



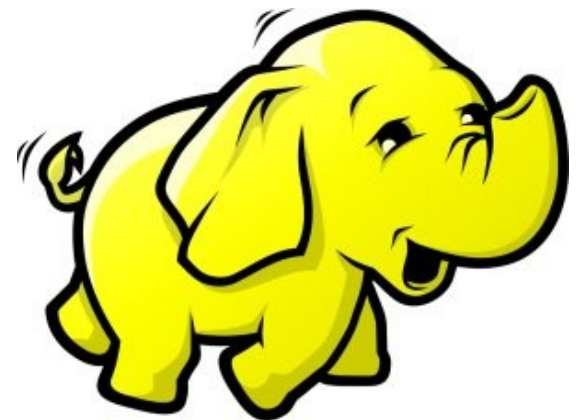
處理巨量資料的資訊架構與關鍵技術

Technologies to build IT Stack for Big Data

Jazz Wang

Yao-Tsung Wang

jazz@nchc.org.tw



Hot Jobs in Big Data

從巨量資料的熱門工作談起

Data Mining

資料探勘

Data Visualization

資料視覺化

Data Analysis

資料分析

Data Manipulation

資料操控

Data Discovery

資料鑑識

How to Get a Hot Job in Big Data, Dan Tynan, InfoWorld, March 19, 2012

出處：<http://www.cio.com/article/print/702388>

Applications of Data Mining

資料探勘的應用 - 搜尋引擎

搜尋結果

檔案搜尋

網址(D) 搜尋結果

搜尋小幫手

您想要搜尋什麼?

- 圖片、音樂，或視訊(P)
- 文件(文字處理、試算表，等等)(O)
- 所有檔案和資料夾(L)
- 電腦或人員(C)
- 說明和支援中心裡的資訊(I)

您也可能想要...

- 搜尋網際網路(S)
- 變更喜好(G)



0 個物件

Gmail Calendar Documents Photos Sites Web More -

Search

All Mail

From

To

Subject

Has the words

Doesn't have

Has attachment

Date within 1 day of

Examples: f

Create

信件搜尋

發的交談

jarwin.nchc.org.tw 於 2011年12月02日 (週五) 10時53分46秒 的交談

日 (週五)

- (10時53分48秒) Shunfa 楊順發
- (10時53分51秒) Jazz Yao-Tsung
- (10時54分08秒) Shunfa 楊順發
- (10時54分42秒) Jazz Yao-Tsung
- (10時54分49秒) Jazz Yao-Tsung
- (10時54分51秒) Jazz Yao-Tsung
- (10時55分02秒) Shunfa 楊順發
- (10時55分04秒) Shunfa 楊順發
- (10時55分39秒) Jazz Yao-Tsung

尋找(F)

關閉(C)

即時通訊搜尋

IEEE Xplore[®] DIGITAL LIBRARY

IEEE

BROWSE

- Journals & Magazines
- Conference Proceedings
- Standards
- Books
- Educational Courses

SIGN IN

Search 3,076,887 documents

SEARCH

Advanced Search | Preferences | Search Tips

資料庫搜尋

「網頁搜尋」

設Yahoo!奇摩為首頁 資訊展PK線上搶先

YAHOO! 奇摩

網頁 | 知識+ | 圖片 | 影片 | 部落格 | 字典 | 新聞 | 購物^{BETA}

網頁搜尋

熱門: 第一美腿 12歲父親 嫩模女神 幼稚病 51區 花心星座 解夢 知識: 傷口癢竟是 電鍋料理

2011 資訊月 ONLINE 3C特展搶先看!!

Applications of Data Visualization

資料視覺化的應用 - Infographics

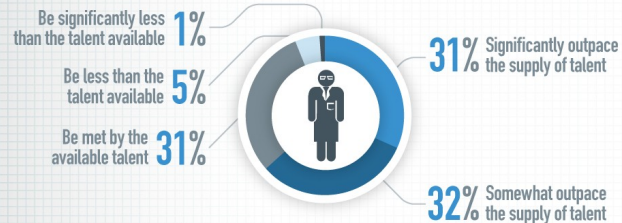
Data Scientist Study



The explosion in digital data, bandwidth and processing power – combined with new tools for analyzing the data – has sparked massive interest in the emerging field of data science. Organizations of all sizes are turning to people who are capable of translating this trove of data – created by mobile sensors, social media, surveillance, medical imaging, smart grids and the like – into predictive insights that lead to business value. Despite the growing opportunity, demand for data scientists has outpaced supply of talent, and will for the next five years. Who are data science practitioners, what skills do they need, and why are they so different?

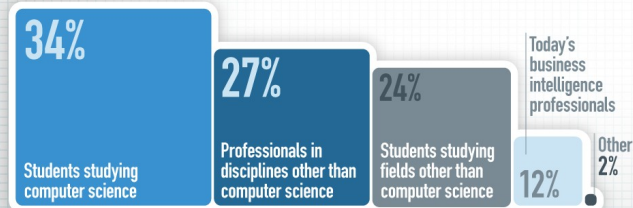
Over 2/3 believe demand for talent will outpace the supply of data scientists

OVER THE NEXT FIVE YEARS, DEMAND FOR DATA SCIENTISTS WILL:



