



How green are the mobile users of OSNs?

4th TREND Plenary Meeting
Ghent, February 14th-15th

Carmen Guerrero
Universidad Carlos III de Madrid

Once upon a time....

Content Is King – Bill Gates (1/3/1996)

Content is where I expect much of the real money will be made on the Internet, just as it was in broadcasting.

The television revolution that began half a century ago spawned a number of industries, including the manufacturing of TV sets, but the long-term winners were those who used the medium to deliver information and entertainment.

Today Media Internet

social networks

knowledge sharing



personalized browsing

content sharing

search engines



the social web browser

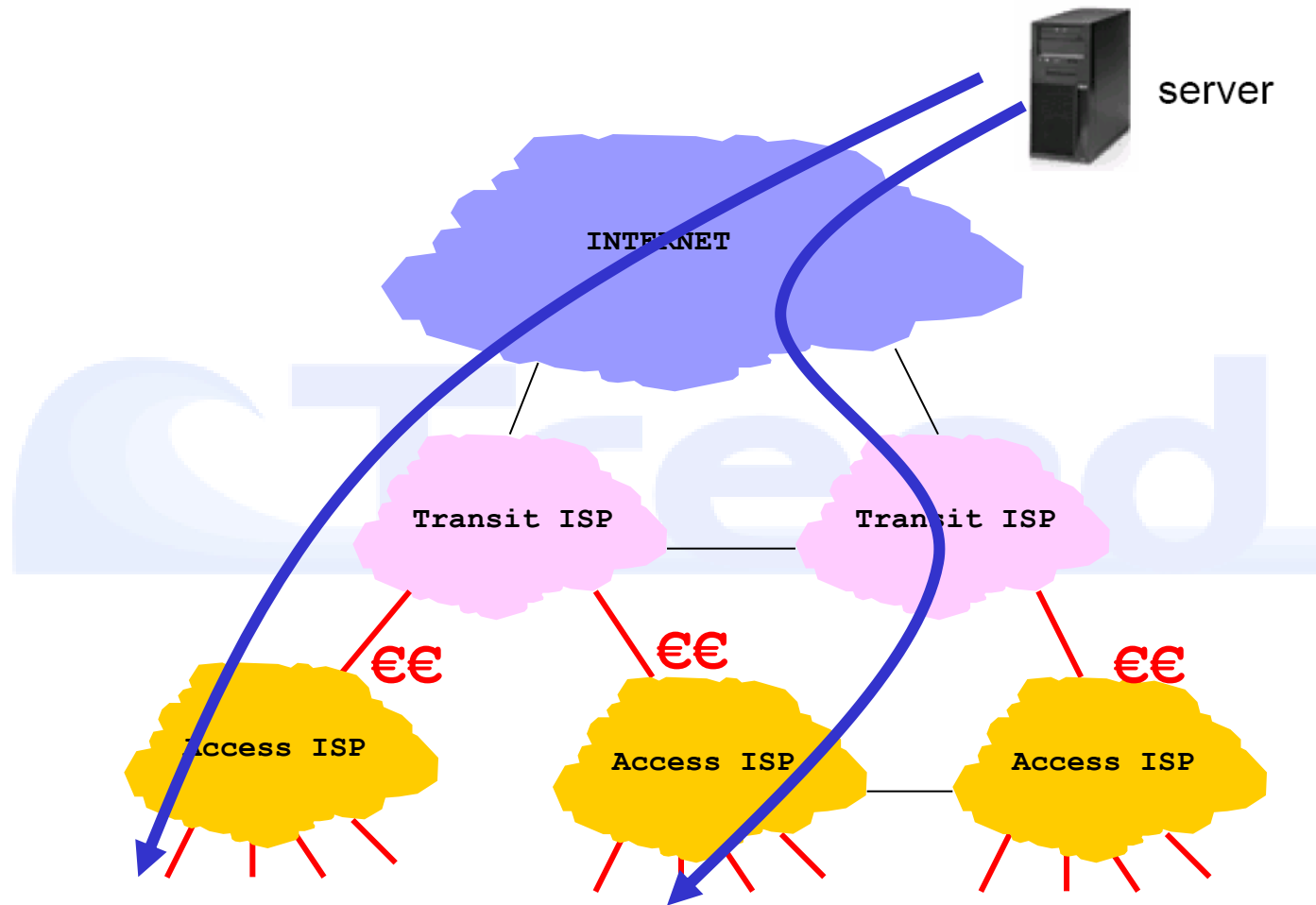


Today Media Internet (ii)

