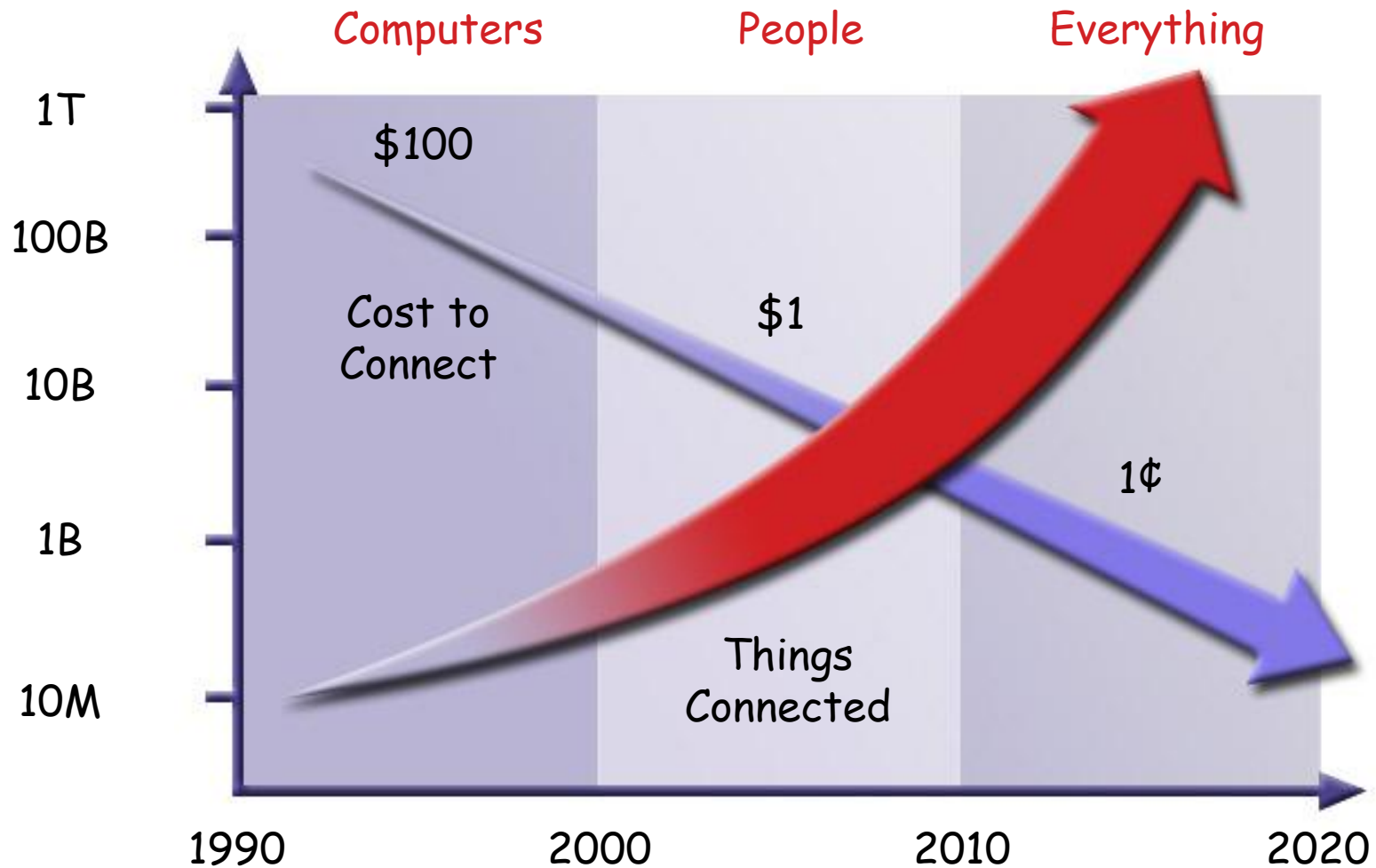# Open Networking:
Investing for Fun and Profit

