Zero infrastructure: Anything-as-a-service

A technology operating model for the cloud-centric era
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<table>
<thead>
<tr>
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<th>Name</th>
<th>Title</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>
Executive summary

• The cloud, especially the public cloud, is now officially beyond hype. Supply options are real, as is enterprise buyer spend.

• Increasingly, chief experience officers (CXOs) are using the cloud to solve the most important business and technology challenges across all functions of the business, from speed and agility to innovation and cost advantage.

• The cloud is becoming the core paradigm for delivering business technology, with an aspirational promise of “zero infrastructure — anything-as-a-service.”

• To deliver on this promise, tech operating models will need to evolve and grow a new set of cloud-centric capabilities that are very different from the old ways of IT:
  A new, consultative approach to cloud demand and business relationship management
  A retooled architecture, engineering, and operations capability, embracing such concepts as cloud orchestration tool sets, continuous integration and deployment, and development operations (DevOps)
  Strong controls for cloud consumption, performance, and vendor/partner management

• Where to start, and where to focus, will depend on your industry. The journey will look different for players whose technology is the product vs. less tech-centered mid-cap and large enterprises.

• We offer a blueprint for a cloud-centric operating model, and a road map for how to get there.
After years of hype, public cloud services are now reaching scale — with dramatic growth ahead

**Total IT spend**
(in US$ billions; CAGR)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total IT Spend (in US$ billions)</th>
<th>CAGR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>$491</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>$630</td>
<td>+22%</td>
</tr>
</tbody>
</table>

**Spend for public services**
(CAGR 2013–17)

- **IaaS**: +26%
- **PaaS**: +27%
- **SaaS**: +20%

**Cloud revenue shares**
(as % of total revenue)

- **Oracle**: 3% (2013), 8% (2017)
- **IBM**: 8% (2013), 17% (2017)
- **SAP**: 6% (2013), 29% (2017)
- **Adobe**: 28% (2013), 53% (2017)

**Cloud revenues**
(in US$ billions, annualized run rate)

- **Amazon**: Not reported, 6 (2013), 6 (2017)
- **Microsoft**: 20 (2017)

**Observations**

- What we see today is only a glimpse of what lies ahead
- Public cloud services are dramatically outpacing general IT spend (22% vs. 4% CAGR)
- Companies adopt service models, going as far as striving for a zero infrastructure footprint
- IT suppliers are rapidly adopting their business models to compete with new players

Note: Numbers are analyst estimates and are not exactly comparable.

Source: IDC; Forrester; Gartner; Oracle; Strategy& analysis
Cloud models have benefits beyond costs, but a number of perceived and real inhibitors slow adoption

**Expected benefits of cloud operating models**

- **Costs:** Declining infrastructure costs (Moore’s law), competitive environment, pay-per-use model, opex for capex
- **Scalability/elasticity of supply:** Resources scale based on user demand, transparent resource utilization
- **Manageability:** Self-service and automation, SaaS/PaaS replace complex legacy solutions
- **Agility:** Faster time-to-market
- **Mobility:** Aligned with new customer behavior, supporting mobile workforces

**Key inhibitors of cloud adoption**

(% of respondents who mentioned)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>46%</td>
</tr>
<tr>
<td>IT management complexity</td>
<td>46%</td>
</tr>
<tr>
<td>Vendor lock-in</td>
<td>35%</td>
</tr>
<tr>
<td>Compliance</td>
<td>30%</td>
</tr>
<tr>
<td>Cost</td>
<td>28%</td>
</tr>
<tr>
<td>Interoperability</td>
<td>27%</td>
</tr>
<tr>
<td>Privacy</td>
<td>26%</td>
</tr>
<tr>
<td>Reliability</td>
<td>22%</td>
</tr>
<tr>
<td>Technology complexity</td>
<td>21%</td>
</tr>
</tbody>
</table>

Source: North Bridge (2013); Strategy& analysis
The move to the cloud is creating a disruption comparable to the shift from mainframe to client/server architecture

