金融與科技之結合--數位金融為金融業帶來之衝擊

國家高速網路與計算中心

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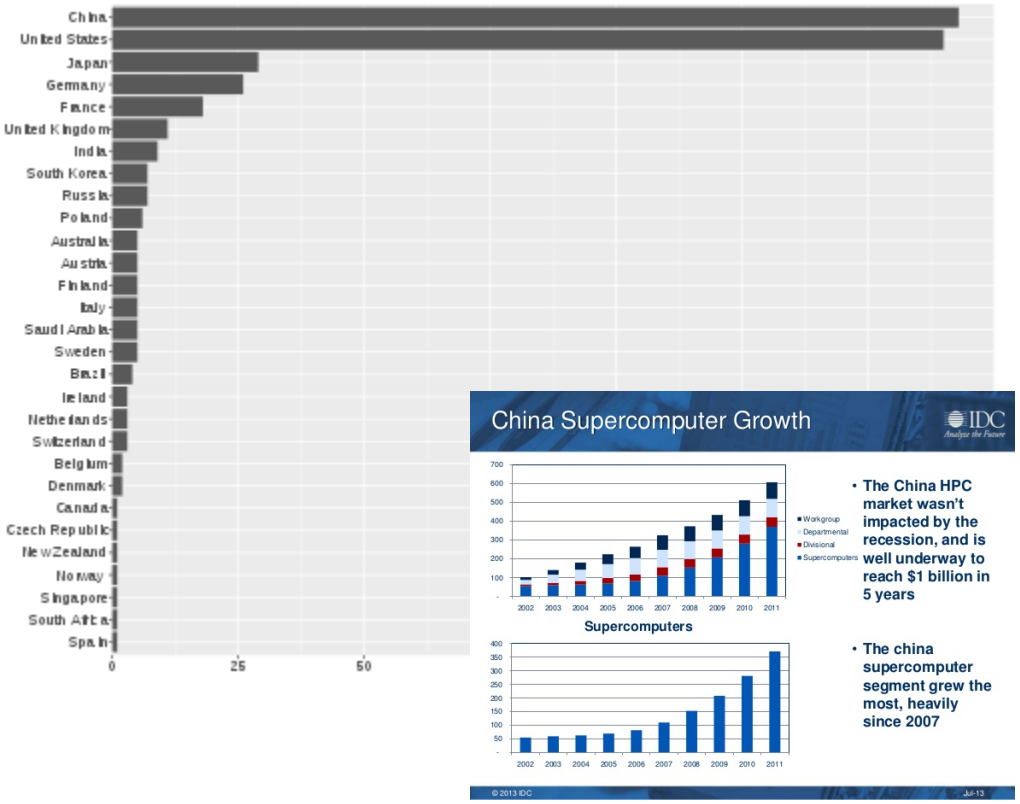
NARLabs 國家實驗研究院
國家高速網路與計算中心

第十三屆金融與經濟政策研討會

數位科技: Citius, Altius, Fortius

(Faster, Higher, Stronger)

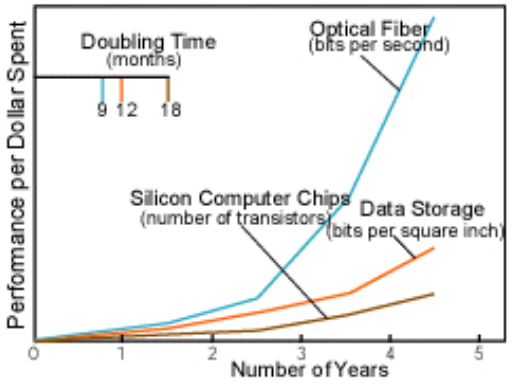
- September 2016, Scientists in Germany have achieved internet speeds averaging a sustained 1 terabit per second **(1 Tbps)** on an optical fibre network. -> heralding **new internet era.**
- Peta-scale storage within **$100K**.
- **Use on demand!**



Research and Education Network

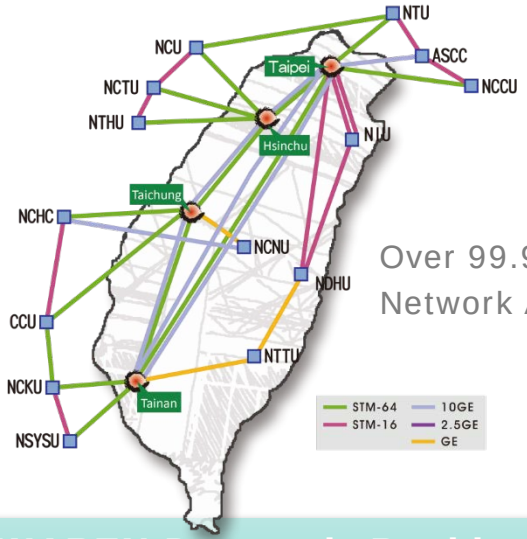
TaiWan Advanced & REsearch Network

- **100G Bandwidth**
  - 12 regional networks
  - 94 universities & research institutes
  - 500 K. users
- Link with TANet: 4000 schools, 4.5 M. users