Only 12% see today's BI professional as the best source for new data scientists

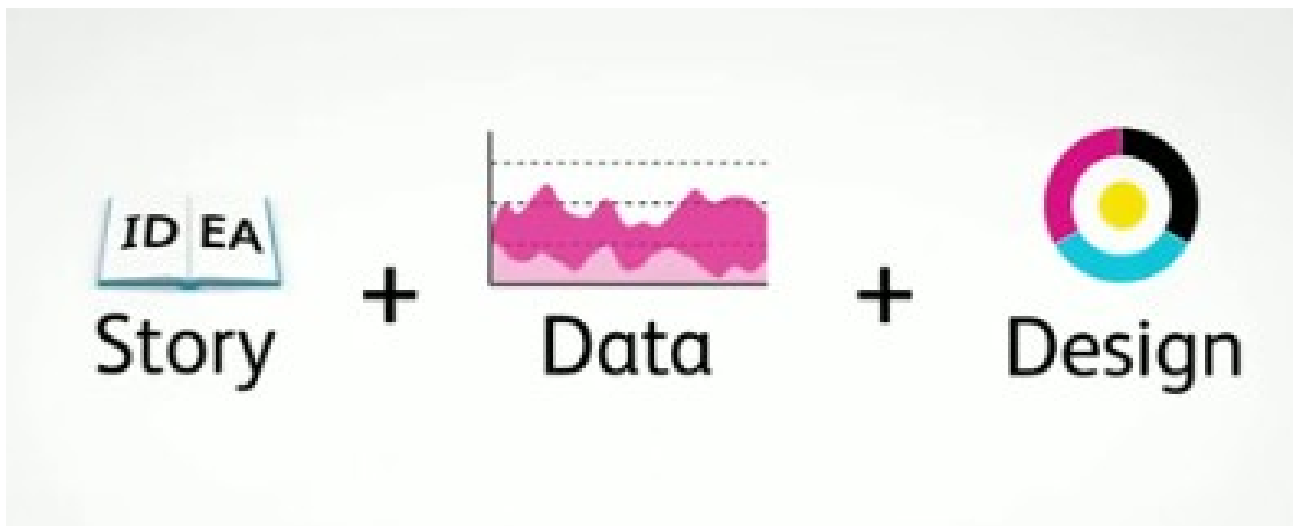
THE BEST SOURCE OF NEW DATA SCIENCE TALENT IS:



DUO TO THE ROUNDING, SOME PERCENTAGES MAY NOT ADD UP TO 100

Lack of training and resources are the biggest obstacle to data science in organizations

THE BIGGEST OBSTACLE TO DATA SCIENCE ADOPTION IN OUR ORGANIZATION IS:



參考來源：未來「夯」職業：資料科學家
淺談超吸睛的資訊圖表

<http://www.bnext.com.tw/print/article/id/21740>
<http://www.inside.com.tw/2011/04/13/infographics>

Applications of Data Analysis

資料分析的應用 - 商業智慧 (BI)

