

CLOUD COMPUTING OVERVIEW

2110414 Large Scale Computing Systems
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Outline

2

- Overview
- Cloud Approaches
- Real-World Case Study

3

Overview

What is Cloud Computing?

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□ Various definitions

▣ Wikipedia

- Web-based processing, whereby shared resources, software, and information are provided to computers and other devices (such as smartphones) on demand over the Internet

▣ Gartner

- a style of computing in which massively scalable IT-related capabilities are provided 'as a service' using Internet technologies to multiple external customers

Common Understanding about Cloud Computing

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- ❑ Web-enabled services
(software/platform/infrastructure)
- ❑ Remote datacenter
- ❑ Shared resources via virtualization
- ❑ Outsource maintenance tasks to the hosting organizations

(Good Luck) Defining Cloud Computing

- ❑ Software-as-a-Service
- ❑ “My customer resource management (CRM) system is out on the Internet!”
- ❑ Grids vs. Clouds
- ❑ Shared Virtual Resources
- ❑ Batch Jobs vs. Online Applications
- ❑ Different Approaches to State Management
- ❑ Network Diagrams
- ❑ A service is “on a cloud somewhere”
- ❑ Virtualization Platforms & APIs
- ❑ Hardware can be manipulated with software



Grid vs. Cloud

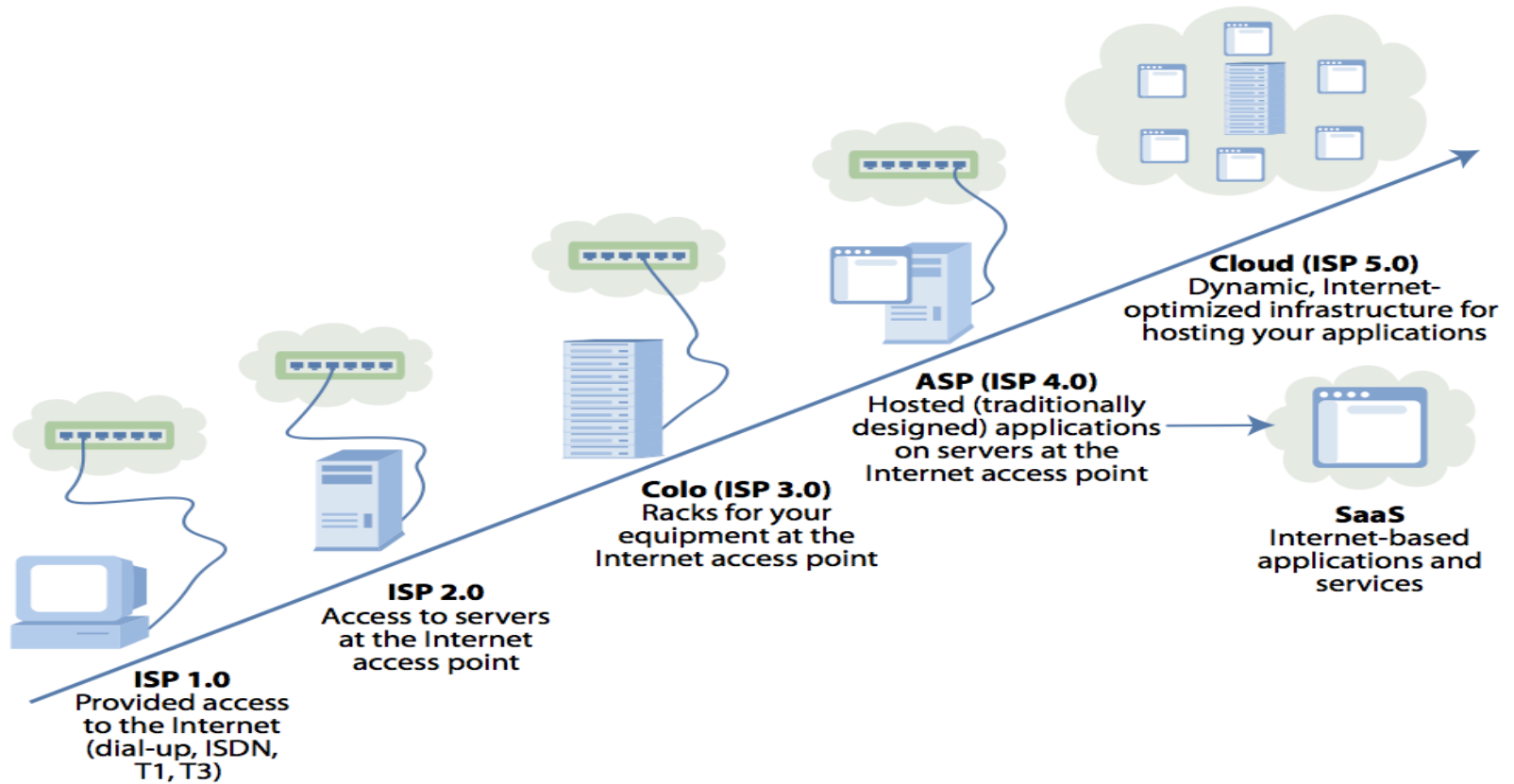
	Grid	Cloud
Underlying concept	Utility Computing	Utility Computing
Main benefit	Solve computationally complex problems	Provide a scalable standard environment for network-centric application development, testing and deployment
Resource distribution / allocation	Negotiate and manage resource sharing; schedulers	Simple user <-> provider model; pay-per-use
Domains	Multiple domains	Single domain
Character / history	Non-commercial, publicly funded	Commercial

Evolution of Cloud Architecture

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- Stand-Alone
- Client-Server
- Web-Based Application
- ASP
- Cloud Computing

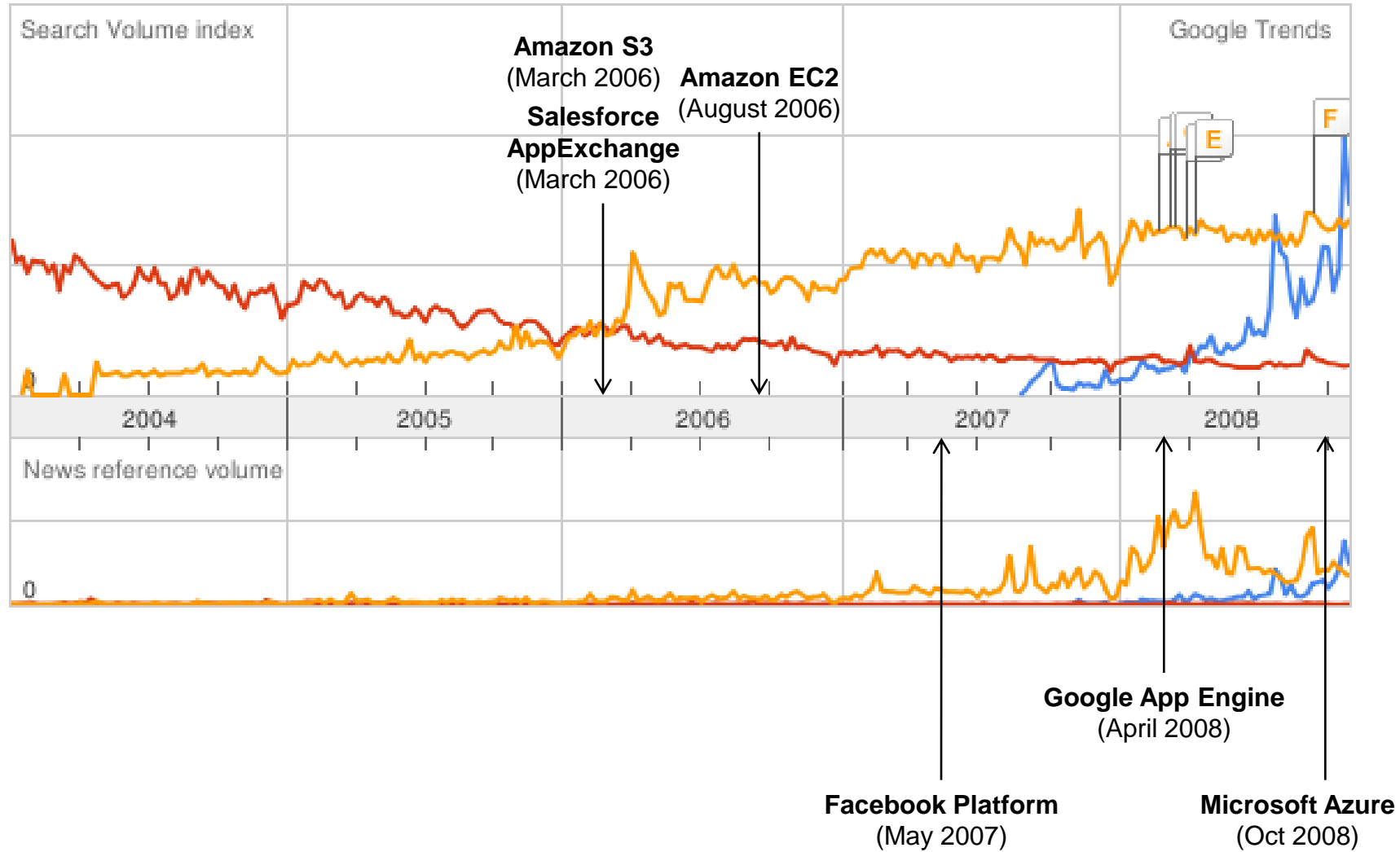
A Brief History



44229

Source: Forrester Research, Inc.

● cloud computing ● grid computing ● virtualization

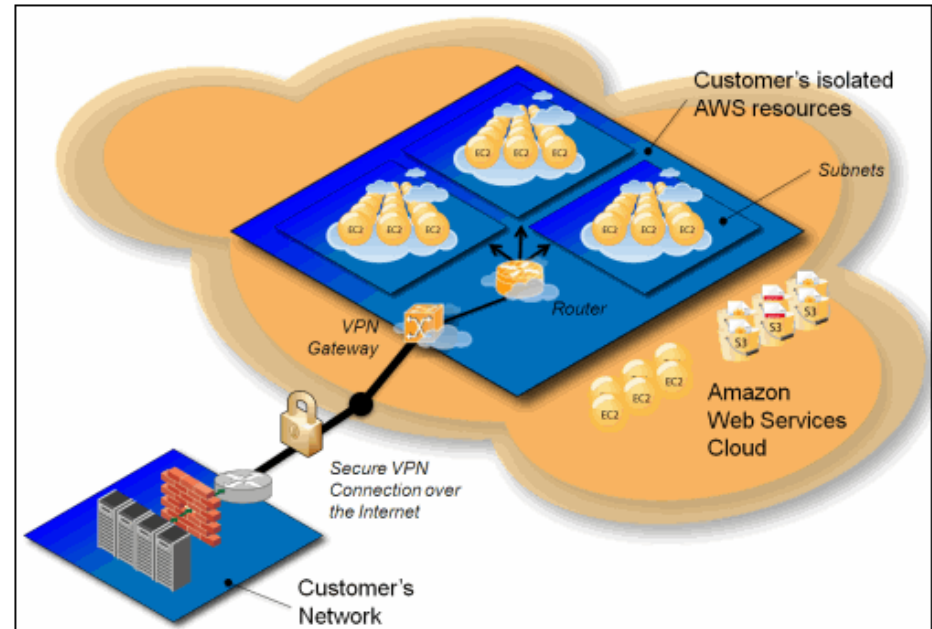


Source: F. Javadi, "Clearing the Air - Cloud Computing : Adobe Air, Google Gears and Microsoft Mesh"

Example: Amazon EC2

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- Elastic Cloud Computing
- virtual servers for rent
- called Amazon Machine Images (AMIs)
- based on Xen
- priced on per hour from \$0.10 to \$1



Amazon EC2 Management Console

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The screenshot shows the Amazon EC2 Management Console interface. At the top, there are three tabs: "Amazon EC2" (selected), "Amazon Elastic MapReduce", and "Amazon CloudFront". Below the tabs is a navigation pane on the left with a "Region:" dropdown set to "US-East". The main content area is titled "Amazon EC2 Console Dashboard" and is divided into several sections:

