Cloud Technology

Dr. Charles (Cal) LOOMIS
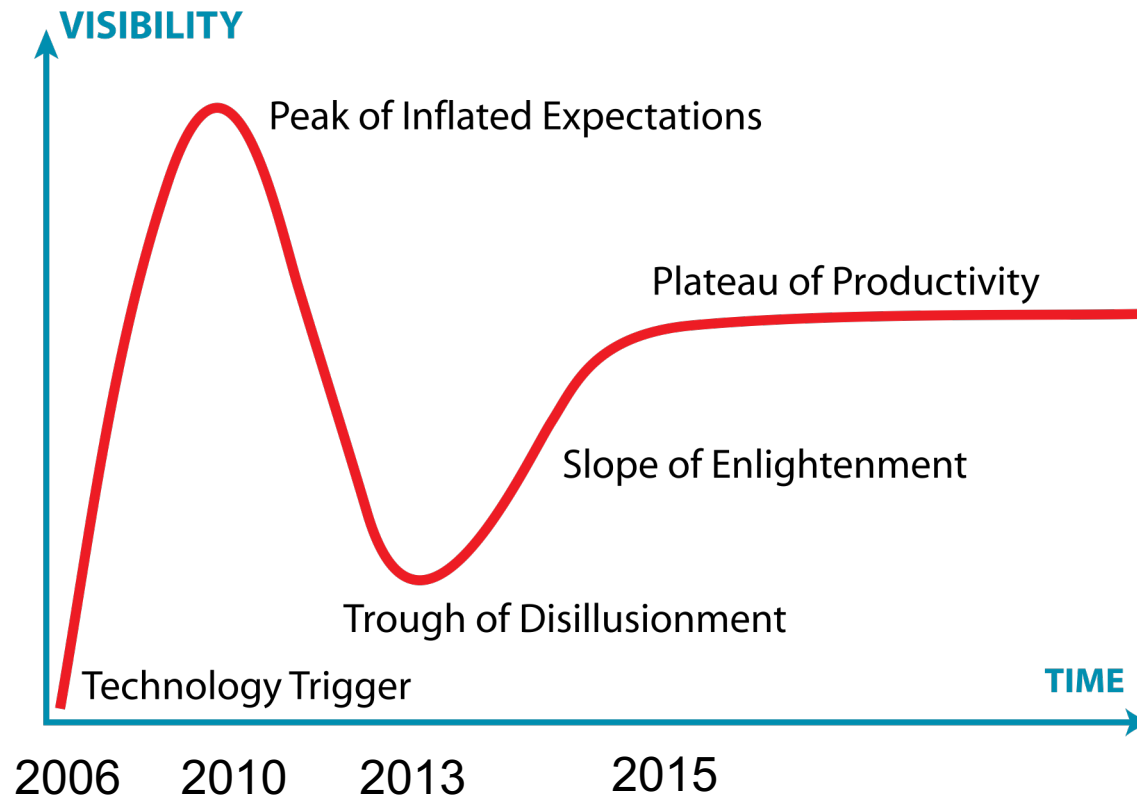
What is the Cloud?
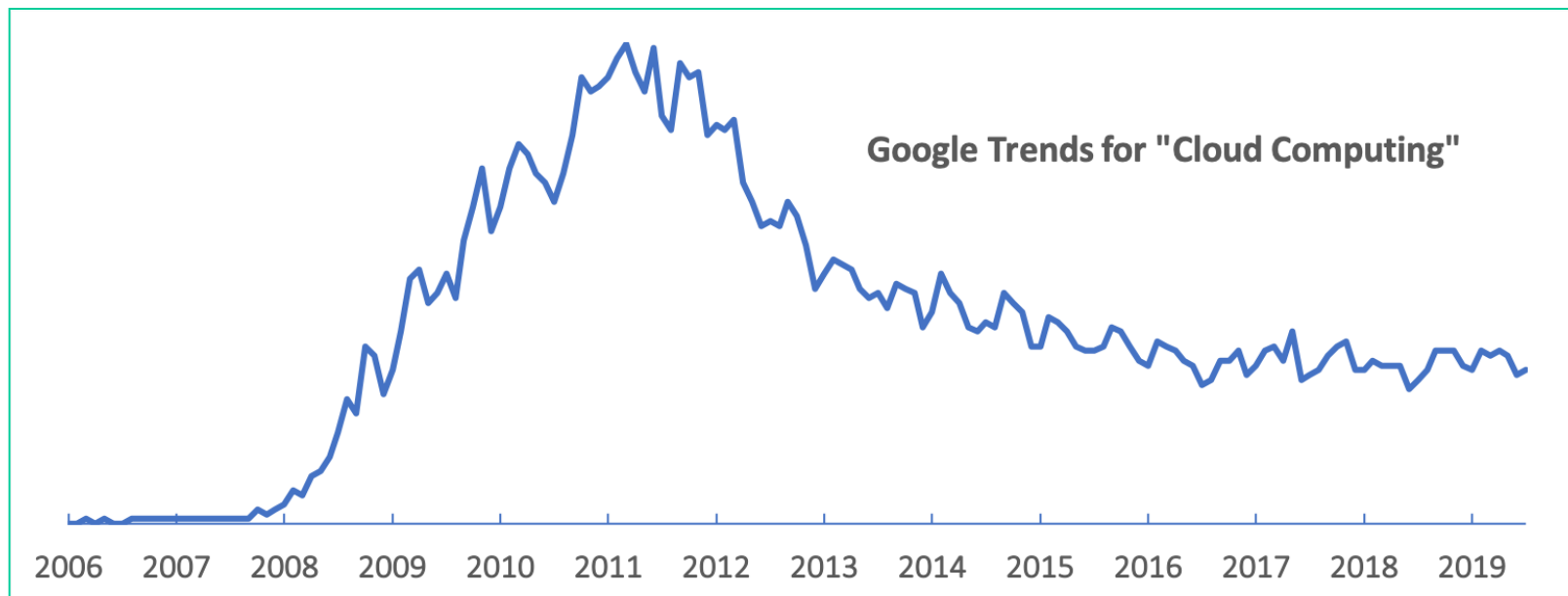
Person on the Street