Evolution of the digital technology agenda

**Today**

- Custom-developed applications and stand-alone platforms requiring onerous maintenance schedules
- Siloed development and operations functions managing lengthy release cycles
- Long lead times to provision IT components and code deployments
- Dedicated, high-touch infrastructure (data centers, server, storage, mainframe) estate
- Focus on development and supporting operations — “IT for IT”
- Device-driven, static-capacity end-user IT and supporting business services
- Big IT/CIO controlling the IT spend and resourcing

**Tomorrow**

- Standard, cloud-based, integrated SaaS/PaaS solutions — focus on configuration vs. code
- Continuous software delivery with accelerated time-to-market enabled by collaborative DevOps
- On-demand provisioning of IT infrastructure services
- Zero infrastructure: low-touch, flexible, and scalable compute and store capacity
- Orchestrator of services, focused on business enablement — “IT for business”
- Software-defined, auto-scalable end-user IT and supporting business services
- Shared funding and resourcing among IT, business, and partners

Source: Strategy&
Senior executives looking to adopt a cloud strategy face substantial business and IT challenges

**Business challenges**

- Leveraging digital to gain agility and faster time-to-market
- Acquiring talent to manage product innovation
- Attaining economies of scale due to “shadow IT”
- Digitizing customer engagement to drive evolving technology needs

**IT challenges**

- Shortage of talent/skills to operate the new model
- Inefficient IT cost management
- Exposure to new risk and security challenges
- Legacy systems that make changes cost prohibitive

Source: Strategy& analysis
Transitioning to the cloud requires a mix of new and enhanced traditional operating model capabilities

Holistic view: Components of an ideal cloud-centric operating model

**Cloud demand**
- CMO: sales and marketing
- CPO: product value chain
- Other CxOs: analytics, financial reporting, HR benefits administration, etc.

**Cloud demand management**
- Cloud solution evangelism and consulting
- Portfolio assessment focused on cloud adoption planning

**Cloud supply management**

**Cloud architecture and engineering**
- Cloud-first architecture design
- DevOps discipline and tooling for continuous integration, deployment, and multi-cloud operations

**Cloud operations**
- Multi-cloud/hybrid cloud operations (zero infrastructure aspiration)

**Cloud vendor management**
- Strategic cloud solution sourcing
- Vendor relations and innovation exchange
- SLA and vendor performance management

**Cloud cost and consumption management**: Disciplined metering, tuning, and reporting for consumption-based cost charge-back model

**Workforce/talent management**: Continuous talent pool mix and skill set development to support cloud-focused organization

**Cloud security and risk management**: Cloud risk vs. benefits assessments, security policy setting, and audits

**Cloud transition management**: Coordination and program management of initiatives to move to/adopt cloud platforms

Source: Strategy& analysis
## Demand for cloud services is largely driven by needs of stakeholders outside the IT domain

<table>
<thead>
<tr>
<th>Key stakeholder strategic objectives</th>
<th>Digital agenda implications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CMO</strong></td>
<td></td>
</tr>
<tr>
<td>– Faster time-to-market and increased agility</td>
<td>– Enable advanced analytics through cloud-based solutions</td>
</tr>
<tr>
<td>– Innovative sales and marketing powered by cloud solutions</td>
<td>– Digitize customer engagement platforms</td>
</tr>
<tr>
<td>– Enhanced user and customer experience</td>
<td></td>
</tr>
<tr>
<td><strong>CPO</strong></td>
<td></td>
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<tr>
<td>– Innovative service and/or product design — component customization based on rapidly evolving customer needs</td>
<td>– Digitize technology service stack for product customization</td>
</tr>
<tr>
<td>– Product value chain digitization and innovation</td>
<td>– Define architecture standards for product development</td>
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<tr>
<td><strong>CIO</strong></td>
<td></td>
</tr>
<tr>
<td>– Cloud-first target architecture blueprint</td>
<td>– Define architecture standards for corporate IT platforms</td>
</tr>
<tr>
<td>– DevOps service management model supporting hybrid cloud platforms</td>
<td>– Digitize infrastructure to achieve a zero infrastructure footprint</td>
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<tr>
<td>– Strict security and risk management</td>
<td>– Build cloud security capability</td>
</tr>
<tr>
<td><strong>CxO</strong></td>
<td></td>
</tr>
<tr>
<td>– Cost control and allocation</td>
<td>– Establish cloud consumption and cost control mechanism</td>
</tr>
<tr>
<td>– Capex to opex shift for increased operational agility and economies of scale</td>
<td>– Develop strong-form vendor management</td>
</tr>
<tr>
<td>– Back-office process automation</td>
<td>– Digitize back-end and support processes and functions</td>
</tr>
</tbody>
</table>