- **20G Bandwidth**

w/35 int'l research networks



Over 99.99%
Network Availability

TWAREN Domestic Backbone

TWAREN International Connection

數位科技與金融業

- 數位科技
  - HPC、Cloud、IoT 、Big Data、AI
  - Cyberinfrastructure Applications
    - Enablement of following examples
      - Virtualized operations & services
      - High speed/high frequency trading
      - Blockchain
      - Deep learning
  - Disruptive in almost every industry (4.0)
- 數位科技應用
  - 數位科技協助金融業解決問題 (incremental)
  - 數位科技上重新思考金融本質 (Disruptive)

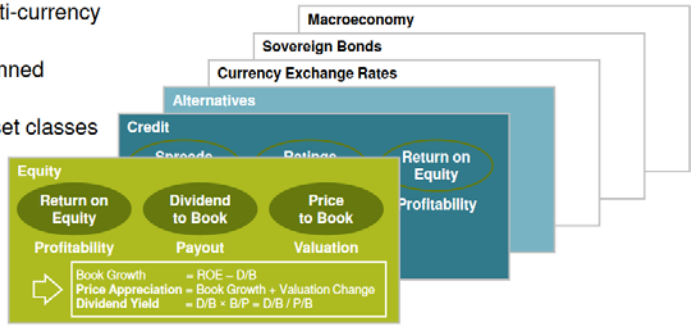
HPC impact on Finance Services

NARLabs

⇨ Intelligent

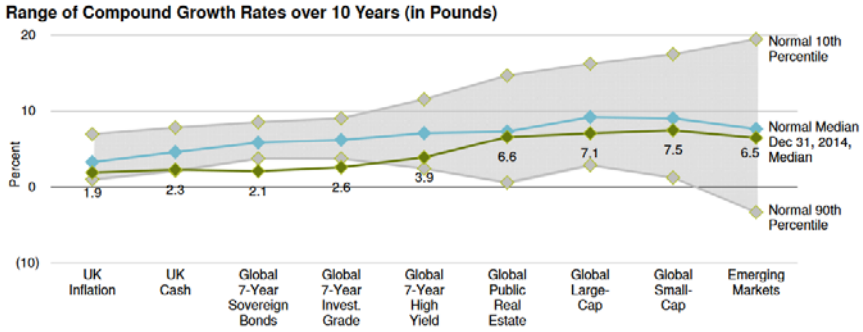
Capital Markets Engine Modelling the Economic Building Blocks of Return

- Global real-world scenarios
- Multiple horizons, multi-currency
- Economically underpinned
- Consistent across asset classes



Typically 10,000+ scenarios are needed for reliable outcomes such as converged prices and risk sensitivities and accurate measurement of tail risks

Multitude of Scenarios Captures both Risks and Returns

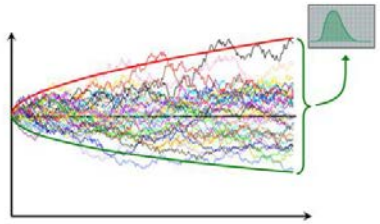


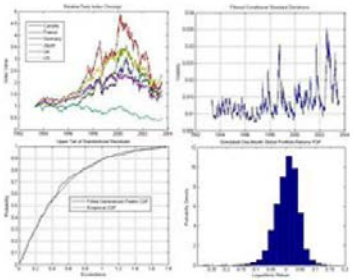
View of the future by means of probabilities, not point forecasts

As of December 31, 2014
Returns hedged into GBP and reported in GBP
Data do not represent past performance and are not a promise of actual returns or range of future results.
Source: AB

Source: Erik Vynckier

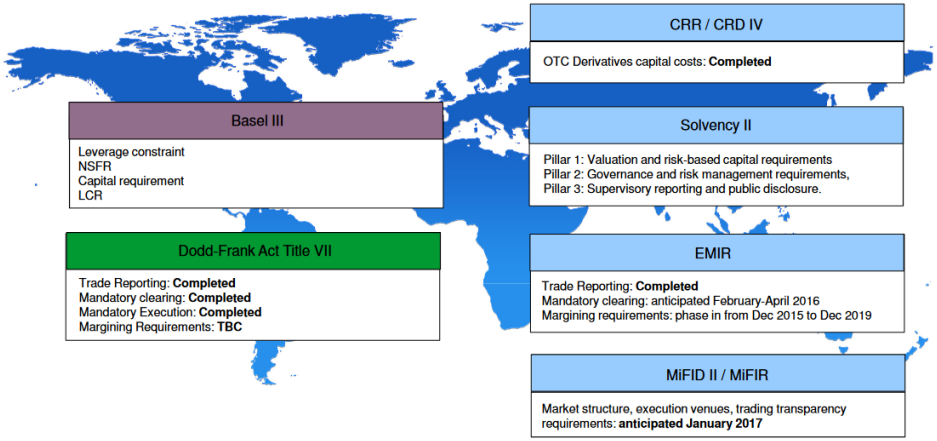
Computationally Intensive Monte Carlo Simulation in Finance Often Embarrassingly Parallel





