Introduction to Cloud Computing

I am here to help

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Historic Waves of Economic and Social Transformation

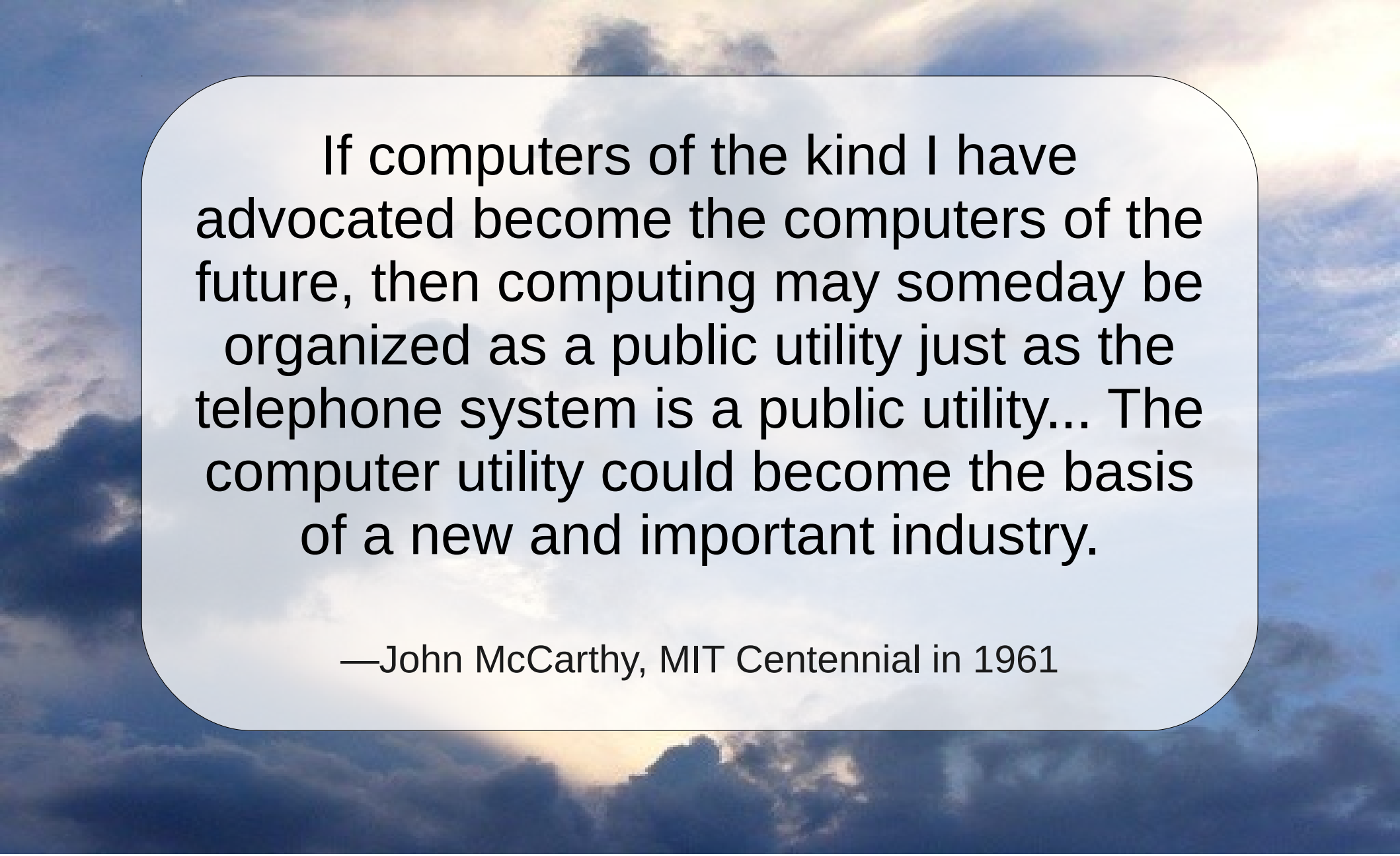
Industrial Revolution

Age of Steam and Railways

Age of Steel and Electricity

Age of Automobiles and Oil

Age of Communication & Information

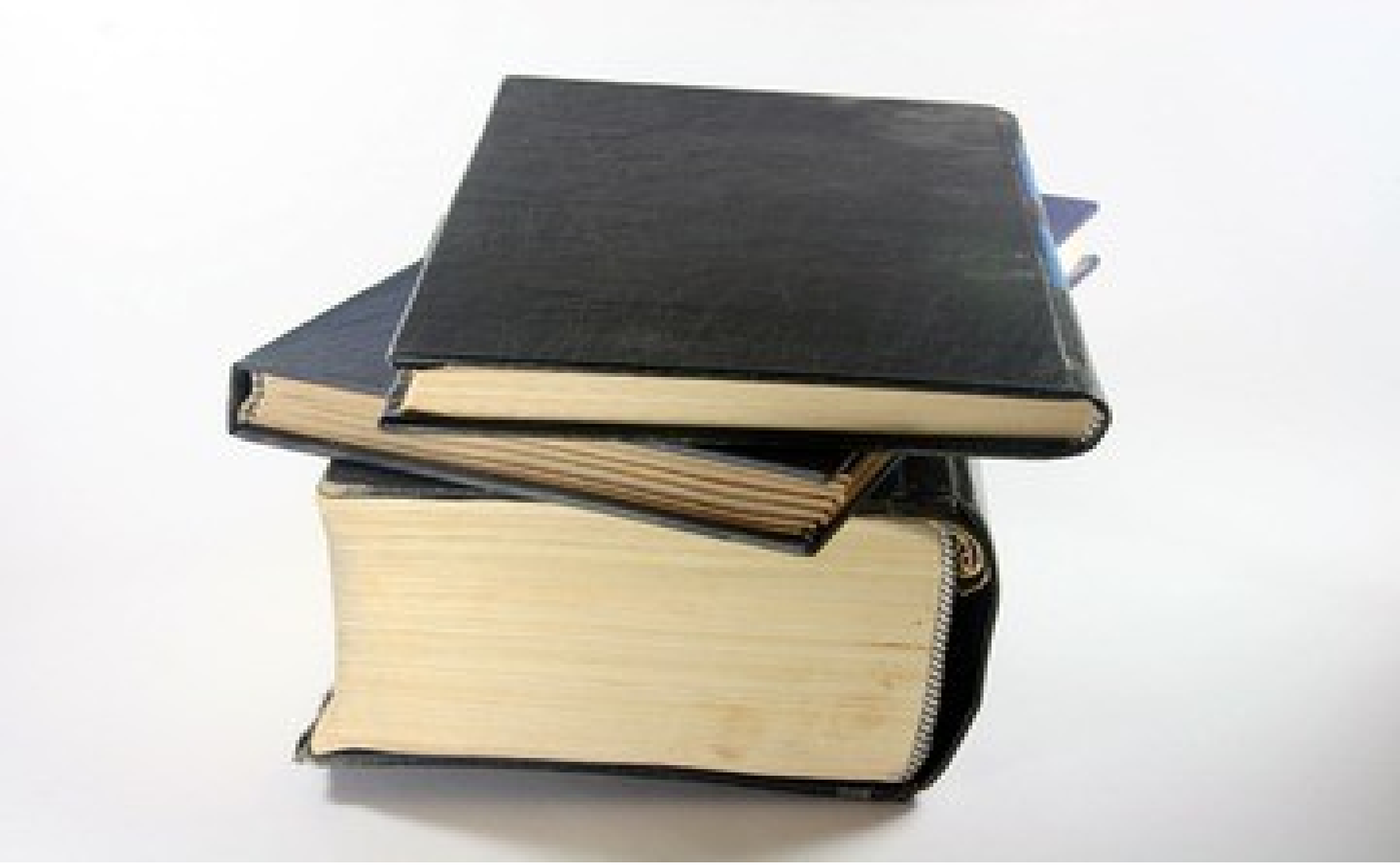

If computers of the kind I have advocated become the computers of the future, then computing may someday be organized as a public utility just as the telephone system is a public utility... The computer utility could become the basis of a new and important industry.
—John McCarthy, MIT Centennial in 1961

