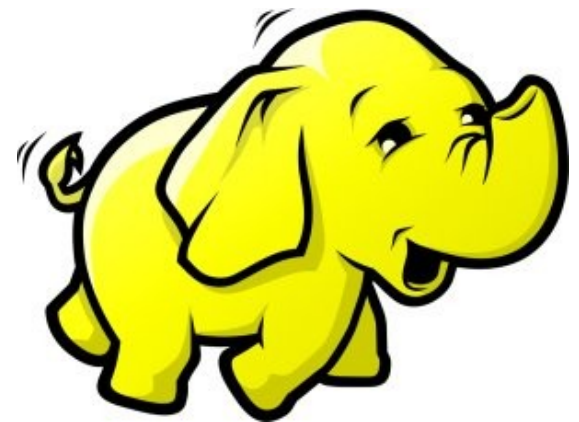




淺談海量資料的趨勢、挑戰與因應對策

Big Data : the Trends, Challenges and Solutions

Jazz Wang
Yao-Tsung Wang
jazz@nchc.org.tw



Agenda 演講大綱

What is Big Data ? 何謂海量資料

Why should we care? 為何需要關切

When to deploy it ? 何時導入技術

How to handle it ? 三大因應策略

Who is key player ? 誰是成功關鍵

WHAT



What is Big Data ?

何謂海量資料

趨勢

Trends

定義

Definitions

挑戰：管理維度

The Six Dimensions

Source: <http://www.2010taipeiexpo.tw/ct.asp?xItem=17186&CtNode=5952&mp=3>

Trends It's all about **Buzzwords** 「趨勢」亦或「流行語」？ Web 3.0, Cloud Computing, Social Network, Big Data,

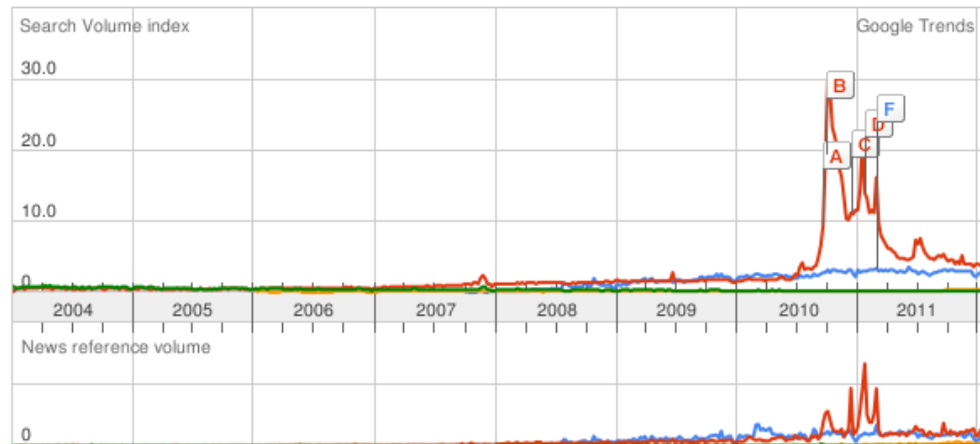
Google Trends

Tip: Use commas to compare multiple search terms.

Searches [Websites](#)

- Scale is based on the average worldwide traffic of **cloud computing** in all years. [Learn more](#)
- An improvement to our geographical assignment was applied retroactively from 1/1/2011. [Learn more](#)

cloud computing 1.00 social network 2.40 big data 0.20
semantic web 0.40



語意網 (Semantic Web) 從 2001 年開始制定標準後，逐漸下滑。而同義詞 Web 3.0 也呈現相似趨勢。海量資料 (Big Data) 與其關鍵技術 Hadoop，則仍在上揚中。

A
B

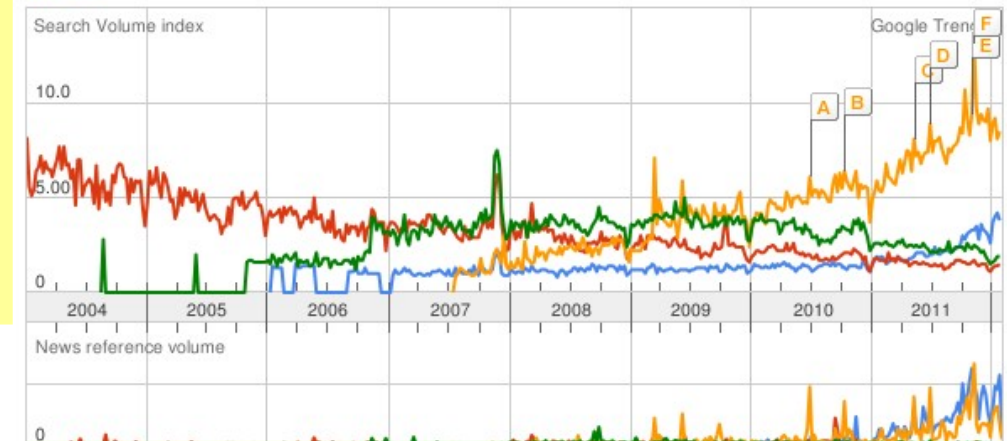
Google Trends

Tip: Use commas to compare multiple search terms.

