Customer-driven Regulation of Broadband Services

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Telecom Regulation

- Highly technical, driven largely by operators, vendors and independent experts
- Public review usually only cursory

Broadband Defined

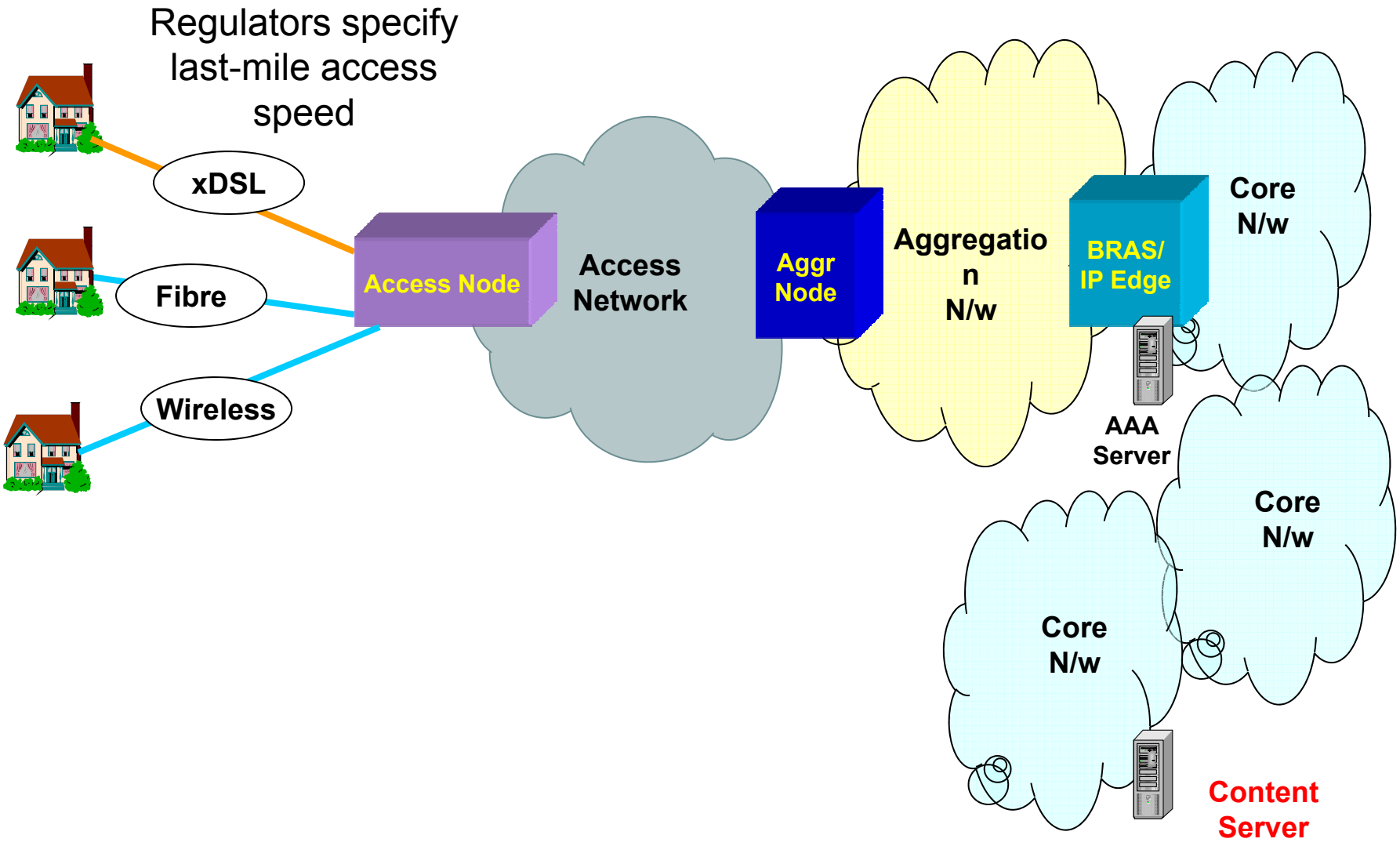
- ITU-T: 1.5 Mb/s
- TRAI : 256 kb/s
- QoS Metrics Standardization - operator-oriented
  - ITU-T 1540/1541
  - IETF IPPM
- TRAI 15Jan09 paper discusses the QoSE requirements to be met by Operators
- Subscriber:

  Good experience with common services -- multi-media browsing, downloads, streaming media, VOIP, multi-player games

  Requires 256 kb/s - 2 Mb/s

Mismatch between regulator's requirements and subscribers' expectations

Broadband Network Architecture



The Customer-driven Approach

- Define metrics that relate to customer's expectations
- Provide test tools that the customer can run
- Aggregrate and disseminate test results from many customers of the same operator/tariff plan

  Influences operators and the regulator

AT QoSE Metrics

- Defined by TeNeT Group of IIT-Madras and LirneAsia
- Subscriber-oriented metrics, objective way of measuring subscriber QoSE
- Measured by subscriber without operator involvement

1. Download throughput
   Download Bandwidth available to the user
2. Upload throughput
   Upload Bandwidth available to the user
3. Round-trip delay (RTT)
   Time taken for a packet to reach a destination and return
4. Delay jitter
   Average variation in RTT
5. Packet loss
   No of packets lost, expressed in %
6. Availability of service

