

# Broadband Service Quality: Diagnosing the Bottlenecks

Rohan Samarajiva, CEO, LIRNEasia

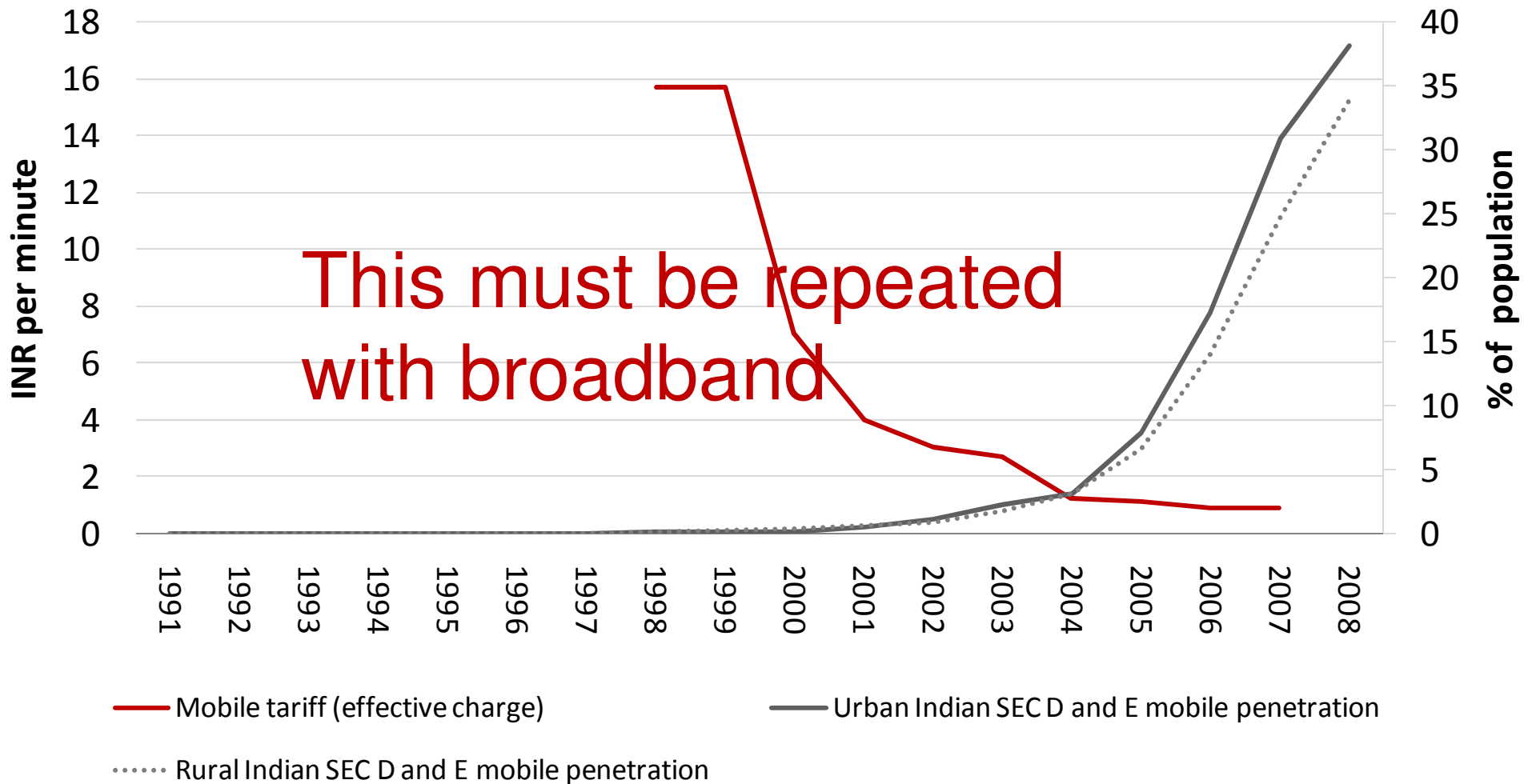
5<sup>th</sup> APT Policy and Regulation Forum for Pacific  
(23-25 July 2012, Nadi, Fiji)



