Measuring packet loss

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FCC Open Internet Order

Open Internet Order 2015

With respect to network performance, we adopt the following enhancements:

- The existing transparency rule requires disclosure of actual network performance. In adopting that requirement, the Commission mentioned speed and latency as two key Measures. **Today we include packet loss as a necessary part of the network performance disclosure.**

- We expect that **disclosures to consumers of actual network performance data should be reasonably related to the performance the consumer would likely experience in the geographic area in which the consumer is purchasing service**.

- We also expect that network performance will be **measured in terms of average performance over a reasonable period of time and during times of peak usage.**

Paragraph 166 in
http://transition.fcc.gov/Daily_Releases/Daily_Business/2015/db0312/FCC-15-24A1.pdf

Open Internet Order 2015

"Participation in the Measuring Broadband America (MBA) program continues to be a safe harbor for fixed broadband providers in meeting the requirement to disclose actual network performance."

Will packet loss of interconnection links be reported?

- FCC's Measuring Broadband America currently is **designed to primarily measure access network performance**

- Video streaming tests are being planned but will only measure paths associated with video content

Samknows tests

Test	Primary measure(s)
Download speed	Throughput in Megabits per second (Mbps) utilizing three concurrent TCP connections
Upload speed	Throughput in Mbps utilizing three concurrent TCP connections
Web browsing	Total time to fetch a page and all of its resources from a popular website
UDP latency	Average round trip time of a series of randomly transmitted UDP packets distributed over a long timeframe
UDP packet loss	Fraction of UDP packets lost from UDP latency test
Video streaming	Initial time to buffer, number of buffer under-runs and total time for buffer delays[23]
Voice over IP	Upstream packet loss, downstream packet loss, upstream jitter, downstream jitter, round trip latency
DNS resolution	Time taken for the ISP's recursive DNS resolver to return an A record[24] for a popular website domain name
DNS failures	Percentage of DNS requests performed in the DNS resolution test that failed
ICMP latency	Round trip time of five regularly spaced ICMP packets
ICMP packet loss	Percentage of packets lost in the ICMP latency test
Latency under load	Average round trip time for a series of regularly spaced UDP packets sent during downstream/upstream sustained tests
Availability[25]	Total time the connection was deemed unavailable for any purpose, which could include a network fault or unavailability of a measurement point
Consumption[26]	A simple record of the total bytes downloaded and

Loss measures

Samknows Internet measurements use by regulators

https://www.samknows.com/regulators

How regulators have reported loss measurements in public reports

Regulator	Report date	Loss metric	Notes	Links
United States FCC	July 2014, Feb 2013, July 2012, Aug 2011		Never reported on loss	https://goo.gl/tlz6oB https://goo.gl/PsHP5A
European Commission	October 2013, March 2012	Averages derived from UDP latency tests	Compare loss averages to averages in US	http://goo.gl/0uhdLt http://goo.gl/TJlg6e
Singapore	Ongoing	Averages derived from UDP latency tests	Calculate loss to targets in US	http://goo.gl/LtrJ8t
UK Ofcom	12 reports from 2008-2014 (every 6 months)		Only reported on loss in first report	http://goo.gl/a05dea
Brazil	7 reports from 2013 – 2015 (every six months)	Threshold metric drived from UDP latency tests	Report metric is % of time loss is below 2%	https://goo.gl/yQhYuN

Loss results from other countries using Samknows

EU 2013 Report

Technology and Period	xDSL Peak	xDSL 24hr	Cable Peak	Cable 24hr	FTTx Peak	FTTx 24hr	EU Peak	EU 24hr
Packet Loss (%)								
October 2013	0.50%	0.35%	0.20%	0.18%	0.39%	0.22%	0.39%	0.27%
March 2012	0.7%	0.4%	0.3%	0.3%	0.3%	0.3%	0.5%	0.4%