Searches [Websites](#)

- Scale is based on the average worldwide traffic of **big data** in all years. [Learn more](#)
- An improvement to our geographical assignment was applied retroactively from 1/1/2011. [Learn more](#)

big data 1.00 semantic web 3.30 hadoop 2.50
web 3.0 2.40

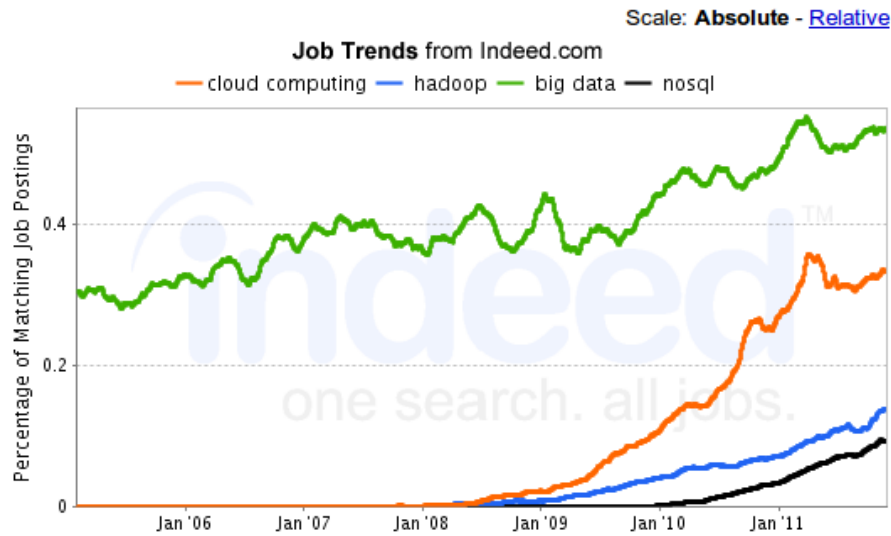


A
B
C
D
E
F

整體而言，雲端運算 (Cloud Computing) 與社交網路 (Social Network) 呈現上揚。且社交網路比雲端運算還引人注目。

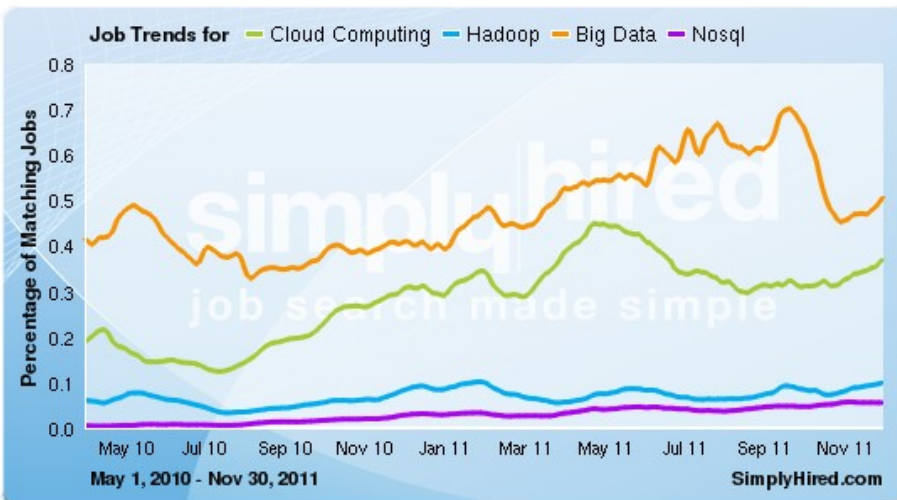
Trends of Market Needs 市場需求趨勢

cloud computing, hadoop, big data, nosql Job Trends



Indeed.com searches millions of jobs from thousands of job sites. This job trends graph shows the percentage of jobs we find that contain your search terms.

Find [Cloud Computing jobs](#), [Hadoop jobs](#), [Big Data jobs](#), [Nosql jobs](#)



美國軟體就業市場分析，根據 indeed 與 simply hired 兩間公司的趨勢觀察，都得到一樣的結果：

Big Data > Cloud Computing > Hadoop > NoSQL

To

CIO technologies	Ranking of technologies CIOs selected as one of their top 3 priorities in 2012			
Ranking	2012	2011	2010	2009
Analytics and business intelligence	1	5	5	1
Mobile technologies	2	3	6	12
Cloud computing (SaaS, IaaS, PaaS)	3	1	2	16
Collaboration technologies (workflow)	4	8	11	5
Virtualization	5	2	1	3
Legacy modernization	6	7	15	4
IT management	7	4	10	*
Customer relationship management	8	18	*	*
ERP applications	9	13	14	2
Security	10	12	9	8
Social media/Web 2.0	11	10	3	15