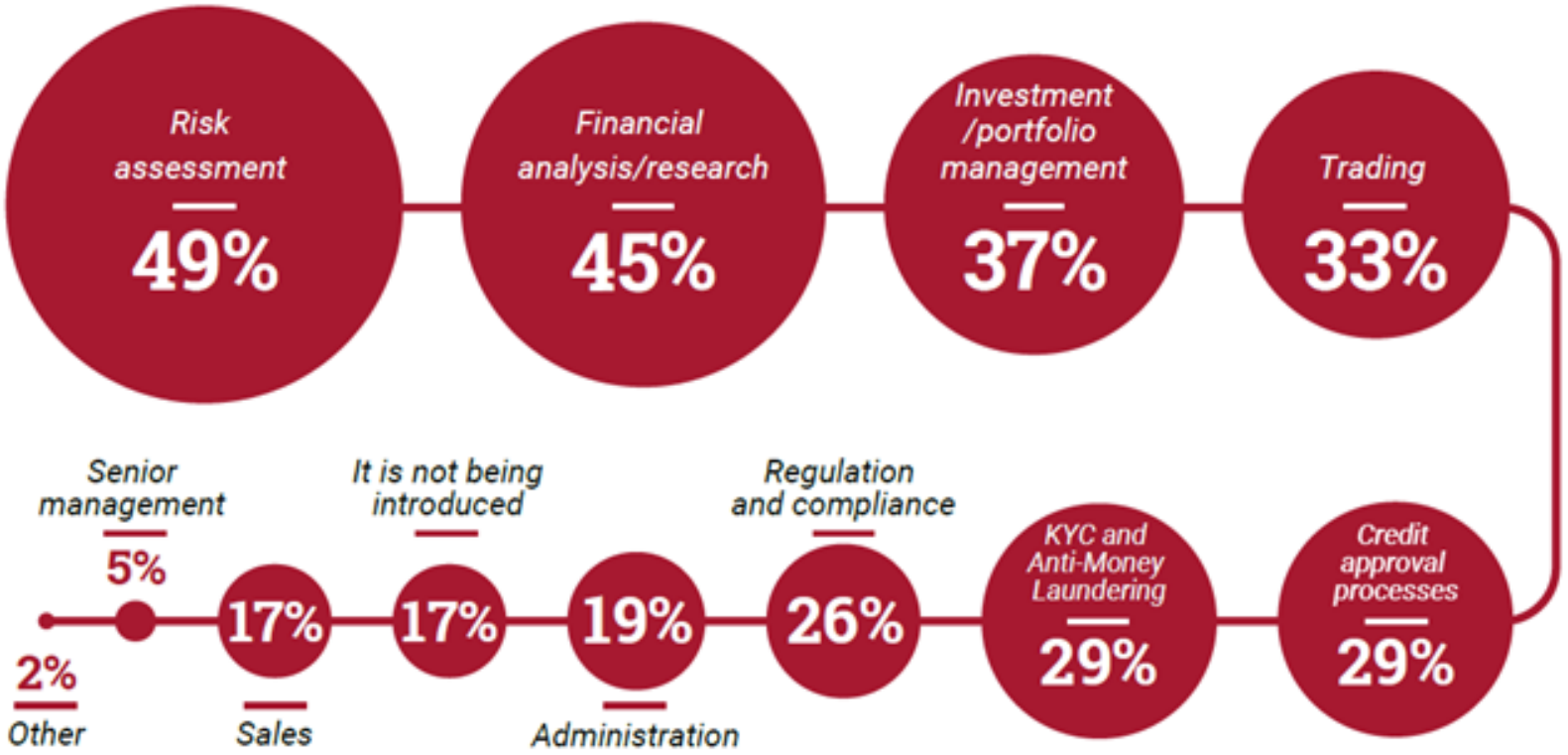
Entrenched method for modelling financial risks and deriving metrics, such as option pricing, risk sensitivities and Value @ Risk

Regulations on Capital, Derivatives and Trading Affecting Corporate Banks, Investment Banks, Pension Funds, Hedge Funds …



Where do you expect AI/machine learning technology to be introduced in your organisation in the next three years?

