Panel on Emerging Technologies

AP2PS 2011, Lisbon, Portugal

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Population Growth

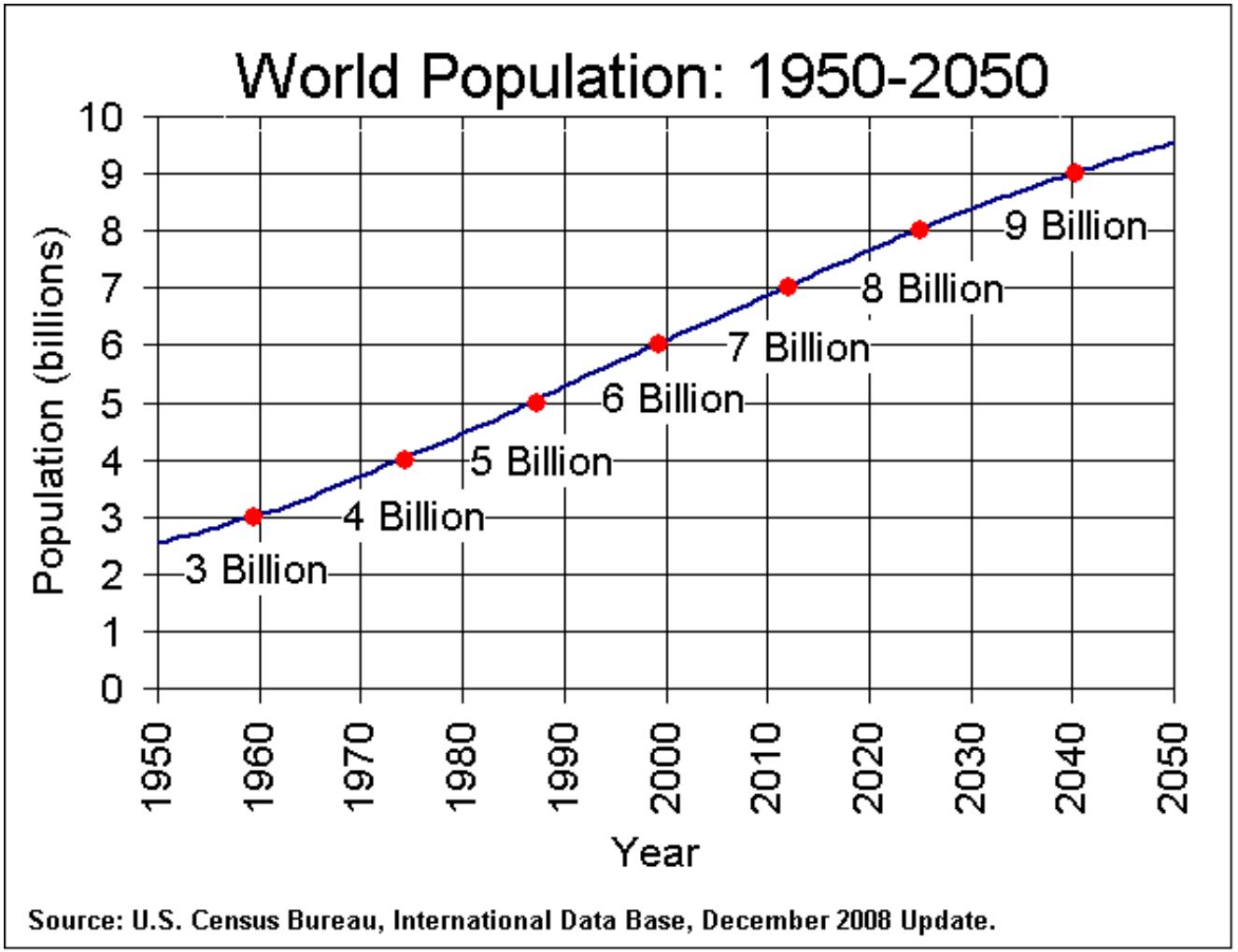
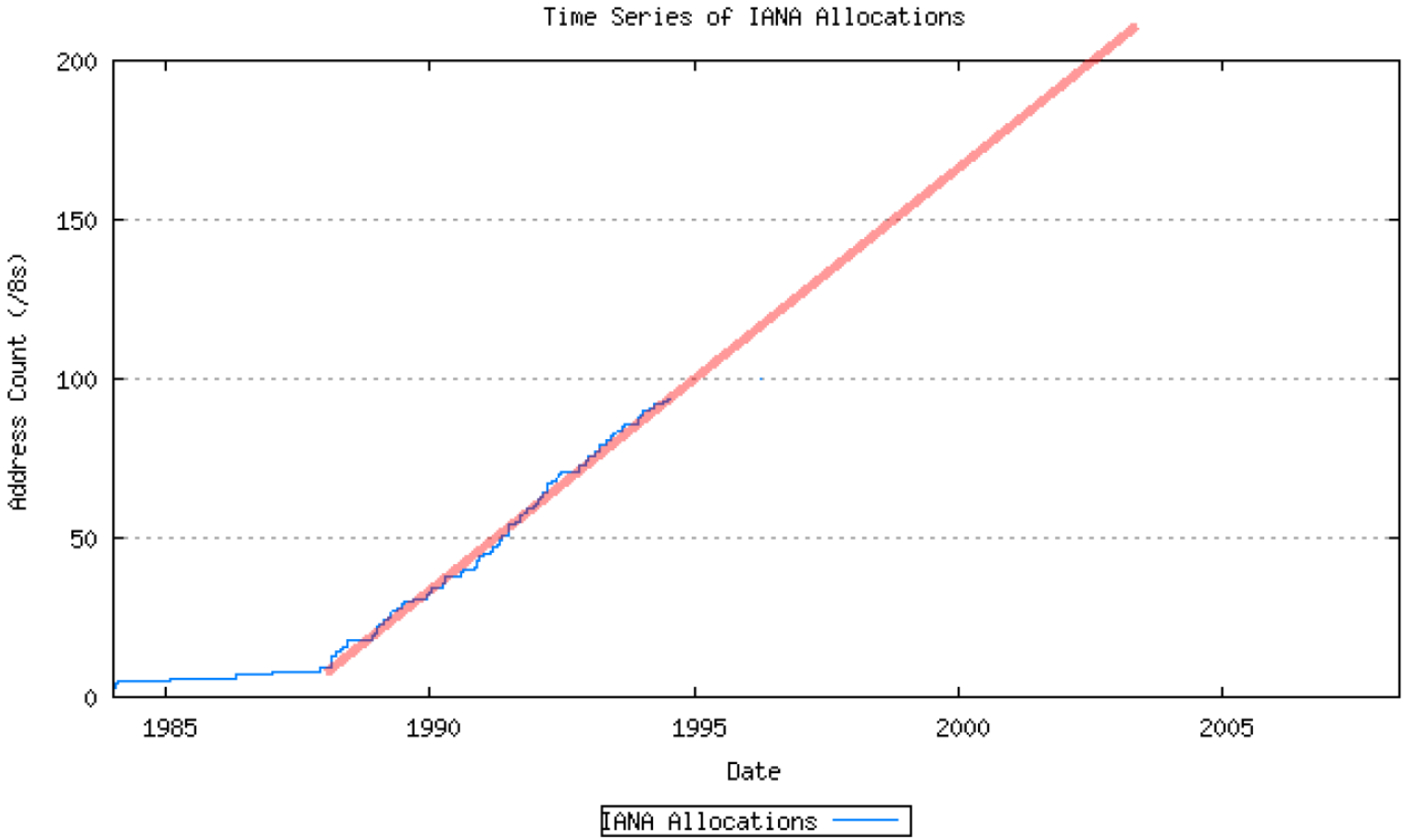


