Testing Broadband Quality of Service Experienced (QoSE)

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INTRODUCTION

- Why test Broadband Quality of Service Experience?
  - There are other metrics apart from download speed that affects a user's broadband experience
  - Diagnostics can be used to identify potential bottlenecks in the network
  - Value for money across packages can be compared
  - Consumer protection can be enhanced based on data

- What is AT Tester?
  - A tool developed by Lirneasia in collaboration with IIT Madras
  - Tests different parameters of quality affecting a users online experience

PARAMETERS TESTED

Parameters	Definitions	Methods
Throughput (Download/Upload) (kbps)	The rate at which the data is sent/ received to/from a server Min file size – 1MB (image file) Max time – 3mins	Download File size kb / (Download end time (s) – Download start time (s))
Latency (ms) (Round Trip Time – RTT)	The time taken for a packet to reach its destination and back (delays when packet transverse the network)	Average of 10 pings $\frac{\sum_{i=1}^{10}(X_i)}{10}$
Jitter	The Variation of Latency (RTT) – End to end delay from 1 packet to next in same packet stream/flow	Average of 10 pings $\sqrt{\frac{\sum_{i=1}^{10}(X_i-\bar{X})}{10}}$
Packet Loss	The fraction of packets that fail to reach its destination	
Network Availability	Number of times the Broadband link can be accessed within a given timeframe	(1-F/T) x 100% [where T = total number of attempts; F = number of failed attempts]

How do the parameters affect in real time?

Service	Download (kbps)	Upload (kbps)	Latency (RTT – ms)	Jitter (ms)	Packet Loss (%)
Browsing (Text)	+ +	-	+	-	+
Downloading	+ + +	-	-	-	+
Online Shopping	+	-	+	-	+
Streaming Media	+ + +	-	+ +	+ +	+ +
VOIP	+	+	+ + +	+ + +	+ + +
Online 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

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The Actual Test

- Multiple Days – weekdays including the weekends
- Different Time slots – ideally – 0800, 1100, 1500, 1800, 2000, 2300 hrs
- Varying Server Locations – ISP domain, National domain and International domain