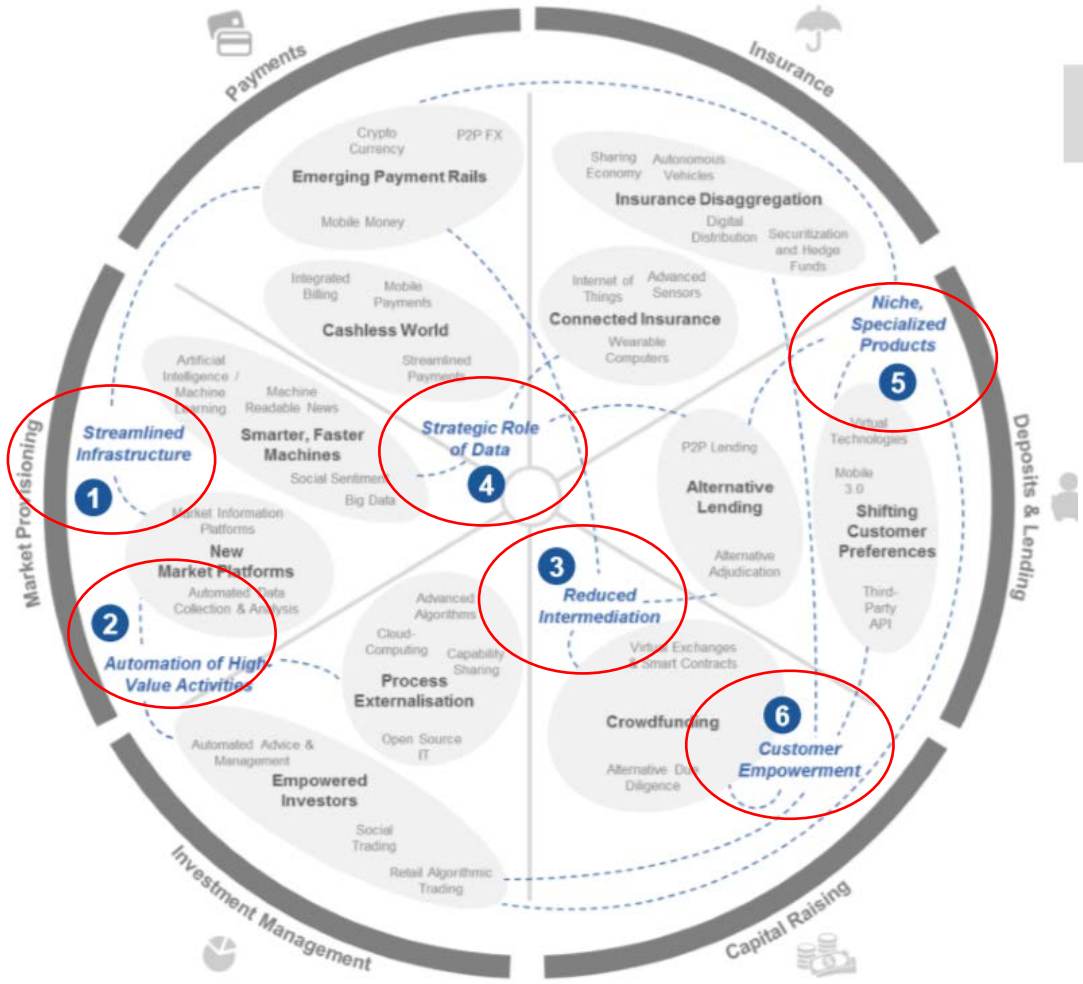
Source: Baker & McKenzie

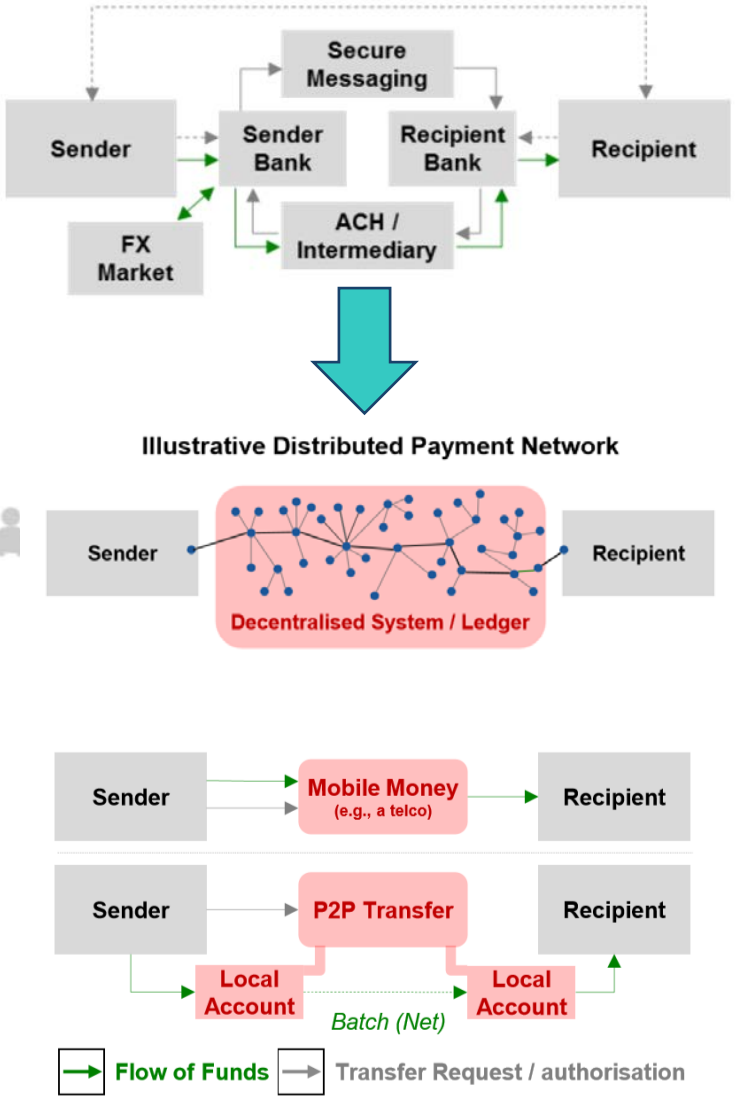


Enable “Fintech"