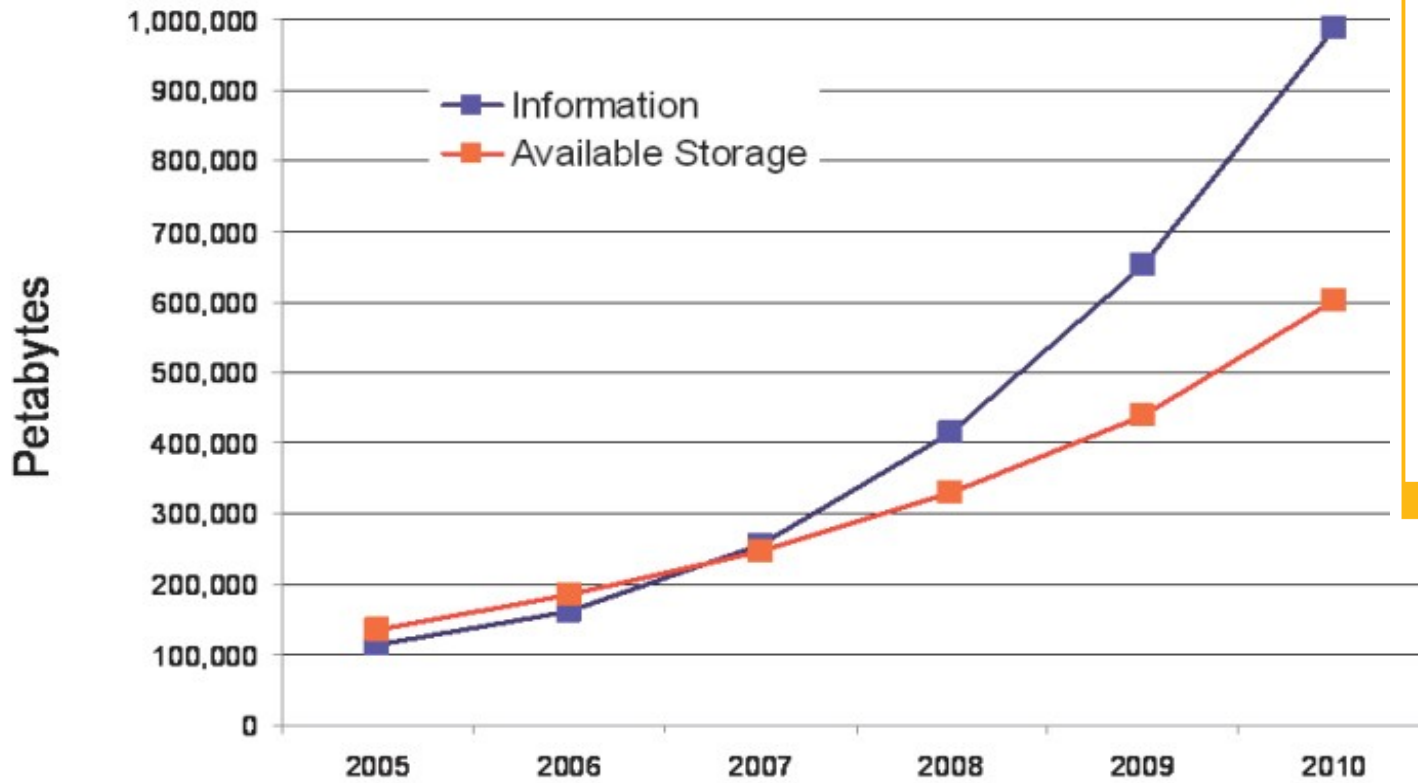
Gartner CIO Agenda 2012 前三名：
 [1] Business Intelligence (Big Data)
 [2] Mobile technology
 [3] Cloud Computing

How BIG? 讓我們先來認識一下容量單位

Bit (b)	1 or 0
Byte (B)	8 bits
Kilobyte (KB)	1,000 bytes
Megabyte (MB)	1,000 KB
Gigabyte (GB)	1,000 MB
Terabyte (TB)	1,000, GB
Petabyte (PB)	1,000 TB
Exabyte (EB)	1,000 PB
Zettabyte (ZB)	1,000 EB

Data Explosion!! 始於 2007 的「資料大爆炸」時代

Information Versus Available Storage

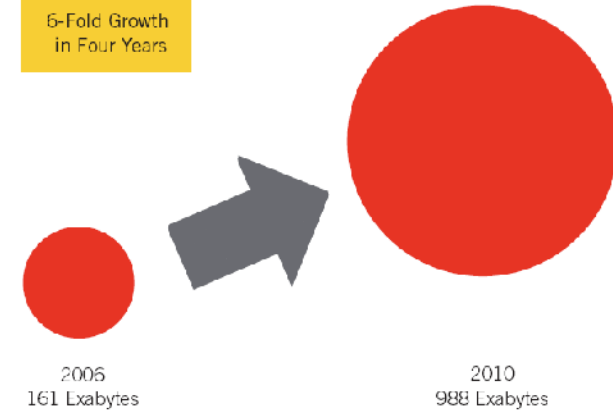


Source: IDC, 2007

Figure 1

Information Created, Captured and Replicated

6-Fold Growth
in Four Years



Source: IDC, 2007

2007 年，IDC 預估
2010 年會成長**六倍**！
(相較 2006 年)

