Cloud Platforms: A Rational Comparison

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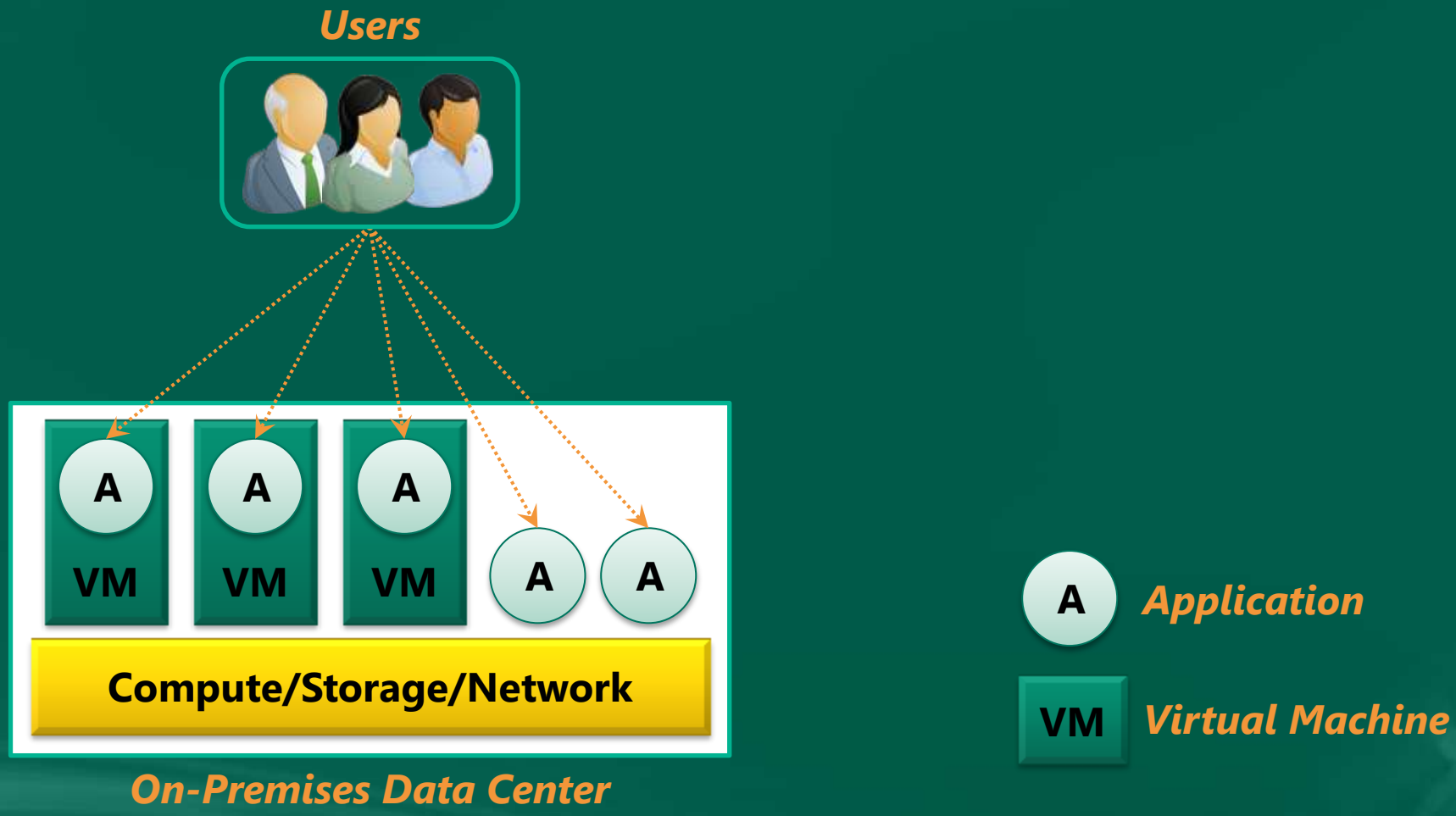
Microsoft Partner Network

