

A Measurement of Mobile Traffic Offloading

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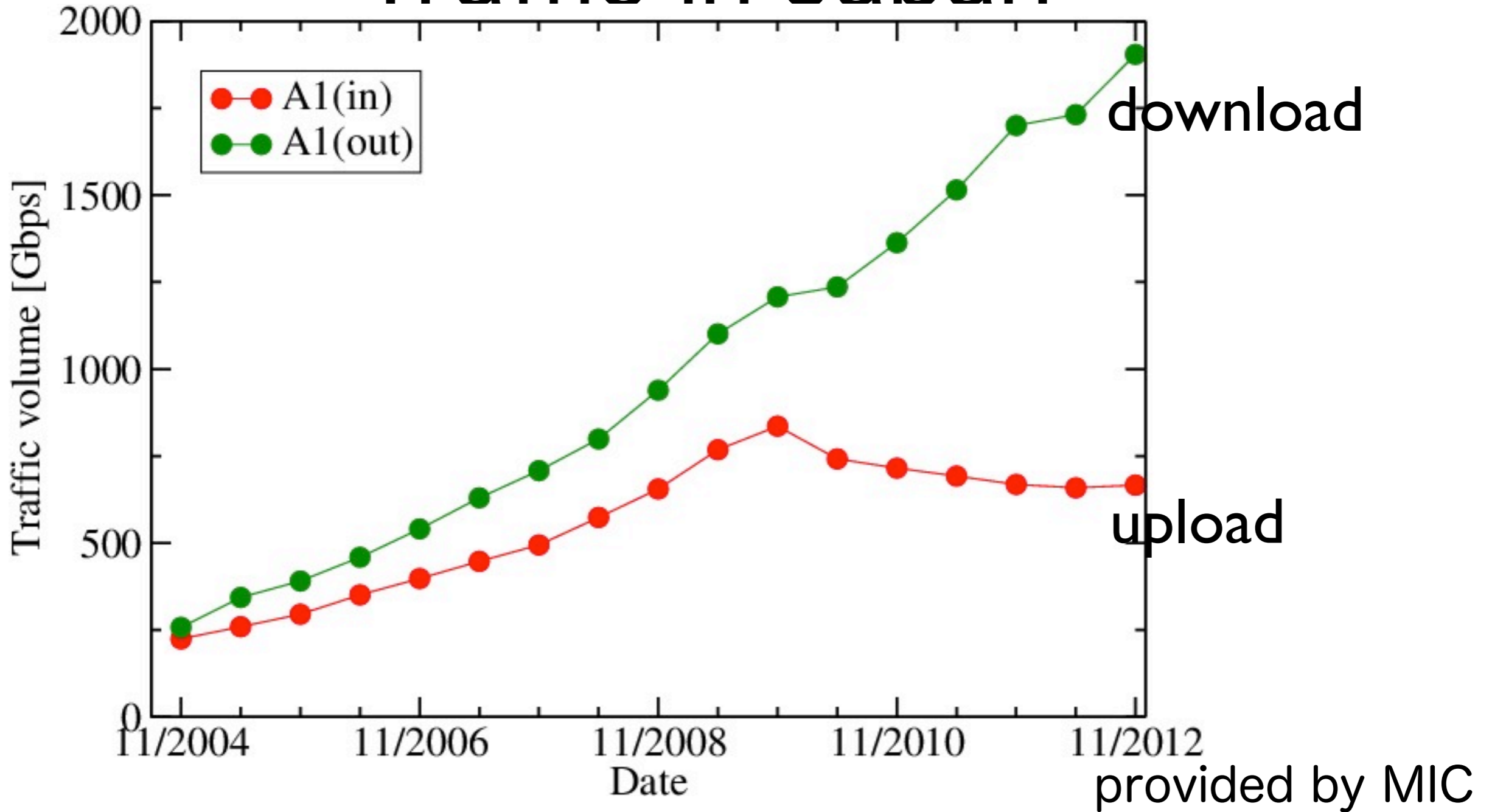
INTEC

