INTERACTIONS BETWEEN HIGH SPEED INTERNET AND
VIDEO ENTERTAINMENT ON THE SAME NETWORK

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Outline

- Study Objectives

- Technology Foundations

- Methodology

- Findings and Conclusions

Study Objectives

To compare mix of video+internet on vDSL versus cable systems

Video

vDSL

11010▾▾11101

High Speed
Data
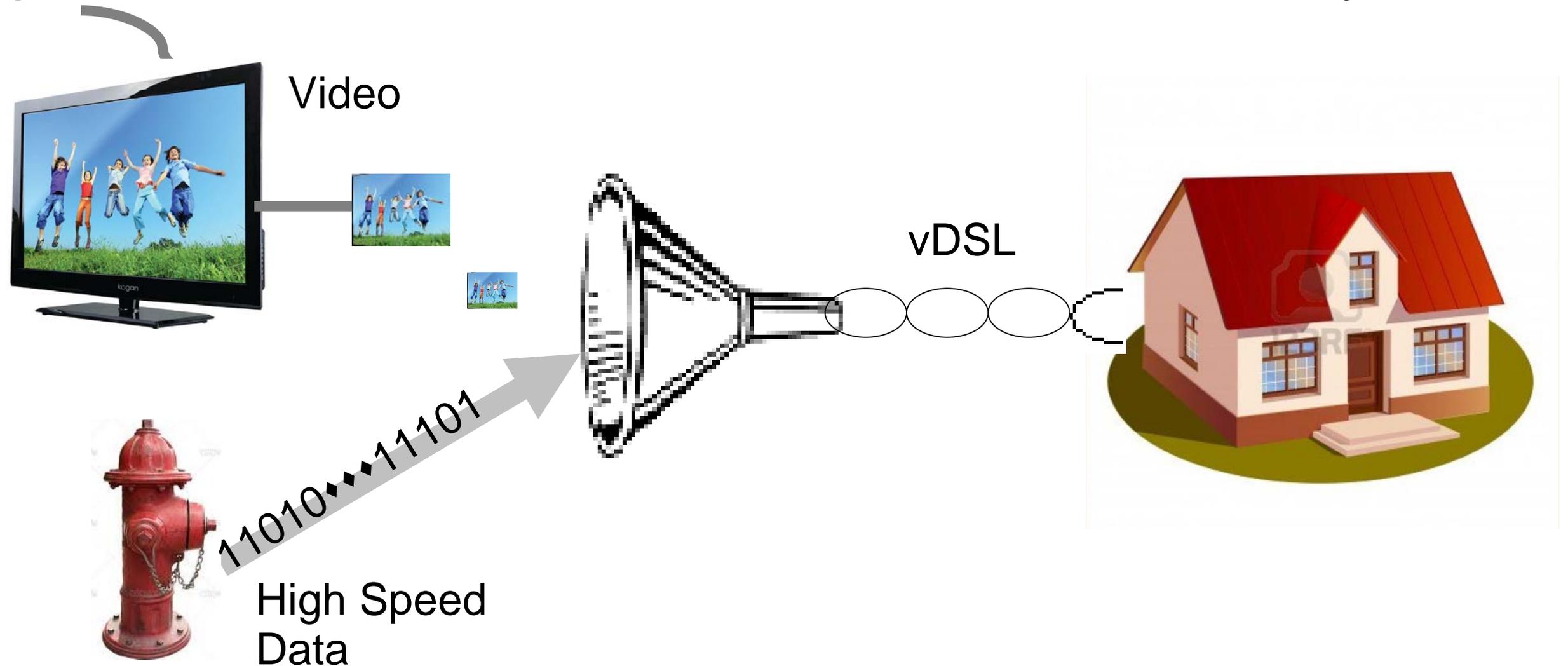
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Technology Foundations

Technology Foundations

Central Office

Fiber to The Cabinet
FTTCab
(Remote DSLAM)

Copper Pair Cable
(<1000-1500 m)