➡ connected & smarter

NARLabs

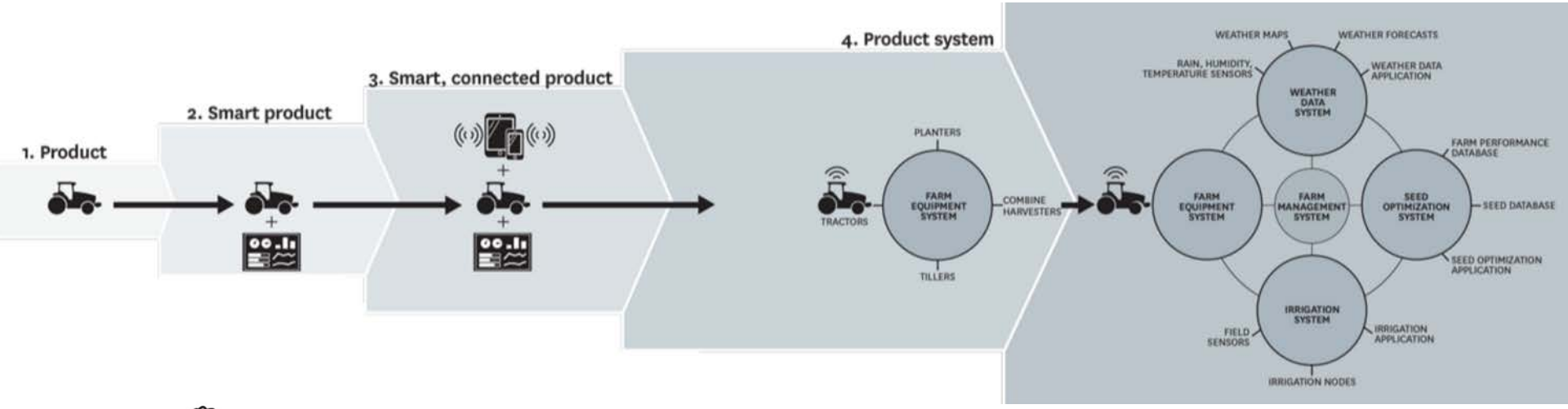


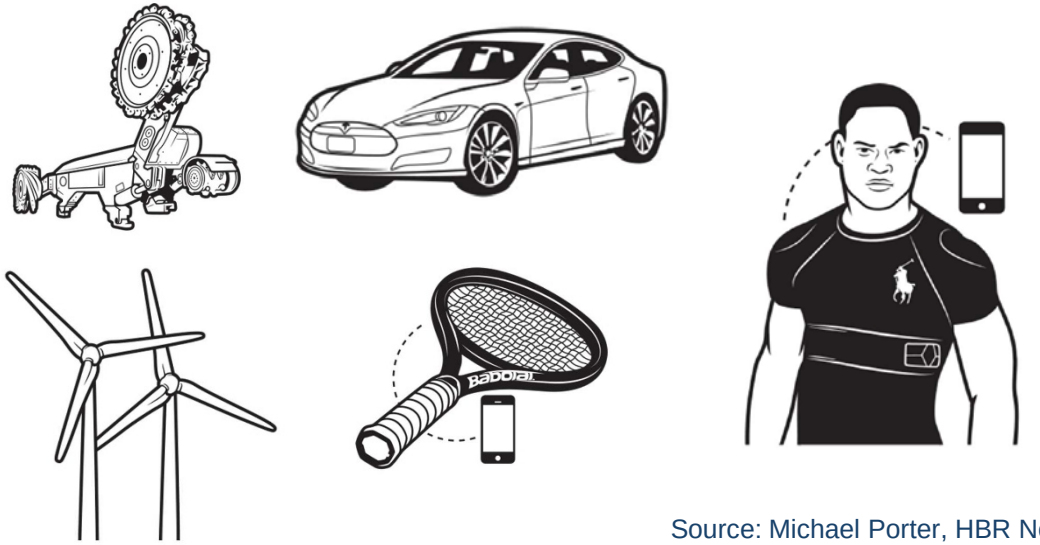


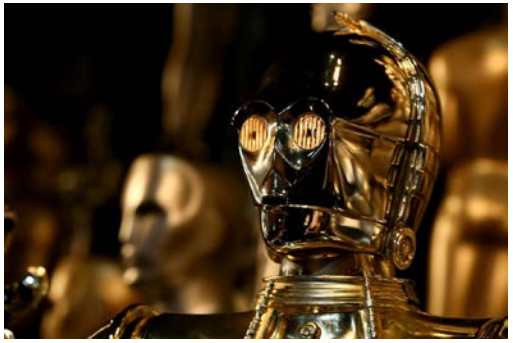
Source: WEFreport: “The Future of Financial Services”