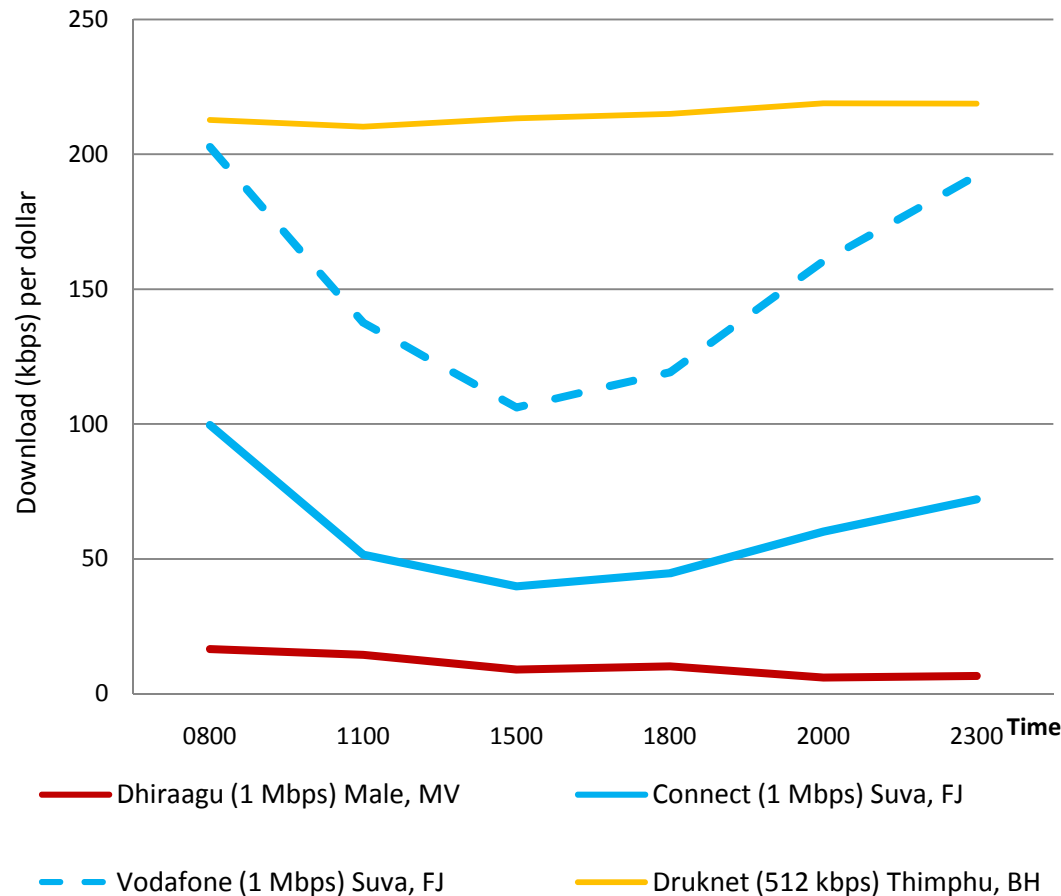
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# Success in voice: Low prices → greater connectivity (India SEC D&E)



# But, will low prices necessarily yield low value for money?



Advertised package	Per month in USD
Dhiragaugu (1 Mbps) Male, MV	45
Connect (1 Mbps) Suva, FJ	22
Vodafone (1 Mbps) Suva, FJ	8
Druknet (512 kbps) Thimphu, BH	8