2013
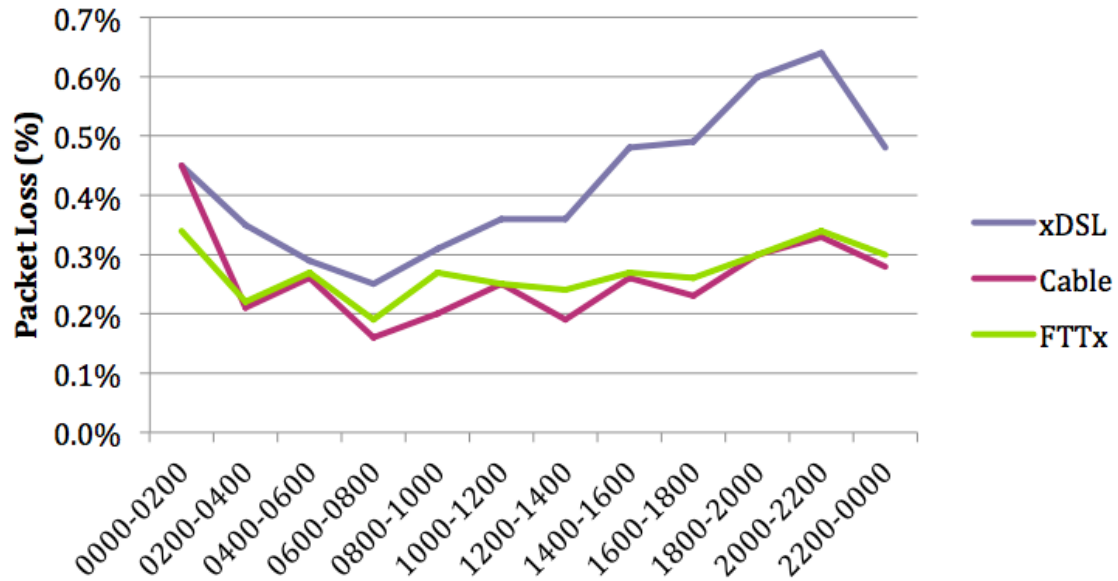
2012
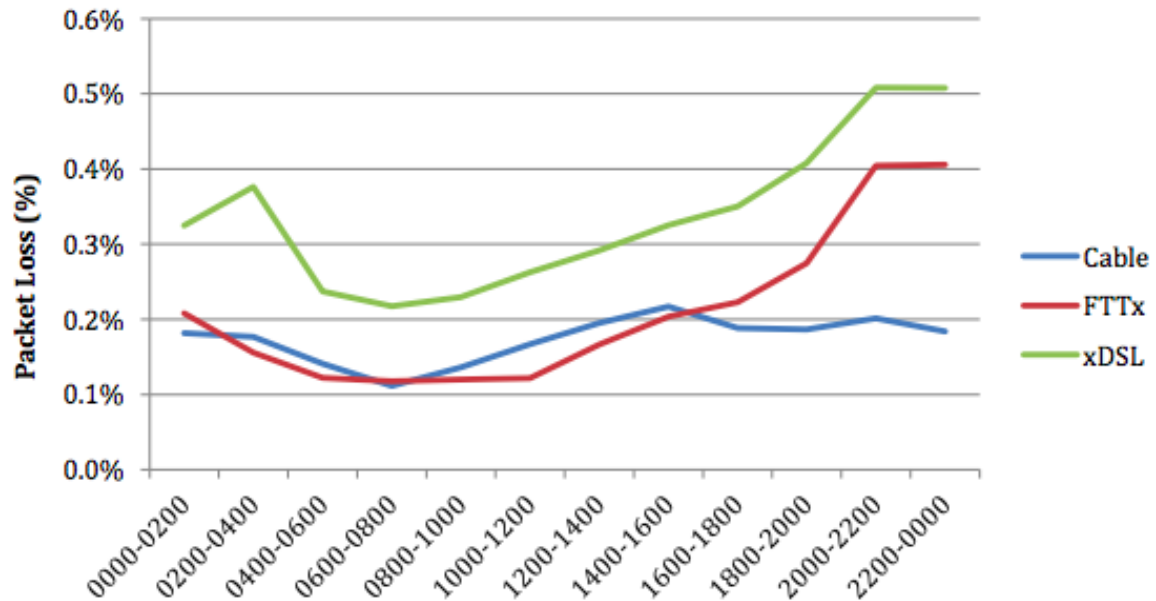
Figure EU.1-17: Packet Loss by hour of day and technology (lower is better)