How **Smart, Connected** Products are Transforming Competition

From **Passive, Generative** to **Intuitive**







source: *Christopher Polk/Getty Images*

Source: Michael Porter, HBR Nov, 2014

Cloud, Big Data & IoT: New Economics Opportunity

BIG DATA ECOSYSTEM : FROM DATA TO DECISIONS

IDC Analyze the Future

DATA CREATION

PRODUCERS

- Machine and Sensors
- Geolocation
- Transaction and Usage Logs
- Mobile Apps Data
- Email and Messaging
- Relationships and Social Influence

VOLUME
VELOCITY
VARIETY

DATA ACQUISITION

ARCHITECTS / ENGINEERS

- Shared Nothing Scale-out Storage + SSD
- Converged Infrastructure
- MPP + In-Memory Compute
- Hi-Speed / - Resiliency Networking
- Non-relational DWH
- Hadoop
- Cloud

SYSTEMS INTEGRATION

OBJECTIVES

- DEEP INSIGHTS
- REAL-TIME EVENTS

INFO PROCESSING

ANALYSTS / SCIENTISTS

- Data Exploration
- Contextualized Data
- Modeling / Scenarios
- Forecasting
- Stream Processing
- Event Management

DELIVERY MODELS

- ON-DEMAND
- PUSH
- EMBEDDED

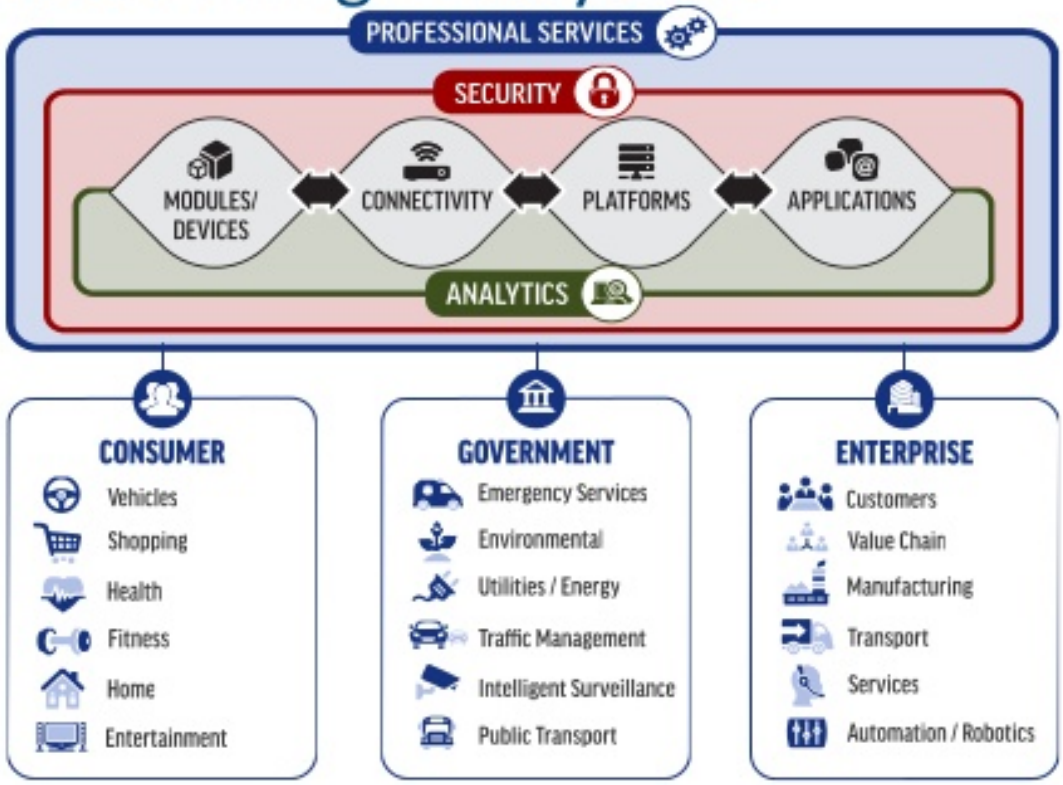
BUSINESS PROCESS

END USERS

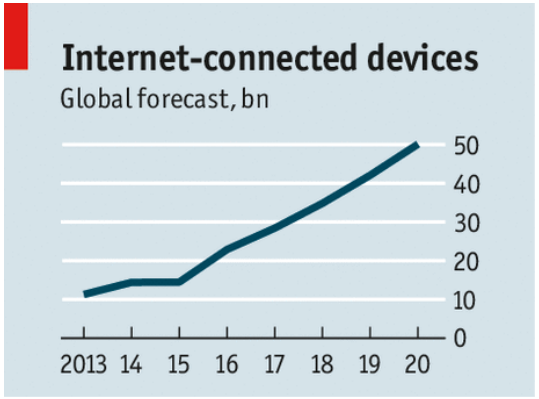
- Access-Anywhere Analytics Services
- Context-Aware Business Applications
- Location-Based Services
- Alert and Respond
- Workflow and Interaction Automation
- Smart devices and systems

