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Cloud Solutions Meet Changing Needs with a Competitive Advantage

Public, private, and hybrid clouds deliver IT services and capabilities for today's complex technological challenges, regardless of business size

This solution brief describes how to solve business challenges through investment in innovative technologies.

If you are responsible for...

- **Business strategy:** You will better understand how a cloud solution will enable you to successfully meet your business outcomes.
- **Technology decisions:** You will learn how a cloud solution works to deliver IT and business value.

Executive Summary

Imagine rapidly responding to new business opportunities in the marketplace without concern for technology. What if ideas could be quickly turned into prototypes and products, regardless of the workload? Organizations today face a dizzying array of tools and solutions, and technology is changing at unprecedented rates. Regardless of industry or business need, many organizations are turning to cloud solutions to gain flexibility, agility, and scalability. Cloud solutions can help accelerate the delivery of new IT infrastructure, speed production of new products, and improve IT responsiveness.

Cloud solutions can help organizations achieve rapid deployment, scalability, and innovation as well as decrease costs by eliminating vendor lock-in and delivering the flexibility to pay as you go. Whether the business is a start-up, looking to gain needed infrastructure; a mid-sized operation with a lean IT organization, looking to expand its capabilities; or a mature business with a strong market position, deepening its research and development, cloud solutions can help achieve those goals. Public, private, and hybrid clouds deliver a wide choice of solutions for business-specific needs.

Cloud Models
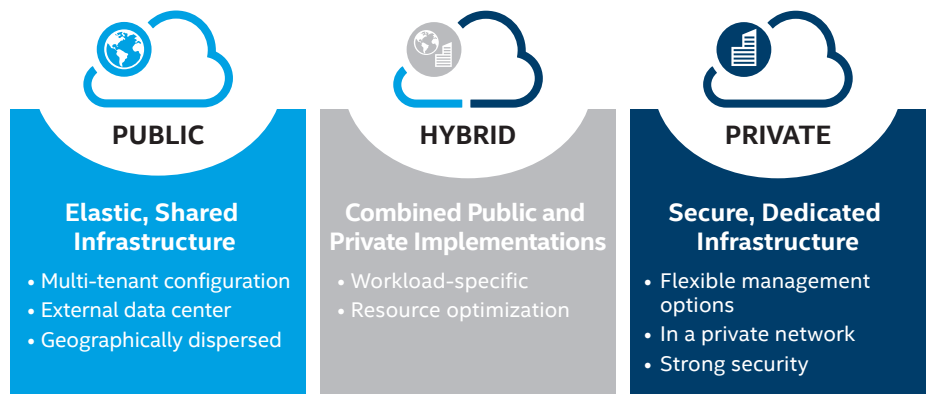
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PUBLIC

Elastic, Shared Infrastructure

- Multi-tenant configuration
- External data center
- Geographically dispersed

HYBRID

Combined Public and Private Implementations

- Workload-specific
- Resource optimization

PRIVATE

Secure, Dedicated Infrastructure

- Flexible management options
- In a private network
- Strong security

Figure 1. Public, private, and hybrid clouds offer business-specific solutions.

Business Challenge: Traditional Infrastructure Limits Time-to-Market

Maintaining a competitive advantage in today's constantly changing, technology-focused landscape requires agility and flexibility. But traditional infrastructure can be costly to purchase and maintain, and many industries are governed by strict regulations about how data must be stored and accessed. Costs associated with computing, massive data storage, outdated infrastructure, and overburdened resources prevent companies from achieving maximum return on technology investments. Organizations are seeking new ways to modernize their infrastructure and optimize the total cost of technology ownership, and cloud technology has matured to meet modern storage and compute demands, and help achieve the following:

- **Reduce time-to-market (TTM).** Traditional infrastructure, when virtualized, can improve TTM and agility by reducing physical server provisioning and landing times; however, without the orchestration associated with a cloud solution, environment management and application team efficiency remains challenging.

- **Lower costs.** Similarly, virtualizing traditional infrastructure can improve cost efficiency, but automated orchestration is necessary to truly maximize hardware utilization by eliminating manual processes.

- **Improve scalability and resiliency.** Traditional environments rely on the underlying infrastructure to provide application availability and may not provide scaling and failover features, especially when faced with irregular load demand.