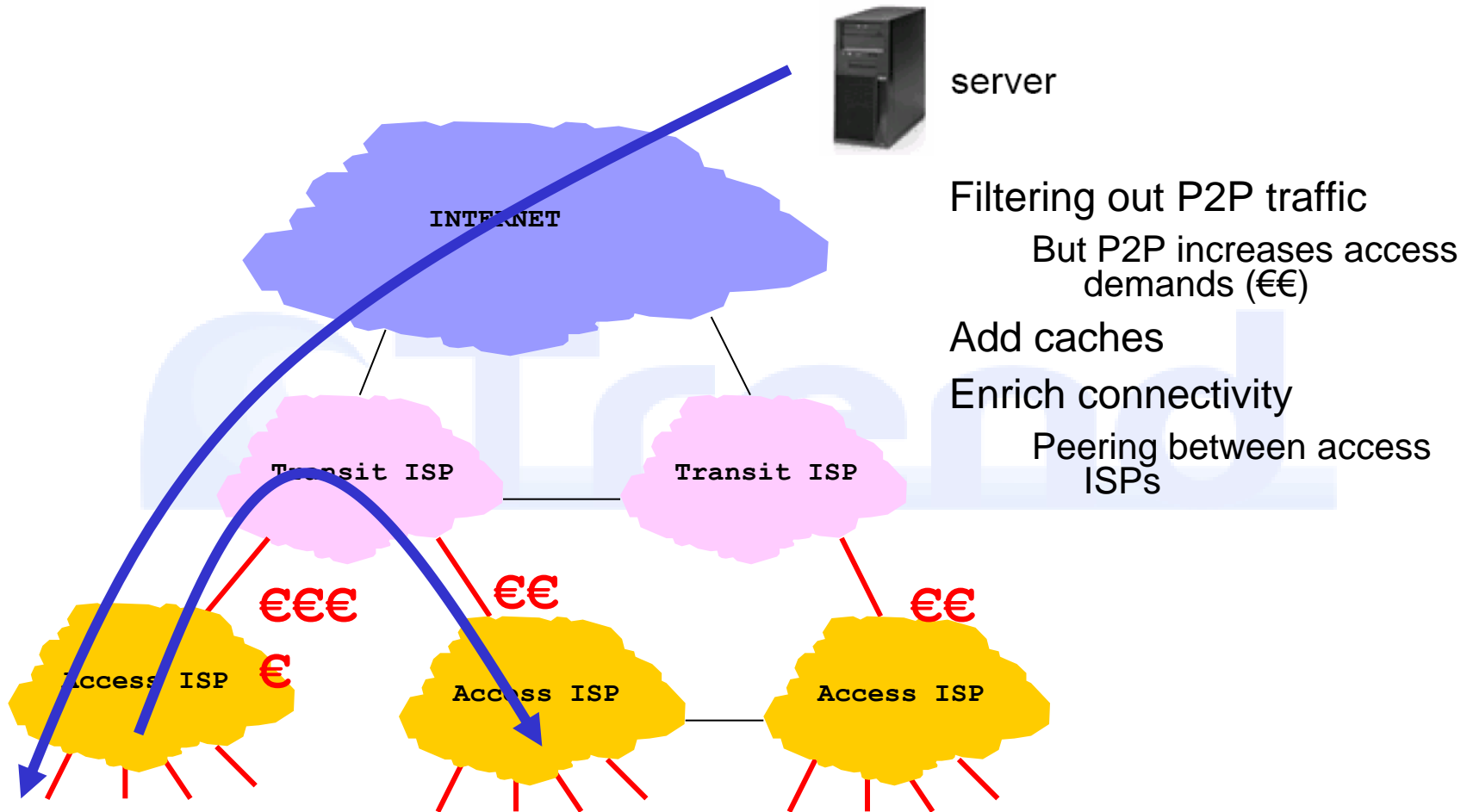
And much more almost every day...