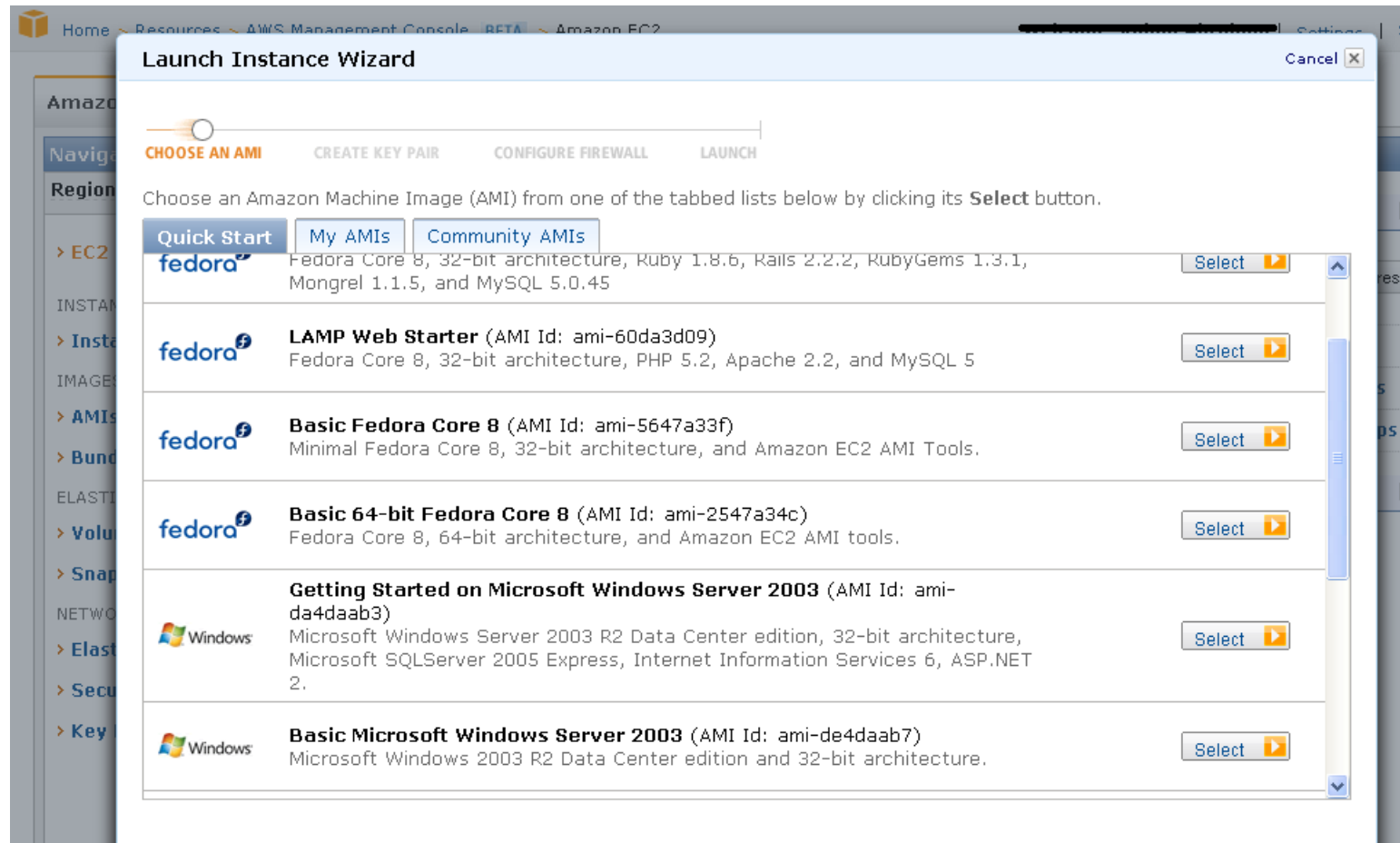
- Getting Started:** A yellow box with the text "To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance." and a prominent "Launch Instances" button. Below this is a note: "Note: Your instances will launch in the US-East region."
- My Resources:** A summary of resources in the US-East region, including a "Refresh" button. The resources listed are: 1 Running Instance, 0 Elastic IPs, 0 EBS Volumes, 0 EBS Snapshots, 1 Key Pair, and 2 Security Groups.
- Service Health:** A section showing the current status of the Amazon EC2 (US) service, which is "operating normally". A link is provided to "View complete service health details".
- Related Links:** A list of links including Documentation, All EC2 Resources, Forums, Feedback, and Report an Issue.

The navigation pane on the left includes the following categories and sub-items:

- EC2 Dashboard
- INSTANCES
 - Instances
- IMAGES
 - AMIs
 - Bundle Tasks
- ELASTIC BLOCK STORE
 - Volumes
 - Snapshots
- NETWORKING & SECURITY
 - Elastic IPs
 - Security Groups
 - Key Pairs

Amazon EC2 Launch Wizard

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Source: iphp, "Get your own cloud server running in 15 minutes",
http://www.webdigi.co.uk/blog/2009/get_your_own_cloud_server_running_in_15_minutes/

Example: Google Apps

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Content, Community, Collaboration



Google
Apps

- Web based office applications and collaboration
- Provide API for further customization and information accessing
 - Application API
 - Authentication API
 - Etc.
- Google Gears for offline operations

Google Docs - All items - Mozilla Firefox

File Edit View History Bookmarks GMarks Tools Help

google.com https://docs.google.com/?hl=en&tab=wo&authuser=0#all

Most Visited Drools Warcraft SOA Bloggang.com : Kissing... Welcome — IT2020: UC... Welcome — IT2020: UC...

Google Docs - All items Google apps - Google Search

Gmail Calendar Documents Reader Web more

New Features! | natawut.n@gmail.com | Product Survey | Settings | Help | Sign out

Google docs Search Docs Search Templates Show search options Browse template gallery

Create new Upload...

All items

Refresh

1-18 of 18 Last modified

Name	Folders / Sharing	Date
EARLIER THIS YEAR		
Solution Consult Spread Sheet	Kitisak.pr to 3 collaborators	Sep 19 Kitisak.pr
dimension	Not shared	Jul 14 me
Solution Consulting Worksheet (20100712)	Motif Not shared	Jul 13 me
HPC - Undergrad	HPC Track me to 4 collaborators	Jun 3 me
e-Passport addendum	Proadpran to everyone, 4 collaborators	Apr 27 Proadpran
credit card payment	Not shared	Apr 26 me
My test form	Not shared	Feb 20 me
iprocess-0.5.rar	Motif me to 2 collaborators	Feb 20 me
i-Doc Log	Proadpran to everyone, 8 collaborators	Jan 19 Proadpran
OLDER		
Request temporary accounts for depart...	Not shared	12/20/09 me
Inner Meeting Note - 8 December 2009	Inner Meeting Not shared	12/7/09 me
Meeting Minute - 2 December 2009	ITAL Thai Not shared	12/1/09 me
Inner Minute Note - 1 December 2009	Inner Meeting Not shared	11/30/09 me
ICS Project Outline	Cloud Project me to 2 collaborators	11/27/09 me
24-switch	Not shared	11/17/09 me
spec of quick terminal bases on HP Th...	Not shared	7/26/09 me
AIR-AP1242AG-ver2	Not shared	6/4/09 me
Progress IT	Proadpran to 7 collaborators	2/22/09 Proadpran

Done

Google Docs BETA New features | Docs Home | Help | Sign Out

Unsaved spreadsheet Share Save

File Edit Format Insert Tools Form

File Edit Format Insert Tools Form

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

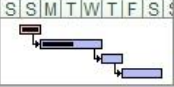
A B

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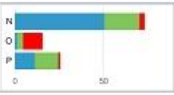
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Gantt Chart
By Viewpath

Creates a basic Gantt Chart that displays task schedules using Name, Start, Finish, and optional Progress columns.

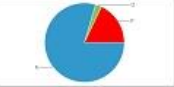
[Add to spreadsheet](#)



Bar Chart
By Google

Bar Chart using Google Charts API


[Add to spreadsheet](#)



Pie Chart
By Google

Pie Chart using Google Charts API

[Add to spreadsheet](#)



Bars of Stuff
By The visapi-gadgets project

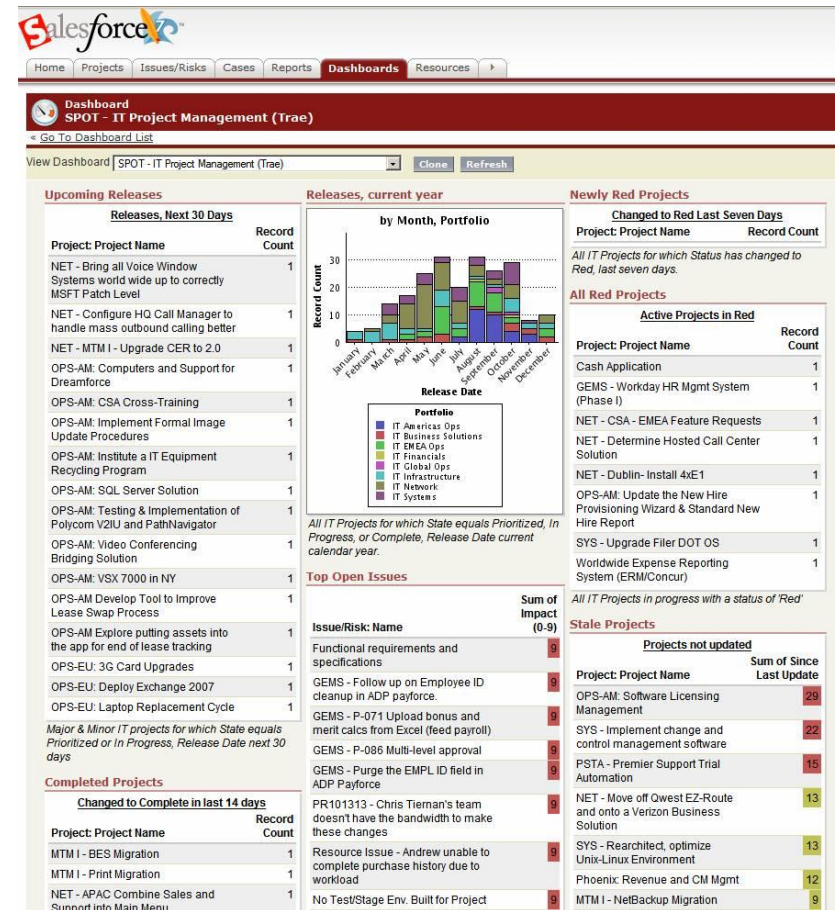
Fun bar charts using images of trains,

Sheet1

Example: Salesforce.com

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- Provide web-based CRM applications
- Customers just sign-up and do not have to maintain any infrastructure
- Currently have more than 80,000 customers (over 2,100,000 subscribers)
- Pricing from \$5/user/month to \$250/user/month



Salesforce.com CRM Functions



Workday HCMD
 Salary.com
 Salary Manager
 Performance Management
 Time-off Manager
 Volunteer tracking
 ADP Payroll
 Employee Time Tracking

Coupa
 Procure to Pay
 Concur T&E Manager
 Manhattan Space & Lease Management
 Contract Management

Salesforce Customer Service
 Salesforce Content
 Salesforce Ideas
 Plateau Learning Management
 Professional Services Management

SFA
 Marketing
 Click to dial (CTI Integrations)
 Event Management
 Opportunity to Quote
 Quote to cash
 Sales Compensation
 Checkout E-commerce
 Live Chat (Google)

Development Domain
 Program and Resource Management
 Agile Scrum and Bug Management
 QA Test Director

IT Infrastructure Support
 Portfolio Management
 Compliance
 IT Help Desk
 LiveOps
 Asset Management
 Intranet
 Google Apps

Compliance/Risk Domain
 Audit Controls Management

Benefits of Cloud Computing

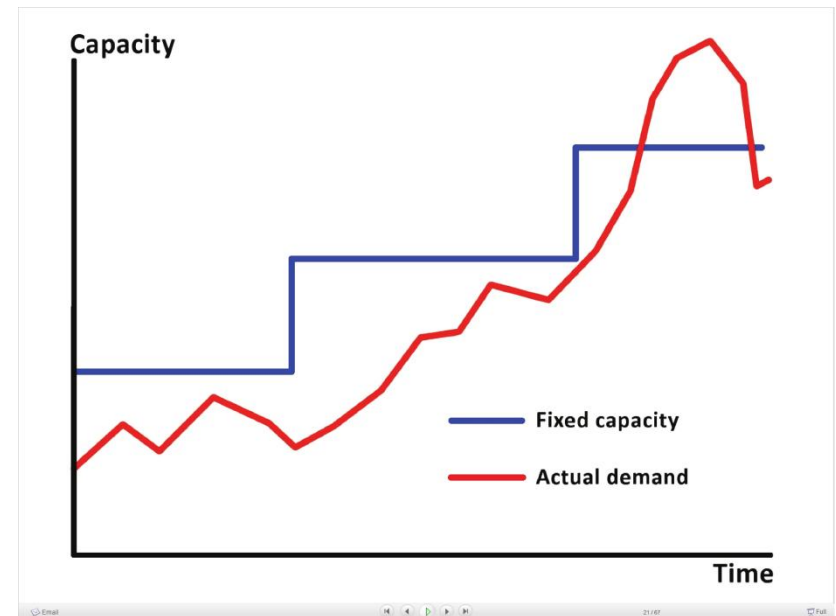
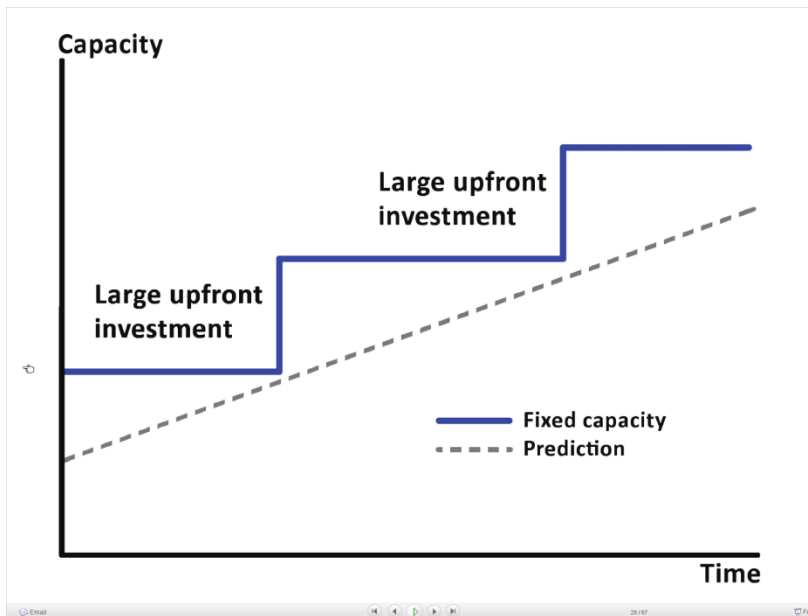
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- No Capital Expenditure (CapEx)
- Pay as you go
- Pay only for what you need
- Elastic Capacity
- Faster time to market
- Focus on your business