Cloud

Economics

Risk Management

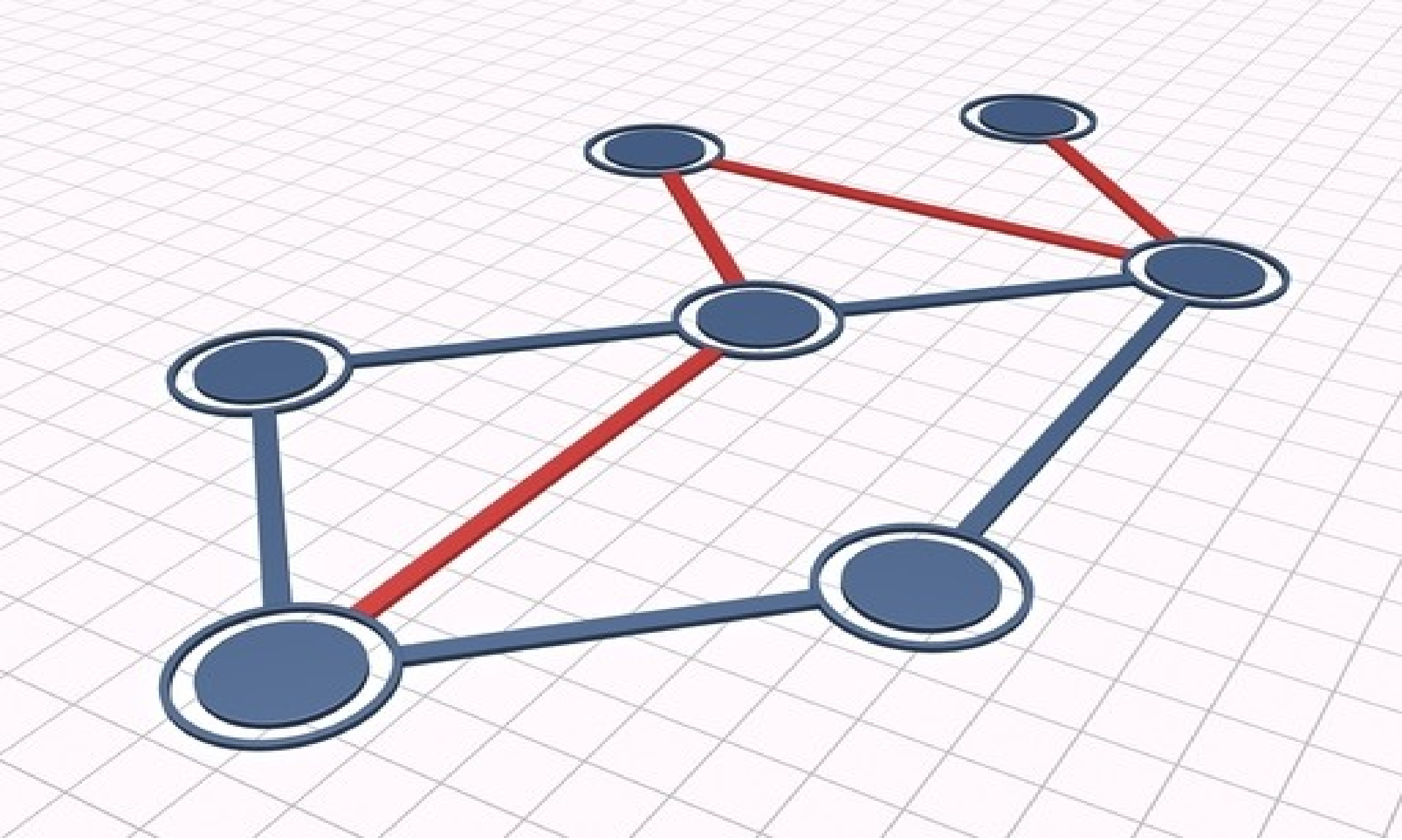
Time to Market



Information Society

Ubiquitous Society


NIST



Characteristics

Self Service

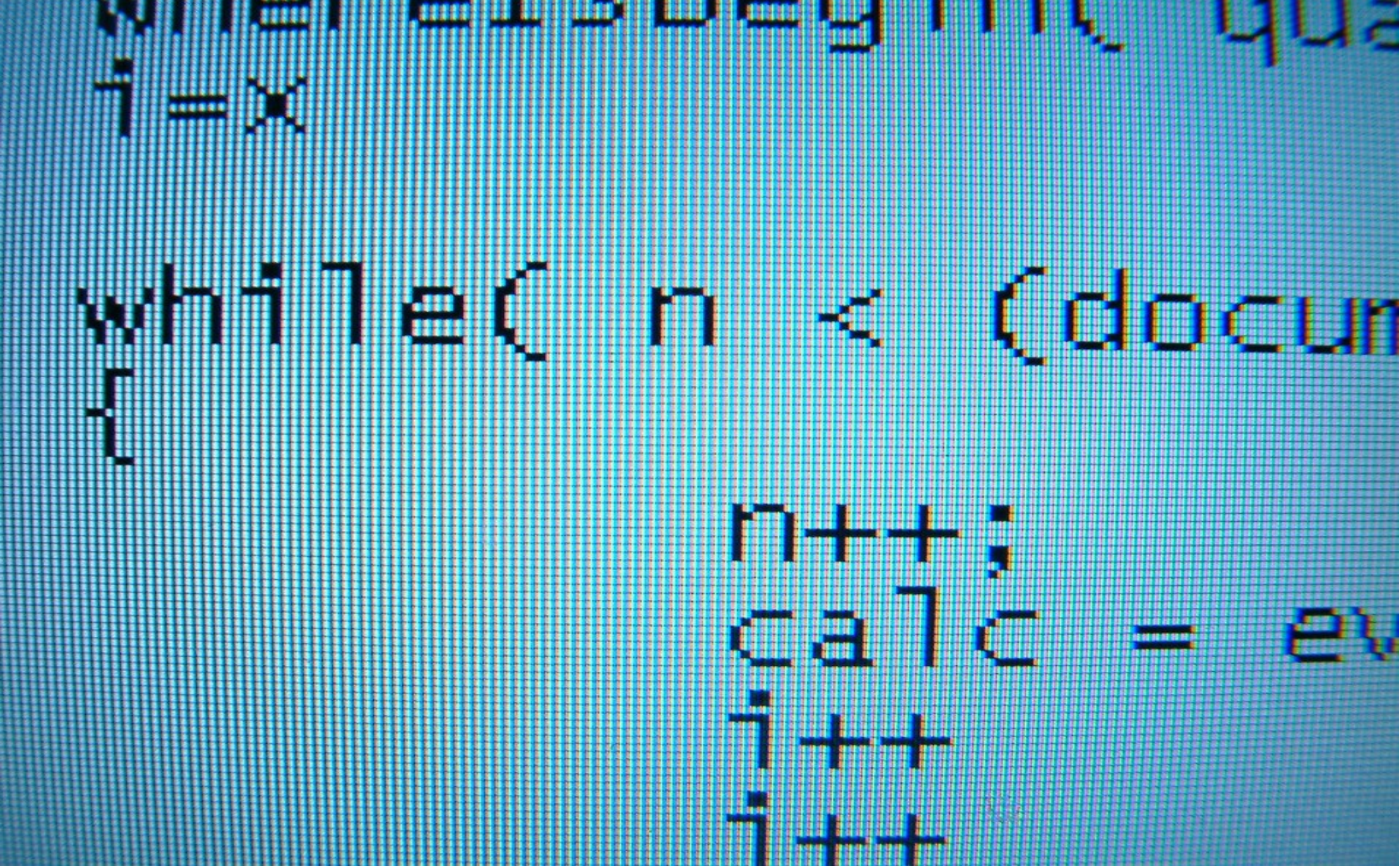
Broad Network Access

Resource Pooling

Rapid Elasticity

Measured Service

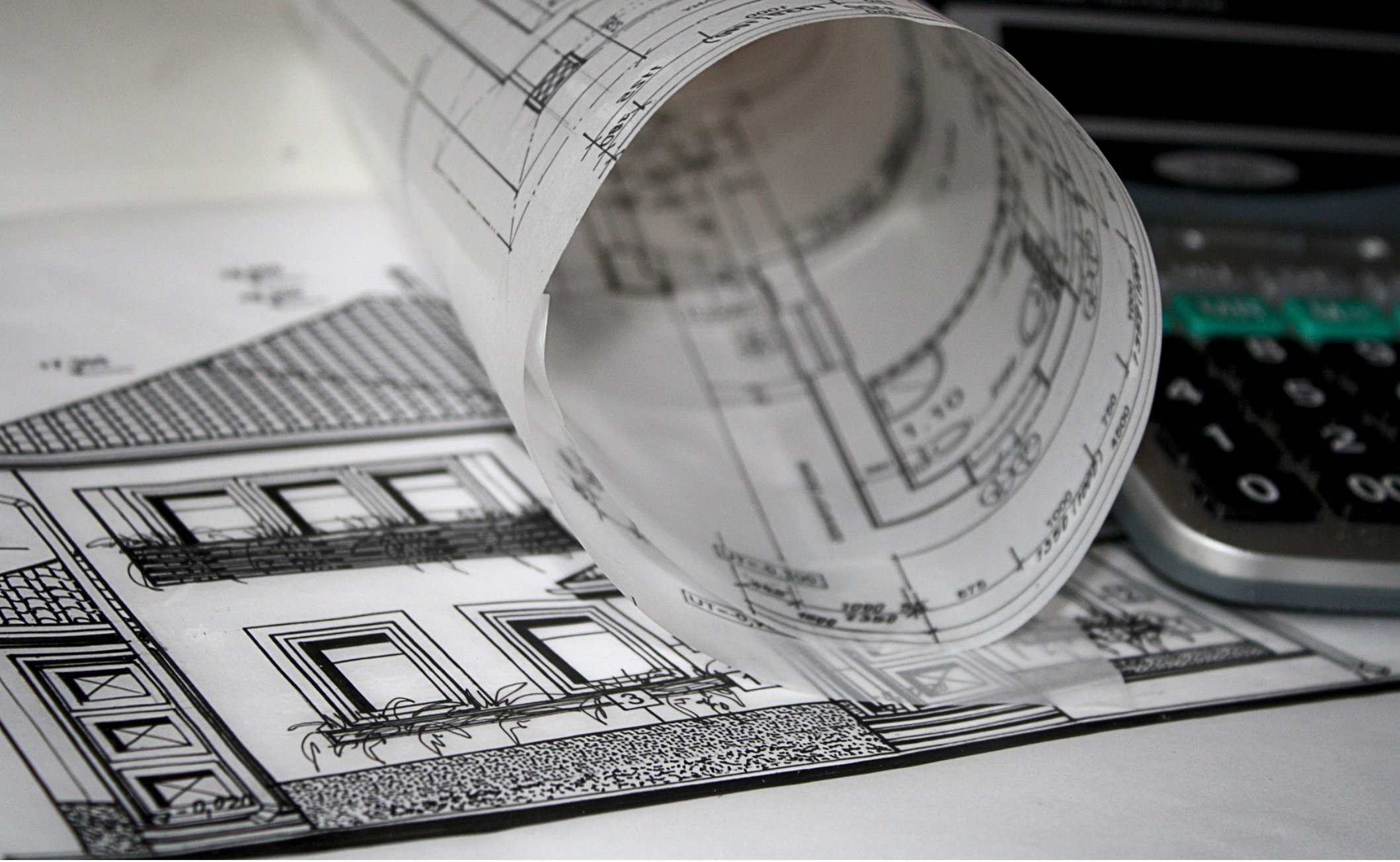
Service Models



SaaS

PaaS

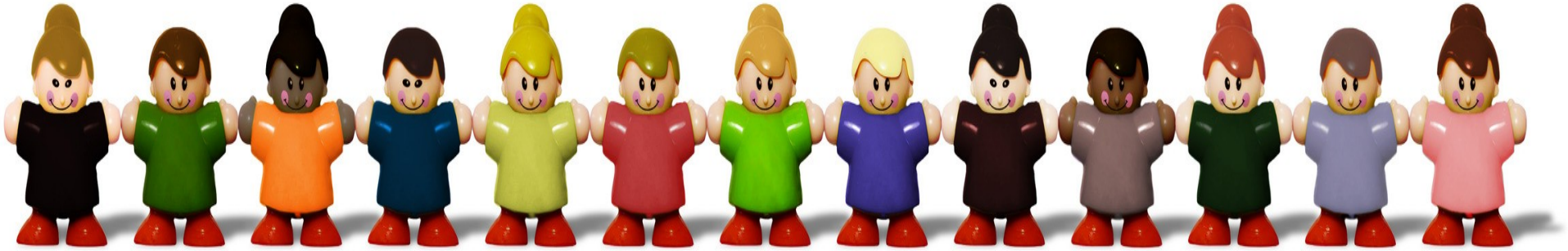
IaaS



Deployment Models

Private Cloud

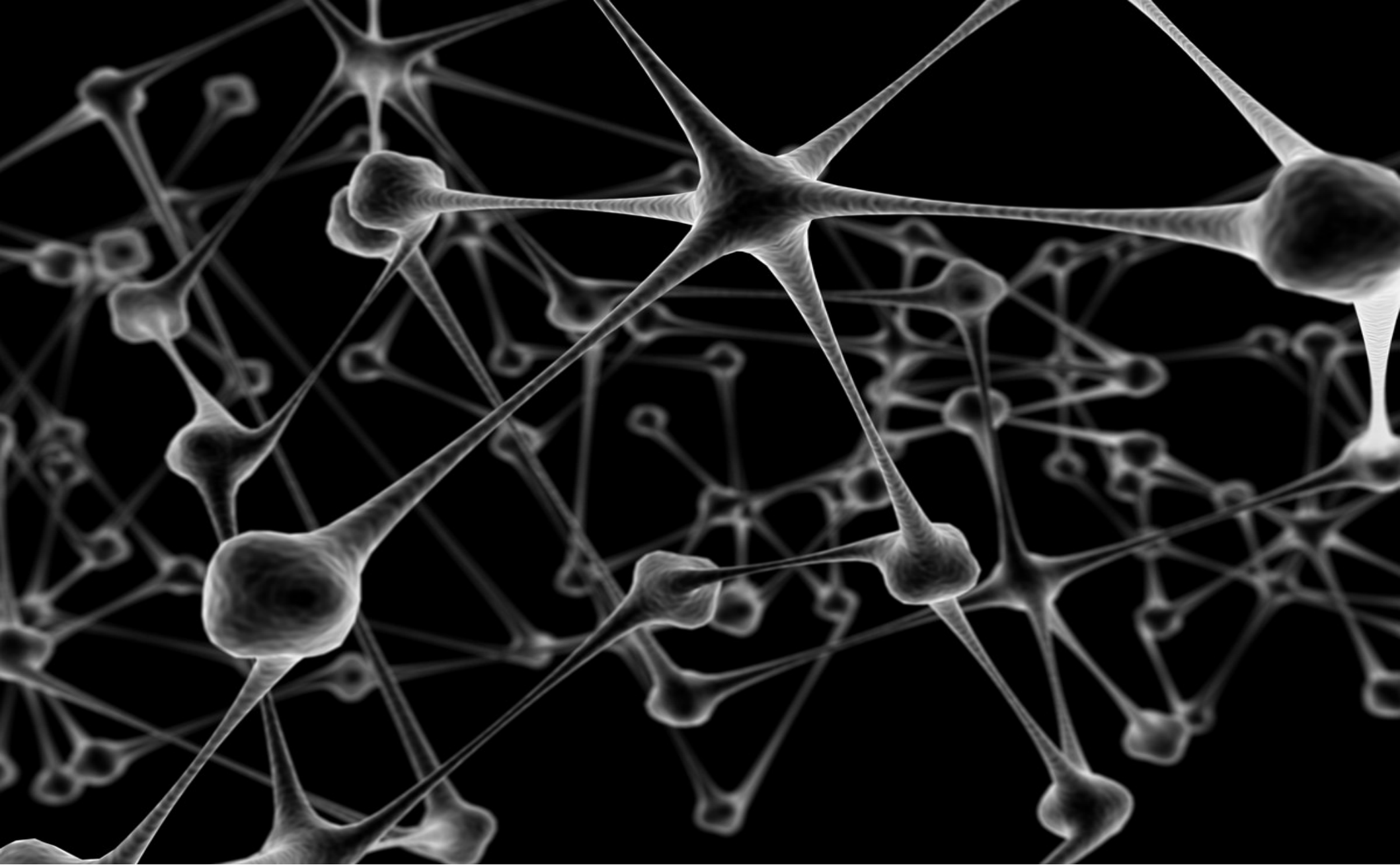
Public Cloud



Community Cloud

Hybrid Cloud

Building Blocks



Virtualization

Service Management

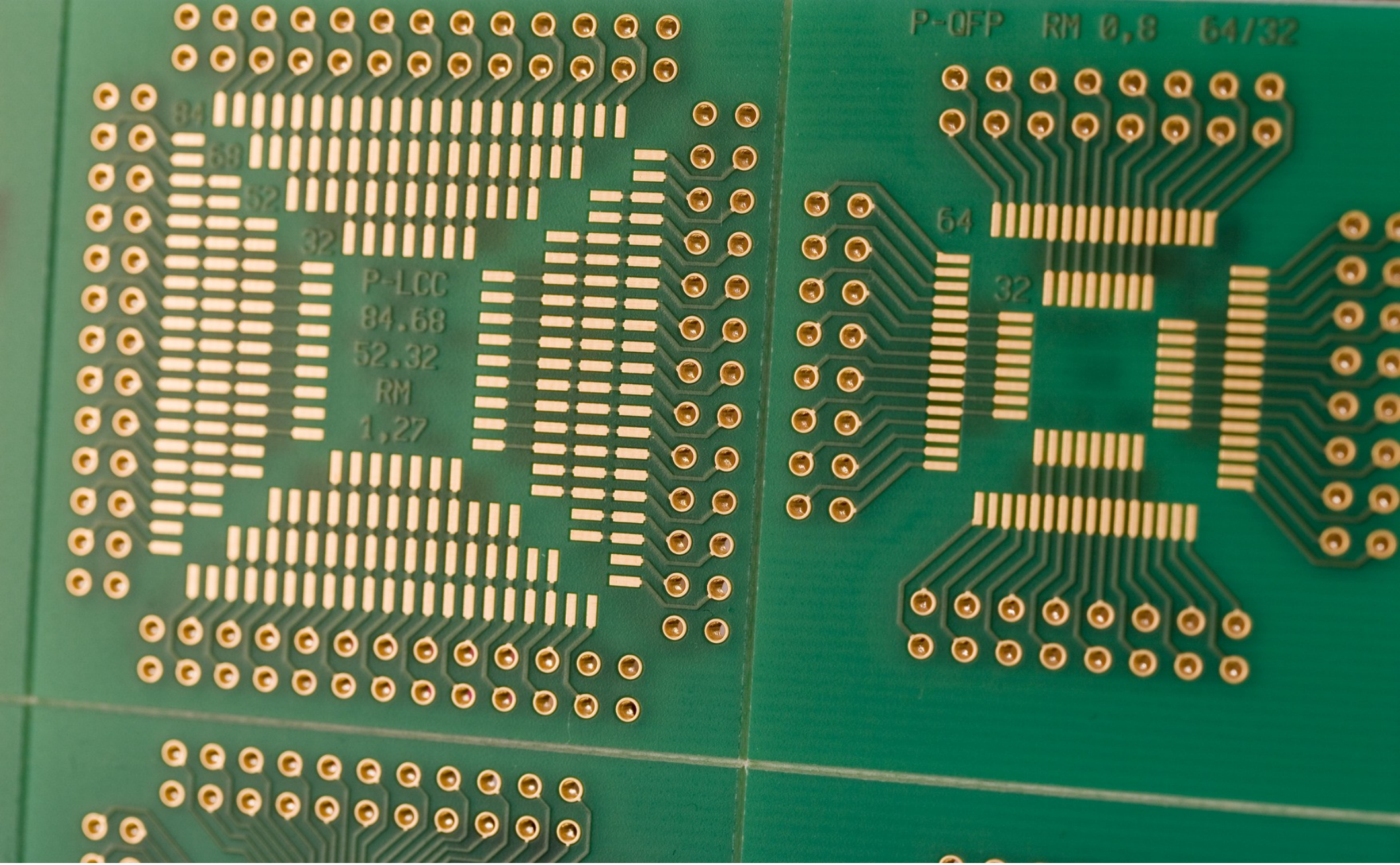
Web 2.0

How is it different ?