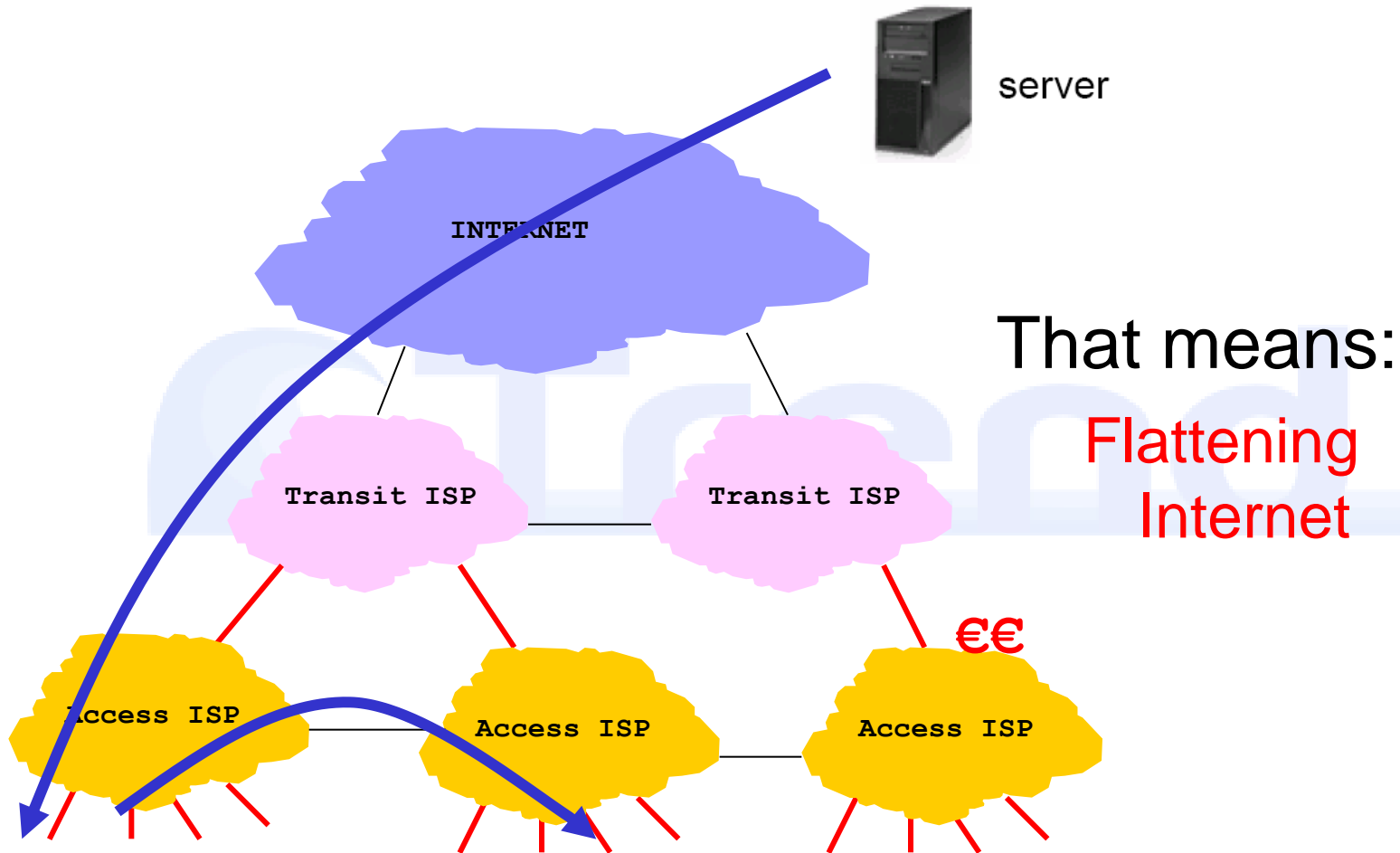
Client-Server Economics



P2P Economics



P2P Economics



Flattening the Internet

The world is Flat: A Brief History of the
Twenty-First Century. Thomas Friedman



Flattening the Internet

The world is Flat: A Brief History of the
Twenty-First Century. Thomas Friedman

and

*It's also increasingly in the palm of your
hand...*

Flattening the Internet

The world is Flat: A Brief History of the
Twenty-First Century. Thomas Friedman

and

*It's also increasingly in the palm of your
hand...*

and

Increase the needs of battery/power

Flattening the Internet

The world is Flat: A Brief History of the
Twenty-First Century Thomas Friedman

It's also increas... the palm of your



and

Increase the needs of battery/power



*“Content is King
or
How we can make the Content Green”*

Content is not Green

- Content distribution infrastructures consume substantial amounts of energy