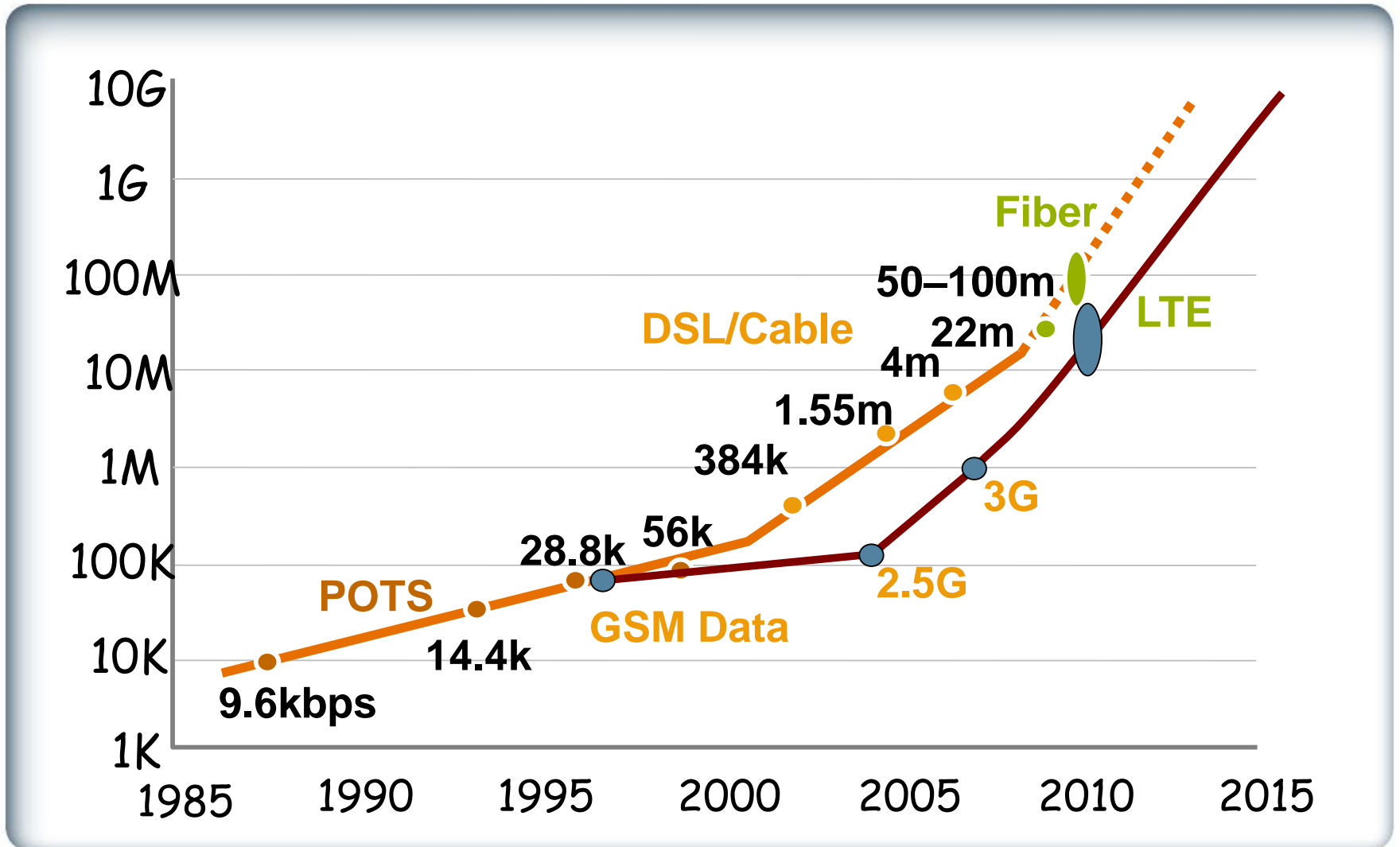NEA.

