TRUST
A **FIRM** belief in the... 

- Reliability
- Truth
- Ability

...of someone or something.
# Cloud Computing Drivers & Inhibitors

## Market Opportunities and Challenges

Security and Regulatory continue to be top concerns, Privacy emerging..

## Market Drivers

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalability</td>
<td>Scalability</td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>Agility</td>
<td>▲</td>
</tr>
<tr>
<td>Innovation</td>
<td>Cost</td>
<td>▼</td>
</tr>
</tbody>
</table>

- Customers continue to see value in cloud technologies
- Self-service and on-demand
- US government “cloud first” policy
- Several cloud security and privacy standards maturing

## Market Inhibitors

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td>Security</td>
<td></td>
</tr>
<tr>
<td>Interoperability</td>
<td>Lock-in</td>
<td>▲</td>
</tr>
<tr>
<td>Regulatory</td>
<td>Privacy</td>
<td>▲</td>
</tr>
</tbody>
</table>

- Security continues to be #1 inhibitor
- Privacy is an emerging concern post-Snowden and EU Safe Harbor decision
- Regulations are evolving but still fragmented

Source: *North Bridge 2016 Future of Cloud Computing Study*
A Rigged Game
The Game is Rigged...

**Black Hats:** …initiate the game
...don’t play fair
...can (and do) change the rules
...know your defenses
...need only to score once
...leverage time to their advantage
...are clearly incentivized
Risk

\[ f(a) = \frac{h \nabla_h}{1 - \nabla_h \log(1 - \nabla_h)} \approx h \left( 1 + \frac{1}{2} \nabla_h + \frac{5}{12} \nabla_h^2 + \frac{3}{8} \nabla_h^3 \right) f(a) = \]

\[ = hf(a) + h^{\frac{1}{2}} (f(a) - f(a - h)) + h^{\frac{5}{12}} (f(a) - 2f(a - h) + f(a - 2h)) + \]

\[ + h^{\frac{3}{8}} (f(a) - 3f(a - h) + 3f(a - 2h) - f(a - 3h)) = \]

\[ = h \left( 1 + \frac{1}{2} \cdot \frac{5}{12} + \frac{3}{8} \right) f(a) - h \left( \frac{2}{12} + \frac{2 \cdot 5}{12} + \frac{3 \cdot 3}{8} \right) f(a - h) + \]

\[ + h \left( \frac{5}{12} + \frac{3 \cdot 3}{8} \right) f(a - 2h) - h \left( \frac{3}{8} \right) f(a - 3h) = \]

\[ = h^{\frac{55}{24}} f(a) + h^{\frac{39}{24}} f(a - h) + h^{\frac{37}{24}} f(a - 2h) - h^{\frac{3}{8}} f(a - 3h) = \]

\[ = \frac{1}{24} (55f(a) - 59f(a - h) + 37f(a - 2h) - 9f(a - 3h)) \]
Probability = \frac{Incentive \times Opportunity}{RISK}
Ooops, your files have been encrypted!

What Happened to My Computer?
Your important files are encrypted. Many of your documents, photos, videos, databases and other files are no longer accessible because they have been encrypted. Maybe you are busy looking for a way to recover your files, but do not waste your time. Nobody can recover your files without our decryption service.

Can I Recover My Files?
Sure! We guarantee that you can recover all your files safely and easily. But you have not so enough time. You can decrypt some of your files for free. Try now by clicking <Decrypt>. But if you want to decrypt all your files, you need to pay. You only have 3 days to submit the payment. After that, the price will be doubled. Also, if you don’t pay in 7 days, you won’t be able to recover your files forever. We will have free events for users who are so poor that they couldn’t pay in 6 months.

How Do I Pay?
Payment is accepted in Bitcoin only. For more information, click <About bitcoin>. Please check the current price of Bitcoin and buy some bitcoins. For more information, click <How to buy bitcoins>. And send the correct amount to the address specified in this window. After your payment, click <Check Payment>. Best time to check: 9:00am - 11:00am GMT from Monday to Friday.

Send $300 worth of bitcoin to this address: 12t9YDPgwueZ9NyMgw519p7AA8isjr6SMw

Contact Us
Threat Defense Effectiveness

Invention & Development

Development Ramp

Procurement

Shelf-ware

Implementation

Evasion & Countermeasure

Sustaining Innovation

TIME

Cloud?
Cloud Computing Terminology

NIST SP 800-145

“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”

**Service Models**
- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

**Deployment Models**
- Private Cloud
- Community Cloud
- Public Cloud
- Hybrid Cloud

**Isolation Models**
- Dedicated
- Multi-Tenant
Cloud vs. Cloud

Cloud Service Value Chains

Producer | Consumer
---|---
R&D | Support Maint
Tech | Delivery
Product | }

---

Producer

Consumer

\[
\text{vNSP, vATD, MOVE}
\]

---

\[
\text{A Producer Consumer Dynamic Endpoint (GTI, MAR, Real Protect)}
\]