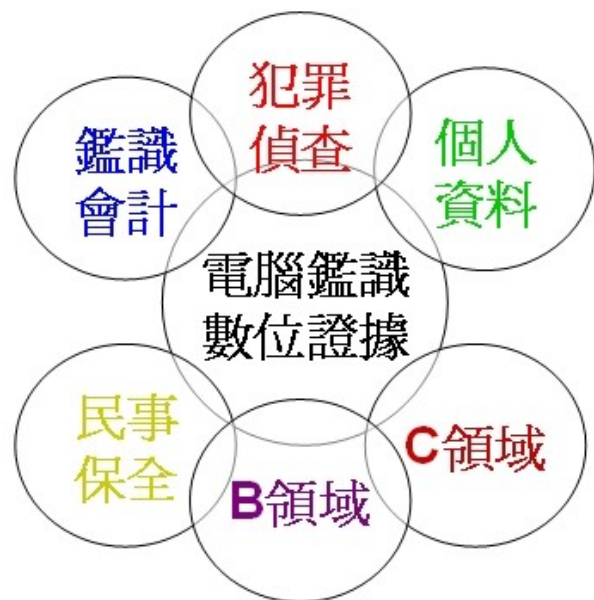


Applications of Data Discovery

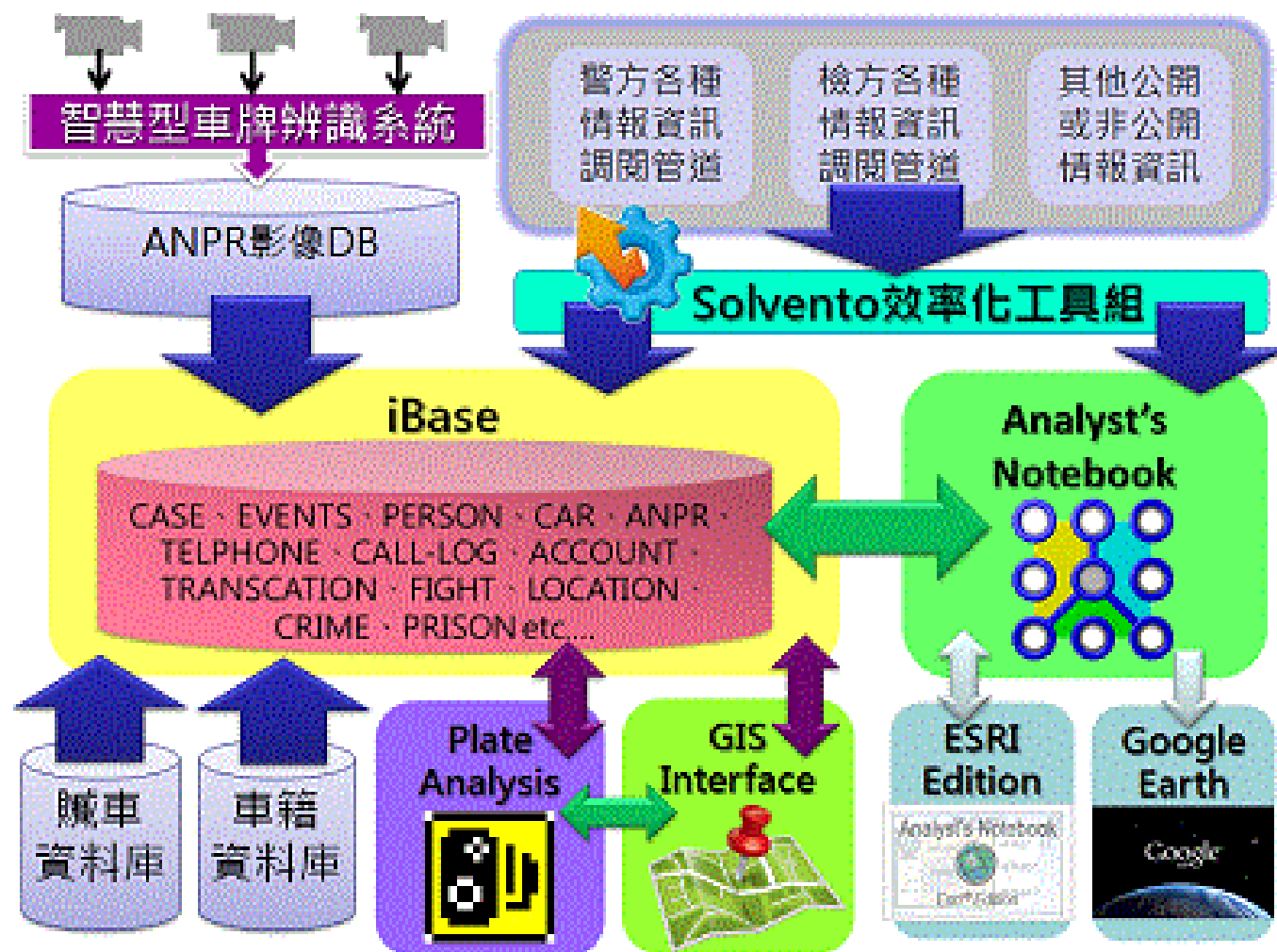
數位鑑識 - 資訊與法律的結合

電腦鑑識 & 會計鑑識

http://www.solventsoft.com/upload/ANPR_02s.gif

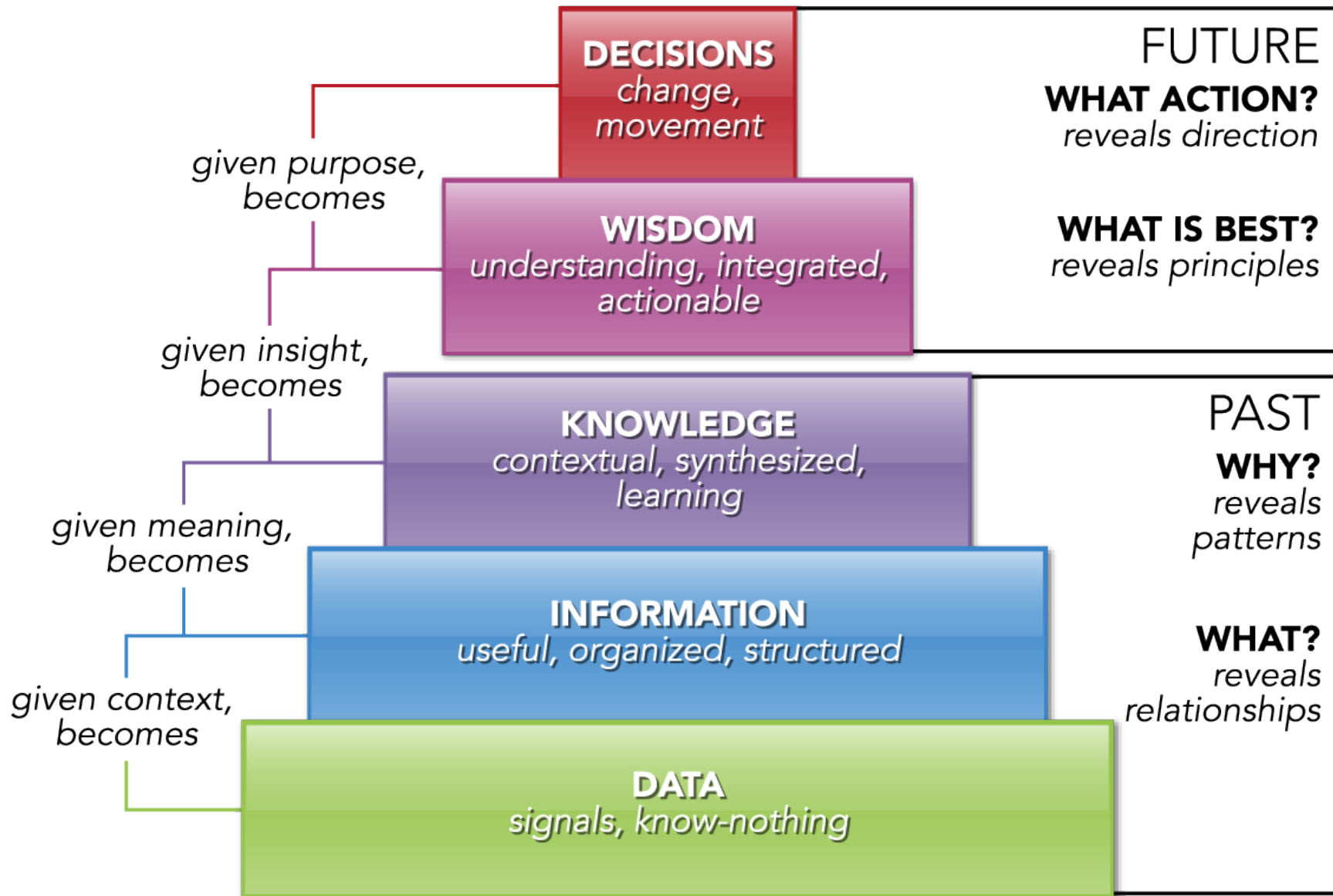


<http://blog.udn.com/kf0630/6018593>



Data, Information, Knowledge, Wisdom