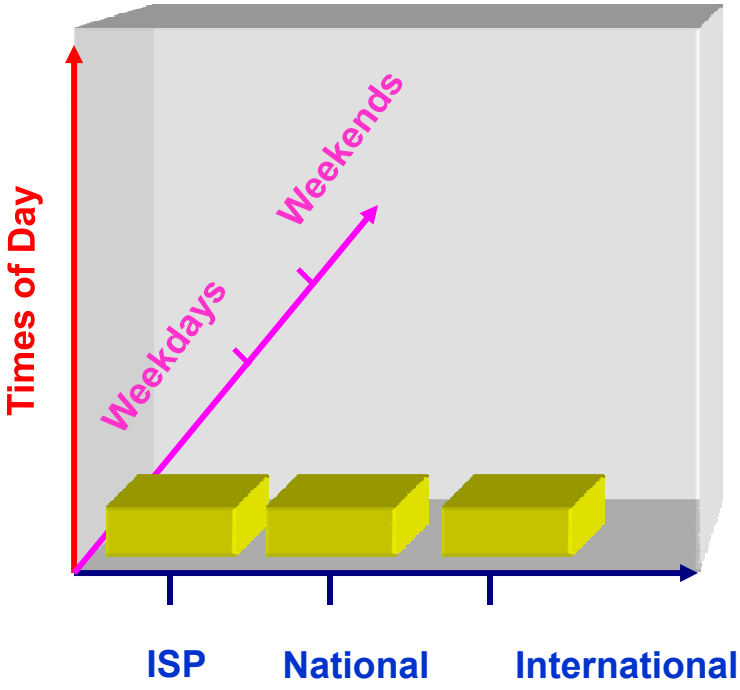
Relevance of Metrics

Service	Throughput		Delay		Loss
	Download	Upload	RTT	Jitter	
Browse (text)	↑	-	↑	-	-
Browse (media)	↑	-	↑	↑	↑
Download file	↑	-	-	-	-
Transactions	-	-	↑	↑	-
Streaming media	↑	-	↑	↑	↑
VOIP	↑	↑	↑	↑	↑
Games	↑	↑	↑	↑	↑

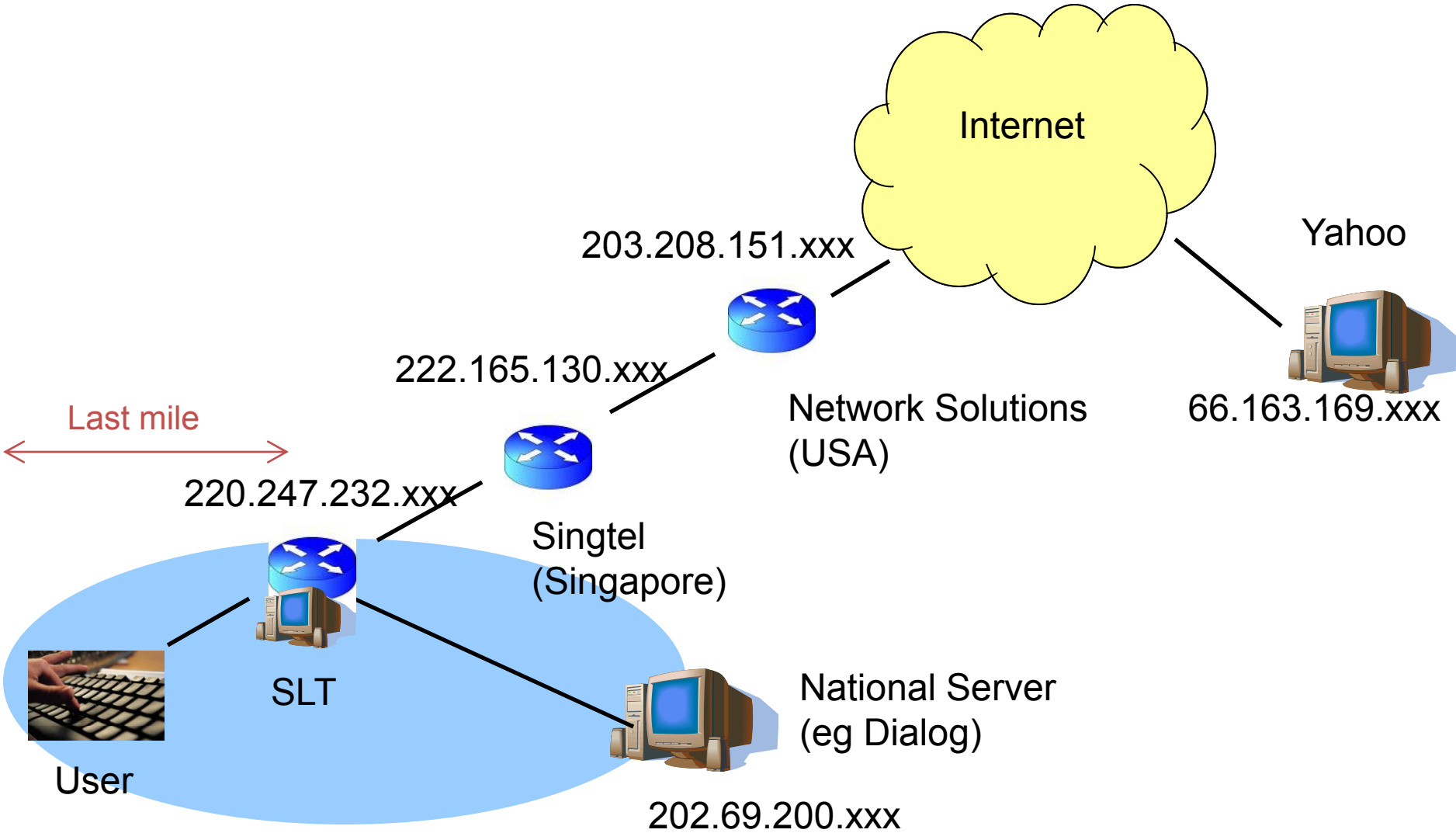
++ ↑ highly relevant ↑ very relevant ↑ relevant - not relevant