▸ Greg Papadopoulos
Venture Partner, NEA
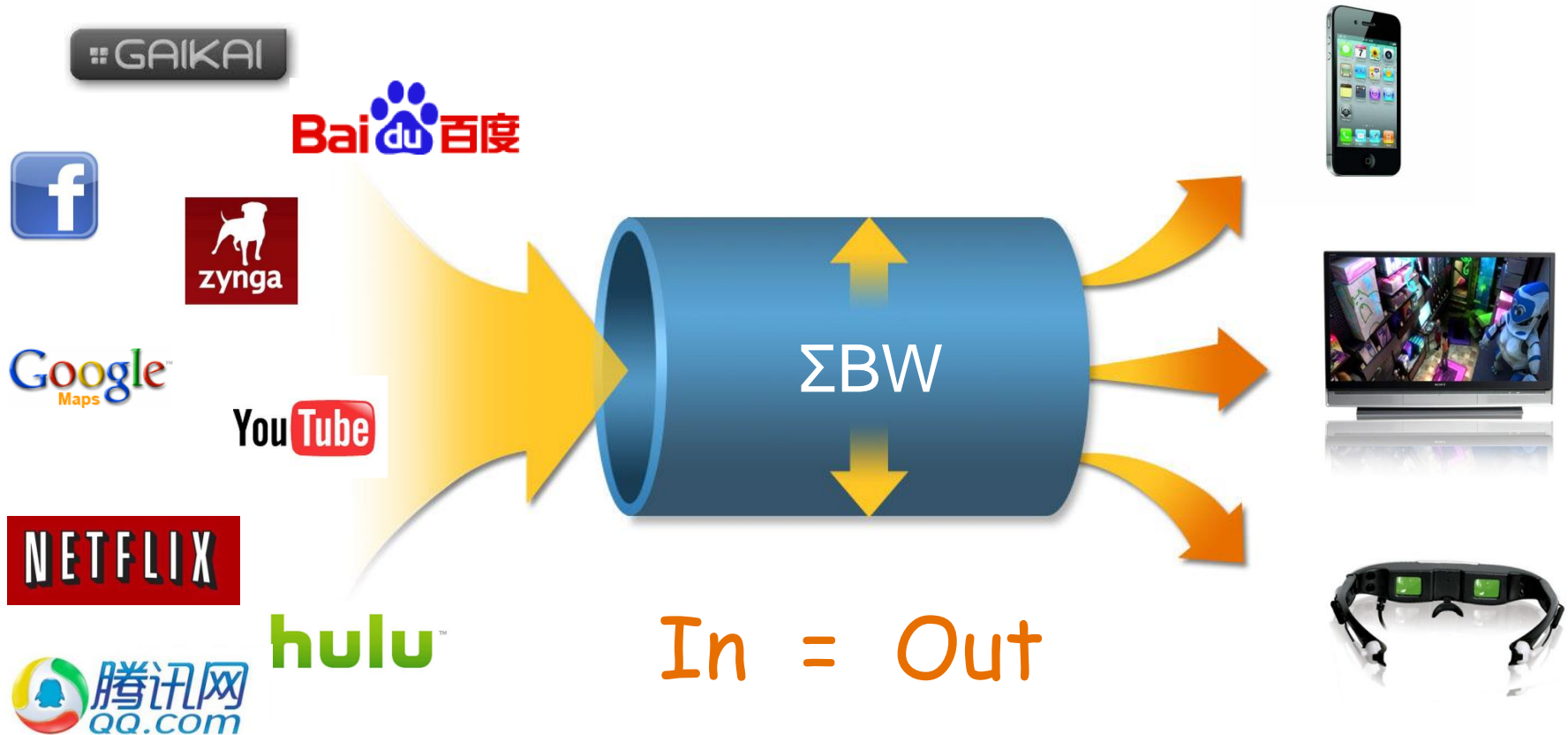
The Revolution