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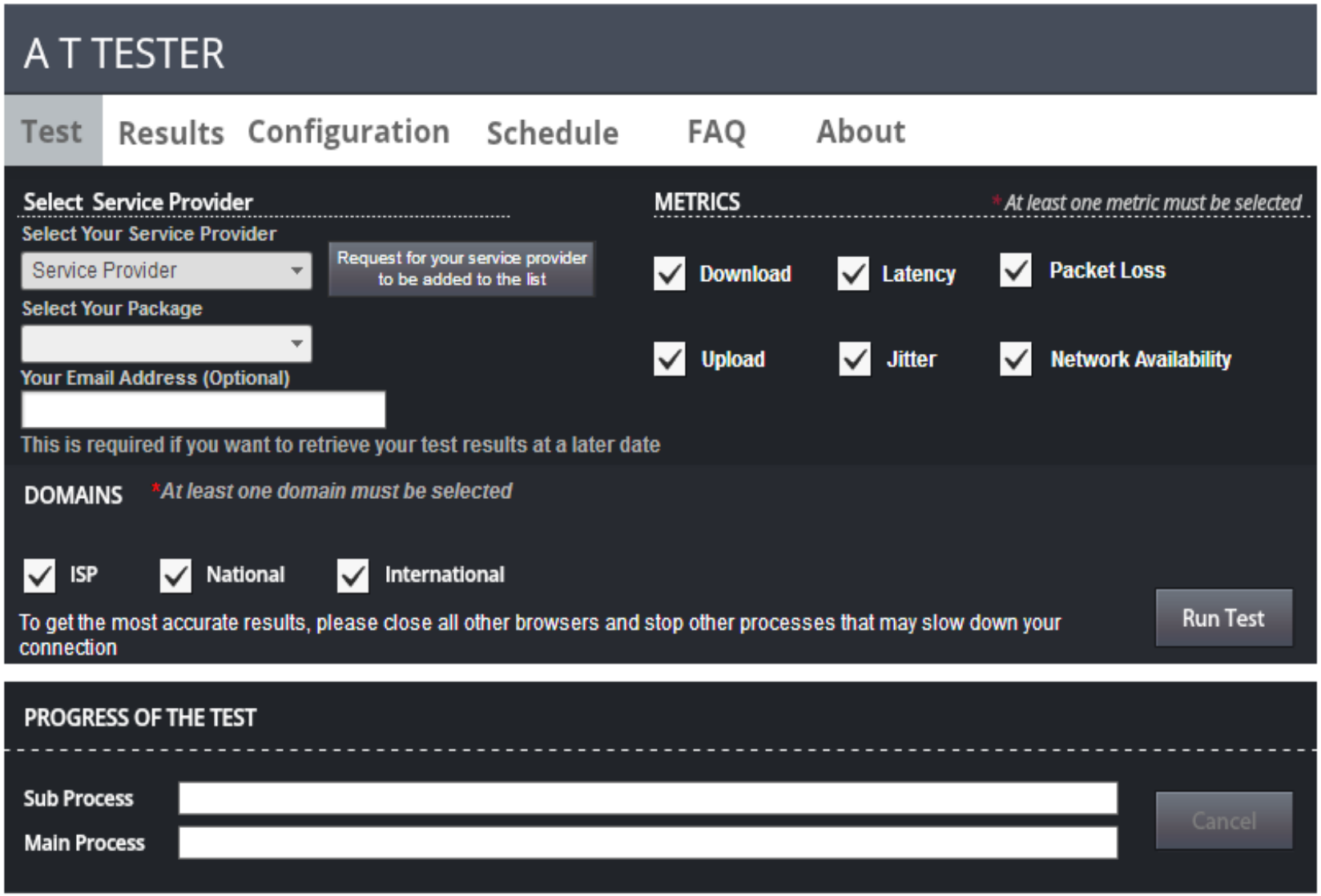
The AT Tester – Test Tab