# **INTERNATIONAL BACKHAUL**

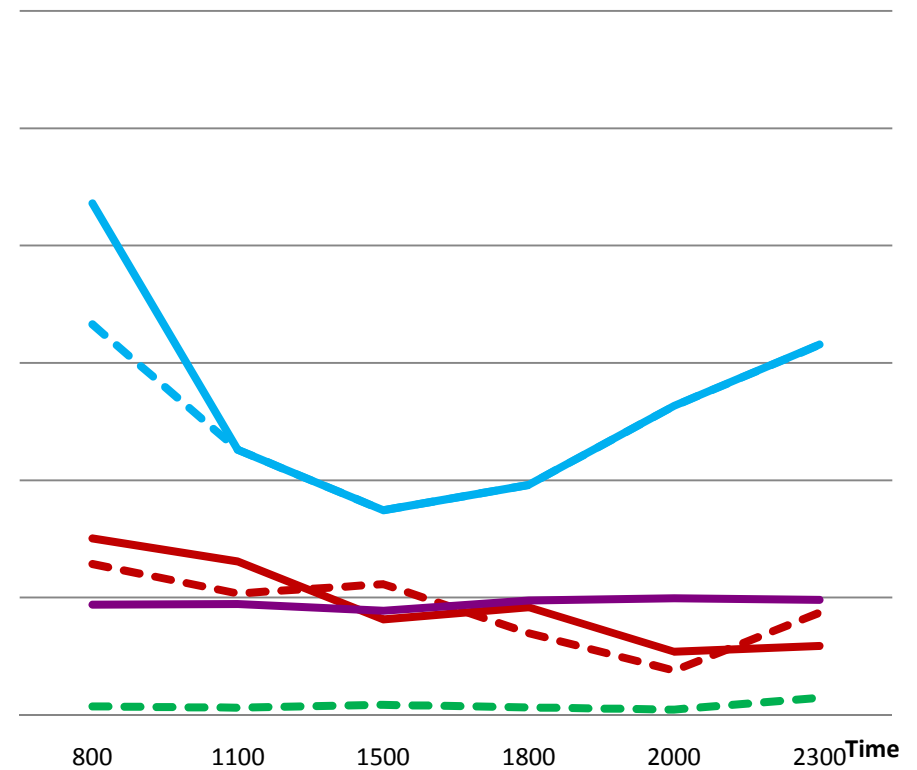
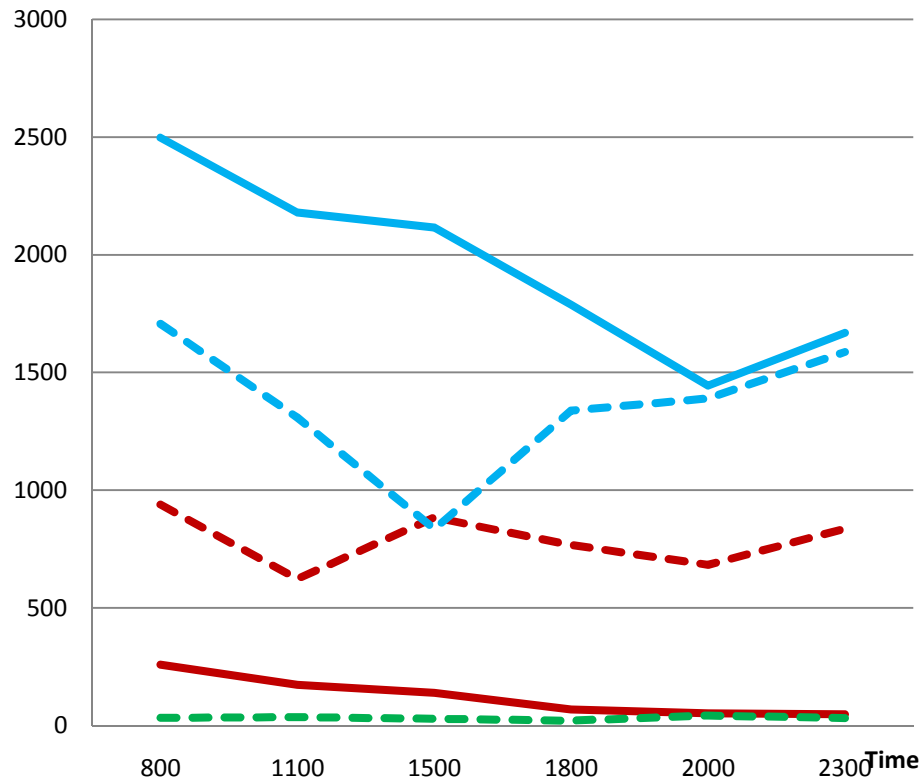
Around 50% of broadband costs are in international segment: Is value for money in broadband possible without addressing this?