Test Methodology

- Tests 6 parameters
  - Covers most aspects of subscriber QoE
- Tests three servers (ISP, National, International)
  - ISP local network, National Peering and International bandwidth
- Repeated at different times of the day
  - Provisioning & Dimensioning of Network
- Repeated at weekdays and weekends
  - Provisioning & Dimensioning of Network

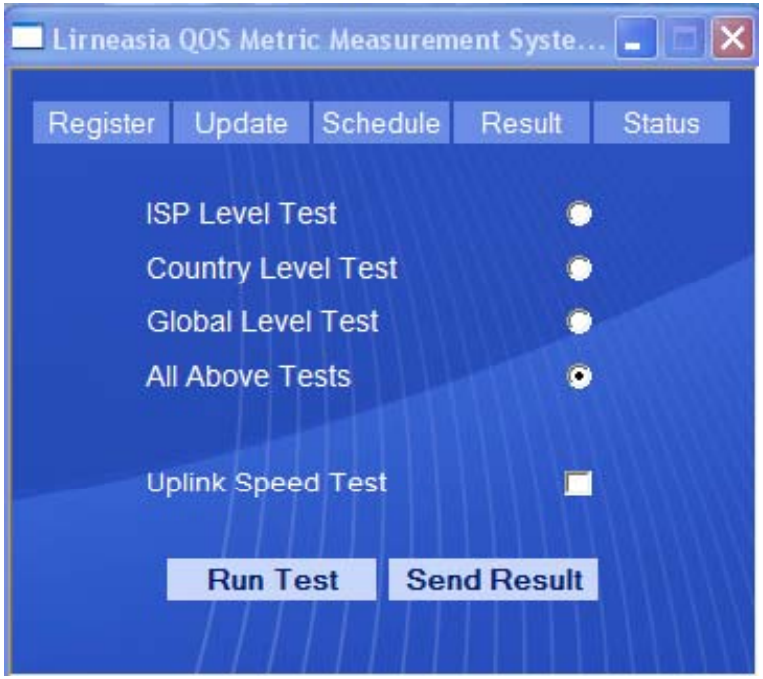


Network Diagram of a Test



AT Tester www.broadbandasia.info

- Windows-based test software to run the AT test suite
- Server aggregates the results (www.broadbandasia.info)
- Web and mobile versions soon



Testing Rounds

- Mar 08: India, Sri Lanka
- Oct 08: India, Sri Lanka, Bangladesh
- Mar 09: India, Sri Lanka, Bangladesh
- Oct 09: India, Sri Lanka, Bangladesh, US, Canada, Sweden

About 200 locations

This work was carried out with the aid of a grant from the International Development Research Centre, Canada and the Department for International Development, UK.

IDRC International Development Research Centre
CRDI Centre de recherches pour le développement international
DFID Department for International Development

Sample Test Results

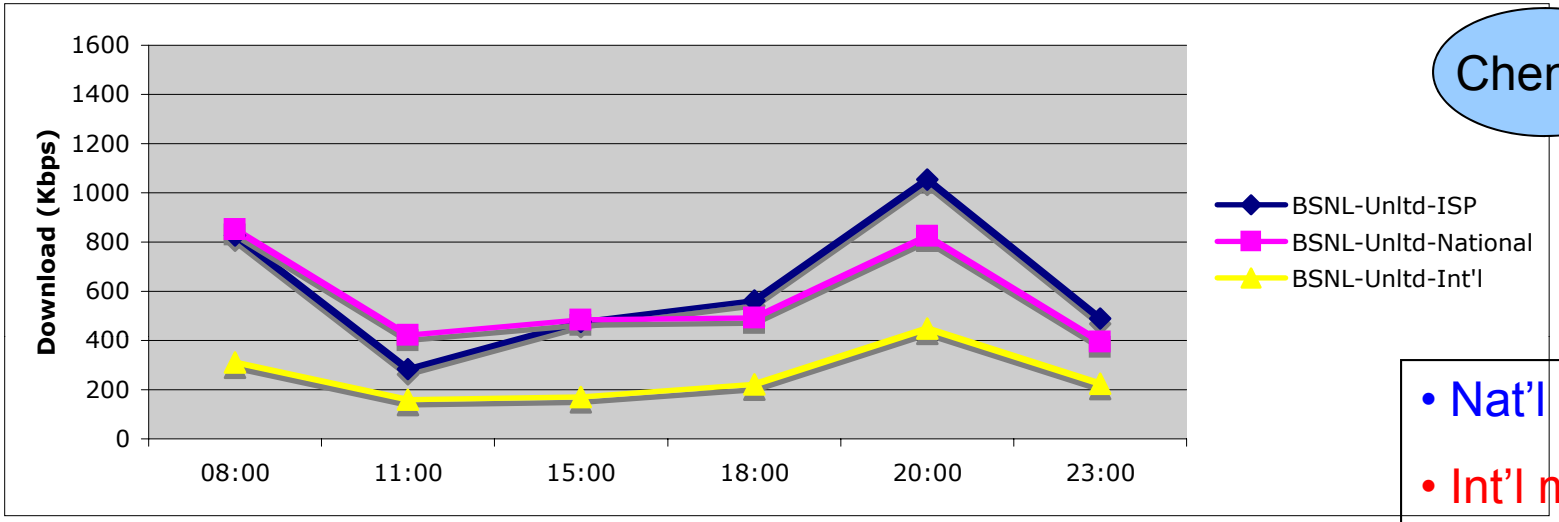
Download speed, RTT, jitter, loss metrics

