

The Software Alliance logo, consisting of the text "The Software Alliance" in a sans-serif font, enclosed within a square frame made of four thick black lines.

The
Software
Alliance

The BSA logo, consisting of the letters "BSA" in a bold, sans-serif font, enclosed within a square frame made of four thick black lines.

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A low-angle, upward-looking photograph of a modern glass skyscraper. The building's facade is composed of a grid of glass panels that reflect the sky and clouds. The sky is a vibrant blue with scattered, fluffy white clouds. The perspective makes the building appear to converge towards the top of the frame.

Moving to the Cloud

A Primer on Cloud Computing

Research Insights by



What Is Cloud Computing?

At its most basic, cloud computing refers to online computing resources made available to a customer on demand by a third-party service provider (the cloud services provider, or CSP). These resources are typically delivered over the Internet, and users are charged for only the resources they actually consume, similar to the manner in which consumers pay for electricity or water.

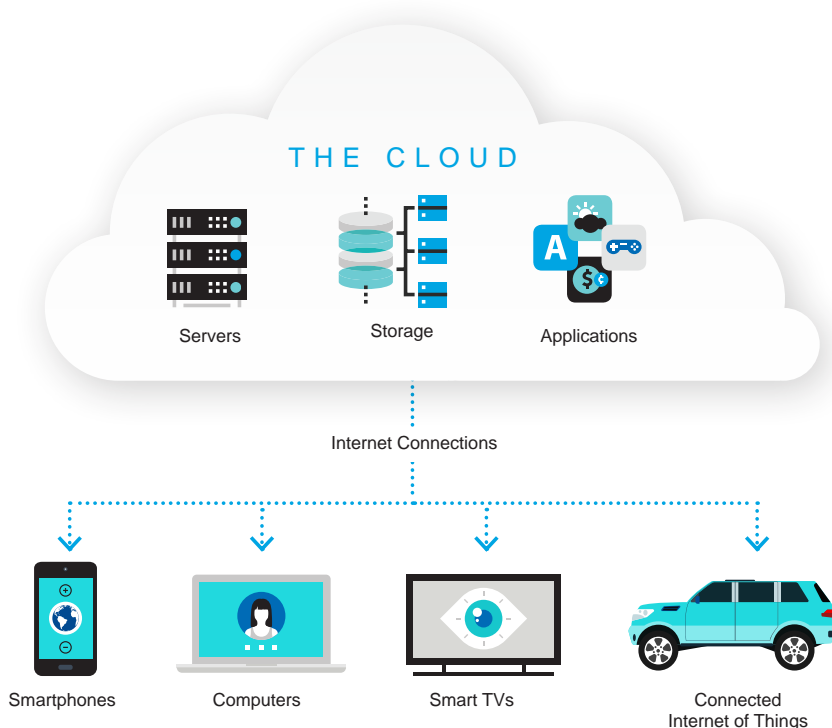
The cloud is emerging as one of the most transformative technologies of this generation. It is fundamentally revolutionizing how computing resources are delivered and consumed. Consumers no longer need to be tied to using software or data found only on their computing devices. They can access innovative cloud-enabled services and data anytime, anywhere, and on any device with Internet connectivity. This allows for better, more reliable, affordable, and flexible usage of applications and data.

Because of the cloud's power and versatility, there has been an explosion in the quantity, quality, and variety of cloud-based services available to consumers. Worldwide, the public cloud services market is projected to reach a value of a US\$128.4 billion in 2017 and grow to US\$266.0 billion by 2021¹.

Indeed, the cloud is already at the heart of many indispensable Internet-based services and apps used in our daily lives. Today, the cloud enables us to check our e-mail from multiple devices, share our personal photos with others around the world, access our bank accounts while on the go, and use social networking to collaborate with friends and colleagues.

The cloud has revolutionized not only the way that consumers interact with applications and data, but also how companies do business. The cloud provides enterprises—both large and small—access to affordable and scalable storage, processing power and information-sharing capabilities. Colleagues and clients can collaborate across the globe in ways never before possible. Products and services can now be delivered in entirely different ways, opening up new forms of business and business models. Because remote servers handle much of the computing and storage, companies can avoid expensive in-house IT infrastructure maintenance and upgrade costs, and instead leverage nearly infinite computing and storage capacity over the Internet.