EU 2013 Report Comparing packet loss in EU and US
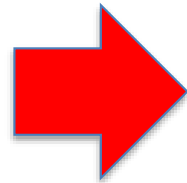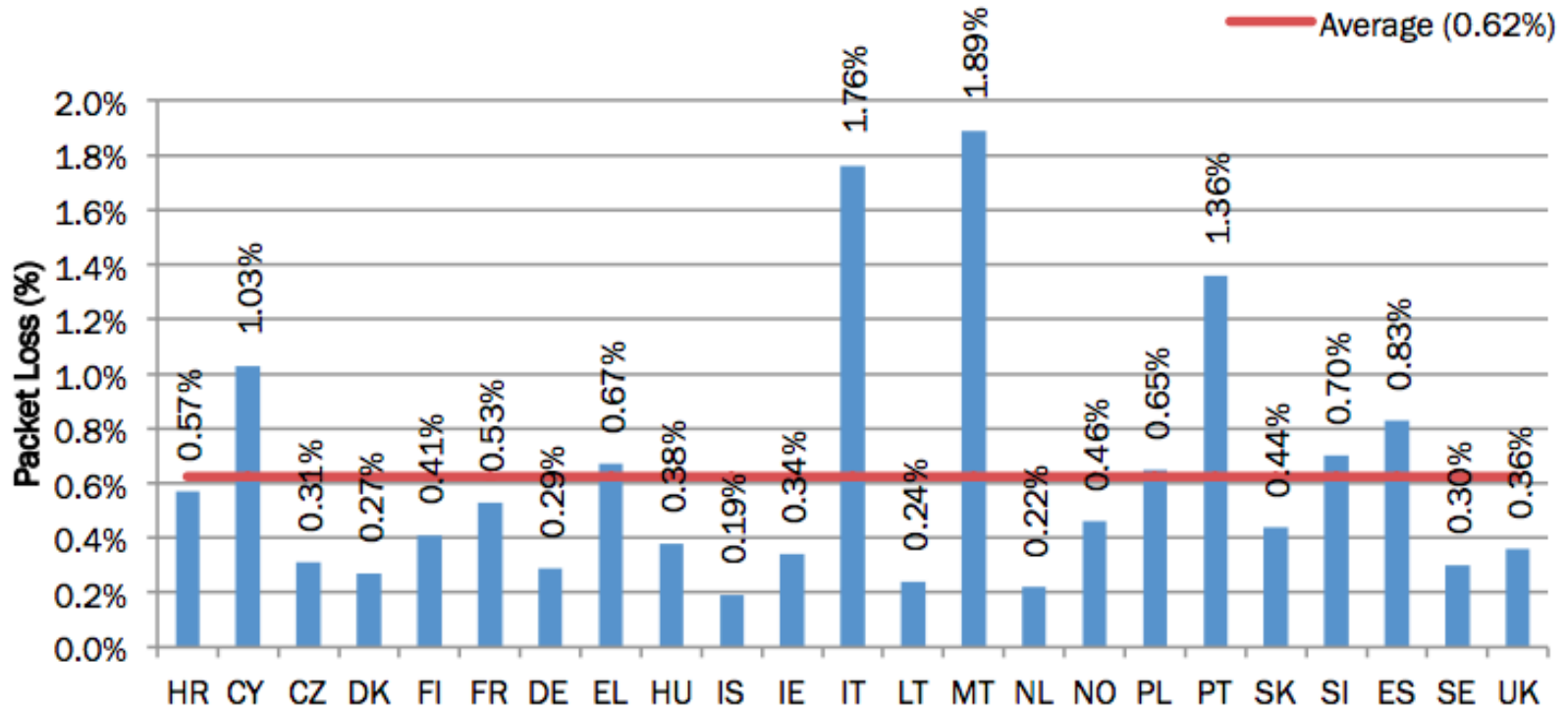
Packet Loss