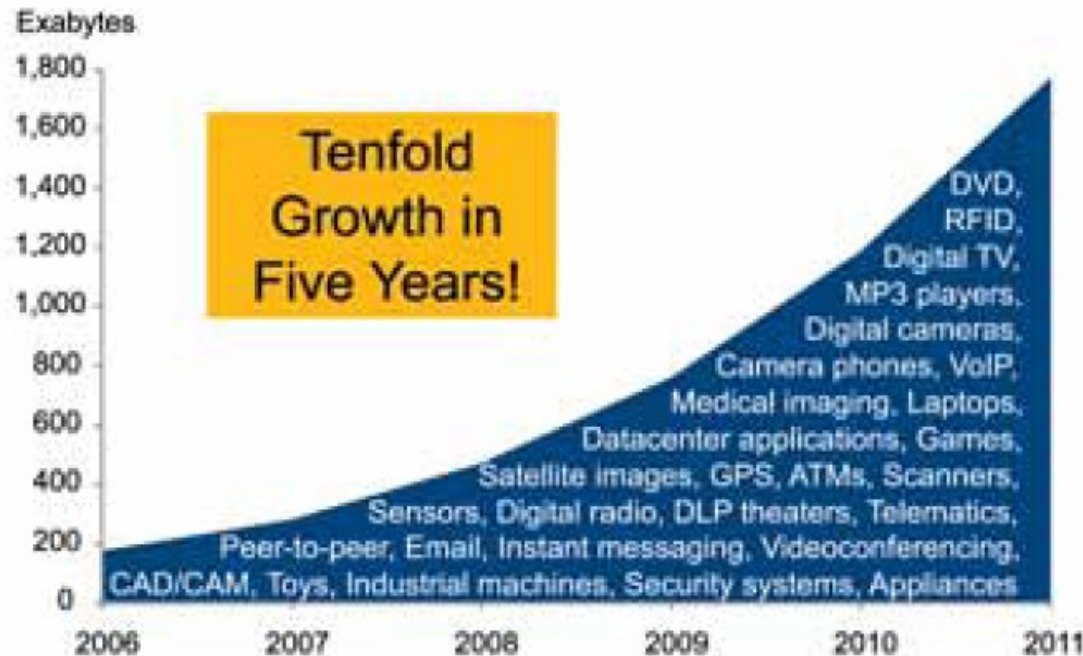
2006 161 EB
2010 988 EB (預測)

出處：The Expanding Digital Universe,
A Forecast of Worldwide Information Growth Through 2010,
March 2007, An IDC White Paper - sponsored by EMC
<http://www.emc.com/collateral/analyst-reports/expanding-digital-idc-white-paper.pdf>

Data Explosion!! 始於 2007 的「資料大爆炸」時代

Figure 1

Digital Information Created, Captured, Replicated Worldwide



Source: IDC, 2008

2009 年，IDC 預估
2011 年會成長**十倍**！
(相較 2006 年)

2006	161	EB
2007	281	EB
2010	988	EB (預測)
2011	1773	EB (預測)

出處：[The Diverse and Exploding Digital Universe](#),
An Updated Forecast of Worldwide Information Growth Through 2011
[March 2008](#), An IDC White Paper - [sponsored by EMC](#)
<http://www.emc.com/collateral/analyst-reports/diverse-exploding-digital-universe.pdf>

Data expanded 2x each year !! 每年約略兩倍



追蹤歷年的 IDC 數據：

2006 161 EB

2007 281 EB

2008 487 EB

2009 800 EB (0.8 ZB)

2010 988 EB (預測)

2010 1200 EB (1.2 ZB)

2011 1773 EB (預測)

2011 1800 EB (1.8 ZB)

景氣差而成長趨緩？
或受新技術抑制？

出處：[Extracting Value from Chaos](#),
June 2011, An IDC White Paper - sponsored by EMC

<http://www.emc.com/collateral/about/news/idc-emc-digital-universe-2011-infographic.pdf>

What is Big Data?! 何謂『海量資料』？

海量資料泛指資料大小已無法用一般軟體擷取、管理與處理；
單一資料集大小介於數十 TB 至數 PB 的資料。

'Big Data' = few dozen TeraBytes to PetaBytes in single data set.

Definition

[edit]

Big data is a term applied to data sets whose size is beyond the ability of commonly used software tools to capture, manage, and process the data within a tolerable elapsed time. Big data sizes are a constantly moving target currently ranging from a few dozen terabytes to many petabytes of data in a single data set.

In a 2001 research report^[14] and related conference presentations, then META Group (now Gartner) analyst, Doug Laney, defined data growth challenges (and opportunities) as being three-dimensional, i.e. increasing volume (amount of data), velocity (speed of data in/out), and variety (range of data types, sources). Gartner continues to use this model for describing big data.^[15]

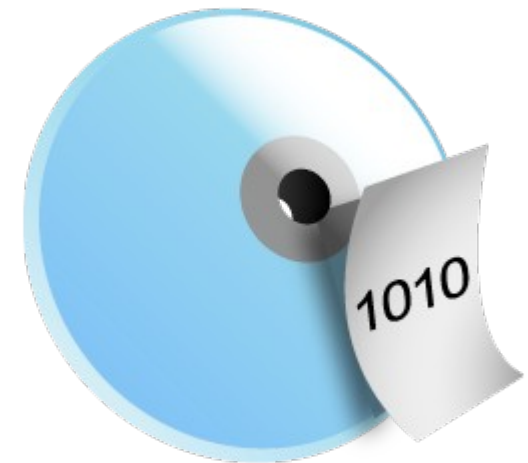
出處：http://en.wikipedia.org/wiki/Big_data