Benefits of Cloud Computing

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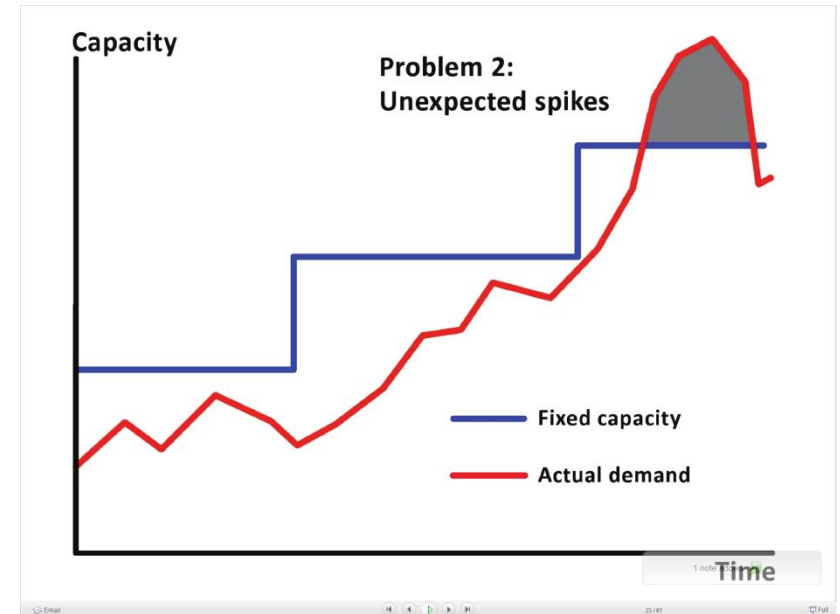
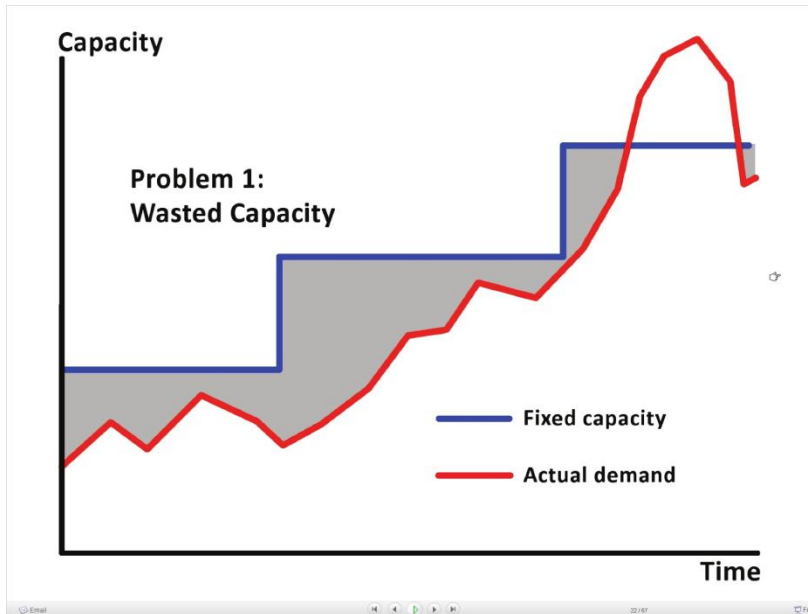
Source: S. Brunozi, "2010 architecting for the cloud",
<http://www.slideshare.net/simone.brunozzi/2010-architecting-for-the-cloud-4719195>, 2010



Benefits of Cloud Computing

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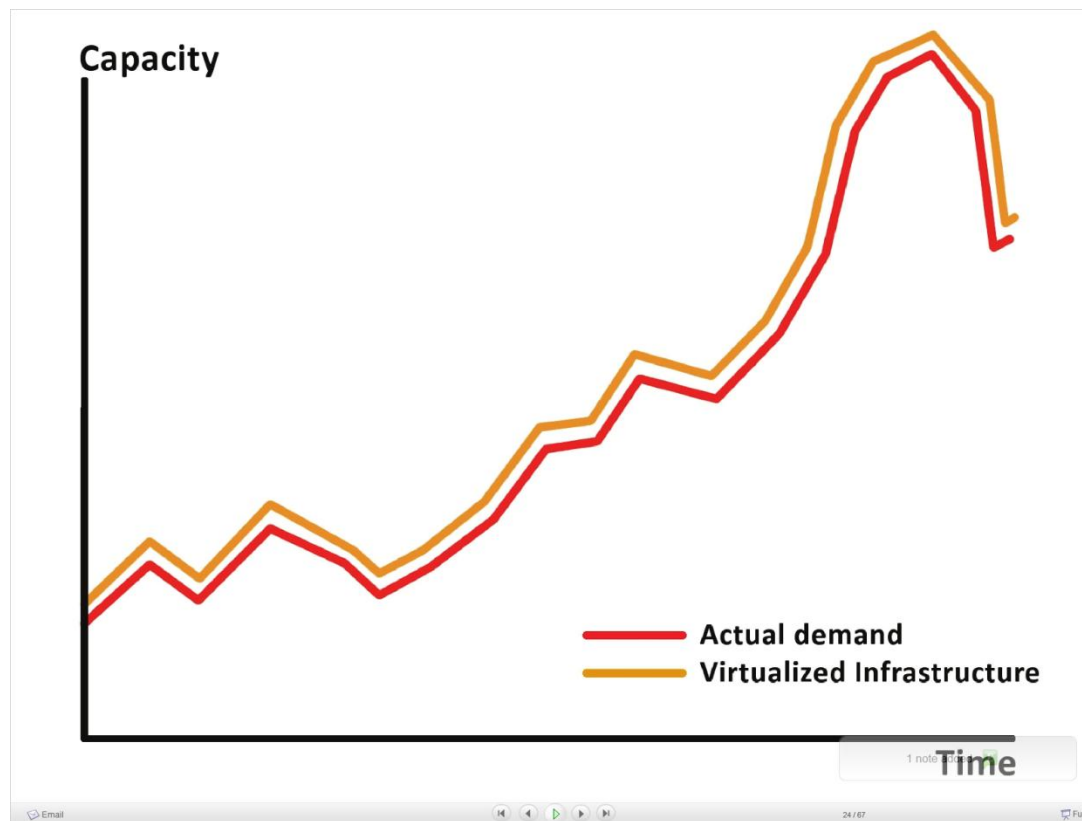
Source: S. Brunozi, "2010 architecting for the cloud",
<http://www.slideshare.net/simone.brunozzi/2010-architecting-for-the-cloud-4719195>, 2010



Benefits of Cloud Computing

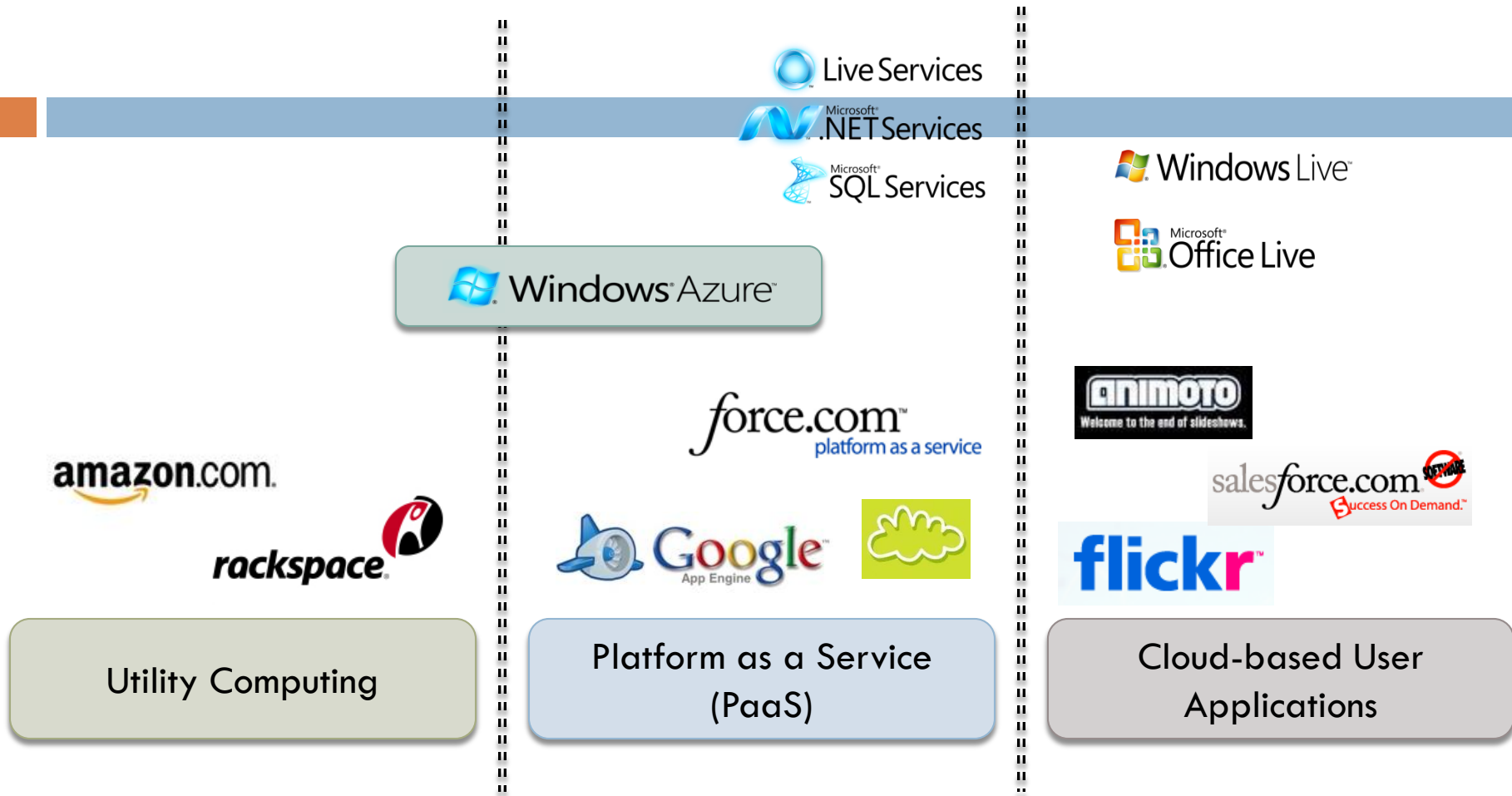
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Source: S. Brunozzi, "2010 architecting for the cloud",
<http://www.slideshare.net/simone.brunozzi/2010-architecting-for-the-cloud-4719195>, 2010



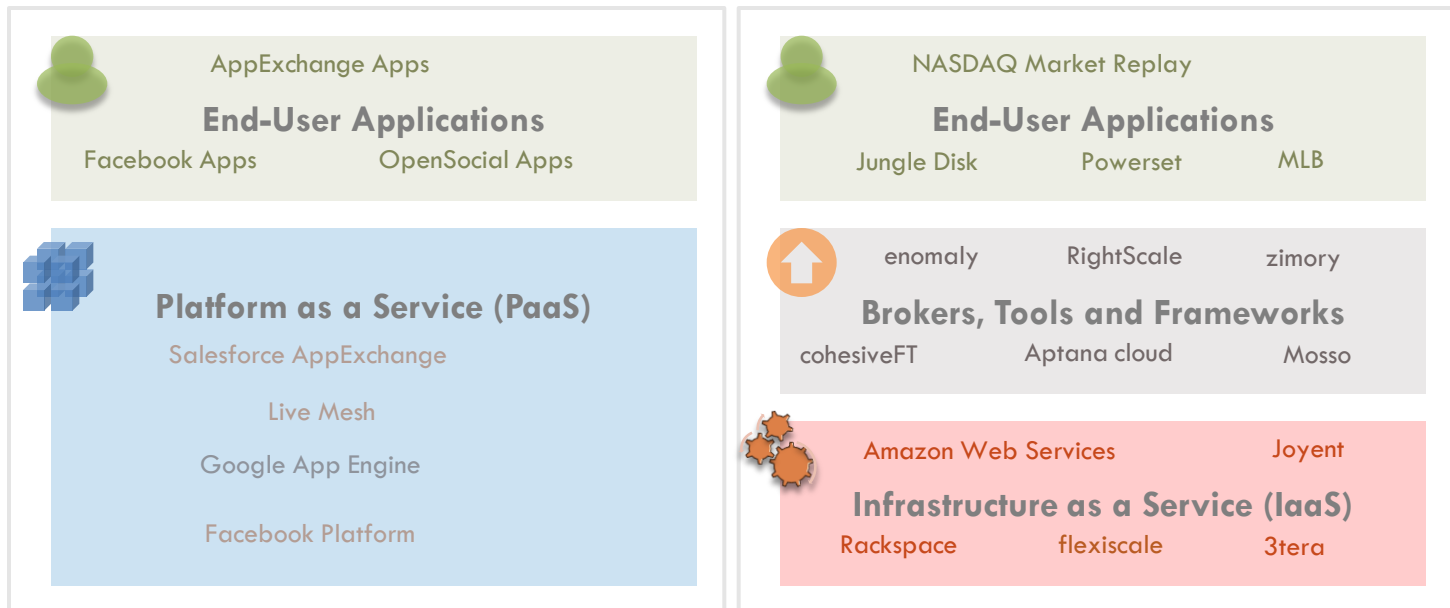
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Cloud Approaches