- Hypothesis
  - Performance WITHIN ISP DOMAIN > Performance in the INTERNATIONAL DOMAIN
- International performance may be affected because operators are economizing on the costly input of international backhaul

# Download speeds: ISP vs. International

Download from a server in the ISP domain (Kbps)

Download from a server in the International domain (Kbps)



- Dhiraagu (1 Mbps) Male, MV      - - - Dhiraagu 3G (1 Mbps) Male, MV
- Connect (1 Mbps) Suva, FJ      - - - Vodafone (1 Mbps) Suva, FJ
- - - Digicel (2 Mbps) Port Moresby, PG      — Samoa.Ws (512 kbps) Apia, WS

# Mixed results

- Generally confirms the hypothesis
- But,
  - Maldives (pop. 300,000; two undersea cables) fixed operator has a package where international performance exceeds that within ISP
    - Not been observed in large countries
  - Unable to compare performance of Samoa package because of problems in data collection
  - PNG performance extremely poor in both international and ISP domains

# It's not just about download speeds

Service	Download (kbps)	Upload (kbps)	Latency (Round Trip Time, RTT) (ms)	Jitter (ms)	Packet Loss (%)
Browsing (Text)	++	-	++	-	-
Browsing (Media)	+++	-	++	+	+
Downloading	+++	-	-	-	-
Transactions	-	-	++	+	-
Streaming media	+++	-	++	++	++
VOIP	+	+	+++	+++	+++
Games	+	+	+++	++	++

+++ Highly relevant; ++ Very relevant; + Relevant; - Irrelevant

**RTT** has implications on client-server interactive systems

- **Jitter** adds to the 'noise' of the transmission
- **Packet Loss** affects streaming media



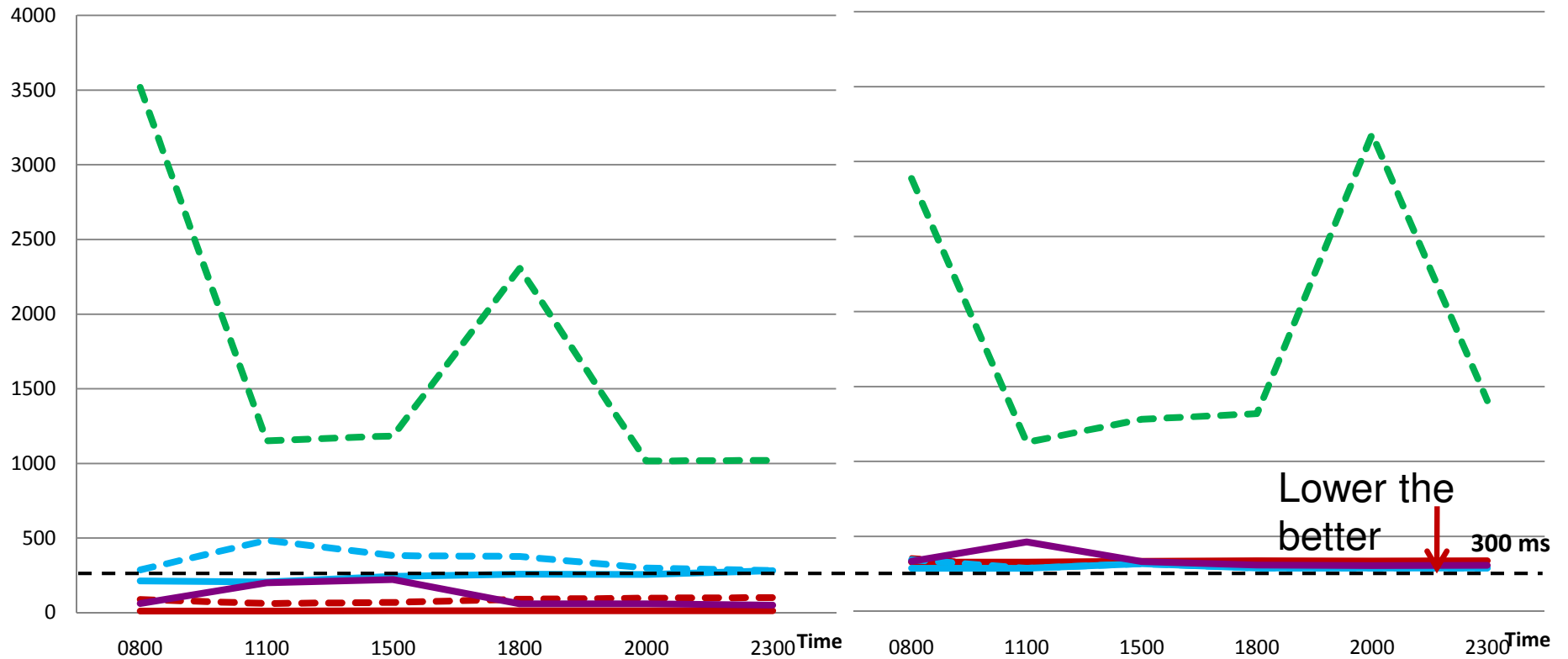
# Return trip time is becoming increasing important