Kenichi Nagami

- Background
- Measurement setup
- Results
- Conclusion

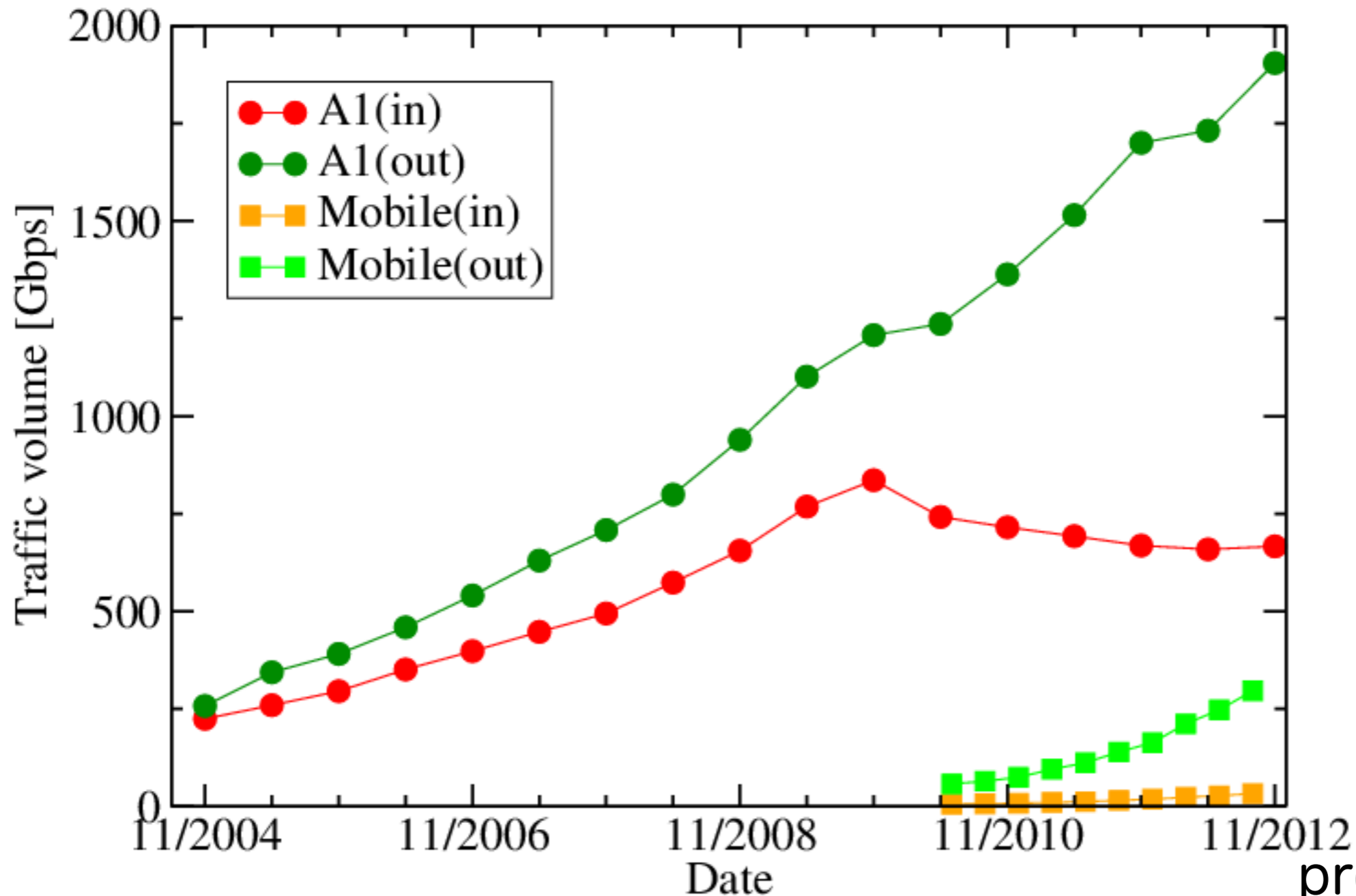
Growth of Residential Broadband

Traffic in Japan



- Estimated by 6 ISP's traffic volume in Japan

Growth of 3G Traffic in Japan

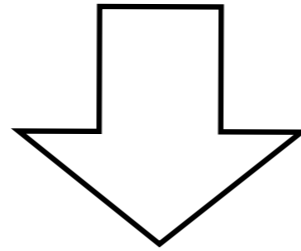


- Data provided by 4 Japanese mobile carriers

- Growth of mobile traffic is not negligible (>15%)

Growth of mobile traffic

- Traffic congestion in downtown area
 - Smartphones with rich contents
 - Flat fee (/w soft BW cap)
 - Limited amount of frequencies



- More base stations
- New technology (e.g., LTE)
- Traffic offloading from 3G to WIFI

Deployment of WIFI

- Private WIFI
 - User's home or Office
 - (APs provided by 3G carriers)
- Public WIFI service (!= free)
 - Station, Airport, Cafe, etc
 - Deployment by 3G carriers and WIFI carriers

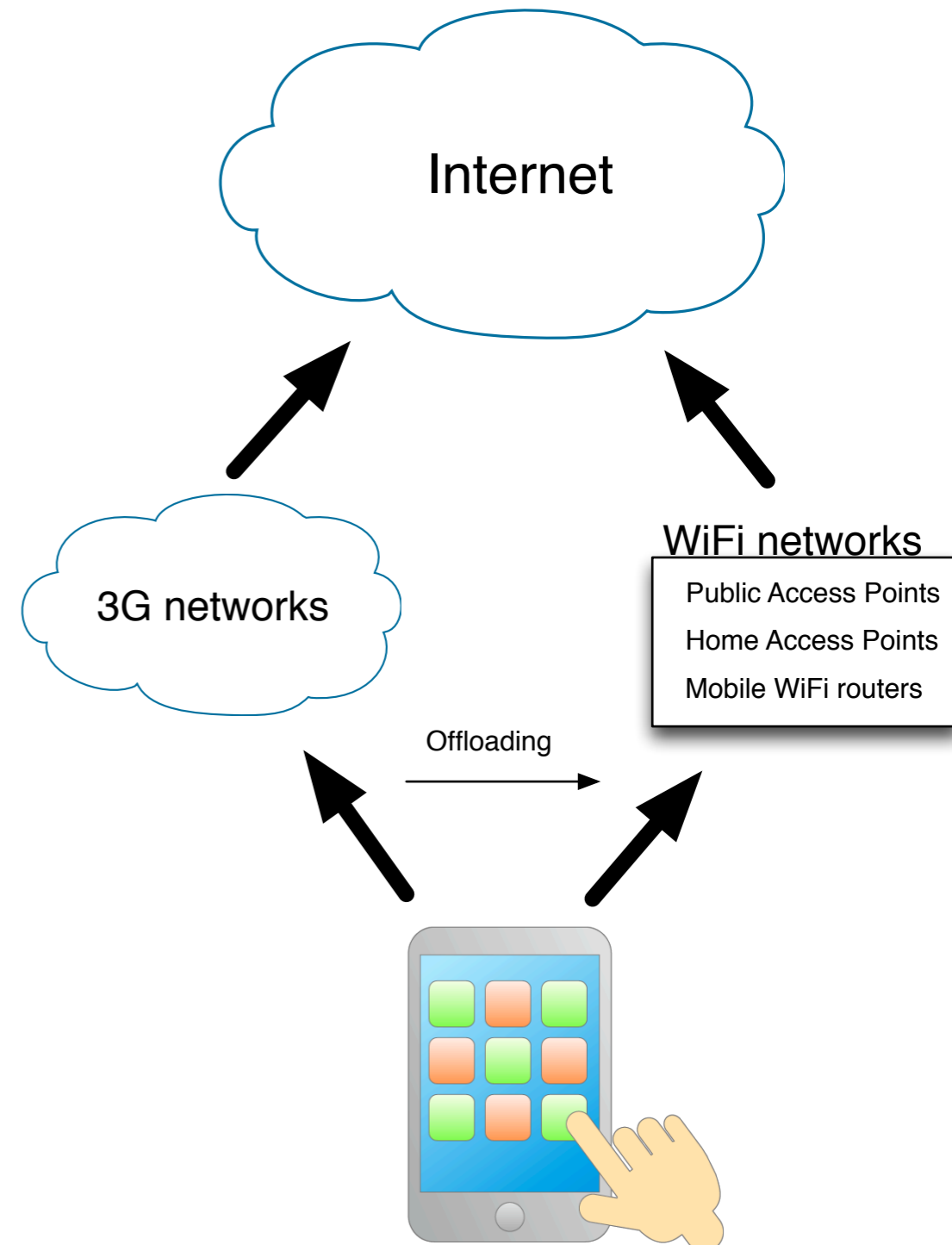


=> WIFI is available at many places in downtown

Measuring Effect of Offloading

- Difficulties in collecting data
 - BB ISPs
 - only total traffic from home
 - 3G carriers
 - only 3G traffic
 - Public WiFi carriers
 - only public WiFi traffic