IT Professional

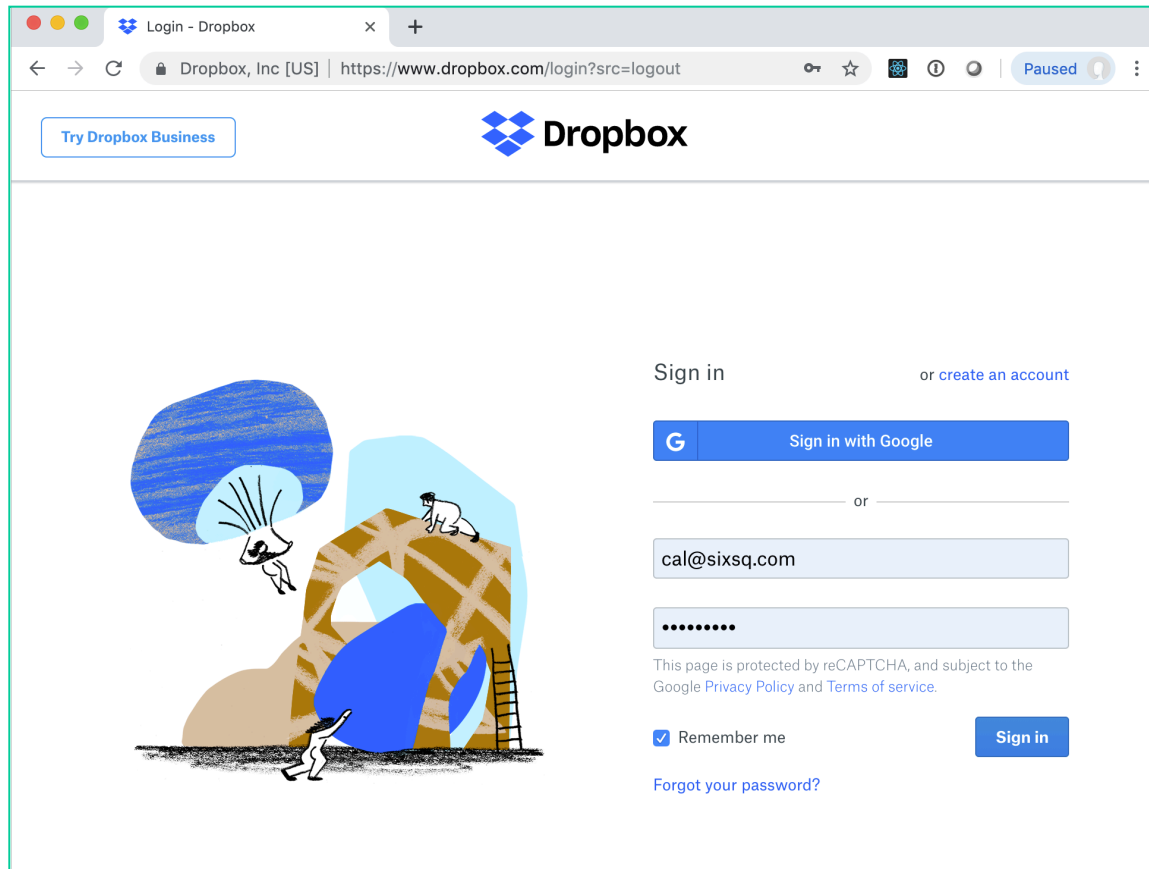**Gartner's Hype Cycle**

Since its debut in 2006, the cloud has gone through the complete hype cycle.

Google Trends for "Cloud Computing"

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The term "cloud" frequently used to market IT software and services, regardless of whether they have anything to do with cloud computing.

Dropbox

Distributed storage for transparent access to personal files from any device.

Dropbox

- Simple access from laptops, phones, etc.