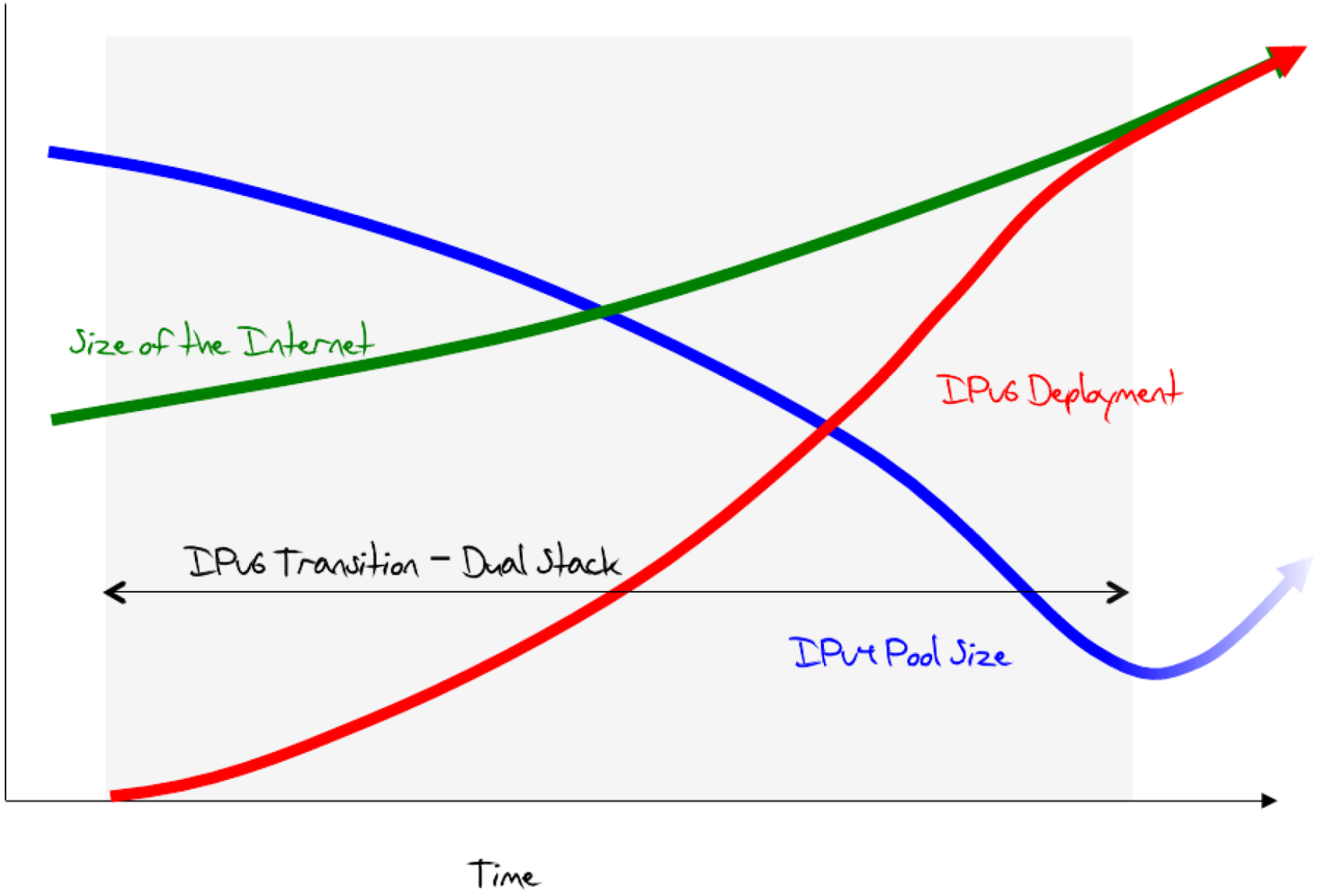
Figure: The progress of humans' count on the planet.

IP Addresses – Mid 90s

- Internet IP addresses will run out **around 2003**
  - however, *B*-class addresses will run out earlier
  - $\Rightarrow$ a new IP protocol (having bigger address space) is necessary

