Flash in a Hybrid Cloud World

How "Cloud Shift" will affect flash in the Data Center

Steve Knipple: Cloud Shift Advisors

Abstract
Study the Intersection of 2 Major Trends

- **The maturation of FLASH products for the data center**
- **The growth of HYBRID CLOUD as a common, and often preferred, deployment model for IT Infrastructure**

SPEED

SCALE

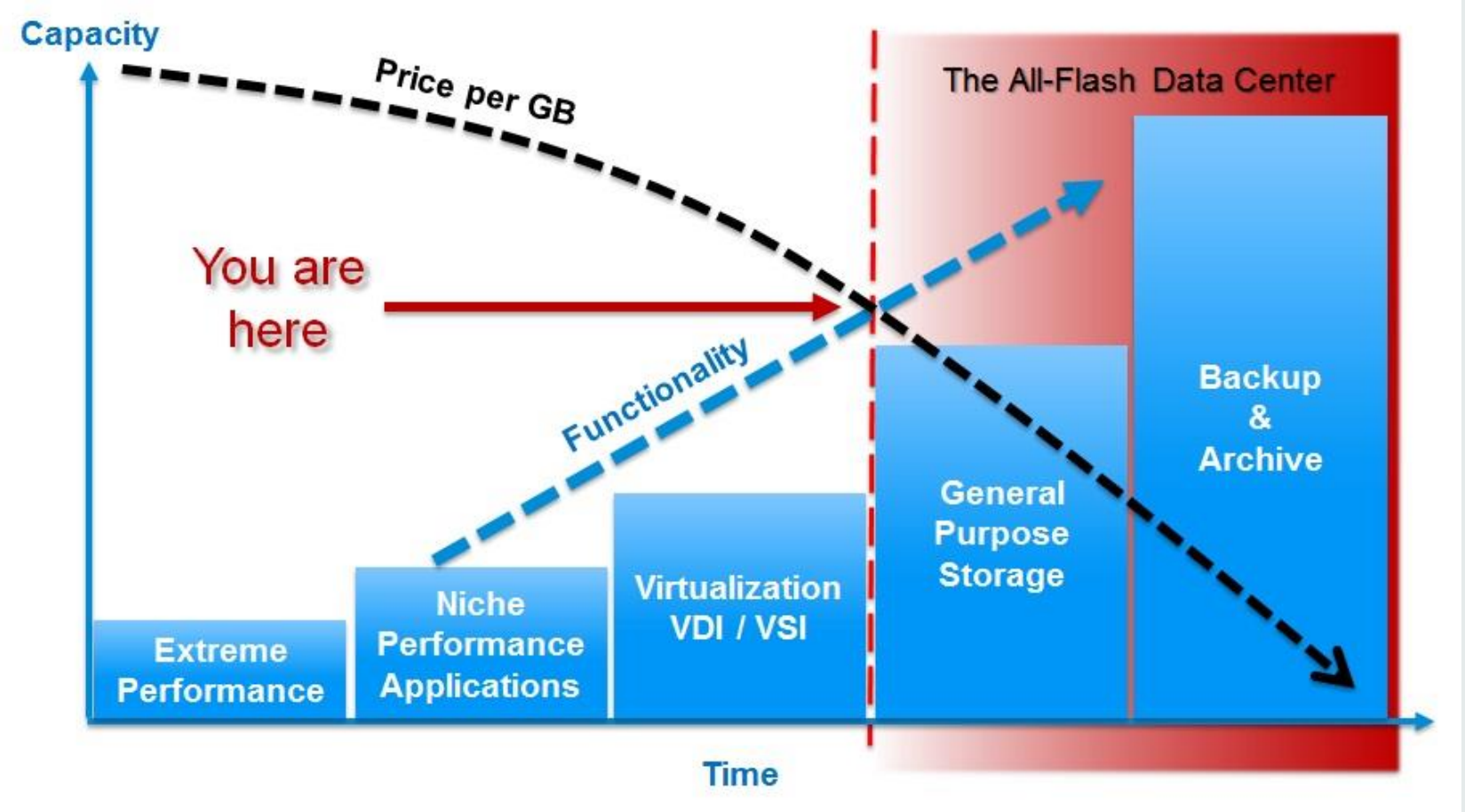
Things to think about…

- How does a Hybrid Cloud deployment impact an organization operationally?
- Was does Flash represent from a service standpoint?
- What type of skills are needed to operate in this new paradigm?
- How will the disruption created by the cloud impact the disruption created by Flash?
- Extrapolate the trends we discuss today… where does that take us?