=> User side measurement is required



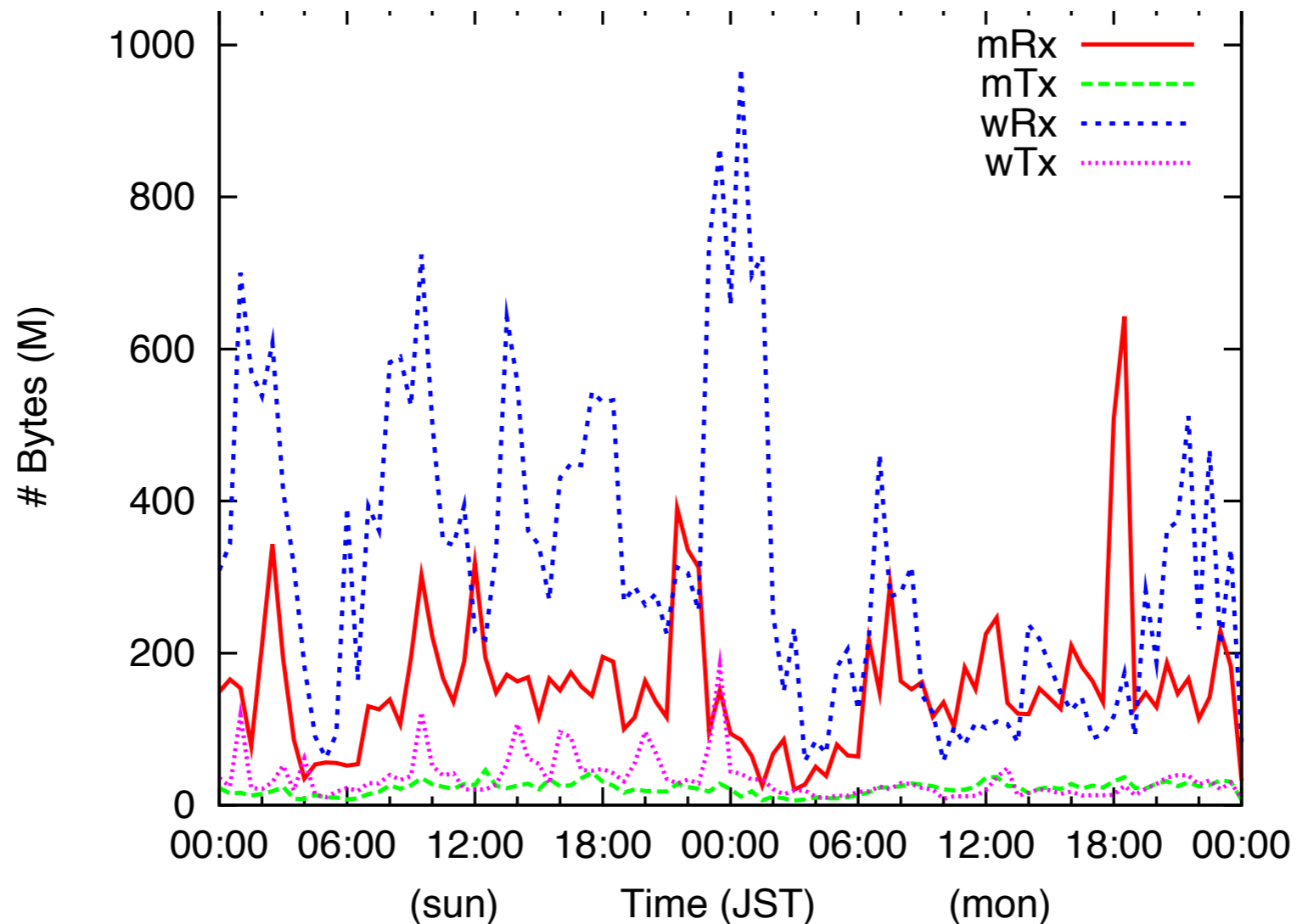
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Measurement setup

- Measurement with Android application
 - Date : 13(Sun)-14(Mon) May 2012 (48hrs)
 - #Users : 450+ (Nationwide, 90% had home WIFI AP)
 - Measured data:
 - 3G and WiFi traffic volume (per 10min)
 - 3G base station and WIFI AP info
 - No GPS and Application info

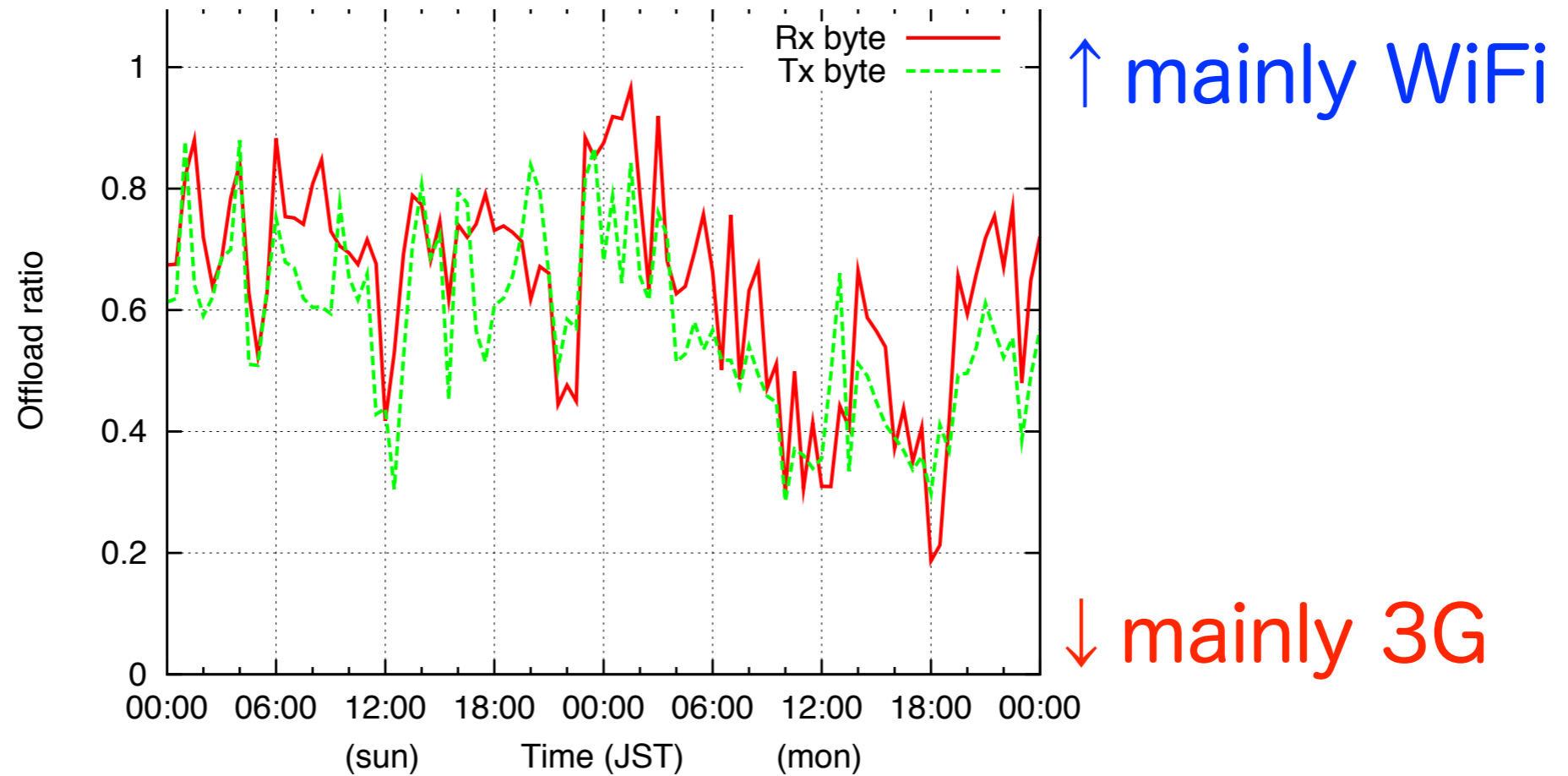
- Background
- Measurement setup
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 - Global view
 - User view
 - WIFI usage
- Conclusion