- Hypothesis: International performance likely to be lower than within ISP domain

# RTT: ISP Domain vs. International

ISP Domain (ms)

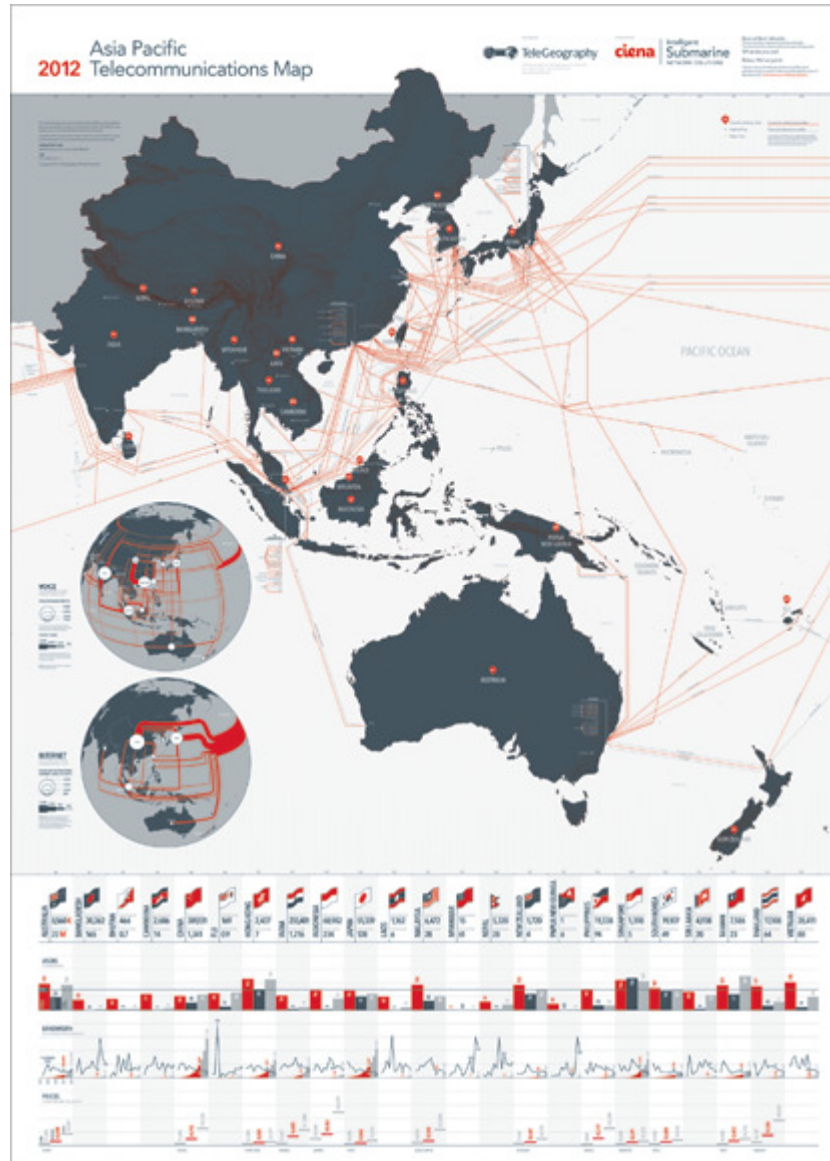
International server Domain (ms)