Flash in the Data Center

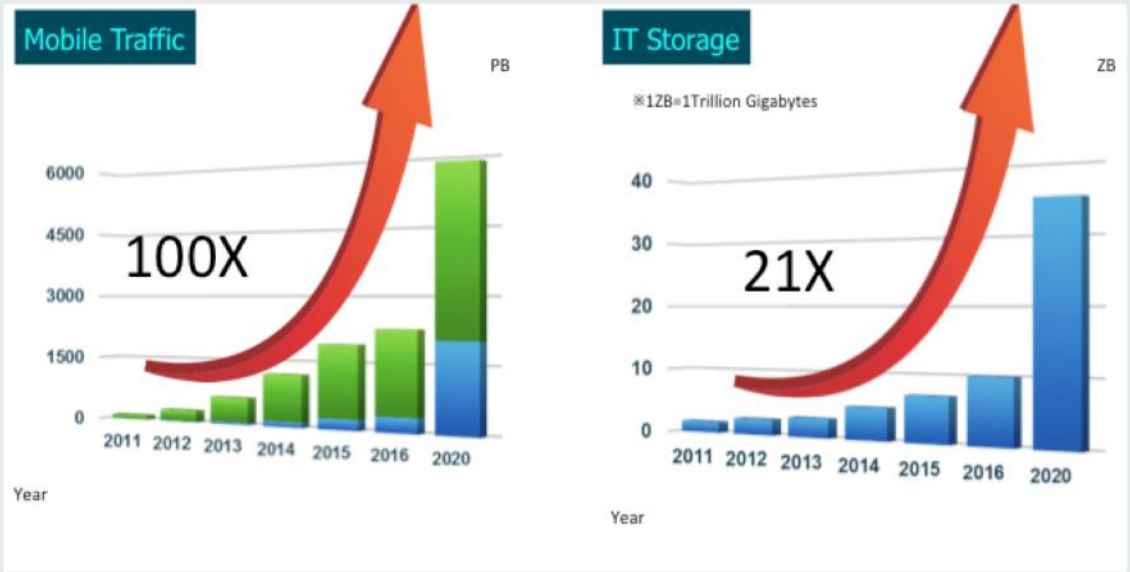
We've come a long way in a short time

Flash continues to grow in the data center…



Storage growth continues driven by…

- New applications (IoT, Big Data)
- Geo-Dispersion of data creates multiple copies
  - For disaster resiliency
  - For localization of workload to improve performance
- Content created (and shared) with social media



Data Center Flash Options abound

- Performance
  - IOPS / Throughput / Latencies
- Form factors
  - All flash arrays
  - Hybrid Arrays
  - Local (SATA, PCI-E)
- Suppliers
  - New entrants
  - Established players
  - In-house builds

The outlook for Flash is bright

- Roadmaps promise innovation
- More performance
- Higher density
- Lower cost

The size of this conference proves it!

Who buys Flash for their Data Centers?

Software companies

- Revenue comes directly from the sales of their software (SaaS or Paas)
- Business is created by the use of technology

Examples

- Linked-in, Facebook, Amazon.

