Synchronized Clients and Traffic Trends

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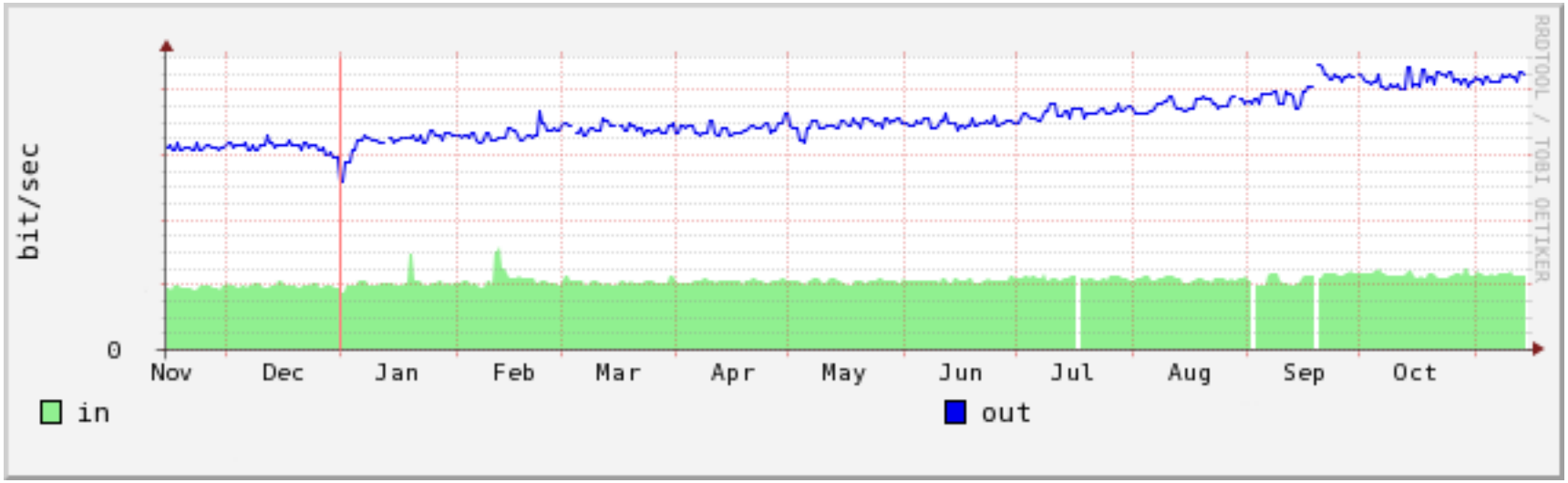
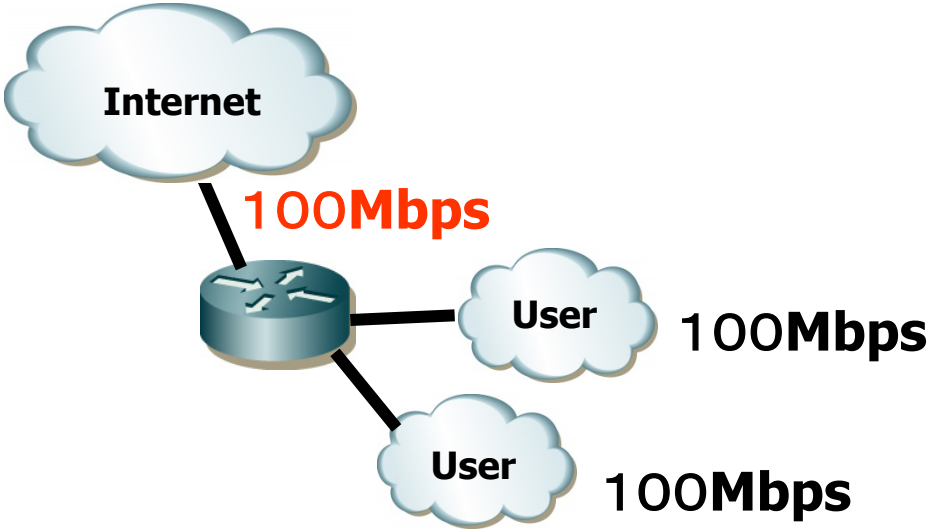
traffic and network design



- we plan upgrading based on traffic trend
  - to avoid congestions

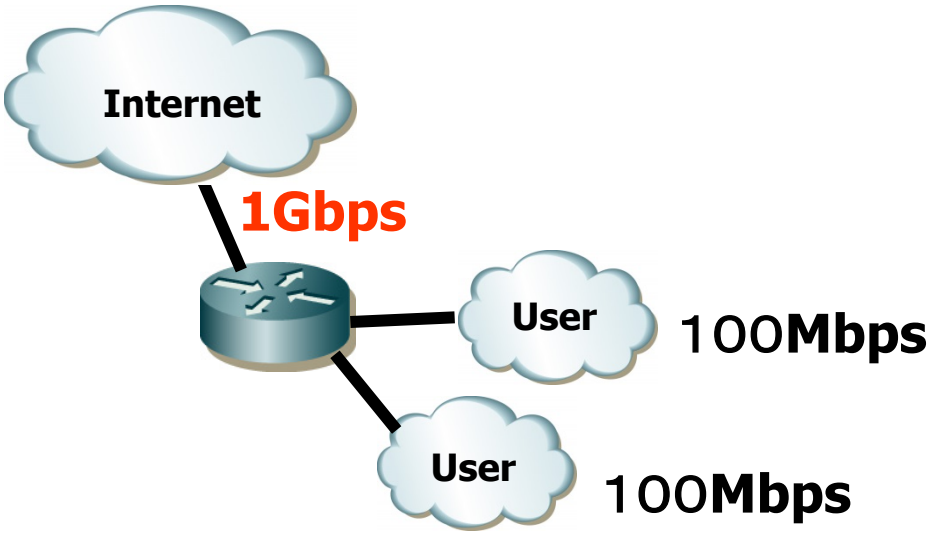
network design #1

- over-subscription
  - only some of users uses the network at once
  - expecting statistical multiplexing effect
  - need to estimate utilization to avoid congestion