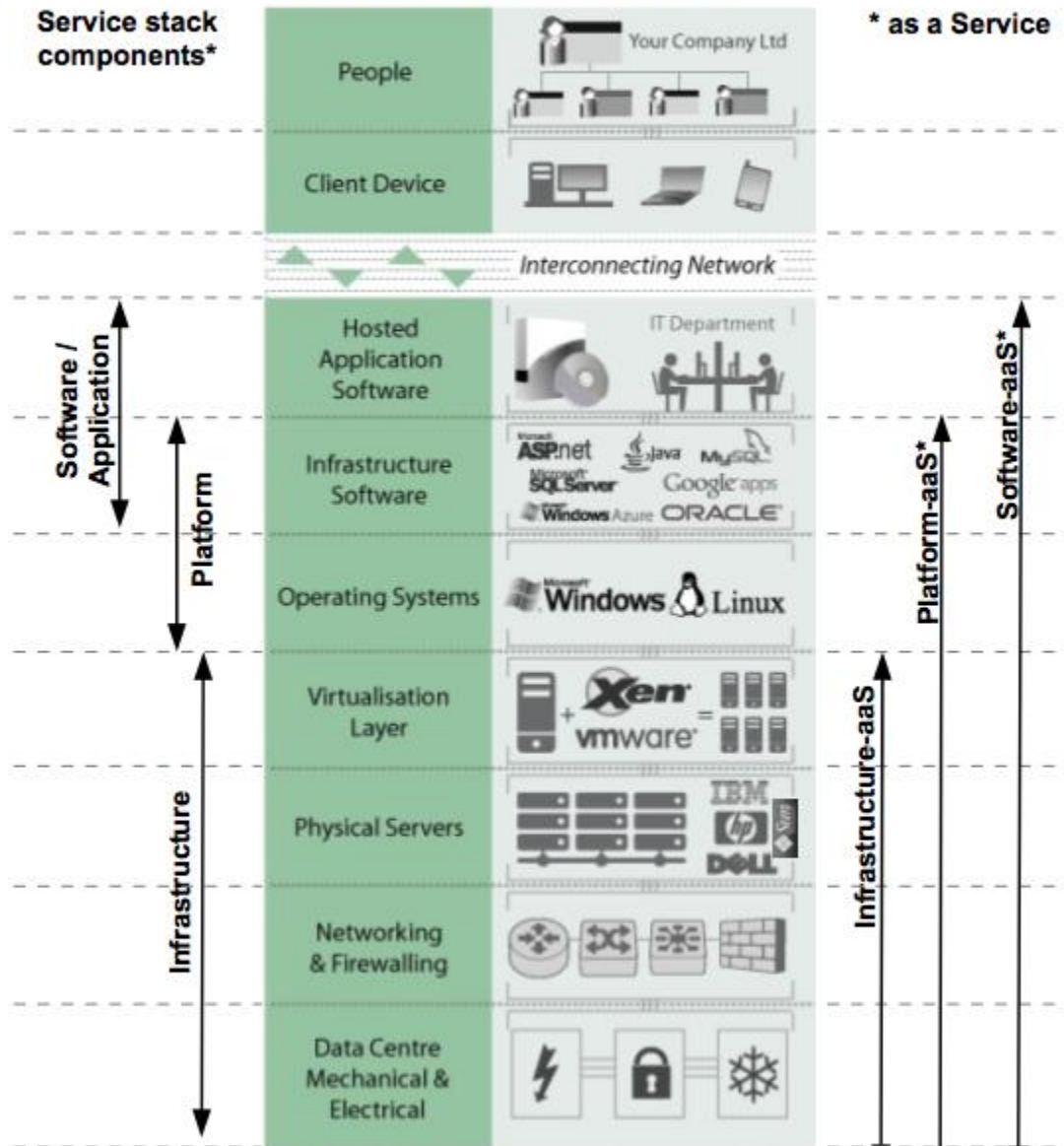


Cloud Ecosystem

- End-user applications, Software-as-a-Service (SaaS)
- Platform-as-a-Service (PaaS)
- Infrastructure-as-a-Service (IaaS)



Service Layers Definition



Notes:

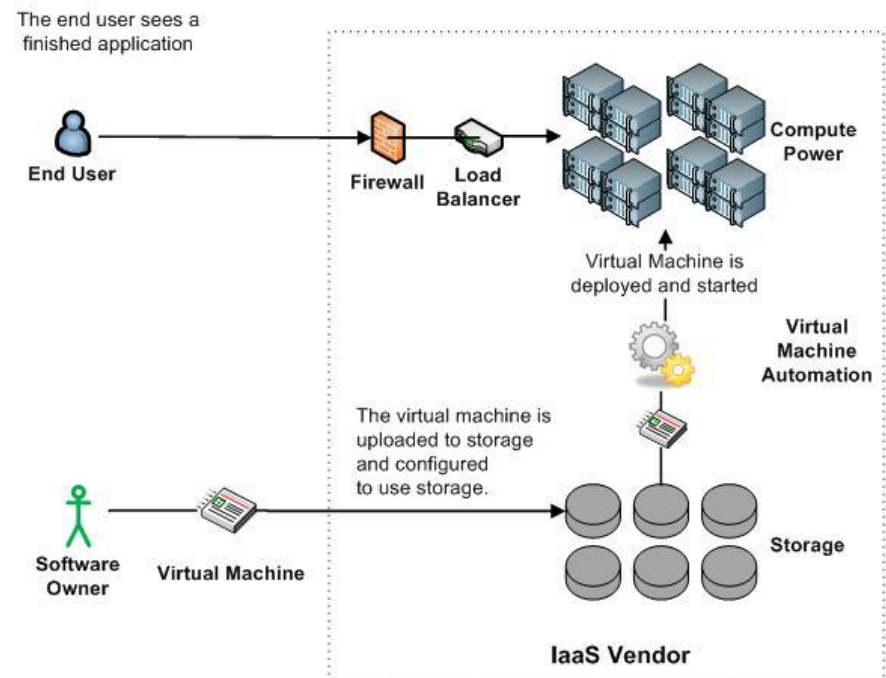
Brand names for illustrative / example purposes only, and examples are not exhaustive.

* Assumed to incorporate subordinate layers.

Infrastructure as a Service (IaaS)

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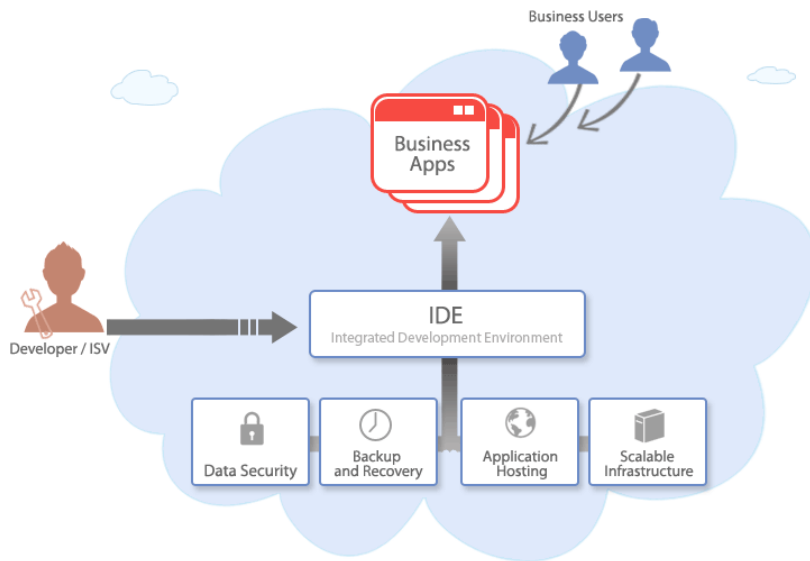
- Provide computer infrastructure as a service
 - Virtual Servers / Storages
 - Network equipments: Load balancers, Firewalls, etc.
- “Utility computing”, pay per use
- Simple to scale and manage
- Example:
 - Amazon EC2, S3
 - Rackspace Mosso
 - GoGrid



Source: <http://microreviews.org/types-of-cloud-computing/>

Platform as a Service (PaaS)

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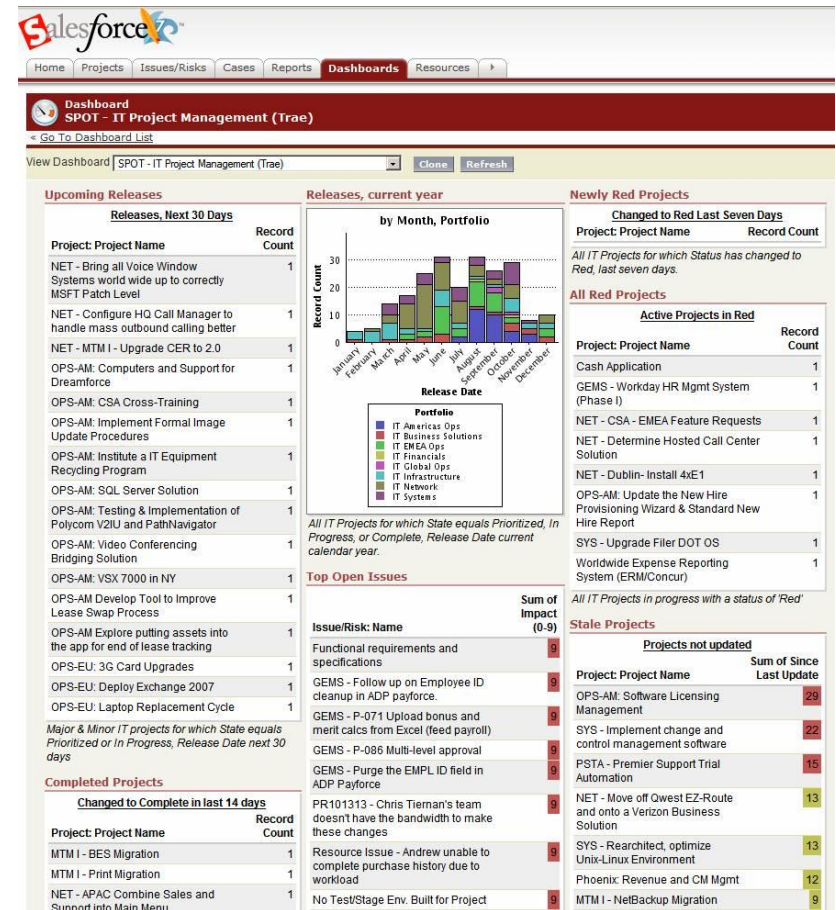
Source: <http://www.zoho.com/creator/paas.html>

- Provide infrastructure, system software stacks, and development tools
 - ▣ Web servers, database servers, etc.
- Many vendors provide services with API
 - ▣ Google Calendar, etc.
- Examples
 - ▣ Google AppEngine
 - ▣ Yahoo! Maps

Software as a Service (SaaS)

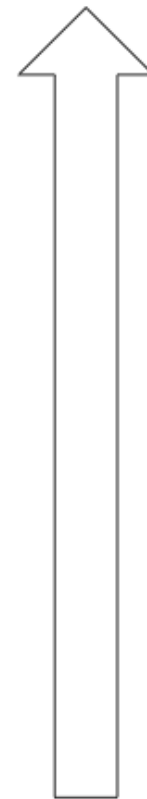
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- Complete web-based software
- “Pay-as-you-go” model
- Allow customization via parameter configuring
- Examples
 - Salesforce.com
 - Google Docs
 - Gmail, hotmail