知識管理模型：資料、資訊、知識與智慧



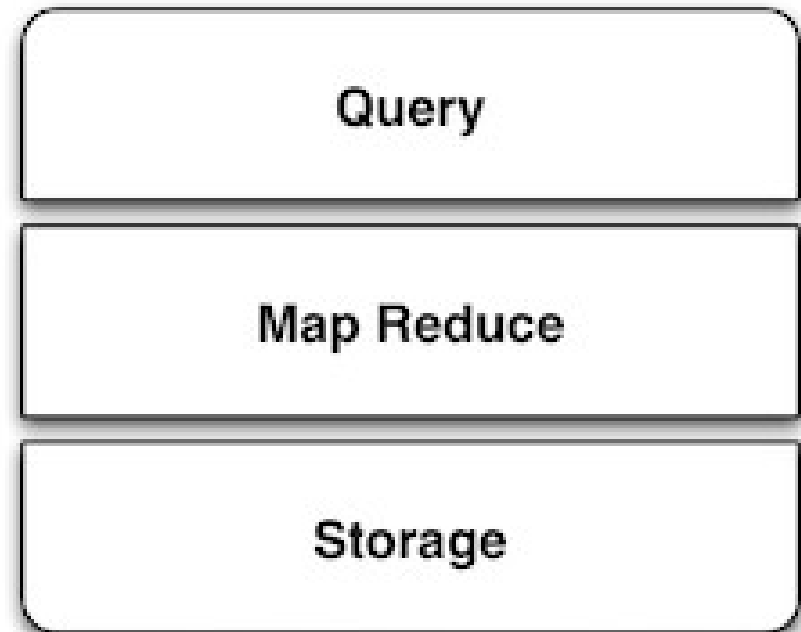
The SMAQ stack for big data

巨量資料處理的資訊架構

做網頁相關的人可能聽過 LAMP



未來處理海量資料的人必需知道
SMAQ (Storage, MapReduce and Query)



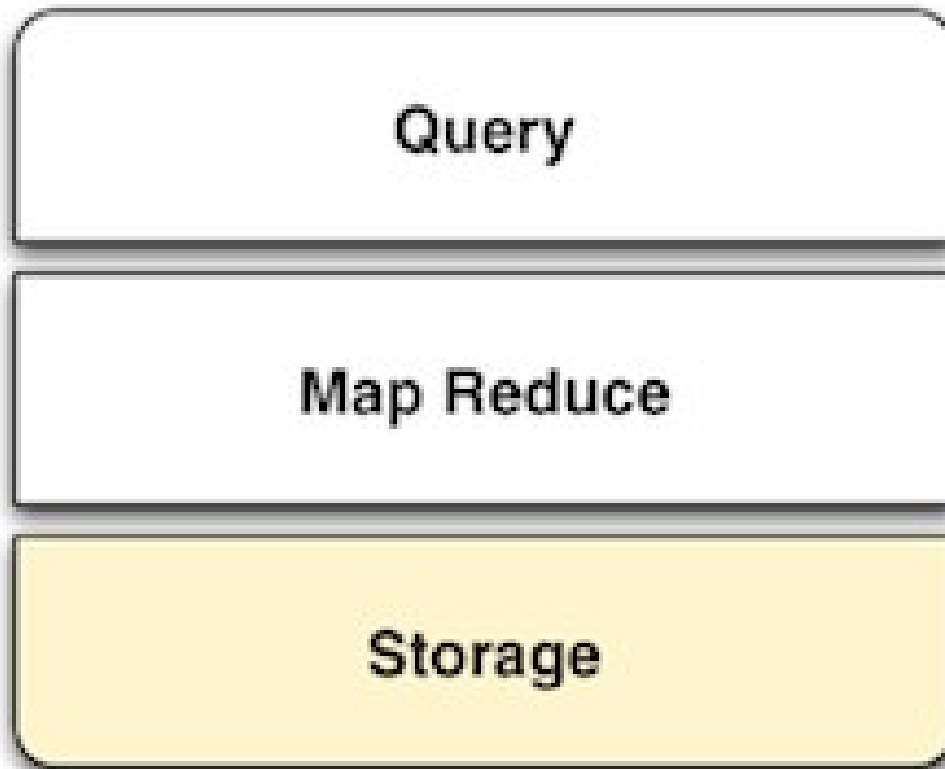
參考來源：The SMAQ stack for big data，Edd Dumbill，22 September 2010，