Well…

Figure EU.1-42 is the comparison of packet loss during the peak period between Europe and the USA, split by technology. As was the case in March 2012, all acces technologies in the USA displayed significantly lower packet loss compared to Europe. In actuality, the difference is not significant and can be negligible with respect to broadband performance for individual users

Technology	Europe	US
xDSL	0.50%	0.23%
FTTx	0.40%	0.17%
Cable	0.21%	0.15%

Figure EU.1-42: Comparison of Packet Loss between Europe and the USA, by technology

EU Packet loss of xDSL technology during peak periods, split by country

EU Packet loss of cable technology during peak periods, split by country
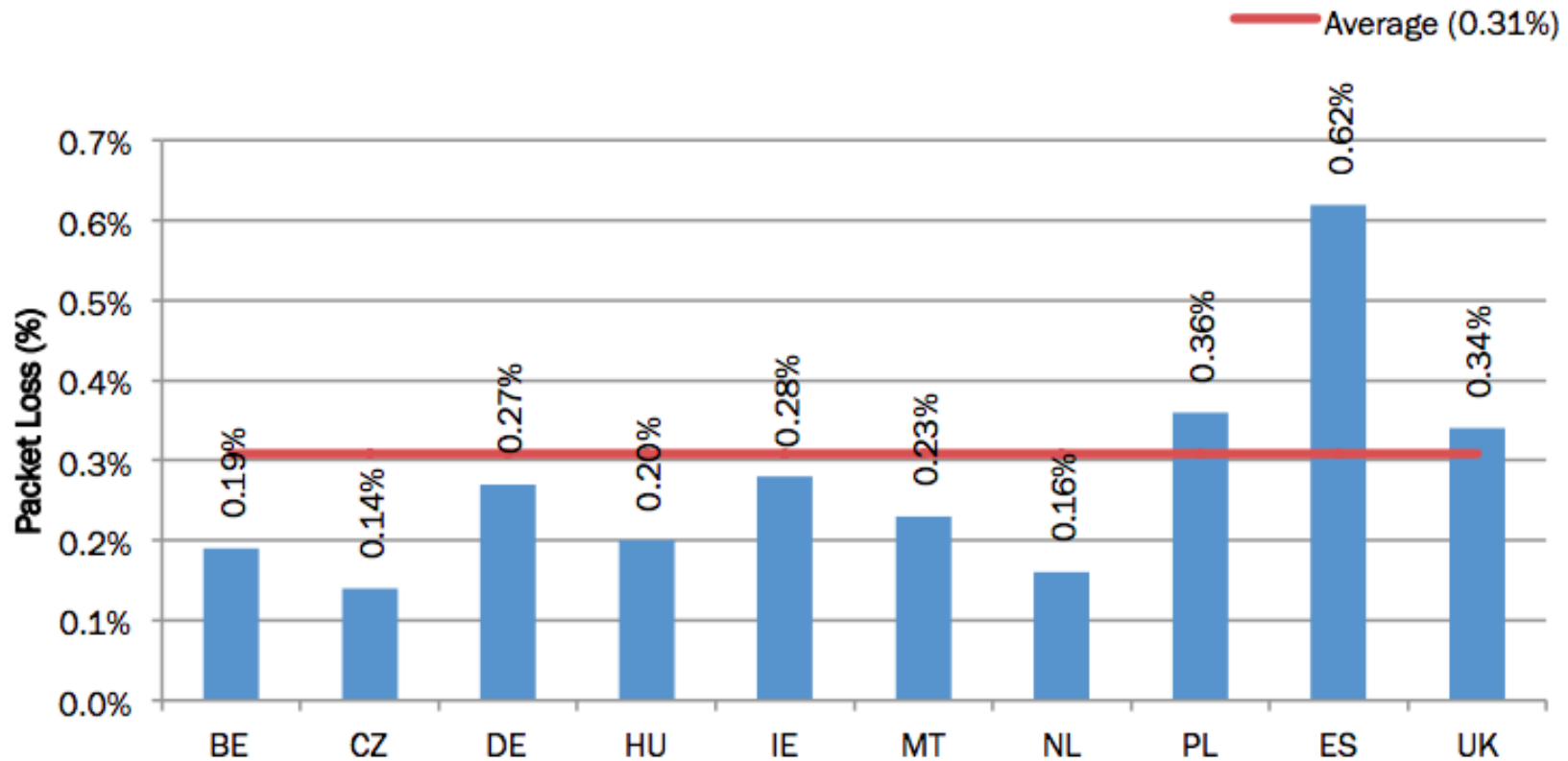