LIRNEasia
www.lirneasia.net

TeNeT

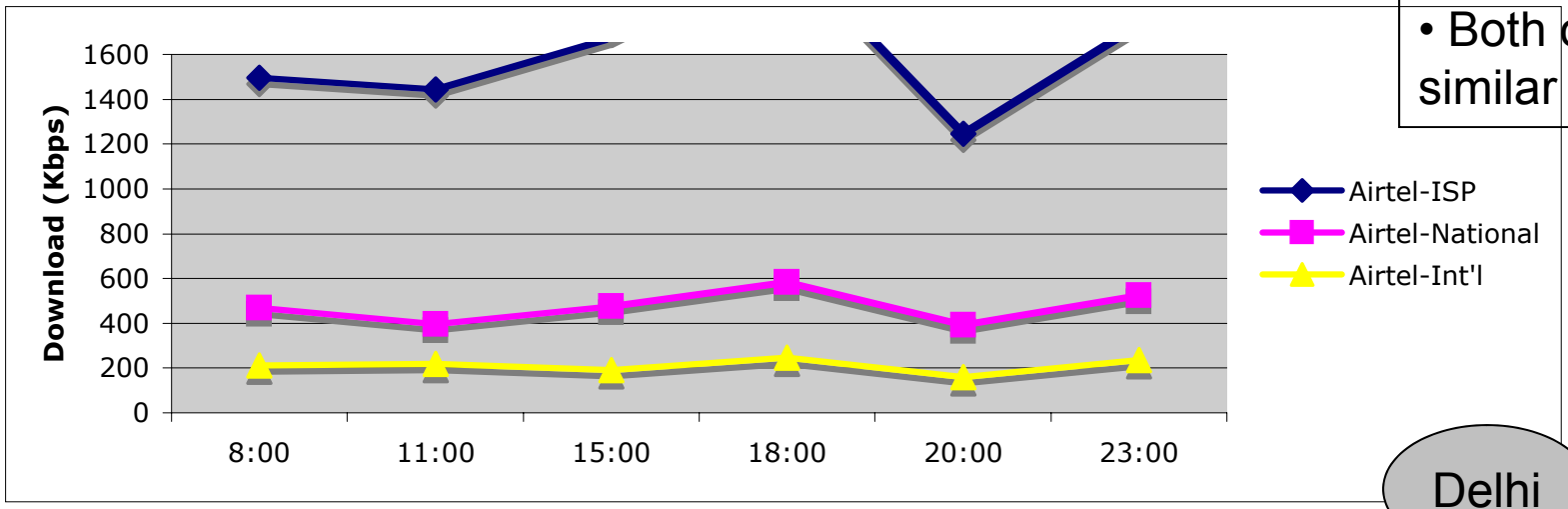
Download speed (Chennai/Delhi 256k unlimited):

Relatively healthy in National domains, Int'l much lower



Chennai

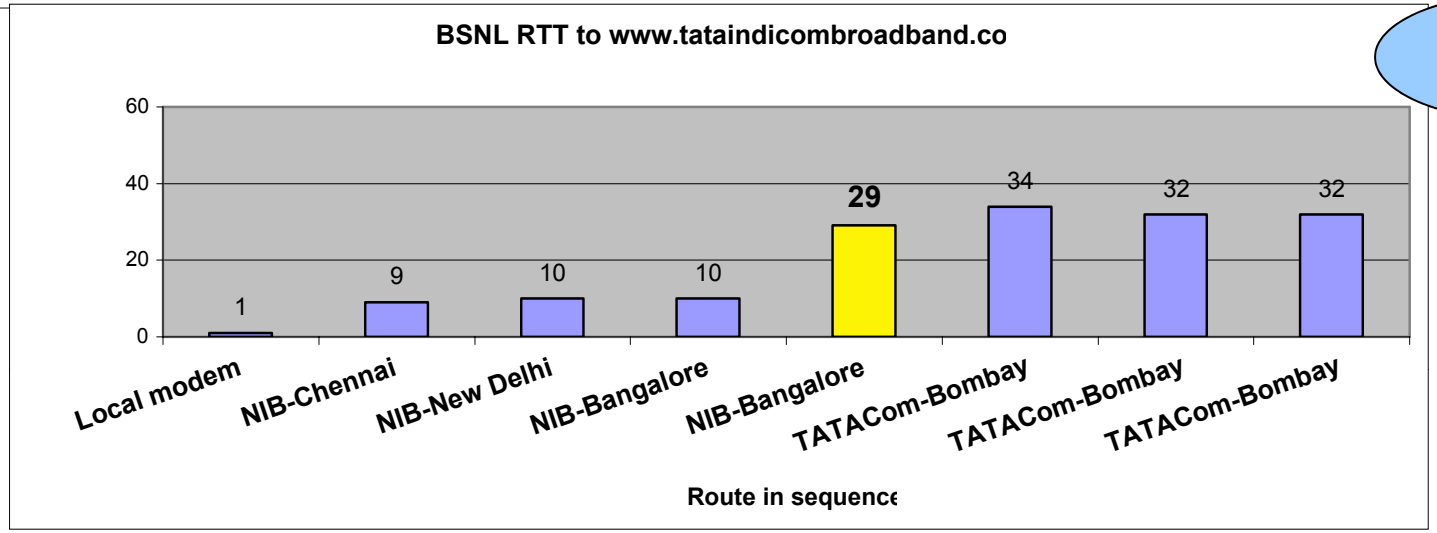
- Nat'l good
- Int'l marginal
- Both operators similar



