloud Computing Changes the Vendor Landscape

Recommendations

✓ Separate evaluation of cloud services from evaluation of private cloud-enabling technologies
✓ Expect few vendors to excel in both cloud service and enterprise system markets
✓ Challenge cloud service providers to prove enterprise readiness (e.g., security certifications)
✓ Carefully evaluate service levels and pricing models to determine risk and total cost over time
✓ Exploit marketplace and brokerage services
✓ When evaluating private cloud solutions focus on the service interfaces in addition to enabling technologies
Related Gartner Research

- The What, Why and When of Cloud Computing
  David Mitchell Smith, Daryl C. Plummer, David W. Cearley (G00168582)

- Top Five Cloud-Computing Adoption Inhibitors
  Bruce Robertson (G00167920)

- What You Need to Know About Cloud Computing Security and Compliance
  Jay Heiser (G00168345)

- Cloud Engineering: Somebody Has to Do It
  David Mitchell Smith, Valentin T. Sribar (G00169095)

- Hype Cycle for Cloud Computing, 2010
  David Mitchell Smith (G00201557)