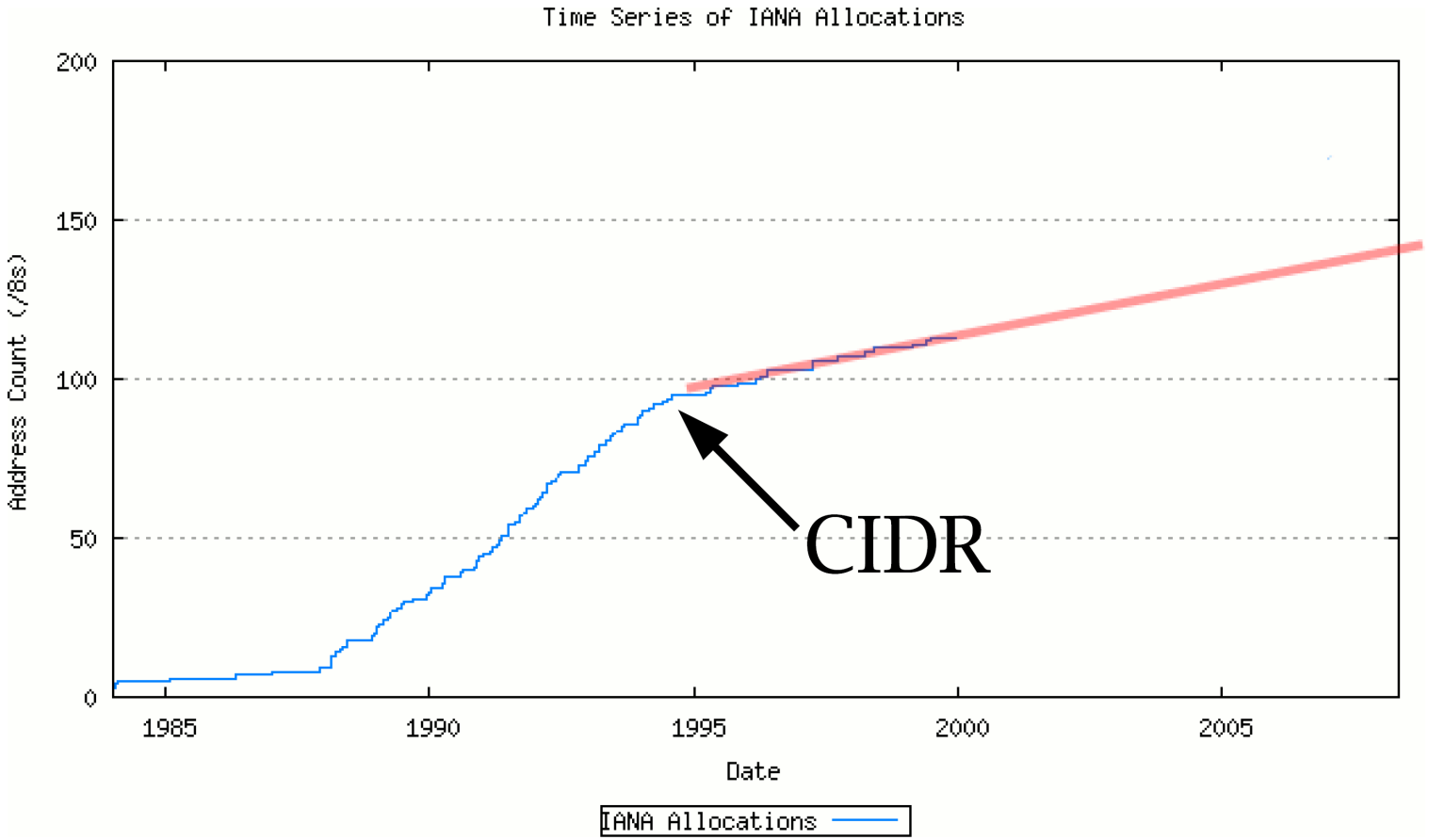


IP Addresses – The Idea of Transit to IPv6



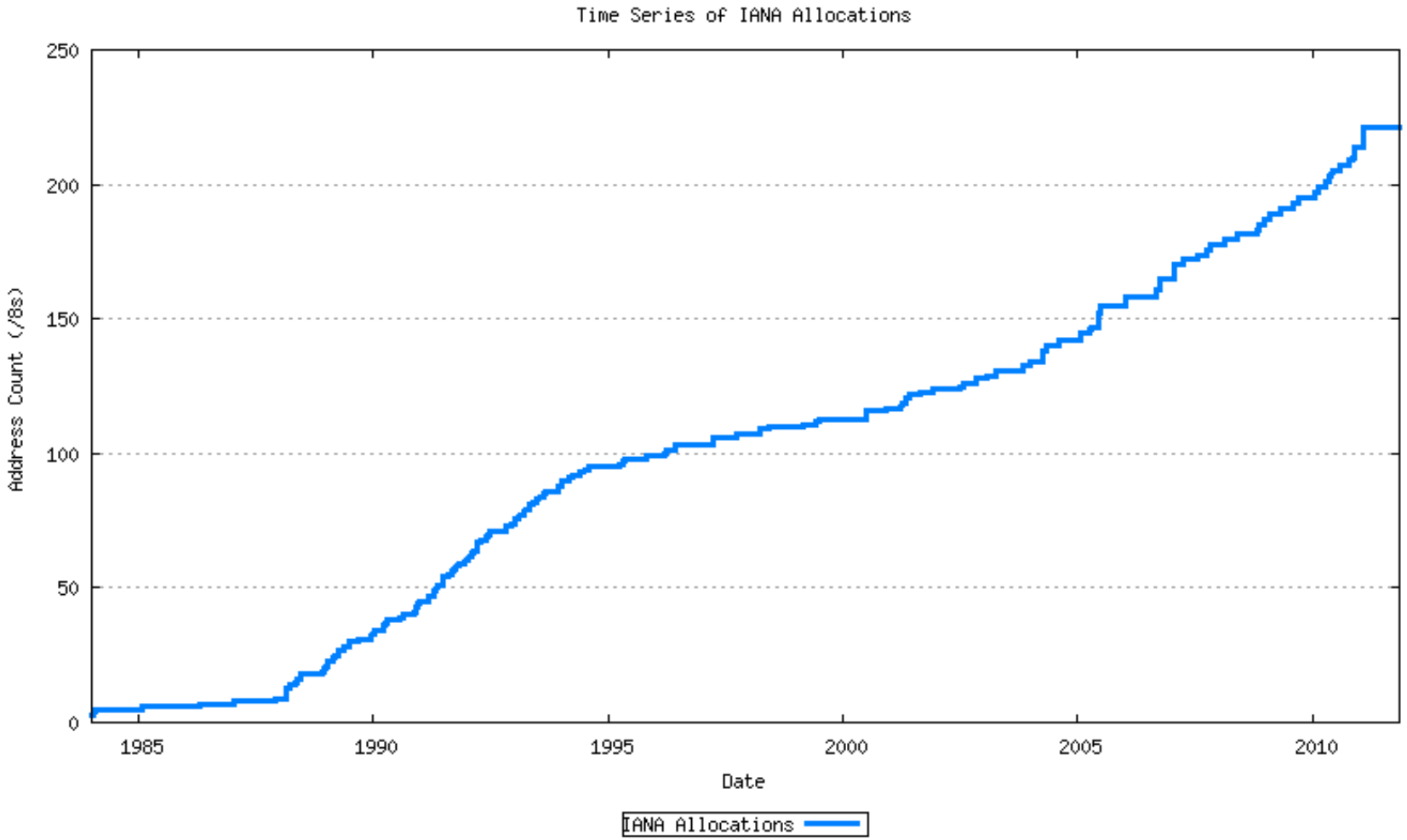
IP addressess – Around the year 2000

- IPv6 was not alone – CIDR, NAT
  - IPv4 addresses will run out **around the year 2030**
    $\Rightarrow$ *"Don't worry, be happy!"*