Consumer Access BW Inflection

"Kirchoff's Law" : Filling the Pipe

ΣBW

In = Out

Servers * BW/Server = # Devices * BW/Device

Not Winner take all, but…

Big Computers
100Ks – 1Ms Nodes
Globally Distributed

amazon web services™
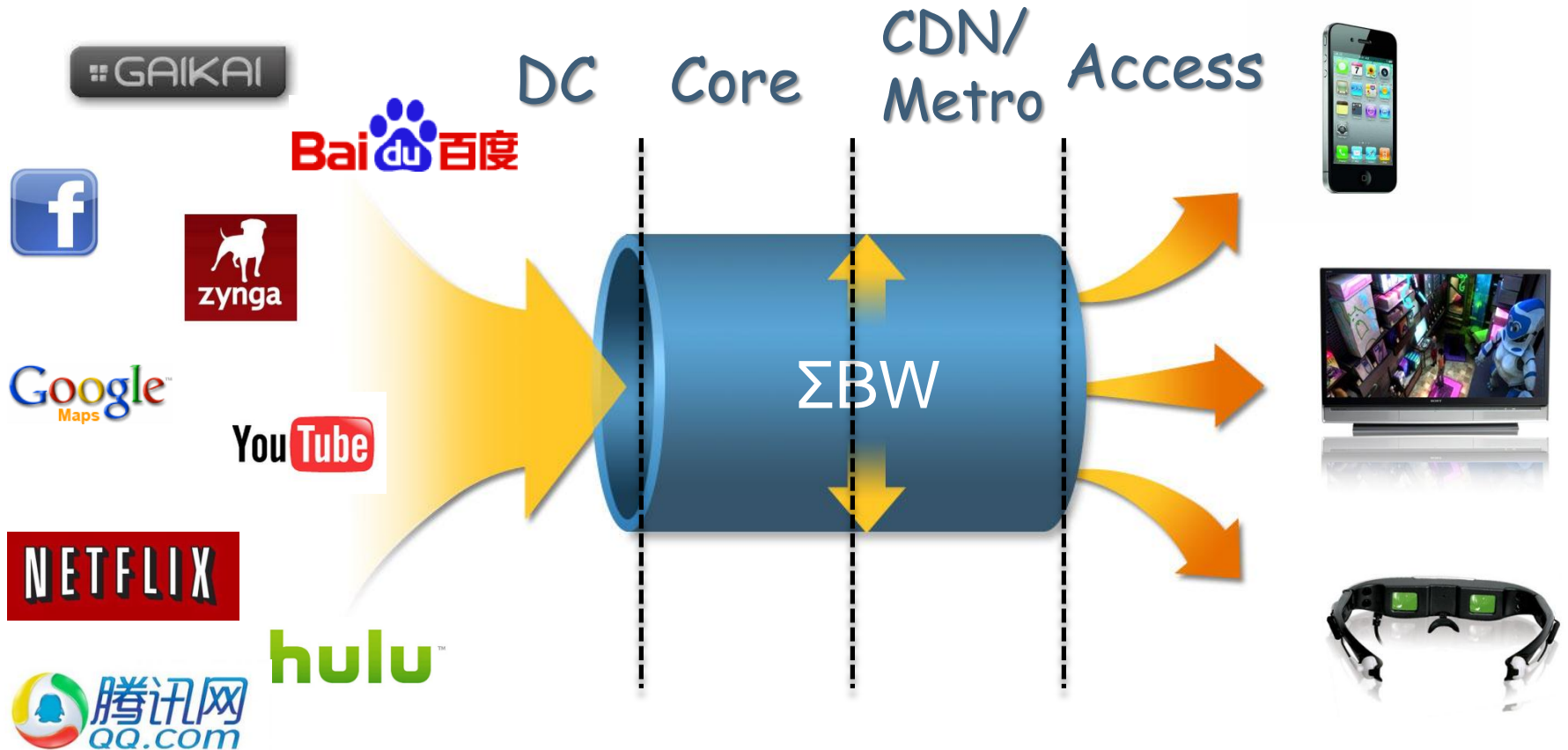
Windows Azure

rackspace

Google™

salesforce.com
Success. Not Software.™

OPEN
Compute Project

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

ebaY

GCC

中国移动通信
CHINA MOBILE
移 动 信 息 专 家

vodafone

verizon

Devices

...A little more structure, perhaps