多個檔案，容量 100TB



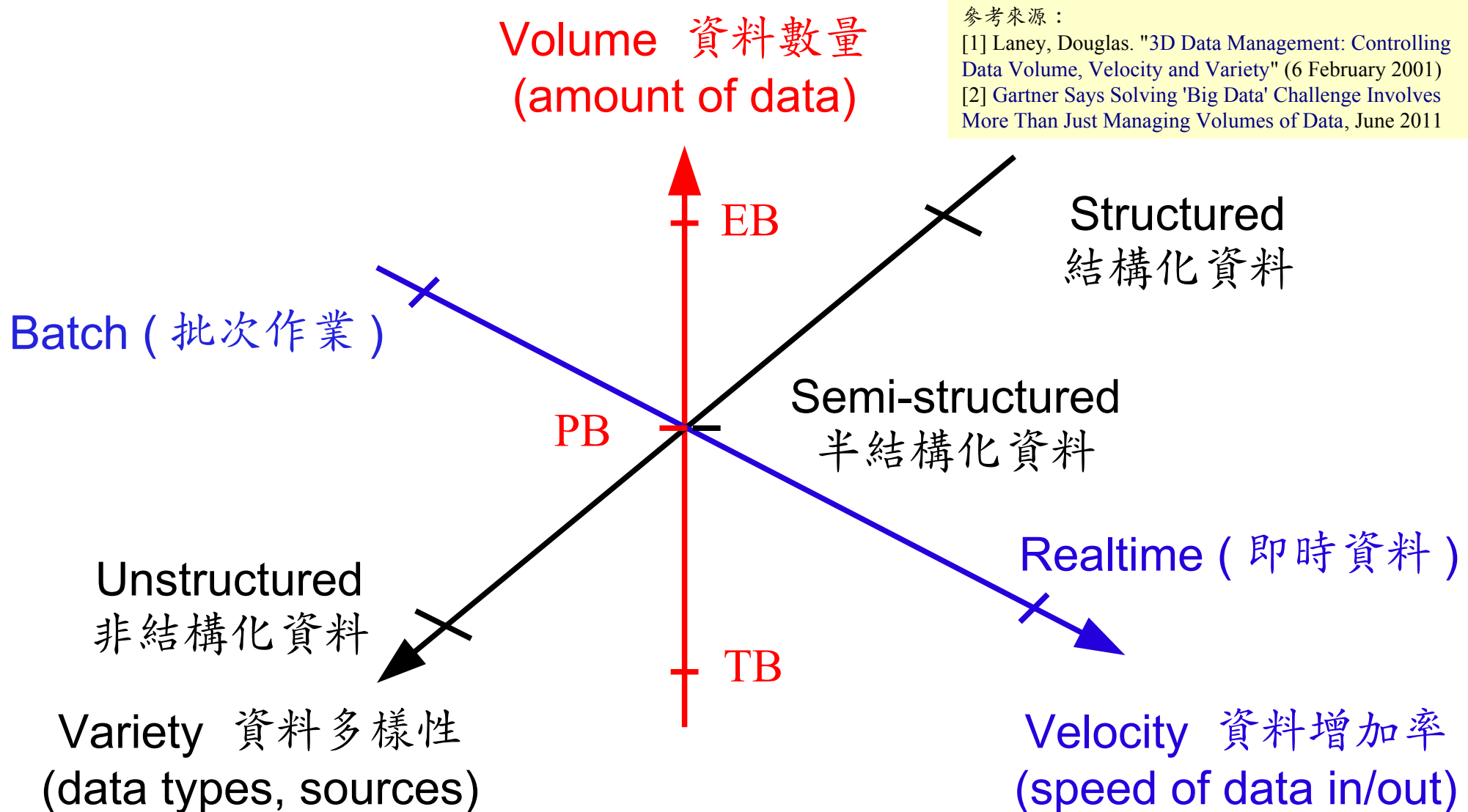
一個資料庫，容量 100TB



一個檔案，容量 100TB

Gartner Big Data Model? 海量資料的模型?

海量資料的挑戰在於如何管理「數量」、「增加率」與「多樣性」



參考來源:

[1] Laney, Douglas. "3D Data Management: Controlling Data Volume, Velocity and Variety" (6 February 2001)

[2] Gartner Says Solving 'Big Data' Challenge Involves More Than Just Managing Volumes of Data, June 2011

Six Dimensions of Big Data? 六個維度?



12D of Information Management? 12 個維度?



Big Data
只是終極
資訊管理
的開端!

Source: Gartner (March 2011), 'Big Data' Is Only the Beginning of Extreme Information Management, 7 April 2011, <http://www.gartner.com/id=1622715>

Agenda 演講大綱

What is Big Data ?

何謂海量資料

Why should we care?

為何需要關切

資料 Data

知識 Knowledge

智慧 Wisdom

WHY



花精靈-小葵

Why we call it “SMART” !!