- Offline access via local cache on device

- Synchronization of changes between devices

- History of file versions

- Sharing of files and directories with others

- Free service to 2 GB, must pay for more

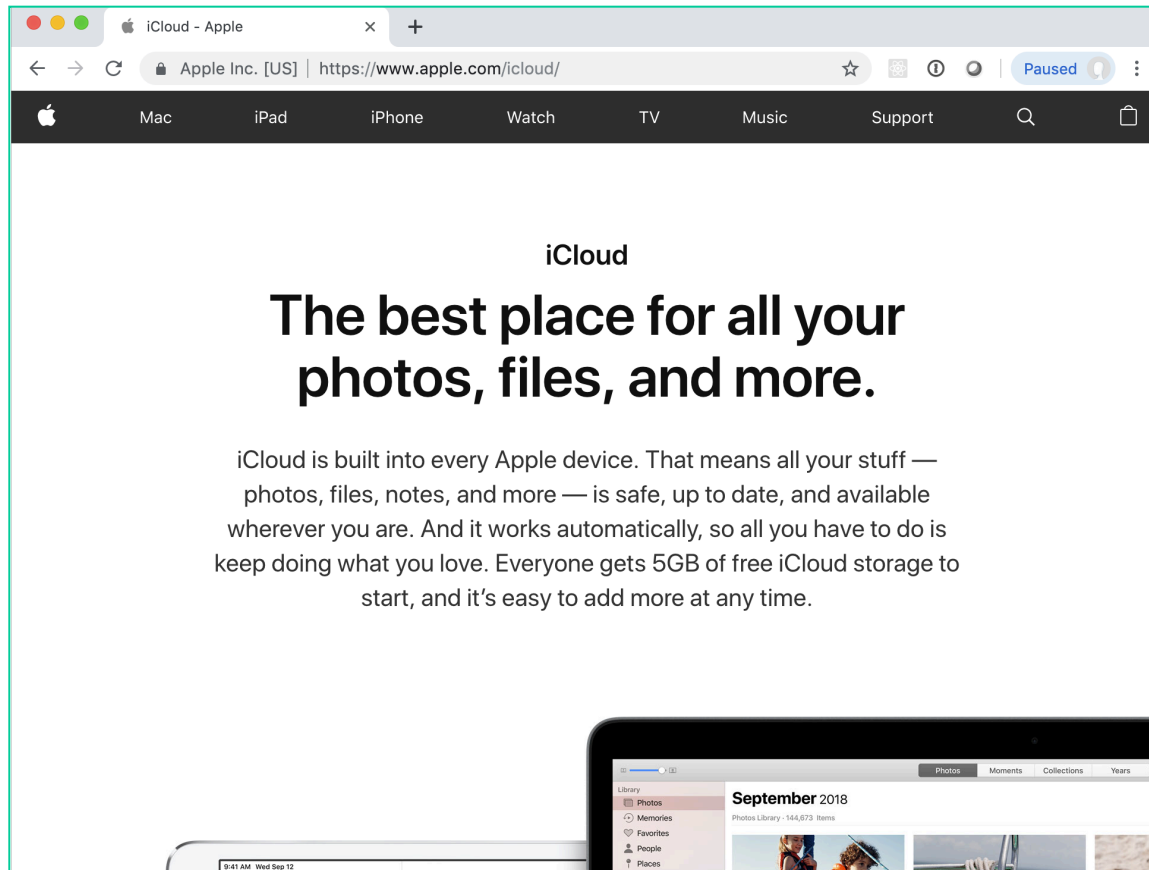- Files are stored in the United States
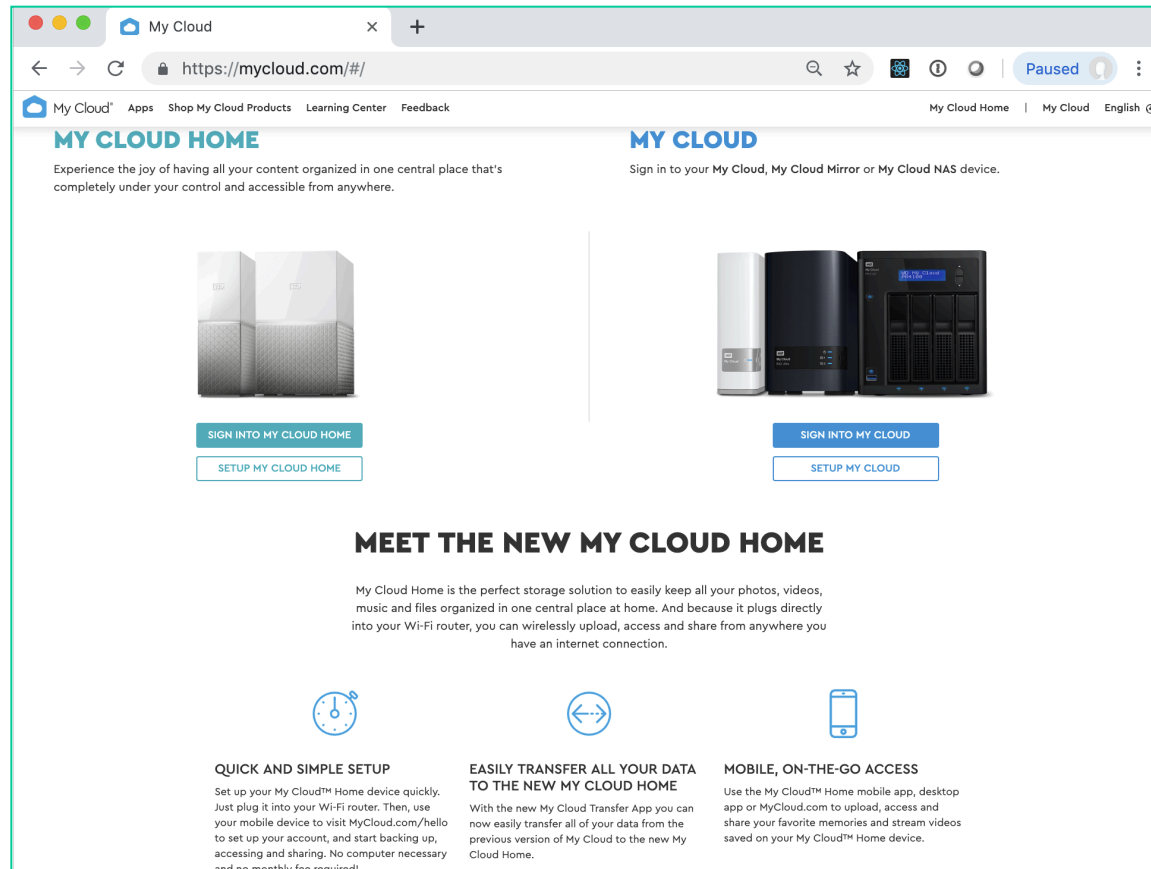
My Cloud