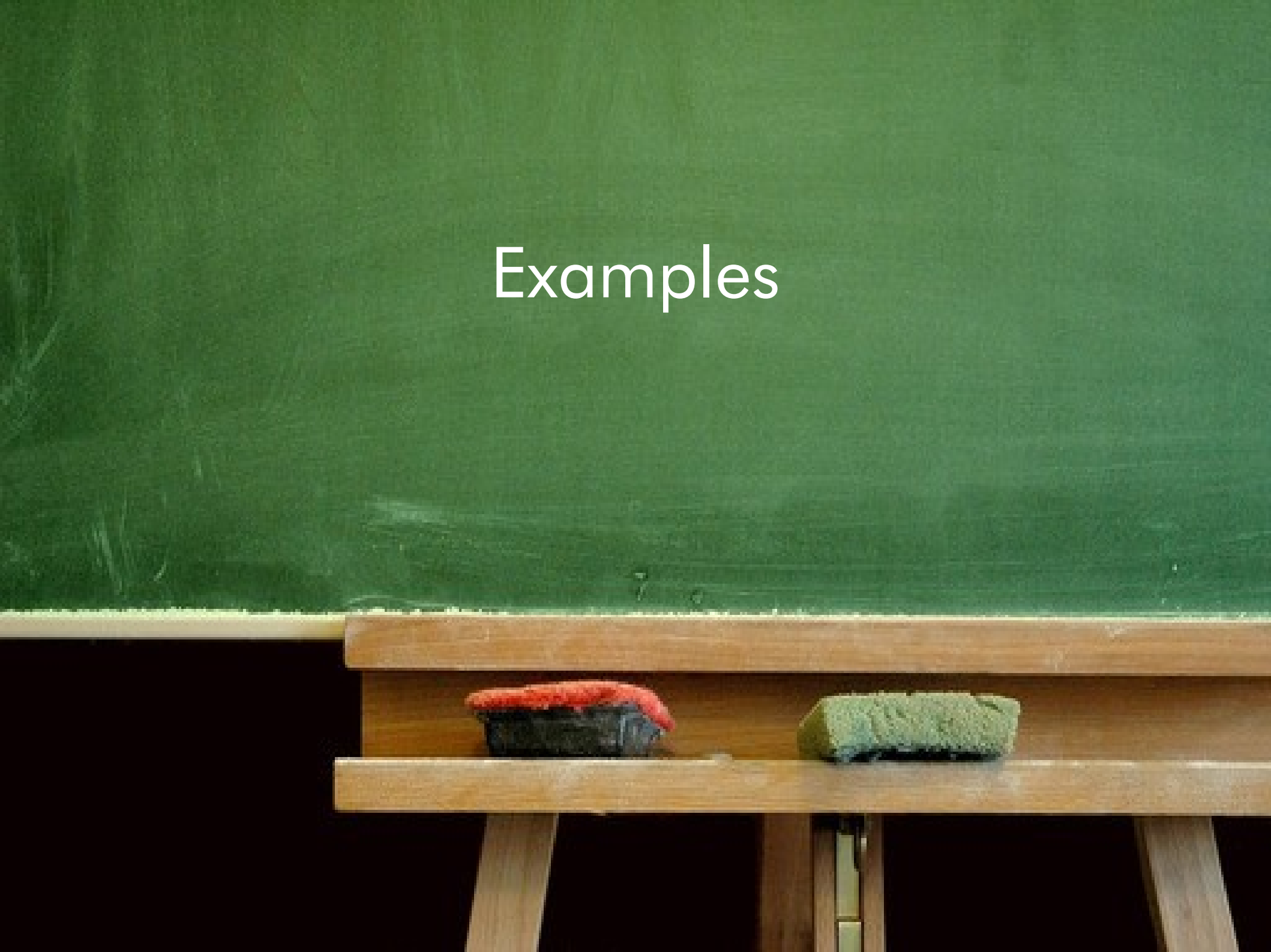
Delivery Model

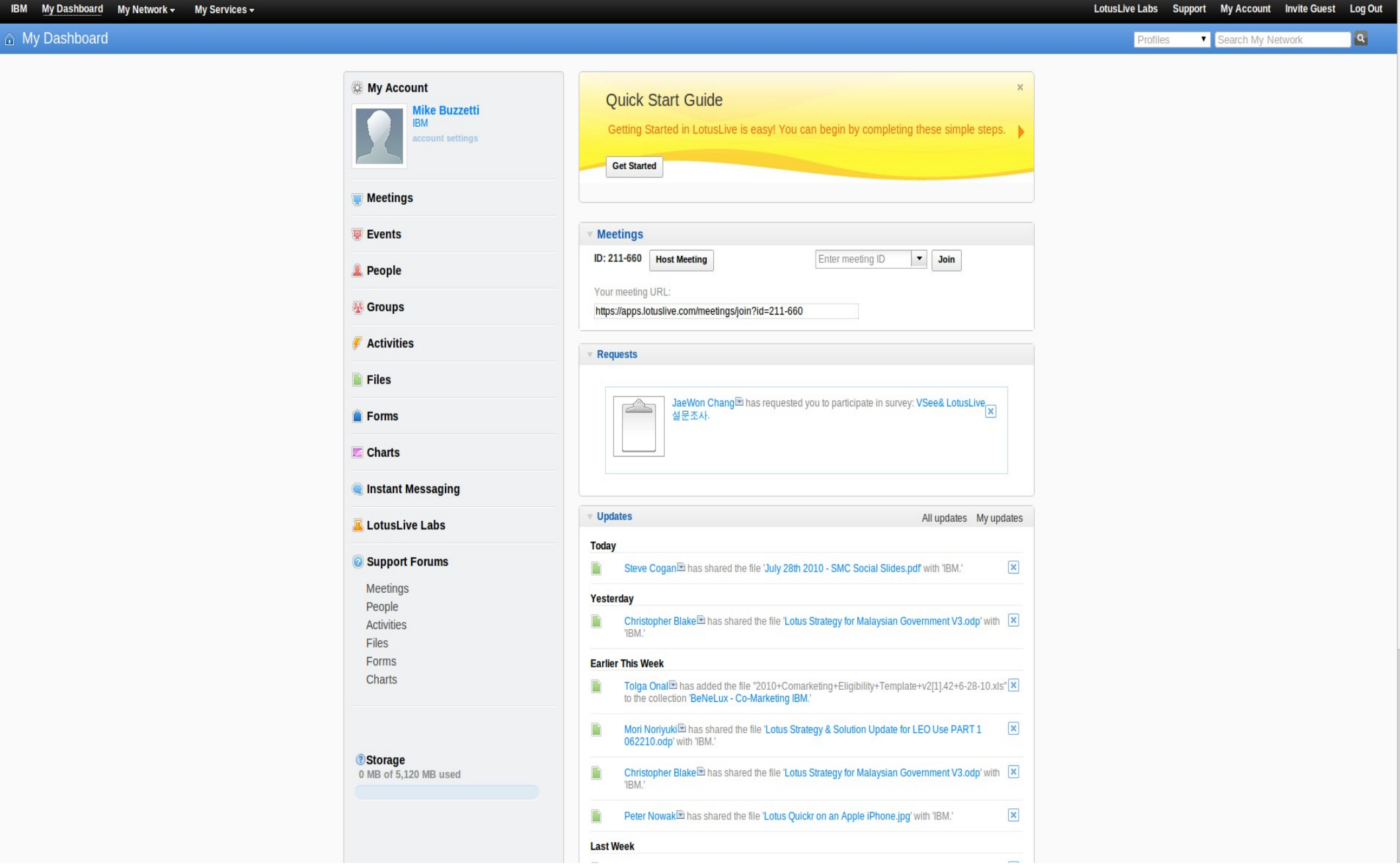
Interface Model

Business Model



Technical Model


Examples


IBM
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Invite Guest
Log Out
My Dashboard
Profiles
Search My Network
My Account
Mike Buzzetti
IBM
account settings
Meetings
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Forms
Charts
Instant Messaging
LotusLive Labs
Support Forums
Meetings
People
Activities
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Storage
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Quick Start Guide
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Get Started
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Enter meeting ID
Join
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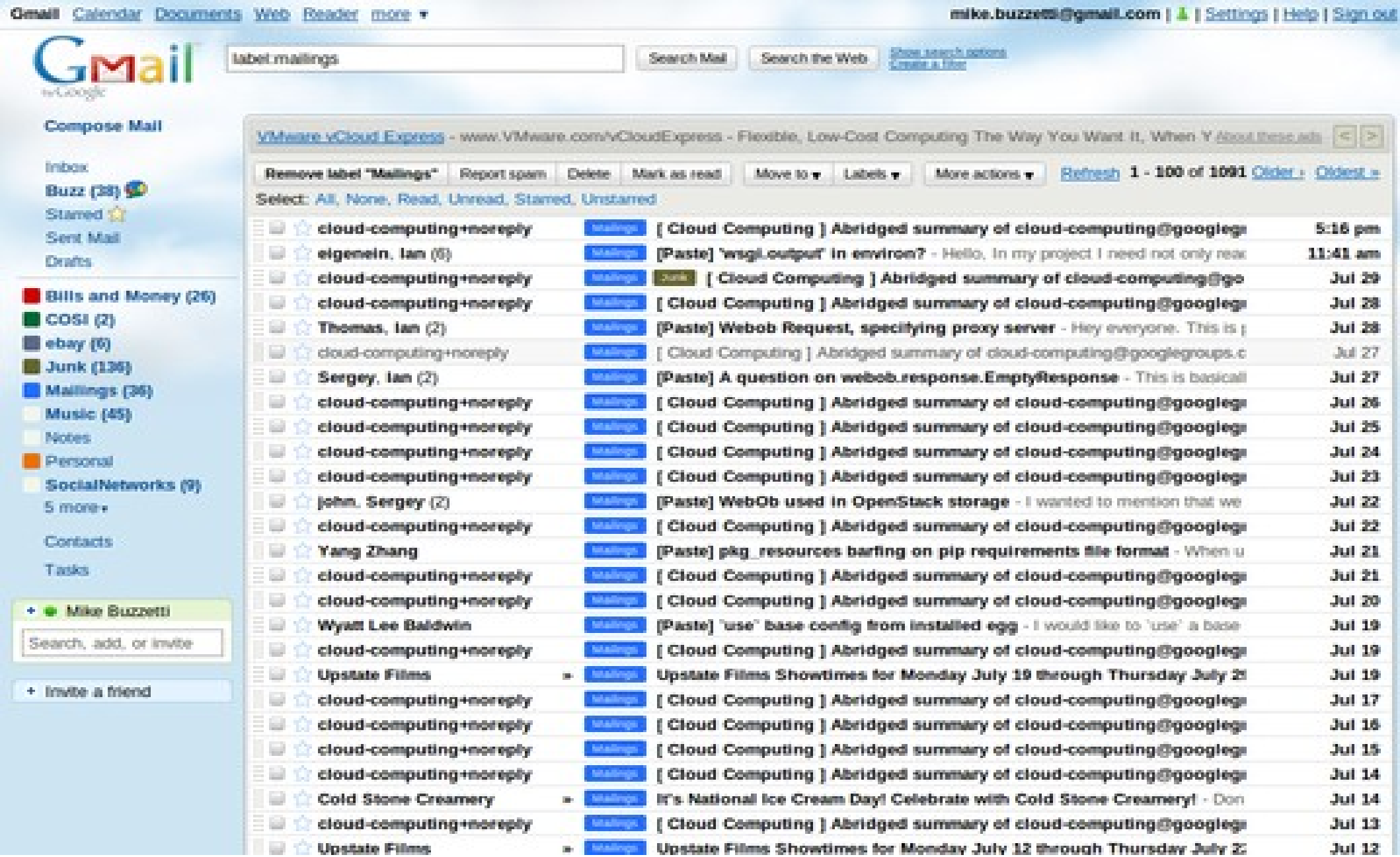
https://apps.lotuslive.com/meetings/join?id=211-660
Requests
JaeWon Chang has requested you to participate in survey: VSee& LotusLive 설문조사.
Updates
All updates
My updates
Today
Steve Cogan has shared the file 'July 28th 2010 - SMC Social Slides.pdf' with 'IBM.'
Yesterday
Christopher Blake has shared the file 'Lotus Strategy for Malaysian Government V3.odp' with 'IBM.'
Earlier This Week
Tolga Onal has added the file "2010+Comarketing+Eligibility+Template+v2[1].42+6-28-10.xls" to the collection 'BeNeLux - Co-Marketing IBM.'
Mori Noriyuki has shared the file 'Lotus Strategy & Solution Update for LEO Use PART 1 062210.odp' with 'IBM.'
Christopher Blake has shared the file 'Lotus Strategy for Malaysian Government V3.odp' with 'IBM.'
Peter Nowak has shared the file 'Lotus Quickr on an Apple iPhone.jpg' with 'IBM.'
Last Week

Lotus Live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mike.buzzetti@gmail.com | Settings | Help | Sign out
Gmail
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Search Mail
Search the Web
Compose Mail
Inbox
Buzz (38)
Starred
Sent Mail
Drafts
Bills and Money (26)
COSI (2)
ebay (6)
Junk (136)
Mailings (36)
Music (45)
Notes
Personal
SocialNetworks (9)
5 more
Contacts
Tasks
Mike Buzzetti
Search, add, or invite
Invite a friend
VMware vCloud Express - www.VMware.com/vCloudExpress - Flexible, Low-Cost Computing The Way You Want It, When Y
Remove label "Mailings"
Report spam
Delete
Mark as read
Move to
Labels
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cloud-computing+noreply [Cloud Computing] Abridged summary of cloud-computing@googlegroups.c Jul 27
Sergey, Ian (2) [Paste] A question on webob.response.EmptyResponse - This is basicall Jul 27
cloud-computing+noreply [Cloud Computing] Abridged summary of cloud-computing@googlegr Jul 26
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Yang Zhang [Paste] pkg_resources barfing on pip requirements file format - When u Jul 21
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Wyatt Lee Baldwin [Paste] "use" base config from installed egg - I would like to "use" a base Jul 19
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Upstate Films Upstate Films Showtimes for Monday July 19 through Thursday July 2 Jul 19
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Cold Stone Creamery It's National Ice Cream Day! Celebrate with Cold Stone Creamery! - Don Jul 14
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Upstate Films Upstate Films Showtimes for Monday July 12 through Thursday July 2 Jul 12

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Systemz Mainframe Guess I'll never be on "Does it blend?" on Thursday
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Events
Write something...
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Filters
Systemz Mainframe RT @ragtag: IBM zEnterprise launch event on YouTube: http://wp.me/pt8DS-9e
11 hours ago via Twitter · Comment · Like · @IBM_System_z on Twitter
3 people like this.
Write a comment...
Systemz Mainframe what does the new z196 give clients? Up to 90% improvement in performance with CICS and DB2 10 #systemz
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Systemz Mainframe are you ready for today? I know I am..
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Daniela Graeser Nasci pronta!
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Write a comment...
View Photos of Systemz (4)
View Videos of Systemz (1)
Send Systemz a Message
Poke Systemz
I do it 99.9999
Information
Current City:
Poughkeepsie, NY
Create an Ad
AT&T Motorola BACKFLIP
Get the all-new Motorola BACKFLIP Android phone exclusively from AT&T and sync to your favorite social networking site.
Like
Operator of the Year
LEROS
point to point
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Amazon Elastic Compute Cloud (Amazon EC2)
Amazon EC2 Details
EC2 Overview
EC2 FAQs
EC2 Pricing
Amazon EC2 SLA
EC2 Instance Types
EC2 Instance Purchasing Options
Reserved Instances
Spot Instances
Windows Instances
Amazon EC2 Features
Elastic Block Store
Amazon CloudWatch
Auto Scaling
Elastic Load Balancing
Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers.
Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction. It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change. Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use. Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios.
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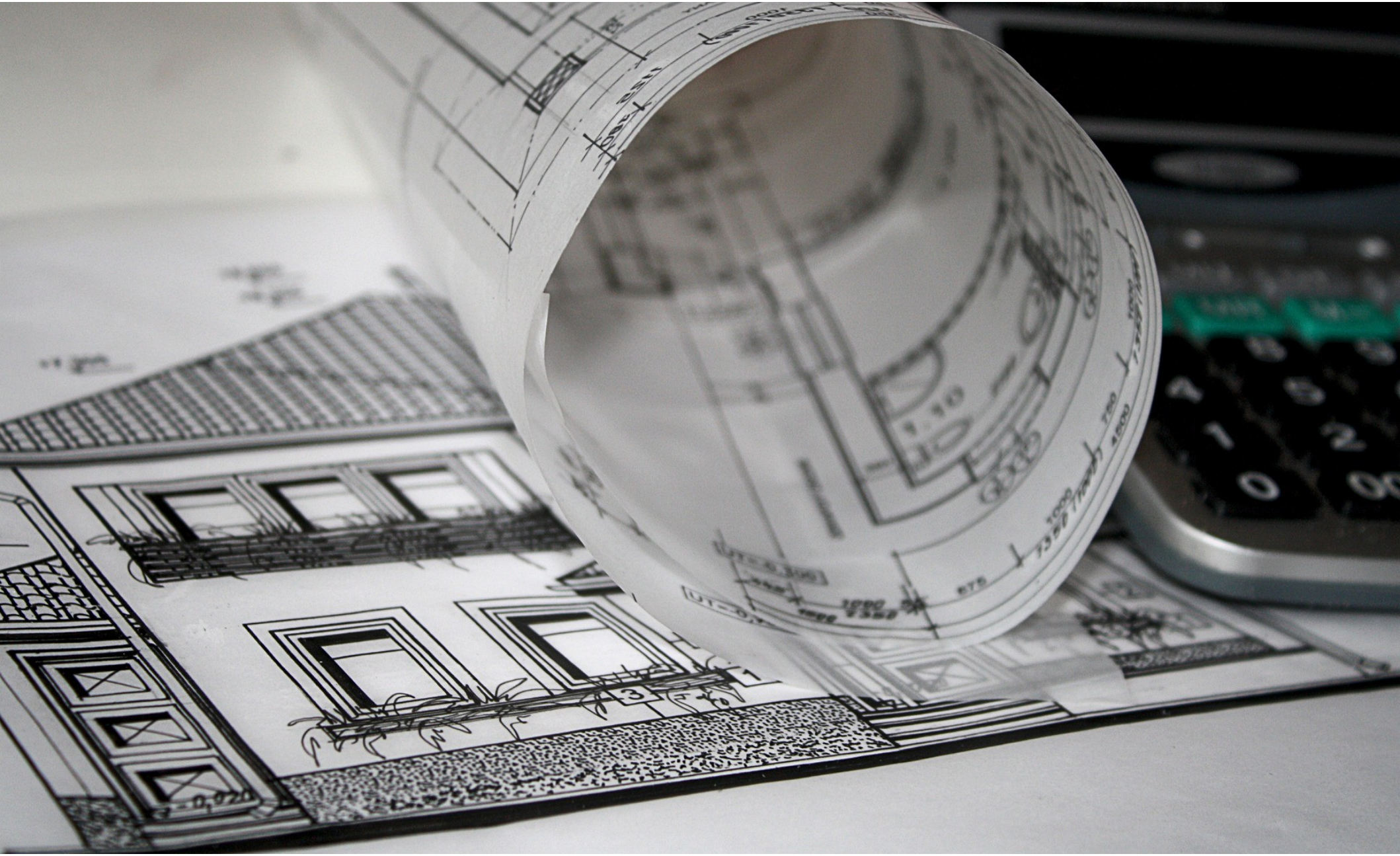
Amazon EC2

Getting Started

Buy or build ?