智慧打哪兒來？！

Smart Phone

智慧手機

Smart Car

智慧車輛

Smart Grid

智慧電網

SMART

哪裡長
智慧了？

Smart City

智慧城市

Smart Home

智慧家庭

Smart Meter

智慧電錶

資料

Data

知識

Knowledge

智慧

Wisdom

Can Machine understand You? 讓機器更懂你?

iPhone

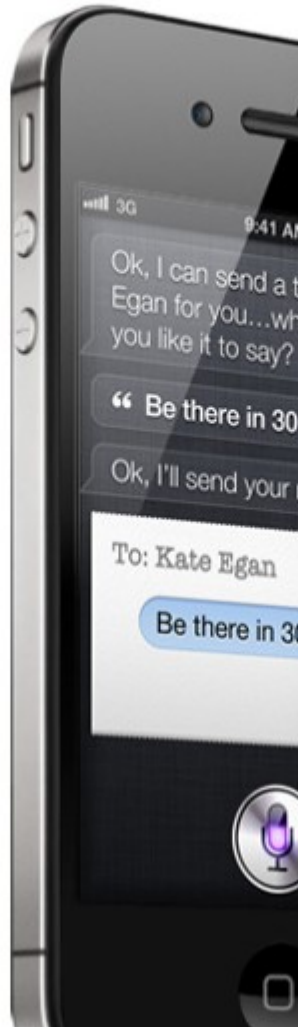
Features Built-in Apps



Siri. Beta

Your wish is its command.

Siri on iPhone 4S lets you use your voice to send messages, schedule meetings, place phone calls, and more. Ask Siri to do things just by talking the way you talk. Siri understands what you say, knows what you mean, and even talks back. Siri is so easy to use and does so much, you'll keep finding more and more ways to use it.



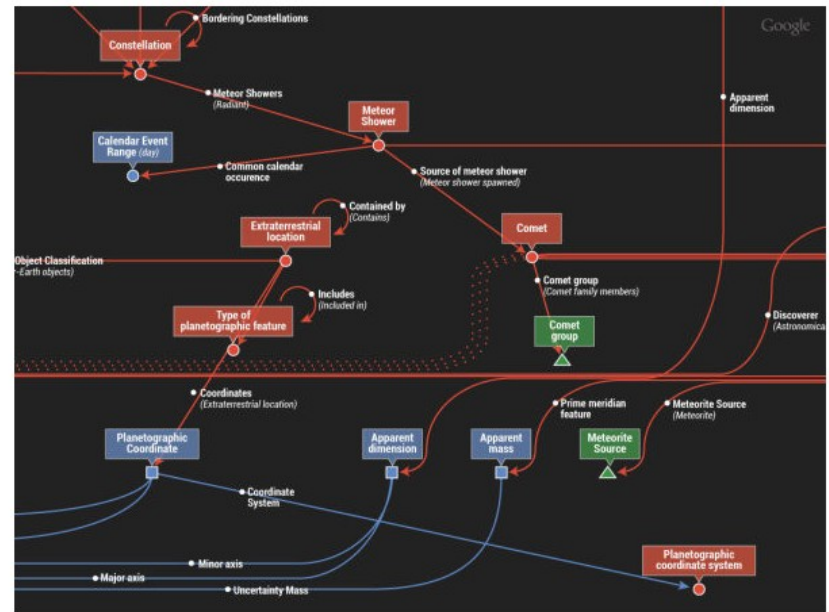
Google將發展「人工智慧」 永久改變搜尋引擎

2012年02月15日 00:11

點評: 超級阿斯拉, 衝啊! (阿斯拉: 好的, 華人!)