Storage device located in a user's home and under the user's control.
Files accessible from anywhere.
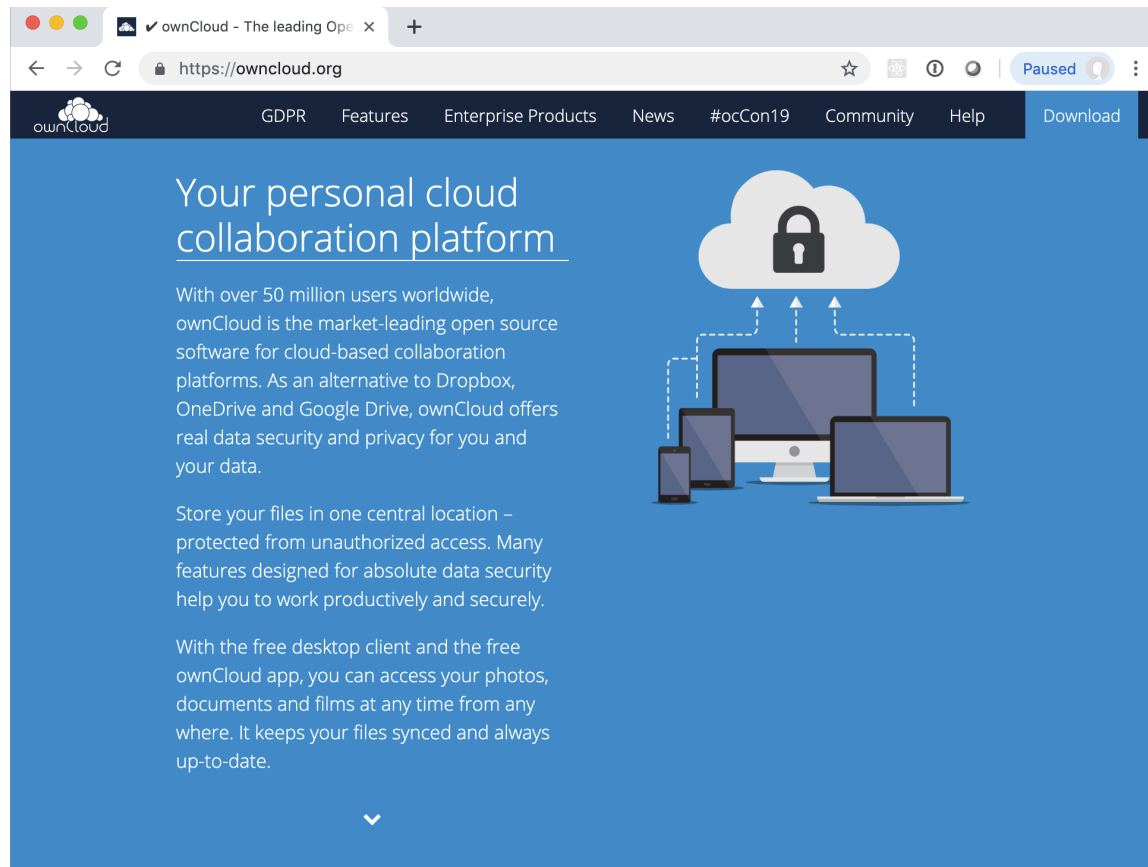
ownCloud

Storage of files, contact, and calendars for an institute or enterprise.

iCloud

Apple's solution for synchronization of files, contacts, passwords, and other personal information between Apple devices.

Why and how?

- Constant use many different devices:

  - Portable telephones, tablets, laptops, desktops, etc.

- People are always connected:

  - The mobile, wireless, and wired network connections are everywhere, fast, free, and very reliable.

Common Characteristics

- Data stored in remote data centers

- Easily accessible via the Internet

- Often see "free" tier of service

Standard Services

If the cloud is just remotely accessible data, then there are lots of "cloud" services.