Delhi

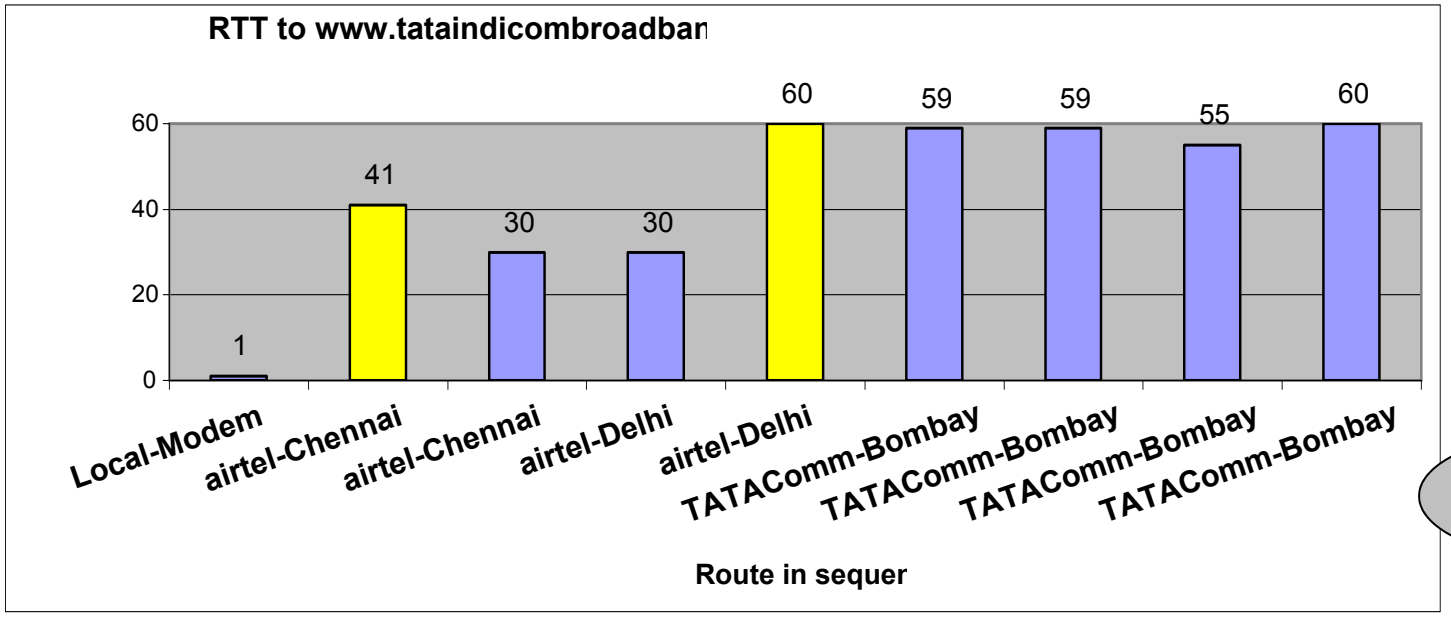
Nat'l Round-trip time -- hop-by-hop

Trace route from PC in Chennai to server



Chennai

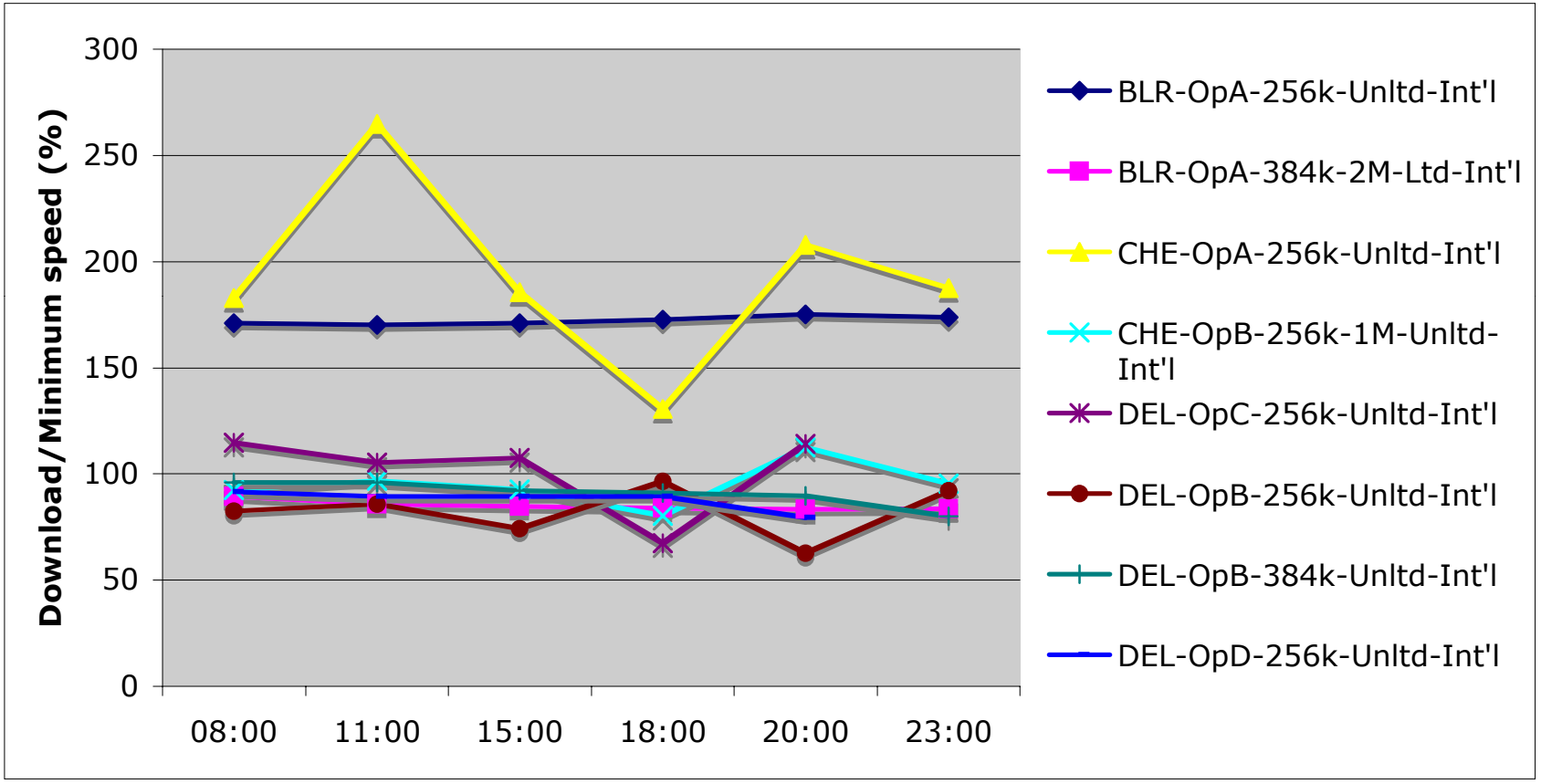
- Gateway to other ISP is bottleneck