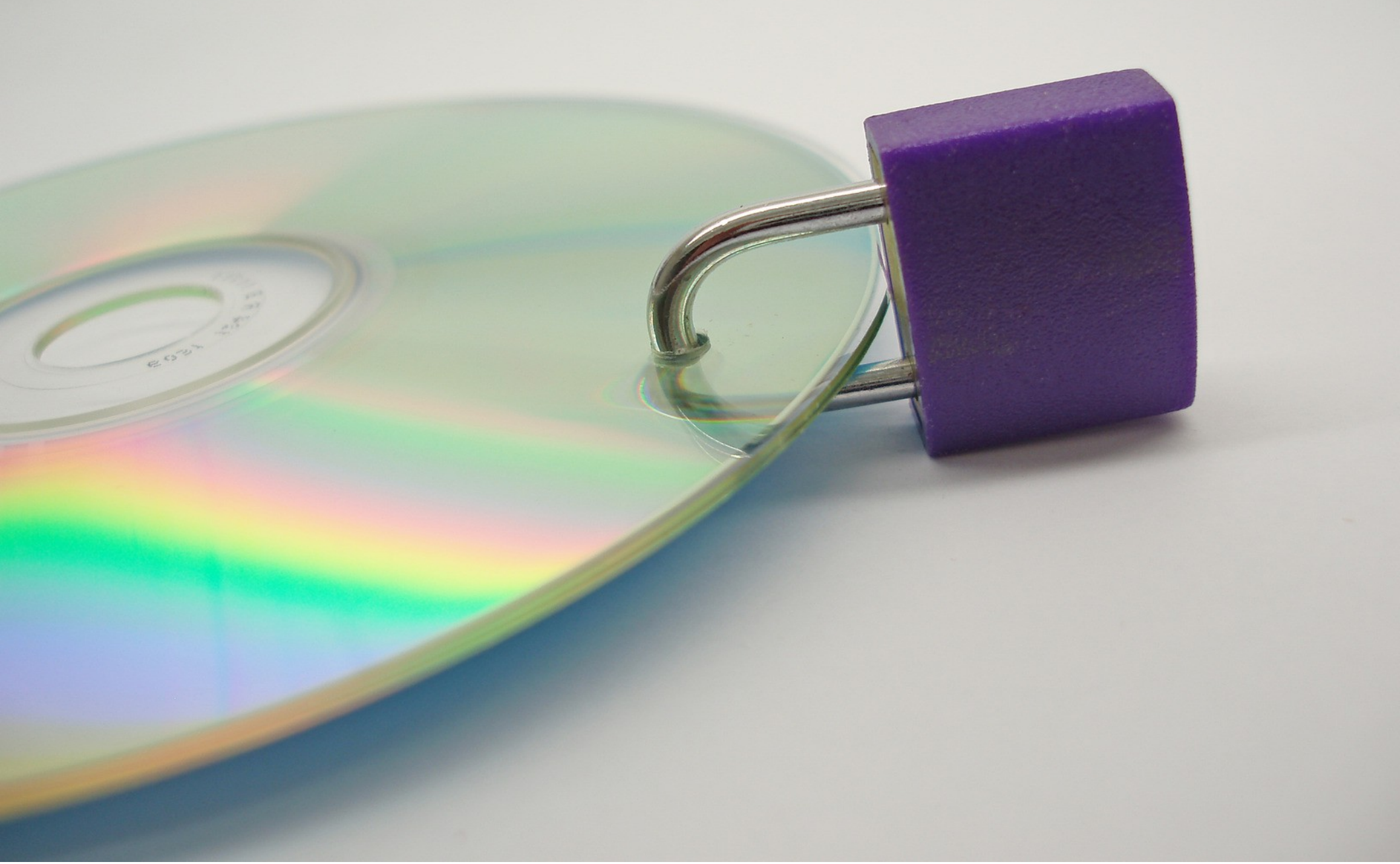
Business Plan

Know your costs

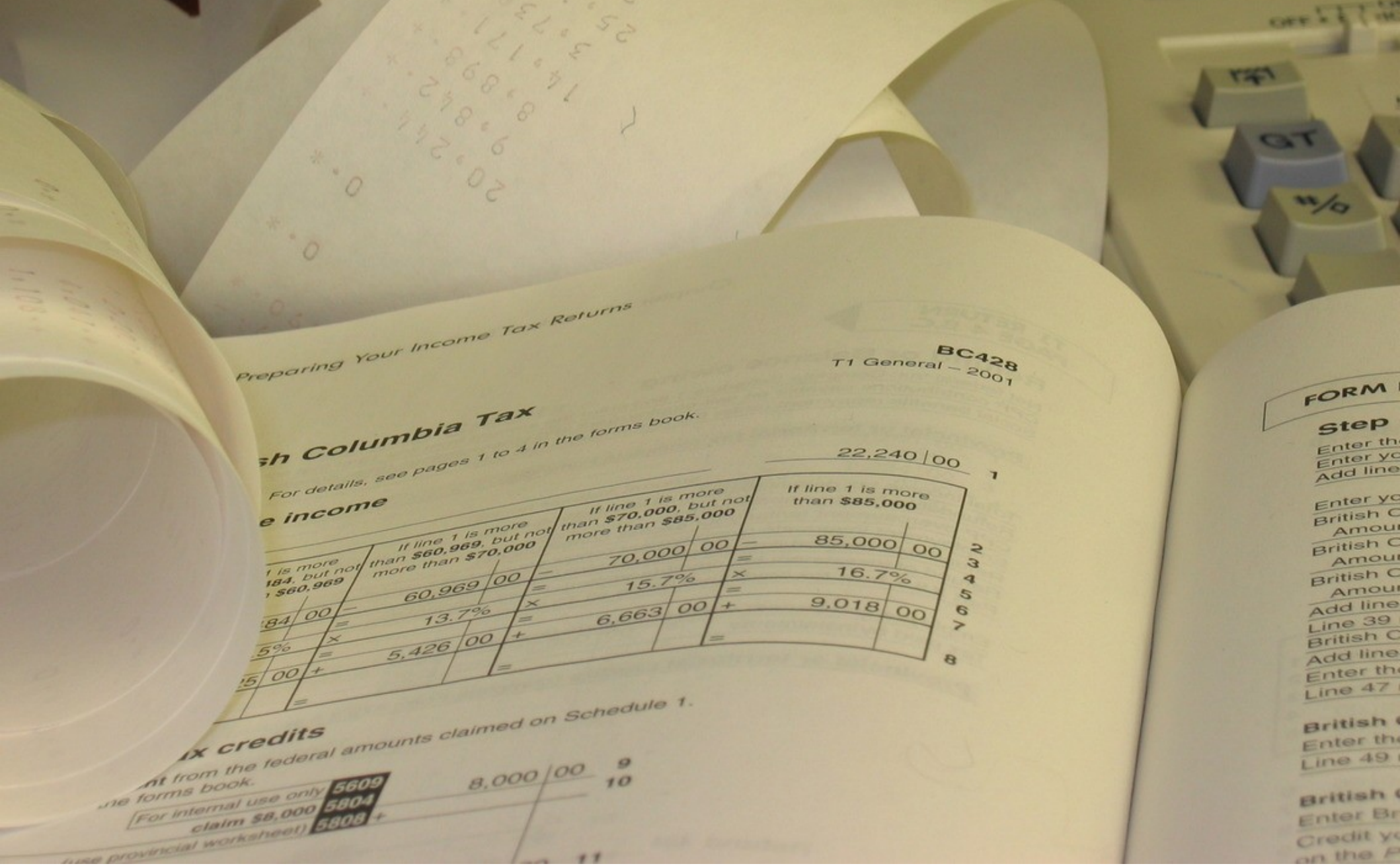
Define Service Catalog

Define your SLA

Barriers to Adoption



Security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5,426 00
6,663 00
9,018 00
ax credits
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Compliance

Reliability

Budgeting

Customization

It's New

It's Magic

My two cents

Backup

Cloud Computing and SaaS

- SaaS is a software application delivery model where a software vendor develops a web-native software application and hosts and operates (either independently or through a third-party) the application for use by its customers over the Internet. Customers do not pay for owning the software itself but rather for using it.
- Software as a Service has been around for a while now and actually precedes the newer term Cloud Computing.
- Delivering software applications is just one capability of cloud computing. Not all SaaS offerings can be classified as cloud enabled. However, if an SaaS offering is written in such a way that it is "massively scalable," then that SaaS offering could be considered a form of cloud computing. (source: Gartner)
  - Many SaaS vendors are now re-positioning their offerings as 'Cloud' offerings in order to participate in the cloud hype...even if their offering is not "massively scalable“
- Cloud Computing is great for the SaaS model as it can further reduce the costs associated with producing and delivering a SaaS application.
- Examples
  - GMail
  - Salesforce.

Platform as a Service

- Definition: includes all the systems and environments comprising the end-to-end life cycle of developing, testing, deploying and hosting web applications delivered as a service over the Internet.

- Examples include:
  - Mosso, PHP, .NET, Java, Rails, Python, other?
  - Google App Engine, Python
  - SalesForce – Proprietary
  - Morph - Ruby on Rails
  - Heroku - Ruby on Rails
- Benefits: Quickly launch new applications for a relatively low cost. Other benefits include limited scalability and reduced cost of operations (e.g no system administrators needed).
- Disadvantages can include porting development time costs for existing applications as not all applications come straight over.
- Billing for these services varies. It can be by the hour, request, CPU cycle, or other creative ways. Some even help you do pass through billing for your customers; like Mosso. But, the defining factor in pricing of Application Platform Clouds is that they generally strive to be robust, simple, and easy to load your application into when you are ready.

Infrastructure as a Service

- Definition: IaaS is a pay-for-what-you-need-when-you-need-it information technology delivery and service model. It is a technology service delivered over the Internet that provisions the resources such as servers, connections, storage, and related tools necessary to build an application environment from scratch on-demand. A common characteristic is a high degree of flexibility in what resources are provisioned.
- Examples of IaaS providers:
  - Amazon Web Services - Extremely flexible Build your own w/ many add-ons
  - VMWare - Build your own
  - Elastra - Up an comer build and manage your own IaaS
  - Tera - Sexy GUI based IaaS/PaaS building tools
  - Xen - Build your own
  - XCalibre - Very interesting and can do Linux or Windows
  - Nirvanix - All about cloud storage, very interesting subset similar to Amazon S3
  - EngineYard - Rails only Build your own
  - Joyent - Build your own on Solaris w/ Java/PHP/Rails/Python
- Benefit: Rapid provisioning of computing resources All the details of provisioning, racking, stacking, cabling, and more are completely abstracted away from you.
- Disadvantage: Difficult to move from one cloud to another in some cases.
- Billing for these services is usually incremental by use and can get complex with tiered on-demand pricing that can be difficult to track in real time. Pricing is usually well defined but can be rather difficult to forecast in some cases. It can vary to the minute depending on levels of use, tiers of service, and other interesting combinations.

So What Is Different About Cloud Computing?

	Traditional Computing		Cloud Computing
Delivery Model	Buy assets and build delivery architecture	→	Buy external **service**
Interface Model	Internal network or intranet	→	Via the **Internet** using standard Internet IFaPs (IP, HTML, HTTP)
Business Model	Pay for fixed assets and administrative overhead	→	Pay directly based on **usage** or indirectly (e.g., subsidized by advertising)
Technical Model	Single tenant	→	Scalable, elastic, dynamic, **multi-tenant**

Source: Gartner

What Trends Are Driving The Cloud Computing?

Infrastructure Technologies: Virtualization, Automation, SLAs

Application Technologies: Grid, MapReduce, Hadoop, SOA, Web 2.0

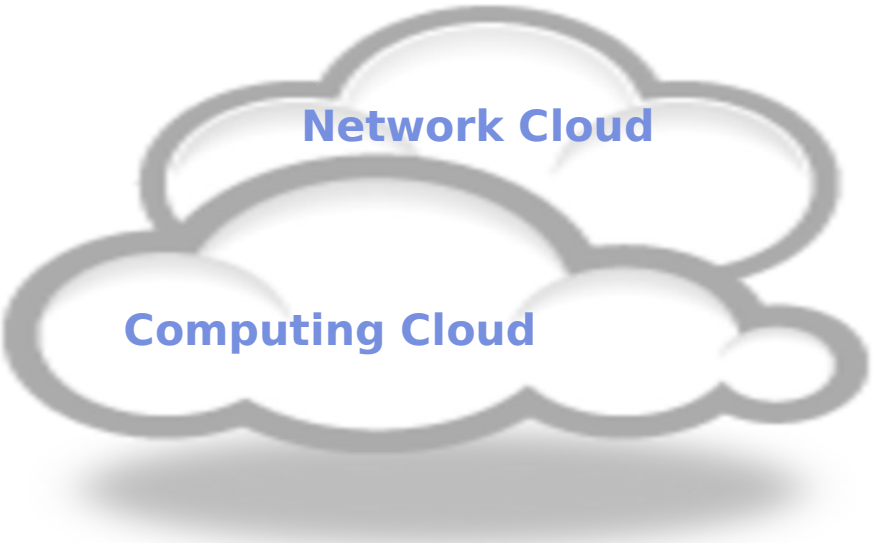
Data Intensive Applications: From massively parallel (e.g. Google) to large data files (e.g. You Tube)

Computing & Network Appliances: Special servers designed to handle specific tasks are blurring the lines between Network and Data Center

Open IT: Open Technologies, APIs, protocols, data formats, software platforms / data (e.g. Creative Commons, Open Data License)

Business Agility: Enter new markets, Deploy new application services. Stay ahead of compeition.

Broadband: Growth in Internet bandwidth enabling ubiquitous connectivity. Increased reliability and functionality embedded in the network.



Utility Computing: Get as much computing power as you need when you need it, pay for only what you use.

Industrialization of IT: Standardization, and commoditization (e.g email). Falling costs of storage.