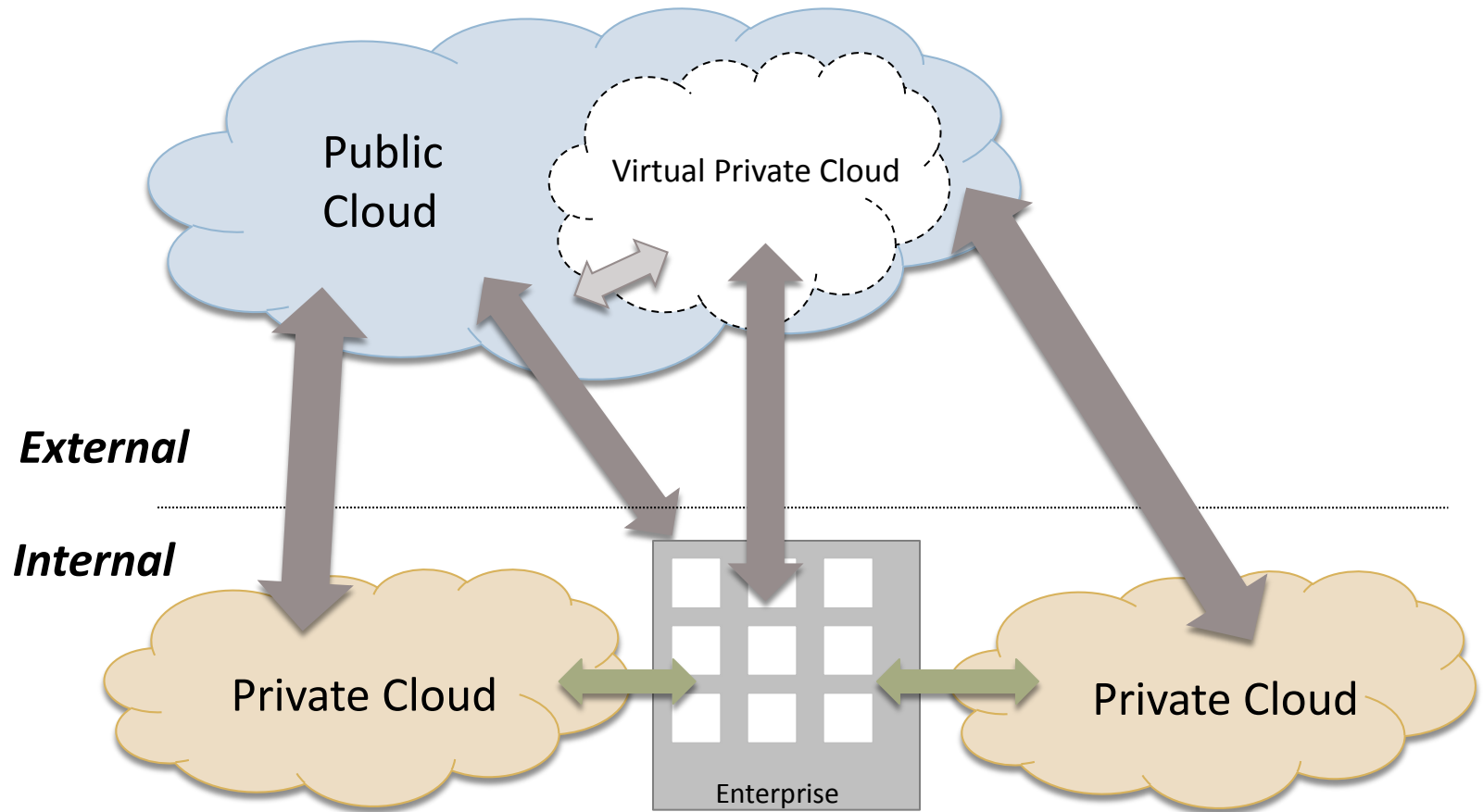
Cloud Market Types	Types of Offerings	Examples
Software-as-a-Service	<ul style="list-style-type: none"> • Rich Internet application web sites • Application as Web Sites • Collaboration and email • Office Productivity • Client apps that connect to services in the cloud 	<ul style="list-style-type: none"> • Flickr • Myspace.com • Cisco WebEx office • Gmail • IBM Bluehouse
App-components-as-a-Service	<ul style="list-style-type: none"> • APIs for specific service access for integration • Web-based software service than can combine to create new services, as in a mashup 	<ul style="list-style-type: none"> • Amazon Flexible Payments Service and DevPay • Salesforce.com's AppExchange • Yahoo! Maps API • Google Calendar API • zembly
Platform-as-a-Service	<ul style="list-style-type: none"> • Development-platform-as-a-service • Database • Message Queue • App Servicer • Blob or object data stores 	<ul style="list-style-type: none"> • Google App Engine and BigTable • Microsoft SQL Server Data Services • Engine Yard • Salesforce.com's Force.com
Infrastructure-as-a-Service	<ul style="list-style-type: none"> • Virtual servers • Logical disks • VLAN networks • Systems Management 	<ul style="list-style-type: none"> • Akamai • Amazon EC2 • CohesiveFT • Mosso (from Rackspace) • Joyent Accelerators • Nirvanix Storage Delivery Network
Physical Infrastructure	<ul style="list-style-type: none"> • Managed Hosting • Collocation • Internet Service Provider • Unmanaged hosting 	<ul style="list-style-type: none"> • GoDaddy.com • Rackspace • Savvis