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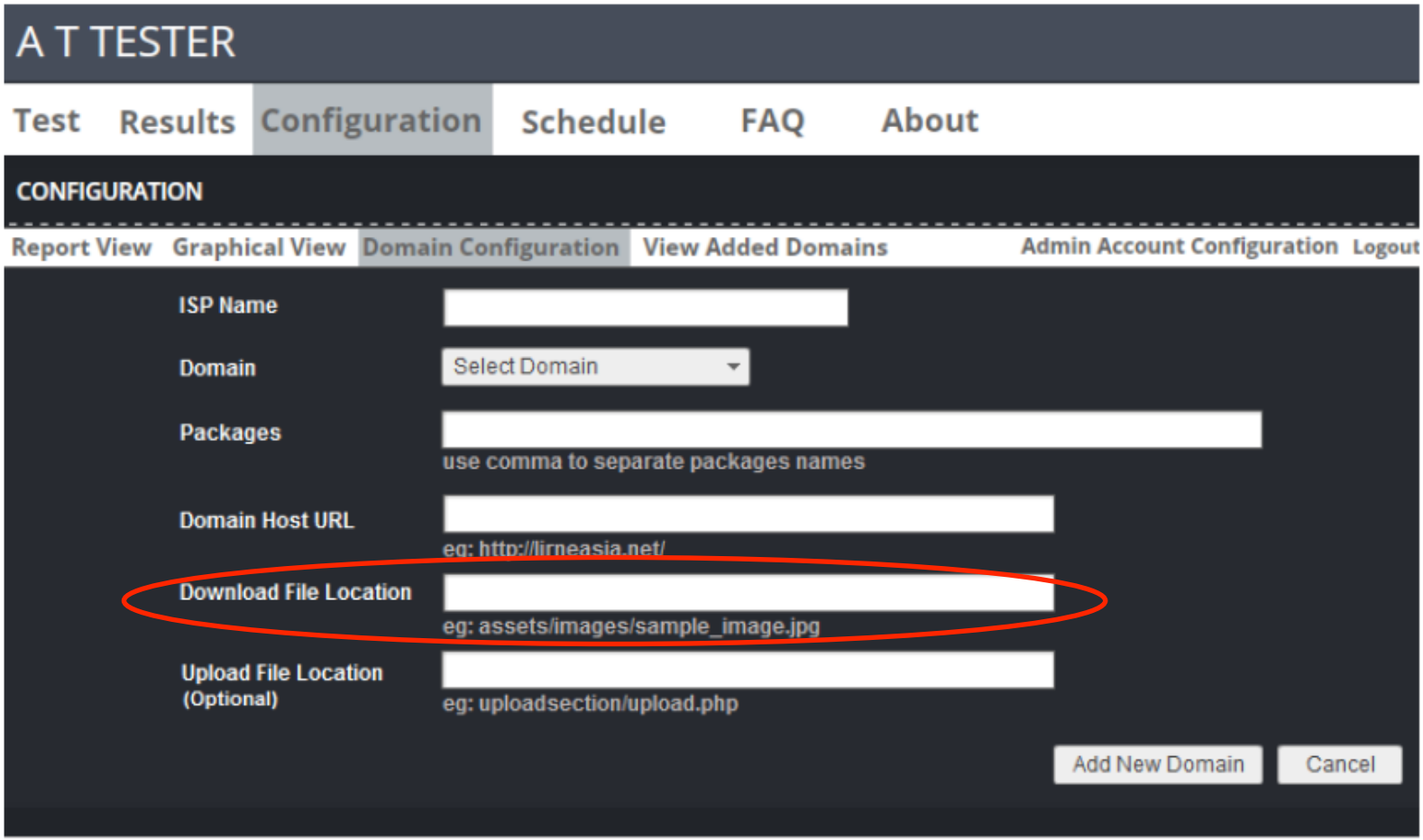
Mandatory Information Before Testing



- Information provided in this form is mandatory and vital for the application to run
- Need to enter the URL of a image file hosted on the ISP's Domain to test the ISP domain. File size should not be less than 1MB.