<http://radar.oreilly.com/2010/09/the-smaq-stack-for-big-data.html>

圖片來源：<http://smashingweb.ge6.org/wp-content/uploads/2011/10/apache-php-mysql-ubuntu.png> 8

The SMAQ stack for big data

巨量資料處理的資訊架構



用來儲存分散、沒有關聯
的非結構化資料

Key features

- Distributed
- Non-relational or unstructured

The SMAQ stack for big data

巨量資料處理的資訊架構

運用批次處理的方式，將
運算工作平均分散到許多
的伺服器做運算。

Query

Map Reduce

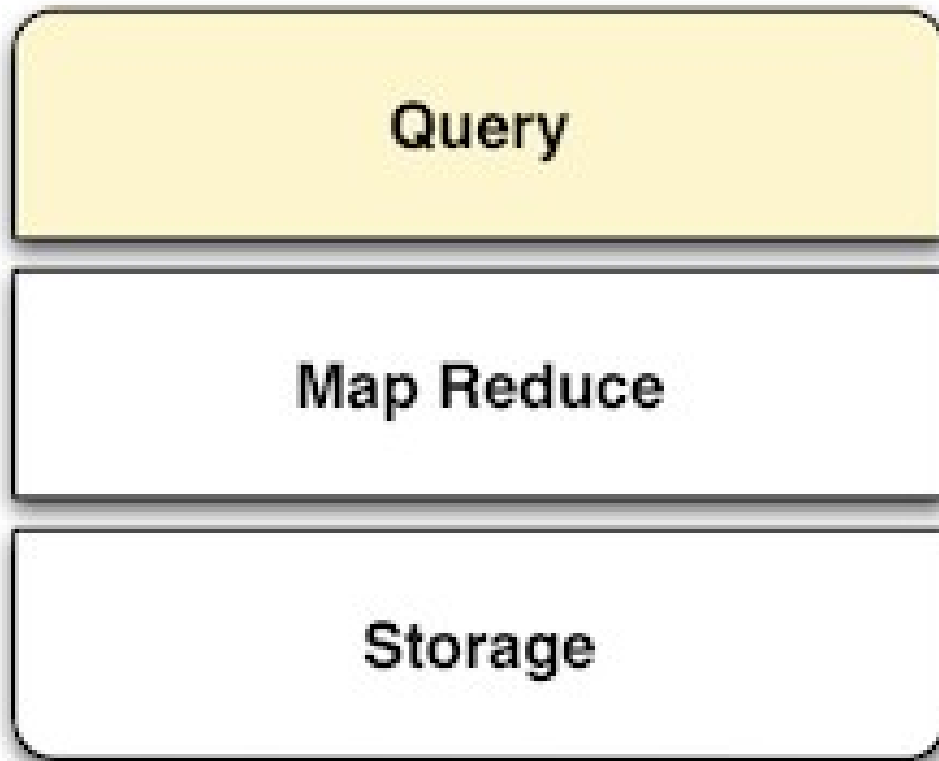
Storage

Key features

- Distributes computation over many servers
- Batch processing model

The SMAQ stack for big data

巨量資料處理的資訊架構



Key features

- Efficient way of defining computation
- Platform for user friendly analytical systems

將算完的結構化資料儲存到可供查詢的資料庫系統

Three Core Technologies of Google

Google 的三大關鍵技術

- Google 在一些會議分享他們的三大關鍵技術
- Google shared their design of web-search engine
 - SOSP 2003 :
 - “The Google File System”
 - <http://labs.google.com/papers/gfs.html>
 - OSDI 2004 :
 - “MapReduce : Simplified Data Processing on Large Cluster”
 - <http://labs.google.com/papers/mapreduce.html>
 - OSDI 2006 :
 - “Bigtable: A Distributed Storage System for Structured Data”
 - <http://labs.google.com/papers/bigtable-osdi06.pdf>



Open Source Mapping of Google Core Technologies

Google 三大關鍵技術對應的自由軟體

BigTable

A huge key-value datastore

HBase, Hypertable
Cassandra,

MapReduce

To parallel process data

Hadoop MapReduce API
Sphere MapReduce API, ...

Google File System

To store petabytes of data

Hadoop Distributed File System (HDFS)
Sector Distributed File System

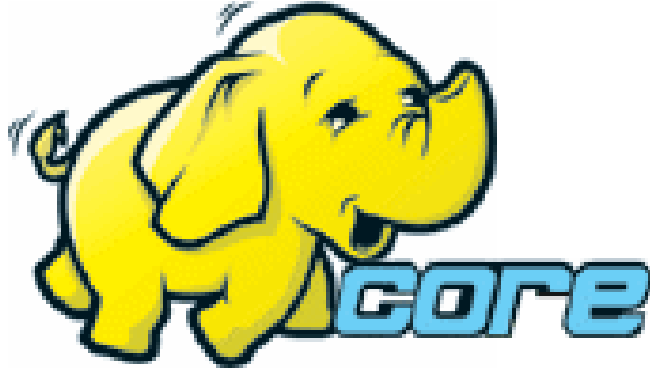
更多不同語言的 MapReduce API 實作：

<http://trac.nchc.org.tw/grid/intertrac/wiki%3Ajazz/09-04-14%23MapReduce>

其他值得觀察的分散式檔案系統：

- IBM GPFS - <http://www-03.ibm.com/systems/software/gpfs/>
- Lustre - <http://www.lustre.org/>
- Ceph - <http://ceph.newdream.net/>