Traditional and software-defined infrastructure (SDI) solutions can run on a common infrastructure, delivering new capabilities with cloud technologies—an approach that offers both agility and cost effectiveness. But moving to cloud solutions, whether public, private, or hybrid, is an evolutional journey; each step brings higher value to the organization, including improved asset utilization, flexibility, and operational efficiency.

Cloud Solutions Help Improve Agility Across Industries

Businesses from a variety of industries and with a wide range of needs are turning to cloud solutions, and especially multi-cloud environments, to run workloads more efficiently and accelerate the delivery of solutions. A few examples include:
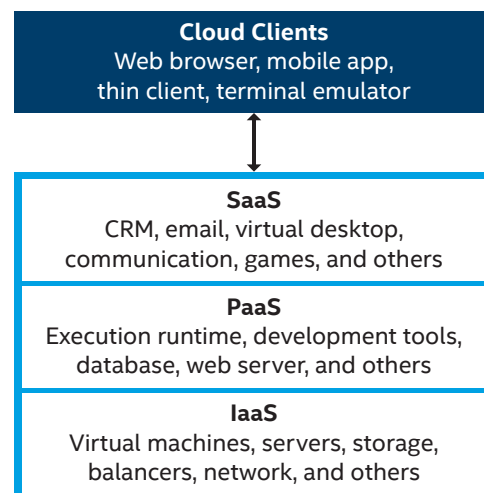
- **Automotive.** The Volkswagen Group* used a private cloud solution to overcome outdated, legacy infrastructure. Resources that were previously locked into silos could be pooled, shared, and accessed on-demand through self-service portals. Volkswagen developers gained quick access to resources for faster innovation across business and consumer applications[1].

- **Financial.** Commonwealth Bank of Australia* (CBA) realized its legacy environment was slow to respond to its rapidly changing business needs. CBA created an agile private enterprise cloud solution based on SDI, open source technologies, continuous integration and delivery, and industry-standard Intel® architecture. CBA can now adopt new technology as it becomes available, while maintaining security and stability.[2]

Cloud Service Types

Cloud services can be offered in public, private, or hybrid environments, and generally fall into these categories:

- **Software-as-a-Service (SaaS).** SaaS includes network-based services using commercially available software, such as customer relationship management (CRM), office productivity, as well as team collaboration applications, online file storage, and backup services. SaaS options offer simple management with little to no capital expense.

- **Platform-as-a-Service (PaaS).** PaaS provides a pre-provisioned environment with an OS, abstracted middleware, and infrastructure. PaaS enables rapid application development, testing, and deployment through self-service, on-demand tools, resources, automation, and a hosted platform runtime container.

- **Infrastructure-as-a-Service (IaaS).** IaaS is virtualized hardware (compute, storage, and network) delivered as code. IaaS gives developers more control over the entire application stack or when the application requires a level of isolation from other applications on the same stack.

Cloud Clients
Web browser, mobile app,
thin client, terminal emulator

SaaS
CRM, email, virtual desktop,
communication, games, and others

PaaS
Execution runtime, development tools,
database, web server, and others

IaaS
Virtual machines, servers, storage,
balancers, network, and others

- **Research.** Bioinformatics scientists need access to high-performance computing (HPC) environments for genomic sequencing; astrophysicists engage machine learning to analyze proton collisions; and industrial designers construct and manipulate hundreds of compute- and storage-intensive 3D models during the development process. Through hybrid cloud solutions, these and other organizations gain cost-effective alternatives to building on-premises infrastructure.

The scalability of cloud solutions, as well as the option to use them only when they are needed, saves organizations time and money.

Solution Value: Increase Agility, Efficiency, and Scalability

Cloud solutions, whether public, private, or hybrid, deliver reliability and high performance while helping organizations modernize operations and gain the following benefits:

- **Agile.** Cloud solutions provide environment management and application team efficiencies because cloud-aware applications are designed to be stateless—infrastructure and location independent—and to use software features to manage tasks without requiring teams to manually touch databases and application engines.

- **Cost-efficient.** Cloud solutions help reduce costs by improving hardware efficiency and reducing manual tasks by automating orchestration.

- **Scalable and resilient.** Instead of relying on the underlying infrastructure for application availability, cloud solutions take advantage of built-in scaling and failover features to automatically meet irregular load demands.

It is important to understand the unique differences of each cloud implementation and how they apply to business and workload needs when deciding which to choose. The three basic cloud models include public, private, and hybrid.