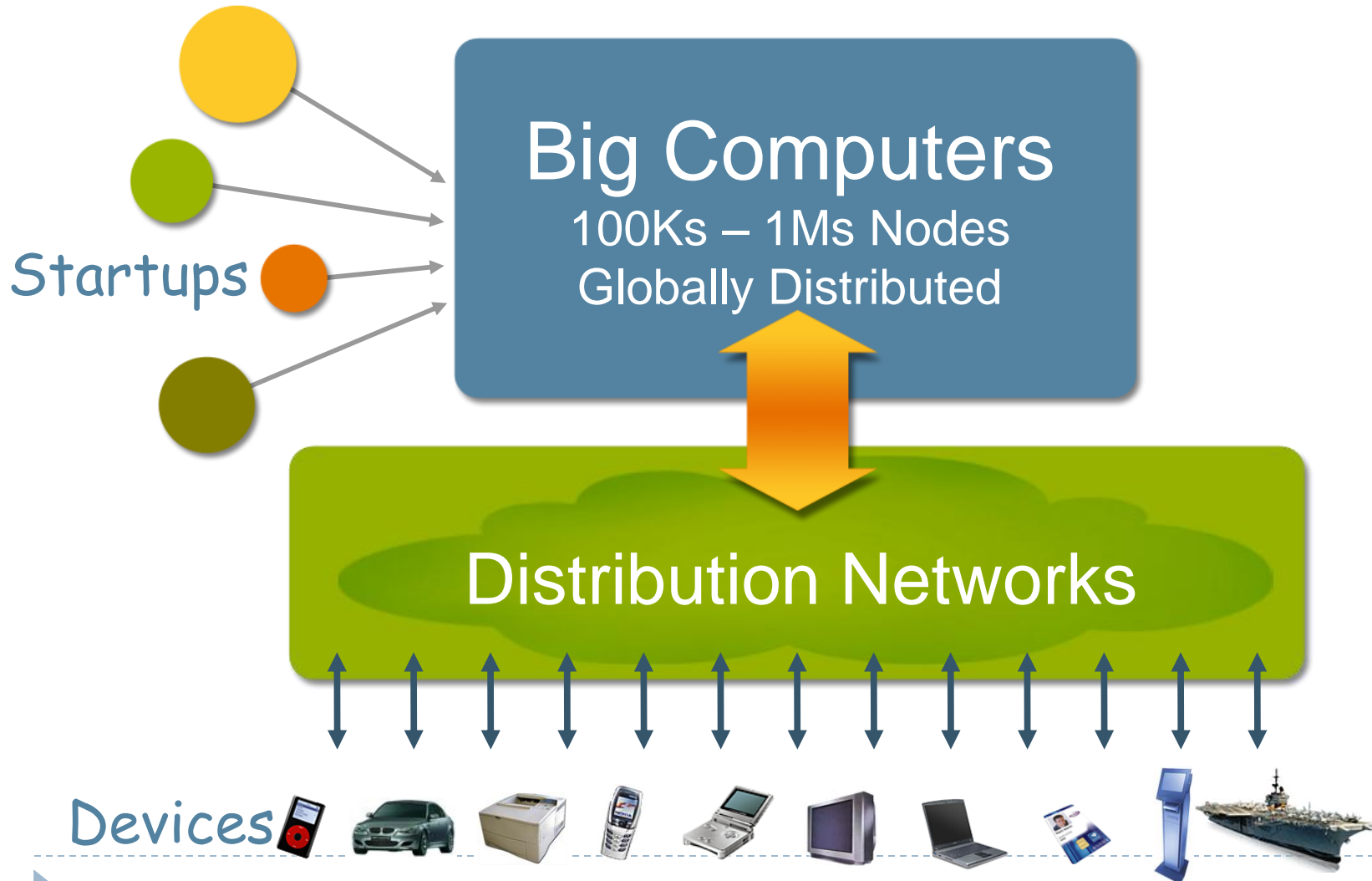
Startups

Big Computers
100Ks – 1Ms Nodes
Globally Distributed

Distribution Networks

Devices

"Kirchoff's Law" : Filling the Pipe

DC   Core   CDN/Metro   Access

ΣBW

Bell's Law

Historical Cycle of Computing Industry, every 10 – 15 years

System	When	Tech	Scale
MF	'60s	Trans/Core	1+
Minis	'70s	SSI/MSI	1
PC/WS	'80s	uP / LSI	1
SMP	'90s	VLSI / DRAM	100

Bell's Law

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Bell's Law

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Exascale	'10s	NoC/ Optics	10^6