Level of Abstraction

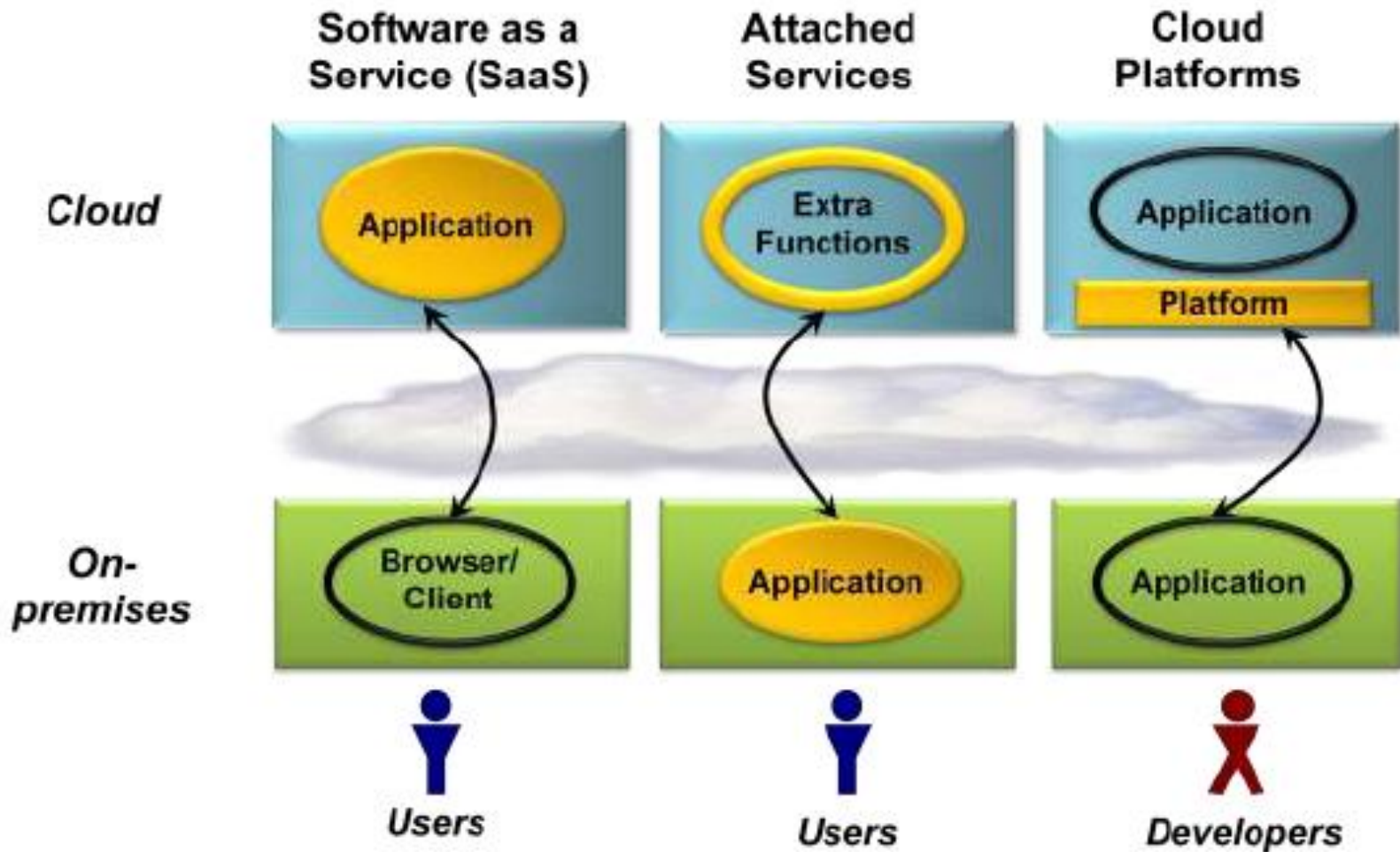


Adapted from Forrester Research Taxonomy

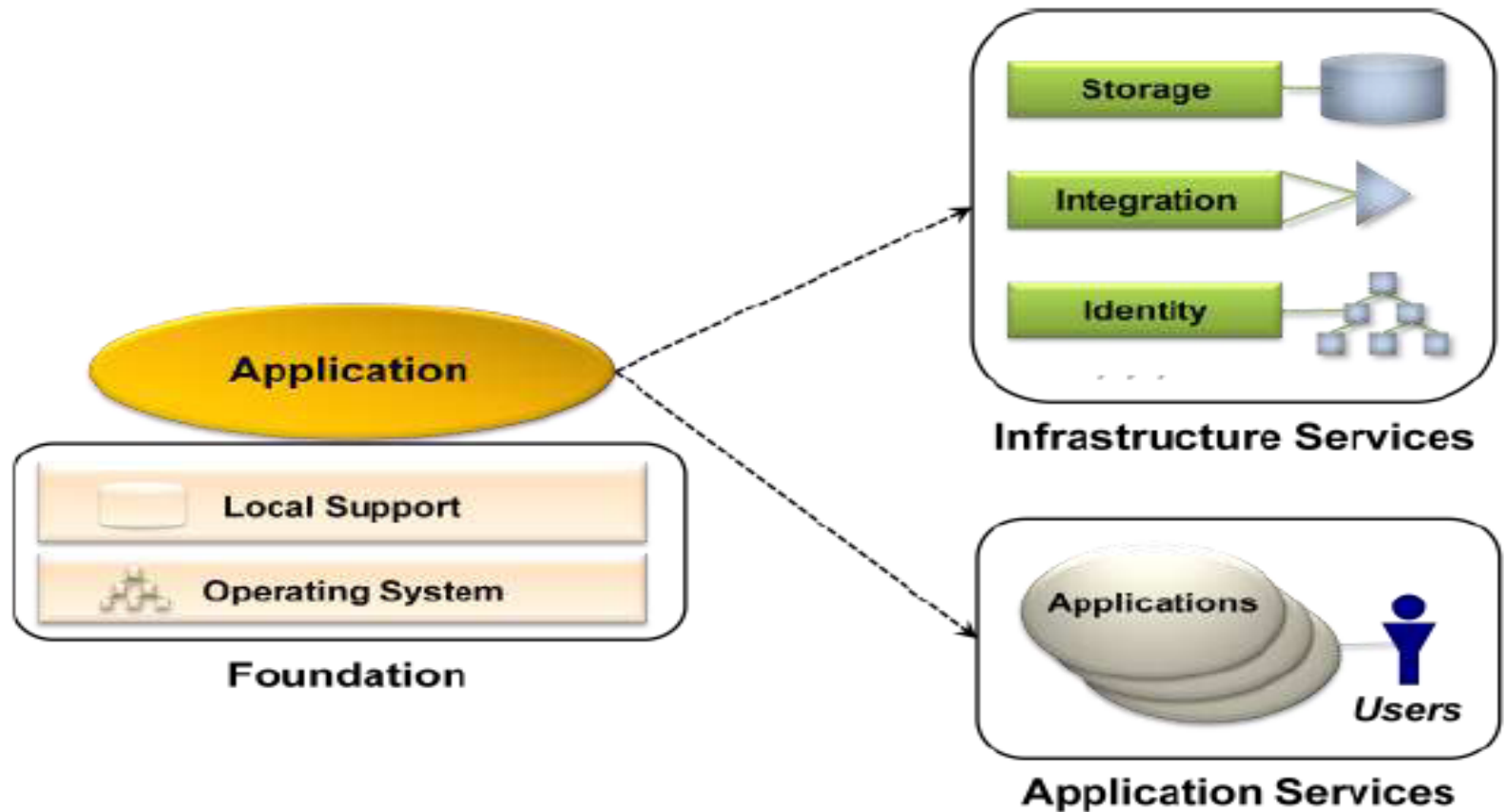
Cloud Ecosystem



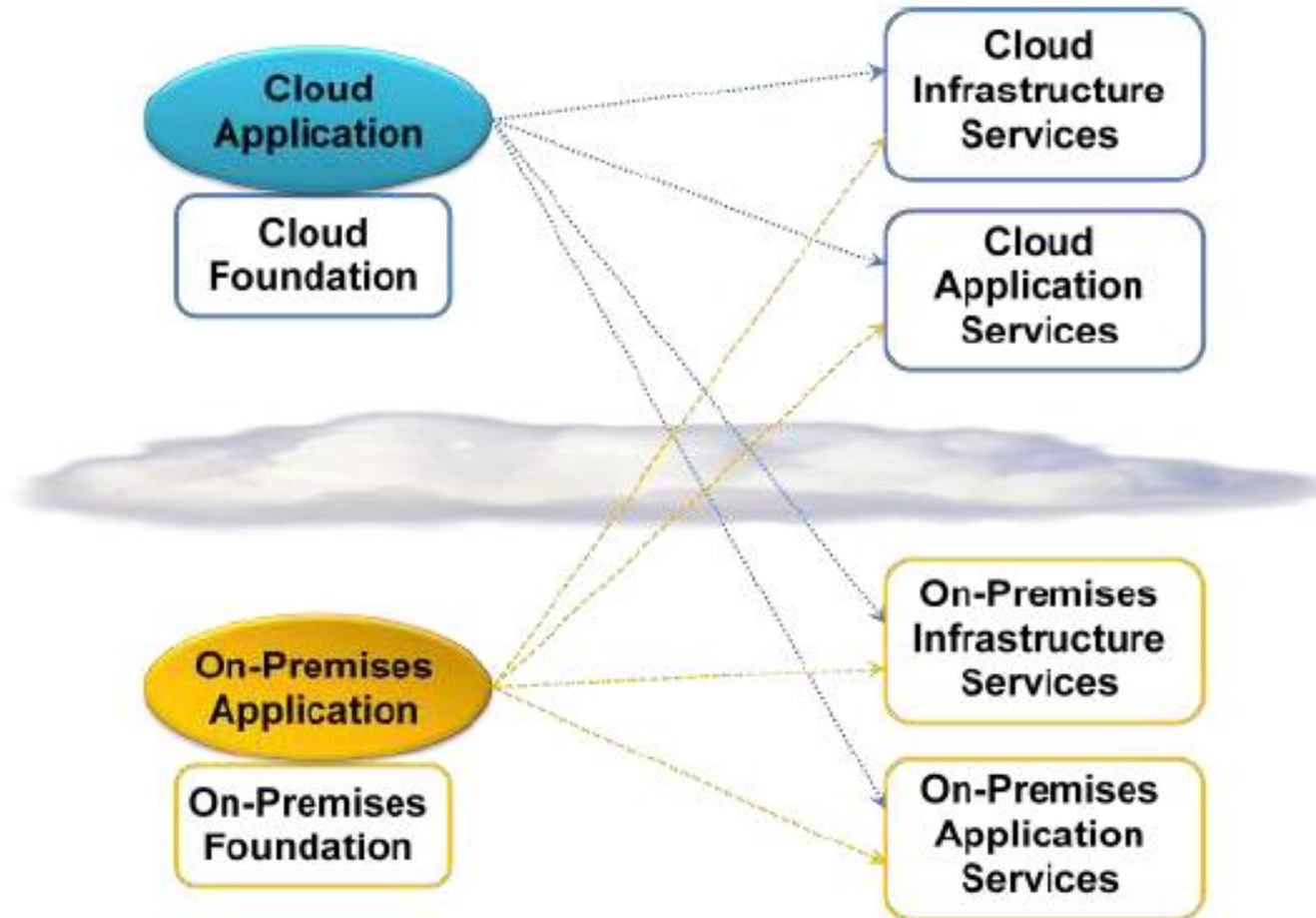
CLOUD PLATFORMS IN CONTEXT: THREE KINDS OF CLOUD SERVICES



From On-Premise to Cloud Platforms



From On-Premise to Cloud Platforms



From On-Premise to Cloud Platforms

Application runs
on-premises

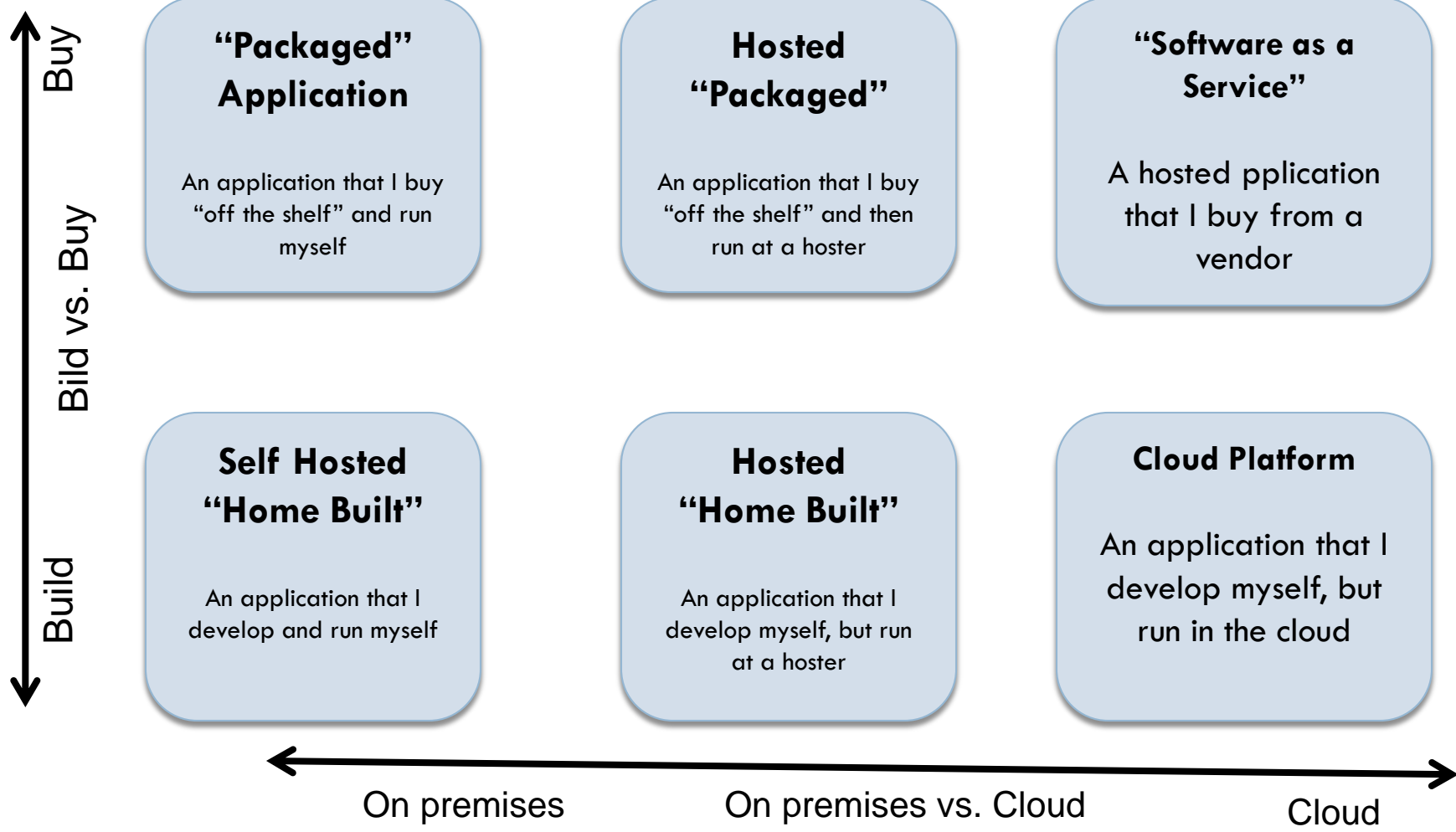
Buy my own
hardware, and
manage my own
data center