Figure EU.2-17: Packet loss of cable technology during peak periods, split by country

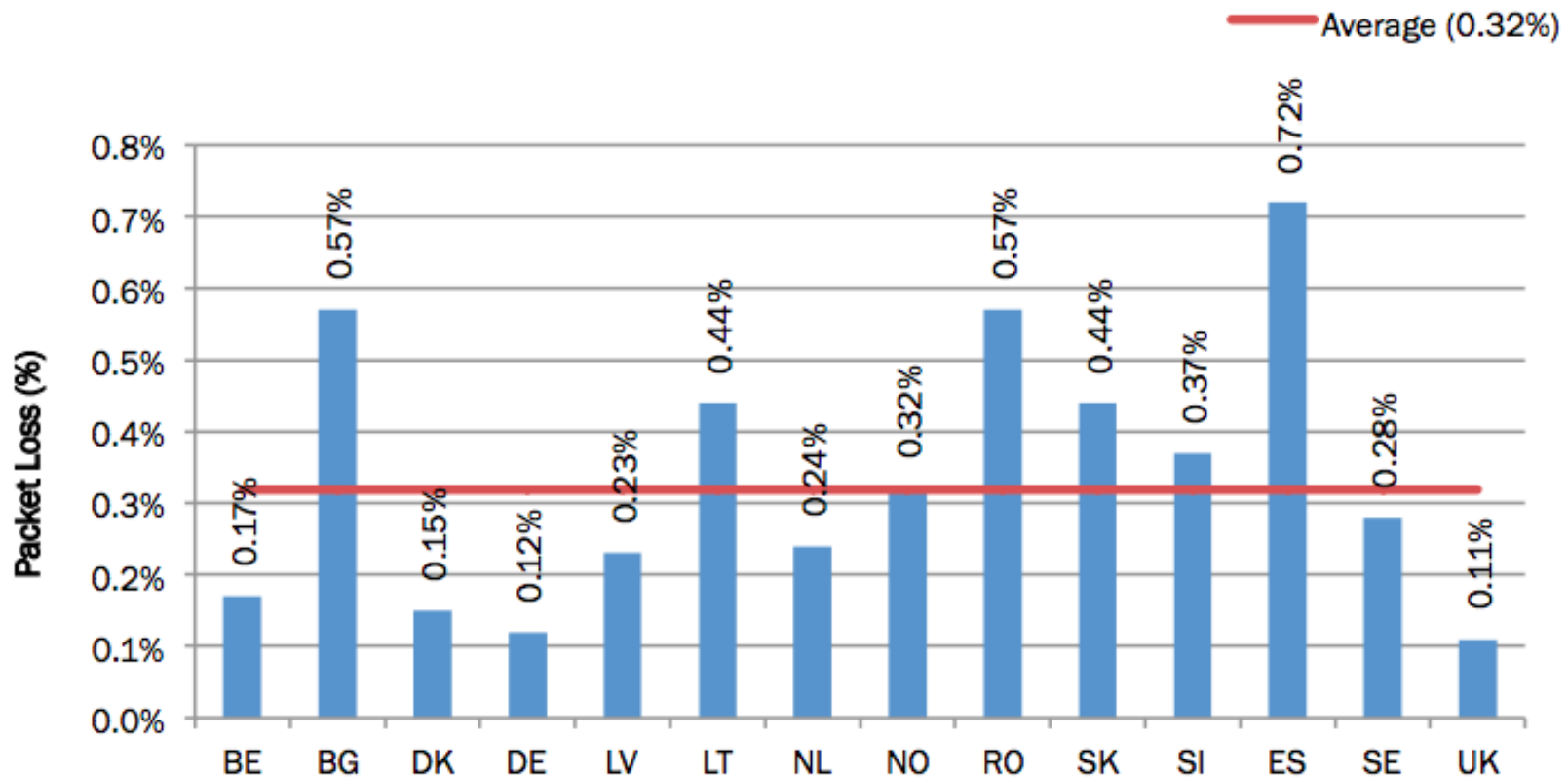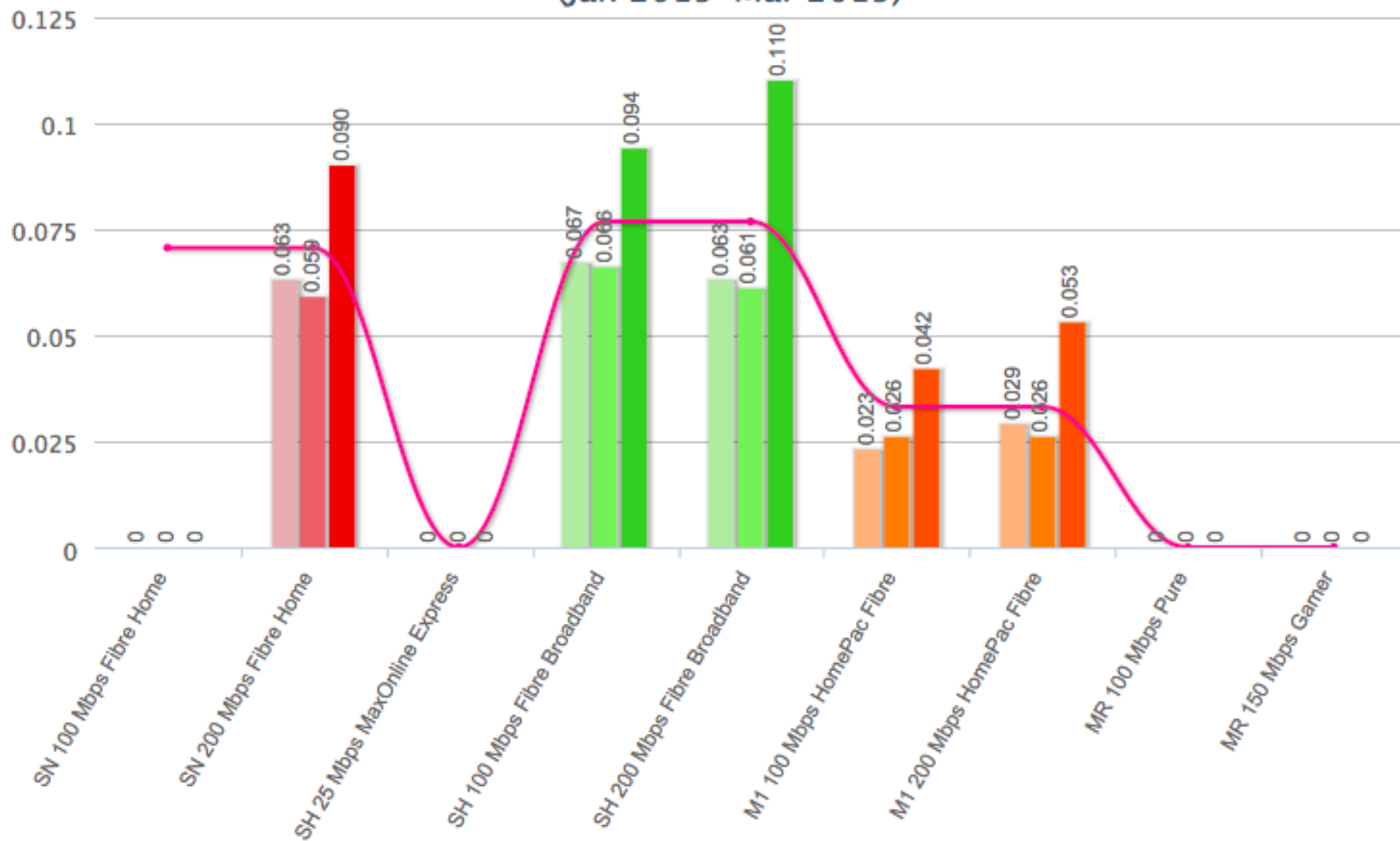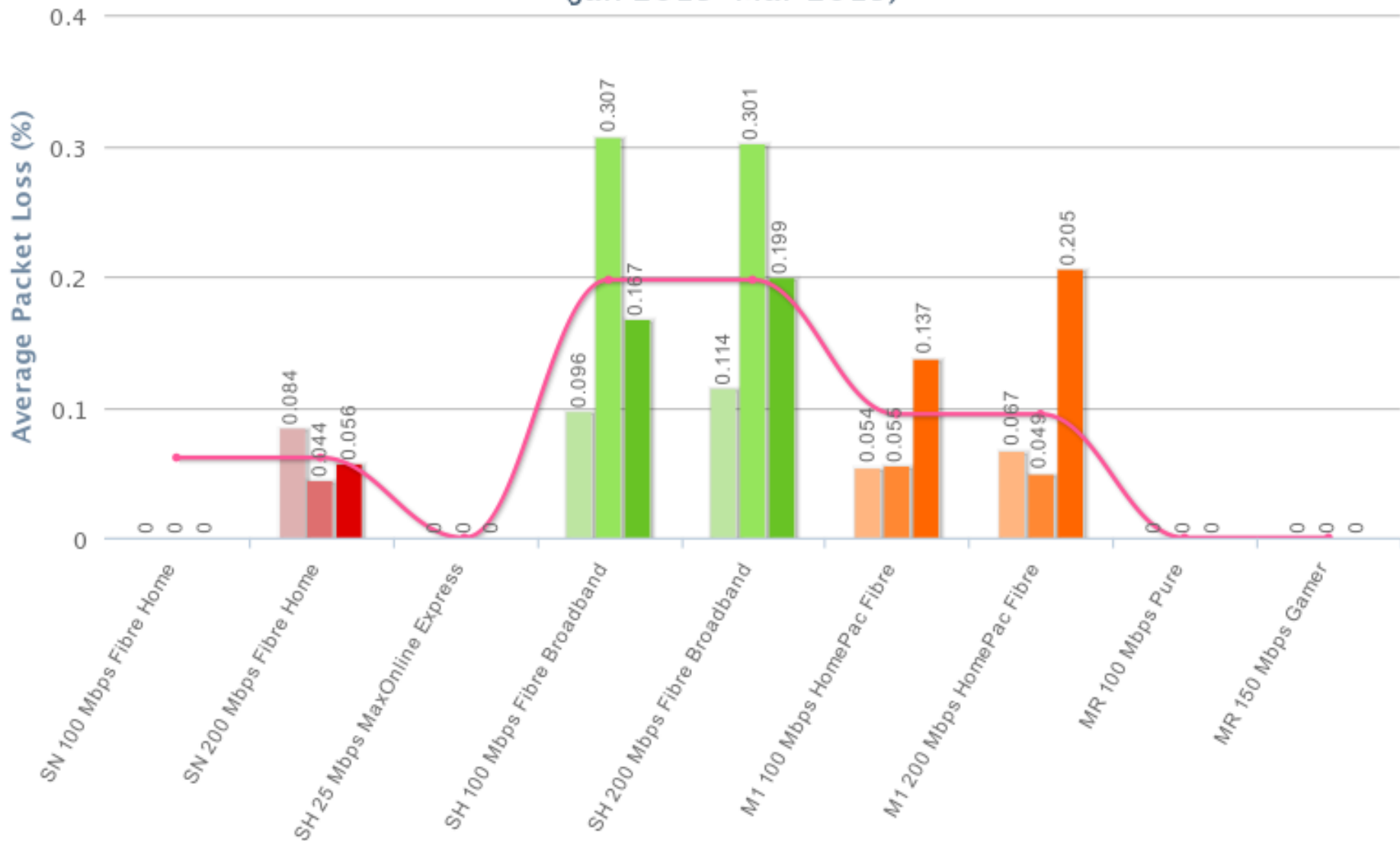# EU Packet loss of FTTx technology during peak periods, split by country

