

# WIDE Update

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## new director of WIDE project (since March 2010)

Hiroshi Esaki: new Director



Jun Murai: Founder



from News Release:

It is the conviction of the WIDE Project that the changing of Jun Murai's position from Director to Founder allows him, and therefore WIDE, to give full attention to achieving the future Internet-based society.

# Hot Topics in WIDE

- ▶ new director
- ▶ regional WiMAX experiments
  - ▶ Fujisawa City, Kanagawa
- ▶ IOT (Internet of Things)
  - ▶ IOT 2010, Nov 29 - Dec 1, Tokyo
- ▶ Green University of Tokyo
  - ▶ Smart Campus with IP-based sensors
- ▶ WIDE clouds
  - ▶ federated clouds (U. Tokyo, Keio, NAIST, JAIST)

## measurement activities

not covered in this workshop

- ▶ BGP research
  - ▶ workshop at IIJ, April 2010
  - ▶ Tim Griffin (Cambridge), Olaf Maennel (Loughborough), Debbie Perouli (Purdue), Randy Bush, Cristel Pelsser, Kenjiro Cho (IIJ)
  - ▶ will install new monitors for eBGP/iBGP at WIDE and IIJ
- ▶ DITL 2010
  - ▶ packet traces (4/13 00:00-4/16 11:00) at samplepoint-F
- ▶ residential broadband traffic measurement
  - ▶ new measurements from mobile carriers under discussion

# Trends in Japanese Residential Traffic

ISOC Panel on Internet Bandwidth: Dealing with Reality

November 10 2009

## residential broadband subscribers in Japan

30.9 million broadband subscribers as of June 2009

- ▶ reached 63% of households, increased by only 3% in 2008

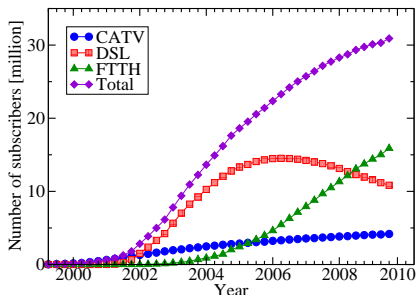
- ▶ FTTH:15.9 million, DSL:10.8 million, CATV:4.2 million

shift from DSL to FTTH

- ▶ 100Mbps bi-directional fiber access costs 40USD/month

  - ▶ 200M/100M, 1G/1G also available

- ▶ 60% of Internet traffic in Japan is residential traffic



residential broadband subscribers in Japan

## data collection experiences

our data collection with 6 ISPs started in 2004

- ▶ covering 42% of Japanese traffic
- ▶ voluntary effort by ISPs

to answer concerns about rapid growth of residential traffic

- ▶ ISPs' concerns are often not shared by other parties because no data is available
  - ▶ e.g., technologies, fairness, profitability
- ▶ although most ISPs internally measure their traffic
  - ▶ data is seldom made available to others
  - ▶ measurement methods and policies differ from ISP to ISP

what is specific to Japan?

- ▶ high penetration of fiber access leads to a larger skew in bandwidth usage among users

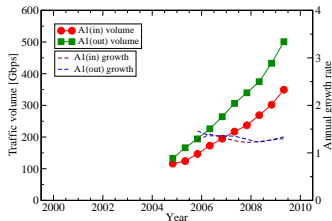
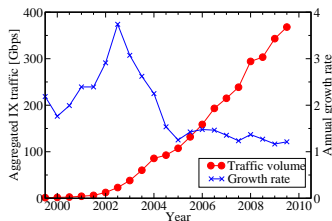
# traffic growth

why is traffic growth important?

- ▶ one of the key factors driving research, development and investment in technologies and infrastructures
- ▶ what is crucial is the balance between demand and supply
  - ▶ network capacity also grows 50% per year by various sources

traffic growth of the peak rate at major Japanese IXes

- ▶ modest growth of about 40% per year since 2005
- ▶ the number for residential traffic is similar: 30% per year



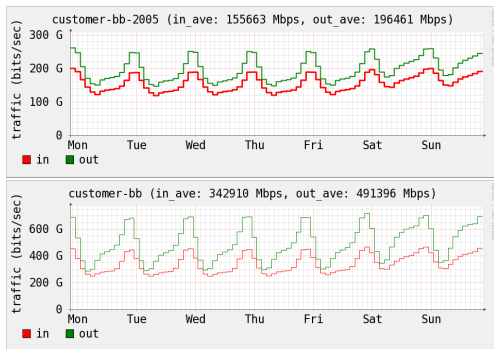
traffic growth at the major Japanese IXes (left) and residential broadband (right)