An Organization without Cloud Computing

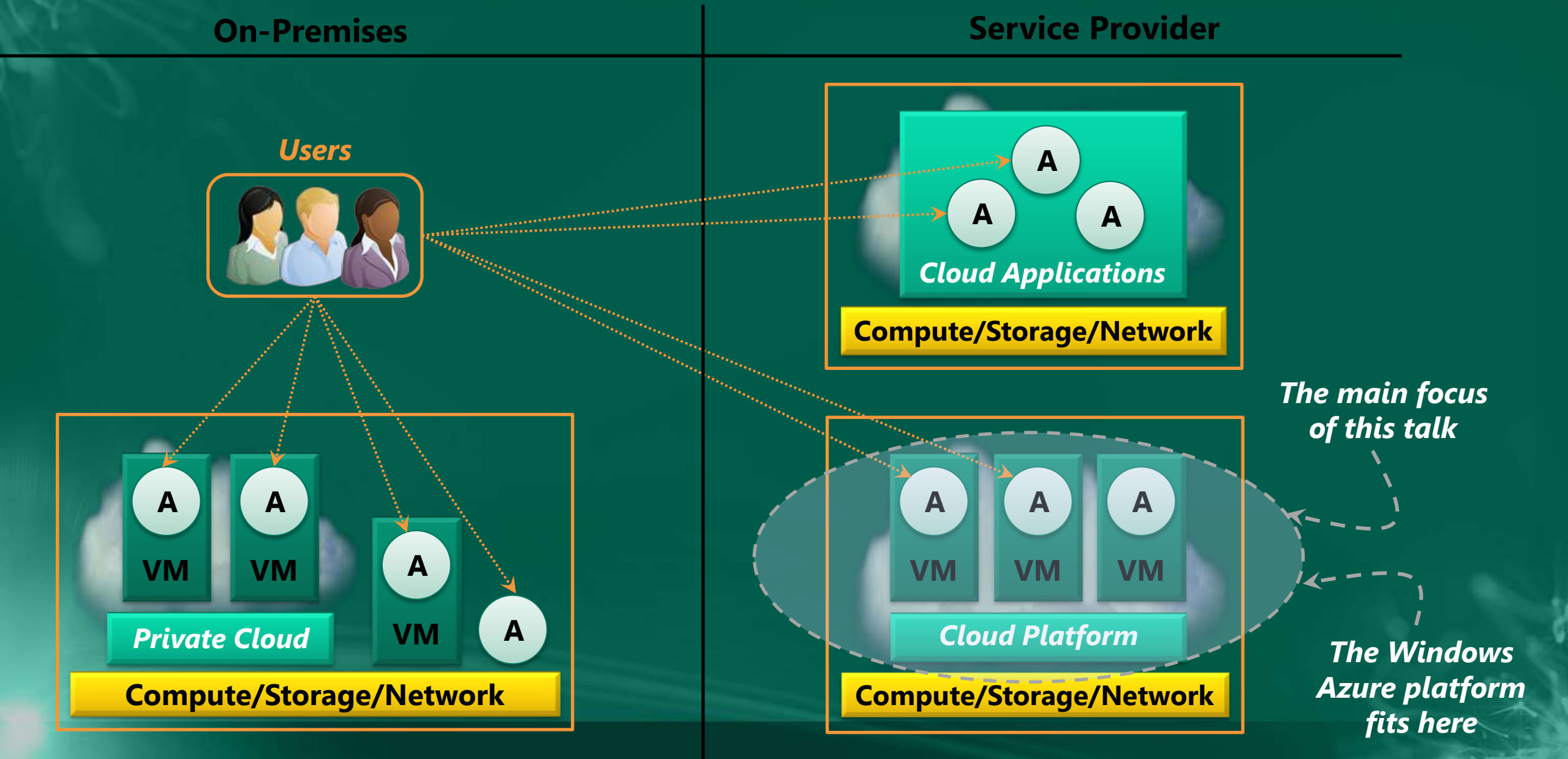


Categorizing Cloud Computing

Three categories

- Cloud applications
  - Often called *Software as a Service (SaaS)*
- Cloud platforms
  - Public cloud platforms
- Private clouds
  - On-premises cloud platforms

An Organization with Cloud Computing



Cloud Platforms:
A Framework for Comparison

What is a Cloud Platform?