Variation of traffic volume



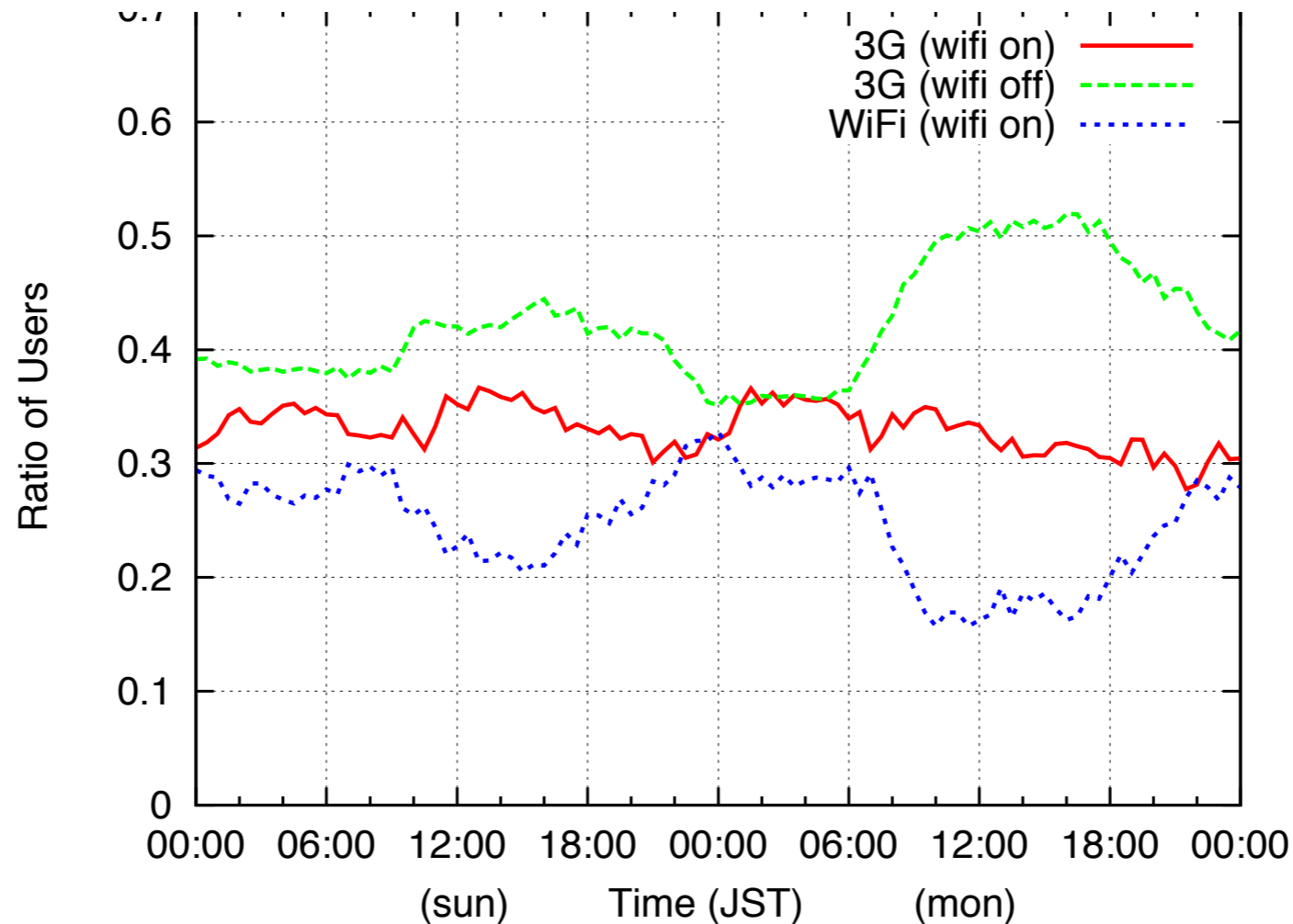
- WiFi traffic > 3G traffic
- Peaks are not synchronized => explicitly switched
- Peaks in 3G: Monday evening (Rush hour)
- Peaks in WiFi: Night