Hadoop

- <http://hadoop.apache.org>
 - Hadoop 是 Apache Top Level 開發專案
 - **Hadoop is Apache Top Level Project**
 - 目前主要由 Yahoo! 資助、開發與運用
 - **Major sponsor is Yahoo!**
 - 創始者是 Doug Cutting，參考 Google Filesystem
 - **Developed by Doug Cutting, Reference from Google Filesystem**
 - 以 Java 開發，提供 HDFS 與 MapReduce API。
 - **Written by Java, it provides HDFS and MapReduce API**
 - 2006 年使用在 Yahoo 內部服務中
 - **Used in Yahoo since year 2006**
 - 已佈署於上千個節點。
 - **It had been deploy to 4000+ nodes in Yahoo**
 - 處理 Petabyte 等級資料量。
 - **Design to process dataset in Petabyte**
- 
- Facebook、Last.fm
、Joost are also
powered by Hadoop**

Sector / Sphere

- <http://sector.sourceforge.net/>
- 由美國資料探勘中心研發的自由軟體專案。
- **Developed by National Center for Data Mining, USA**
- 採用 C/C++ 語言撰寫，因此效能較 Hadoop 更好。
- **Written by C/C++, so performance is better than Hadoop**
- 提供「類似」Google File System 與 MapReduce 的機制
- **Provide file system similar to Google File System and MapReduce API**
- 基於UDT高效率網路協定來加速資料傳輸效率
- **Based on UDT which enhance the network performance**
- Open Cloud Testbed有提供測試環境，並開發Ma1Stone效能評比軟體
- **Open Cloud Consortium provide Open Cloud Testbed and develop Ma1Stone toolkit for benchmark**