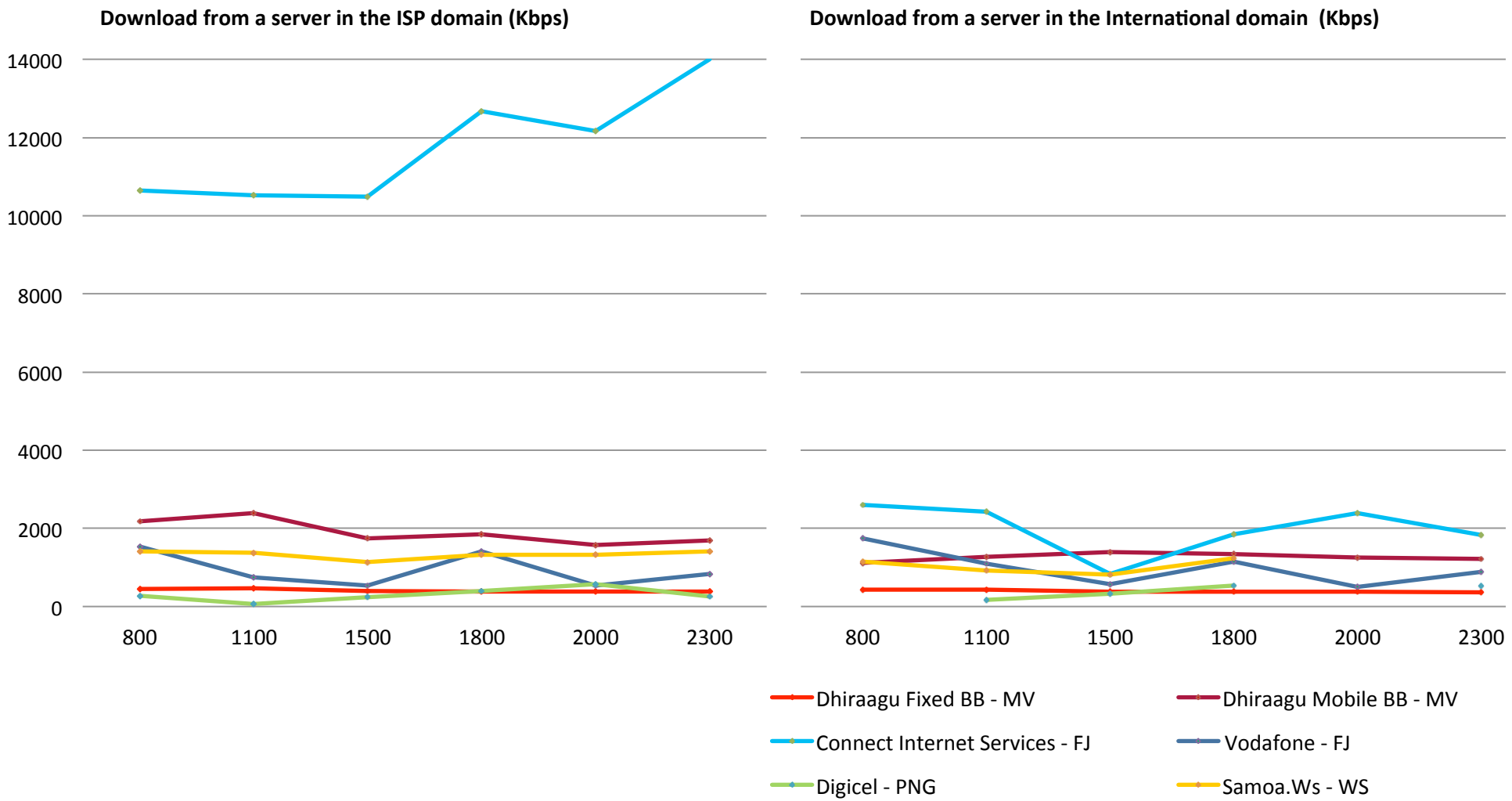
2012 Results Snapshot

Around 50% of broadband costs are in international segment:

- **Hypothesis:**
  Performance WITHIN ISP DOMAIN > performance the INTERNATIONAL DOMAIN

- International performance may be affected because operators are economizing on the costly input of international backhaul