- Dhiragaugu (1 Mbps) Male, MV      - - - Dhiragaugu 3G (1 Mbps) Male, MV
- Connect (1 Mbps) Suva, FJ      - - - Vodafone (1 Mbps) Suva, FJ
- - - Digicel (2 Mbps) Port Moresby, PG      — Samoa.Ws (512 kbps) Apia, WS

# Bleak picture: Hypothesis confirmed

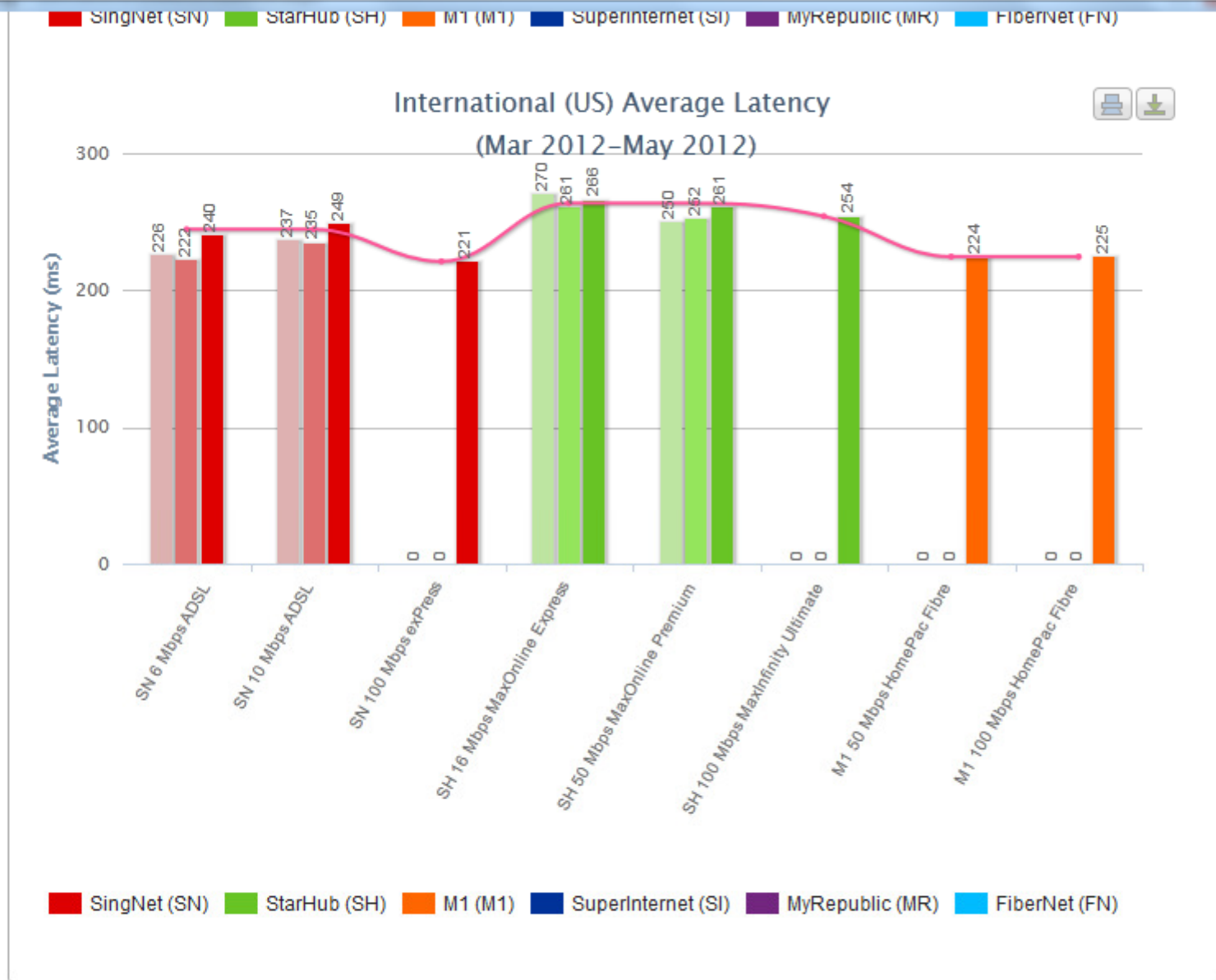
- Pretty much no tested package meets 300 ms standard
- PNG performance is worst we have seen



Is the relative paucity of undersea cables in South Pacific the cause?