Some defining characteristics

- It lets developers create and run apps, store data, and more
- It provides self-service access to a pool of computing resources
- It allows granular, elastic allocation of resources
- It allows charging only for the resources an application uses

Public Clouds and Private Clouds

Typical definitions

- Public cloud: A cloud platform run by a service provider made available to many end-user organizations
- Private cloud: A cloud platform run solely for a single end-user organization, such as a bank or retailer
  - The technology can be much like public clouds, but the economics are different
- Most organizations will probably use some hybrid of both

Cloud Platform Technologies

- The most important today:
  - Computing
    - Infrastructure as a Service (IaaS)
    - Platform as a Service (PaaS)
  - Storage
    - Relational storage
    - Scale-out storage
    - Blobs
- There are many more
  - Messaging, identity, caching, …

Computing
Infrastructure as a Service (IaaS)

- Developers create virtual machines (VMs) on demand
  - They have full access to these VMs
- Strengths:
  - Can control and configure environment
  - Familiar technologies
  - Limited code lock-in
- Weaknesses:
  - Must control and configure environment
  - Requires administrative skills to use

Computing
Platform as a Service (PaaS)

- Developers provide an application, which the platform runs
  - They don't work directly with VMs
- Strengths:
  - Provides higher-level services than IaaS
  - Requires essentially no administrative skills
- Weaknesses:
  - Allows less control of the environment
  - Can be harder to move existing software

Computing
What's the most popular approach?

- IaaS is more widely used today than PaaS
  - Gartner estimates that public IaaS revenues are significantly greater than public PaaS revenues today
- Perspective:
  - IaaS is easier to adopt than PaaS
    - IaaS emulates your existing world in the cloud
  - Over time, PaaS is likely to dominate
    - PaaS should have an overall lower cost than IaaS
    - It's typically a better choice for new applications

Storage
Relational

- Traditional relational storage in the cloud
  - With support for SQL
- Strengths:
  - Familiar technologies
  - Many available tools, e.g., for reporting
  - Limited data lock-in
  - Can be cheaper than on-premises relational storage
- Weaknesses:
  - Scaling to handle very large data is challenging

Storage
Scale-out

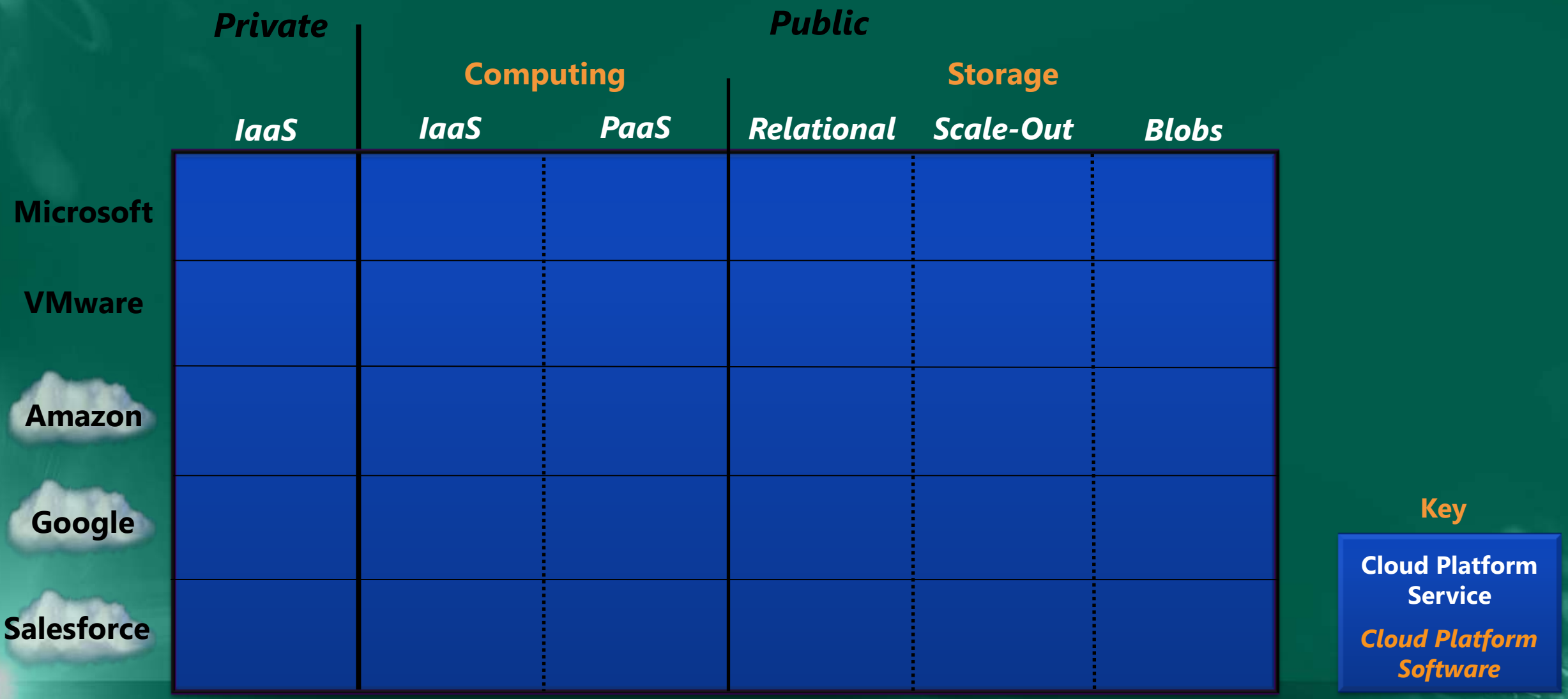
- Massively scalable storage in the cloud
  - No support for SQL
- Strengths:
  - Scaling to handle very large data is straightforward
  - Can be cheaper than relational storage
- Weaknesses:
  - Unfamiliar technologies
  - Few available tools
  - Significant data lock-in