Download speeds: ISP vs. International



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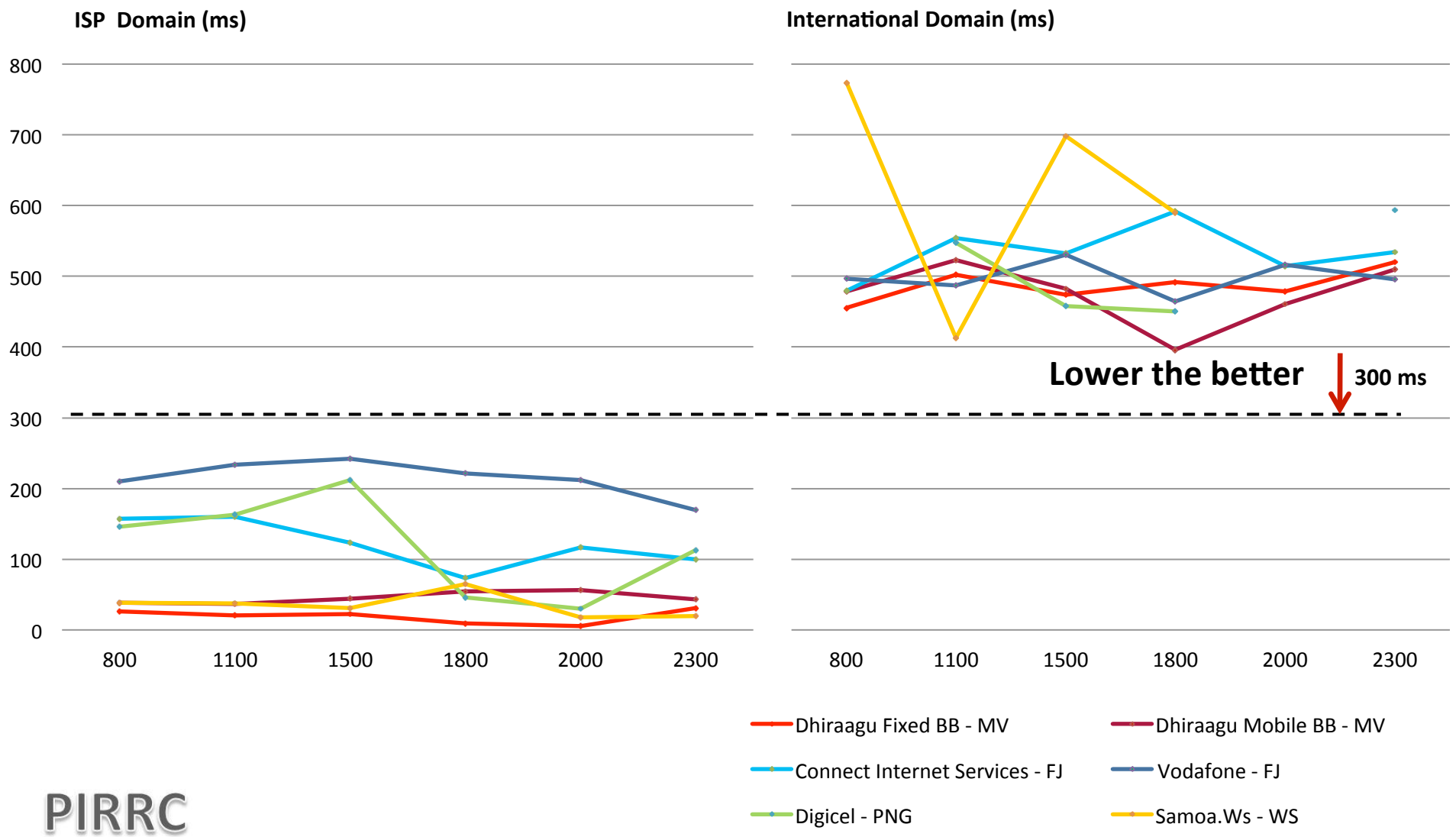
Mixed Results

- Generally confirms the hypothesis
- But,
  - Unable to compare performance of Samoa package because of problems in data collection
  - PNG performance extremely poor in both international and ISP domains

Return Trip Timing (RTT)