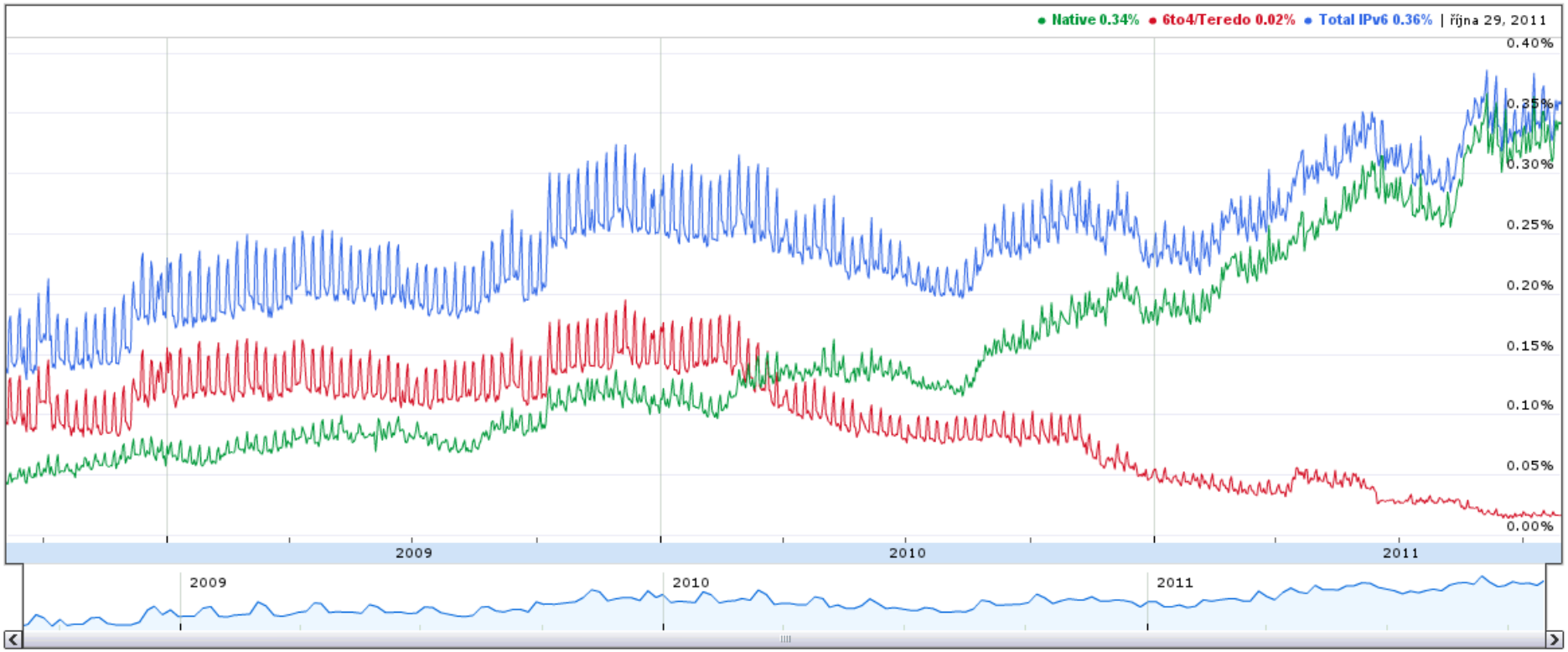
IP addressess – Year 2011

- the IP addresses **have already run out** (February 2011)
  - *"Houston, we have a problem!" :-(*