Traffic offload ratio



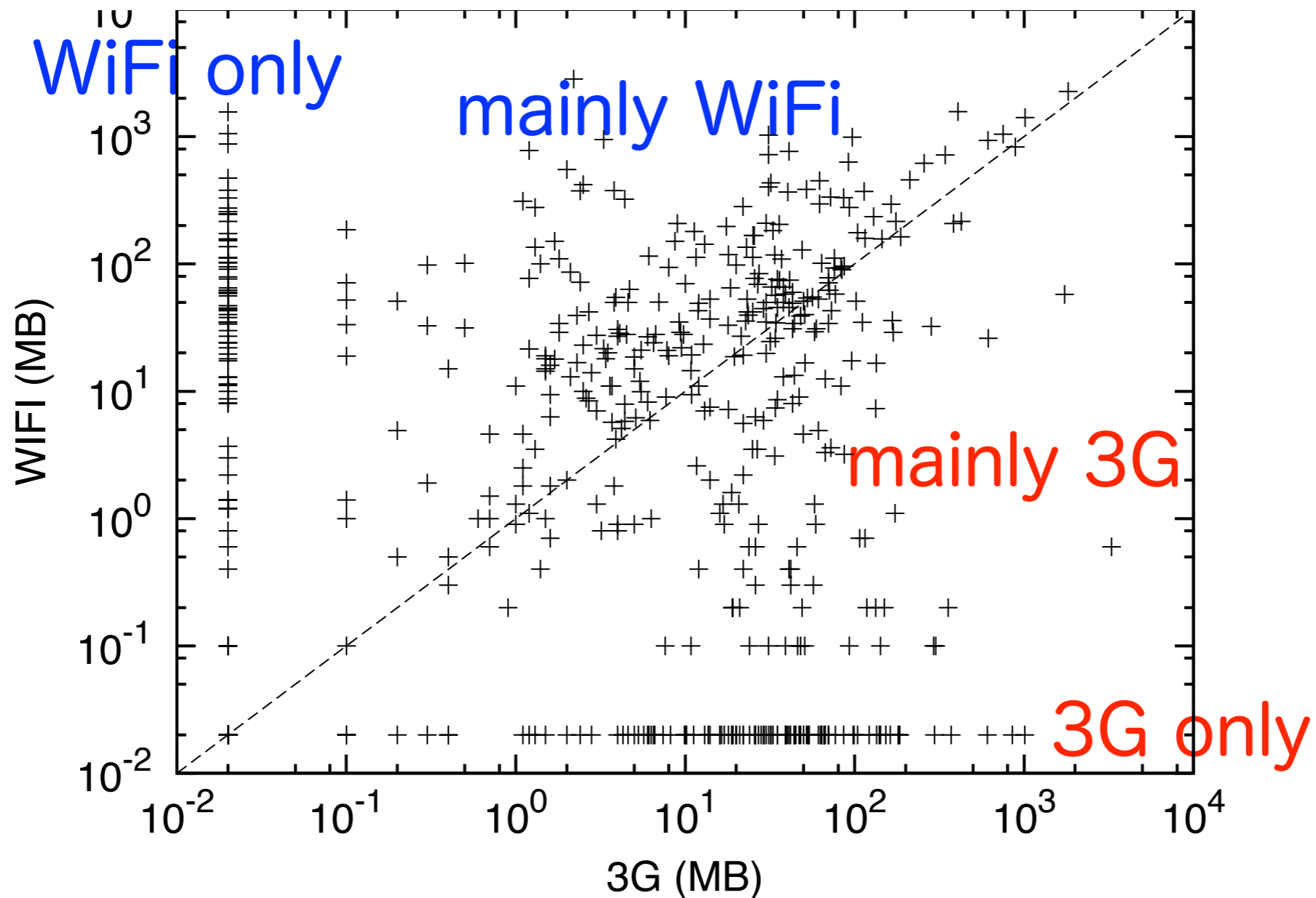
- Traffic offload ratio = WiFi bytes / (3G + WiFi bytes)
- Low : Sun. noon, Sun. 9pm, Mon. morning, Mon. 6pm
- High : Sun. night, Mon. night

Interface breakdown



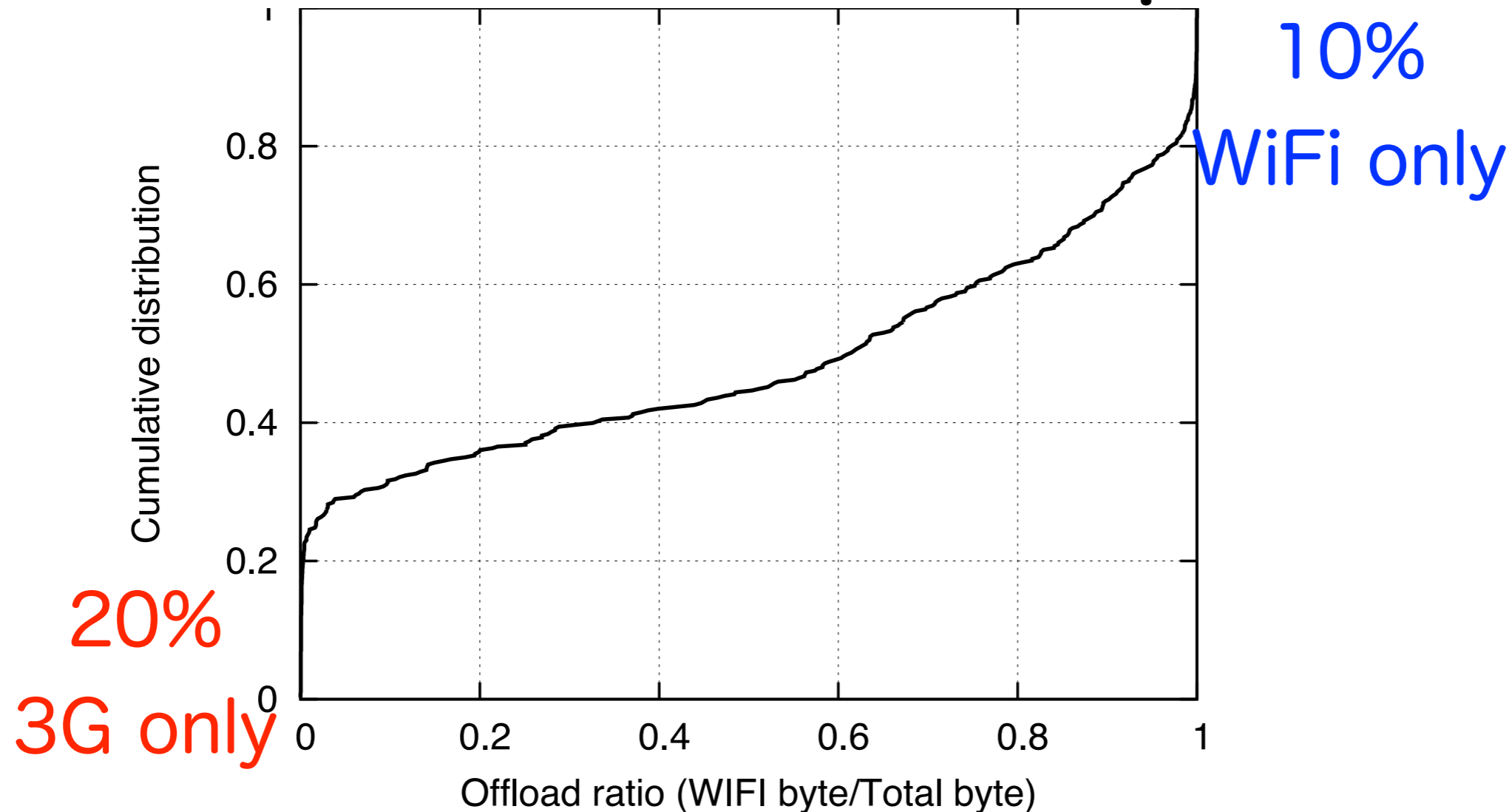
- 50% users turned off WIFI in Mon. daytime
- 10% users explicitly use WIFI at night