Figure EU.2-18: Packet loss of FTTx technology during peak periods, split by country

Singapore (IX) Average Packet Loss
(Jan 2015–Mar 2015)

| Provider	Values
SN 100 Mbps Fibre Home	—
SN 200 Mbps Fibre Home	0.063, 0.059, 0.090
SH 25 Mbps MaxOnline Express	—
SH 100 Mbps Fibre Broadband	0.067, 0.066, 0.094
SH 200 Mbps Fibre Broadband	0.063, 0.061, 0.110
M1 100 Mbps HomePac Fibre	0.023, 0.026, 0.042
M1 200 Mbps HomePac Fibre	0.029, 0.026, 0.053
MR 100 Mbps Pure	—
MR 150 Mbps Gamer	—

International (US) Average Packet Loss
(Jan 2015–Mar 2015)

OFCOM report 2008

Figure 8.5   Packet loss, by hour of day
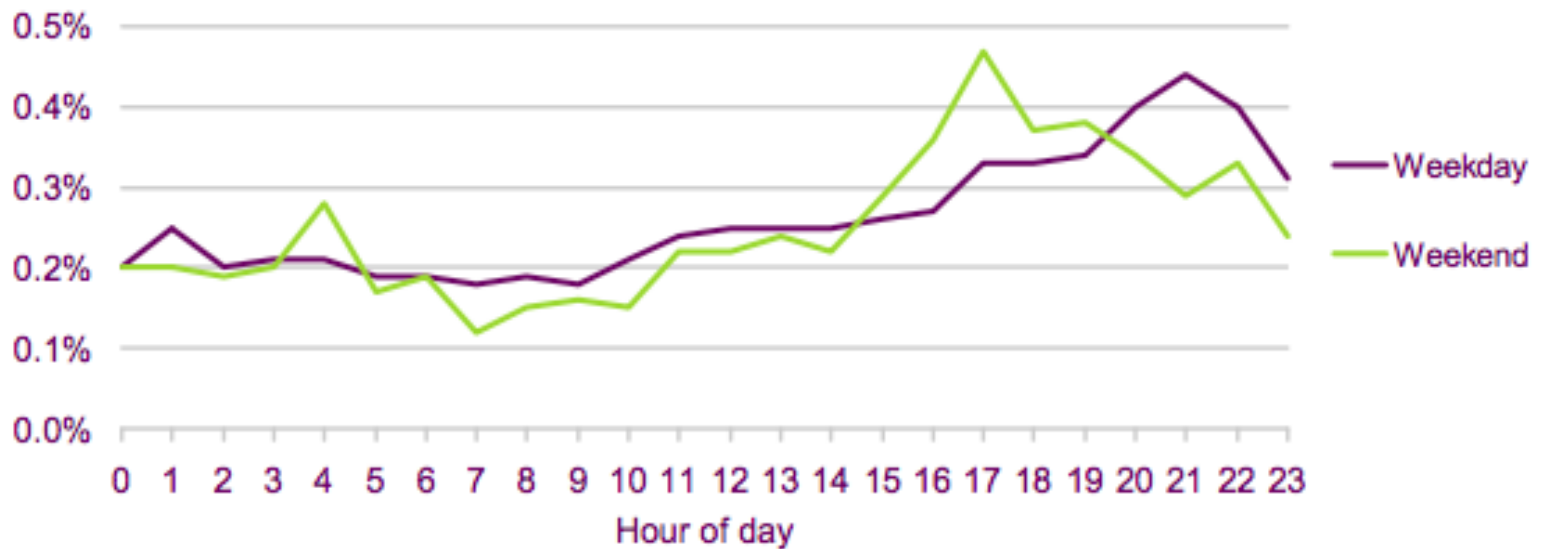
Source: SamKnows measurement data for all panel members with a connection in the 30 days from 23rd October 2008