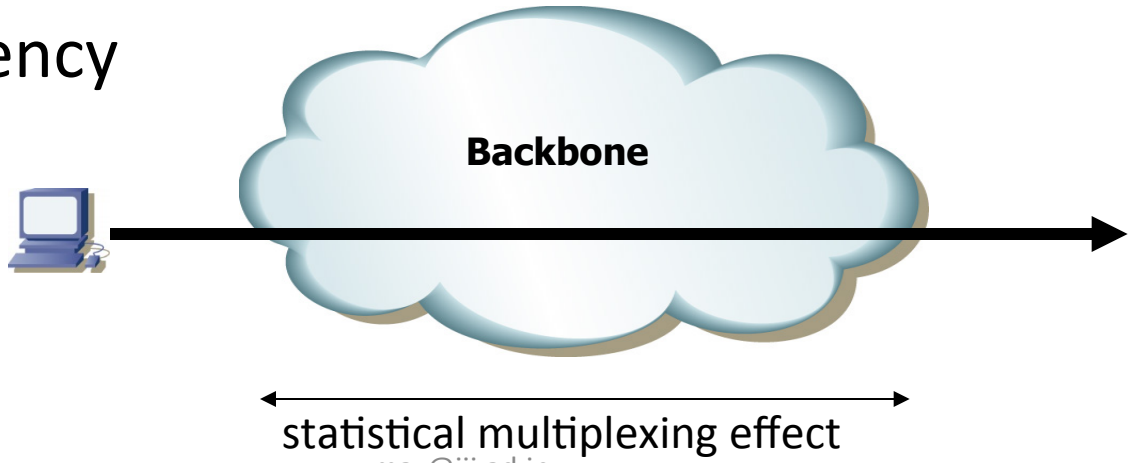
network design #2

- over-provisioning
  - provide more bandwidth than needed



backbone network design

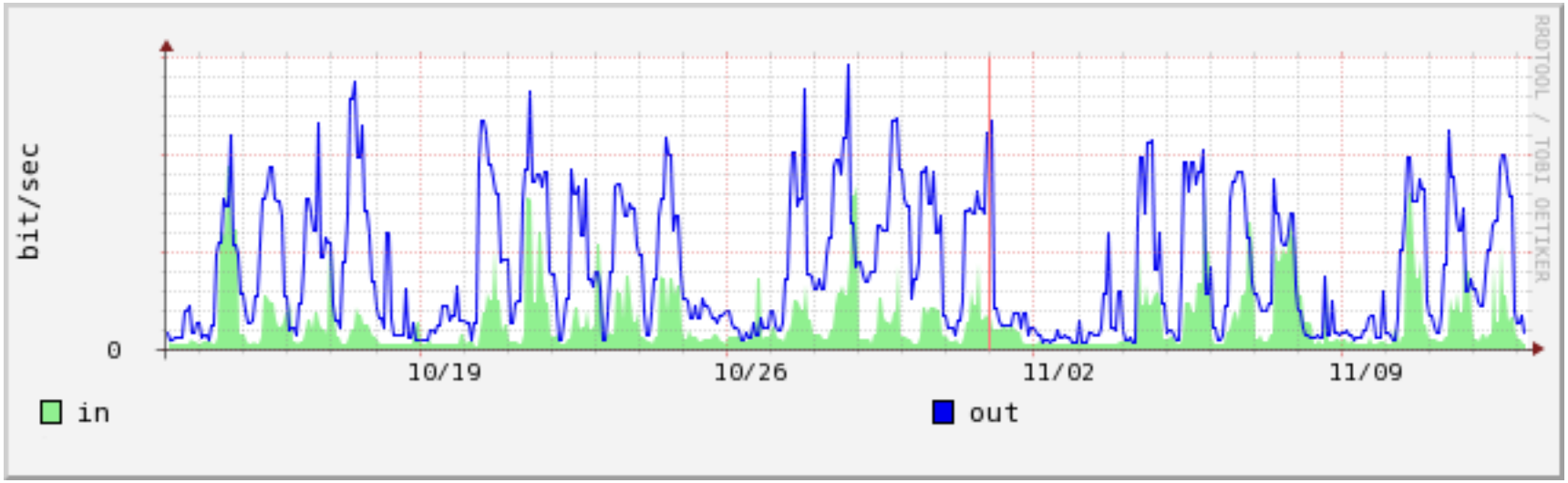
- based on over-subscription
  - we can expect more statistical multiplexing effect
  - cost effective
- over-provisioning to its utilization
  - for redundancy
  - low latency



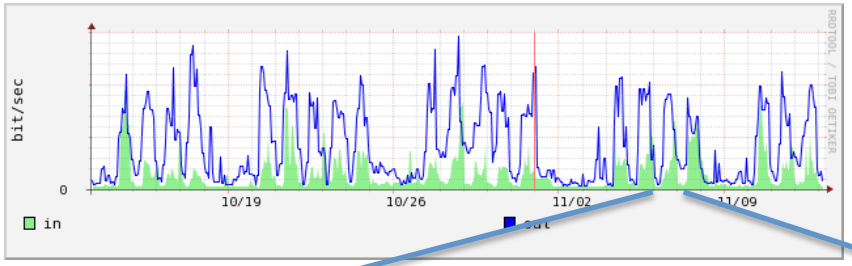
typical traffic

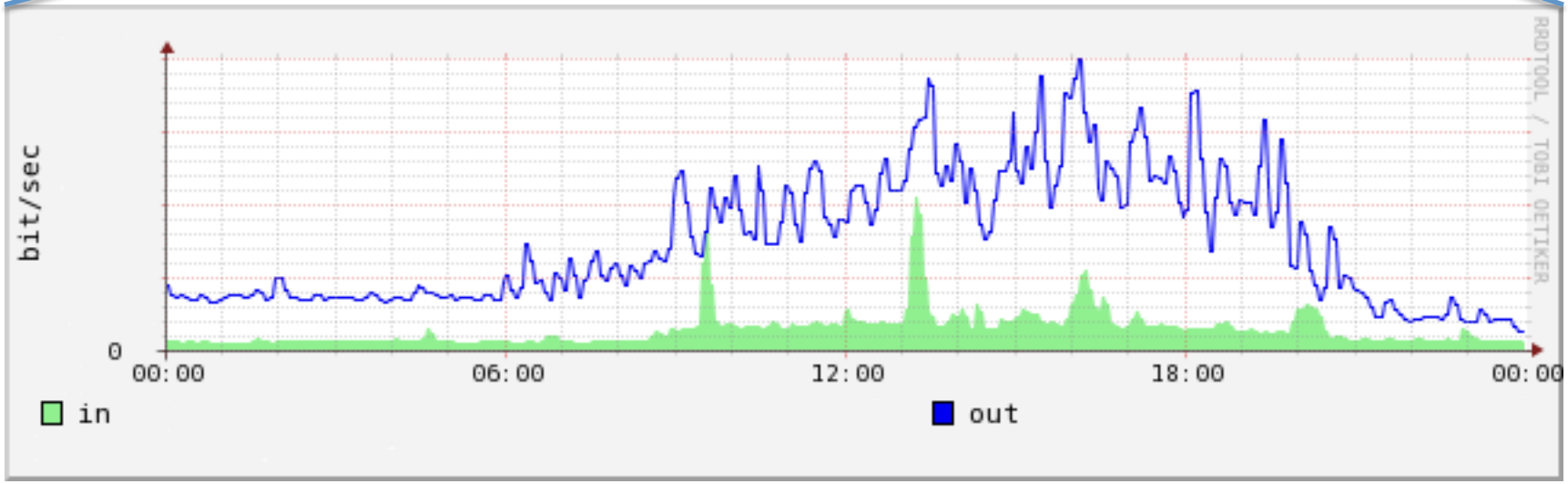
- enterprises
- consumers
- CDN
- IX
- mobile