Storage
Blobs

- Storage for *B*inary *L*arge *OB*jects in the cloud
  - Such as video, back-ups, etc.
- Strengths:
  - Globally accessible way to store and access large data
  - Can be cheaper than on-premises storage
- Weaknesses:
  - Provides only simple unstructured storage

Cloud Platforms

Representative technologies and vendors



Cloud Service or Cloud Software?

Understanding the alternatives

- Cloud platform service
  - A hardware/software combination
  - Typically provided by organizations that run Internet-scale services, e.g., Microsoft, Amazon, and Google
    - They write their own software

- *Cloud platform software*
  - Provided by software vendors and open source projects
    - Hosters can use this software to offer a public cloud service
  - The same software can also be used in private clouds

Applying Public Cloud Platforms (1)

Some characteristics of typical applications

- Apps that need high reliability
  - Example: A SaaS application
- Apps that need massive scale
  - Example: A Web 2.0 application
- Apps with variable load
  - Example: An on-line ticketing application
- Apps that do parallel processing
  - Example: A financial modeling application

Applying Public Cloud Platforms (2)

Some characteristics of typical applications

- Apps with a short or unpredictable lifetime
  - Example: An app created for a marketing campaign
- Apps that must fail fast or scale fast
  - Example: Start-ups
- Apps that don’t fit well in an organization’s data center
  - Example: A business unit that wishes to avoid its IT department
- Apps that can benefit from external storage
  - Example: An application that archives data