Technology Foundations DSL
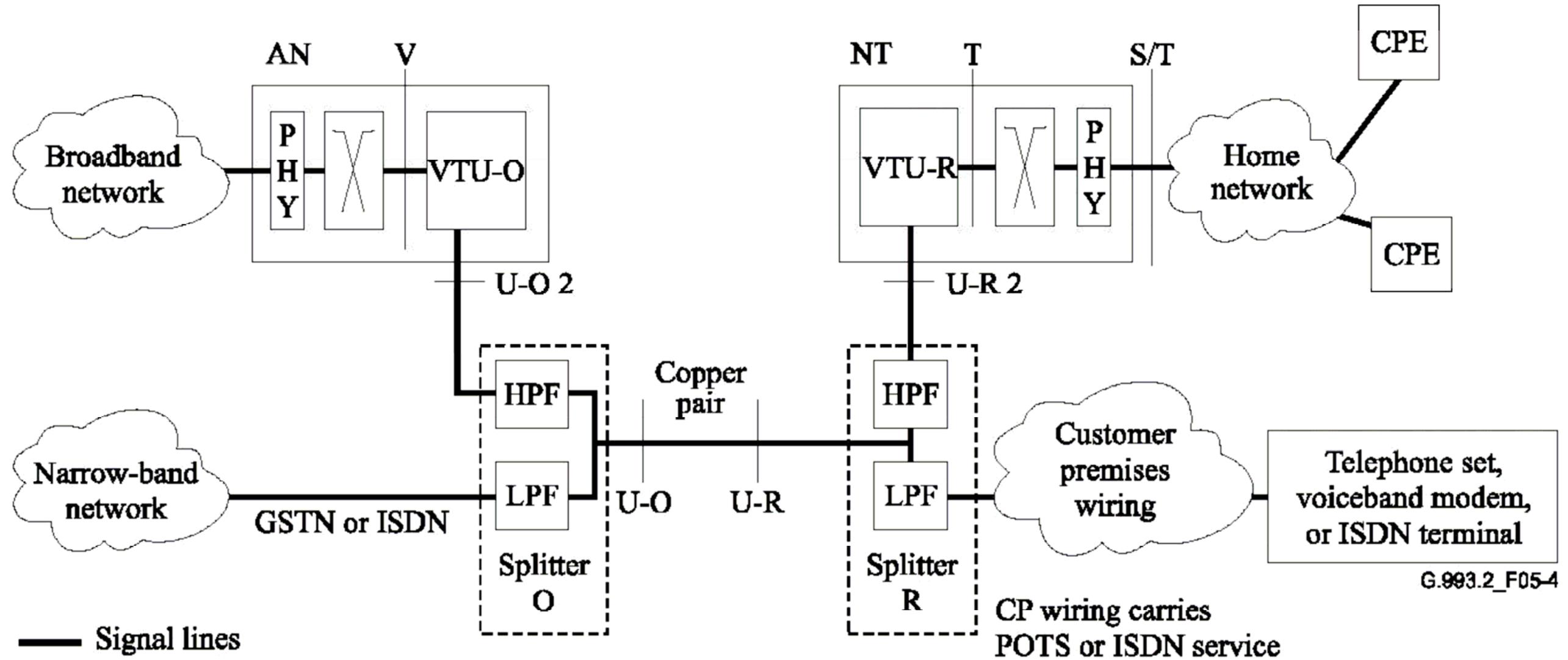
G.993.2_F05-4