By harnessing the cloud, organizations are accelerating opportunities, enhancing productivity, achieving cost savings, strengthening data security, and even helping the environment. Governments are similarly turning to the cloud to reduce their technology costs, improve the way they deliver citizen services, reduce energy needs, and better protect sensitive data.



¹ IDC Worldwide Public Cloud Services Market 2016

Three Common Cloud Service Models

| | TYPES | EXAMPLES | USERS |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------|
| SaaS | <p>Software-as-a-Service (SaaS)</p> <p>SaaS is a software distribution model in which the software application is hosted remotely on the CSP's IT infrastructure, instead of being run locally on the user's device. SaaS allows users to access software applications on demand, using a simple web browser or application.</p> | <p>Web-based e-mail, online documents, customer relationship management and online collaboration tools</p> | <p>End users</p> |
| PaaS | <p>Platform-as-a-Service (PaaS)</p> <p>PaaS provides on-demand access to a platform and associated tools to develop and run software applications, all managed by the CSP and housed on the CSP's IT infrastructure.</p> | <p>Operating system, programming languages, software development tools</p> | <p>Developers</p> |
| IaaS | <p>Infrastructure-as-a-Service (IaaS)</p> <p>IaaS enables the use of basic computing resources, traditionally associated with the purchase of hardware, like data processing, storage and networking components. With IaaS, however, hardware is provided externally and managed by the CSP, avoiding the need for expensive on-premises investments in IT infrastructure and enabling users to easily scale operations according to changing needs.</p> | <p>Remote hardware</p> | <p>System administrators</p> |

What Can You Do with the Cloud?

Consumers, businesses and governments alike are flocking to the cloud because they are now able to do things that were previously impossible or unimaginable.

For example, they can:

■ Access files anytime, anywhere, from any device

Storing data in the cloud allows users to access and retrieve the data regardless of whether they are on the go, or using a desktop, laptop, or smartphone.

■ Collaborate in new and innovative ways

Users can share and synchronize data stored in the cloud across different devices while maintaining data integrity. It enables workers to collaborate on documents and projects, and communicate in more seamless ways. Cloud-based systems that enable data to flow easily and usefully throughout the entire

organization and ecosystem of partners—including suppliers and customers—improves decision-making and time to market.

■ Work more efficiently and effectively

Users can access software functionality across the Internet without needing to take the time to load the entire software application on a particular device.

■ Improve data integrity and resiliency

Users can easily backup data to the cloud in geographically separated locations, protecting against data loss due to technical problems or natural disasters.

