Generate Alpha.

The Rise & Fall (and Rise & Fall) of Data Center Services Demand in the Era of One Trillion Endpoints…

…and What That Means For You.

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Outline

- One Trillion Endpoints & Next-Gen Entrepreneurs
- Opportunities
- Summary
- Questions

Headlines

✓ In 2008, **3.8% of all adults** using the internet used Twitter. This **increased by 2 million users in 2009** and currently **10.8% of all adults** using the internet use Twitter, approximately 18.5 million adults. (eMarketer)

✓ **400 million users** currently use Facebook. **100 million** access Facebook **via mobile devices**, a 110% increase (YoY) and they are two times more active than other users. To support this, **over 200 mobile operators** in 60 countries are **developing Facebook applications** for mobile devices. (Facebook)

✓ The number of businesses using virtualization is projected to **increase to 58 million by 2012** from 5.8 million today. (GigaOm)

✓ The number of users accessing **increased from 13,368 to 21,395** in the past year. This is an increase from approximately 30% of users accessing video games via **smartphones to close to 50%.** (ComScore)

✓ The percentage of mobile phone users who own smartphones has **increased from 11% from 17%** in the last year. And the percentage of mobile phone users who use 3G phones has **increased from 32% to 43%.** (ComScore)

✓ CapEx for cloud infrastructure was **$56.3 billion in 2009**, up from $46.41 billion in 2008. **Projected spending in 2013 is $150.1 billion**, which aligns with the idea that business spending on clouds is expected to increase by at least 30% in the next five years. (ComScore)

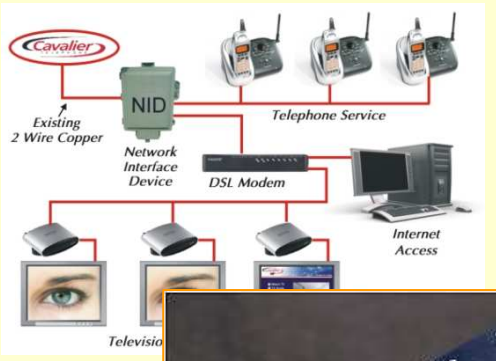
✓ **IT budget dedicated to cloud infrastructure & applications**: 16% would spend at least 30% of their IT budget; and **46% would spend at least 11%** of their IT budget. (InformationWeek).

✓ **A Cisco executive forecasts nearly ONE TRILLION endpoints by 2013, each consuming tremendous resources.**

Today's discussion

- Challenges in the Data Center sector
  - In-depth research carried out among PGR clients & network experts
- Key observation: **individuals, not the enterprise** will drive data center design going forward
  - Power management
  - Network design
  - Data center development
  - Cloud computing
- Implication
  - We are at an inflection point and headed for a data center crisis