The ITU VDSL$_2$ Standard

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.993.2

(02/2006)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS
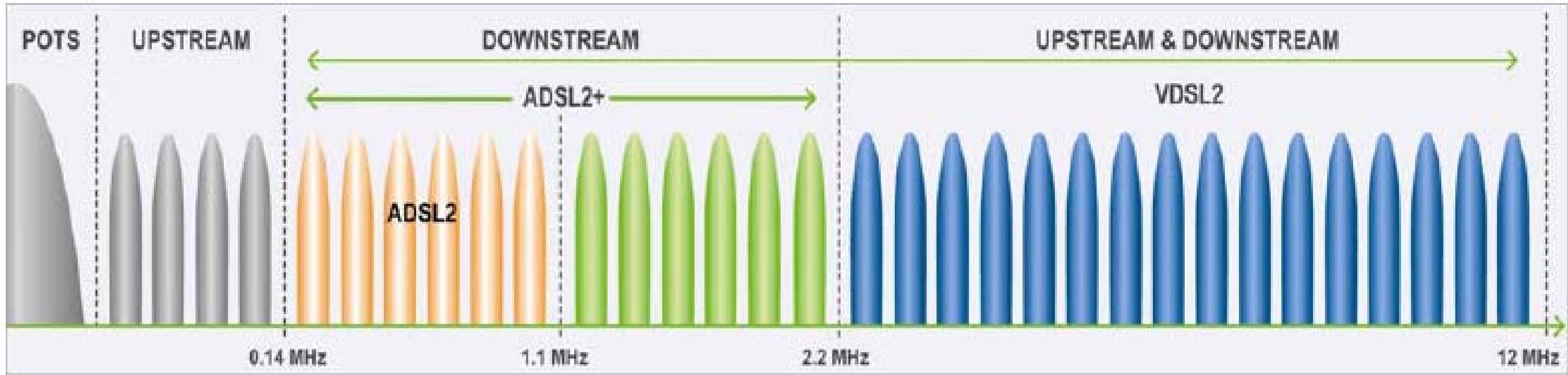
Digital sections and digital line system – Access networks

**Very high speed digital subscriber line
transceivers 2 (VDSL2)**

The VDSL$_2$ Spectrum Plan
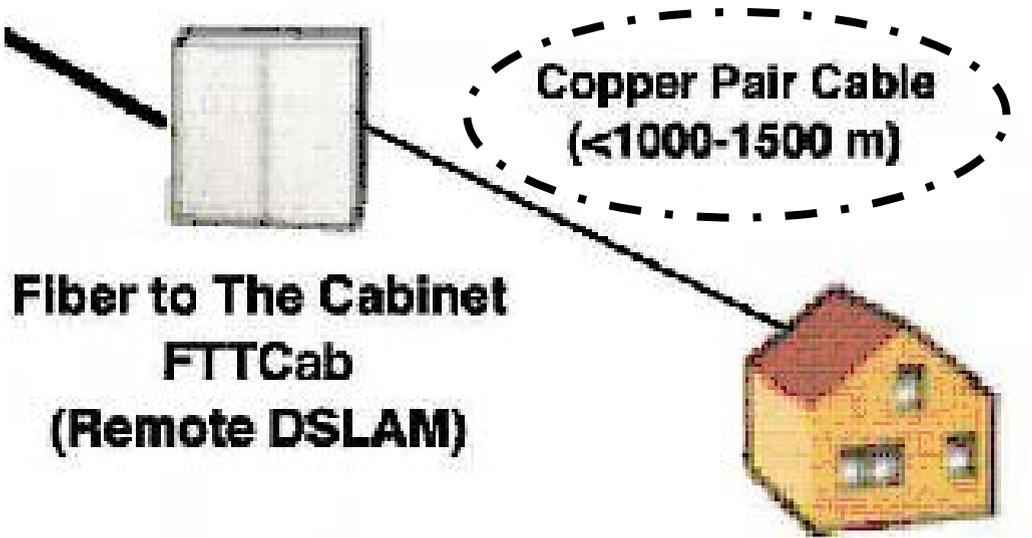
Fibe FTTcab Bandwidth

- In the Bell fiber to the node architecture the cooper pair is <1500m

- This limits the bandwidth to the home to the "knee" of the curve at about 25 M b/s