*Source: Strategy& analysis*
Cloud IT architecture is constantly evolving, standards are rare, and new technologies keep rolling out

### Trends in cloud architecture stack technologies

<table>
<thead>
<tr>
<th>Platform</th>
<th>Service catalog</th>
<th>Service assurance and SLA management</th>
<th>Service billing and consumption control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology stack</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Orchestration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Release management tool kit</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code repository, software configuration management, build/deploy coordination across environments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Security controls</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security policies, compliance audits, and risk management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>QA orchestration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automated testing, test case management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Orchestration of continuous integration and deployment</strong></td>
<td>Integration and deployment pipes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operations monitoring</strong></td>
<td>Monitoring, alerts, and backups to ensure quality of service level</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Service metrics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption and cost metrics for metering and reporting purposes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Resource orchestration</strong></td>
<td>Resource stacks, payload allocations (storage, computer power, network), images (instances and failovers/disaster recovery)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Growing list of commercial and open-source solutions provide a range of alternatives to manage the cloud technology stack.*

*App container and orchestration can be managed through a number of platforms.*

*Fierce competition within public cloud space is driving prices down.*

*Private cloud and on-premise VM providers are expanding into hybrid solutions.*

*Source: Strategy& analysis*
A cloud-centric delivery model requires a new, more fluid, DevOps-style take on service deployment and operations

Cloud deployment and operations considerations

**Continuous integration and deployment (CI/CD)**

Need for simultaneous, frequent deployments

Coordinate multiple cloud platforms with ability to rapidly scale according to build/test/run needs

- Adopt CI/CD best practice and corresponding tools
  - Code repository management
  - Build automation
  - Self-testing
  - Automated deployment

**Multi-cloud service management**

Need to ensure user/customer experience across distributed clouds

Coordinate multiple third parties that contribute to delivering a given service

- Design end-to-end measures at platform and aggregated service levels
- Adapt IT service management discipline to multi-cloud setting
  - Monitoring/events/alerts
  - Incident/problem flows
  - SLA/performance

Source: Strategy& analysis
Organizations can set the path toward a zero infrastructure footprint by employing a four-step asset reduction process

Four steps toward a zero infrastructure footprint

- **Decommission:** “Kill”
  - Reduce infrastructure estate by identifying and eliminating underutilized assets

- **Move to the cloud:** “Ship”
  - Migrate eligible on-premise hosted applications and services to cloud-based solutions

- **Virtualize:** “Shrink”
  - Shrink remaining physical asset estate through virtualization of servers and storage

- **Consolidate:** “Merge”
  - Reduce remaining physical infrastructure footprint through consolidation of assets within and across data centers

Performance and utilization should be consistent boundary conditions across the steps

Source: Strategy& analysis
The cloud service supplier landscape is diverse, and maturity varies across technology and domains

### Cloud supplier landscape and maturity

#### SaaS

<table>
<thead>
<tr>
<th>Enterprise software</th>
<th>Collaboration and productivity</th>
<th>Content management</th>
<th>CRM</th>
<th>E-commerce/payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM, Oracle, SuccessFactors, Workday</td>
<td>Atlassian, Google for Work, Jive, Kaltura, Office 365, ON24, Yammer</td>
<td>Adobe CQ5, HP Autonomy, OpenText, SDL</td>
<td>Oracle Service Cloud, Salesforce</td>
<td>Demandware, Hybrid Software, IBM Sterling Commerce, Intershop, Oracle Commerce</td>
</tr>
</tbody>
</table>

*Examples:*
- High supplier diversity
- Will continue to grow as more applications move to the cloud
- Interoperability is a challenge

#### PaaS

<table>
<thead>
<tr>
<th>Security</th>
<th>Private cloud stacks/solutions</th>
<th>App containers and middleware</th>
<th>Big data and analytics</th>
</tr>
</thead>
</table>