- RTT 10-15 ms achieveable



- Gateway to other ISP and ADSL link are bottlenecks
- RTT 10-15 ms achieveable

Delhi

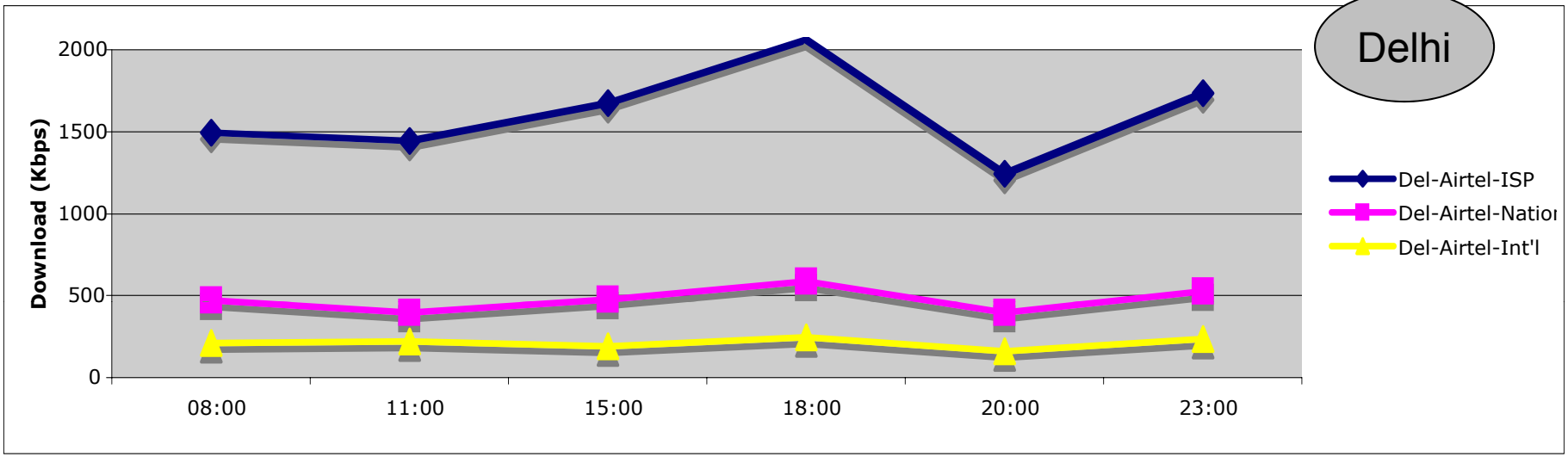
Int'l download/minimum speed % (all India metro):