- Servers and data centers consumed around 100 billion kilowatt hours at a cost of 7.4 billion USD in 2011
- To meet the growing demand for content:
 - Content providers are enlarging data centers
 - Network providers are increasing network capacity

Content is not Green

Providers invest in more content distribution infrastructures, which consume a substantial amount of energy.

Research today

- Most research focused on energy consumption/optimization at data centers
- Dynamic resource provisioning (e.g., DVFS, sleeping)
- Request routing to a data center with lower energy costs
- Energy-proportional computing: power consumption \sim utilization
- Researchers are seeking energy-proportional (EP) networking

But...

...user demands increase, so EP
computing/networking is not the solution

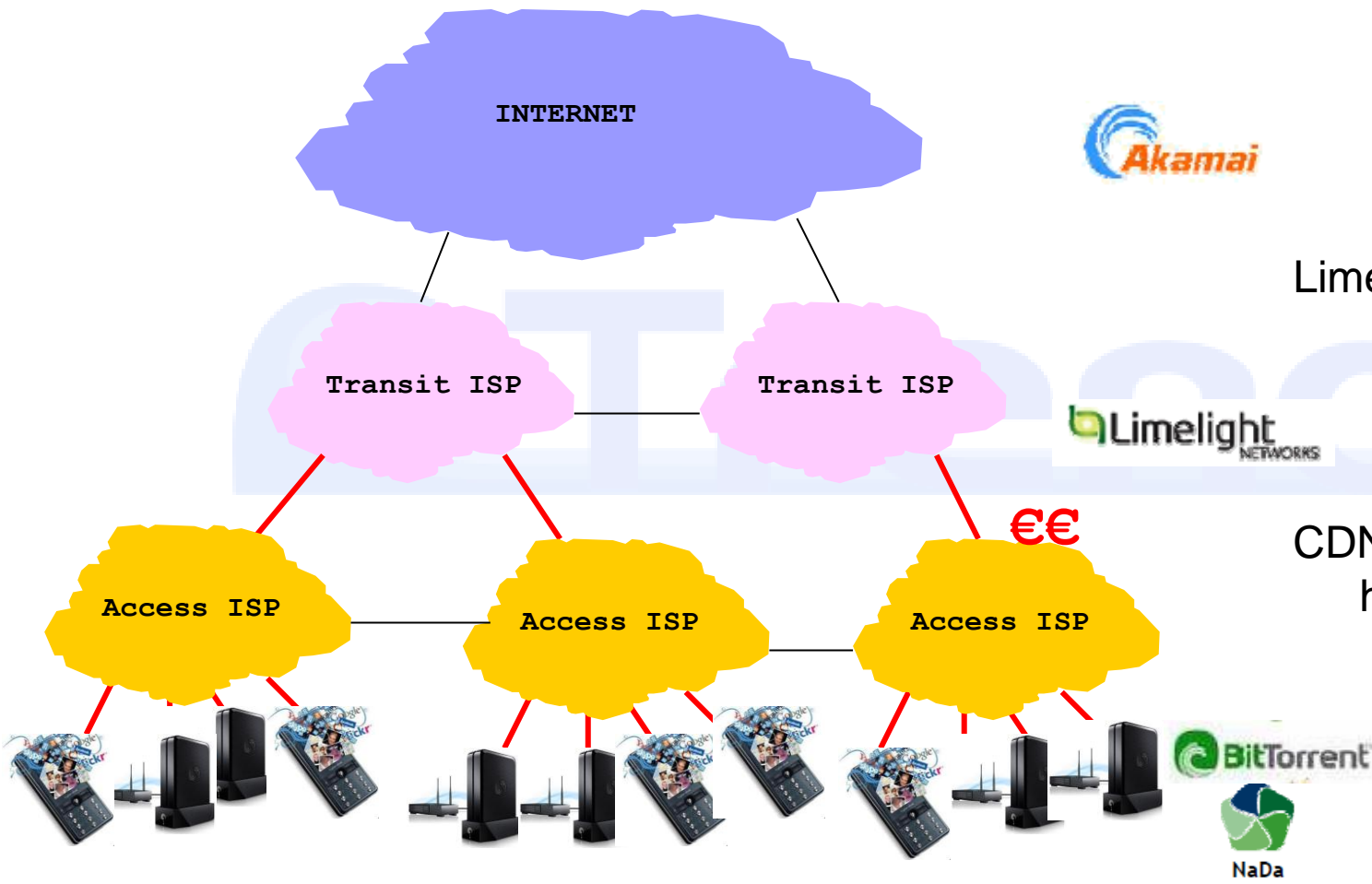
Maybe CDN can helps....