Mobility: Explosion of form factors, cell phones/connected devices, Proliferation of sensors

New Business Models: Advertising, Services, Subscription

Web Applications and Platforms: Mashable applications and services built on Web Oriented Architecture (e.g. REST, RSS/ATOM)

Data Center Pressures: Growing costs of power and space, server sprawl

Source: Gartner, Thomas Weisel Partners, Merrill Lynch, IBM MI

Barriers To Adoptions

- **Security & Privacy** – Many companies and governments are uncomfortable with the idea of their information be located on systems that they do not control. Authentication and access right technologies will become increasingly important.
- **Compliance Issues** – Complying with Sarbanes-Oxley, HIPPA and other regulations may prohibit the use of clouds for some applications.
- **Reliability** – High availability will be a key concern. IT departments will worry about a loss of control should outages occur. Thus mission critical applications for large enterprises will probably not be run in the cloud.
- **Cloud Management** - Service Monitoring / Reporting / Management Technologies immature
- **Costs** – Economies of Scale only go so far, unless customer is willing to trade data or advertising views for services
- **Customization May Be Difficult** - Large Enterprises are used to fully customizable environments. Some clouds may not offer that capability.
- **It's Something New** – As with anything new, conservative oriented companies will hesitate to adopt clouds. Issues of security, trust, chargeback, & sharing will limit adoption by these types of companies
- **Organization / Culture** – Clouds have the potential to significantly reduce IT labor costs. IT organizations may be reluctant to encourage their companies to move to the new cloud computing model
- **Budgeting** – Clouds will have a significant impact in how companies budget for and spend money on Information Technology.

Source: Gartner, Forrester, CHQ MI

The Historical "Stack" Will Slowly Evolve To Compute Clouds.

From Historical Stacks to…

Services

Software

Hardware

"As a Service" Offerings handle client needs for specific on demand IT components.

Everything as a Service: Using SOA and SaaS businesses will have an opportunity create more dynamic services that enrich our everyday lives and improve how we do business.

SaaS – Software as a Service: Delivery model where a software vendor develops a web-native software application and hosts and operates (either independently or through a third-party) the application for use by its customers over the Internet.

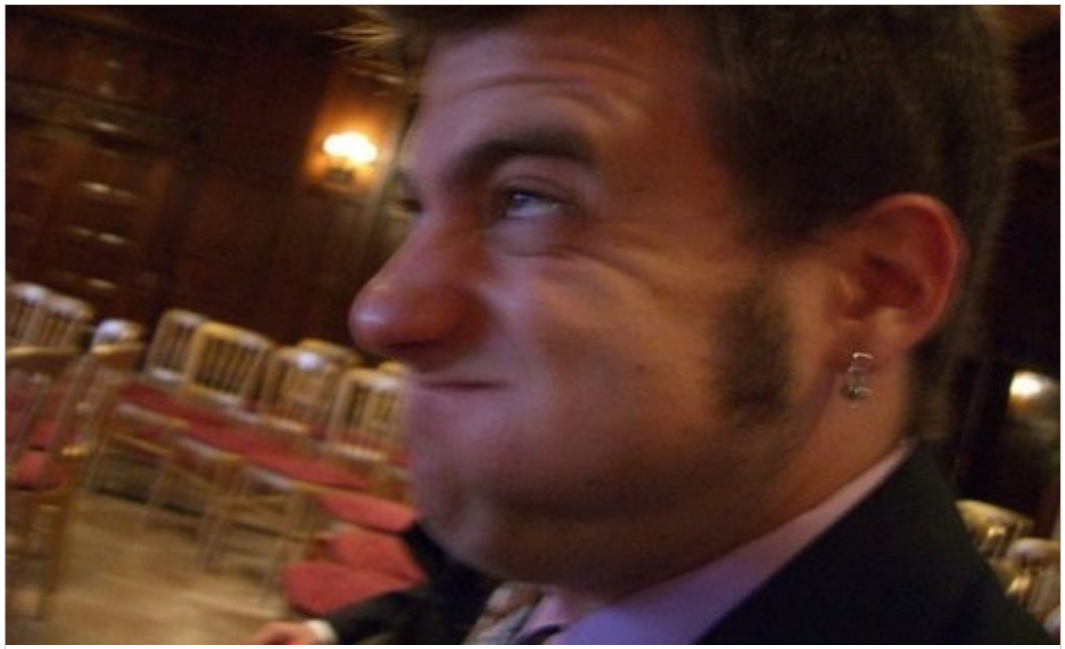
Platform As A Service On demand web-based operating systems and applications, such as SaaS, for 3rd party developers

Hardware as a Service: provides computing capacity and storage delivered online

Storage as A Service: combines a computing interface with online storage over the network as a service

Compute Clouds: provide a high performance infrastructure that delivers simplified services through innovative business models

Introduction to Cloud Computing

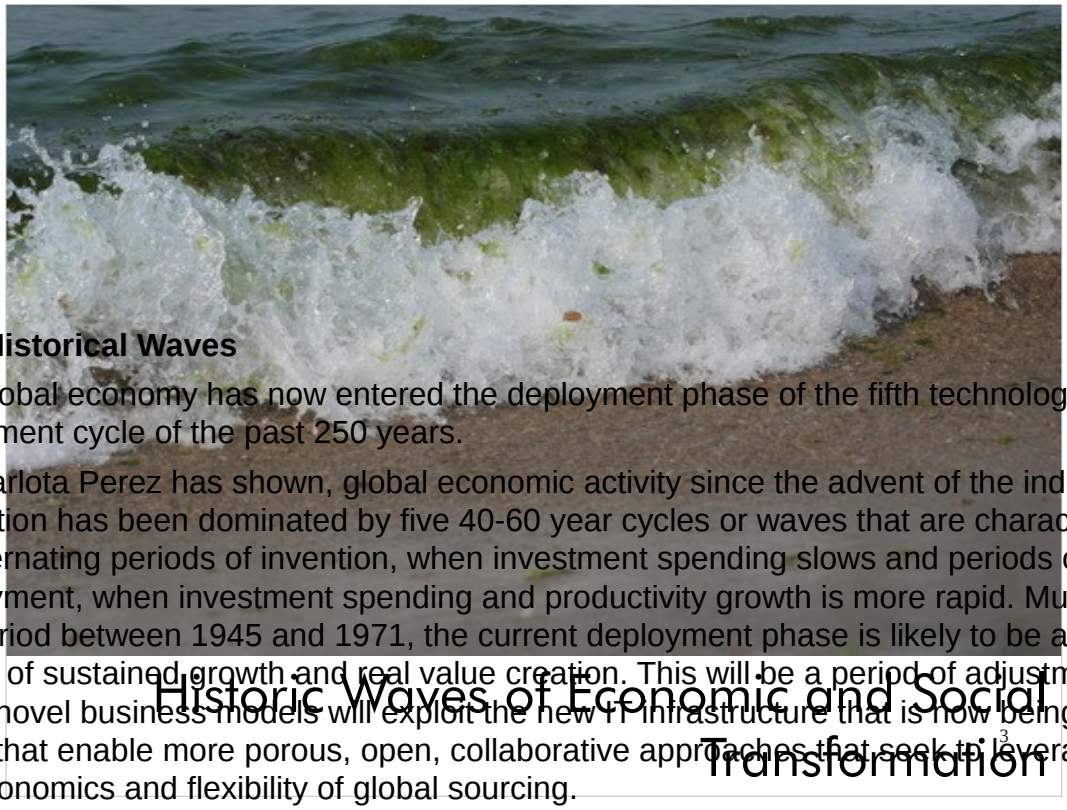


I am here to help
buzzetti@us.ibm.com

This is me. I am here to help. I include this chart so that people can have my email.

The reason I created this presentation is based on the past few years working with customers. Helping them understand that there is a lot of virtualization out there.

Although I might look young, I have been in the IT field for almost 15 years. Virtualization has been a core technology for me for most of it.



Five Historical Waves

The global economy has now entered the deployment phase of the fifth technology investment cycle of the past 250 years.

•As Carlota Perez has shown, global economic activity since the advent of the industrial revolution has been dominated by five 40-60 year cycles or waves that are characterized by alternating periods of invention, when investment spending slows and periods of deployment, when investment spending and productivity growth is more rapid. Much like the period between 1945 and 1971, the current deployment phase is likely to be a long period of sustained growth and real value creation. This will be a period of adjustment when novel business models will exploit the new IT infrastructure that is now being put in place that enable more porous, open, collaborative approaches that seek to leverage the economics and flexibility of global sourcing.

•Enterprises of all sizes will drive a shift toward the application of technology in new and fundamentally transformed business models, processes and operations. An increased need for infrastructure simplification will slow IT spending rates, consolidate key IT sectors, and permit the emergence of new services competitors. However, the shift will create entirely new opportunities to access client spending that will grow rapidly.5 IBM has labeled the new market opportunity Business Performance Transformation Services (BPTS).

•This will be a period of adjustment when novel business models will exploit the new IT infrastructure that is now being put in place that enable more porous, open, collaborative approaches that seek to leverage the economics and flexibility of global sourcing. Enterprises of all sizes will drive a shift toward the application of technology in new and fundamentally transformed business models, processes and operations. This shift will create entirely new opportunities to access client spending that will grow rapidly.

•Transitioning to the deployment phase is not without risk, however. Clients must gain confidence in the profit generating ability of the new approaches. The timing of the decisions to shift spending priorities is uncertain as perceptions of effectiveness will require time. New entrants, with “net native” business designs, free of any legacy transformation burden will challenge incumbents. By 2008, spending on solutions is expected to account for 70% of all IT spend. These solutions are often primarily focused on IT requirements of business decision makers and do not necessarily drive the same fundamental change to client business models, processes and operations as will be apparent over the longer term.

Source: Perez, C., “Technological Revolutions and Financial Capital”, 2002

Industrial Revolution

1771 – 1829
Caused the Panic of 1797

Formation of Mfg. industry
Repeal of Corn Laws opening trade

Age of Steam and Railways

1873 -1892
Caused the panic of 1847

Standards on gauge, time
Catalog sales companies
Economies of scale

Age of Steel and Electricity

1875 – 1920
Cause the Depression of 1893
Urban development
Support for interventionism

Age of Automobiles and Oil

1908 – 1974
Cause the great depresstion
Build-out of Interstate Highways
IMF, World Bank

Age of Communication
& Information

8

1971 – Now
Cause the .com collapse of 2001

The coming period of Institutional Adjustment

This period will be impacted by many significant forces currently at play in the now economy.

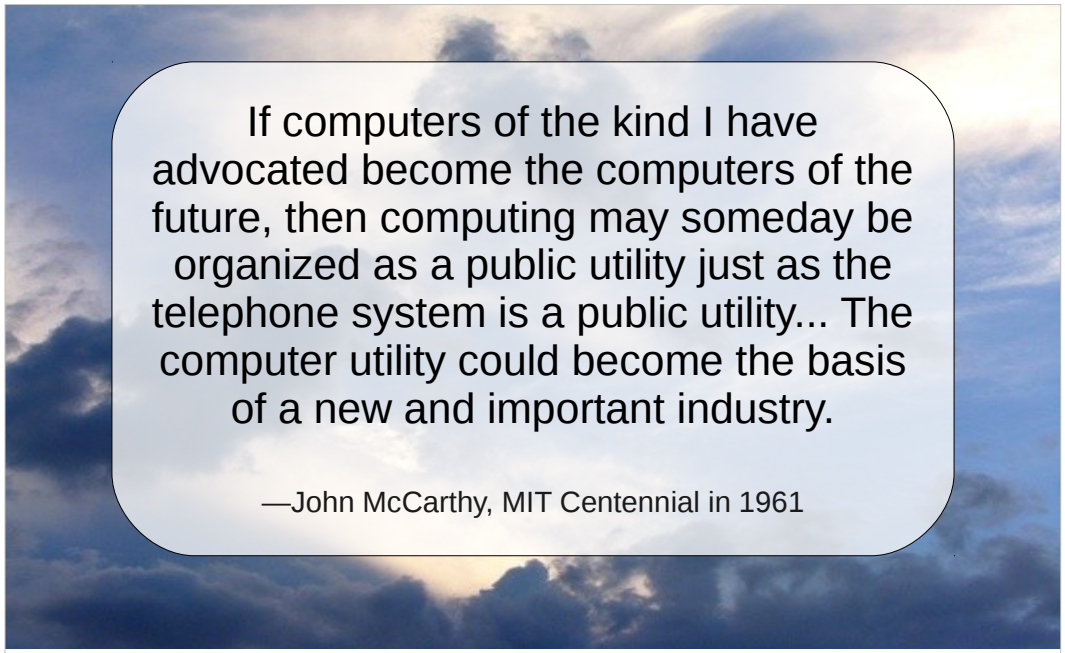
The economy is now truly global, with significant input from across the globe. The available resource pool that businesses can pull from has doubled - a shift that has the potential to have a significant impact on all businesses.

Social and political tension is mounting over these trends. Businesses must acknowledge these tensions and work to address them going forward.

Open standards and modularization provide significant opportunities for businesses of all shapes and sizes, but demand adherence to common standards across countries and industries.

With a new global workforce and evolving modular business models, collaborative tools and organizational models will be more and more important to ensure work gets done in an effective and efficient manner.

Given these trends the individual holds more power than ever. Each person can make choices on where they work, how they work, and what information they choose to access. Enabling, harnessing, and eventually profiting from this power will be key for businesses across the globe.


If computers of the kind I have advocated become the computers of the future, then computing may someday be organized as a public utility just as the telephone system is a public utility... The computer utility could become the basis of a new and important industry.
—John McCarthy, MIT Centennial in 1961

Cloud

Economics

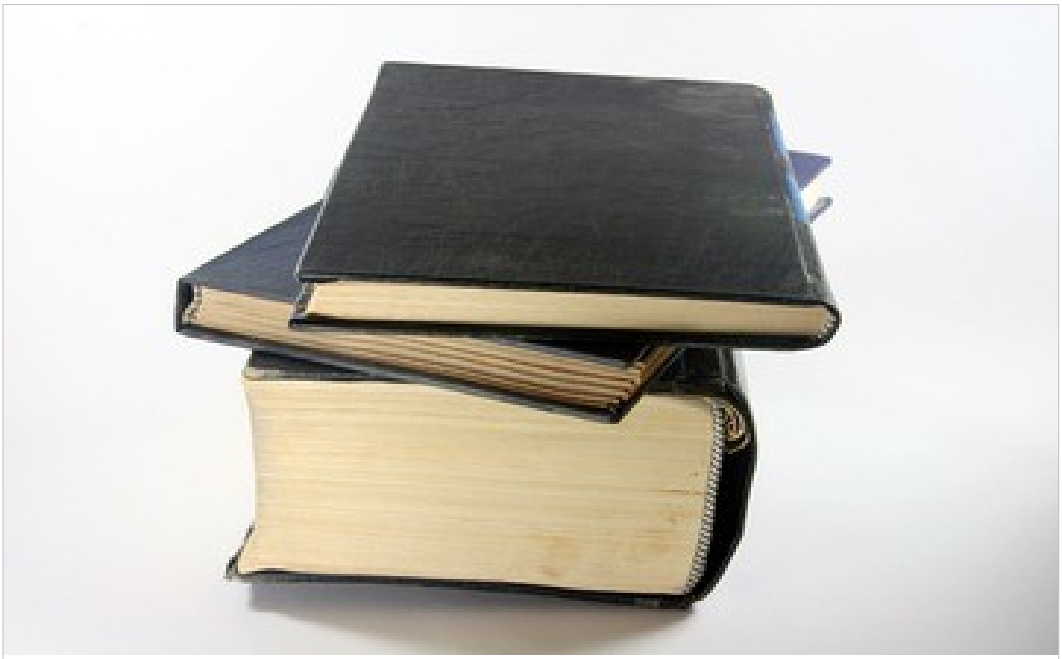
Small up front investment and can be billed by consumption. Reduction of TCO allows clients to pursue operational efficiency and productivity.