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

RTT: ISP Domain vs. International



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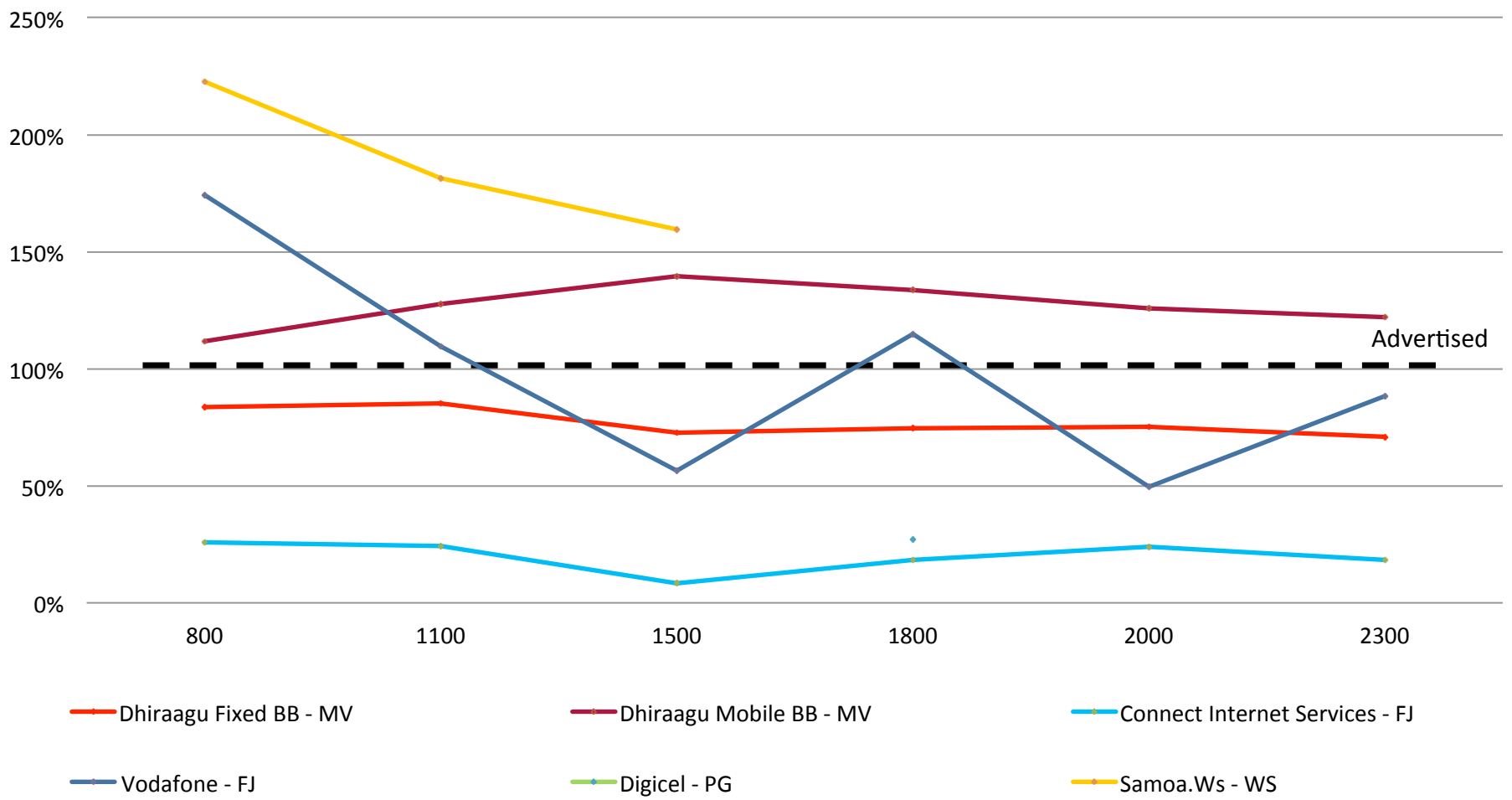
Bleak picture: Hypothesis confirmed

- Pretty much no tested package meets 300 ms standard
- PNG performance is the lowest

Is there truth in advertising?

Download from an international server: Actual vs. advertised speeds



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- Fiji exceeds promise, most times of day
- 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, 512 Kbps	Dhiraagu 3G, 1 Mbps	Connect, 10 Mbps	Vodafone, 1 Mbps	Digicel, 2 Mbps	Samoa.ws, 512 kbps
8:00 AM	428.46	1117.62	2592.6	1743.53		1140.5
11:00 AM	436.67	1277.08	2422.81	1096.3	170	929
3:00 PM	372.69	1395.46	825.62	563.22	322.5	816.5
6:00 PM	381.46	1336.00	1846	1149.66	542	1231
8:00 PM	384.67	1258.69	2390.85	495.57		
11:00 PM	363.25	1219.15	1825.5	883.83	520.5	
Average	**394.53**	**1267.33**	**1983.9**	**988.68**	**388.75**	**1029.25**

Red = performance < Advertised speed

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Thank You