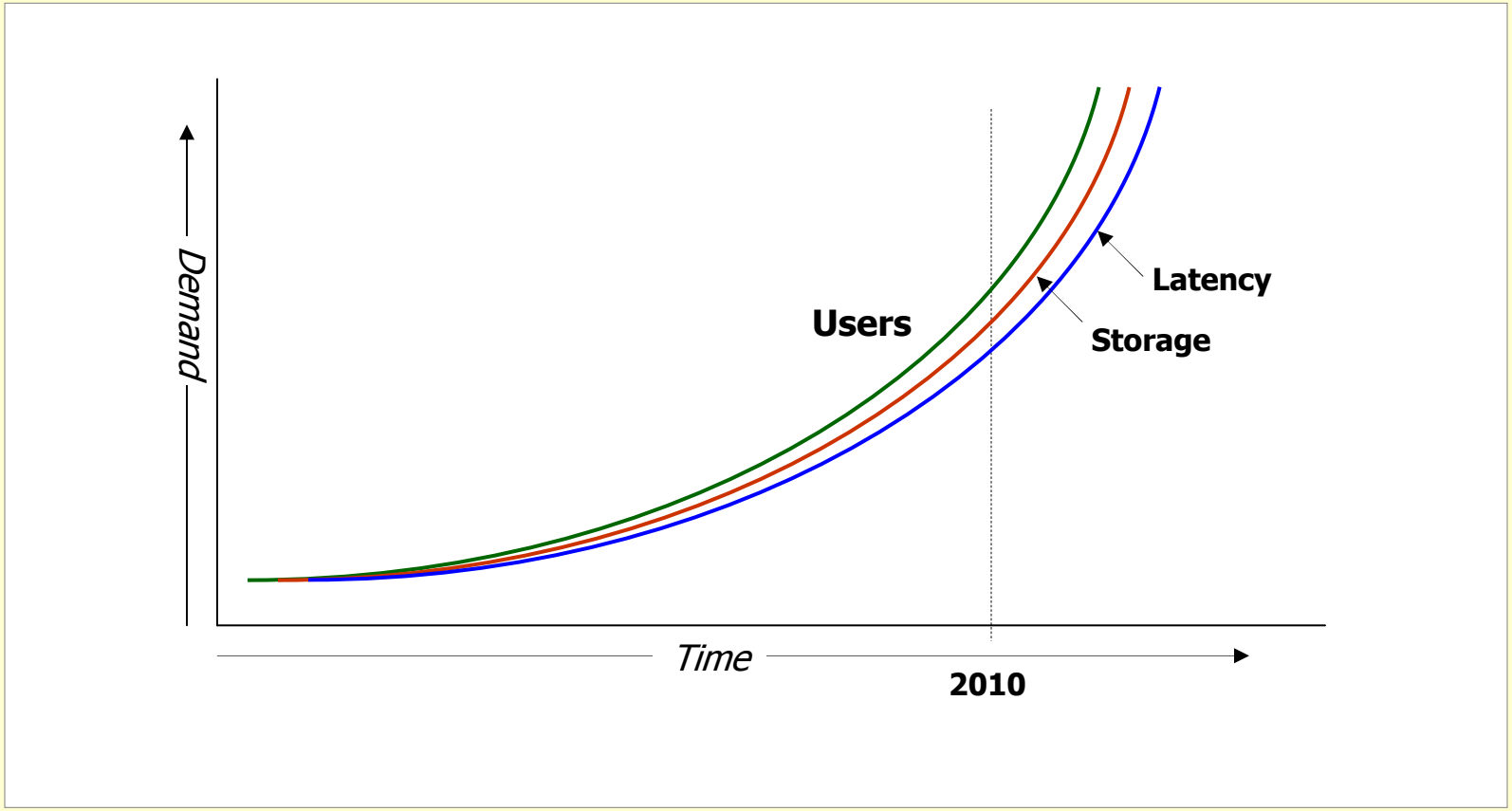
The individual



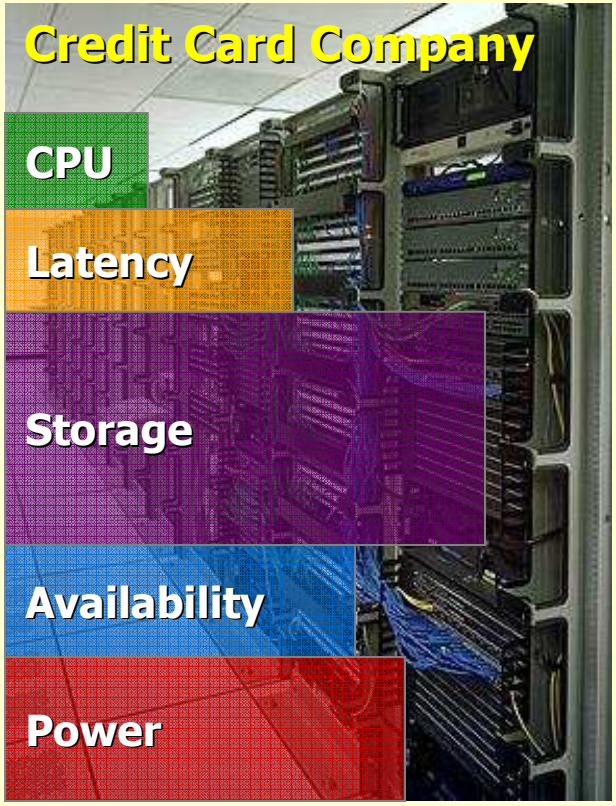
Impact

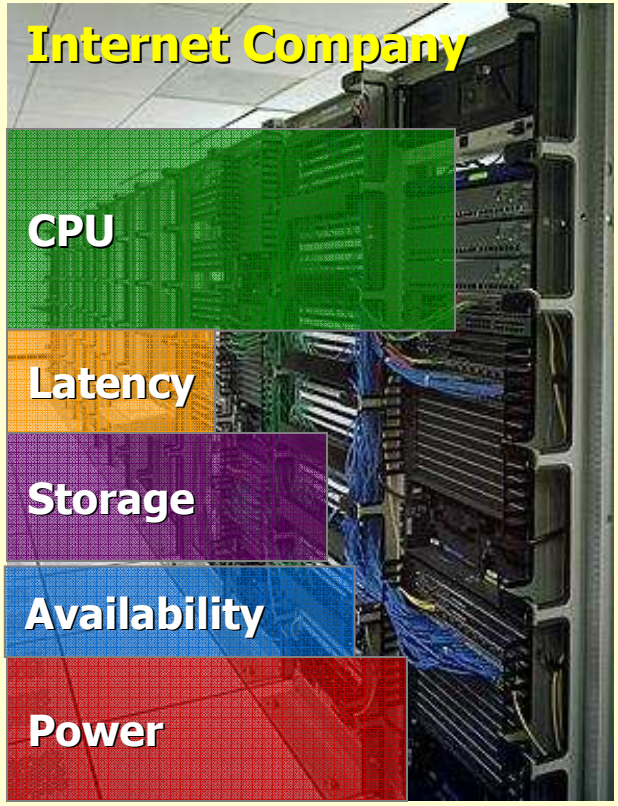
times *X* =

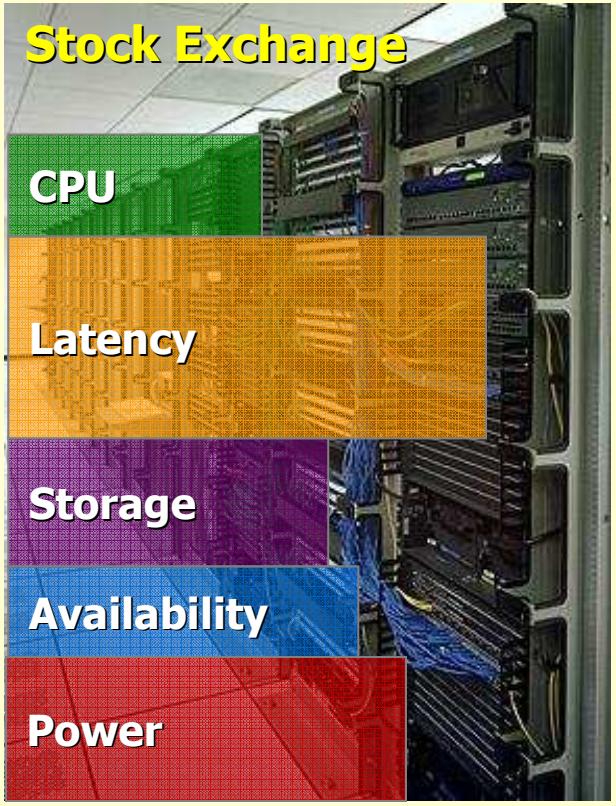