Optical Watershed: Penetrating System Scales
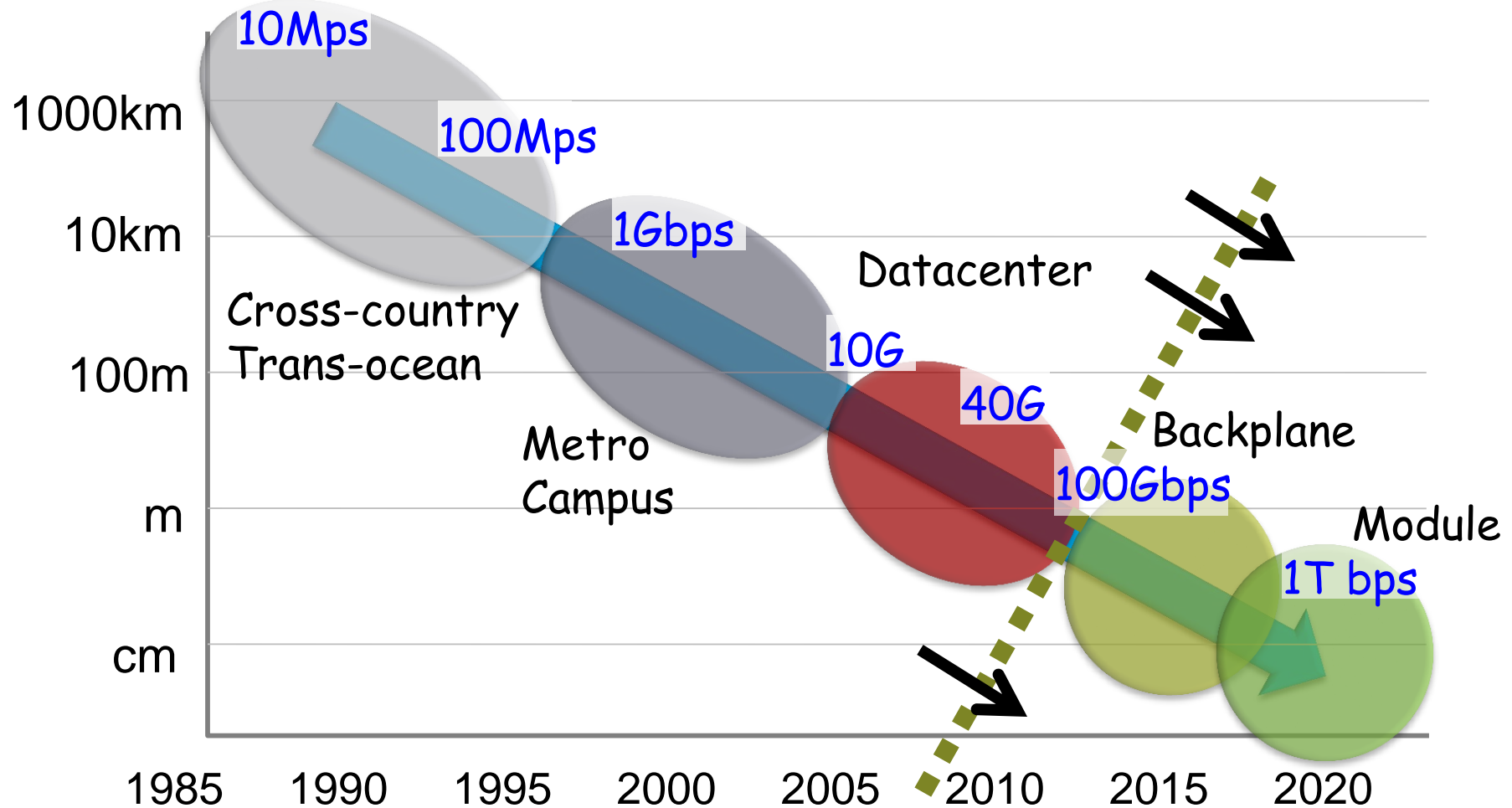
What is the Difference Between...???

A Big Computer

A Set of Servers

$\times 10^4$

Vs.

What is the Difference Between…???

A Big Computer

A Set of Servers

ITNS

vs.

$\times 10^4$

Who's on First?

Bits have mass…

Software has developers…

Networks are the backplane…

… and thus inertia and stickiness

… and thus layers of value-add

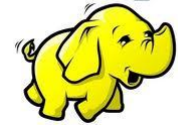… and thus intermediate all interactions

| Storage | Servers | Networks |

My Lens for Just About Everything

1. **Developers**
2. **Developers**
3. **Developers**
4. **Developer Tools**
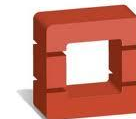5. **Developer Communities**
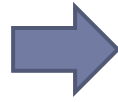6. **Software Ecosystems**

Disruptive Refactoring – Phase 1

**Monolithic
Systems**

Disruptive Refactoring – Phase 1
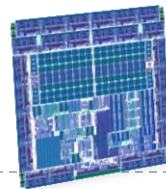

Monolithic Systems
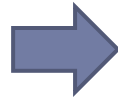
Decomposition & Specialization

Control | Mgt.