記者黃郁棋 / 綜合報導

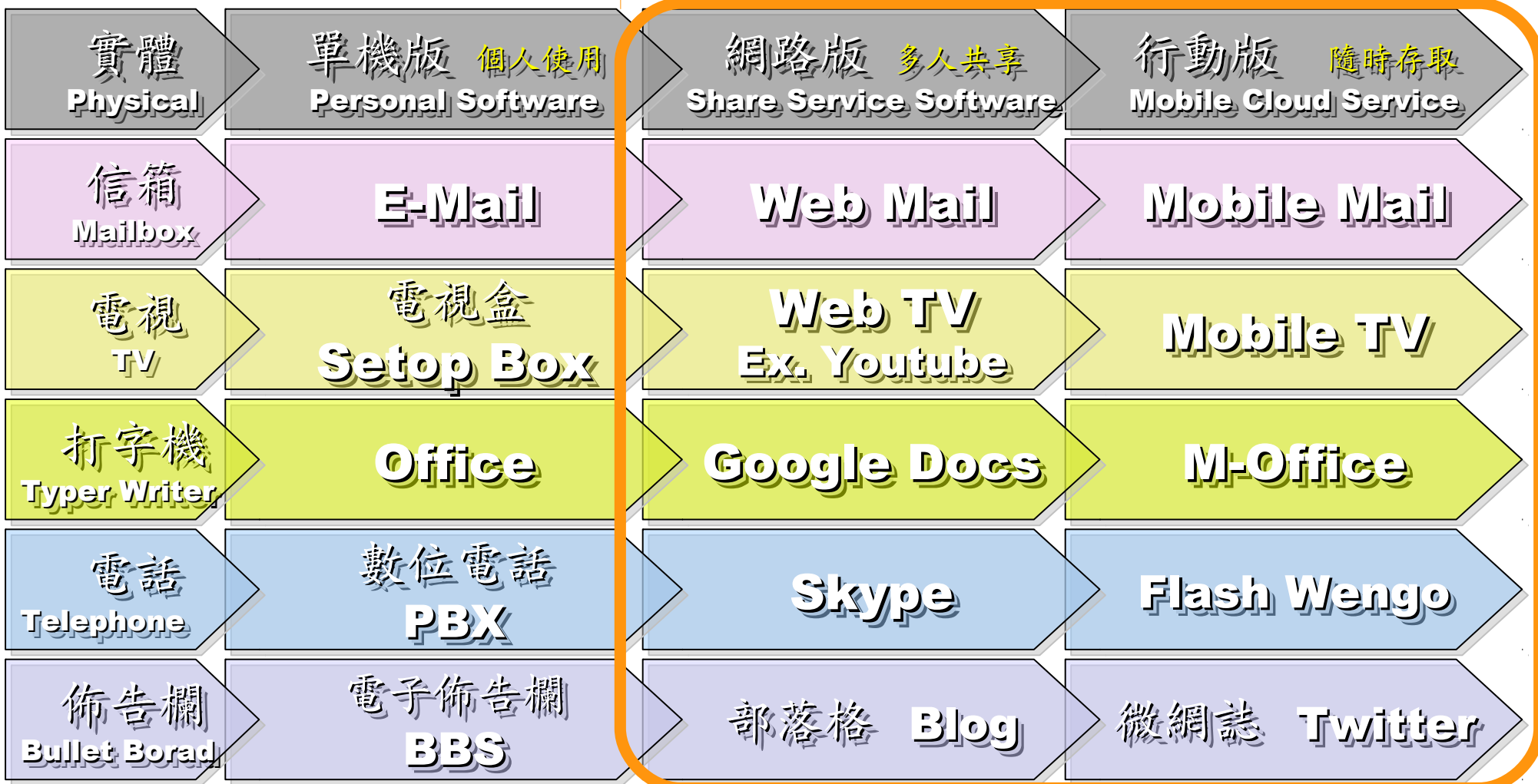
每個人都在猜, 下一波網路革命是什麼? 每個人都在猜, 未來的世界會如何運作? Google的資深副總Amit Singhai透露了一點訊息。「Google正努力從『單字』層面進展到『意義』層面, 未來搜尋引擎提供的不只是關鍵字搜尋, 搜尋引擎甚至會『明白』你到底要什麼。」



▲ Google未來將會朝「人工智慧」前進。(圖 / 取自mashable.com)

Evolution of Software / Service

軟體演化勢必走向『智能化』



The wisdom of Clouds (Crowds)

雲端序曲：雲端的智慧始終來自於群眾的智慧

2006年8月9日

Google 執行長施密特 (Eric Schmidt) 於SES'06會議中首次使用「雲端運算 (Cloud Computing) 」來形容無所不在的網路服務

2006年8月24日

Amazon 以 Elastic Compute Cloud 命名其虛擬運算資源服務



Data is the source of Wisdom !!

用雲掌握資料，加以分析，形成智能給端用



雲

資料中心
提供服務

雲端設計新思維：端的智能來自於雲的服務

Devices share the wisdom of Cloud

端



各類裝置
存取服務

Agenda 演講大綱

What is Big Data ? 何謂海量資料

Why should we care? 為何需要關切

When to deploy it ? 何時導入技術

基礎建設 IaaS

分析平台 PaaS

智慧服務 SaaS

WHEN



花精靈-小蠻

National Definition of Cloud Computing

美國國家標準局 NIST 給雲端運算所下的定義

5 Characteristics

五大基礎特徵

4 Deployment Models

四個佈署模型

3 Service Models

三個服務模式

1. On-demand self-service.

隨需自助服務

2. Broad network access

隨時隨地用任何網路裝置存取

3. Resource pooling

多人共享資源池

4. Rapid elasticity

快速重新佈署靈活度

5. Measured Service

可被監控與量測的服務

4 Deployment Models of Cloud Computing

雲端運算的四種佈署模型

Public Cloud

公用雲端



Microsoft

Google

**Dynamic Resource Provisioning
between public and private cloud**

私有雲端動態根據計算需求
調用公用雲端的資源

Target Market

is **S.M.B.**

主要客戶為
中小企業

Hybrid
Cloud

以大型企業
為主要客戶

**Enterprise is
key market**

Community Cloud

社群雲端



私有雲端

Private Cloud

Academia 學術為主

3 Service Models of Cloud Computing

雲端運算的三種服務模式 (市場區隔)