enterprise

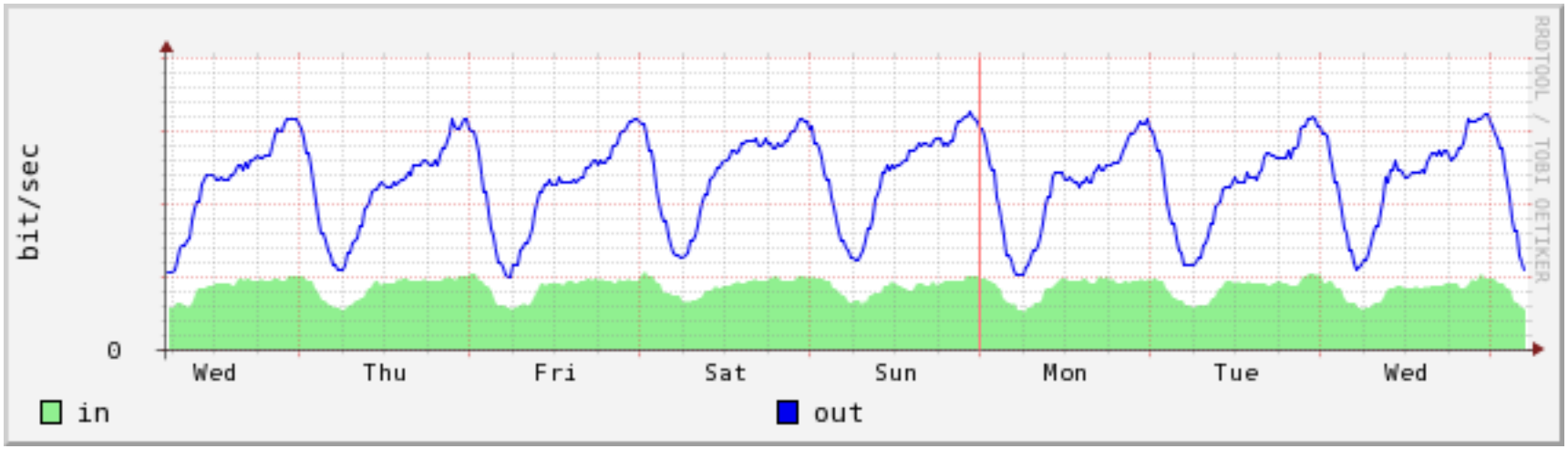


enterprise weekday

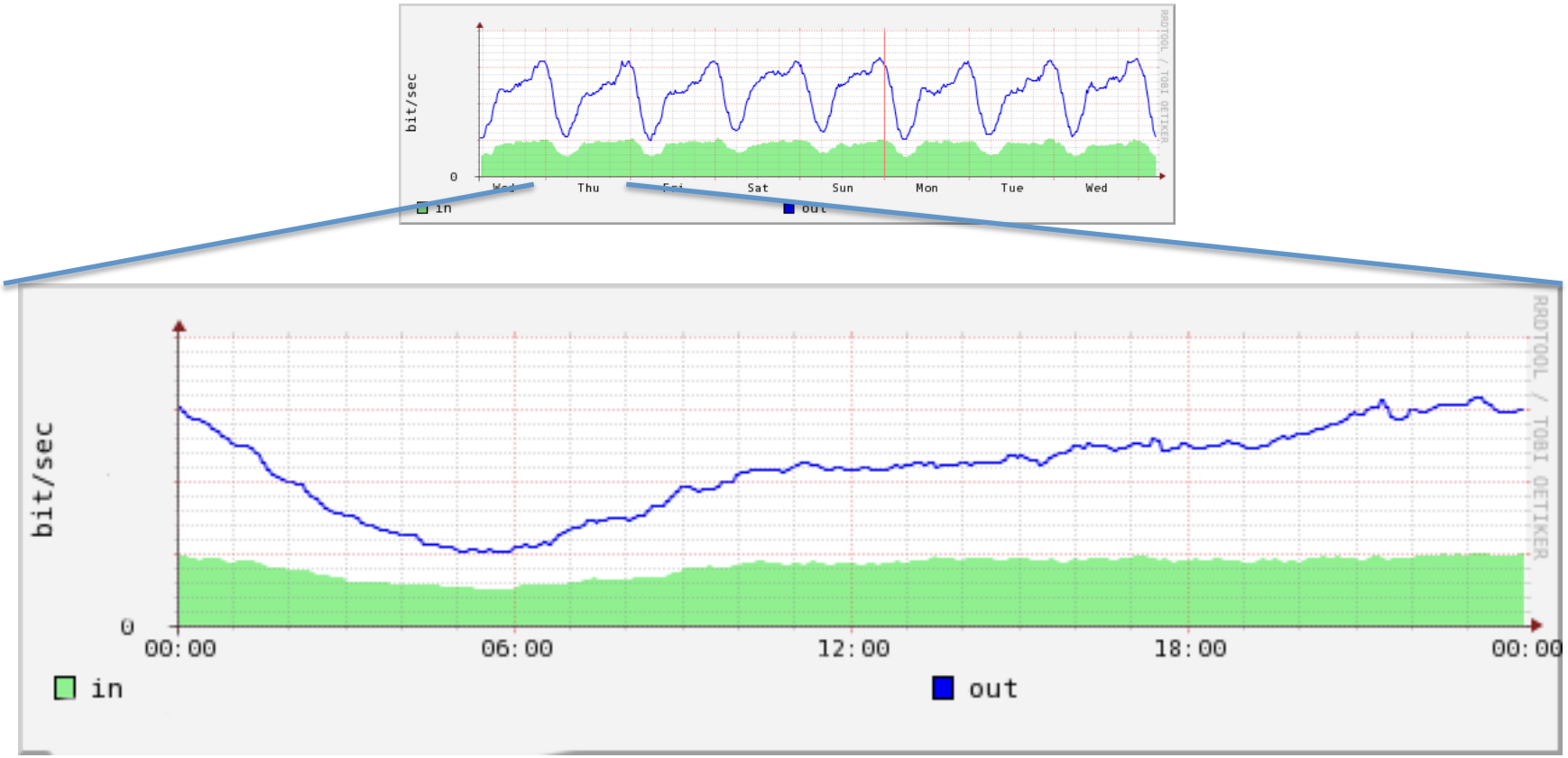




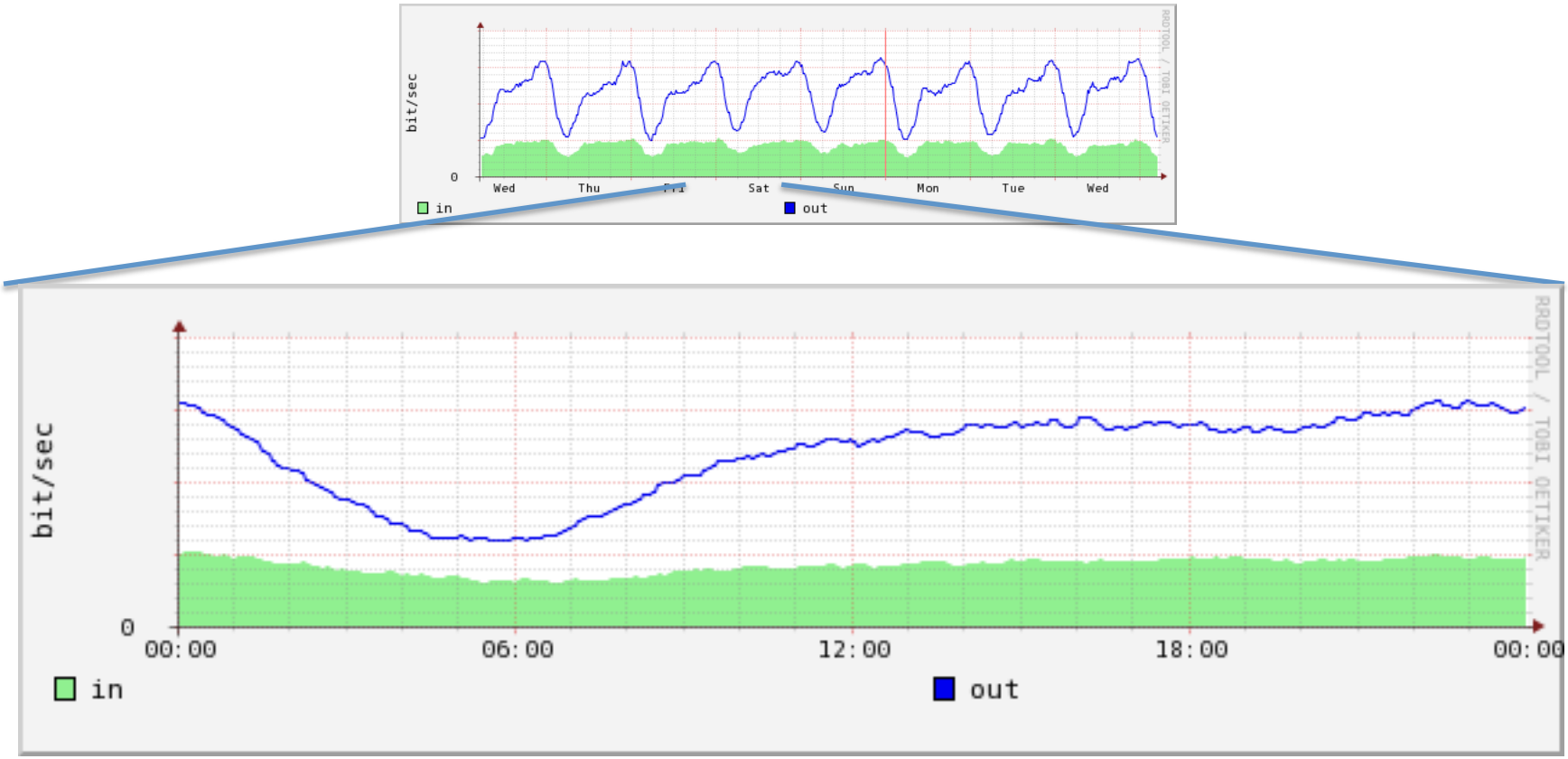
consumer (broadband)