■ Develop, test and deploy new applications

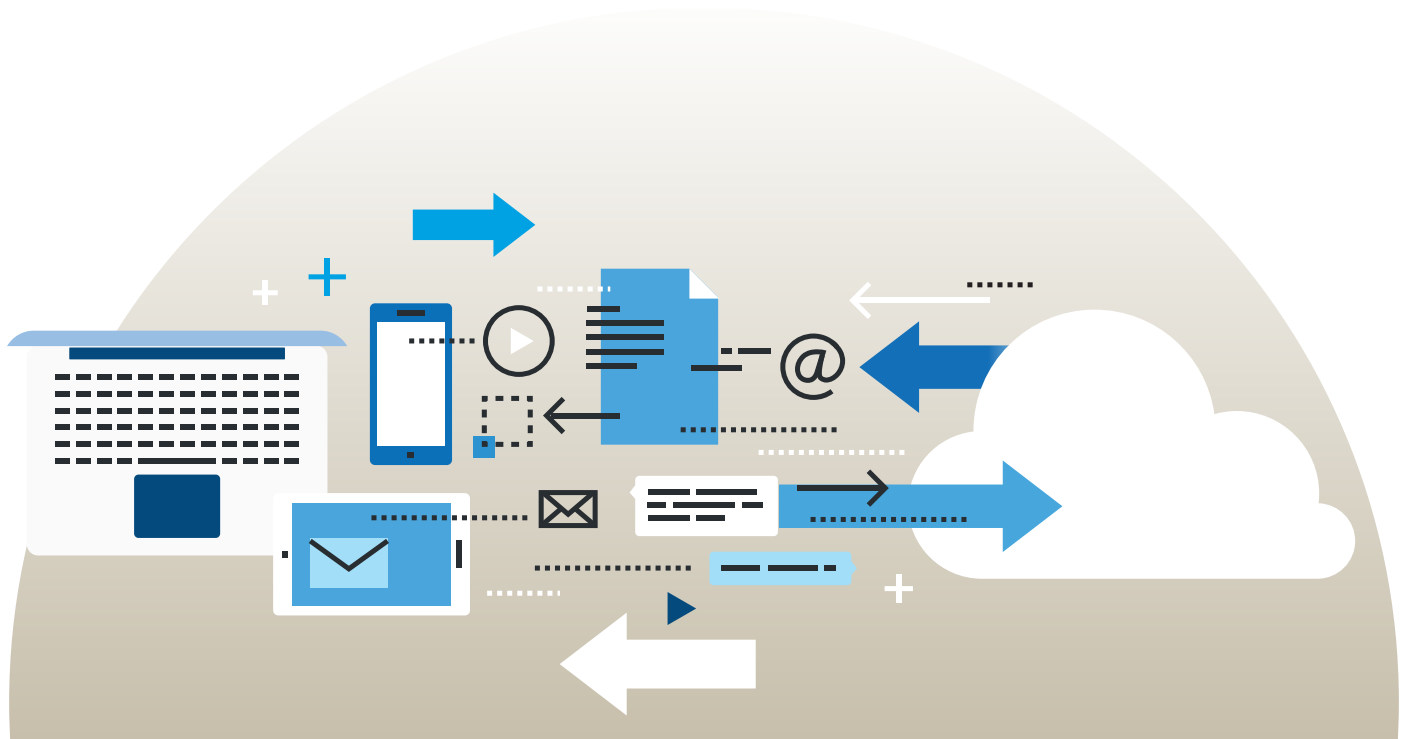
IT professionals and businesses can use the cloud to develop and test new software applications, such as mobile phone apps, without the need to procure costly IT equipment or additional software licenses. This allows them to roll out new applications and updates to their customers quickly and respond more dynamically to the demands of their customers.

■ Gain new insights from data

Cloud-enabled data analytics is making data from both inside and outside organizations more accessible, actionable, and increasingly more valuable by transforming insights into action, and action into tangible results.

■ Lead better lives with the Internet of Things

Sensors built into the physical objects around us and powered by cloud technology allow the “things” around us to help us with daily chores, monitor our health, sense the environment, adjust temperature control systems, and endless other activities.



Why You Should Get in the Cloud

Decision-makers point to several key characteristics that make the cloud critical to their success.

Transforms Speed to Market into a Key Competitive Advantage

- Using cloud computing services avoids the need to invest in large upfront capital outlays to set up and acquire IT assets. It is a democratizing force as small- and medium-sized enterprises can now access the same powerful IT resources once only affordable to the largest enterprises.
- The cloud also enables organizations to develop and deploy technology faster, enabling enterprises to be more agile as they adapt more quickly to changing needs and demands.
- Because the cloud is accessible over the Internet, it enables businesses to scale up nearly instantly to meet the demands that arise from entering into new markets, new geographies, new demographics, and new channels. Cloud resources can be tapped on rapidly, elastically, and cost-effectively to provide services based on users' changing needs.

Boosts the Way You Communicate and Collaborate

- The cloud enables entirely new forms of collaboration and communication. In a global economy, it opens new business opportunities and dramatically transforms the supply chain by enabling businesses to reach partners, suppliers and customers, and deliver services across vast geographical regions in real-time.
- Colleagues can now use cloud-based services like file storage, social networking,



emails, instant messaging, and other productivity tools to significantly improve collaboration and work efficiencies. Cloud-based apps also break down the four walls of an office, enabling today's workforce to work—and companies to source talent—from anywhere in the world.