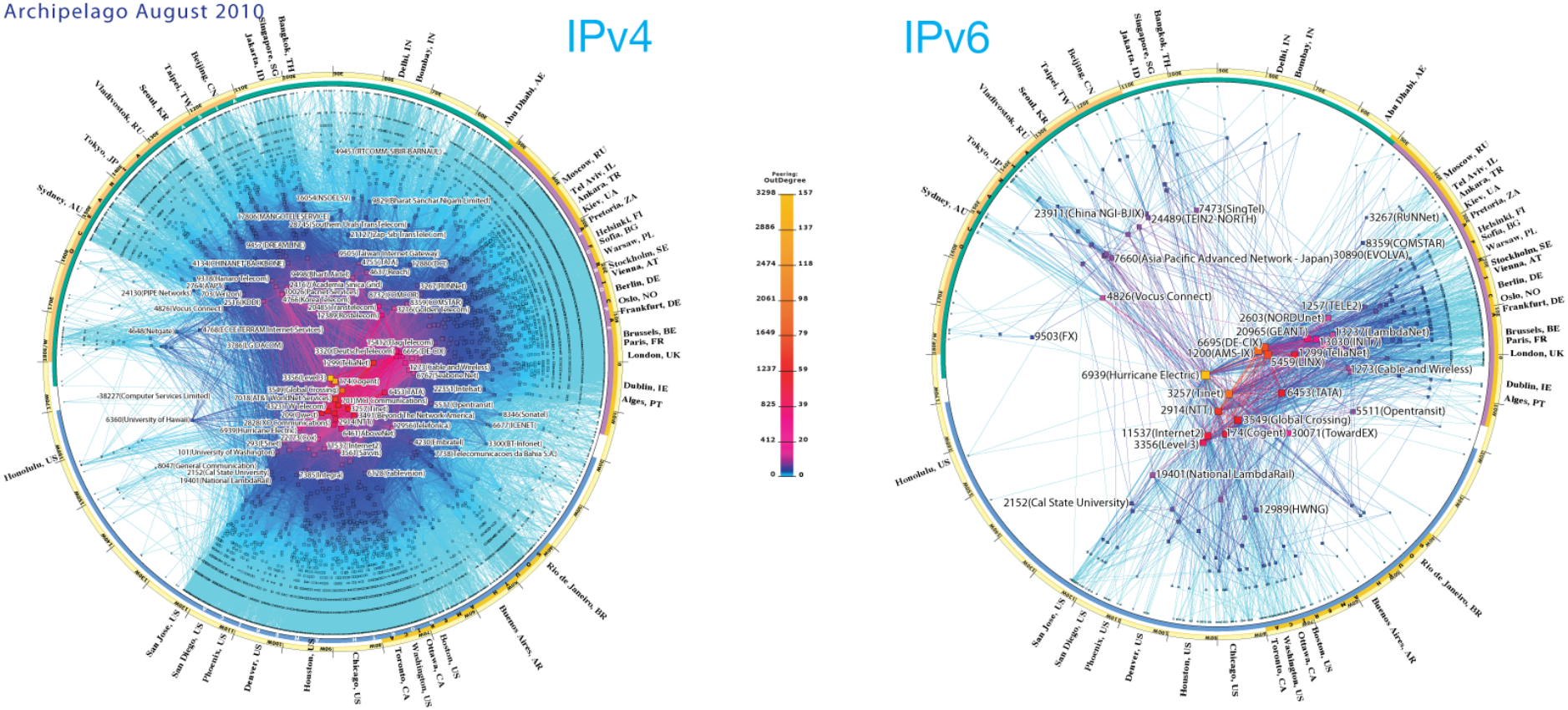


IPv6 is still a rarity

- average data traffic **through AMS-IX**
  - IPv4: 900 Gb/s (rising)
  - IPv6: 2.1 Gb/s (sloooowly rising) . . . 0.23%
- web servers' statistics:
  - just around 0.35% users goes through IPv6 (Google stats.)