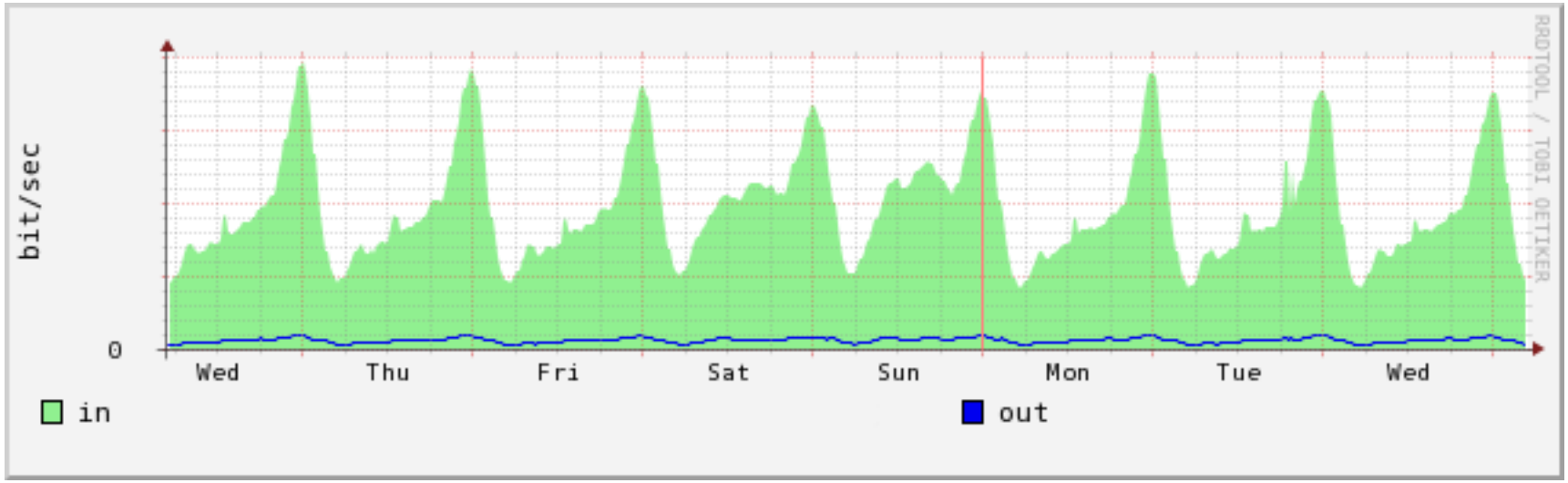
consumer weekday



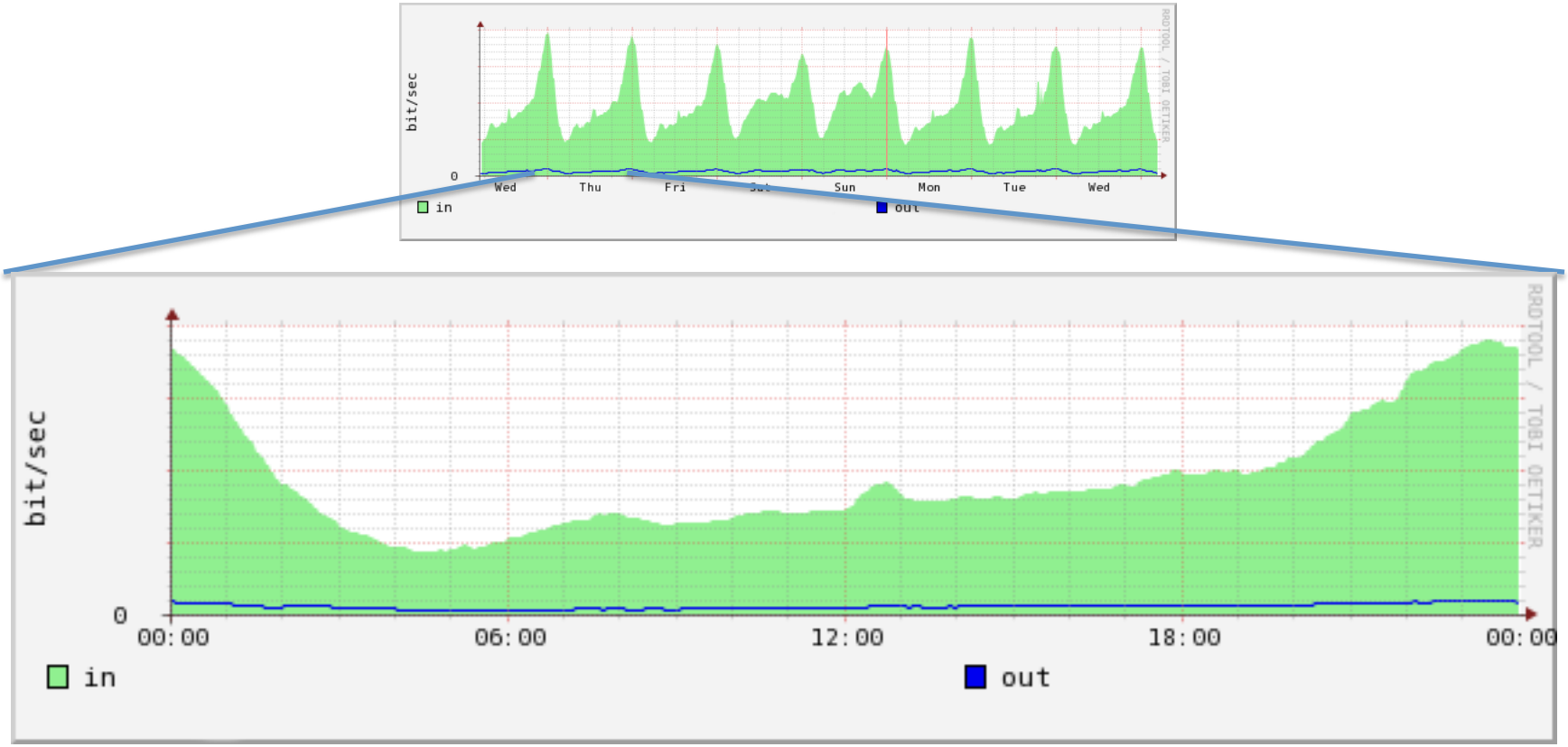
consumer weekend



CDN (contents distribution network)