# Policy/regulatory responses

- More cables across the Southern Pacific?
  - How can more construction and landings be encouraged?
  - Lessons from the cable boom in Africa
- Are abuse of control over essential facilities the cause?
  - Should regulators pay greater attention to
    - Rules for accessing consortium cables?
    - Ensuring access and bringing down costs at cable stations?
- Encouraging Regional Internet Exchanges?
- Is there value in imposing minimum RTT standards and publishing results as in Singapore?

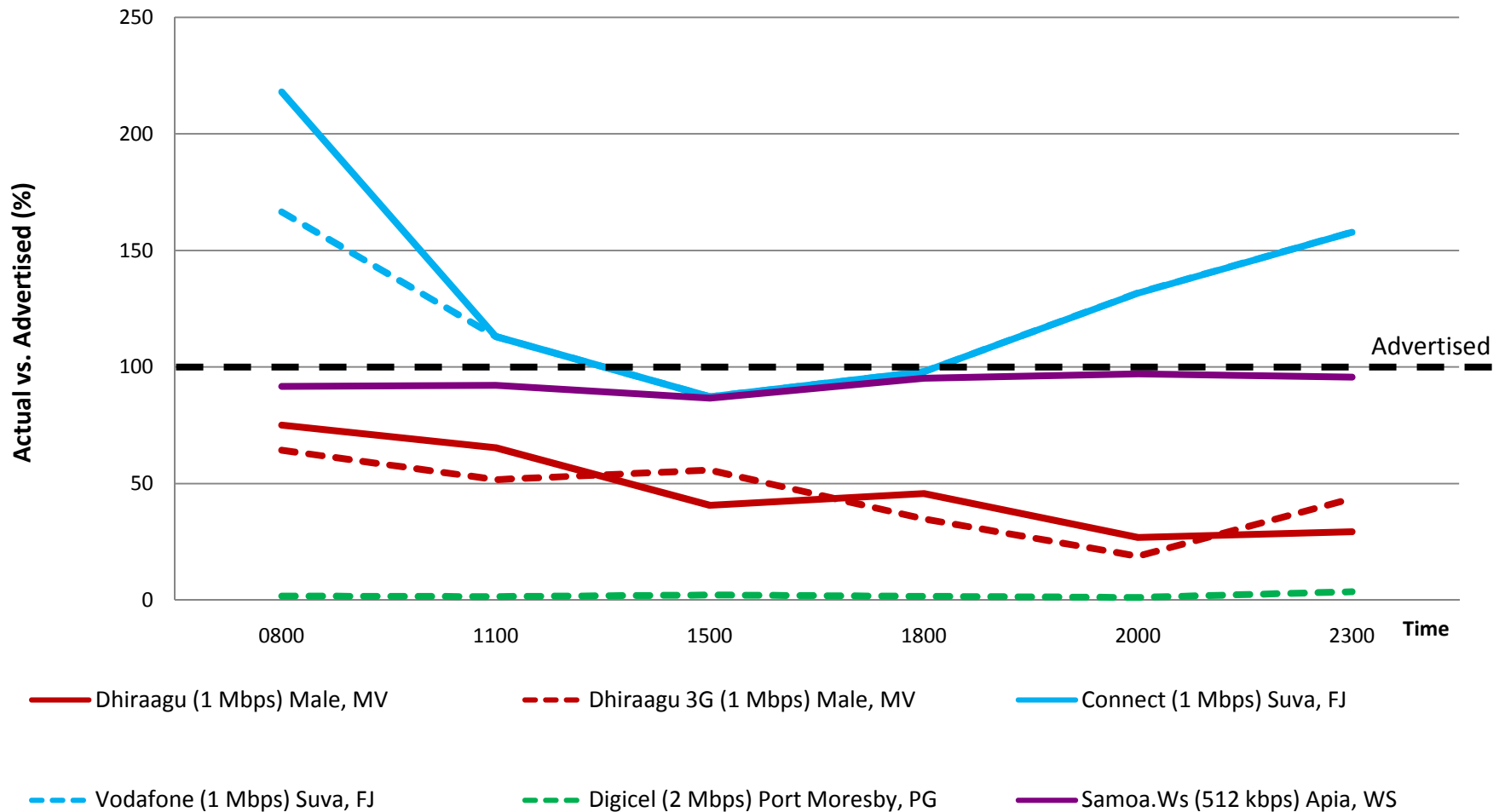


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Actual experience may differ due to website load, home wireless connectivity, and network conditions at time of surfing.