IPv4 vs. IPv6 – Topology Map



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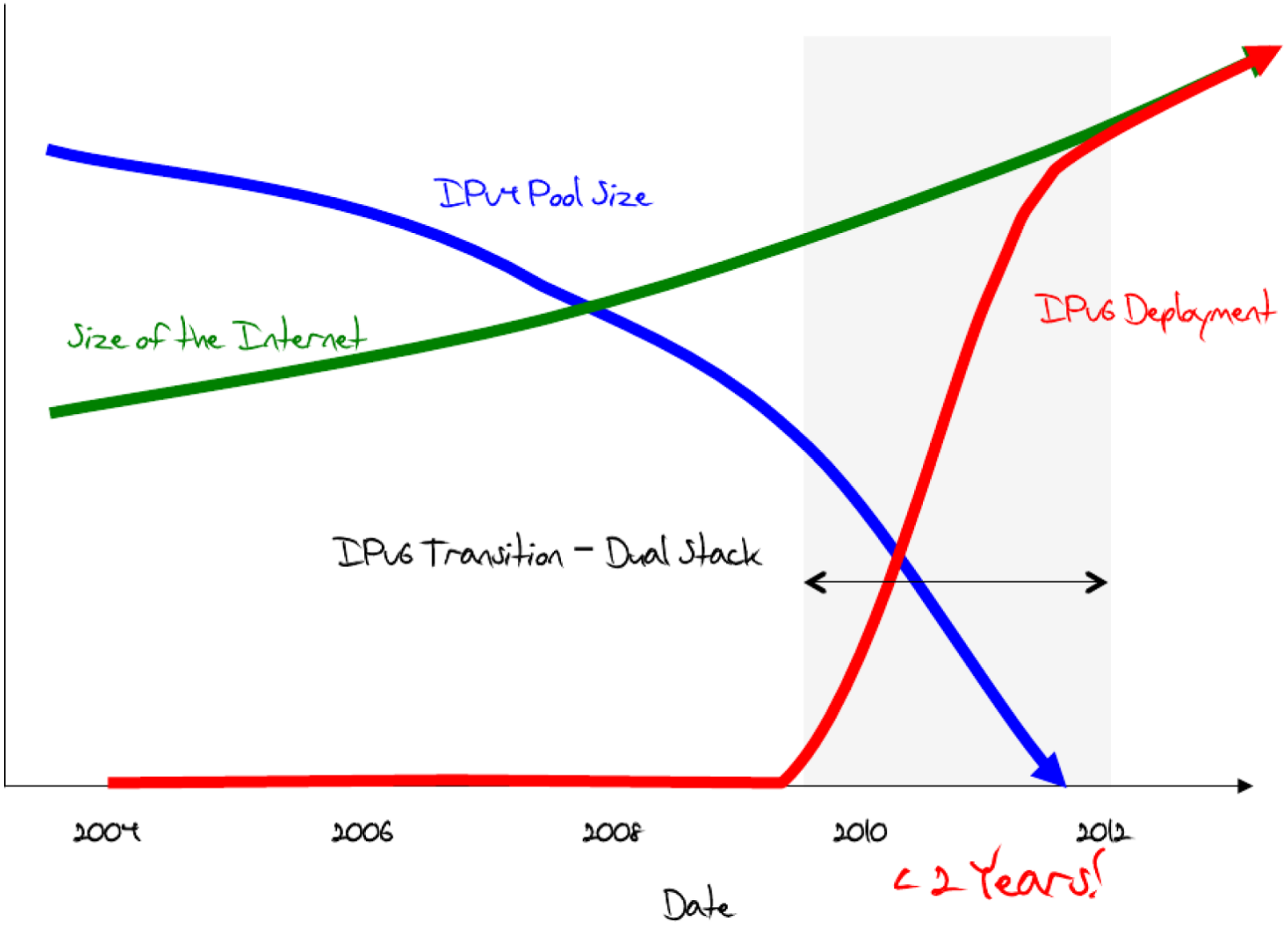
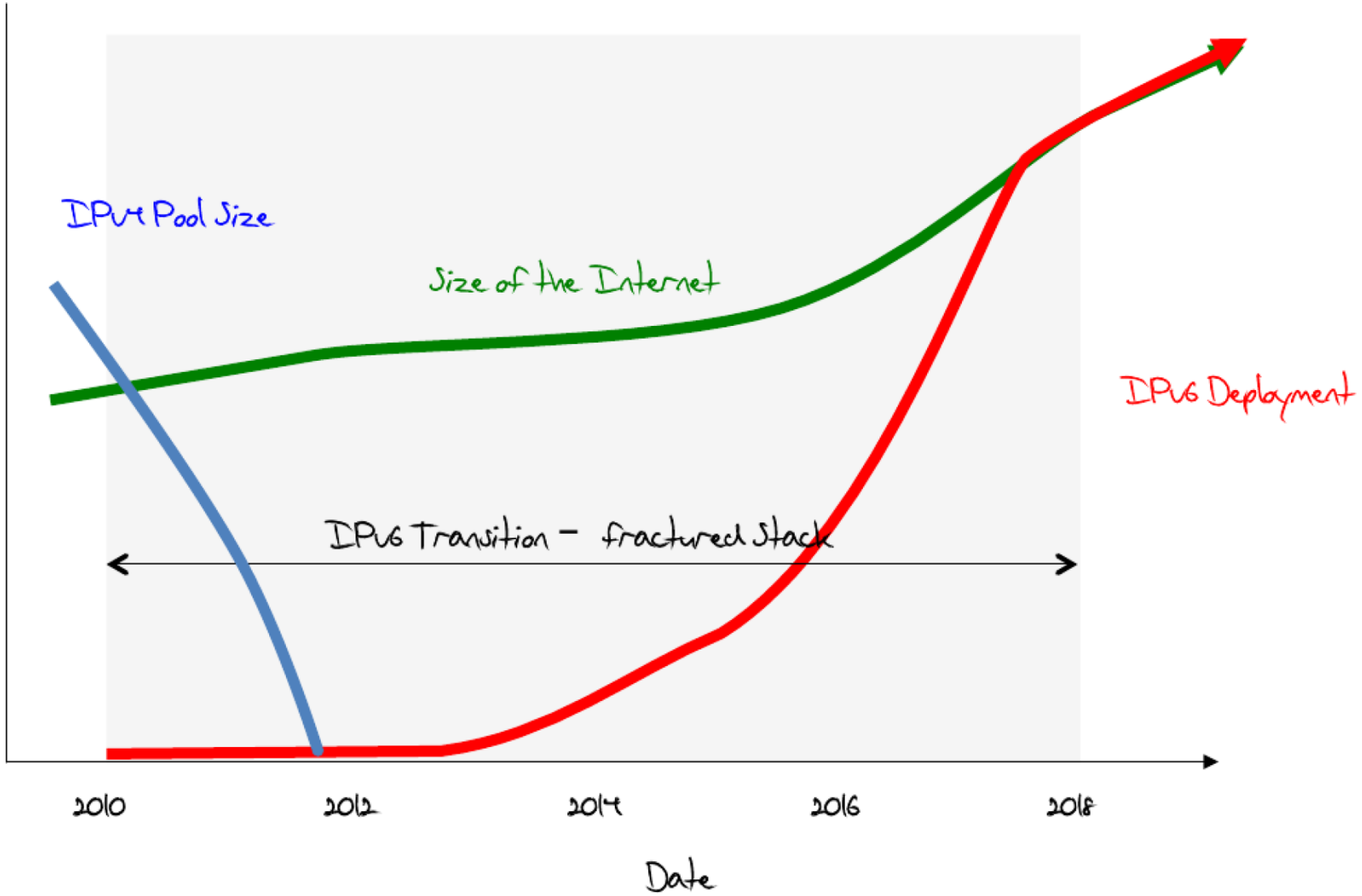
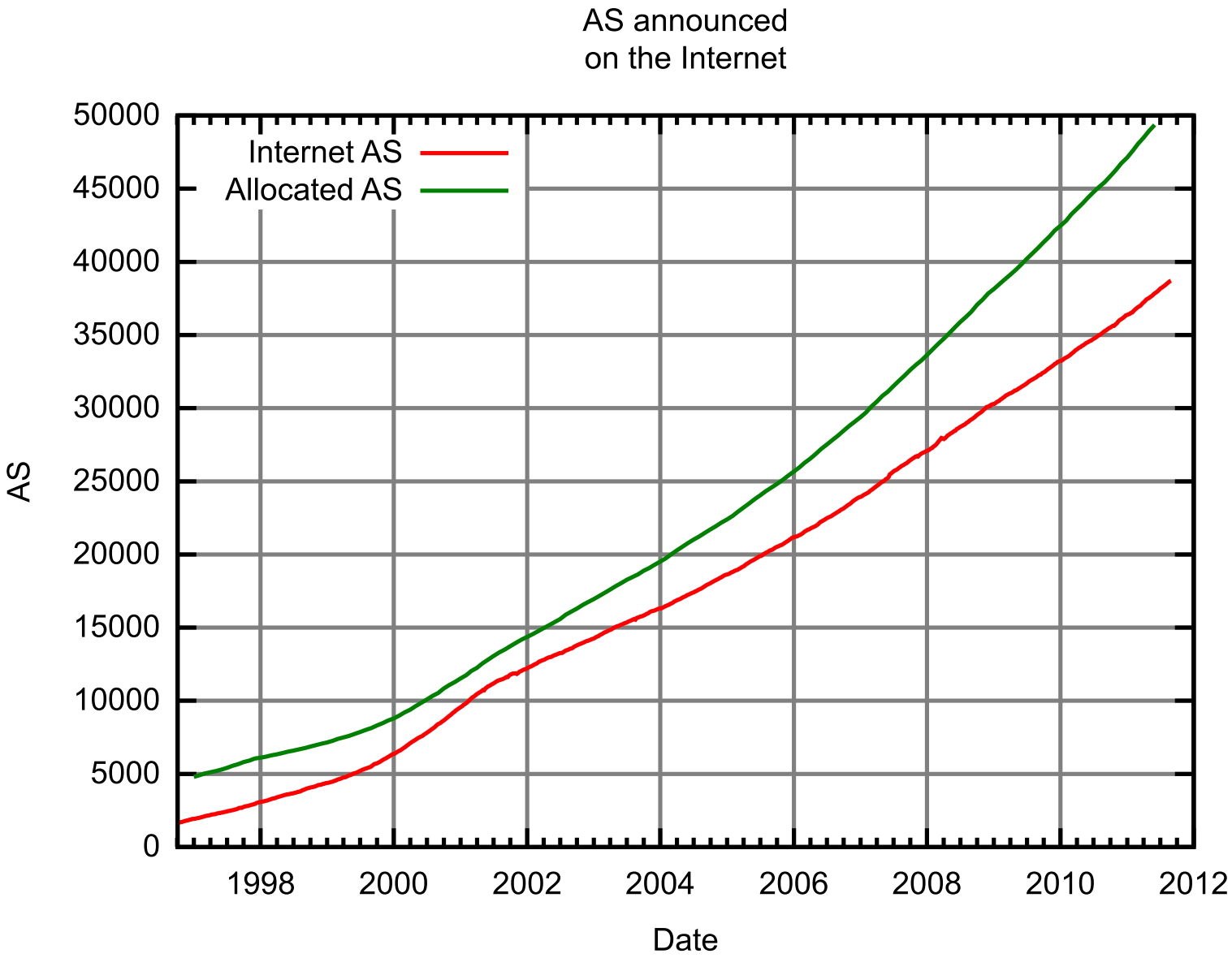
Short time to perform the transition . . .