Enterprises

- Software is used to enable their business
- Their core service is not software

Examples

- Hospitals
- Manufacturing
- Traditional Banks

The Cloud

The Cloud is a business model

A transformative business model

Essential Characteristics

- On demand self service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

Service Models

- Software as a Service
- Platform as a Service
- Infrastructure as a Service

Deployment Method

- Private Cloud
- Public Cloud
- Hybrid Cloud

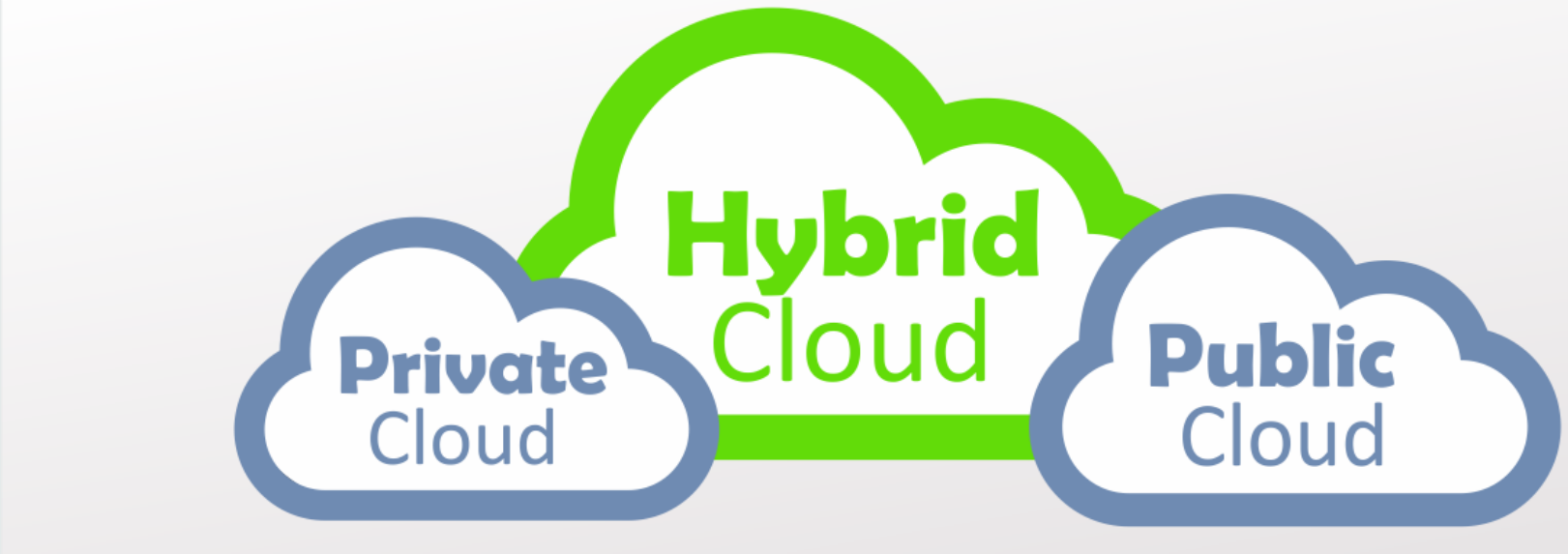
The cloud business model is not new…

Essential Characteristic	Holiday Inn	Avis	Uber	Spirit Airlines
On demand self service	√	√	√	√
Broad network access	√	√	√	√
Resource Pooling	√	√	√	√
Rapid Elasticity	√	√	√	√
Measured Service	√	√	√	√

What do you consider when you use these services?