L4-7

L1-3

Applications

Network Operating Systems

Disruptive Refactoring – Phase 2

Monolithic Systems
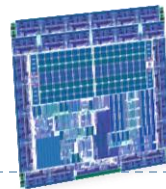
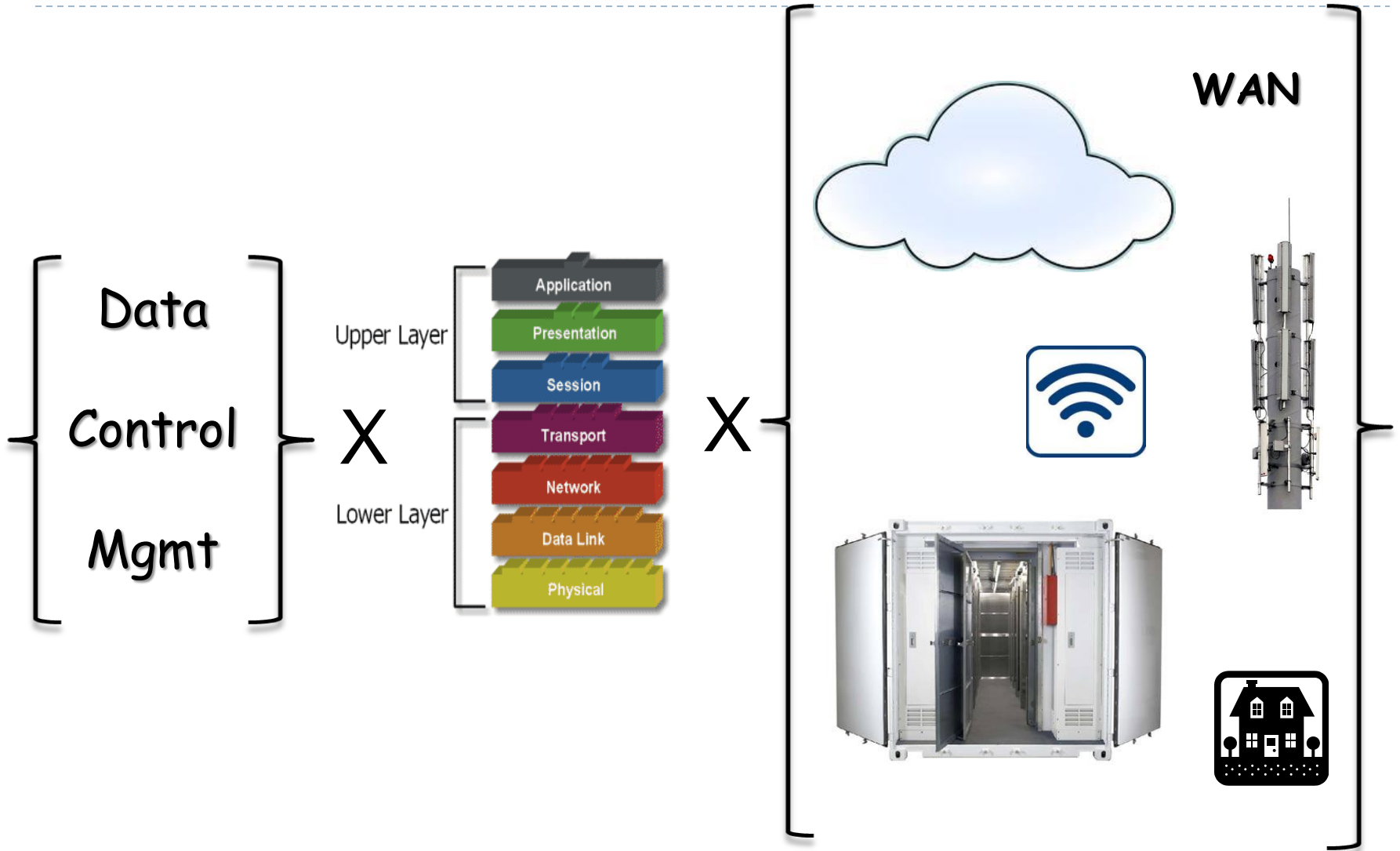**Decomposition & Specialization**

Re-Integration

Control | Mgt.

L4-7

L1-3
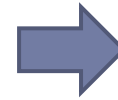
Applications

Network Operating Systems

?

Investment Map

Data

Control

Mgmt

X

Upper Layer

- Application
- Presentation
- Session

Lower Layer

- Transport
- Network
- Data Link
- Physical

X

WAN

This is a great time to venture invest in open networking!

gregp@nea.com

NEA.

▶ Greg Papadopoulos
Venture Partner, NEA