Per user traffic volume



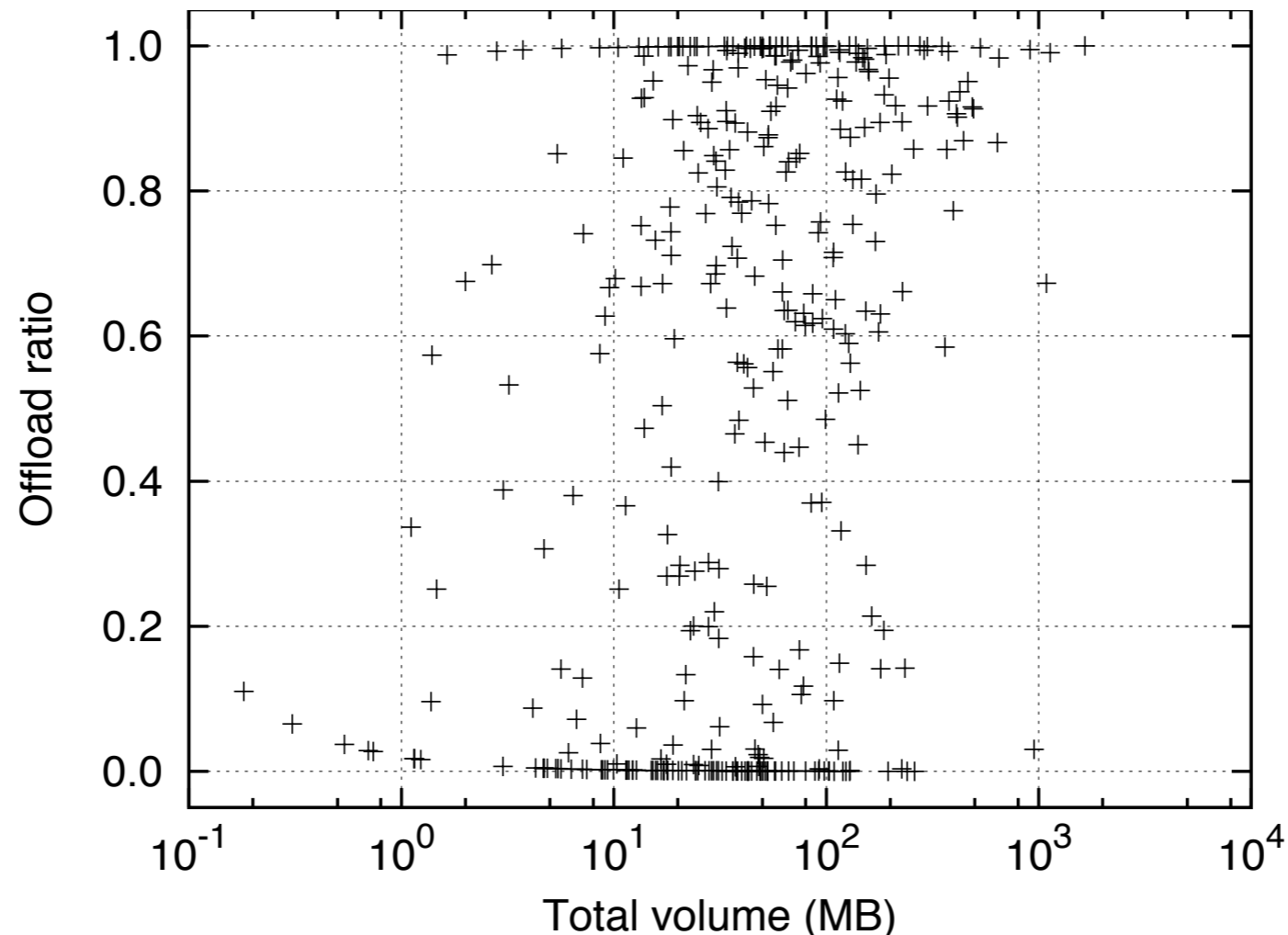
- 3G only and WiFi only users
- Still more room for offloading

Traffic offload ratio per user



- Offload ratio = WiFi bytes / (3G + WiFi bytes)
- Median (50%) user: 60% WiFi and 40% 3G