Improves the Security and Resiliency of Your Data

- With the cloud, computing and storage are distributed across multiple physical hardware systems so that

if one system fails, another will automatically take over. Cloud customers can also choose to have their data stored and processed in multiple geographical locations, providing for even better data resiliency. In cases of natural or man-made disasters, the ability to have continued access to citizen data allows public and emergency services to be quickly deployed and scaled up, which often could mean the difference between life and death.

- Well-managed cloud services are often more secure than their on-

premises counterparts. Because the cloud is their business, CSPs make significant investments to ensure their systems are secure, both physically and digitally. CSPs typically go through stringent auditing processes to meet international security certifications, and are able to provide advanced threat protection technologies and secure data at rest and in transit. CSPs operating globally also have visibility into cyber threats around the world, and ensure their cyber defenses are quickly updated against newly discovered threats.

Who Is Already in the Cloud?

Almost every sector of the economy now widely uses cloud computing technologies, including financial services, healthcare, life sciences, manufacturing, retail, and utilities sectors. The public sector is no exception. Governments around the world are adopting public-cloud-first procurement policies². The following examples illustrate some of the organizations that have already made the move to the cloud.



Cloud Services for Public Sector

■ Estonia is leading the world in e-government, leveraging the power of the cloud to deliver many government services online. It established online voting and paperless government meetings in 2007, and its legislation is only valid if published online. In 2014, Estonia pioneered an e-Residency program, allowing entrepreneurs around the world to remotely establish their digital businesses in Estonia.



Cloud Services for Banking

■ DBS Bank, a regional bank headquartered in Singapore, is on the forefront of a major digital transformation as they fundamentally re-architect their business, using the cloud to be more responsive to customer needs. Cloud implementation allows DBS to rapidly deliver new technological applications, and scale up and down computing capacity to meet the fluctuating demands of financial market analyses, while meeting the risk management requirements of the regulator—the Monetary Authority of Singapore.



Cloud Services for Healthcare

■ New South Wales Health (NSW Health) provides statewide public health services and operates the largest public health system in Australia, operating more than 225 public hospitals across metropolitan, regional, and rural communities. Using the cloud, NSW Health unified its processes for managing its cost centers across 21 health agencies, and gained greater visibility into and control over health services spending. The migration to the cloud helped NSW Health improve its decision-making on fund allocations and more easily meet auditor-general requirements.



Cloud Services for Education

■ The De La Salle-College of Saint Benilde in Manila, Philippines, recently moved its specialist program for the deaf to the cloud. The move enabled De La Salle-College to modernize its educational program and provide students with the opportunity to learn on the latest industry tools, keeping them at the cutting edge of design and graphics, while making it simple for the institution to cater to the special needs of students in the course. Graduates from the program are regarded highly and well-sought after by employers, with many becoming important members of their creative teams.



Cloud Services for Hospitality and Travel

■ Based in Tokyo, Japan, Navitime Japan offers several mobile apps that help users navigate Japan's transit systems. Recognizing the particular benefits English speakers could derive from the app, Navitime harnessed the power of the cloud to integrate a chatbot with language intelligence capable of answering travel-related questions. Navitime now provides tourists with real-time answers to their travel questions as they explore Japan's major tourist cities. Since its launch in February 2017, an increasing number of travelers are using the chatbot not just for sightseeing but also for experience-related searches, such as sampling Japanese food.

² For example, in New Zealand, Australia and the Philippines.