Shifting content to the users...

...means

hop count reduction and overall network traffic
reduction
and
energy savings

CDNs today



Akamai

40,000 servers
900 PoPs, 71 countries
300 Gbps

Limelight

25,000 servers
25 PoPs
1,000 Gbps

CDN servers at home (PC, STB)
NADA, BitTorrent



The particular case of the OSN

How can we reduce the energy cost in mobile users?

Previous research focused on:

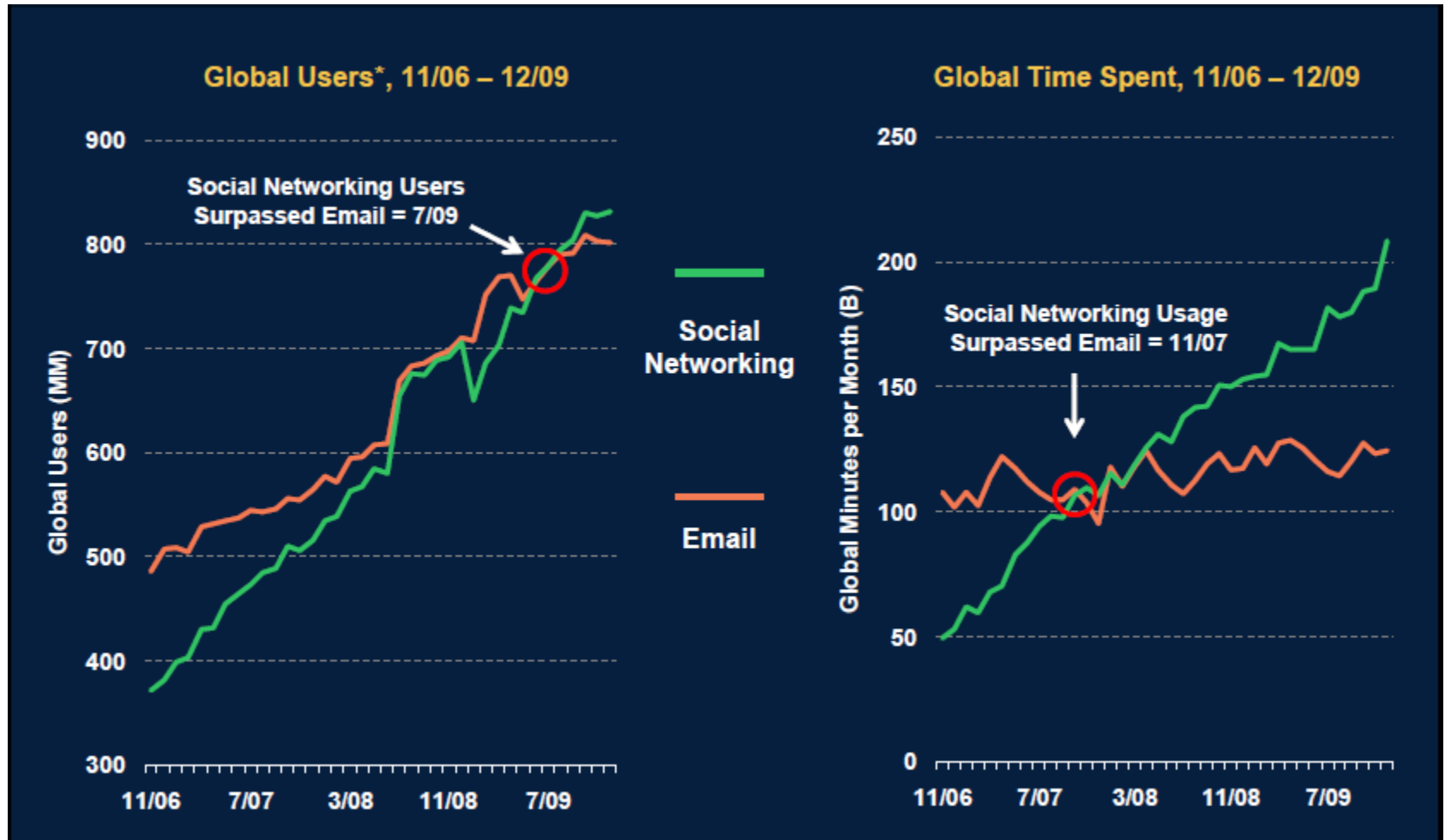
- Email and web applications

But...

Trend

Evolution of Internet Traffic