Risk Management

Small up front commitment allows clients to try many new services faster and choose. This reduces big failure risks and allows clients to be innovative.

Time to Market

Adopt new services quickly for pilot usages and scale quickly to global scale.

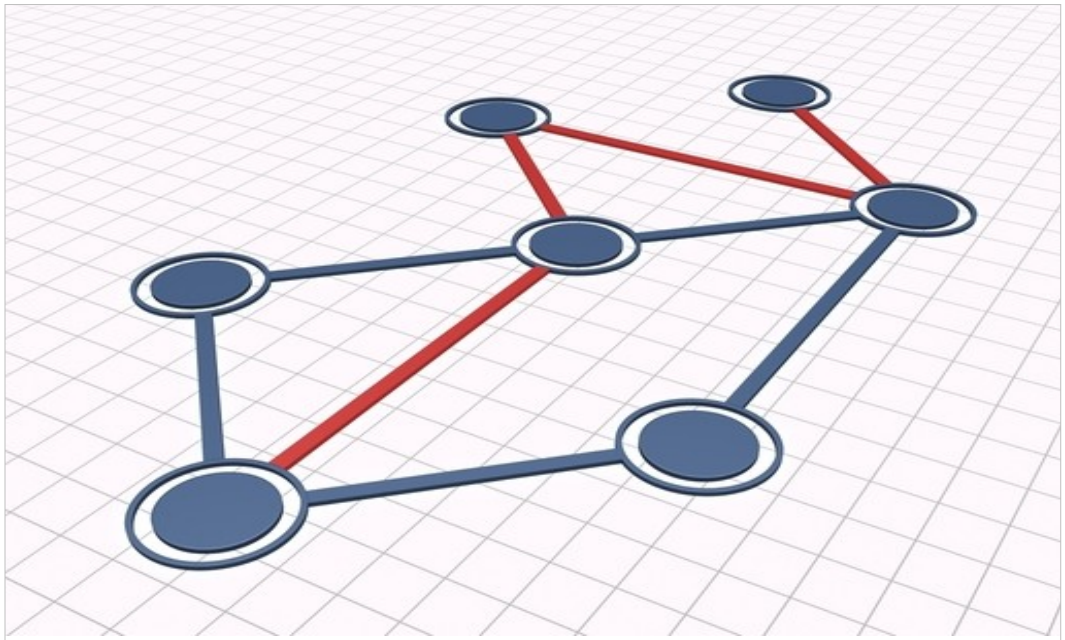


Information Society

Value-added information generated by collection and analysis of massive amounts of unstructured data.

Ubiquitous Society

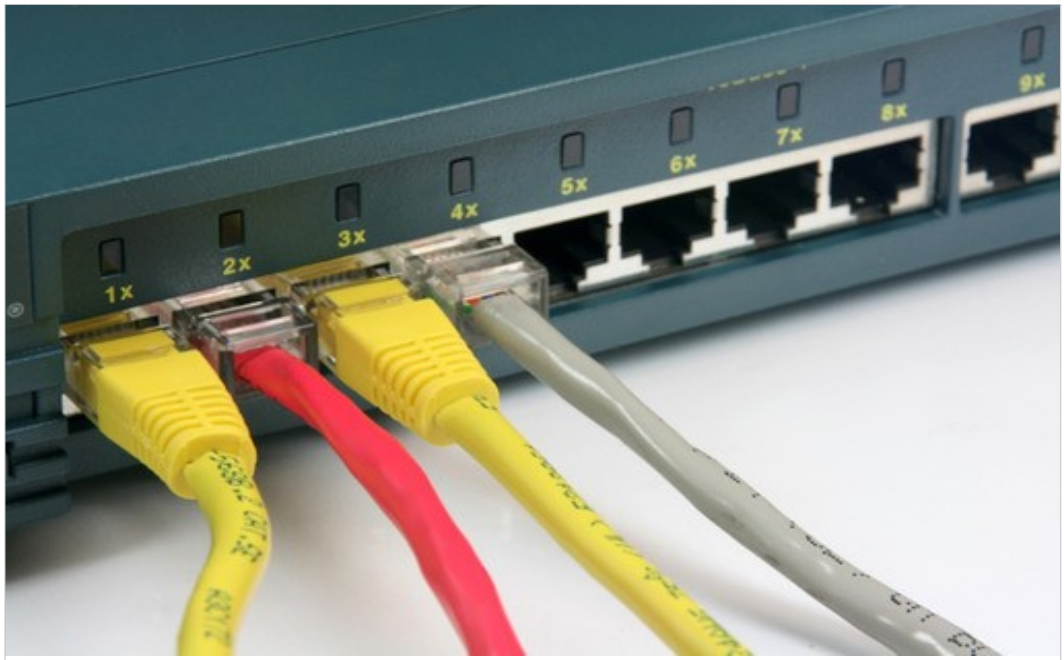
Accessible via a heterogeneous set of devices (PC, phone, telematics..)



Characteristics

Self Service

A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service’s provider.



Broad Network Access

Resource Pooling

The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.

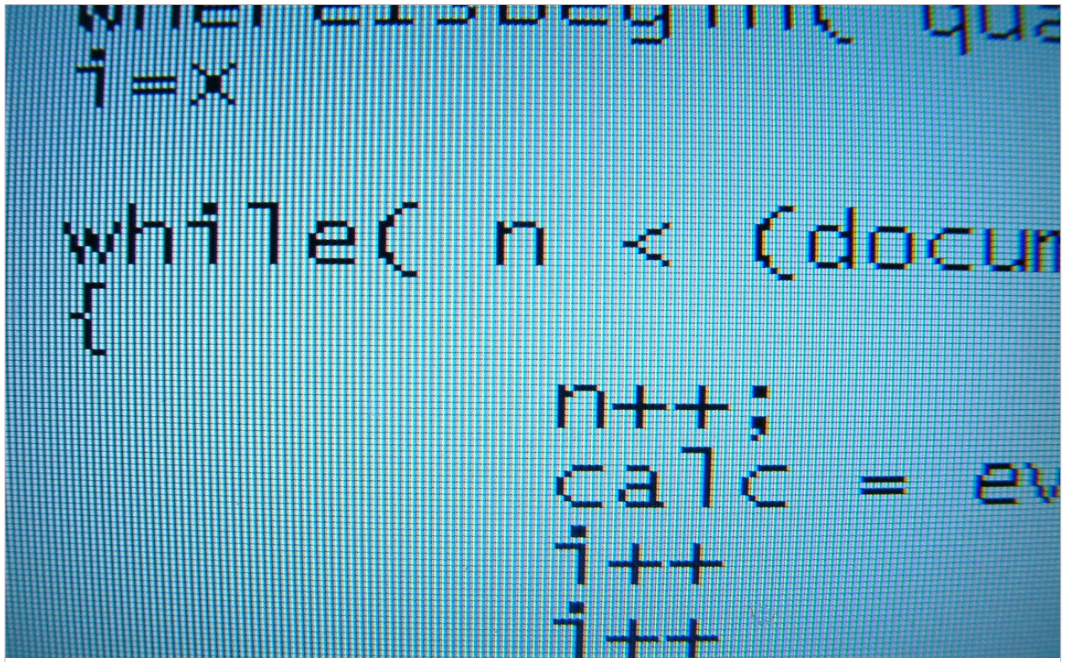
There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter).

Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.

Rapid Elasticity

Measured Service

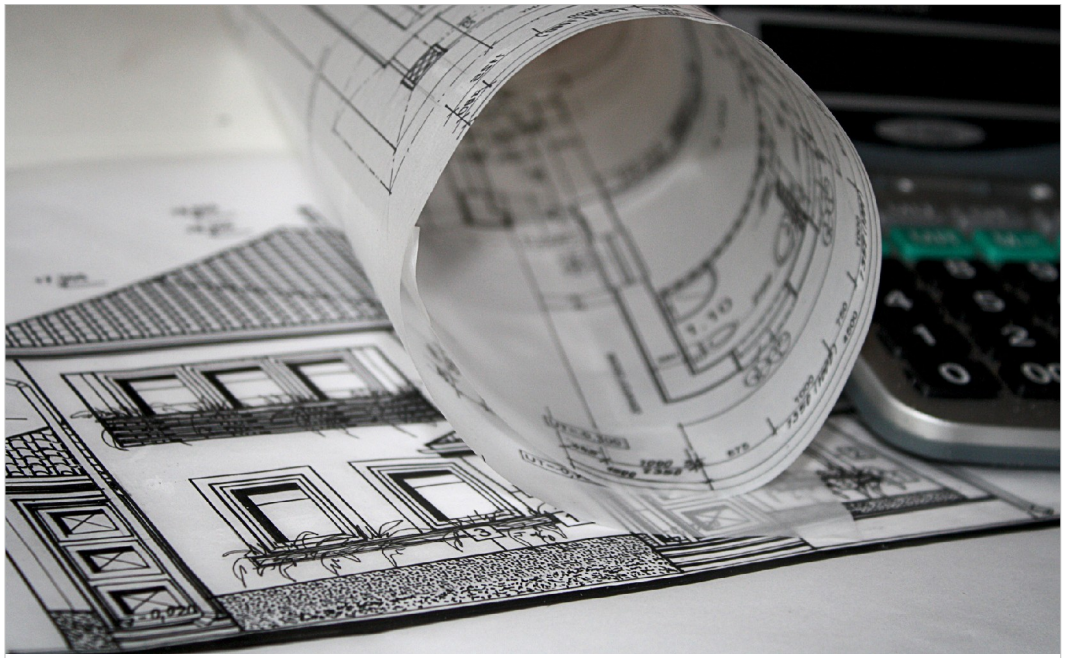
Service Models



SaaS

PaaS

IaaS



Deployment Models

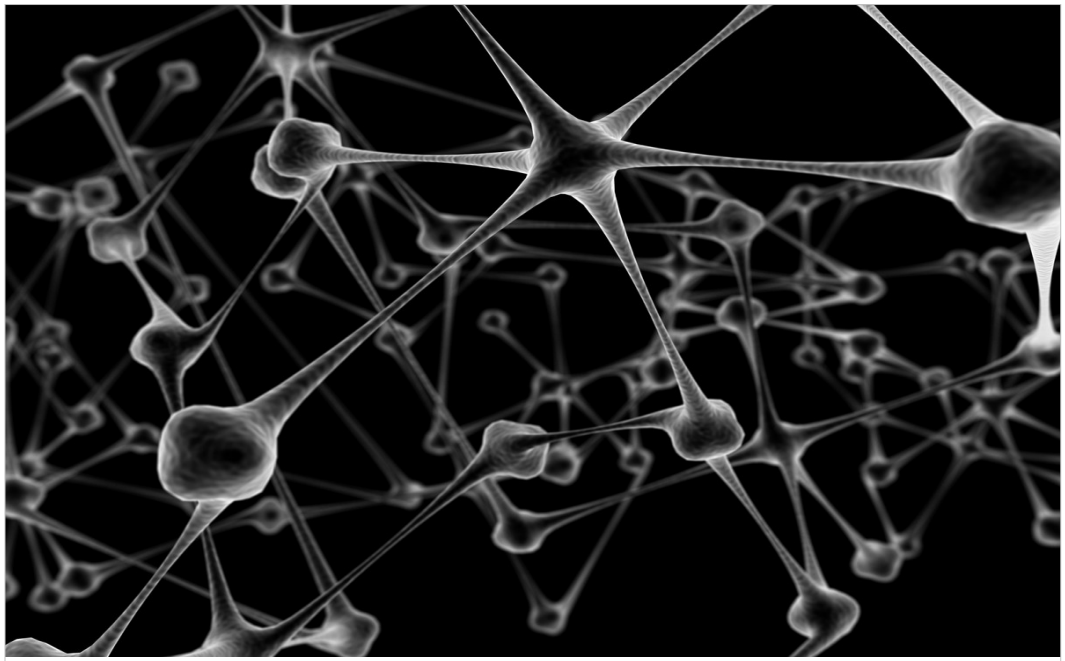
Private Cloud

Public Cloud

Community Cloud

Hybrid Cloud

Building Blocks



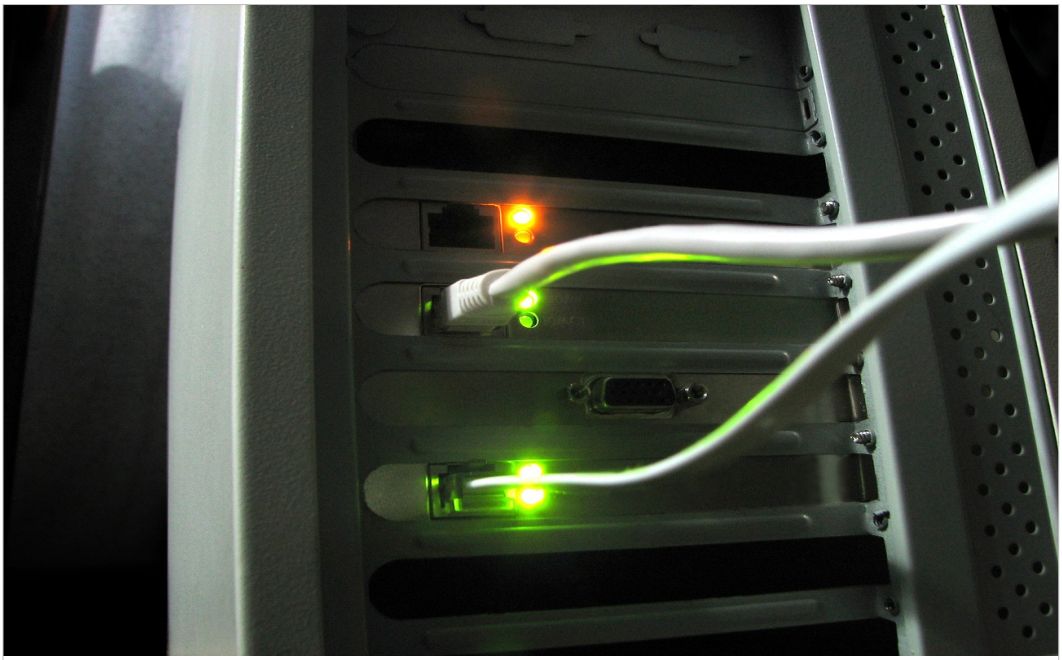
Virtualization

Service Management

Web 2.0

How is it different ?

The next few charts describe how cloud computing differs from how services are delivered today.