Hybrid Cloud

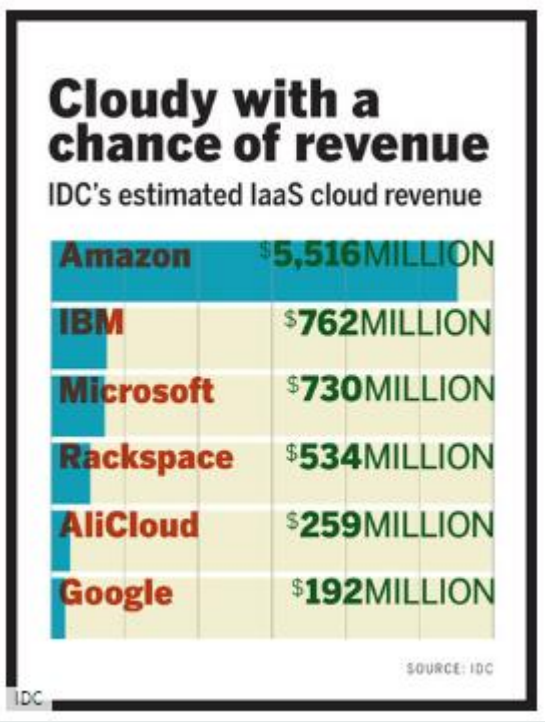
- **Hybrid cloud** is a **cloud** computing environment which uses a mix of on-premises, private **cloud** and third-party, public **cloud** services with orchestration between the two platforms



Who is providing Cloud?

- Infrastructure as a Service (IaaS) providers are becoming fewer
  - Consolidations, acquisitions, business failures due to competition
  - Only the largest will have the scale to compete
  - Infrastructure software is often bundled (economies of innovation)
- Software as a Service providers are growing
  - Many are using IaaS providers for infrastructure
  - They are replacing on premise software installations
  - They are disrupting all indutries

IaaS Cloud Leaders by revenue



amazon web services™

Windows Azure

IBM SmartCloud Enterprise

Google Compute Engine

rackspace
the open cloud company

AliCloud

Example: Amazon (Instance and Storage Types)

Instance Family	Current Generation Instance Types
General purpose	t2.nano | t2.micro | t2.small | t2.medium | t2.large | m4.large | m4.xlarge | m4.2xlarge | m4.4xlarge | m4.10xlarge | m3.medium | m3.large | m3.xlarge | m3.2xlarge
Compute optimized	c4.large | c4.xlarge | c4.2xlarge | c4.4xlarge | c4.8xlarge | c3.large | c3.xlarge | c3.2xlarge | c3.4xlarge | c3.8xlarge
Memory optimized	r3.large | r3.xlarge | r3.2xlarge | r3.4xlarge | r3.8xlarge | x1.32xlarge
Storage optimized	i2.xlarge | i2.2xlarge | i2.4xlarge | i2.8xlarge | d2.xlarge | d2.2xlarge | d2.4xlarge | d2.8xlarge
GPU instances	g2.2xlarge | g2.8xlarge

Region: US West (Oregon)