CDN weekday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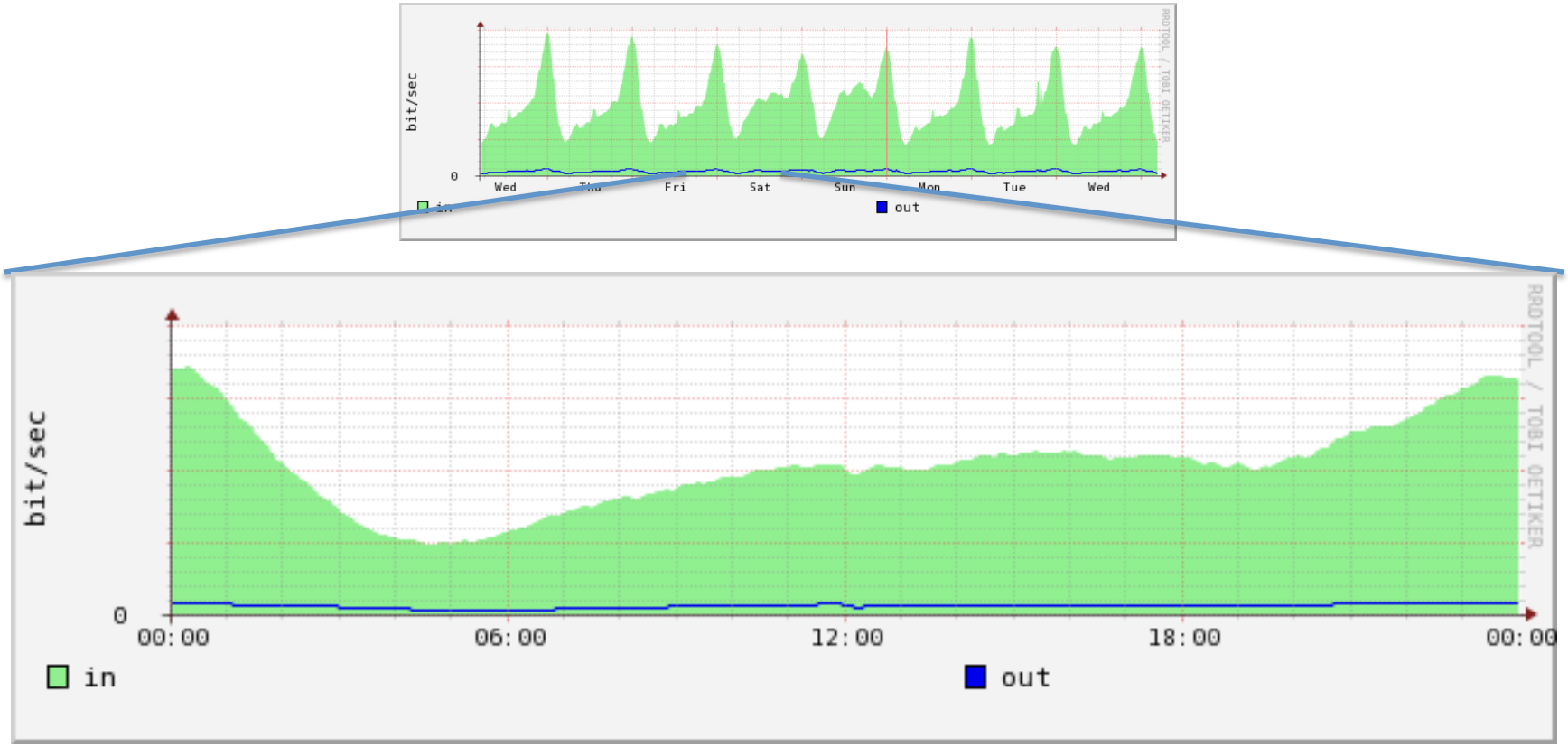
CDN weekend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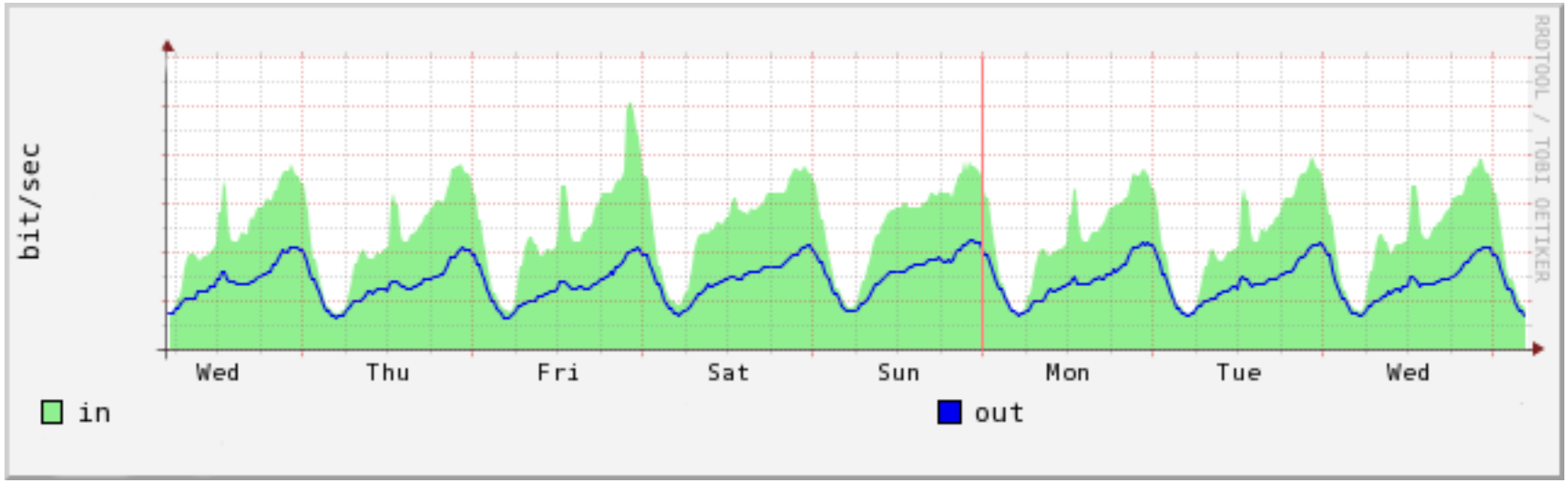
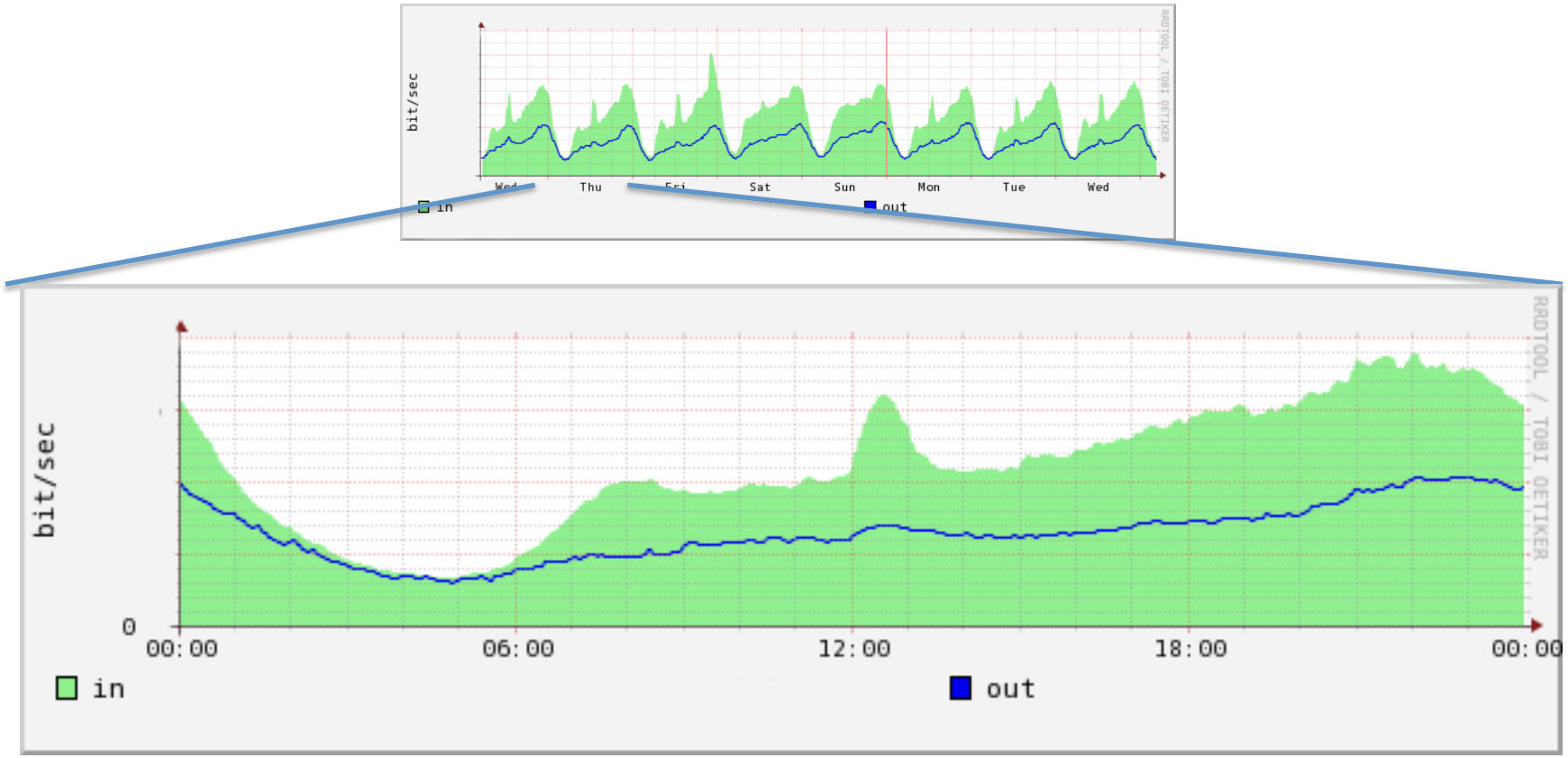
IX (Internet Exchange)