Total traffic volume and offload ratio

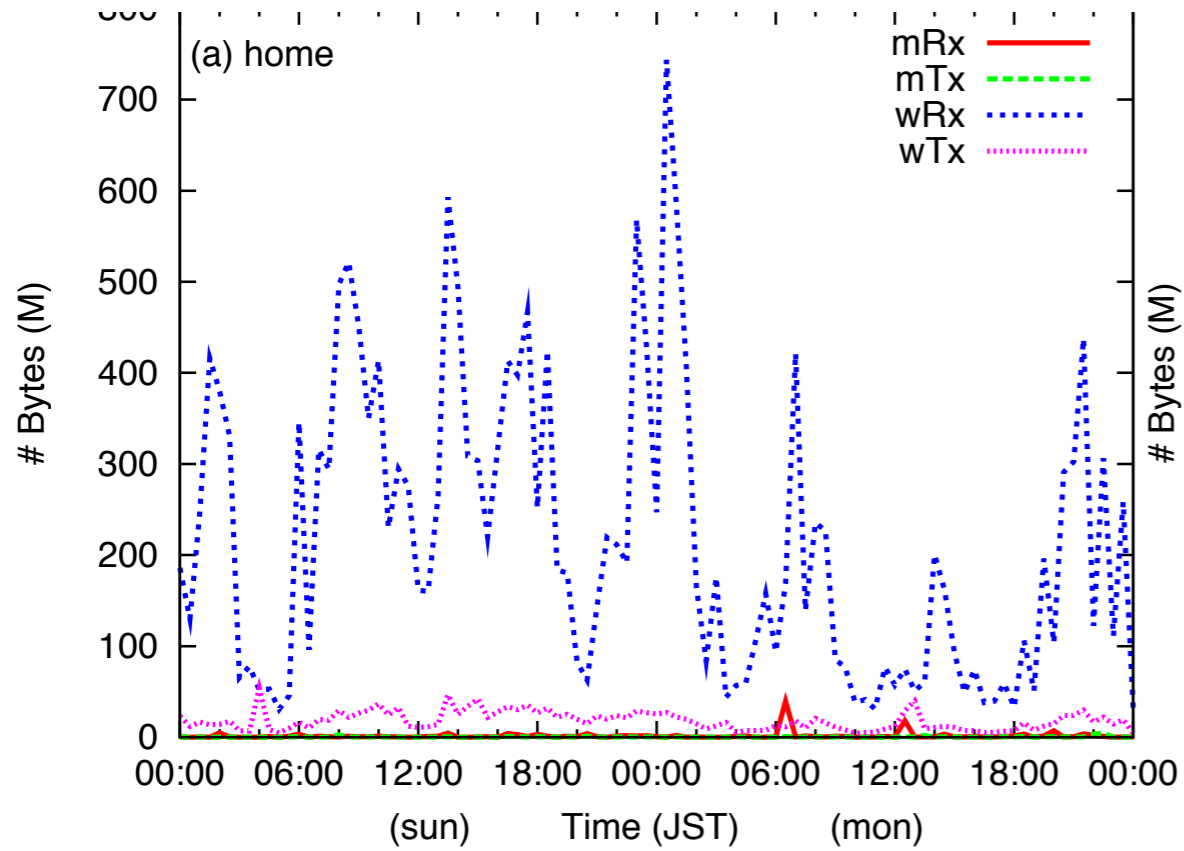


- High offloading users consume more traffic

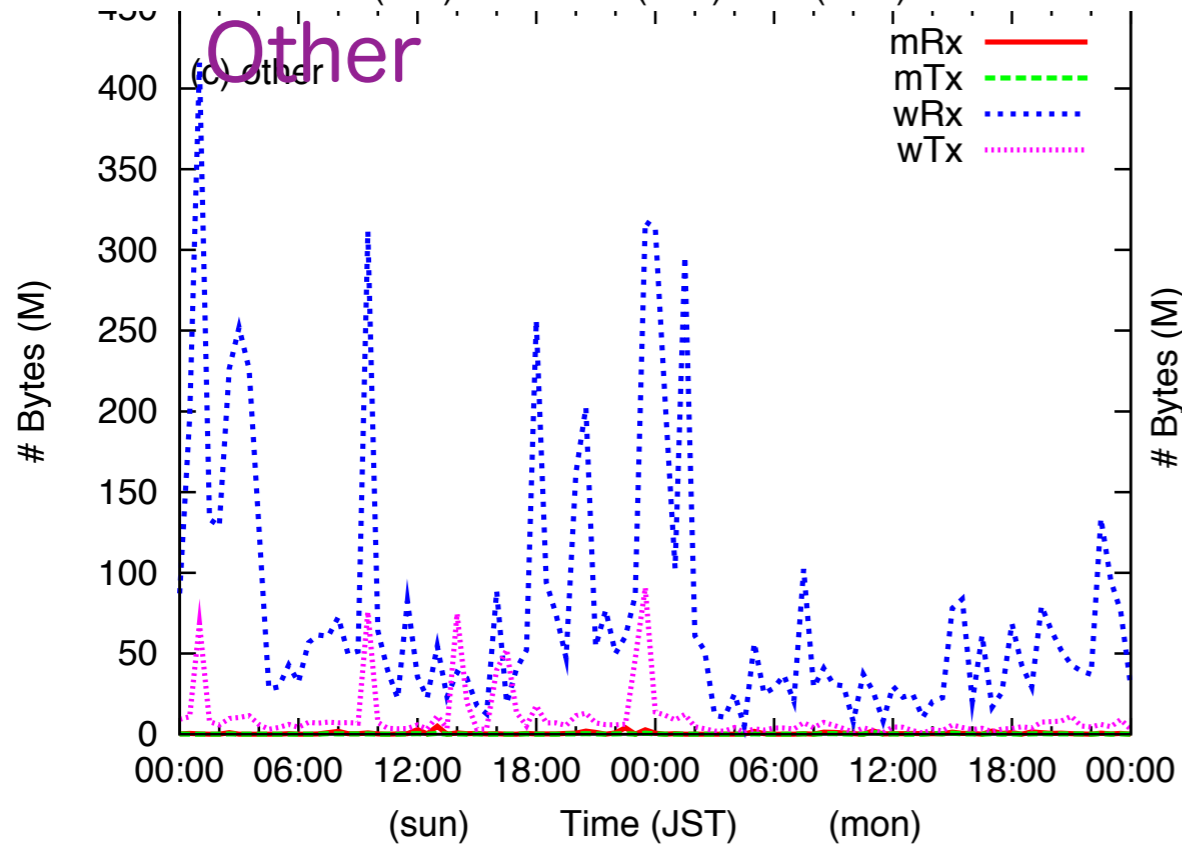
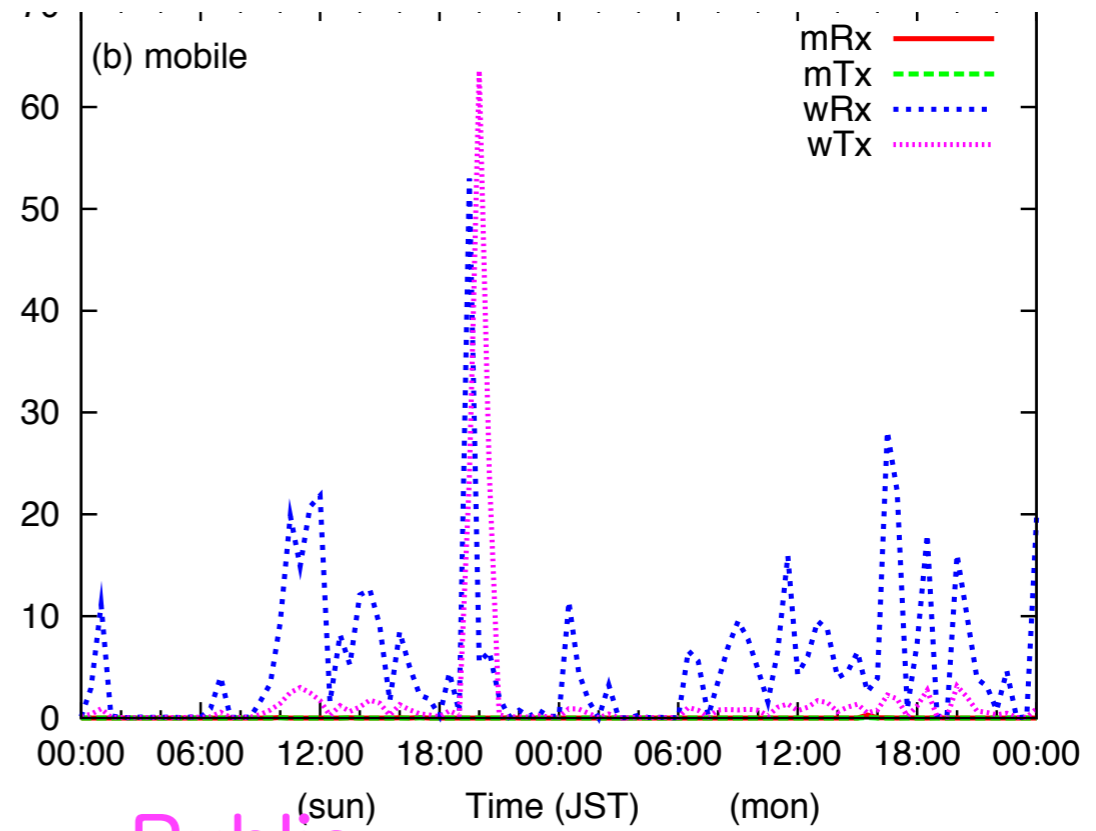
Usage of WIFI APs