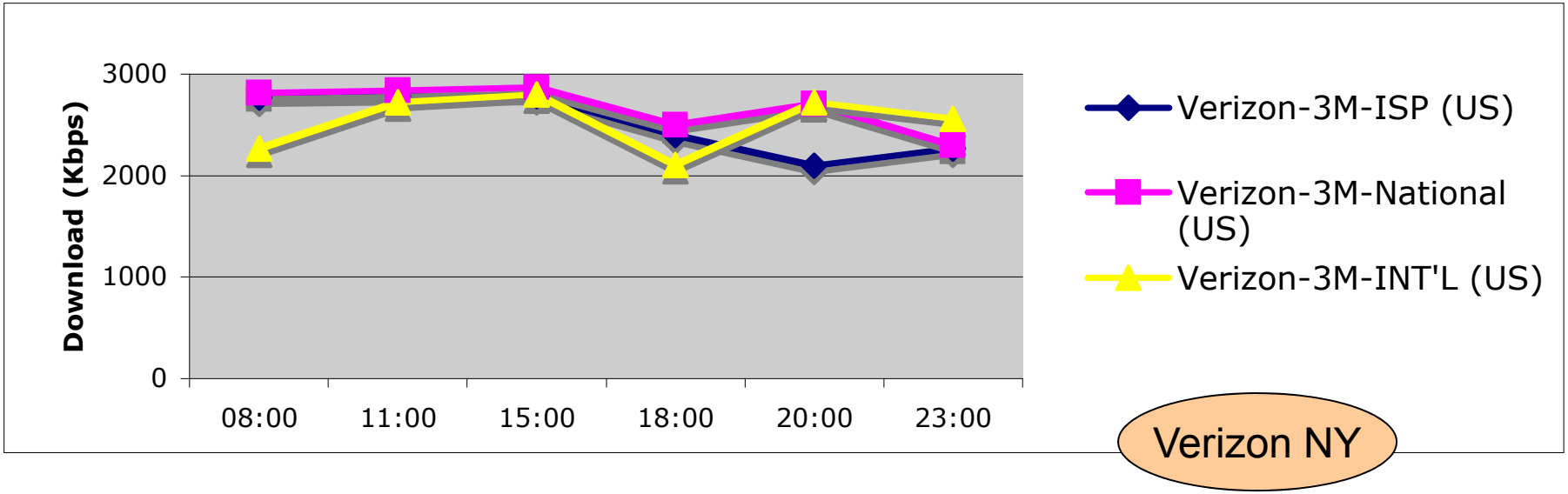


- Most plans under 100%
- OpA gave better than minimum

Download speed (India and US):

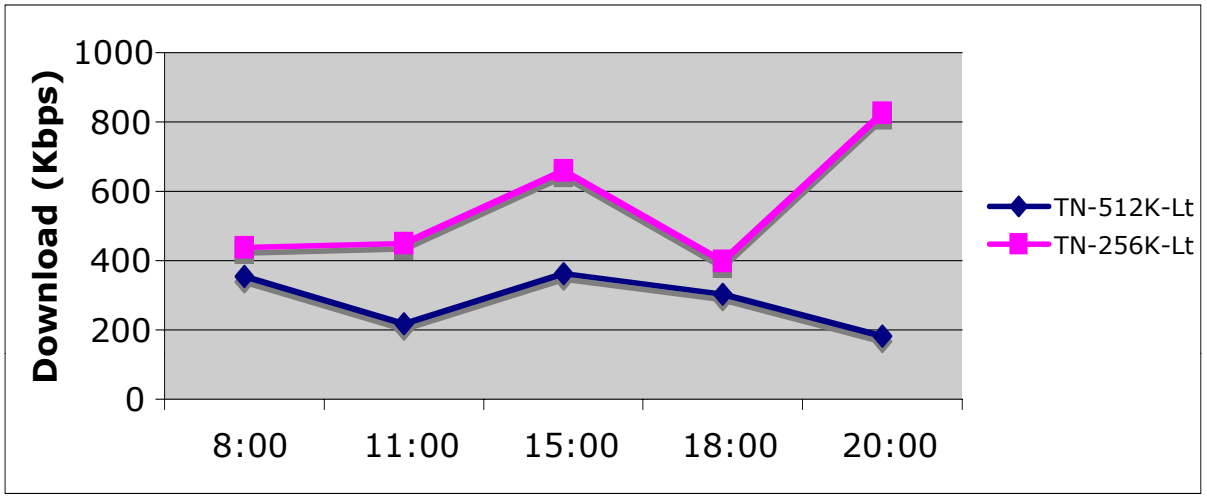
India: ISP good, big differences; US: only small differences