Delivery Model

You no longer have to buy assets and build delivery architecture

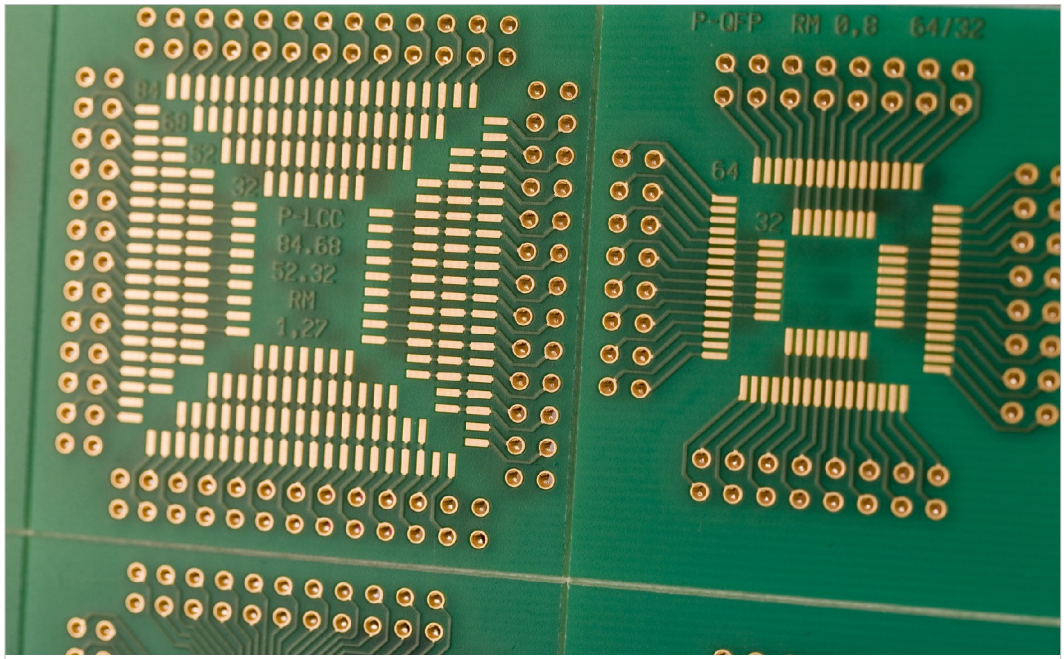
You just buy an external service

Interface Model

Instead of using an internal network and home grown connections, now you can interface using the internet and normal standards like HTML HTTP ReST etc

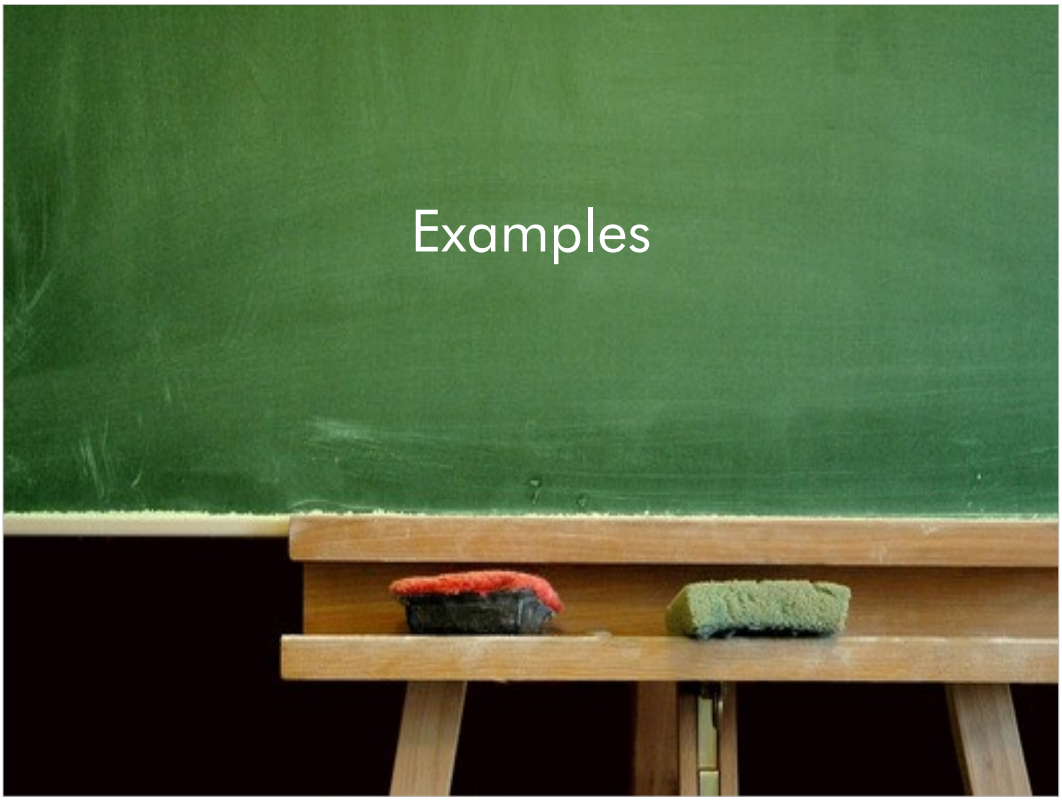
Business Model

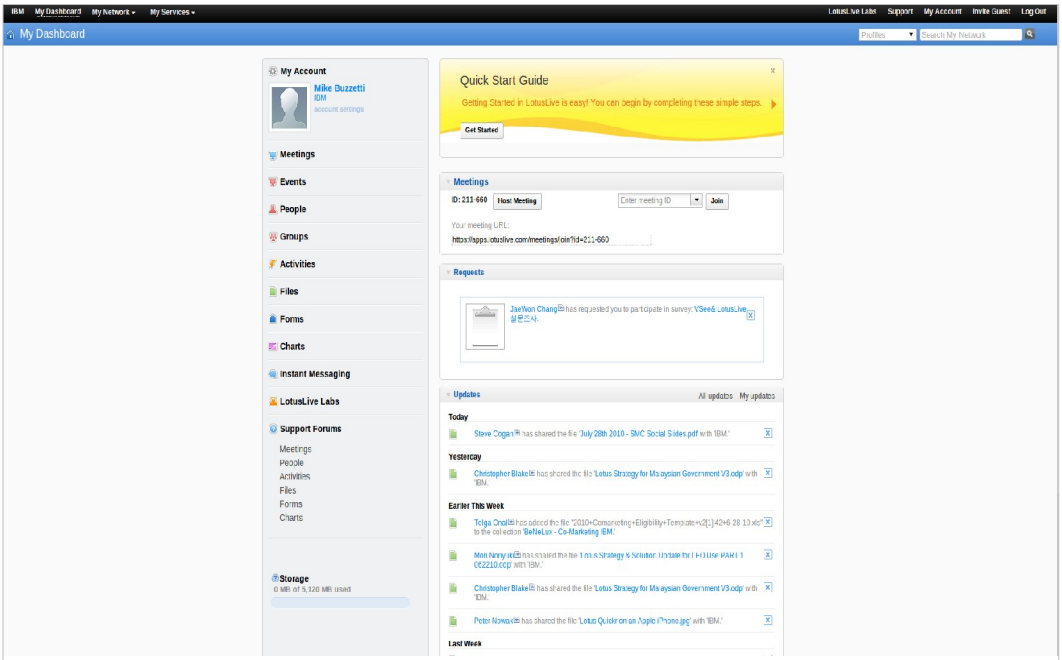
Instead of paying for fixed assets and administration overhead, you pay for usage or some other mechanism



Technical Model

Service can be scalable, elastic, dynamic and mulit tenant


Examples


IBM
My Dashboard
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LotusLive Labs
Support
My Account
Invite Guest
Log Out
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Profiles
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IBM
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LotusLive Labs
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Files
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Storage
0 MB of 5,120 MB used
Quick Start Guide
Getting Started in LotusLive is easy! You can begin by completing these simple steps.
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Meetings
ID: 211 660
Host Meeting
Enter meeting ID
Join
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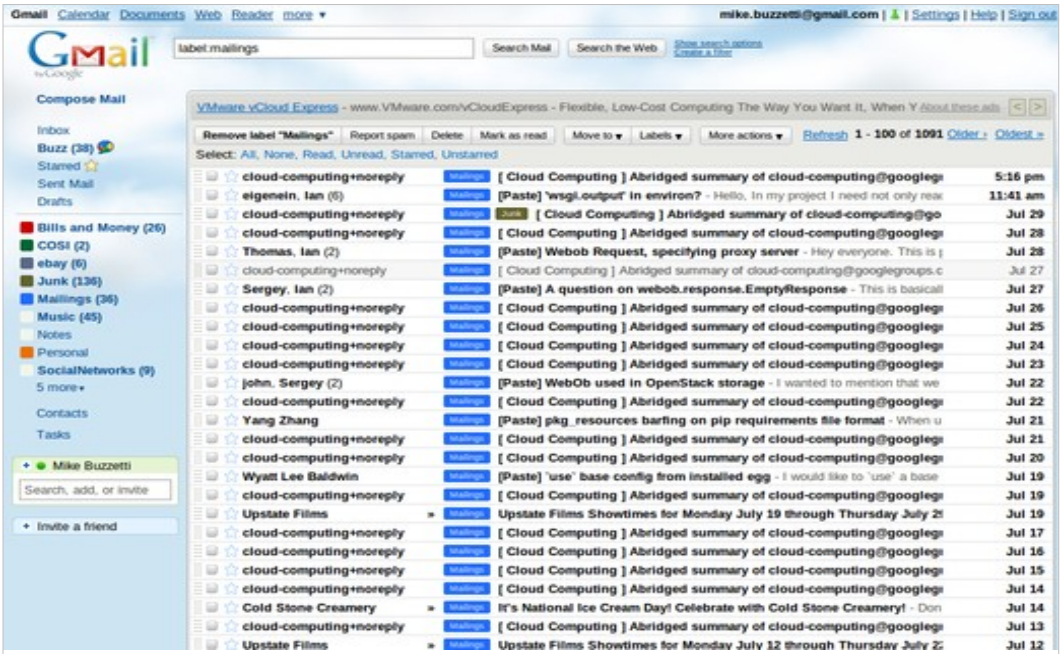
Last Week

Lotus Live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Starred
Sent Mail
Drafts
Bills and Money (26)
COS! (2)
ebay (6)
Junk (136)
Mailings (36)
Music (45)
Notes
Personal
SocialNetworks (9)
5 more
Contacts
Tasks
Mike Buzzetti
Search, add, or invite
Invite a friend
VMware vCloud Express - www.VMware.com/vCloudExpress - Flexible, Low-Cost Computing The Way You Want It, When Y
Remove label "Mailings"
Report spam
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Mark as read
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Wyatt Lee Baldwin [Paste] 'use' base config from installed egg - I would like to 'use' a base Jul 19
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Upstate Films » Upstate Films Showtimes for Monday July 19 through Thursday July 2 Jul 19
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Filters
Systemz Mainframe RT @ragtag: IBM zEnterprise launch event on YouTube: http://wp.me/p1tDS-9e
11 hours ago via Twitter · Comment · Like · @IBM_System_z on Twitter
3 people like this.
Write a comment...
Systemz Mainframe what does the new z196 give clients? Up to 90% improvement in performance with CICS and DB2 10 #systemz
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Systemz Mainframe are you ready for today? I know I am..
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Daniela Graeser Nasci pronta!
7 hours ago · Like
Write a comment...
View Photos of Systemz (4)
View Videos of Systemz (1)
Send Systemz a Message
Poke Systemz
I do it 99.99999
Information
Current City:
Poughkeepsie, NY
Create an Ad
AT&T Motorola BACKFLIP
Get the all-new Motorola BACKFLIP Android phone exclusively from AT&T and sync to your favorite social networking site.
Like
Operator of the Year
LEROS
point to point
Global Ground Transportation Driving People Who Drive Business.
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Amazon Elastic Compute Cloud (Amazon EC2)
Amazon EC2 Details
EC2 Overview
EC2 FAQs
EC2 Pricing
Amazon EC2 SLA
EC2 Instance Types
EC2 Instance Purchasing Options
Reserved Instances
Spot Instances
Windows Instances
Amazon EC2 Features
Elastic Block Store
Amazon CloudWatch
Auto Scaling
Elastic Load Balancing
Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers.
Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction. It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change. Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use. Amazon EC2 provides developers the tools to build failure resilient applications and isolate themselves from common failure scenarios.
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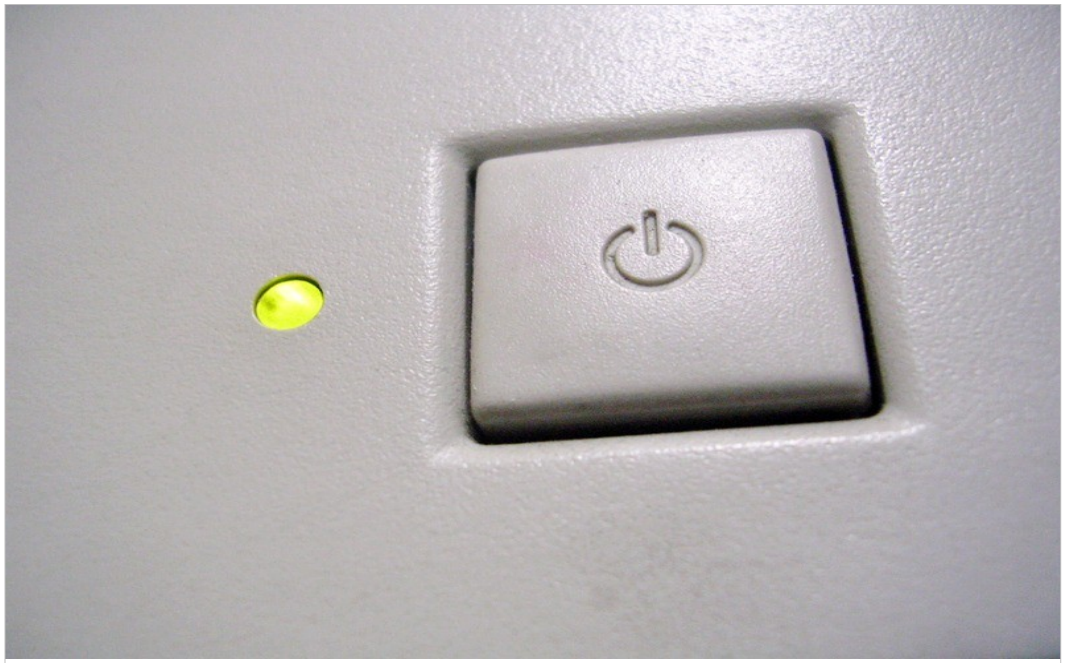
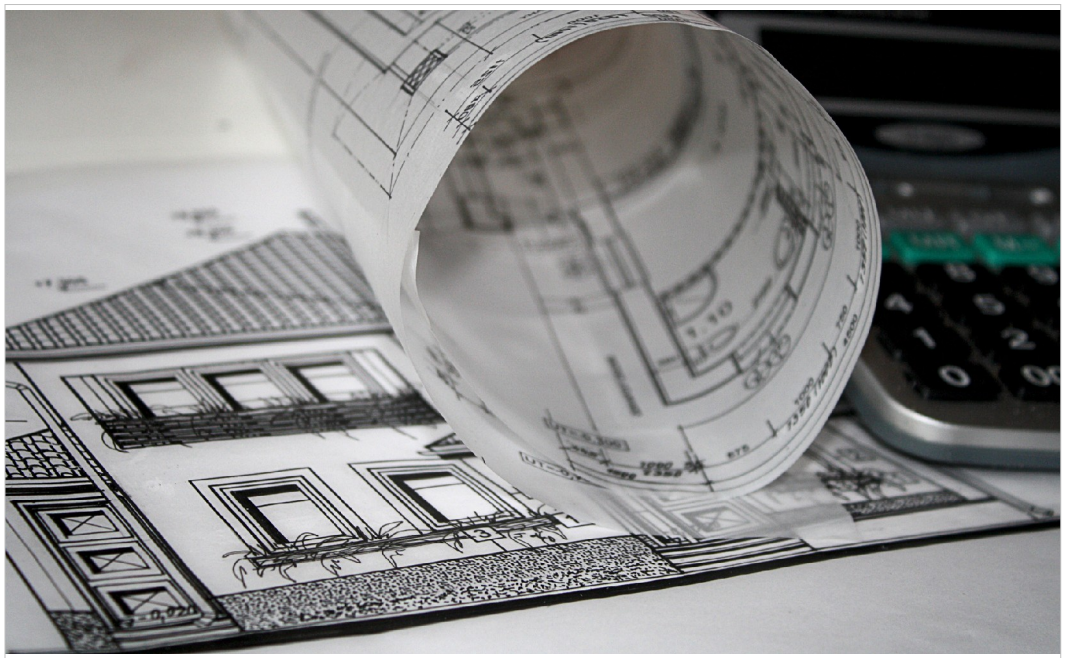
Features
Instance Types
Operating Systems and Software
Pricing
Resources
Detailed Description
Intended Usage and Restrictions

Amazon EC2



Getting Started

Buy or build ?