- Classification by ESSID users associated
 - **Home**: default values set by vendors
 - **Mobile**: Portable WIFI router (e.g., Pocket WIFI)
 - **Public**: Public APs provided by 3G carriers and WIFI carriers (e.g., docomo, AU_WiFi, 001softbank, Fon,...)
 - **Other**: Named ESSID

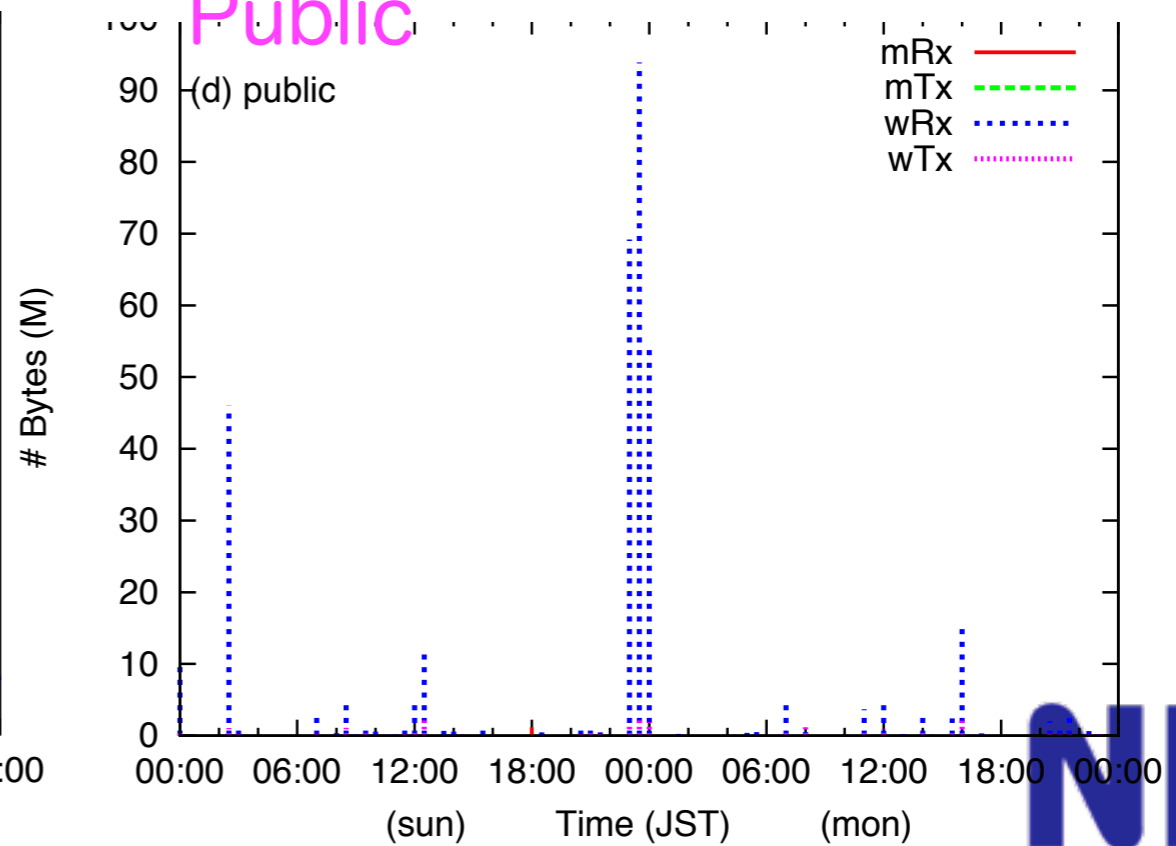
Home



Mobile



Public



Traffic variation per AP Types

- **Home** type dominates traffic volume
- **Other** type is closer to home type (maybe in home)
- **Mobile** type is closer to 3G
- **Public** type's contribution is limited

Low availability of Public APs (plausible reasons)

- No available APs
 - No motivation because of flat fee?
 - No configuration for public WIFI
 - Turned off WIFI interface
 - Unsatisfaction to low quality of WIFI (Myth?)
 - Different application usage (home vs outside)
- => Needs for more Education, Auto configuration,
User-friendly setup assistance

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Conclusion

- Measurement of 3G mobile offloading
 - Offloaded traffic at home is not negligible
 - Usage of WiFi and 3G is complimentary
 - More rooms for WIFI offloading
 - Public WIFI offloading is still limited

Questions?