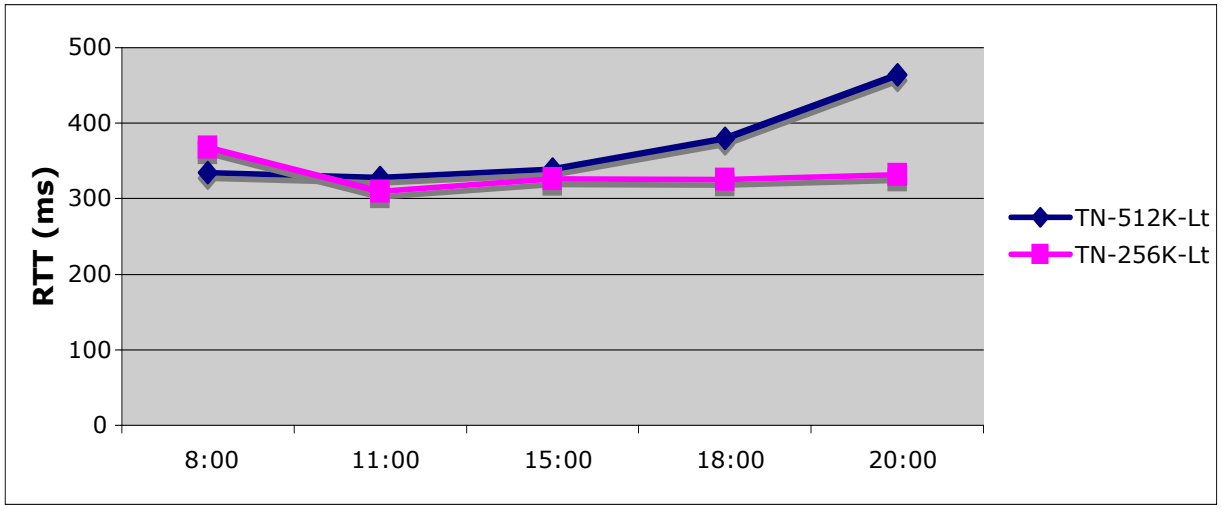


Premium plans

QoSE may not increase with “higher” plans



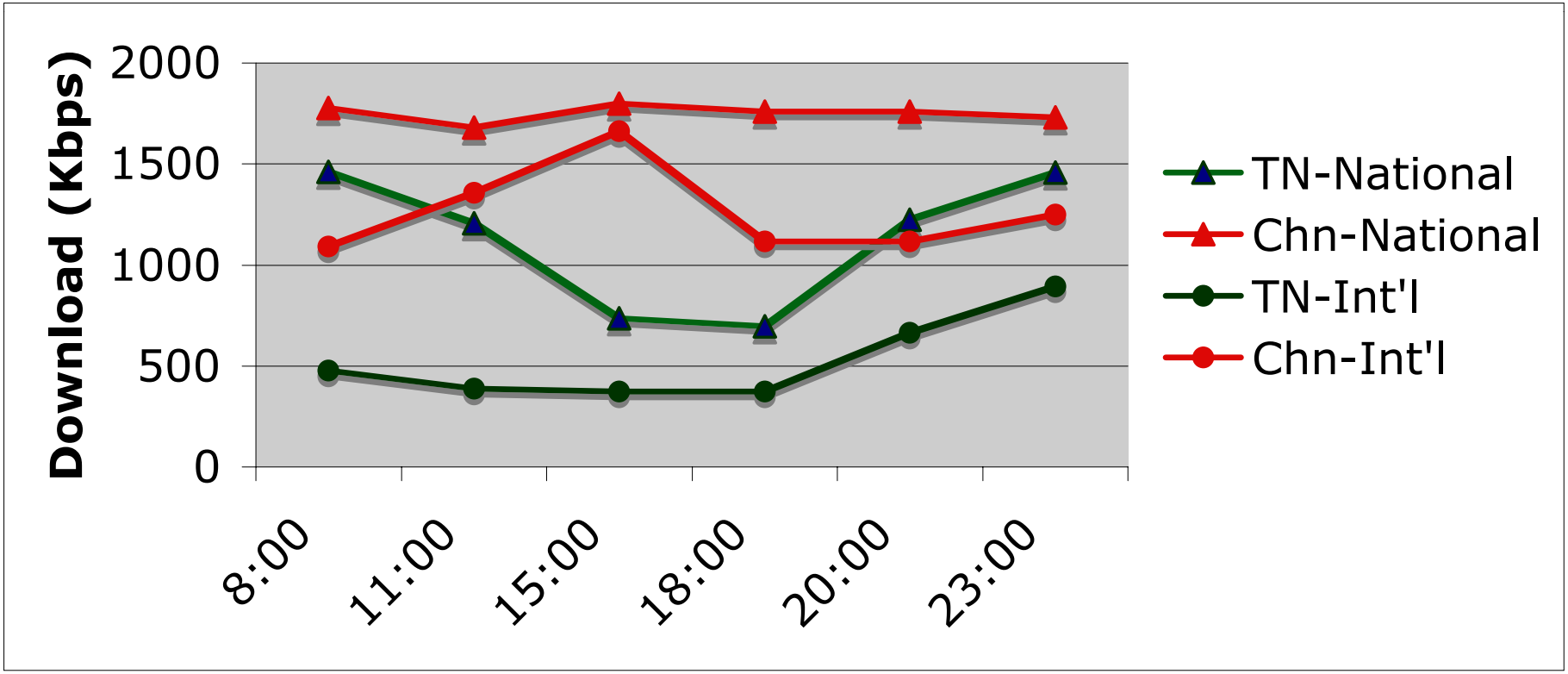
256K 512K



- Last-mile is not the bottleneck, so increasing minimum in it does not help
- End-to-end speed of TCP depends on RTT and loss (not raw bandwidth)
- Premium plans offer other benefits e.g. higher data transfer

Chennai vs. Tamilnadu (256k-2M limited):
The digital divide still exists

Also, power failures common in rural areas



Conclusions

- The AT Test Methodology empowers the customer to “regulate” broadband quality
- Inputs to TRAI, on contention-ratio have been partly accepted
- Only the first step, need many more volunteers
- Definition of broadband should shift away from raw last-mile speed -- specify QoSE to reference servers

Thank You!

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www.tenet.res.in www.lirneasia.net

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