1.0^{12} Endpoints by 2013



Rigid Services Demand







Elastic Demand

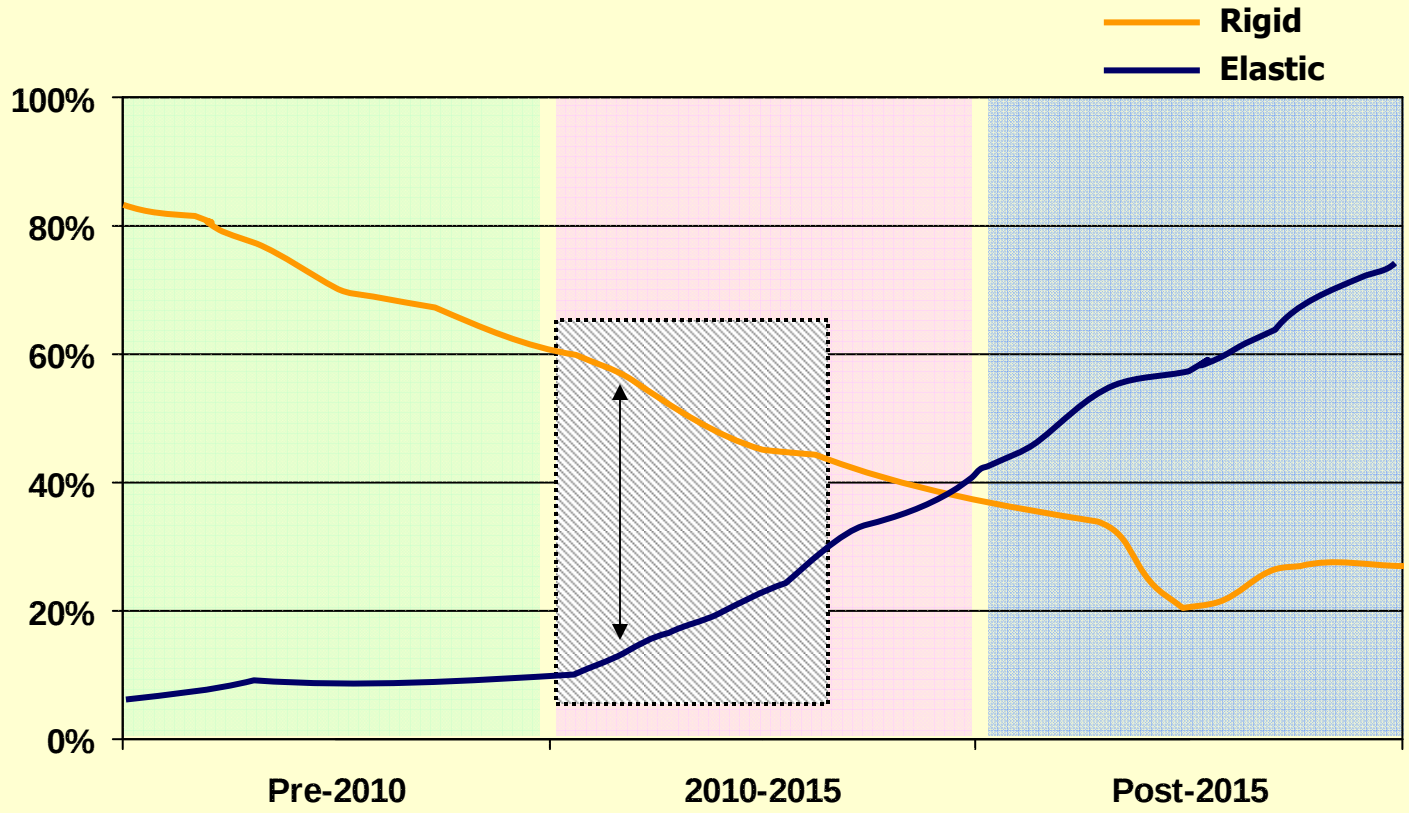
Serving the needs of individuals, however:

- Workload changes across multiple dimensions
  - Different for each individual
  - Different at all times of day
- Resources demand is highly unstable

Inflection Point

JQS.com
(0645Z)