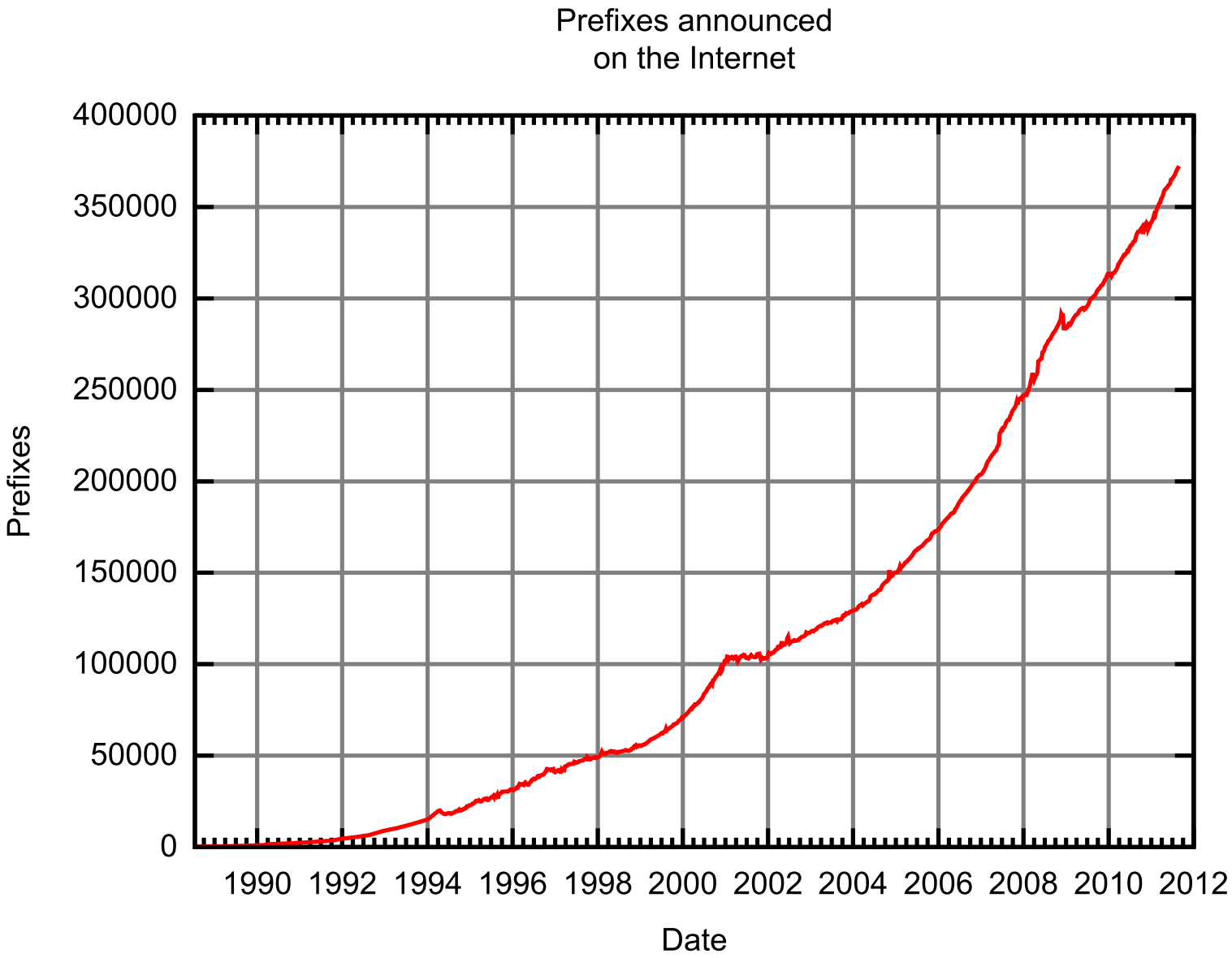
. . . we'll most probably end-up with



BGP: The number of Autonomous Systems on the Internet



BGP: The growth of the BGP routing table



Services' Scalability – atlases.muni.cz

- a collection of high resolution histological images
  - established and operated by MU and CESNET
  - publicly available
    - a free registration is required
- to ease the registration, *atlases* make it possible to use federated access
  - unique penetration in various federations
  - currently member of cca 15 national federations

- BUT: huge administration overheads
  - registration with a federation requires a lot of paper work
    - filling in forms, gathering signatures, ...
  - routine operations must be done separately for every single federation
    - mainatanence of metadata, public keys, certificates, ...

Services' Scalability – Public Key Infrastructure (PKI)

- PKI very often used as a means of scalable authentication mechanism
  - it has its limits, too
- proper operations of PKI imposes strict requirements on:
  - CA - often manual operations
  - RA - need for a "web of trust"
  - best practices - proper distributions of CRLs, ...
- BUT: can't cope well with a huge number of subscribers
  - a remedy can be further "delegations" - i.e. using identity federations
    - but remember the previous slide for their issues :-)

Open issues in Data-as-a-Service (DaaS)

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EBTIC
ETISALAT BT Innovation Center

In Partnership with KHALIFA UNIVERSITY

Standardization

- No standard for DaaS description
  - Each service provider has its own way to describe the provided service/data
  - Description is in html documents
- Limitations
  - Cannot automate service discovery
  - Cannot composite data/service from different service providers
  - …

Service/data integration

- Each DaaS may have
  - A unique service strength
  - A unique provide data set
  - Similar data sets
- How to combine service/data from different providers
  - To leverage strengths of different services
  - To combine data from different datasets

Constrains and optimization

- Some specific data cannot be exported out of a country
  - How to manage data constraints
- Similar data may have different price/cost in different providers
  - How to optimize data delivery to obtain the cheapest cost for the data

Stream data

- Stream data is pervasive
  - Sensor data
  - Stock data
  - Social networking data
- How to provide stream DaaS efficiently
  - Solve issues in combination of data stream processing and cloud computing