VALUE

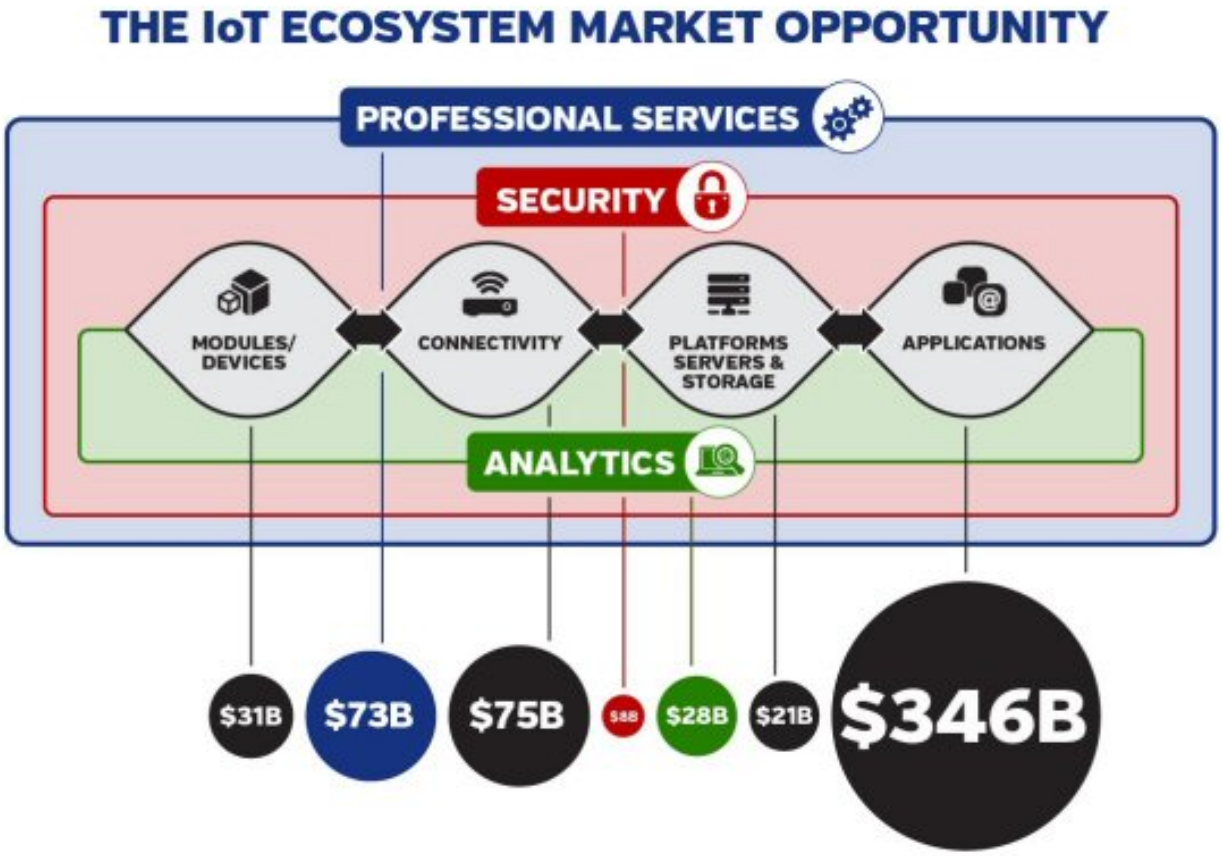
Internet of Things Ecosystem



IDC
Analyse the Future



Source: Economist



Source: IDC & Economist

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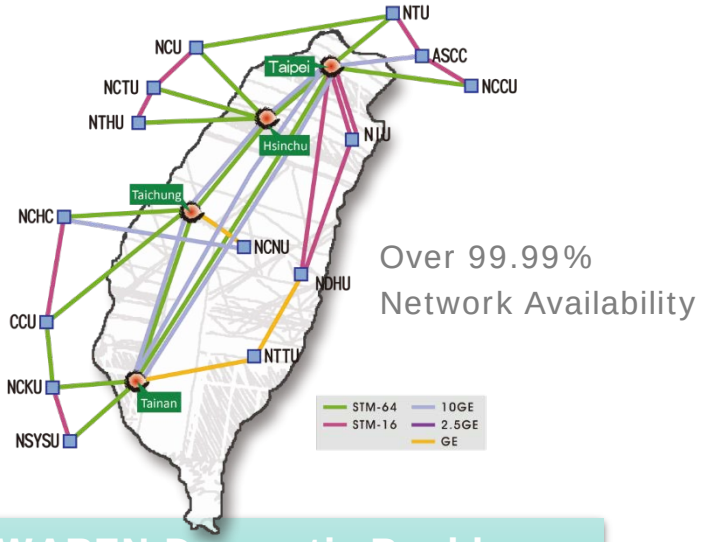