IX weekday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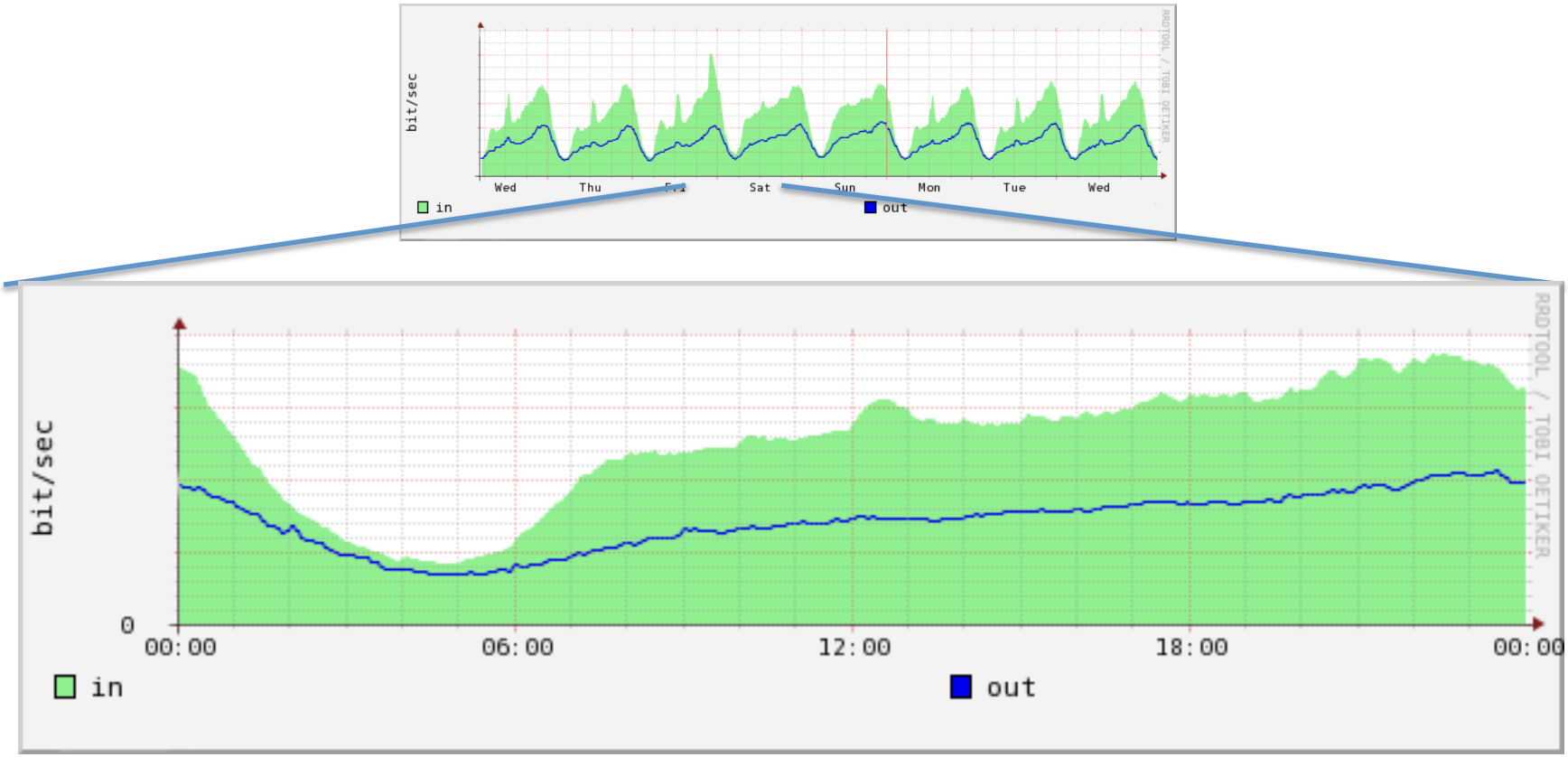
IX weekend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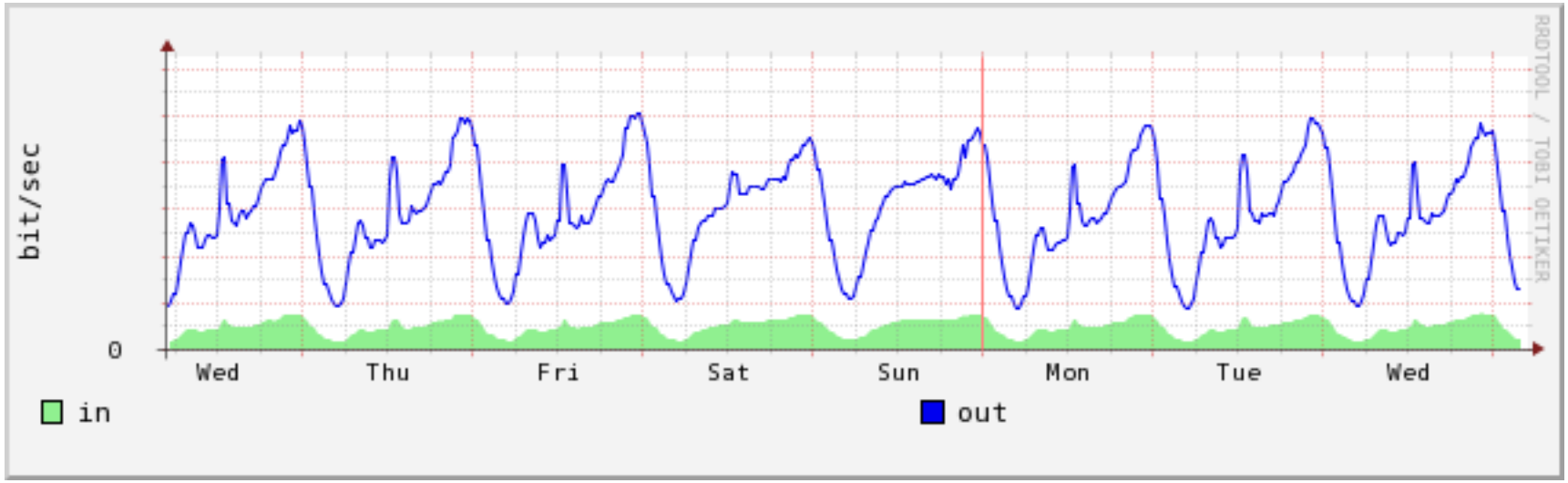
mobile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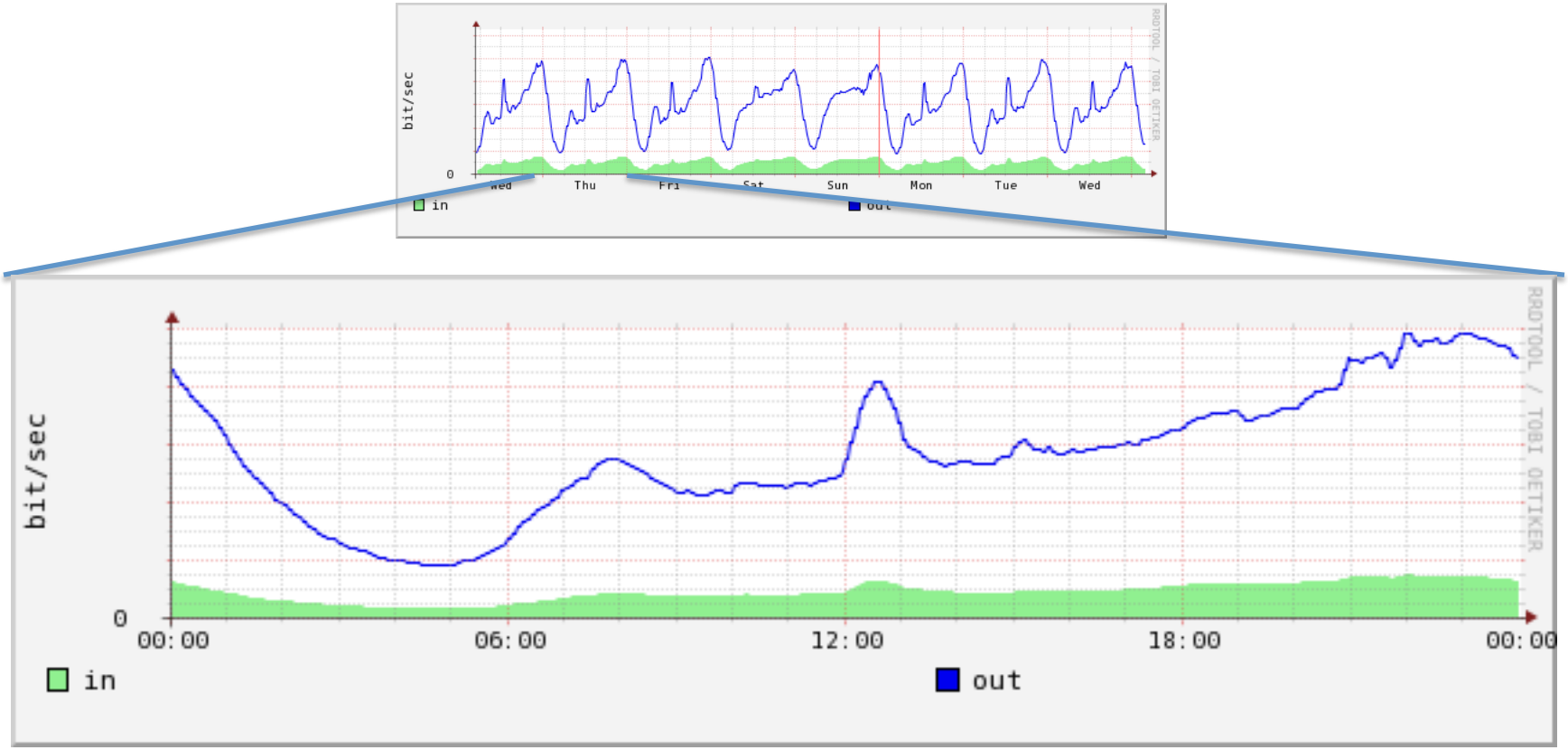
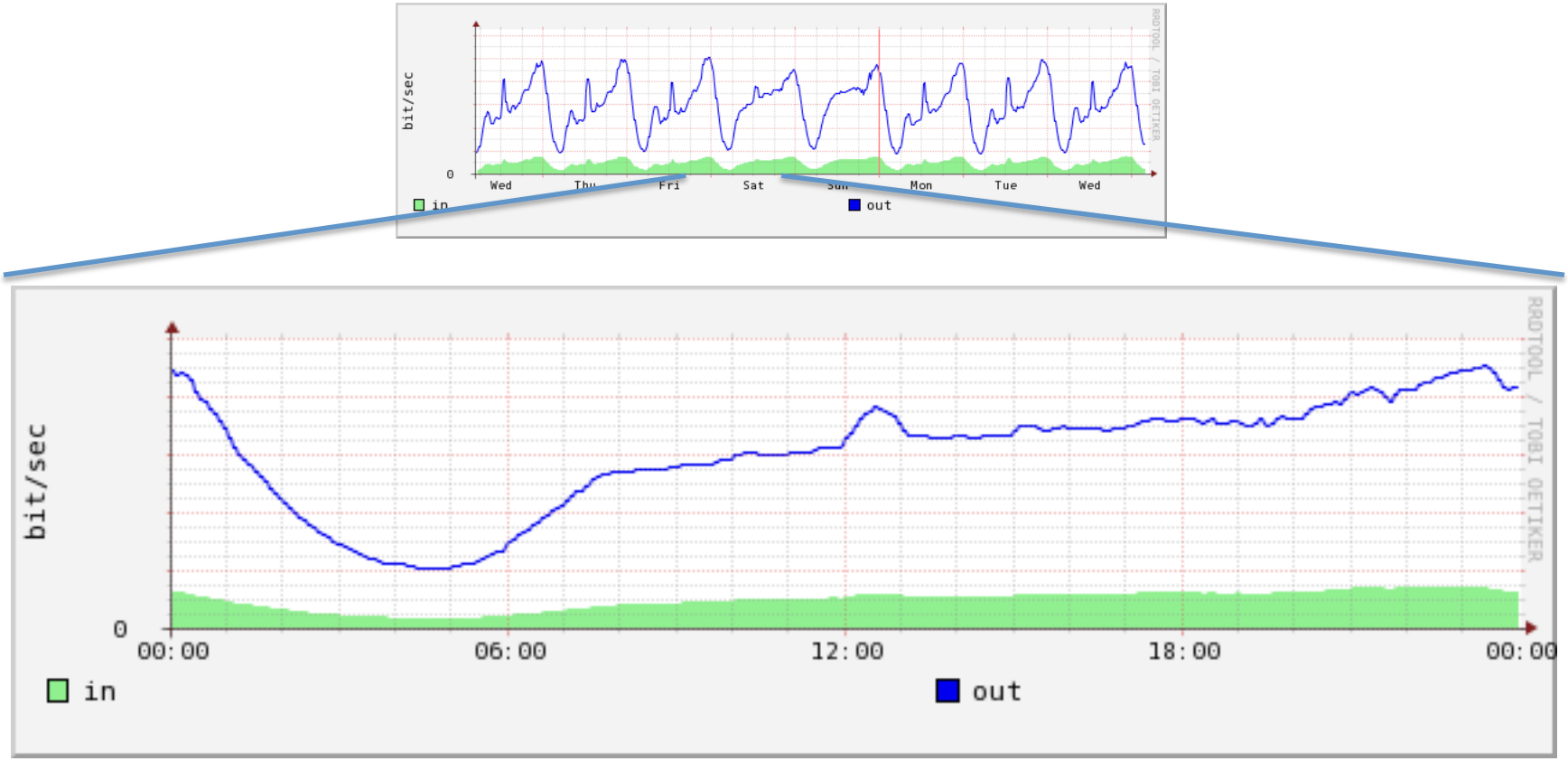
mobile weekday