VDSL$_2$ Bandwidth Capability
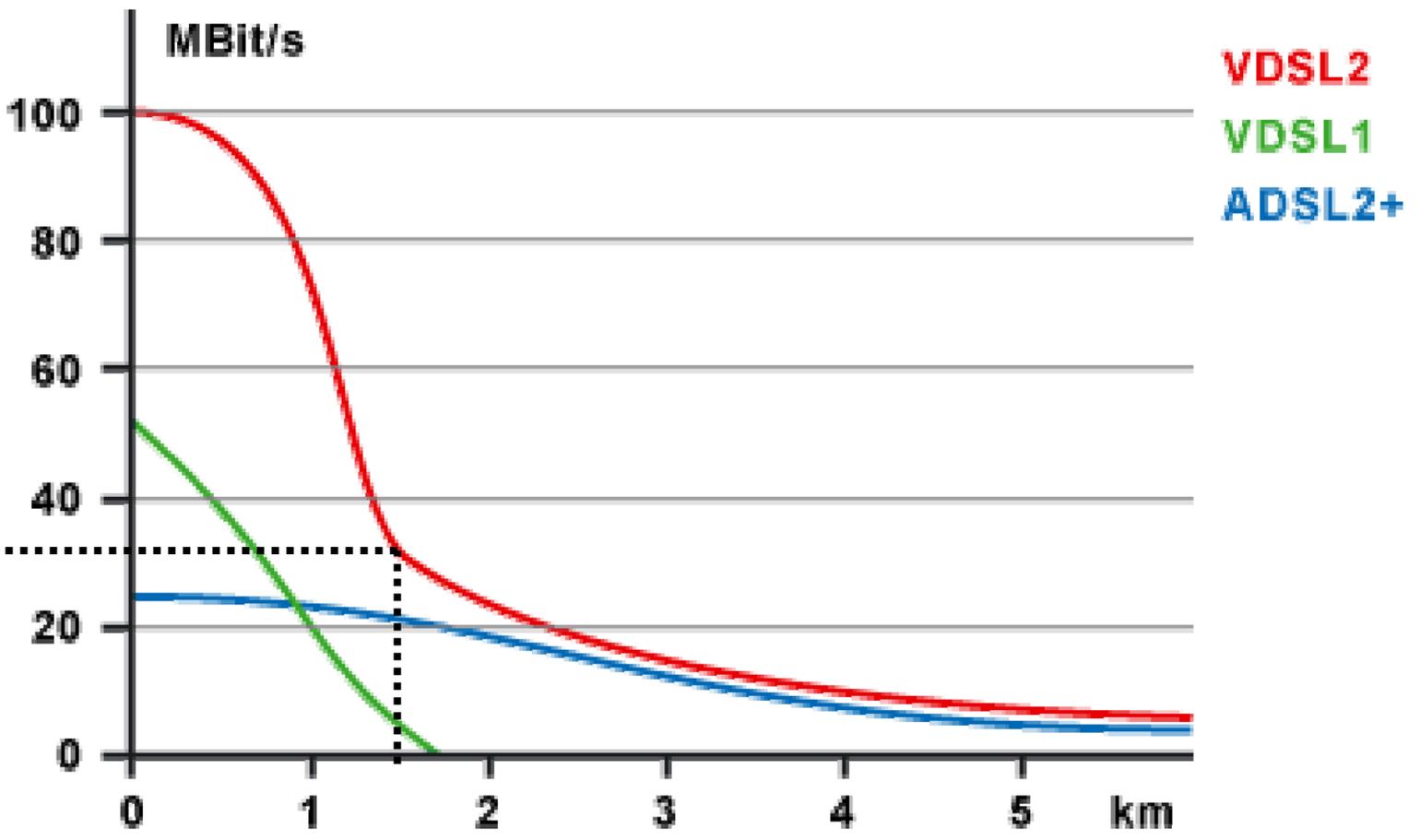
Copper Pair Cable
(<1000-1500 m)

Fiber to The Cabinet
FTTCab
(Remote DSLAM)

About 25M b/s
Limit

MBit/s

VDSL2
VDSL1
ADSL2+

100

80

60

40

20

0

0   1   2   3   4   5   km

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Technology Architecture

National IP video Super hub offices

National IP backbone

Regional IP Video hub offices

IP serving offices (central office)

Fiber

Node

Copper (IP Network)