Sector-Sphere

National Center for Data Mining
University of Illinois at Chicago

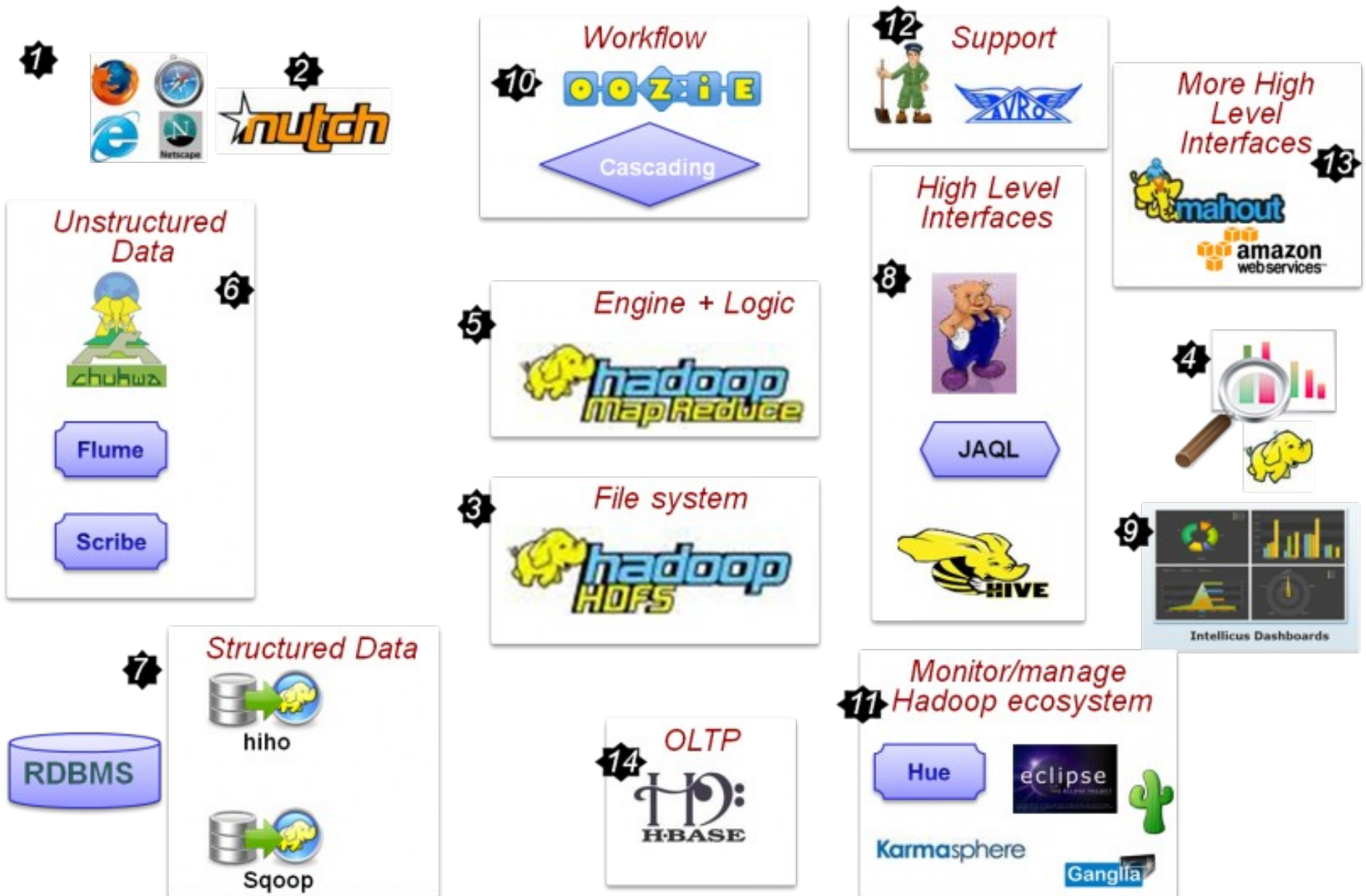


Open Data Group

<http://www.opendatagroup.com/>

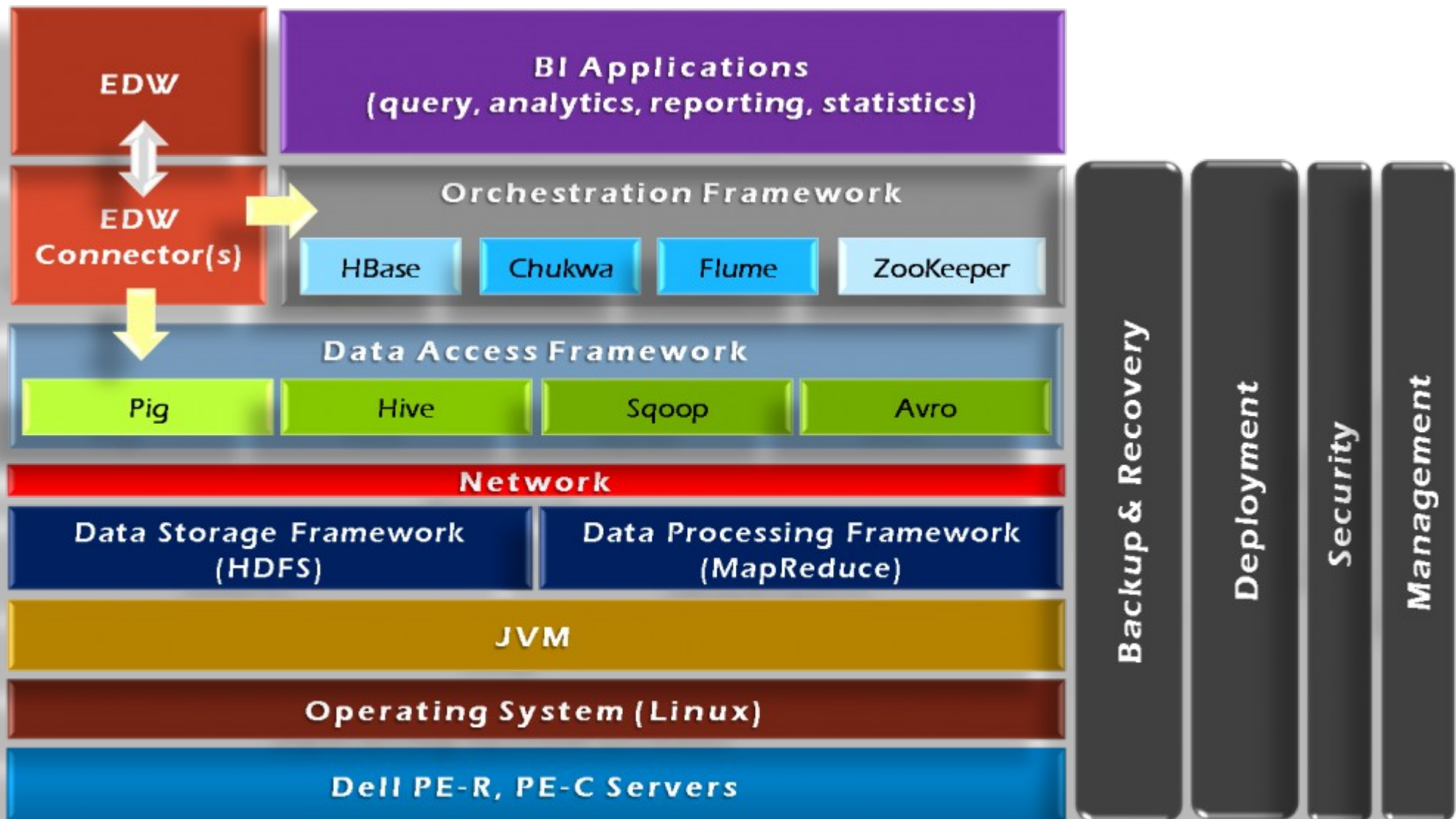
Why we choice Hadoop? Good Ecosystem!

豐富的生態系建構出處理海量資料的工具庫



BI and EDW build on Hadoop Ecosystem

運用 Hadoop 生態系搭建資料倉儲與商業智慧分析



Build your own search engine, too

您也能用 **Hadoop** 搭建自己的搜尋引擎

Web UI (Crawlzilla Website + Search Engine)

JSP + Servlet +
JavaBean

Nutch

Lucene

Crawlzilla System Management

Tomcat

Hadoop

PC1

PC2

PC3

Microsoft love Hadoop, too

微軟幫 Azure 還有 SQL Server 都接上 Hadoop



The screenshot shows the Microsoft SQL Server website. At the top, there's a navigation bar with 'SQL Server', 'All Microsoft Sites', 'United States', 'Change', 'Search Microsoft', 'bing', and 'Web'. Below this is the Microsoft SQL Server logo and a 'Contact Us' button. A menu bar includes 'About SQL Server', 'Solutions & Technologies', 'Editions', 'Get SQL Server', 'Learning Center', and 'Partners'. The main content area is titled 'Business Intelligence' and features a 'Share this page' button. A red banner highlights 'Big Data Analytics'. The main content area is titled 'Big Data Solution' and contains a video player for 'Strata Big Data Conference 2012 and Power View Contest' and a text block describing the solution. Below the text is a 'Key Benefits' section with two bullet points.