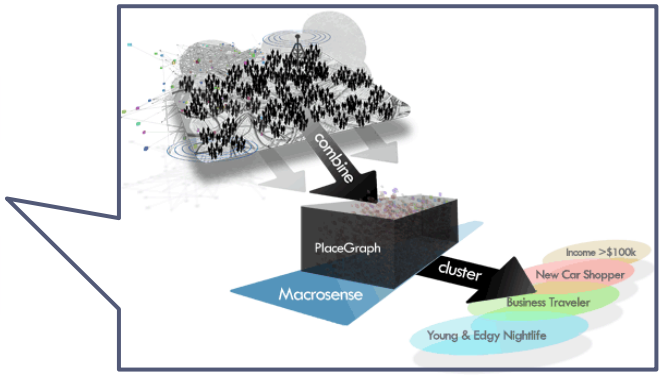
Emerging Technologies:
Integration of Search, Mining, and Sensing Technologies for Cyber Physical Systems

Takahiro Hara (Osaka University)

Panel in NextTech 2011, Nov. 23, 2011

Emerging Technology: Cyber Physical Systems (CPSs)

- Urban Sensing (CENS/UCLA, USA)
- CitySense (Sensor Networks, Inc., USA, 2008-)
  - Providing user distribution in San Francisco (iPhone, Blackberry)
  - Queries like “where do people reside and where will they go?”
    - Using the recorded data (few billions) and real-time data (several tens of thousands) obtained by current users, the current status can be predicted in real-time.



- What is lacking?
  - No universal platform for managing (e.g., integrating and reusing) sensor and other data
  - Real-time data obtained from Twitter and Blog are not fully used.

Future direction: Integration of sensor and cyber data

- A huge amount of social media contents in the cyber space
  - Web, Wikipedia,
  - Blog,
  - Twitter, Flickr, etc.

- Various sensor data generated in the physical space
  - Sensors monitor environments and events in the real world.
    - temperature, rainfall, seismometer, security camera, etc.

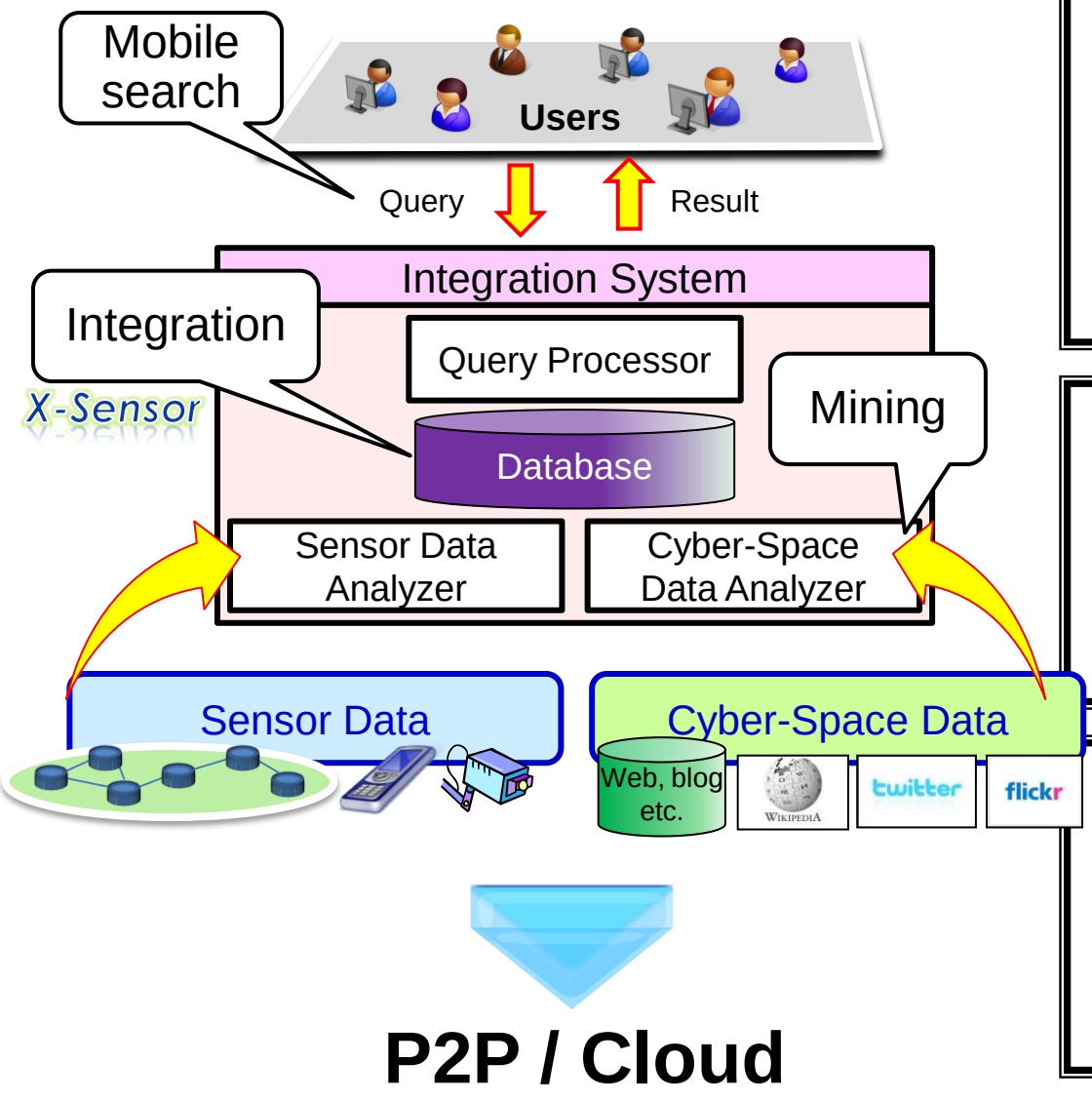
- With the rapid diffusion of smart-phone,
  - People can send and collect rich information anytime, anywhere.
  - Smart-phones can be sensors!
    - GPS, acceleration, etc. ➡ Peoples' location and movement

Application scenarios

- GPS data (users' locations) represent places where people reside and their dynamism.
- Twitter data (with geo tag) tell why people get together at the places.

- .. show what happens in a town.
- Useful for
  - Crime prevention, Pandemic detection, Traffic control, etc.
  - Marketing (e.g., distributing e-coupons), navigation, recommendation of spots (users' decision making), etc.

System architecture and research issues



Integration of hetero. data

- Linking between hetero. data
- Query processing over hetero. Data
- Creating new services from the analytical (query) result

Analysis and recognition of real-world

- Efficient analysis of complicated structured data
- Understanding analytical result

Mechanisms for participation

- Common data format & config.
- Mechanism to collect / manage data from general users (e.g. GPS / tweets from smart phones)