mobile weekend

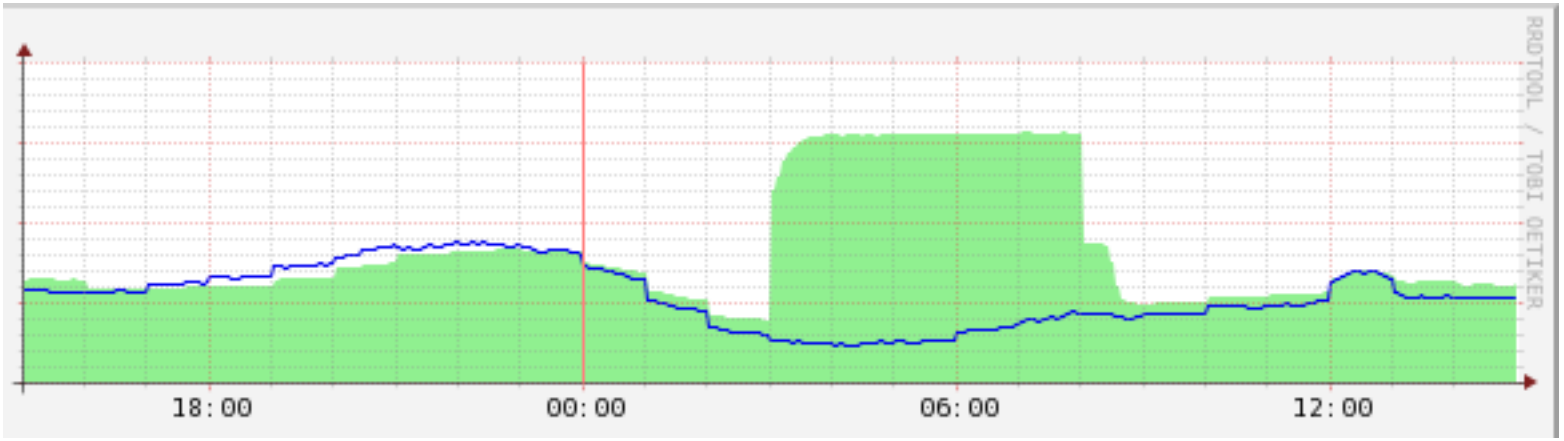


traffic trend

- we can upgrade based on that
  - important!
- know your customer
  - how they are using network

traffic concentration

- it sometimes happens
- 'statistical multiplexing effect' is reduced



how to deal with concentrations

- upgrade
  - more bandwidth
  - cost +
- wait and see
  - congestion
  - customer experience -
- something else
  - ??