---

\[
\text{Data Protection (CASB, DLP, Web SaaS, CePO)}
\]
Cloud vs. Cloud

Cloud Service Value Chains

Producer

- R&D
- Tech
- Product
- Support
- Maint
- Delivery

Consumer

A

vNSP
vATD
MOVE

Producer (CSP)

Consumer

Dynamic Endpoint (GTI, MAR, Real Protect)

Data Protection (CASB, DLP, Web SaaS, CePO)
Cloud vs. Cloud

Cloud Service Value Chains

Producer: R&D, Tech, Product, Support, Maint, Delivery

Consumer: A

Data Protection: CASB, DLP, Web SaaS, CePO

Dynamic Endpoint: GTI, MAR, Real Protect

Producer: vNSP, vATD, MOVE

Consumer: B
Cloud vs. Cloud

Cloud Service Value Chains

Producer (CSP)

R&D  Tech  SaaS  PaaS  Ops  Security  Privacy  Incident  Response  Disaster  Recovery  Support  Maint  Delivery

Consumer

Dynamic Endpoint (GTI, MAR, Real Protect)
Data Protection (CASB, DLP, Web SaaS, CePO)

B

A

Producer

R&D  Tech  Product  Support  Maint  Delivery

Consumer
Cloud vs. Cloud

Cloud Service Value Chains

Producer

R&D  |  Tech  |  Product  |  Support  |  Maint  |  Delivery

Consumer

Management & Control

A

Private Dedicated

R&D  |  Tech  |  MOVE

B

Public Multi-tenant

Producer (CSP)

Management & Control

Dynamic Endpoint (GTI, MAR, Real Protect)
Data Protection (CASB, DLP, Web SaaS, CePO)

Producer

R&D  |  Tech  |  SaaS  |  PaaS  |  Ops  |  Security  |  Privacy  |  Incident  |  Response  |  Disaster  |  Recovery  |  Support  |  Maint  |  Delivery

Consumer

Management & Control
Shift to Cloud
Product Delivery vs. Service Delivery

A Paradigm Shift

Product Delivery
- Comprised of finished good (hardware, software, etc.)
- Long development cycles, versioned releases
- Customer on-premise deployment
- Perpetual + Maintenance

Certifications
- Common Criteria, FIPS 140-2 …
- Specific release (version)
- Build/release, then certify

Service Delivery
- Comprised of people, process, and technology
- Continuous delivery (DevOps)
- Hosted by service provider
- Service Level Agreements
- Subscription. Metered.

Certification/Accreditation
- FedRAMP, ISO 27001 …
- Entire service boundary in scope
- Continuous commitment
Service Organizations

- People
- Process
- Technology
Security vs. Compliance
Cloud Stack
Infrastructure, Platform, and Software as a Service

- **Software (SaaS)**: Application, Data
- **Platform (PaaS)**: Runtime, Middleware, Operating System
- **Infrastructure (IaaS)**: Virtualization, Servers, Storage, Networking

- ✔ FedRAMP
- ✔ ISO 27001
- ✔ SOC1/2/3
- ✔ FIPS 140-2
- ✔ HITRUST
- ✔ Others…

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Cloud Stack

Infrastructure, Platform, and Software as a Service

- Software (SaaS)
  - Application
  - Data
- Platform (PaaS)
  - Runtime
  - Middleware
  - Operating System

Security

FIPS 140-2

- Crypto Boundary?
- Operating Environment?
- Processor Types?
- Hardware?
- Dynamic – Elastic Platform?
## Security Control Families

**NIST SP 800-53**

<table>
<thead>
<tr>
<th>Access Controls</th>
<th>Media Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness &amp; Training</td>
<td>Physical &amp; Environmental Protection</td>
</tr>
<tr>
<td>Audit &amp; Accountability</td>
<td>Planning</td>
</tr>
<tr>
<td>Security Assessment &amp; Authorization</td>
<td>Personnel Security</td>
</tr>
<tr>
<td>Configuration Management</td>
<td>Risk Assessment</td>
</tr>
<tr>
<td>Contingency Planning</td>
<td>System &amp; Service Acquisition</td>
</tr>
<tr>
<td>Identification &amp; Authentication</td>
<td>System &amp; Communication Protection</td>
</tr>
<tr>
<td>Incident Response</td>
<td>System &amp; Information Protection</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
</tr>
</tbody>
</table>
## Double-digit Growth in Public Cloud to Continue

<table>
<thead>
<tr>
<th></th>
<th>2015 Revenue</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>SaaS</td>
<td>66%</td>
<td>19%</td>
</tr>
<tr>
<td>PaaS</td>
<td>3%</td>
<td>33%</td>
</tr>
<tr>
<td>IaaS</td>
<td>31%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Total 2015 – 2016 Public Cloud CAGR = 19%

Source: North Bridge 2016 Future of Cloud Computing Study
Welcome to the Future…

By 2018, at least half of IT spending will be Cloud-based, reaching 60% of all IT infrastructure, and 60–70% of all Software, Services, and Technology Spending by 2020.

-IDC FutureScape: Worldwide Cloud 2016 Predictions