Amazon EBS General Purpose SSD (gp2) volumes

- $0.10 per GB-month of provisioned storage

Amazon EBS Provisioned IOPS SSD (io1) volumes

- $0.125 per GB-month of provisioned storage
- $0.065 per provisioned IOPS-month

Amazon EBS Throughput Optimized HDD (st1) volumes

- $0.045 per GB-month of provisioned storage

Amazon EBS Cold HDD (sc1) volumes

- $0.025 per GB-month of provisioned storage

Amazon EBS Snapshots to Amazon S3

- $0.095 per GB-month of data stored

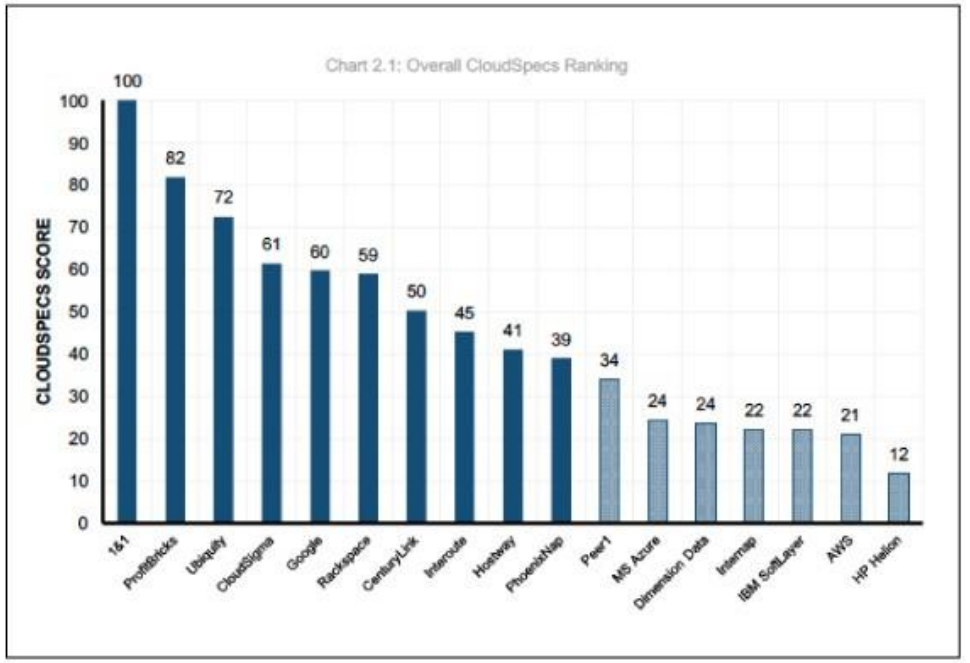
Example: Azure (Instance and Storage Types)

SKU Family	ACU/Core
Standard_A0	50
Standard_A1-4	100
Standard_A5-7	100
A8-A11	225*
D1-14	160
D1-15v2	210 - 250*
DS1-14	160
DS1-15v2	210-250*
F1-F16	210-250*
F1s-F16s	210-250*
G1-5	180 - 240*
GS1-5	180 - 240*

Disk Types	**P10**	**P20**	**P30**
Disk Size	128 GB	512 GB	1024 GB
IOPS per Disk	500	2300	5000
Throughput per Disk	100 MB/sec	150 MB/sec	200 MB/sec