new year greetings

- January 1st 00:00-02:00
  - phone call
  - SMS
  - e-mail
  - SNS
- about 7 times more messages than usual
- mobile operators have asked users to avoid such messages during the peak time

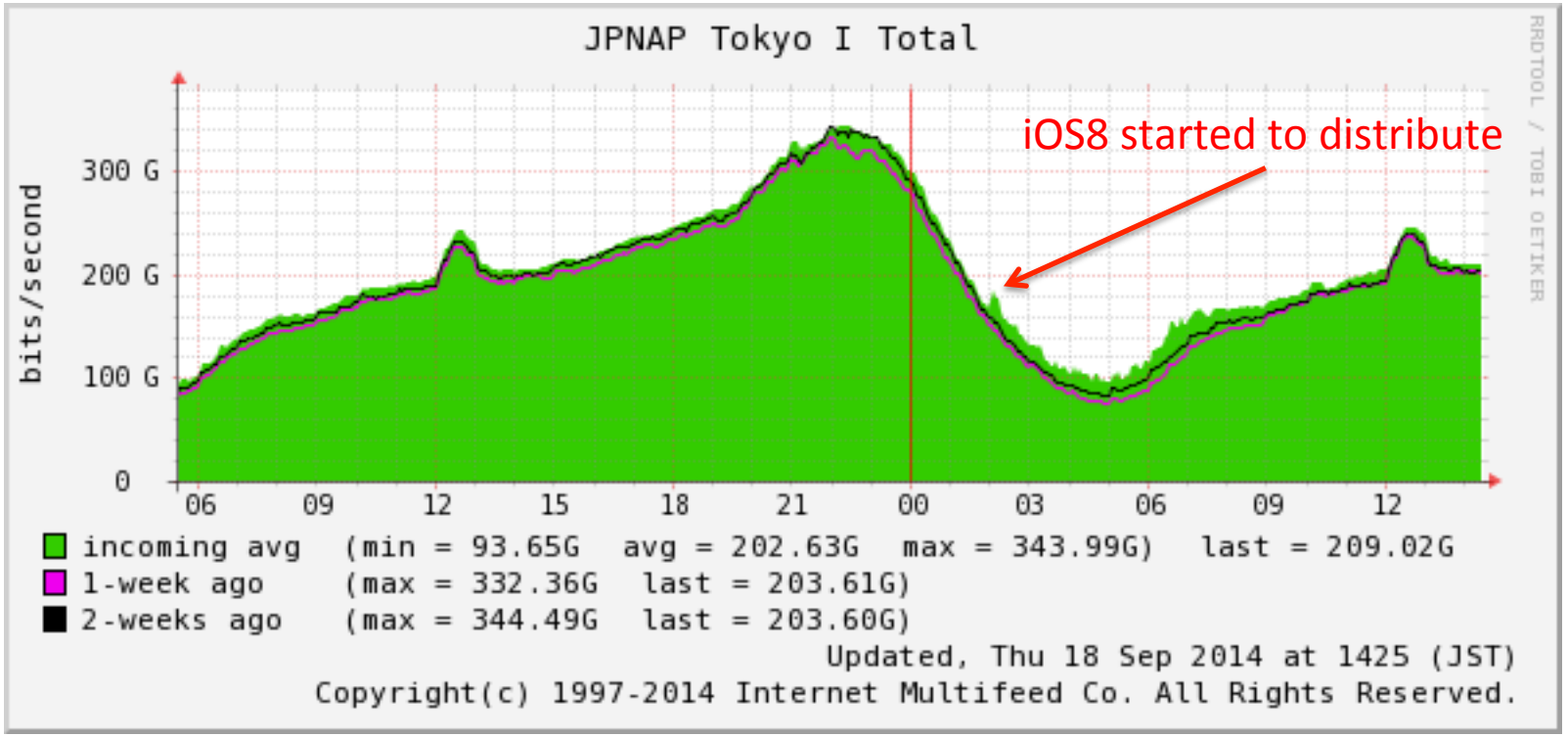
software/data distribution

- Windows Update
- iOS/MacOS Update
- game update
- karaoke update

- several giga byte data
- at the same time
- many clients

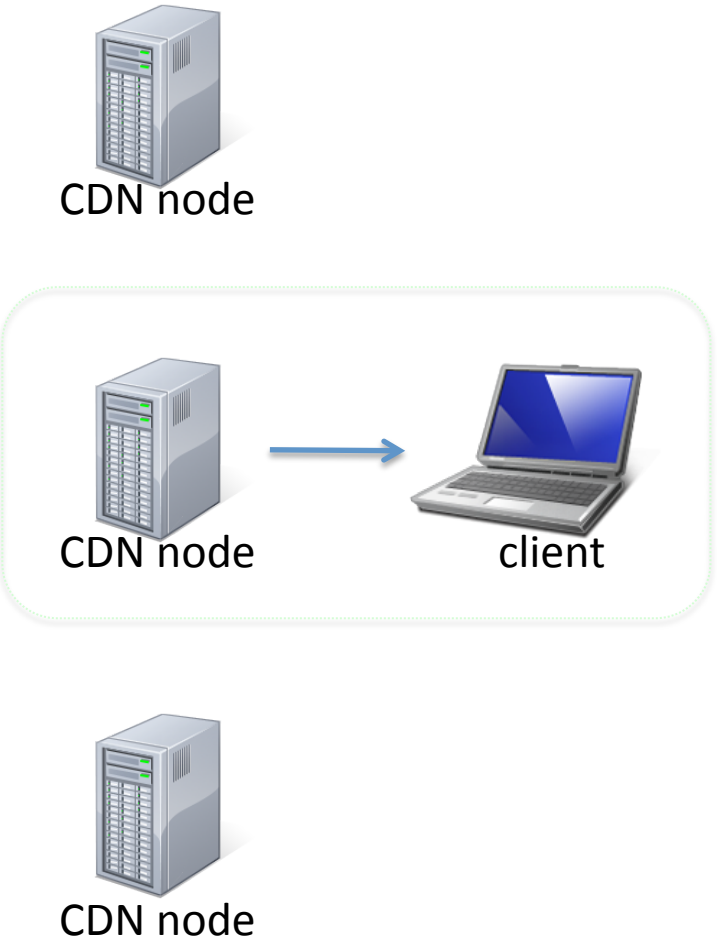
iOS8

- it seems Apple introduced some kinds of queuing mechanism



Now days huge traffic come from CDNs

- CDNs maintain many nodes for contents distribution
- The 'closest' node actually delivers contents to a specific client
- The closer, the better
  - low latency
  - better customers' experience



CDN and traffic engineering

1. Host a CDN cache node in your network
   – Usually CDN has criteria: traffic volume, # of users
2. Connect to a network that is hosting a CDN node inside
   – From Guam, Japan(2500km) is closer than the Continental United States(9500km), and also cables are available ☺
   – We might need to think about inter-connections for mutual benefit

mobile device

- people bring it always
  - they can use it anytime
- it changed traffic pattern in our network
  - commuting and lunch time
- commuting is a challenge for mobile in tokyo
  - about 3000 persons per train
  - 47 trains per hour
  - somehow you need to do handover ☹

mobile devices and alarm clock

- clock on mobile devices is well synced
  - you can use mobile as a clock
- mobile devices ‘sleep’ to reduce battery usage
  - and once wakeup, it starts to communicate

- mobile operators see high traffic peek at
  - 6:30, 7:00, 7:30....
  - very short period traffic

summary

- 'Statistical multiplexing effect' is a key of backbone network design
  - There could be concentrations because of social and technical reasons
- Network operators should give feedbacks
  - to users, CDNs and application developers
  - to avoid concentrations where possible