*Examples:*
- Emerging standards (e.g., Docker, OpenStack)
- Need to integrate and bridge private and public offerings

#### IaaS

<table>
<thead>
<tr>
<th>Network</th>
<th>(Enterprise) storage</th>
<th>Computing</th>
<th>Maturity of product offering:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brocade, Cisco, HP, Juniper, OpenFlow, VMware</td>
<td>Amazon Web Services S3, Box, Dropbox, Egnyte, Google Cloud, Microsoft Azure</td>
<td>Amazon Web Services EC2, Google App Engine, Microsoft Azure, SoftLayer</td>
<td>High, Medium, Low</td>
</tr>
</tbody>
</table>

*Examples:*
- Growth will be driven by volume/unit cost advantages
- Growing maturity of offerings
- Diminishing relevance of risk/security concerns

Source: Strategy& analysis
Sourcing cloud services through a central VMO function allows organizations to leverage scale and expertise

Cloud-centric vendor management

**Performance management**
Vendor SLA performance management to ensure efficient use of services (e.g., cost control based on consumption and level of service)

**Contract management**
Coordinate contracting of cloud services to ensure that economies of scale are leveraged across demand channels

**Strategic sourcing**
Rapidly growing and highly diverse supplier landscape requires guard-rails for cloud strategy (e.g., security compliance, architecture gate checks)

**Transactional purchasing**
Focus on transparency of cloud service procurement by streamlining process based on established sourcing standards

Source: Strategy& analysis
A number of cost models providing varying levels of cost transparency are available to organizations

<table>
<thead>
<tr>
<th>Cost transparency model options</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Consumption-based cost allocation</td>
<td>- Accurate level of cost allocation based on per-unit metric consumption</td>
</tr>
<tr>
<td>2. Product-level cost transparency</td>
<td>- More granular level of cost transparency to inform business group product strategy</td>
</tr>
<tr>
<td>3. Service portfolio menu card</td>
<td>- Ability to conduct product support cost-benefit analysis to identify ways to positively impact P/L</td>
</tr>
<tr>
<td>4. Cost charge-back mechanism</td>
<td>- Provides service offering cost transparency to better inform sales process</td>
</tr>
</tbody>
</table>

- Instills accountability for support costs within business groups by product

Increasing level of transparency

<table>
<thead>
<tr>
<th>What’s required to get there?</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A defined services catalog with associated cost drivers to allocate IT costs in business-relevant terms that reflect the services provided</td>
</tr>
<tr>
<td>- “Good, granular data” and supporting systems to track and manage cost allocations</td>
</tr>
<tr>
<td>- A change in organizational behavior to adopt consumption-based billing and charge-back model</td>
</tr>
<tr>
<td>- Embedded financial acumen across roles within the organization (i.e., service managers) to actively manage and fine-tune consumption-based costs</td>
</tr>
<tr>
<td>- Active communication of the allocation process by IT, business units, and finance to the organization to ensure alignment with existing planning and budgeting processes</td>
</tr>
</tbody>
</table>

Example

Source: Strategy& analysis
Implementing a cloud-first organization requires a service-oriented transformation in the talent and delivery model...

Knowledge and skills in today’s workforce
- Traditional development methodologies
- Custom-developed applications
- Heavy engineering and technical focus
- Infrastructure and application management skills
- Managing resources and staff augmentation

Knowledge and skills in tomorrow’s workforce
- Fit-for-purpose development methodology — agile, DevOps
- Configuration and integration of SaaS apps/platforms
- Finance and business acumen/business consultation
- Information and service management skills
- Strong-form vendor management tracking outcomes
...to identify and retain the right skills for tomorrow’s workforce

Digital keystone skills

- Enterprise and technology architecture
- Project and program management
- Business requirements management
- Quality assurance
- Vendor management
- Prototyping
- User experience design
- Security

Source: Strategy& analysis
Organizations must adapt to stay competitive as the benefits of cloud adoption continue to outweigh security risks

- Security as primary inhibitor of cloud adoption reinforced by well-publicized recent breaches
- Prevailing opinion that third-party services are always riskier than doing it yourself
- Lack of standards leads to vendor lock-in and interoperability problems
- Complex system landscape will be replaced by complex service landscape