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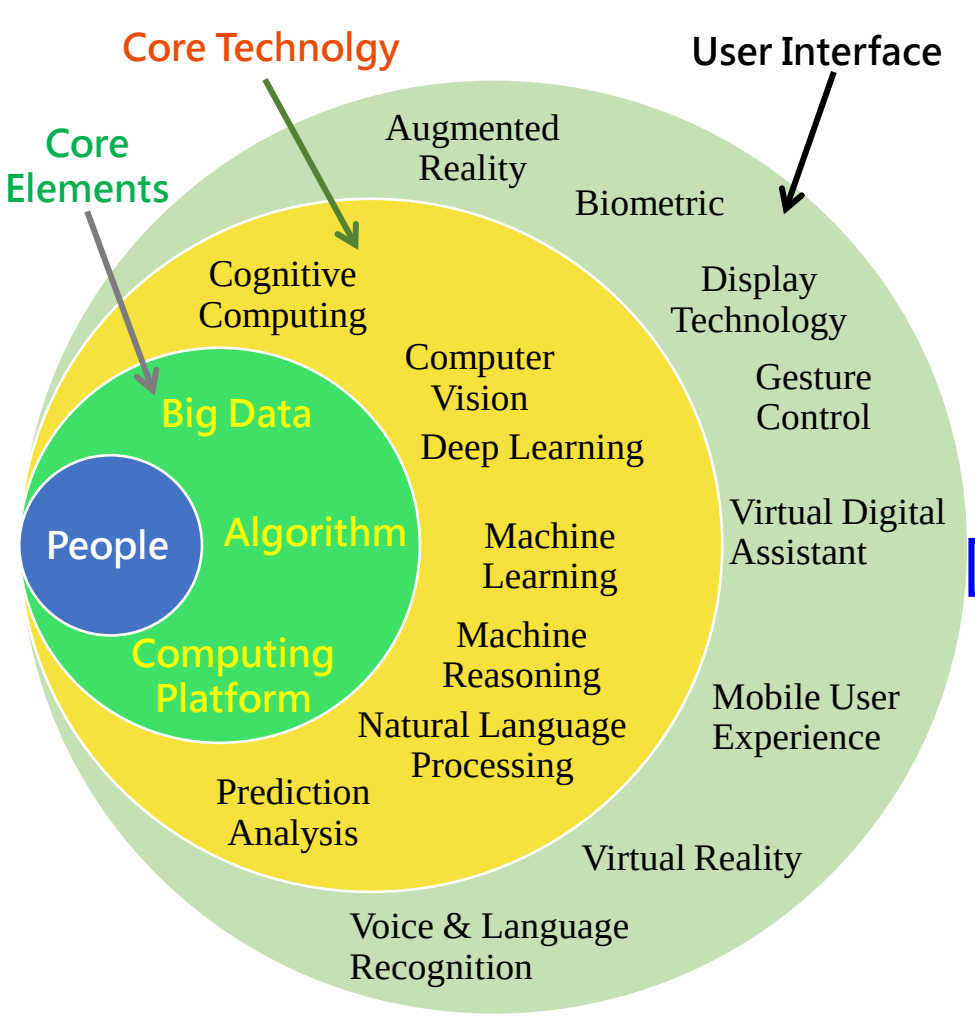
Intelligent Development & Industrial Applications



Source: Tractica · STPI

National Infrastructure for AI Computing

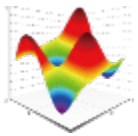
Advance Research

- Government Agencies
- Academia Sinica
- NARLabs
- Universities
- Researcdh Organizations

- Big data hub
- Data analytics
- AI computing
- Content rendering

- Cloud infra. management
- High-performance storage system

- ARM server chip
- AI chip
- High-speed interconnect


Fundamental Science


Env. & Disaster Prevention


Smart Cities


Biomed. & Pharmaceuticals


Intelligent Manufacture

Cultivate Industrial Eco-system

Cloud Software & Data Services

- AI Platform
- Big Data Analytics
- Parallel File System
- ...
- Public Data Mart
- TW biobank
- TW GIS database
- ....

Self-driving Vehicles

Intelligent Robots

Smart Home


AI


Health Care


Industry 4.0


Gene Analysis


E-commerce


Digital Finance


Humanity

- Packages of Tools & Applications
- Marketplace (III、ITRI)

Multi-tenant cloud services management (ITRI)

Cloud Service Management

CPU clusters | GPU clusters

Government & Academia

CPU clusters | GPU clusters

Industry

- System Integration of AI applications
- High Performance Data Center (TW Industry)

Tentative Capacity: 13 Pflops, 160 Pbytes

國內產學服務平台架構

十大產業創新方案

創新研發

新創產業


教育部人才培育

雲端服務使用者

國研院國網中心雲端服務與大資料運算平台

客製化應用開發者

演算法與程式開發者

資料擁有者

應用包 | 生醫 | 民生 | 環境災防 | 新農業 | 能源 | 智慧機械 | 智慧城市 | …

軟體工具 | 人工智慧 | 大數據 | 機器學習 | 各類演算法模擬程式

資料 | TW Biobank 癌症基因 | 空氣品質長照 | 台灣空間資訊氣候變遷 | 台灣農業國際農業 | …

基礎設施


高速運算主機(CPU, GPU)


儲存

客製應用整合

API管理平台

Thank You !