IaaS Cloud Leaders by Price / Performance

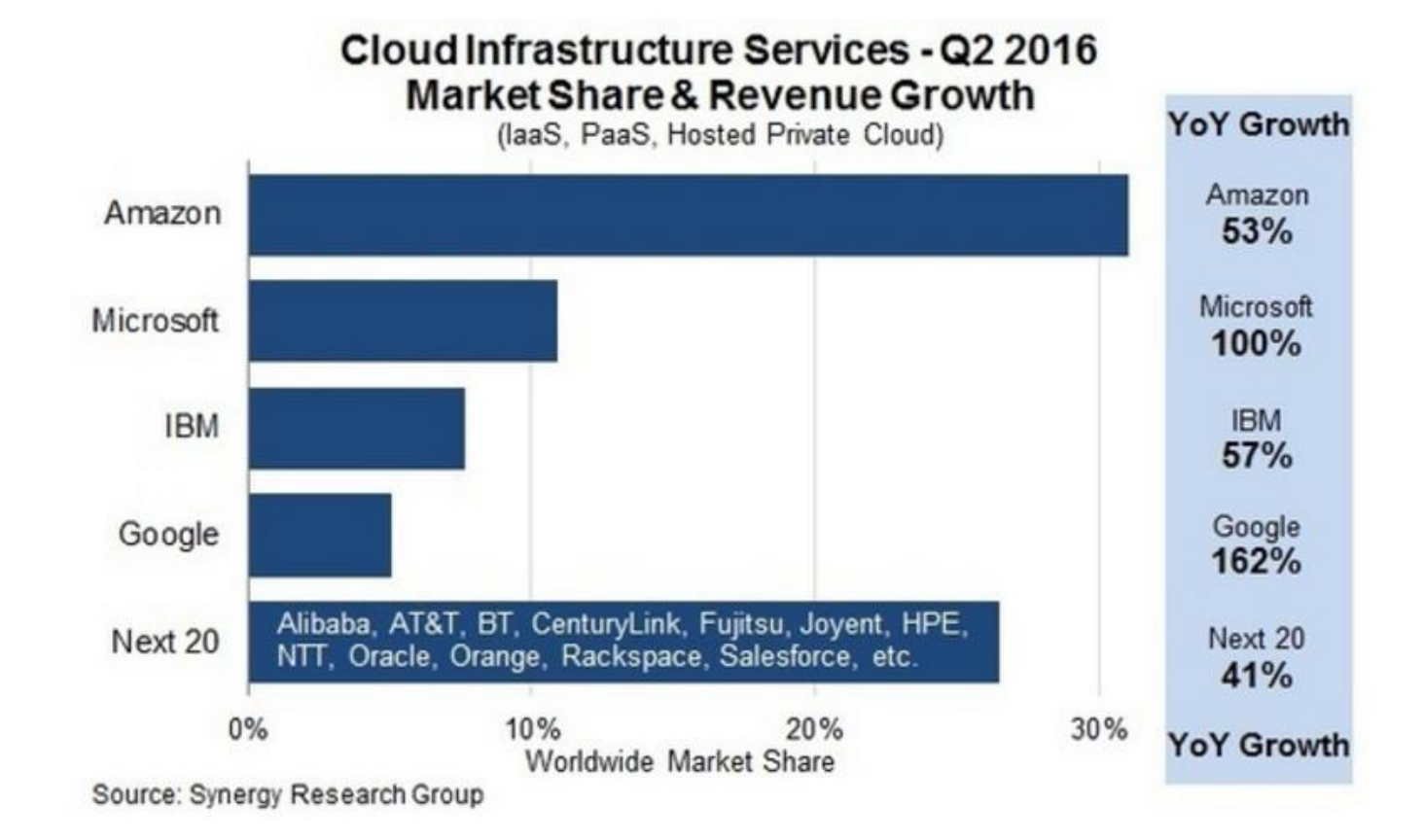
PRICE-PERFORMANCE
KEY FINDINGS



Top 10 Cloud Vendor Benchmark 2016
NORTH AMERICA REPORT