- General opinion trending in favor of wider acceptance of benefit vs. risk of cloud adoption
- In certain cases, stricter security levels can be achieved through cloud solutions
- Regulatory requirements dictate adoption of cloud solutions in some industries (e.g., HIPAA compliance)
- Keeping pace with the competition and disruptive technologies makes cloud transition inevitable

Establish cloud security capability to manage the risks of cloud adoption, avoid collecting and processing un-curated data in the cloud, and develop a response plan in the event of a breach

Source: Strategy& analysis
A cloud transformation entails establishing a business case, strategy, operating model, and target-state architecture

0. Baseline assessment
   Baseline infrastructure and application portfolio estate to determine feasibility of the organization’s cloud adoption aspirations

1. Value assessment and business case
   Determine the business value of the cloud solution chosen by an enterprise and evaluate it through the lenses of cost, usability, functionality, and agility

2. Strategy and road map development
   Enable organizations to develop a unified cloud strategy that aligns business vision, values, and objectives with a cloud solution

3. Cloud operating model
   Define the processes, organization structure, roles, skills, and governance required to effectively operate in a cloud environment

4. Readiness and maturity assessment
   Assess cloud adoption readiness based on infrastructure, governance, and process maturity

5. Target-state service and architecture development
   Define cloud functionality to meet business objectives, develop architecture to achieve these functionalities, and design capabilities to manage cloud services

Source: Strategy& analysis
An organization’s cloud transition play depends on its tech affinity and size

Three archetypes of cloud plays

**Basic: Lower-tech mid-caps**
- Lack of capability to create solutions matching capabilities of cloud offerings
- Difficult to recruit experts to implement cloud services
- IT not seen as a key business enabler

**Midsized non-tech companies**
should selectively adopt cloud to improve cost profile and innovate

**Expert: Tech vanguards**
- Aggressively adopting cloud models
- Modern, virtualized application portfolio
- Young, highly skilled IT personnel

**Cloud adoption is mandatory for tech-affiliated companies in order to stay agile and competitive from an innovation and cost profile perspective**

**Expert: Complex blue chips**
- Cloud required for reducing complexity, improving agility and innovation
- Large legacy portfolio, heterogeneous and highly specific application portfolio

**Large corporations should at the minimum adopt cloud to reduce complexity of their business support functions**

Source: Strategy& analysis
Each organization should decide how far it needs to push the operating model choices

<table>
<thead>
<tr>
<th>Low relevance</th>
<th>High relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloud demand management</td>
<td></td>
</tr>
<tr>
<td>Cloud architecture and engineering</td>
<td></td>
</tr>
<tr>
<td>Cloud operations</td>
<td></td>
</tr>
<tr>
<td>Cloud vendor management</td>
<td></td>
</tr>
<tr>
<td>Cloud cost and consumption management</td>
<td></td>
</tr>
<tr>
<td>Workforce/talent management</td>
<td></td>
</tr>
<tr>
<td>Cloud security and risk management</td>
<td></td>
</tr>
</tbody>
</table>

Source: Strategy& analysis
We offer a full range of cloud-centric services to help clients move to an IT platform of the future

1. Cloud strategy services
   - Value assessment
   - Strategy and road map development
   - Business case development
   - Readiness and maturity assessment

2. Cloud architecture services
   - Service and architecture development
   - Application readiness and migration planning
   - Vendor analysis and selection
   - Public cloud integration

3. Cloud operations services
   - Service optimization
   - Service management optimization
   - Organization and talent optimization
   - Public cloud brokerage

4. Cloud business services
   - Risks, controls, and compliance
     - Implementation assurance
     - Controls design review
     - Regulatory compliance assessment
     - Integrated security compliance
     - Third-party assurance
   - Taxation
     - Permanent establishment issues
     - Federal research credits
     - State data center credits and incentives
     - Sales and use tax equipment exemptions
     - VAT implication analysis

5. Cloud transformation services
   - Program management
   - Stakeholder awareness and alignment
   - Organizational change management
   - Private cloud implementation

6. Cloud governance services
   - Governance model
   - Operating model
   - Financial management and charge-back
   - Supplier management

Source: Strategy& analysis
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