IaaS

Infrastructure as a Service

架構即服務

PaaS

Platform as a Service

平台即服務

SaaS

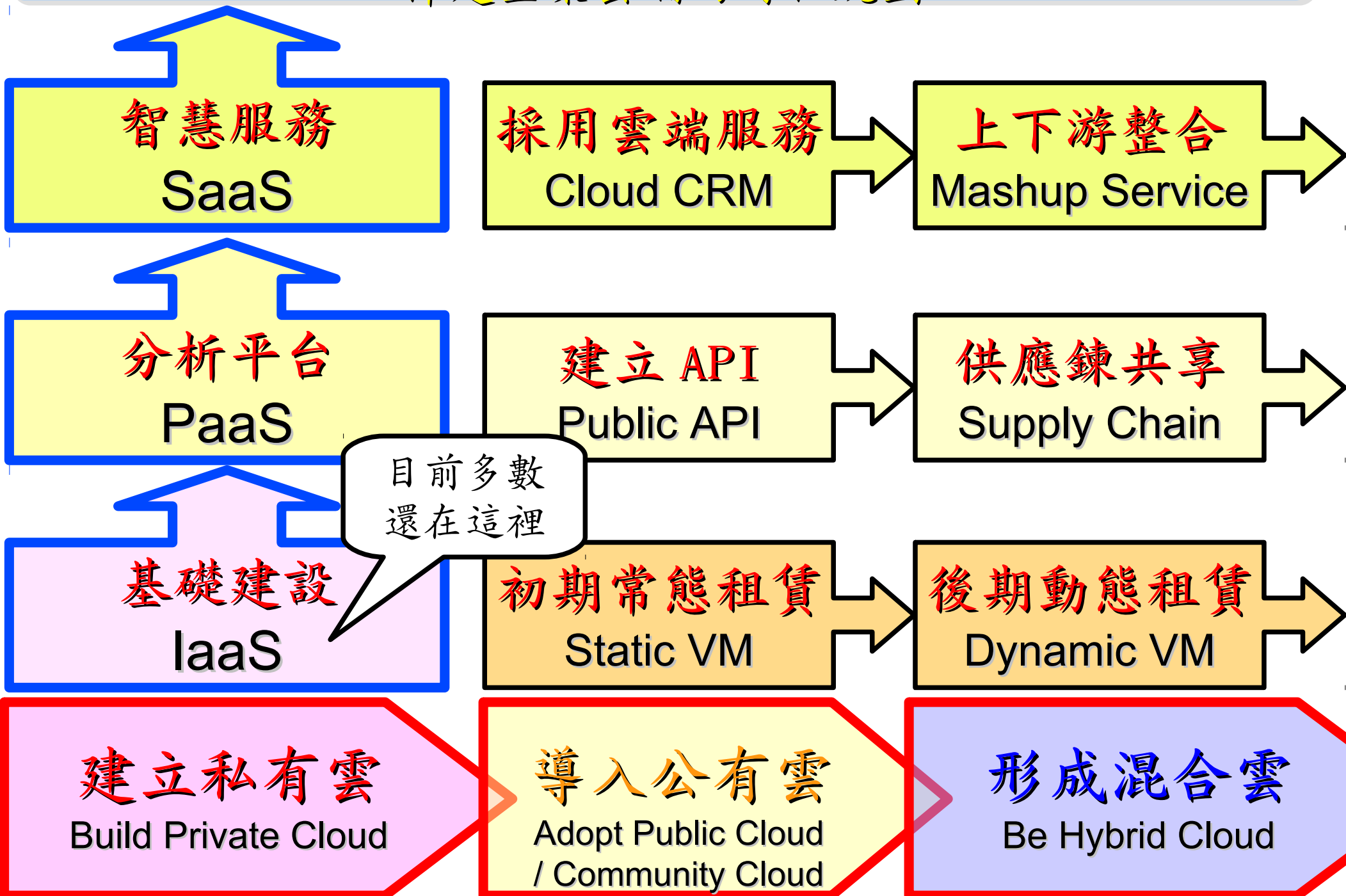
Software as a Service

軟體即服務



Roadmap to build Your Enterprise Cloud !!

佈建企業雲端的時程規劃



Agenda 演講大綱

What is Big Data ? 何謂海量資料

Why should we care? 為何需要關切

When to deploy it ? 何時導入技術

How to handle it ? 三大因應策略

儲存虛擬化 Dedup.

資料安全 Security

智慧服務 SaaS

HOW



花精靈-麗兒

Three Solutions !! 三種服務模式 vs. 三類因應對策

SaaS

Software as a Service

軟體即服務

Web 2.0

網頁服務

(A) 提供 API 介面

(B) 分散式資料庫

PaaS

Platform as a Service

平台即服務

Data Analysis

資料分析

(A) 資料整合

(B) 資料探勘

IaaS

Infrastructure as a Service

架構即服務

Virtualization

虛擬化技術

(A) 儲存虛擬化

(B) 備援與加密

Agenda 演講大綱

What is Big Data ? 何謂海量資料

Why should we care? 為何需要關切

When to deploy it ? 何時導入技術

How to handle it ? 三大因應策略

Who is key player ? 誰是成功關鍵



Data Scientist !! 資料科學家 !!

Data scientist: The hot new gig in tech

By Michal Lev-Ram, writer September 6, 2011: 5:00 AM ET

Companies that want to make sense of all their bits and bytes are hiring so-called data scientists - if they can find any.



ILLUSTRATION: GAVIN POTENZA

FORTUNE -- The unemployment rate in the U.S. continues to be abysmal (9.1% in July), but the tech world has spawned a new kind of highly skilled, nerdy-cool job that companies are scrambling to fill: data scientist.

會「統計」的人照過來！

財星雜誌 (FORTUNE) 等均報導今年最熱門的職缺是「資料科學家」！

What is data science?

Data science can be broken down into four essential parts.

Mining data



Collecting and formatting the information

Statistics



Information analysis

Interpret



Representation or visualization in the form of presentations, infographics, graphs or charts

Leverage



Implications of the data, application of the data, interaction using the data and predictions formed from studying it