Public Clouds Offer Necessary Infrastructure for Businesses with Fewer IT Resources

Public clouds are virtualized compute, network, and storage resources that are offered and managed by a third party outside of the customer's private network. Resources are hosted in a multi-tenant configuration in external data centers which may be distributed geographically. Start-ups and organizations with little or no in-house IT resources can often gain immediate benefits from the public cloud without long-term vendor lock-in, but may need to implement strategies that overcome strict regulatory compliance requirements. For organizations with mainstream business processes, such as customer relationship management (CRM), and general productivity needs, such as email and collaboration tools, public clouds can help rapidly improve capabilities.

Workload Optimization with Cloud Implementation

Some workloads are better suited to public clouds, while others may have requirements, such as regulatory compliance, that make them more appropriate for private or hybrid clouds. Understanding which cloud infrastructure to choose requires a clear understanding of workload requirements. There are three primary considerations:

- **Business.** These include the top business problems the organization is working to solve and the main use cases to enable or enhance, such as improving time-to-market (TTM), agility, or regulatory compliance.

- **Technical.** These include workload attributes, such as necessary performance, security, data volume, and elasticity.

- **Ecosystem.** These include factors such as the maturity of the service provider, solution, or market accessibility.

There are other considerations, as well, such as cloud-readiness, licensing, and organizational practices. For detailed information about each of these, see the Optimal Workload Placement for Public, Hybrid, and Private Clouds white paper.

Cloud Workload Placement
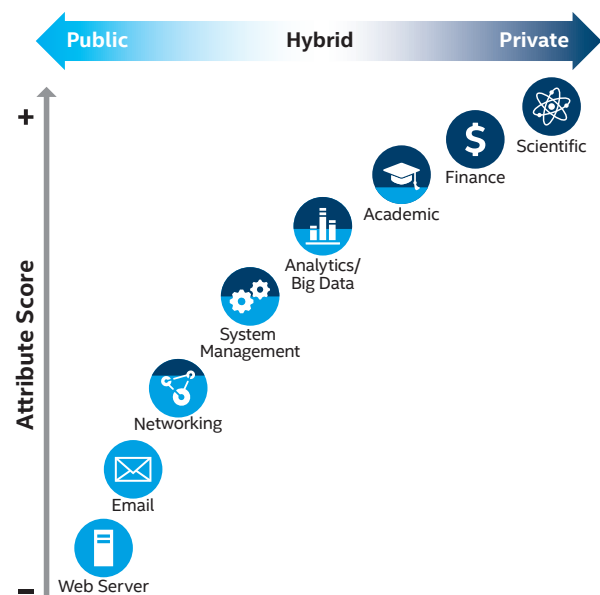
Private Clouds Expand on Investments

Private clouds deliver Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), or Software-as-a-Service (SaaS), and are deployed within a customer's private network. They may reside on-premises, managed internally or be located off-premises, managed by a third party and connected through virtual private networks (VPNs). When the private cloud is owned, managed, and operated by the organizations themselves it is known as do-it-yourself (DIY). DIY is a good option for robust IT organizations that have skills in cloud computing. Private clouds can also be fully managed by a third party, which offers additional benefits to lean IT organizations.

Hybrid Clouds Target Specific Workload Needs

Hybrid clouds provide an approach that combines workload components from both private and public cloud solutions and allow workloads to migrate seamlessly between both instances. Hybrid clouds offer the flexibility to use configurations tailored to specific data types and computing needs to workloads. Ultimately, hybrid clouds enable organizations to optimize their hardware utilization to achieve cost efficiency and lower total cost of ownership (TCO). Orchestration is a critical function in overcoming the challenges of complexity, duplication, and inconsistency in hybrid cloud management, and it can improve delivery times and free up development resources.

Solution Architecture: Strong Security, High Performance

Cloud-based software, powered by Intel® technology, helps improve security, compliance, and performance, while increasing availability. Intel's involvement in the open source community nurtures broad collaboration and innovation, resulting in an SDI approach that delivers hundreds of new, more accessible cloud solutions.

Intel's approach to software and hardware design brings the following benefits to cloud solutions (Figure 2):

- **Security.** Intel® Trusted Execution Technology (Intel® TXT) provides cloud operators with automated security and compliance monitoring. Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) accelerates encryption and decryption algorithms. Intel® Secure Key helps reduce vulnerability to sophisticated cyberattacks.