CLOUD SPECTATOR

Cloud Leaders by Overall Market share



SaaS Leaders my market share

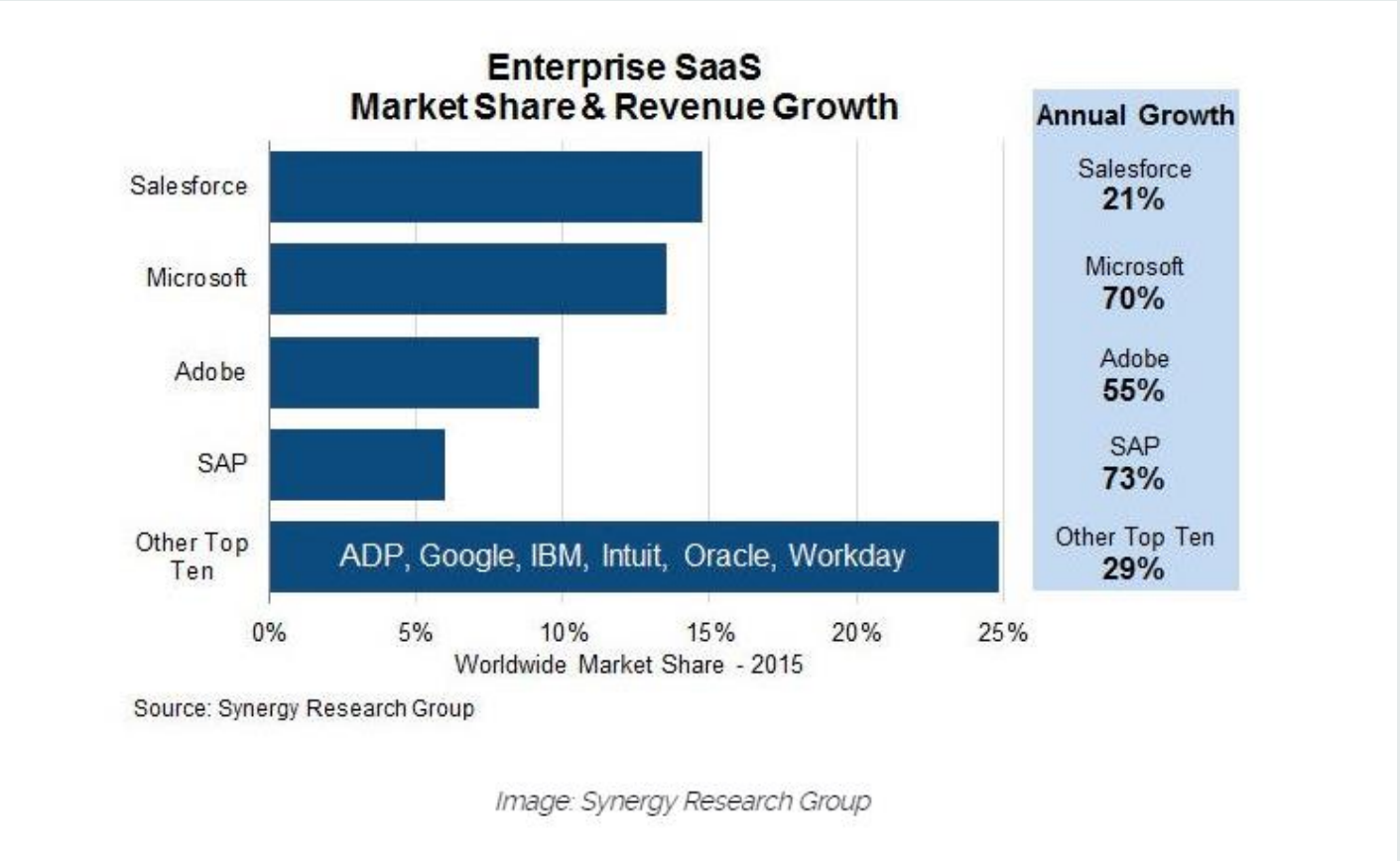
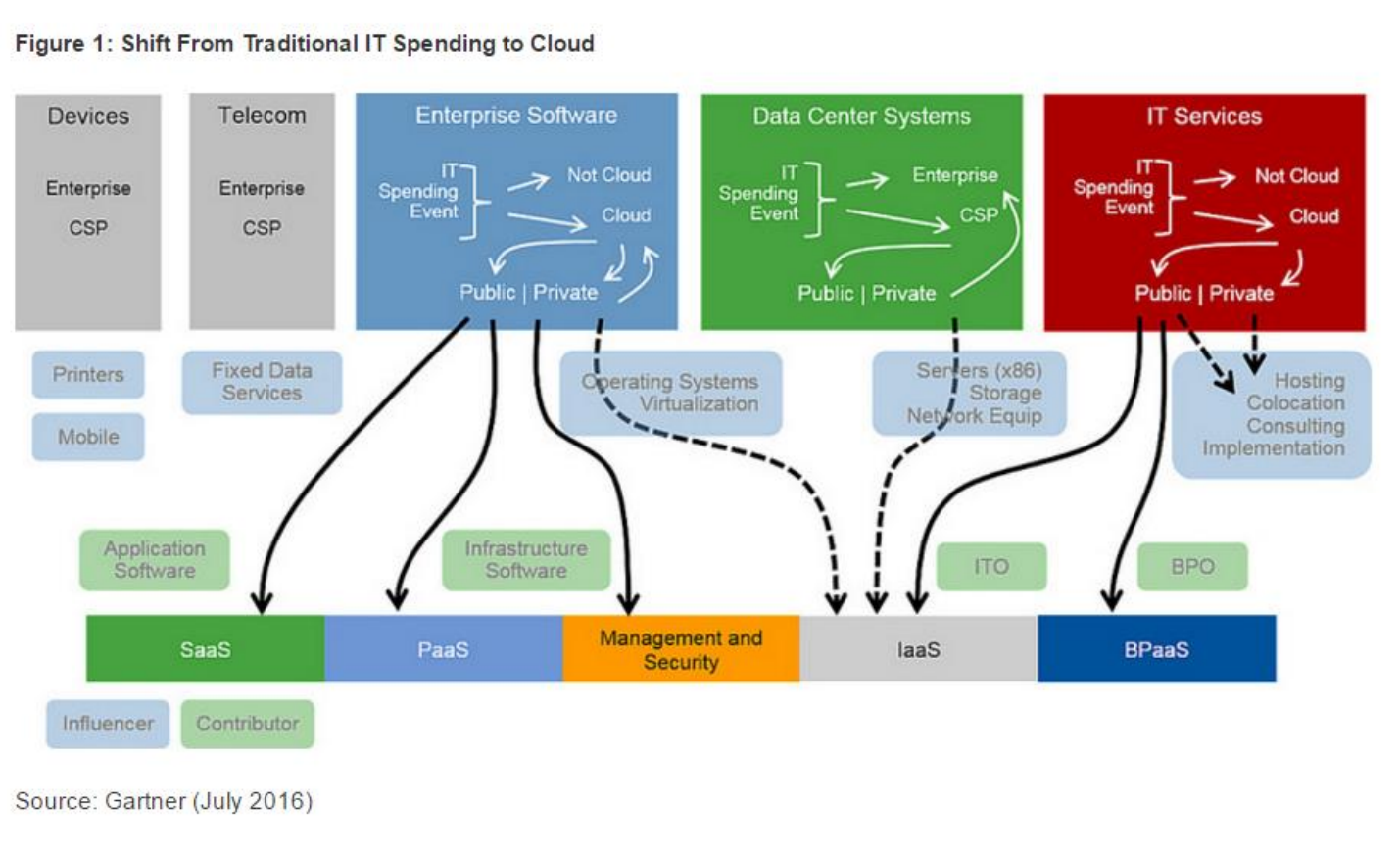