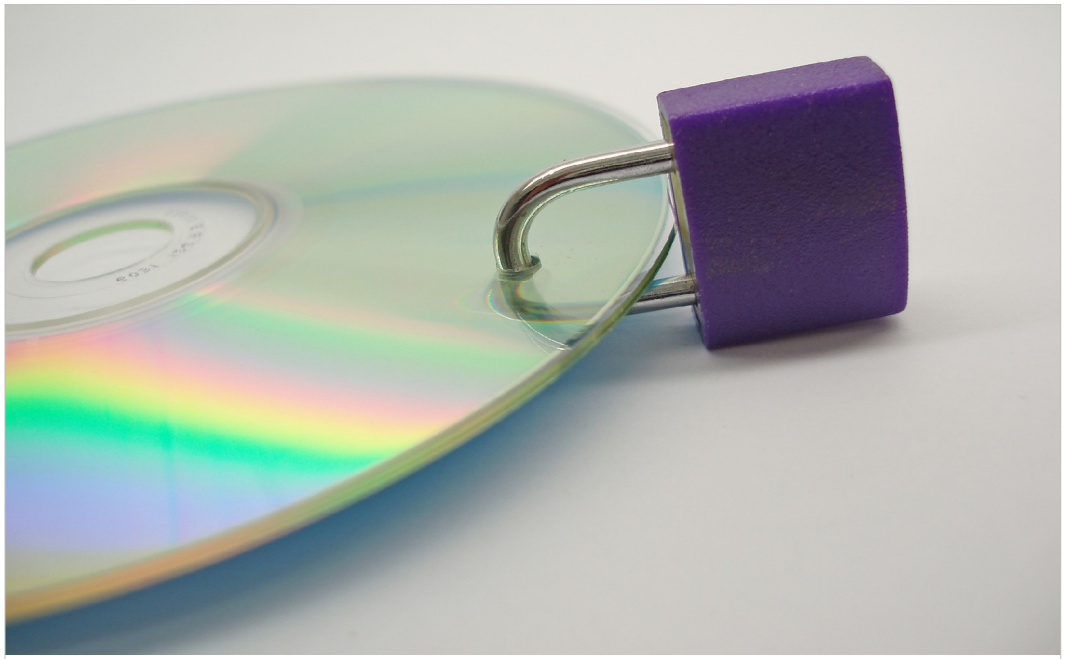
Business Plan

Know your costs

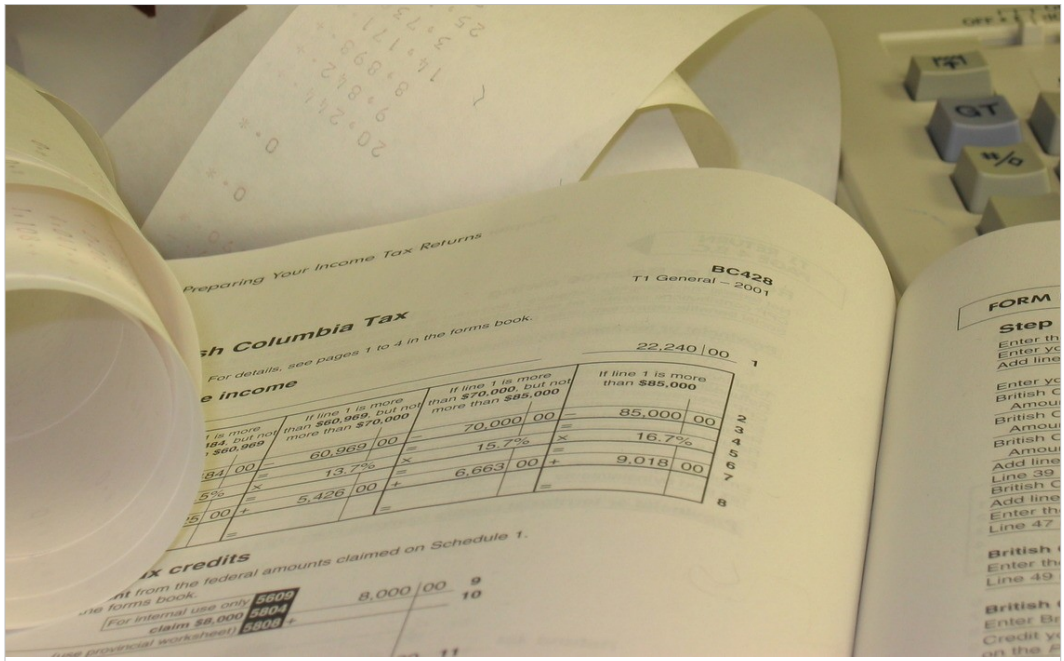
Define Service Catalog

Define your SLA

Barriers to Adoption



Security


Preparing Your Income Tax Returns
BC428
T1 General — 2001
Columbia Tax
For details, see pages 1 to 4 in the forms book.
income
22,240 00
If line 1 is more than $85,000
85,000 00
16.7%
9,018 00
If line 1 is more than $70,000, but not more than $85,000
70,000 00
15.7%
6,663 00
If line 1 is more than $60,969, but not more than $70,000
60,969 00
13.7%
5,426 00
credits
from the federal amounts claimed on Schedule 1.
8,000 00
FORM
Step

Compliance

Reliability

Budgeting

- Clouds will have a significant impact in how companies budget for and spend money on Information Technology.

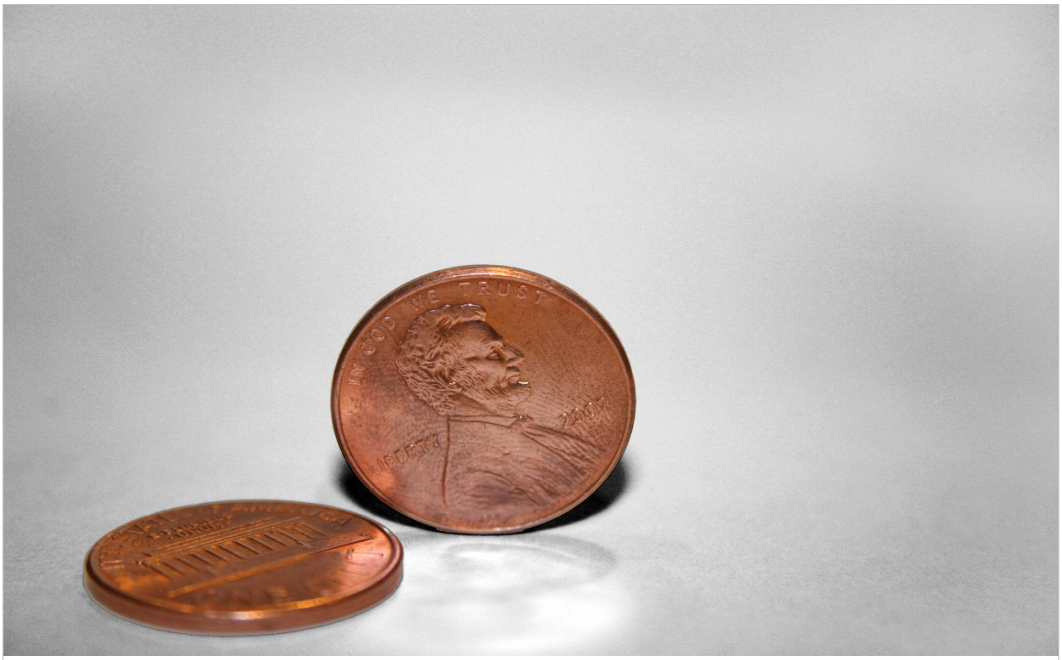
Customization

It's New

It's Magic

http://en.wikipedia.org/wiki/Clarke%E2%80%99s_three_laws

Any sufficiently advanced technology is indistinguishable from magic.



My two cents

Cloud computing lets companies focus in on what is core to them making money.

Example:

- Does running an email server make you money ?
  - If not why not let some one else do it ?

Backup

Cloud Computing and SaaS

- SaaS is a software application delivery model where a software vendor develops a web-native software application and hosts and operates (either independently or through a third-party) the application for use by its customers over the Internet. Customers do not pay for owning the software itself but rather for using it.
- Software as a Service has been around for a while now and actually precedes the newer term Cloud Computing.
- Delivering software applications is just one capability of cloud computing. Not all SaaS offerings can be classified as cloud enabled. However, if an SaaS offering is written in such a way that it is "massively scalable," then that SaaS offering could be considered a form of cloud computing. (source: Gartner)
  - Many SaaS vendors are now re-positioning their offerings as 'Cloud' offerings in order to participate in the cloud hype...even if their offering is not "massively scalable“
- Cloud Computing is great for the SaaS model as it can further reduce the costs associated with producing and delivering a SaaS application.
- Examples
  - GMail
  - Salesforce.

Platform as a Service

- Definition: includes all the systems and environments comprising the end-to-end life cycle of developing, testing, deploying and hosting web applications delivered as a service over the Internet.

- Examples include:
  - Mosso, PHP, .NET, Java, Rails, Python, other?
  - Google App Engine, Python
  - SalesForce – Proprietary
  - Morph - Ruby on Rails
  - Heroku - Ruby on Rails
- Benefits: Quickly launch new applications for a relatively low cost. Other benefits include limited scalability and reduced cost of operations (e.g no system administrators needed).
- Disadvantages can include porting development time costs for existing applications as not all applications come straight over.
- Billing for these services varies. It can be by the hour, request, CPU cycle, or other creative ways. Some even help you do pass through billing for your customers; like Mosso. But, the defining factor in pricing of Application Platform Clouds is that they generally strive to be robust, simple, and easy to load your application into when you are ready.

Infrastructure as a Service

- Definition: IaaS is a pay-for-what-you-need-when-you-need-it information technology delivery and service model. It is a technology service delivered over the Internet that provisions the resources such as servers, connections, storage, and related tools necessary to build an application environment from scratch on-demand. A common characteristic is a high degree of flexibility in what resources are provisioned.
- Examples of IaaS providers:
  - Amazon Web Services - Extremely flexible Build your own w/ many add-ons
  - VMWare - Build your own
  - Elastra - Up an comer build and manage your own IaaS
  - Tera - Sexy GUI based IaaS/PaaS building tools
  - Xen - Build your own
  - XCalibre - Very interesting and can do Linux or Windows
  - Nirvanix - All about cloud storage, very interesting subset similar to Amazon S3
  - EngineYard - Rails only Build your own
  - Joyent - Build your own on Solaris w/ Java/PHP/Rails/Python
- Benefit: Rapid provisioning of computing resources All the details of provisioning, racking, stacking, cabling, and more are completely abstracted away from you.
- Disadvantage: Difficult to move from one cloud to another in some cases.
- Billing for these services is usually incremental by use and can get complex with tiered on-demand pricing that can be difficult to track in real time. Pricing is usually well defined but can be rather difficult to forecast in some cases. It can vary to the minute depending on levels of use, tiers of service, and other interesting combinations.

So What Is Different About Cloud Computing?

	Traditional Computing		Cloud Computing
Delivery Model	Buy assets and build delivery architecture	→	Buy external **service**
Interface Model	Internal network or intranet	→	Via the **Internet** using standard Internet IFaPs (IP, HTML, HTTP)
Business Model	Pay for fixed assets and administrative overhead	→	Pay directly based on **usage** or indirectly (e.g., subsidized by advertising)
Technical Model	Single tenant	→	Scalable, elastic, dynamic, **multi-tenant**

Source: Gartner

What Trends Are Driving The Cloud Computing?

Infrastructure Technologies: Virtualization, Automation, SLAs

Application Technologies: Grid, MapReduce, Hadoop, SOA, Web 2.0

Data Intensive Applications: From massively parallel (e.g. Google) to large data files (e.g. You Tube)

Computing & Network Appliances: Special servers designed to handle specific tasks are blurring the lines between Network and Data Center

Open IT: Open Technologies, APIs, protocols, data formats, software platforms / data (e.g. Creative Commons, Open Data License)

Business Agility: Enter new markets, Deploy new application services. Stay ahead of compeition.

Broadband: Growth in Internet bandwidth enabling ubiquitous connectivity. Increased reliability and functionality embedded in the network.

Utility Computing: Get as much computing power as you need when you need it, pay for only what you use.

Industrialization of IT: Standardization, and commoditization (e.g email). Falling costs of storage.

Mobility: Explosion of form factors, cell phones/connected devices, Proliferation of sensors

New Business Models: Advertising, Services, Subscription

Web Applications and Platforms: Mashable applications and services built on Web Oriented Architecture (e.g. REST, RSS/ATOM)

Data Center Pressures: Growing costs of power and space, server sprawl

Source: Gartner, Thomas Weisel Partners, Merrill Lynch, IBM MI

Barriers To Adoptions

- **Security & Privacy** – Many companies and governments are uncomfortable with the idea of their information be located on systems that they do not control. Authentication and access right technologies will become increasingly important.
- **Compliance Issues** – Complying with Sarbanes-Oxley, HIPPA and other regulations may prohibit the use of clouds for some applications.
- **Reliability** – High availability will be a key concern. IT departments will worry about a loss of control should outages occur. Thus mission critical applications for large enterprises will probably not be run in the cloud.
- **Cloud Management** - Service Monitoring / Reporting / Management Technologies immature
- **Costs** – Economies of Scale only go so far, unless customer is willing to trade data or advertising views for services
- **Customization May Be Difficult** - Large Enterprises are used to fully customizable environments. Some clouds may not offer that capability.
- **It's Something New** – As with anything new, conservative oriented companies will hesitate to adopt clouds. Issues of security, trust, chargeback, & sharing will limit adoption by these types of companies
- **Organization / Culture** – Clouds have the potential to significantly reduce IT labor costs. IT organizations may be reluctant to encourage their companies to move to the new cloud computing model
- **Budgeting** – Clouds will have a significant impact in how companies budget for and spend money on Information Technology.

Source: Gartner, Forrester, CHQ MI

The Historical "Stack" Will Slowly Evolve To Compute Clouds.

From Historical Stacks to…

- Services
- Software
- Hardware

"As a Service" Offerings handle client needs for specific on demand IT components.

Everything as a Service: Using SOA and SaaS businesses will have an opportunity create more dynamic services that enrich our everyday lives and improve how we do business.

SaaS – Software as a Service: Delivery model where a software vendor develops a web-native software application and hosts and operates (either independently or through a third-party) the application for use by its customers over the Internet.

Hardware as a Service: provides computing capacity and storage delivered online

Storage as A Service: combines a computing interface with online storage over the network as a service

Platform As A Service On demand web-based operating systems and applications, such as SaaS, for 3rd party developers

Compute Clouds: provide a high performance infrastructure that delivers simplified services through innovative business models