- **Performance.** The Intel® Xeon® processor family and Intel® Ethernet Gigabit Server Adapters deliver reliable, high-performance network, compute, and storage capabilities for virtualized environments that do more with less. Intel® Optane™ technology provides high throughput and low-latency memory. Intel® Field Programmable Gate Array (Intel® FPGA) accelerators help make the cloud quick, predictable, and energy efficient.

- **Scalability.** Intel® Solid State Drives (Intel® SSDs) deliver high-performance and stable reliability for data storage; Intel Xeon processors improve high-performance computing; and Intel® Resource Director Technology (Intel® RDT) brings new levels of visibility and control over how shared resources such as last-level cache (LLC) and memory bandwidth are used by applications, virtual machines (VMs), and containers.

Cloud solutions ease the burden of deployment and management for enterprises that want to focus on innovation and product development.
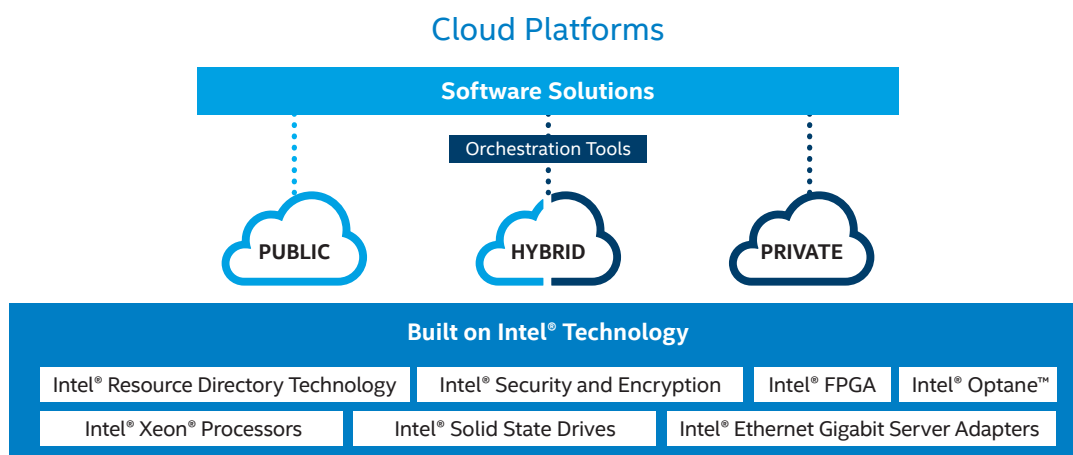
Cloud Platforms

Figure 2. With Intel® technology, cloud platforms provide secure, scalable performance.

Conclusion

Gaining a competitive edge or maintaining a marketplace position relies on the ability to rapidly innovate and deploy solutions. But the dizzying pace of technology changes, the exploding volumes of data, and the increasing need for HPC slows momentum.

Public, private, and hybrid cloud solutions that are built on Intel technology can offer organizations the scalability and flexibility to remain on a competitive path of innovation. Intel's security-focused, high-performance technologies provide the foundation for reliable cloud solutions that let IT organizations focus on meeting business needs while helping to reduce operational costs.

Find the solution that is right for your organization. Contact your Intel representative or visit **intel.com/cloud**.

Solutions Proven By Your Peers

Intel Solutions Architects are technology experts who work with the world's largest and most successful companies to design business solutions that solve pressing business challenges. These solutions are based on real-world experience gathered from customers who have successfully tested, piloted, and/or deployed these solutions in specific business use cases. Solutions architects and technology experts for this solution brief are listed on the front cover.

Learn More

You may also find the following resources useful:
- Optimal Workload Placement for Public, Private, and Hybrid Clouds paper

Ask your Intel representative about these hybrid, private, and public cloud solution briefs.
- VMware SDDC Eliminates Silos to Enable Hybrid Cloud Agility
- Microsoft Hybrid Cloud Solutions Help Businesses Gain Agility
- Gain Security Compliance with IBM Cloud Secure Virtualization* Managed Private Cloud
- Red Hat Private Cloud Solutions Help Enable Rapid Innovation
- Help Improve Operational Efficiency with a SUSE* Cloud
- Innovation is Within Easy Reach with AWS* Public Cloud
- Microsoft Azure* Public Cloud Drives Business Advantage