Image: Synergy Research Group

“Cloud Shift” is underway



- Gartner says by 2020 “Cloud Shift” will affect more than $1 Trillion in IT spending
- 2016 IT spending @ $3.49 trillion
- During this time, “Hybrid Cloud” will be the common model

The Intersection

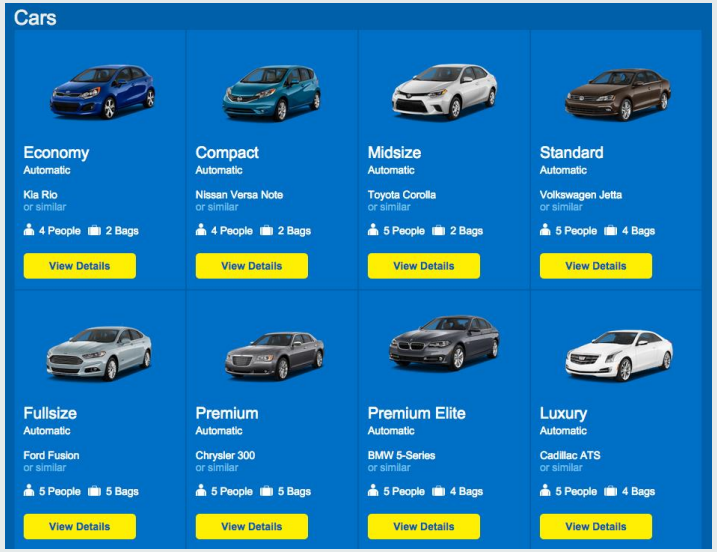
Flash in a Hybrid Cloud World

Flash and Cloud share similar characteristics…

- Both are disruptive
- The use of both are accelerating
- Both have roadmaps promising significant innovation
- Both are becoming mainstream

Intersection 1 – Product vs Service

- The cloud for the data center changes the business model
- Flash is packaged inside of other services
- The storage is not always the bottleneck
- The buyer of the flash changes
  - Buyer beware!



Intersection 2 – Moving workloads between on premise and cloud

- Your workloads may experience very different environments
- More important than ever to characterize your performance
- More important than ever to fully evaluate what you buy

In Summary

In a Hybrid world, buyer beware and keep watching!