## changes in residential traffic patterns

- ▶ data: aggregated interface counters from 6 ISPs
  - ▶ in/out from ISP's view
- ▶ traffic patterns by home users (peak at 21:00-23:00)
- ▶ 2005: in/out were almost equal (dominated by file-sharing)
- ▶ 2009: outbound (download to users) became larger

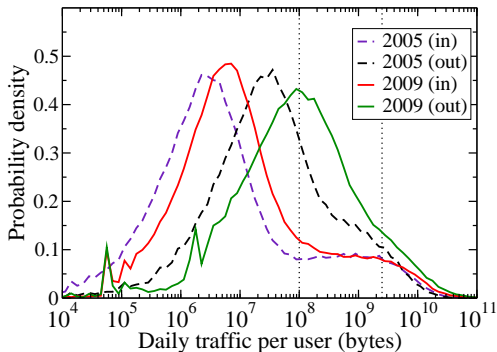
indicates a shift from p2p file-sharing to content services



weekly residential traffic: 2005(top) 2009(bottom)

## increasing daily traffic volume per user

- ▶ data: Sampled NetFlow from IJ
- ▶ roughly log-normal distribution
  - ▶ with another small peak for heavy-hitters
- ▶ increase in download volume is larger
  - ▶ out mode: from 32MB/day to 114MB/day
  - ▶ in mode: from 3.5MB/day to 6MB/day

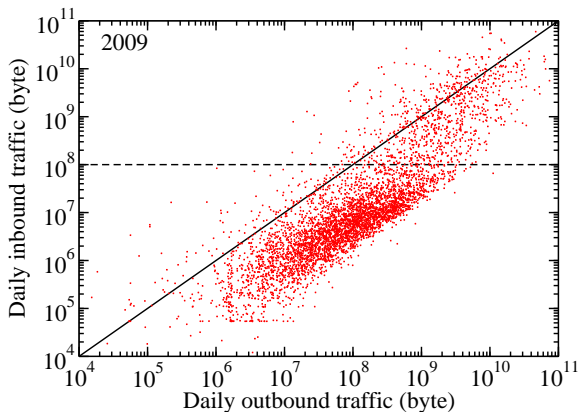


probability distribution of daily traffic per user (2005 vs. 2009)

## individual users have different traffic mix

2 clusters: client-type users and peer-type heavy-hitters

- ▶ no clear boundary: heavy-hitters/others, client-type/peer-type
- ▶ most users use both client-server and p2p style applications



in/out volumes per user in 2009

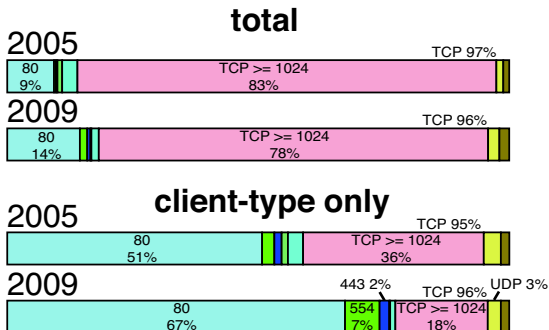
## protocol/port usage

extract client-type users with threshold: 100MB/day upload

- ▶ to observe differences in protocol/port usage
- ▶ port number:  $\min(\text{sport}, \text{dport})$ 
  - ▶ well-known ports for client-server, dynamic ports for p2p

observations

- ▶ dominated by TCP dynamic ports (but each port is tiny)
- ▶ TCP port 80 is increasing (again)



## key observations

- ▶ growth of Japanese residential traffic
  - ▶ stable at around 30% per year for the last 5 years
- ▶ shift in traffic patterns
  - ▶ p2p file-sharing is still dominant in volume
  - ▶ but a shift to content services is clear
  - ▶ individual users have diverse traffic mix

## other observations

- ▶ high penetration of fiber access in Japan
  - ▶ leading to a larger skew in bandwidth usage among users
- ▶ congestion issues in increasing mobile wireless access
- ▶ higher growth in international traffic

## it is difficult to predict future traffic

- ▶ significantly impacted by the behavior of heavy-hitters
  - ▶ technical factors: content caching, CDN, QoS
  - ▶ economic factors: access cost, capacity/equipment costs
  - ▶ political/social factors: net-neutrality, content management

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