- Evolution of rigid vs. elastic workloads

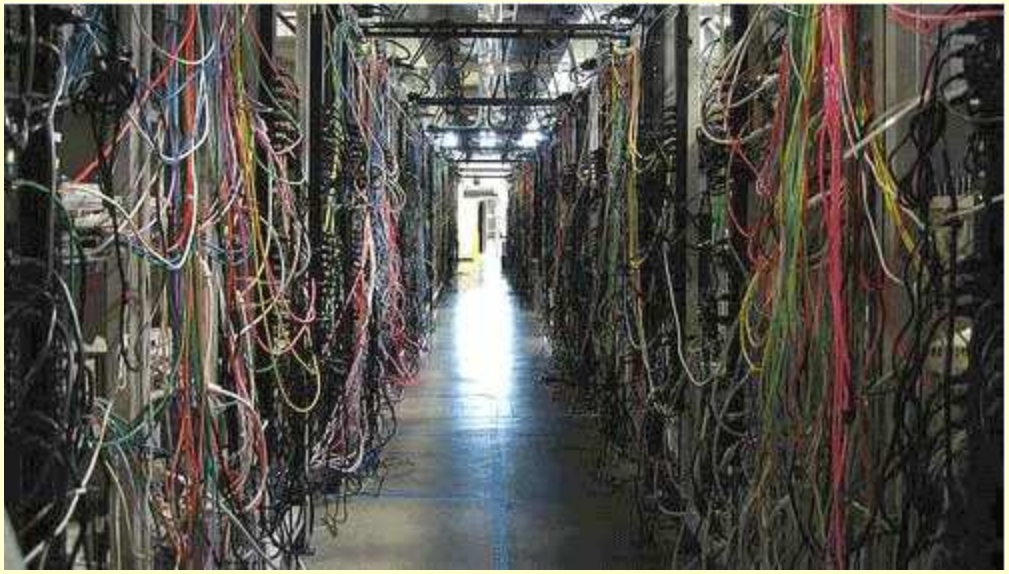


Volatility Drives Change

- What will get funded? Ideas that address & support dynamic resource allocation
  1. Technical innovations
     - Network
     - Server
     - Storage
  2. Business model innovations
     - Power
     - SLAs/Availability
     - Price point
     - Stack management

Technical Innovation

- Network
  - Network management lags server management
    - Largely a manual (human) process
    - 3-4 week lag
  - Reduce the lag
    - Unified console



Technical Innovation

- Network
  - Network management lags server management
    - Largely a manual (human) process
    - 3-4 week lag
  - Reduce the lag
    - Unified console
  - **Migrate the workload with a push of a button**

Technical Innovation

- Server
  - Moving away from point appliances model, **into software**

Technical Innovation

- Server solution
  - Virtual networks
  - Integrated view
- Rack optimization on the fly
  - Moving the rack
    - Not feasible
  - Moving the workload
    - Disrupts the network & power management

4 racks @ 25%
1 rack @ 100%
2 racks @ 50%

Technical Innovation

- Storage
  - Enterprise storage is made highly efficient
  - Individual storage is plagued with duplication

Business Model Innovation

- Power distribution, a unique challenge
  - Reaction is slow
  - Incremental power costs more

Macro

- **Insurance model for providing extra capacity**
- **Sell extra power capacity back to the grid.**
  $65K/year/Mw

Micro

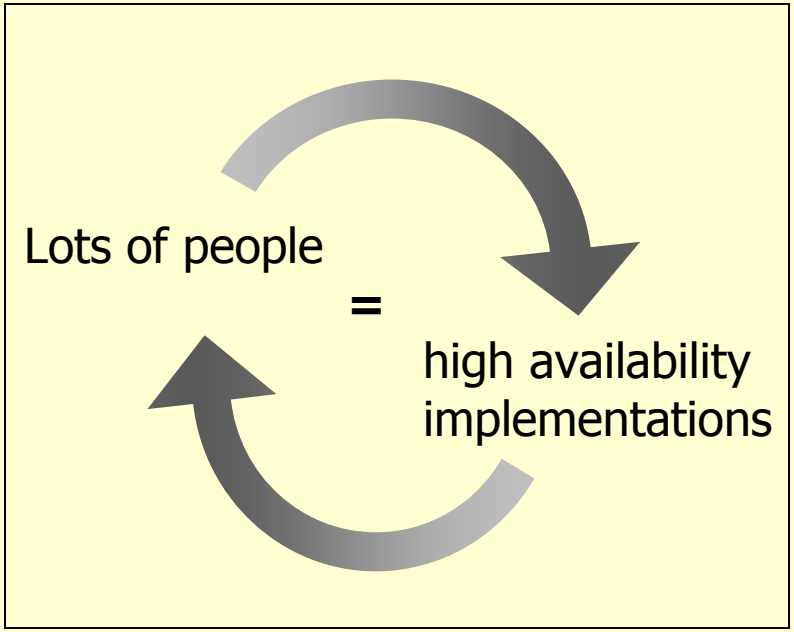
- **Manage demand**
  Power capping

Business Model Innovation

- SLAs & Availability
  - SLAs are a problem
    - A need for cost-effective technologies that support availability

Possible solution:
Instead of 6 backups for 6 servers, have one backup for 6 servers.

Enterprise:
Outsource co-lo space but with aggressive performance requirements in availability



Business Model Innovation

- Price point
  - Better economics

Co-lo facility wants $1000s to lease extra DRAM!!

  - Solution: lease model

Business Model Innovation

- Stack management
  - Improve efficiency
    - Personal/individual virtualization
    - Share the VMware license
  - Workload volatility (excursion management)

Do It Yourself
Human intervention model. Relies on expertise and experience. No auto translate in real-time.