Dispelling Common Myths

Myth 1

The Cloud Is NOT Secure

Just as a bank can better protect the assets of its patrons than individuals can at home, CSPs can provide a level of protection for their customers' digital assets that exceeds what most individual companies can provide on their own. In fact, cloud services provide some key security advantages over most on-premises environments:

- **Physical Security:** Certified personnel can carefully monitor servers 24/7 to prevent physical breaches. CSPs can protect physical access to servers by requiring multifactor authentication (e.g., biometric) and monitoring using motion sensors and video surveillance.
- **Data Security:** CSPs can ensure data integrity through use of state-of-the-art encryption protocols for data at-rest and in-transit. CSPs can establish redundant backups of data in geographically dispersed data centers, mitigating risk of loss in the event of power outages or natural or man-made disasters.
- **Advanced Threat Detection:** CSPs leverage state-of-the-art enhanced security intelligence to track, prevent, and mitigate the risks of cyber threats. They use regular penetration testing to simulate real-world attacks and evaluate security protocols against emerging threats.
- **Automated Patch Deployment:** Automated and centralized patch deployment and real-time updates to network security protocols work to protect systems from newly identified vulnerabilities.
- **Incident Management and Response:** CSPs maintain global teams of incident response professionals to respond and mitigate the effects of attacks and malicious activity.
- **Certification:** CSPs are typically certified to international security standards³, and go through regular audits to maintain their certifications. This provides independent third-party verification that the security controls and practices of these CSPs comply with international best practices.

Myth 2

The Cloud Should NOT Be Used for “Critical” Applications

Many features of cloud computing make it the preferred IT solution for “critical applications.” Few enterprises, no matter how large, can achieve the degree of reliability that CSPs provide. Leading enterprise CSPs, with their globally distributed networks and massive infrastructure, can withstand even the largest distributed denial of service attacks. Enterprise cloud services provide redundant data storage either globally or regionally based on customer preference and regulatory requirements. This level of redundancy improves availability even in the face of large-scale natural disasters or online disruptions and ensures that customer data is protected from local disturbances.

Myth 3

The Cloud Is Expensive

Cloud computing is an affordable way to allow organizations of all sizes to leverage the economies of scale that emerge when computing resources are pooled and the overhead costs associated with the management and maintenance of those resources are shared between multiple users. These economies of scale make cloud computing cheaper and more efficient than the traditional on-premises model. For instance, whereas companies once bore the costs of running and maintaining their own servers and data centers, such costs can now be spread among a CSPs many customers.

The cloud also enables organizations to reduce their IT costs by giving them the flexibility to scale up or down to accommodate fluctuating computing demands. The need for costly capital investments in hardware is eliminated and replaced by a more flexible pay-as-you-go subscription model. Whereas companies once had to make hardware investments based on unpredictable forecasts of their future computing needs, the cloud now allows them to pay only for the resources they need. By freeing up capital once tied up in hardware that exceeded a company's computing needs, cloud is a far more efficient model for IT spending.

Myth 4

Cloud Users Do NOT Have Control of Their Data

Cloud customers remain firmly in control of their own data and can establish access and use policies tailored to their organization's needs, risk profile, and regulatory obligations. With many CSPs, customers retain control over user credentialing, encryption key management, and data retention/destruction policies. At the same time, CSPs also ensure that the storage of customer data complies with applicable international, regional, and industry-specific compliance standards.

³ Such as those comprising the ISO/IEC 27000 family of standards for information security management systems.

Access Cloud Anywhere Anytime

The cloud is fundamentally revolutionizing how computing resources are delivered and consumed. Users and consumers can access innovative cloud-enabled services and data anytime, anywhere, and on any device. It has revolutionized how companies do business by providing access to affordable and scalable storage, processing power, and information-sharing capabilities.

Its many uses are serving businesses and individuals in accelerating opportunities, enhancing productivity, achieving cost savings, strengthening data security, and even helping the environment. Governments are also turning to the cloud to reduce their technology costs, improve the way they deliver citizen services, reduce energy needs, and better protect sensitive data.

The value of cloud computing is estimated to run well over the \$120 billion mark by 2017. As far as cloud computing goes, the future's already here.



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ABOUT BSA

BSA | The Software Alliance (www.bsa.org) is the leading advocate for the global software industry before governments and in the international marketplace. Its members are among the world's most innovative companies, creating software solutions that spark the economy and improve modern life. With headquarters in Washington, DC, and operations in more than 60 countries around the world, BSA pioneers compliance programs that promote legal software use and advocates for public policies that foster technology innovation and drive growth in the digital economy.

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