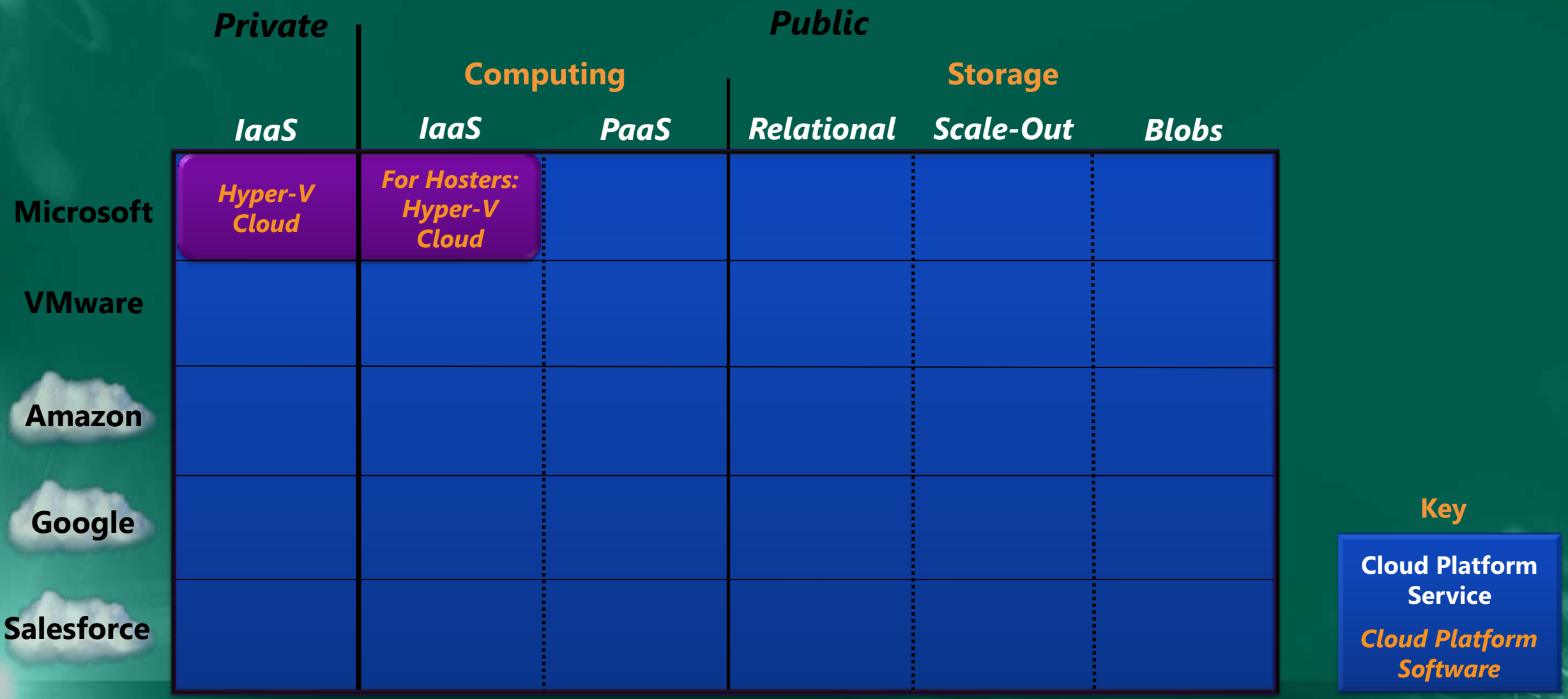
Cloud Platforms: Applying the Framework

From Server Virtualization to Private Clouds

- IaaS allows allocating, managing, and charging for VMs in a more effective way
- This idea first appeared in a public cloud platform
  - If it makes sense there, why not use it in your own data center?
- Private clouds provide IaaS in your data center
  - Although they can also offer more application-oriented services