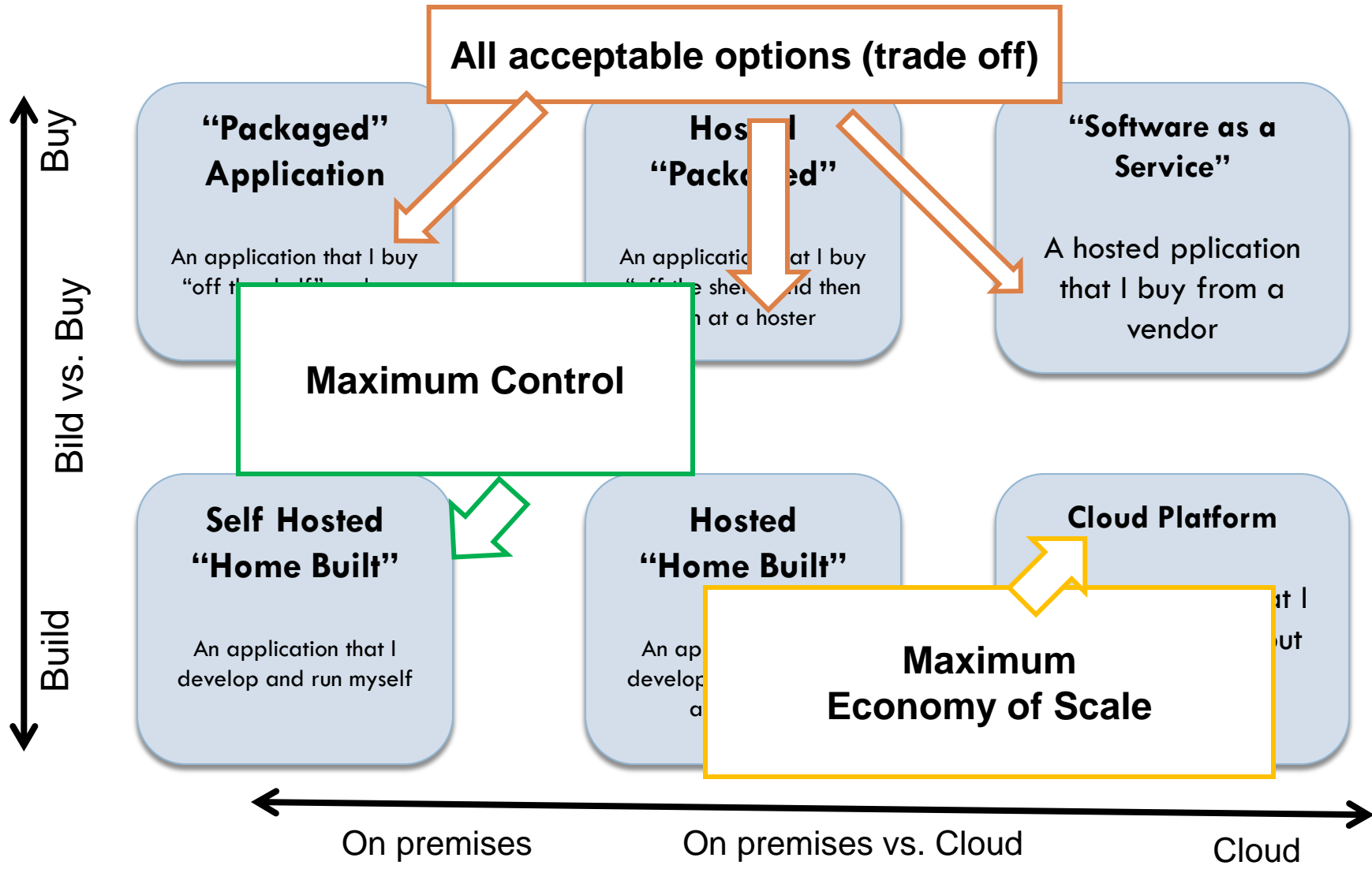
Application runs
at a **hoster**

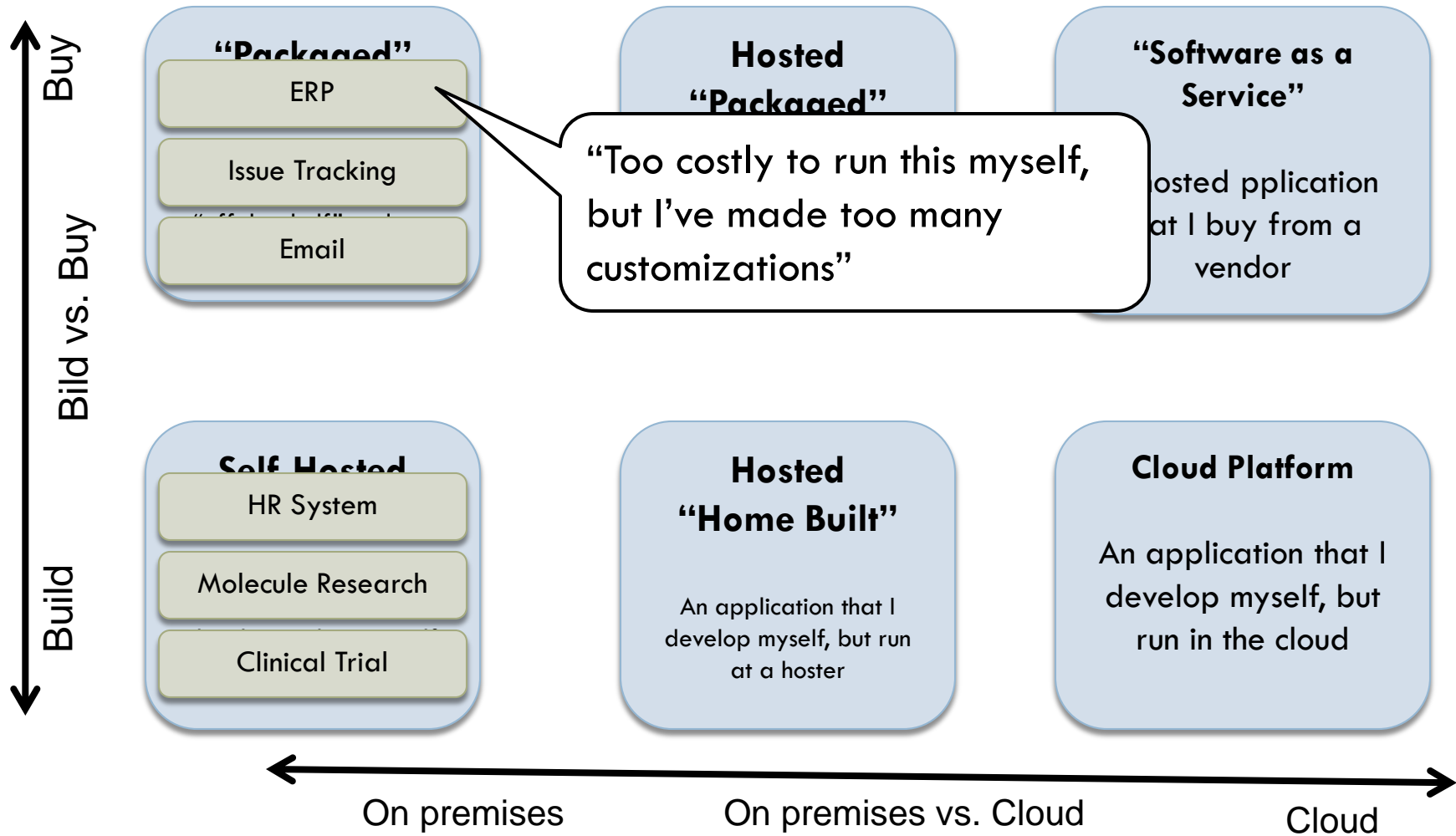
Co-location
or
Managed
servers

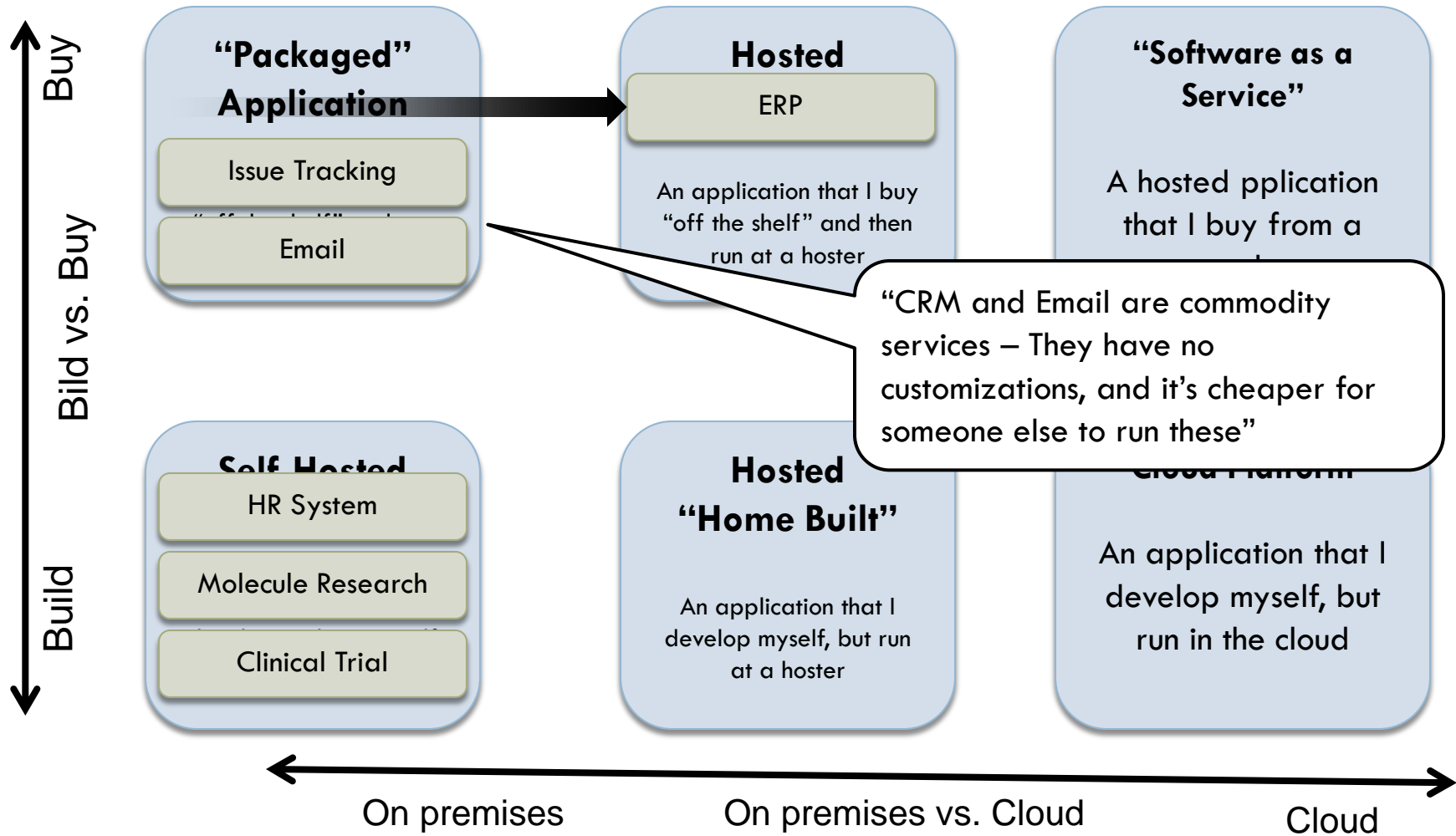
Application
runs using
cloud services

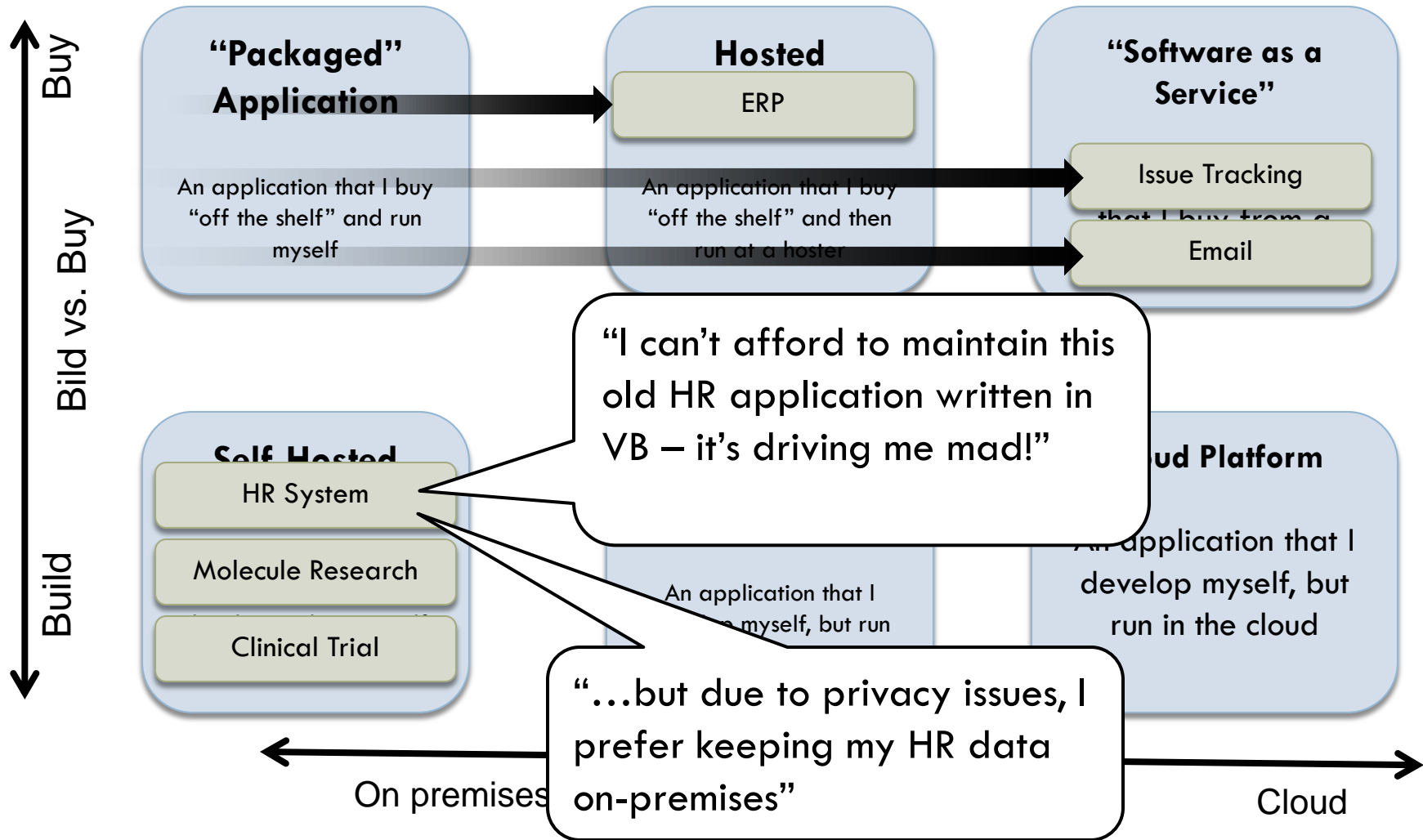
“cloud fabric”
(elastic,
infini-scale)