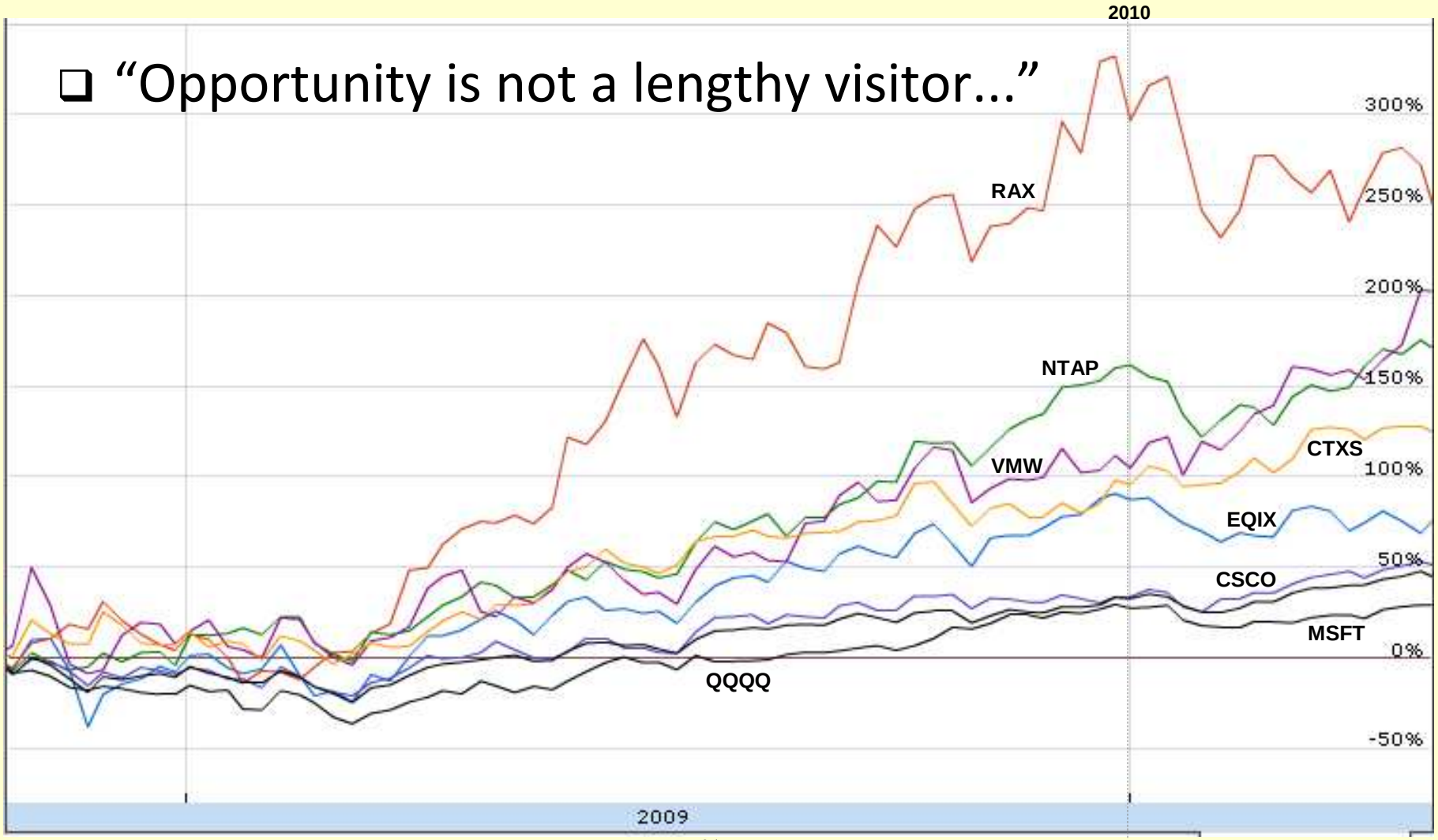
Black Box
Hosting model. One-size-fits-all, not very adaptable or resourceful. Lacks granularity.

Programmatic
Hooks into the OS. Tied to the platform. Much better performance but limited application scope.

Hybrid solution
Leverages better aspects of the above models into a single, broadly applicable solution.

Carpe Diem

- "Opportunity is not a lengthy visitor..."



Summary

- The Data Center is now **elastic**
- The components of the data center – network, servers, power and biz elements – interact
- Complexity of interactions increase:
  - 1.0^{12} endpoints

Thank you.