**IS THERE TRUTH IN ADVERTISING?**

# Download from an international server: Actual vs. advertised speeds





# Good performance by Fiji & Samoa

- Fiji exceeds promise, most times of day
  - Could be an artifact of low user numbers?
- Samoa over 75 percent consistently
- PNG has serious problems
- No truth in advertising in Maldives

# Achieving advertised speeds 80% of the time?

City, Country	Male, MV		Suva, FJ		Port Moresby, PNG	Samoa
Package	Dhiraagu, 1 Mbps	Dhiraagu 3G, 1 Mbps	Connect, 1 Mbps	Vodafone, 1 Mbps	Digicel, 2 Mbps	Samoa.ws, 512 kbps
<b>8:00 AM</b>	751.33	643.03	2180.21	1664.94	34.98	469.44
<b>11:00 AM</b>	653.65	517.07	1130.24	1130.24	30.13	471.95
<b>3:00 PM</b>	406.70	557.16	871.97	871.97	42.58	443.72
<b>6:00 PM</b>	457.73	348.55	979.28	979.28	32.01	487.53
<b>8:00 PM</b>	268.93	188.47	1317.03	1317.03	21.89	496.83
<b>11:00 PM</b>	294.03	435.65	1578.05	1578.05	72.69	489.81
<b>Average</b>	<b>472.06</b>	<b>448.32</b>	<b>1342.80</b>	<b>1256.92</b>	<b>39.05</b>	<b>476.55</b>

**Red = performance < 256 kbps threshold**

# Regulatory responses

- More studies all around and development of consultation-based standards
  - PNG requires additional investigation
- May be worth considering imposing rule that minimum performance standards must be advertised, not theoretical optima
- Should packages > 256 kbps download/upload be described as broadband?

# **OUR METHOD**

# A T TESTER

Test Results Configuration Schedule FAQ About

## Select Service Provider

Select Your Service Provider

Service Provider

Request for your service provider to be added to the list

Select Your Package

Your Email Address (Optional)

## METRICS

\*At least one metric must be selected

Download

Latency

Packet Loss

Upload

Jitter

Network Availability

## DOMAINS \*At least one domain must be selected

ISP

National

International

To get the most accurate results, please close all other browsers and stop other processors that may slow down your connection

Run Test

## PROGRESS OF THE TEST

Sub Process

Main Process

Cancel

# Software based; multiple domains; multiple readings

1. **6 Parameters**: Download, Upload, RTT, Jitter, Packet Loss & Availability
2. **Multiple days**: during the week and on weekends
3. At **six times**: 0800, 1100, 1500, 1800, 2000, 2300 hrs (3 readings per slot)
4. Averages of multiple readings for each time slot, taken from unannounced, unknown locations
5. **Varying server** locations
  - ISP domain
  - International domain
  - National domain

Diagnostics can be used to identify potential bottle-necks in the network. Value for money across packages can be compared.

# Regulatory actions in South Asia

Regulator	Consultancy?	Method Published?	Reports Published?	Test frequency	Parameters				
					Availability	Throughput	Latency (RTT)	Jitter	Packet Loss
ATRA (AF)	The indicators page is inaccessible – <a href="http://www.atra.gov.af">www.atra.gov.af</a>								
BTRC (BD)	✓	-	-	-	✓	-	✓	-	✓
BICMA	-	-	-	-	-	-	-	-	-
TRAI (IN)	✓	-	✓	Quarterly	✓	✓	-	-	✓
CAM (MV)	Website cannot be found								
NTA	-	-	✓	-	✓	✓	-	-	-
PTA	✓	✓	-	-	✓	✓	✓	✓	✓
TRC (LK)	-	-	✓	Monthly	-	✓	✓	-	23 -

# For more information

- <http://lirneasia.net/projects/ict-indicators/>