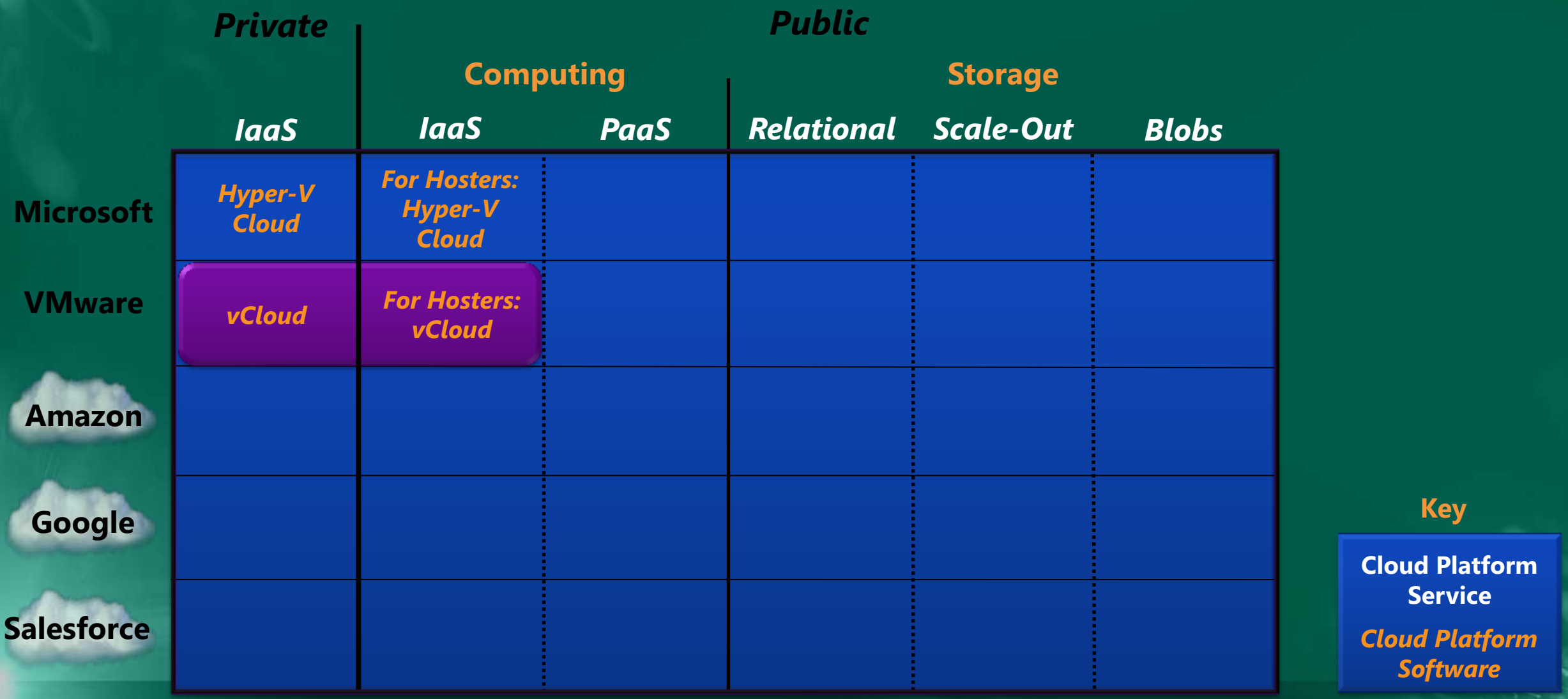
Microsoft

Private and public cloud platform software



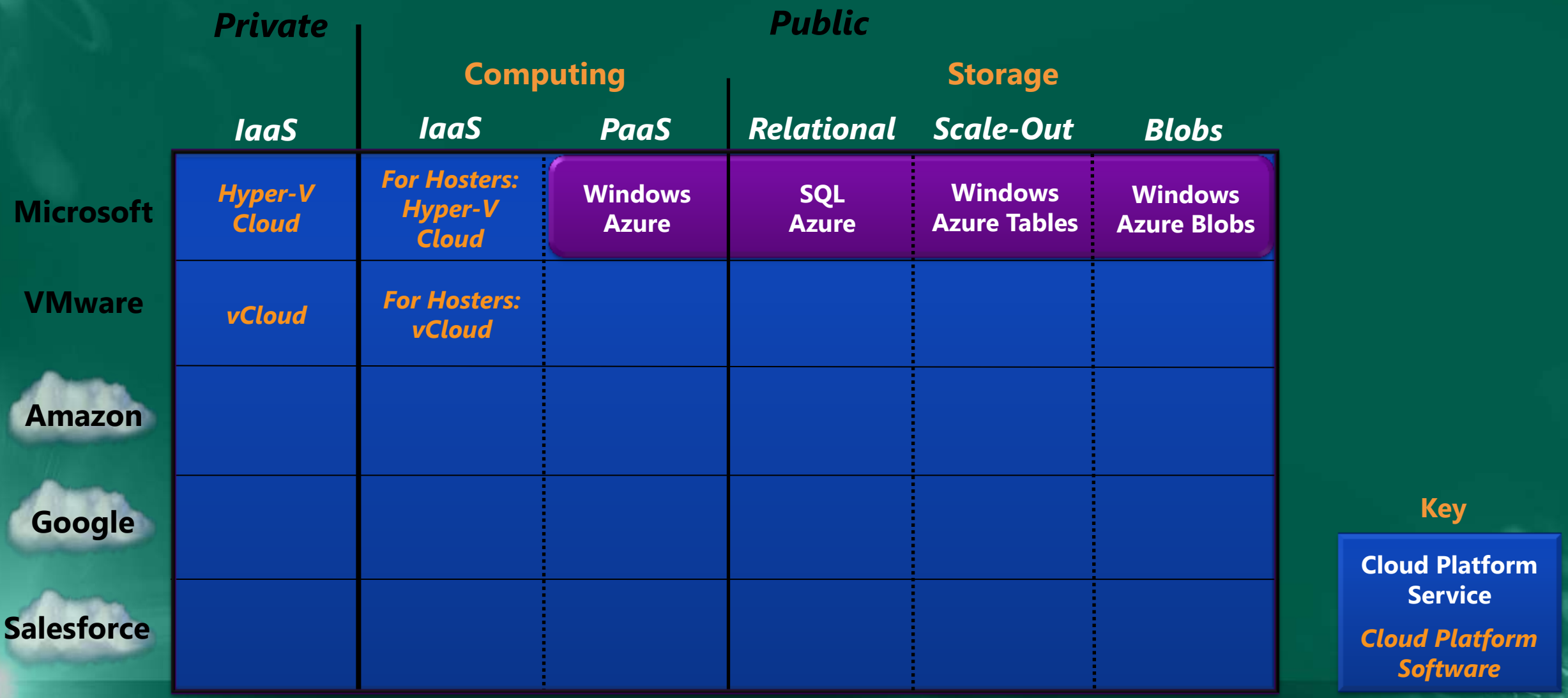
VMware

Private and public cloud platform software



Windows Azure Platform

Public cloud platform



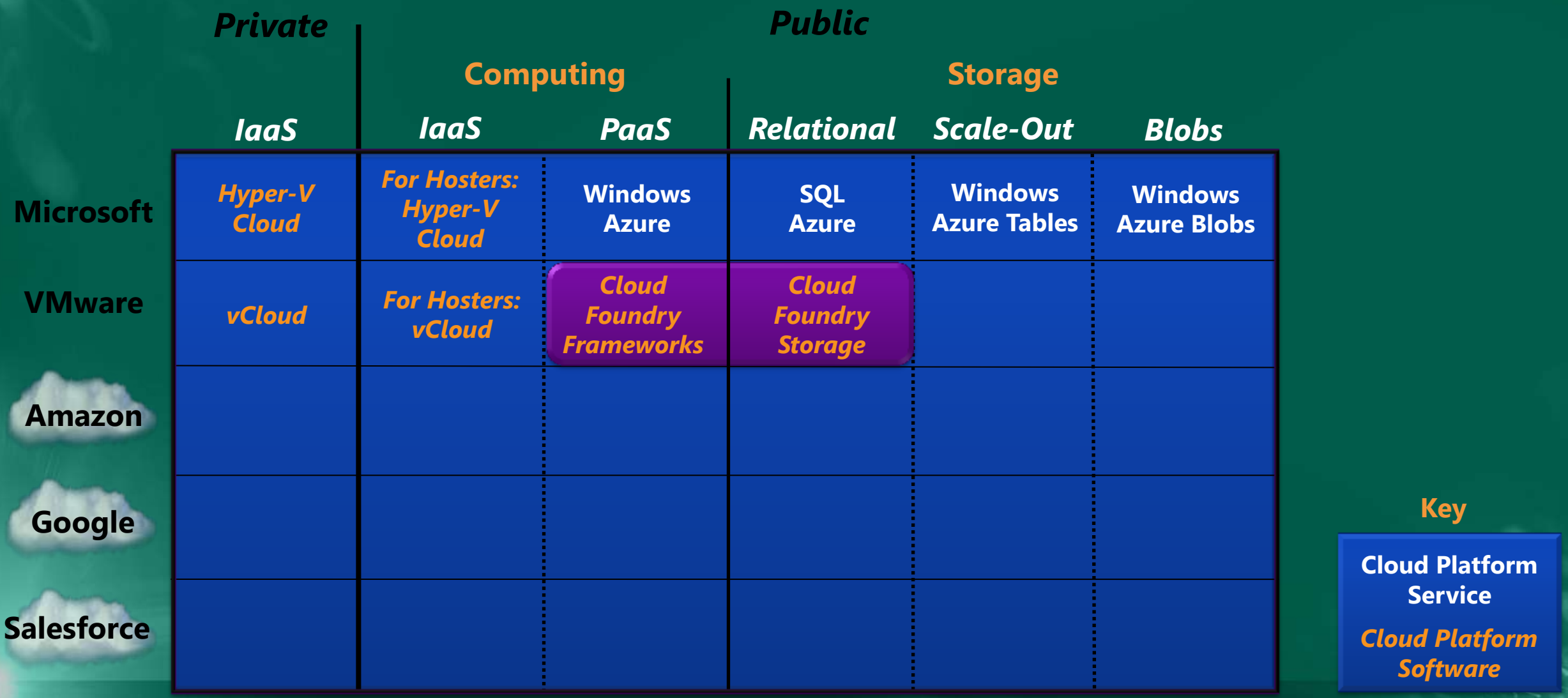
Windows Azure Platform

Pricing examples (in US dollars)

- Compute: $0.05/hour to $0.96/hour for each instance (depending on instance size)
- Storage:
  - Blobs and tables:
    - Data: $0.15/GB per month
    - Access: $0.01/10,000 operations
  - Relational:
    - $9.99/GB per month
- Bandwidth:
  - Inbound: Free
  - Outbound: $0.15/GB