SQL Server | All Microsoft Sites | United States | Change | Search Microsoft | bing | Web

Microsoft SQL Server

Contact Us >

f t YouTube

About SQL Server | Solutions & Technologies | Editions | Get SQL Server | Learning Center | Partners

Business Intelligence

Share this page

Big Data Analytics

Big Data Solution

Unlock business insights from all your structured and unstructured data, including large volumes of data not previously activated, with Microsoft's Big Data solution. Microsoft's end-to-end roadmap for Big Data embraces Apache Hadoop™ by distributing enterprise class Hadoop based solutions on both Windows Server and Windows Azure. Our solution is also integrated into the Microsoft BI tools such as SQL Server Analysis Services, Reporting Services and even PowerPivot and Excel. This enables you to do BI on all your data, including those in Hadoop.

Key Benefits

- Broader access of Hadoop to end users, IT professionals and Developers, through easy installation and configuration and simplified programming with JavaScript.
- Enterprise ready Hadoop distribution with greater security, performance, ease of management and options for Hybrid IT usage.

參考來源：Big Data Solution | Microsoft SQL Server 2008 R2

<http://www.microsoft.com/sqlserver/en/us/solutions-technologies/business-intelligence/big-data-solution.aspx>

Oracle love Hadoop, too

Oracle 也接上 Hadoop



CNET > News > Software, Interrupted

Cloudera teams up to connect Oracle and Hadoop

Cloudera and Quest software are partnering to provide connectivity between Oracle and Hadoop.



by Dave Rosenberg | June 21, 2010 5:30 AM PDT

[Follow](#)

This week [Cloudera](#), a provider of software and services for the Apache Hadoop project, is set to announce a partnership with [Quest Software](#) to develop, support, and distribute an Oracle connector for Hadoop.



Hinet Application of Big Data

中華電信已經在做的海量資料應用

Business
Next 數位時代

中華電信：分析駭客行為，拓展對外新服務

撰文者：趙郁竹

發表日期：2012-03-06



[214期雜誌精選]

全球最大的中華電信提供行動電話、市話、寬頻固網、MOD……，各種業務服務，加起來的用戶數就有3000萬，比全台灣人口還多，光是單月帳務數量就高達100億筆資料。除了電信、寬頻服務，還有日益增加的數位服務、行動增值服務，從服務內容到客戶端，累積出的資料相當驚人。

「資料量越來越大，日常分析工作需要很多時間，但新的運算技術有效解決了這個問題，」中華電信資訊處處長陳明仕說。2010年開始，因為中華電信本身的資料運算需求，採用分散式運算架構Hadoop技術，打造出大資料運算平台，不但解決了自身的資料問題，還能對外提供資料運算應用。

以MOD為例，一天有幾千萬筆資料，如何找出使用者在什麼時段做了什麼事？廣告效益又如何？「用傳統的方法，需要400分鐘才能分析完；用Hadoop大資料平台，13分鐘就能解決，節省非常多時間，」他說。

追蹤再拆解

大資料運算技術除了節省時間，還能防止駭客入侵。「駭客的攻擊行為都有模式可循，」陳明仕解釋，就像球賽一樣，了解進攻模式就能防守。用戶的資料保護是第一要務，因此透過行為模式分析，能有效保護企業資訊安全，也保障客戶的個資安全。

參考來源：中華電信：分析駭客行為，拓展對外新服務，發表日期：2012-03-06

<http://www.bnext.com.tw/print/article/id/22333>

Hinet Application of Big Data

中華電信已經在做的海量資料應用

 ithome.com.tw

中華電信用Hadoop技術分析通話明細

 READ LATER

面對資料快速成長以及非結構性資料的增加，中華電信資訊處第四科科長楊秀一表示，中華電信近來利用Hadoop雲端運算技術自行開發了一個專門用來分析非結構化資料的巨量資料（Big Data）運算平臺，嘗試在資料進到資料倉儲系統之前，先進行資料的分析與處理以減少資料倉儲的資料量。

近年來行動語音市場趨於飽和，為了掌握用戶特性進行客製化行銷，一份資料要進行分析，就會被多次複製，因此即使用戶增加趨緩，但中華電信擁有的資料量仍快速暴增。

中華電信用來分析的資料模型最早於10多年前已有雛形，但當初主要用於行動語音分析。一直到2009年，他們完整導入Teradata的電信業邏輯資料模型cLDM 9.0版，整合更多電信服務的用戶資料。楊秀一表示，當初導入該模型的目的主要是為了整合行動語音、固網、數據的資料，進行以人為中心的分析模式。在導入之前，中華電信的資料模型是以設備為中心，因為不同設備的記錄資料儲存在不同的資料庫，無法進行整合性的分析。

參考來源：中華電信用 Hadoop 技術分析通話明細，發表日期：2011-06-12
<http://www.ithome.com.tw/itadm/article.php?c=68023>