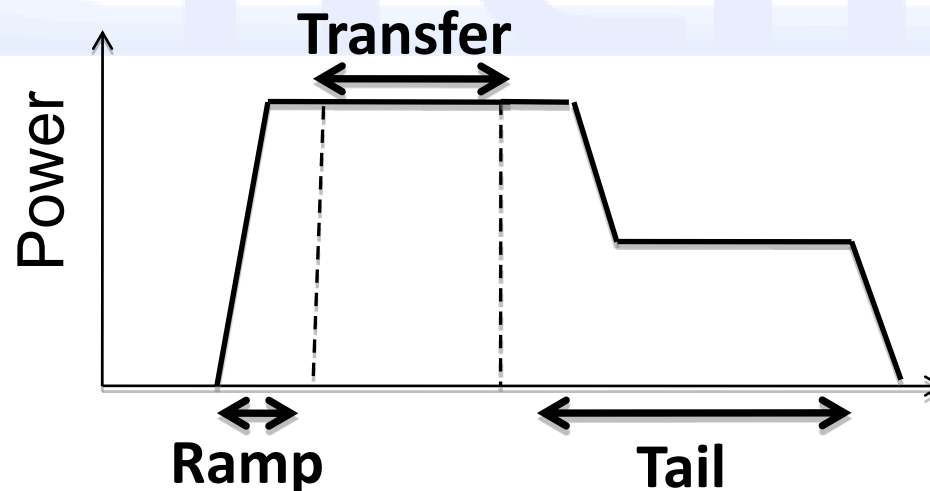
socialnets > email



Energy cost in mobile users depends on....

...traffic pattern, not just data size -> twitter, facebook and g+

... different energy profiling of 3G and WiFi



TREND NoE and Green OSNs

- How green is the networking infrastructure of the OSNs?
- Intensive crawling of Twitter, Facebook and G+
- Collection of datasets
 - Networking infrastructure
 - End users in mobile phones
 - How much energy cost is by data transfer, mobile protocol, data size, temporal pattern, network protocol, app design