VMware Cloud Foundry

Public cloud platform software



VMware Cloud Foundry
Essentials

- Cloud Foundry is an open source PaaS platform
  - Led by VMware
- Designed to support diverse technologies:
  - Frameworks: Spring, Rails, etc.
  - Storage: MySQL, MongoDB, etc.
- Not yet available as a service
  - VMware provides a public dev/test service
  - Partners will provide commercial public platforms

Amazon Web Services

Public cloud platform

	Private	Public				
		Computing		Storage		
	IaaS	IaaS	PaaS	Relational	Scale-Out	Blobs
Microsoft	Hyper-V Cloud	For Hosters: Hyper-V Cloud	Windows Azure	SQL Azure	Windows Azure Tables	Windows Azure Blobs
VMware	vCloud	For Hosters: vCloud	Cloud Foundry Frameworks	Cloud Foundry Storage		
Amazon		Elastic Compute Cloud (EC2)	Elastic Beanstalk	Relational Database Service (RDS)	SimpleDB	Simple Storage Service (S3)
Google						
Salesforce						

Key

Cloud Platform Service

Cloud Platform Software

A Broader View of IaaS/Paas
An aside

- More than cloud compute can be viewed through the IaaS/PaaS lens

- Example: Cloud options for relational storage
  - Run a database server in an AWS EC2 VM
    - An IaaS storage service
  - Use a managed database server with AWS RDS
  - Use a managed database service with SQL Azure
    - A PaaS storage service

Amazon Web Services

Pricing examples

- Compute: $0.02/hour to $3.68/hour for each VM (depending on size and OS)
- Storage (blobs):
  - Data: $0.14/GB per month to $0.037/GB per month (depending on data size and redundancy)
  - Access: $0.01/1,000 PUT, COPY, POST, LIST operations, $0.01/10,000 GET operations
- Bandwidth: Free inbound, $0.12/GB to $0.05/GB out (depending on volume)

Eucalyptus

Private cloud software

	Private	Public			
		Computing		Storage	
	IaaS	IaaS	PaaS	Relational	Scale-Out	Blobs
Microsoft	*Hyper-V Cloud*	*For Hosters: Hyper-V Cloud*	Windows Azure	SQL Azure	Windows Azure Tables	Windows Azure Blobs
VMware	*vCloud*	*For Hosters: vCloud*	*Cloud Foundry Frameworks*	*Cloud Foundry Storage*		
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Google						
Salesforce						

Key

Cloud Platform Service

Cloud Platform Software

The Commoditization of IaaS
An aside

- Public IaaS compute service is widely available today
- Providers include:
  - GoGrid Cloud Hosting
  - Terremark vCloud Express
  - IBM SmartCloud Enterprise
  - Rackspace Cloud Servers
    - A leader in creating *OpenStack*, open source IaaS private/public cloud platform software

Google App Engine

Public cloud platform

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		Computing		Storage		
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Amazon	Eucalyptus	Elastic Compute Cloud (EC2)	Elastic Beanstalk	Relational Database Service (RDS)	SimpleDB	Simple Storage Service (S3)
Google			App Engine		Datastore	Blobstore
Salesforce						

Key

Cloud Platform Service

Cloud Platform Software

Google App Engine
Pricing examples (today)

- Compute: $0.10/CPU hour
- Storage:
  - Datastore: $0.15/GB per month
  - Blobstore: $0.15/GB per month
- Bandwidth: $0.10/GB in, $0.12/GB out

- App Engine also allows some free usage every day
  - Other platforms have a free tier as well

Salesforce.com Force.com

Public cloud platform

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Google			App Engine		Datastore	Blobstore
Salesforce			AppForce VMForce	Database .com		

Key

Cloud Platform Service

Cloud Platform Software

Salesforce.com Force.com
Pricing examples

- One (small) application is free
- Enterprise Edition: $50/user per month
  - Compute: up to 10 applications
  - Storage: up to 200 database objects
  - Bandwidth: No extra charge
- Unlimited Edition: $75/user per month
  - Compute: unlimited applications
  - Storage: up to 2,000 database objects
  - Bandwidth: No extra charge

Conclusions

- Cloud platforms are important
  - Many vendors are active here
- A new world is unfolding
  - Prepare to be part of it