Search is a Calculation

Everyone searches for information in public and private databases

- These searches require rapid calculations that are often complex

- Searches via voice recognition require calculations to understand the question

Siri

amazon alexa

Google Assistant

Common Characteristics

- Provides unique service

- Data stored in remote data centers

- Easily accessible via the Internet

- Dynamic allocation of resources

- Integration with other services possible

Communication and Social Interaction

Many of these services provide APIs that allow other applications to query their databases and interact with their services.
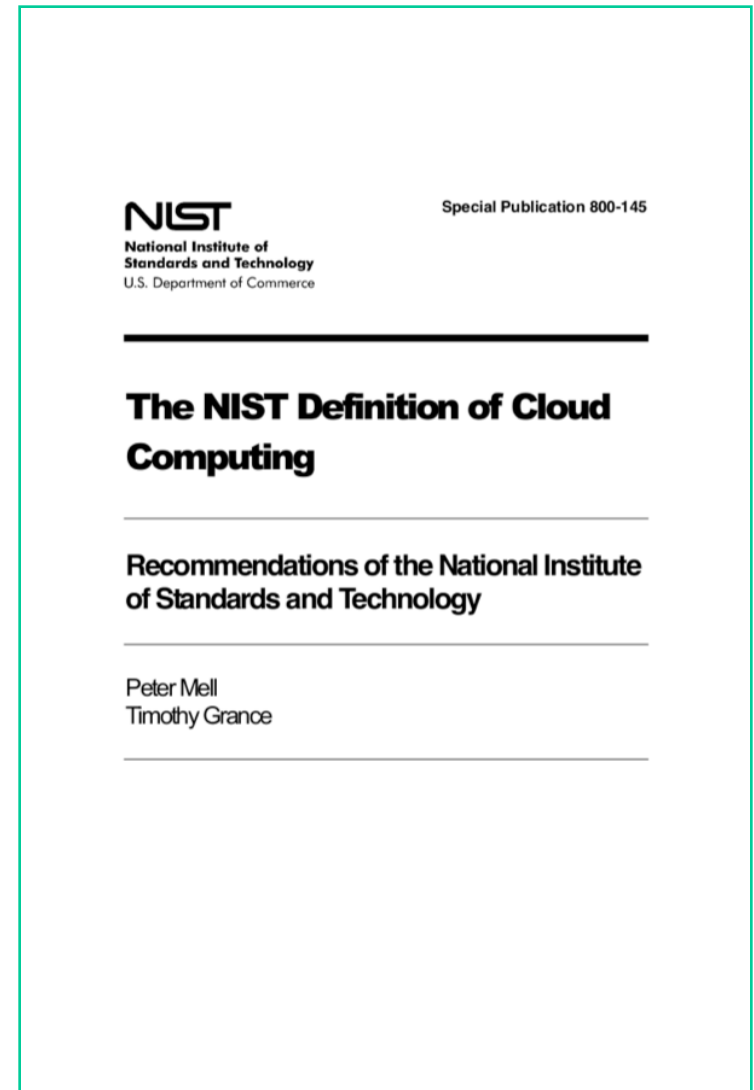
Common Characteristics

- Connect people by text, chat, video, …

- Expectation of instantaneous, secure, fast connection

- Provide unique service for users

- Provide platform for integration with other services

Formal Definition

NIST Definition

- Essential characteristics

- Service models

- Deployment models

Service Models

- Software as a Service (SaaS)

- Platform as a Service (PaaS)

- Infrastructure as a Service (IaaS)

Doodle

G Suite

Dropbox

WORDPRESS

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Deployment Models

- ## Public
  - Aimed at the general public with payment via credit card

- ## Community
  - Infrastructure shared between a community of users

- ## Private
  - Infrastructure intended for "local" users of an institute or enterprise

- ## Hybrid

Cloud for (Data) Science

- Data science needs a platform that has all these characteristics:

  - Accessible remotely: instantaneous, secure, and fast

  - Dynamic allocation: respond quickly to peak in demand

  - Cost effective: pay only resources that are used

  - Flexible: customization of the environment, application

  - Specific Platforms: sequencers, instruments, etc.

- Infrastructure as a Service is the best fit

Conclusions

- The cloud is an evolution of computing resources that makes them more useful, dynamic, scalable, and flexible.

- Cloud services (commercial and academic) are extremely diverse and offer enormous benefits to users.