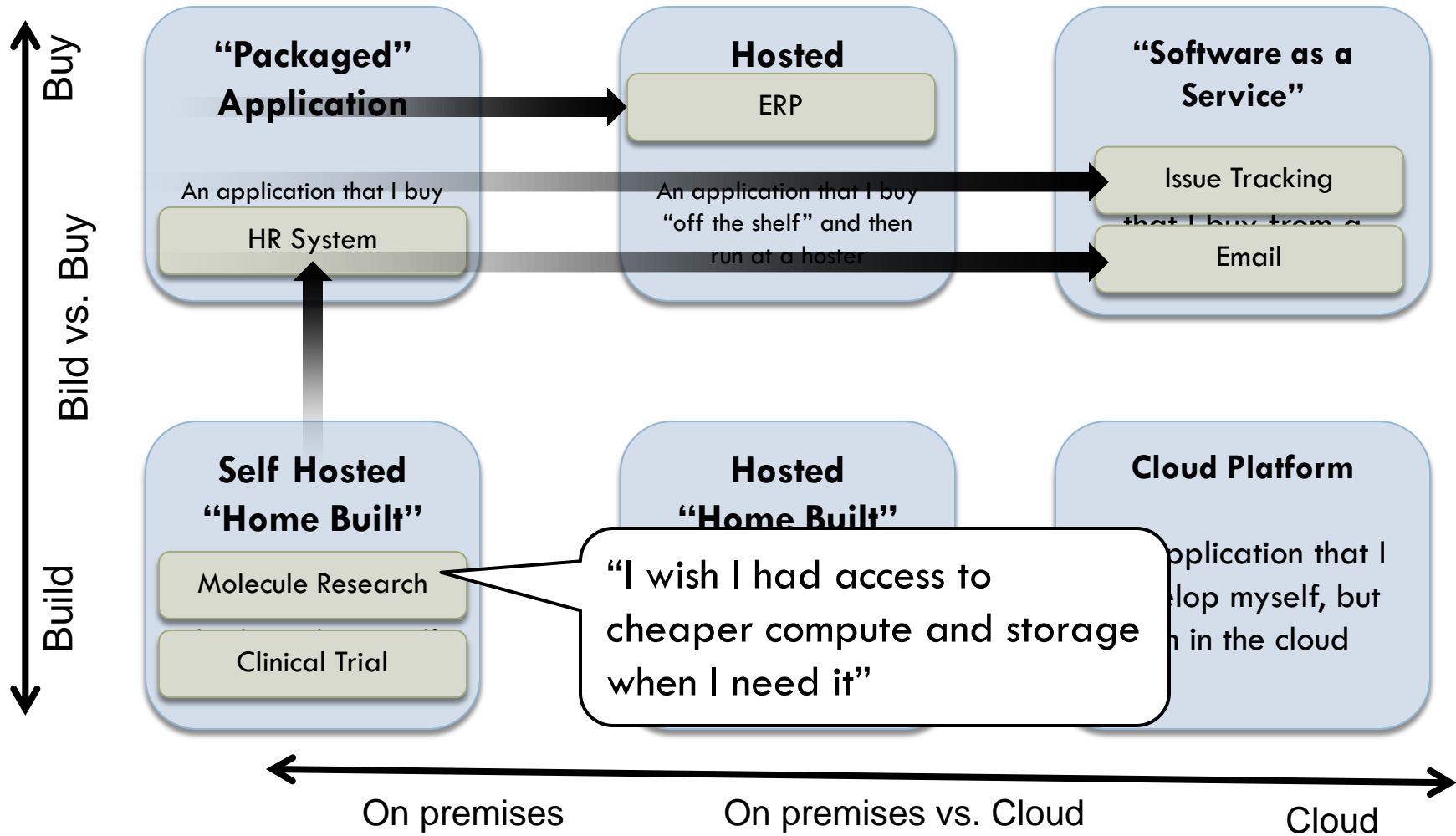


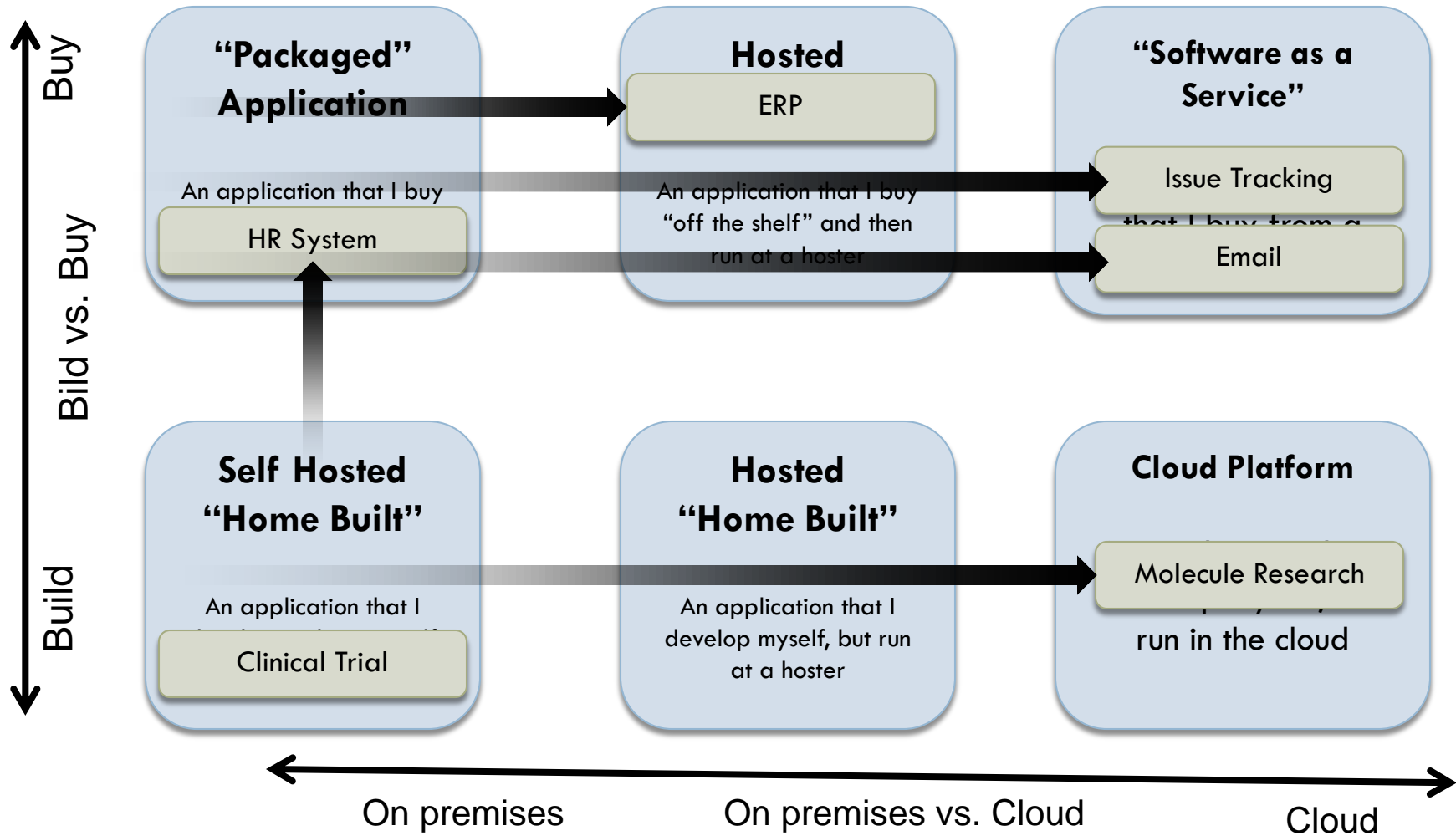


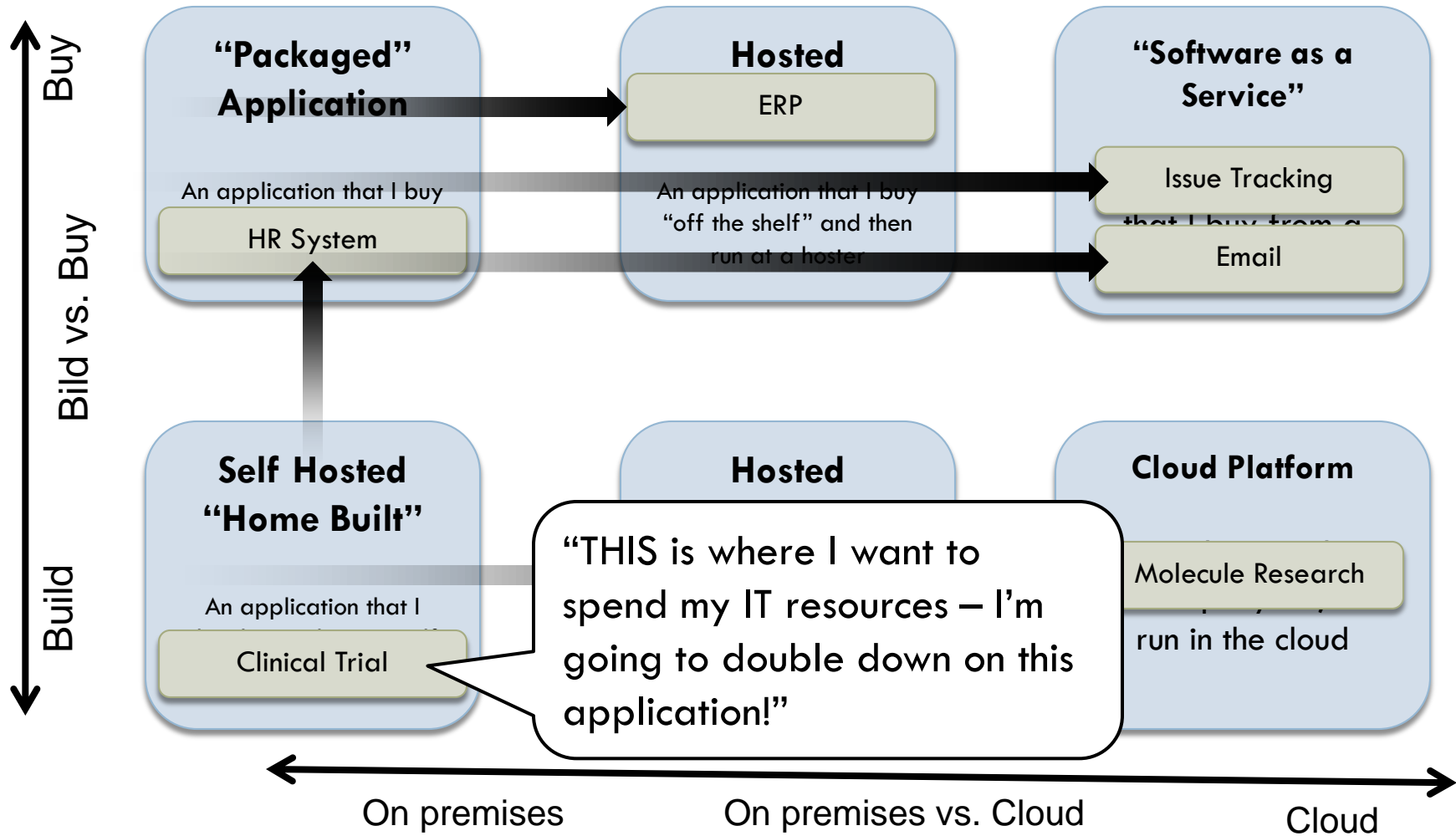


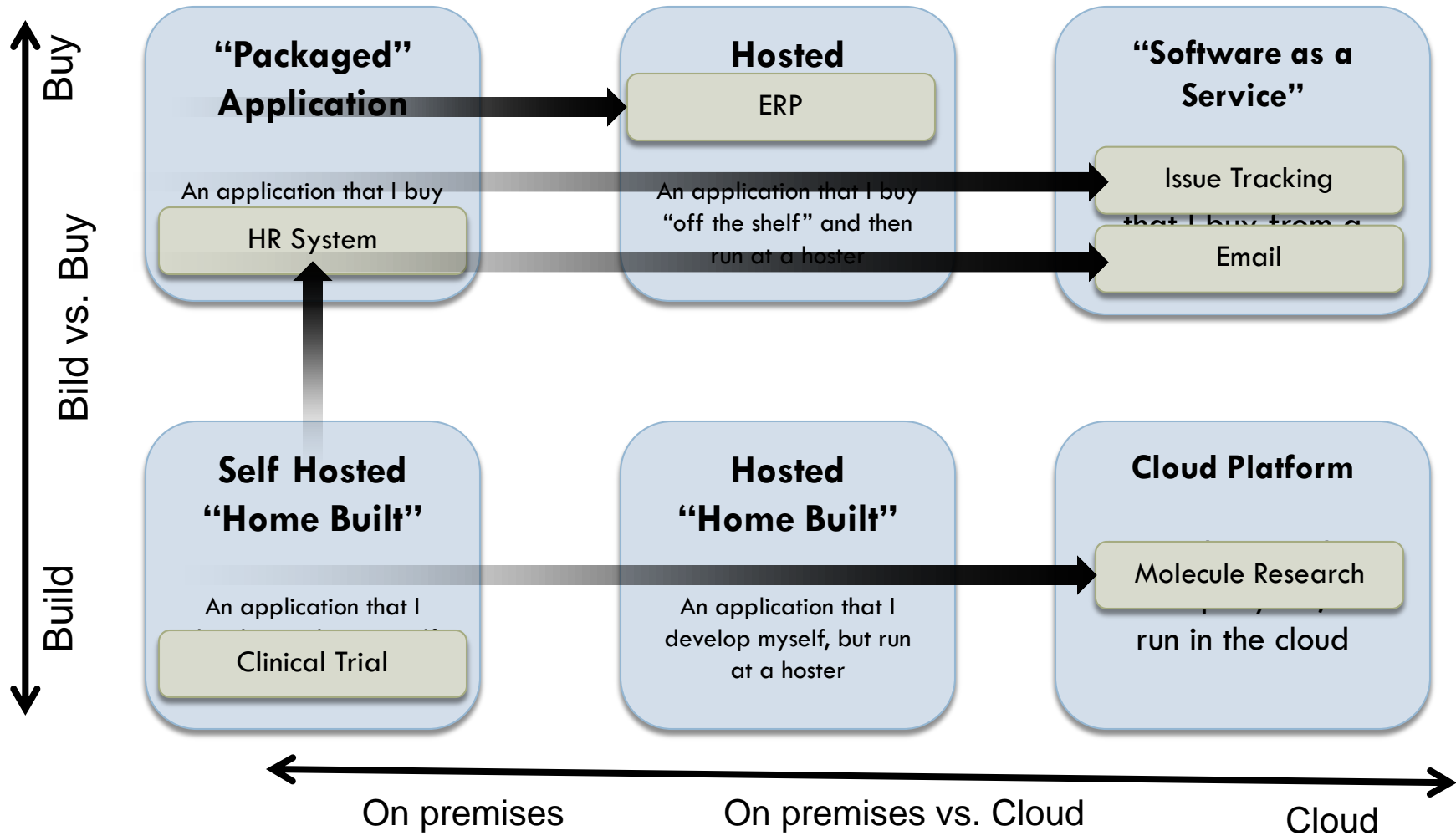












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Real-World Case Study: Animoto



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Animoto for...
 business
 photography
 real estate
 education
 a cause

Product
 music lounge
 aperture plug-in
 lightroom plug-in
 pricing details

Partnership
 quickstart api
 referrals
 affiliates

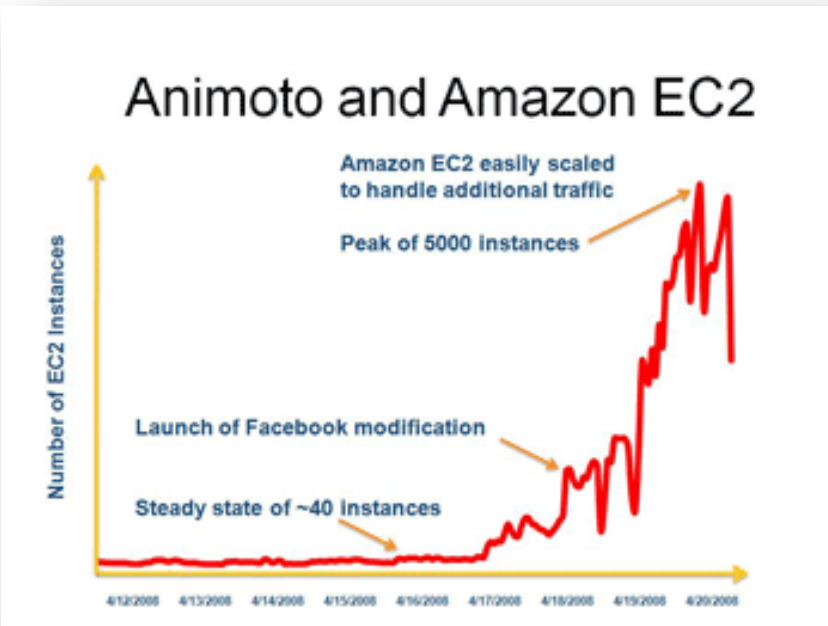
Support
 knowledge base
 community help
 contact us



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Case Study: Animoto

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Source: R. Smith, "The Cloud/Electric Generator Analogy", InformationWeek Analytic, Jan 2009

- Automatic VDO creation from still pictures
- SaaS on IaaS
- 10x users' growth in 3 days (from 25k to 250k)
- Total number of servers owned by Animoto = 0
- The most expensive piece of equipment in the office is the espresso machine
- Utilize Amazon EC2



References

- F. Javadi, “Clearing the Air - Cloud Computing : Adobe Air, Google Gears and Microsoft Mesh”
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- G. Barton, “Animoto – The Poster Child for AWS & EC2”,
<http://bartongeorge.net/2009/03/25/animoto-the-poster-child-for-aws-ec2/>