U-verse receiver

U-verse gateway

Fiber to the node

Source: AT&T
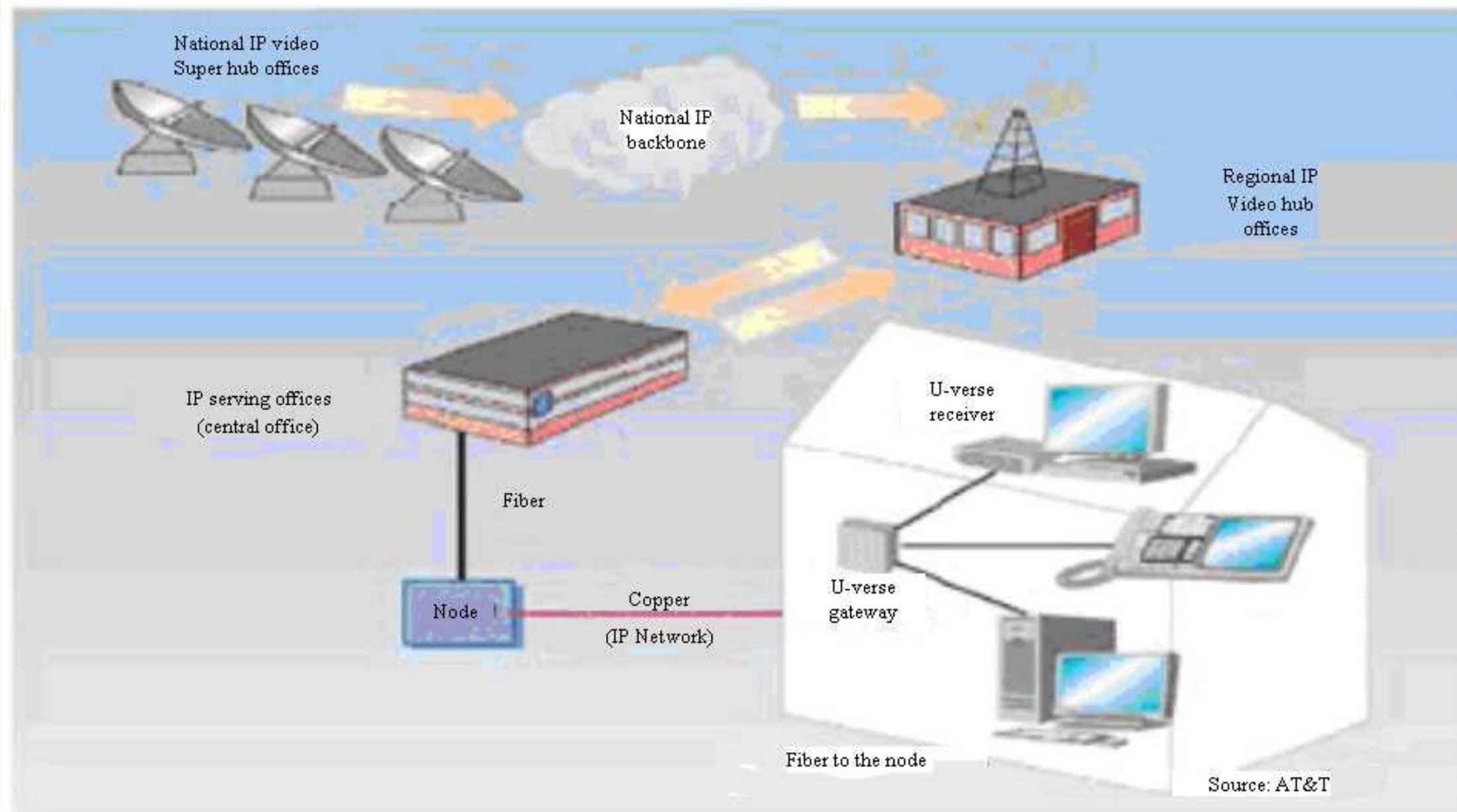
Video BW Demands

- 6MHz ATSC channel data rate of 19.2 M b/s

  — Typical cable quality video allocates 12 M b/s to two "HD" programs using MPEG2 and stat mux

  — FibeTV uses MPEG4 for 2:1 compression gain

- To maintain cable quality video FibeTV allocates

  — 6 M b/s per HD program

  — 2-3 M b/s per SD program

Video QoS

- Desire to use industry standard Internet protocols

- Mainstream Internet protocols are designed for delay insensitive web surfing and are not suitable for streaming video

- TCP/IP with request repeat is reliable but too slow

- UDP/IP is fast but not reliable enough

- FibeTV solution is a hybrid of TCP UDP protocol

Methodology

Methodology

- 5 households in BellCanada FibeTV areas

- Subscription to FibeTV+Fibe16 internet

- Dedicated computer and in-home network

- Recorded internet speed vs. active video streams

Methodology/Test Plan

Tests over 7 days at 3X/day day & night

- No TV channel baselines
- Active HDs: 1, 2, and 3 (if possible)
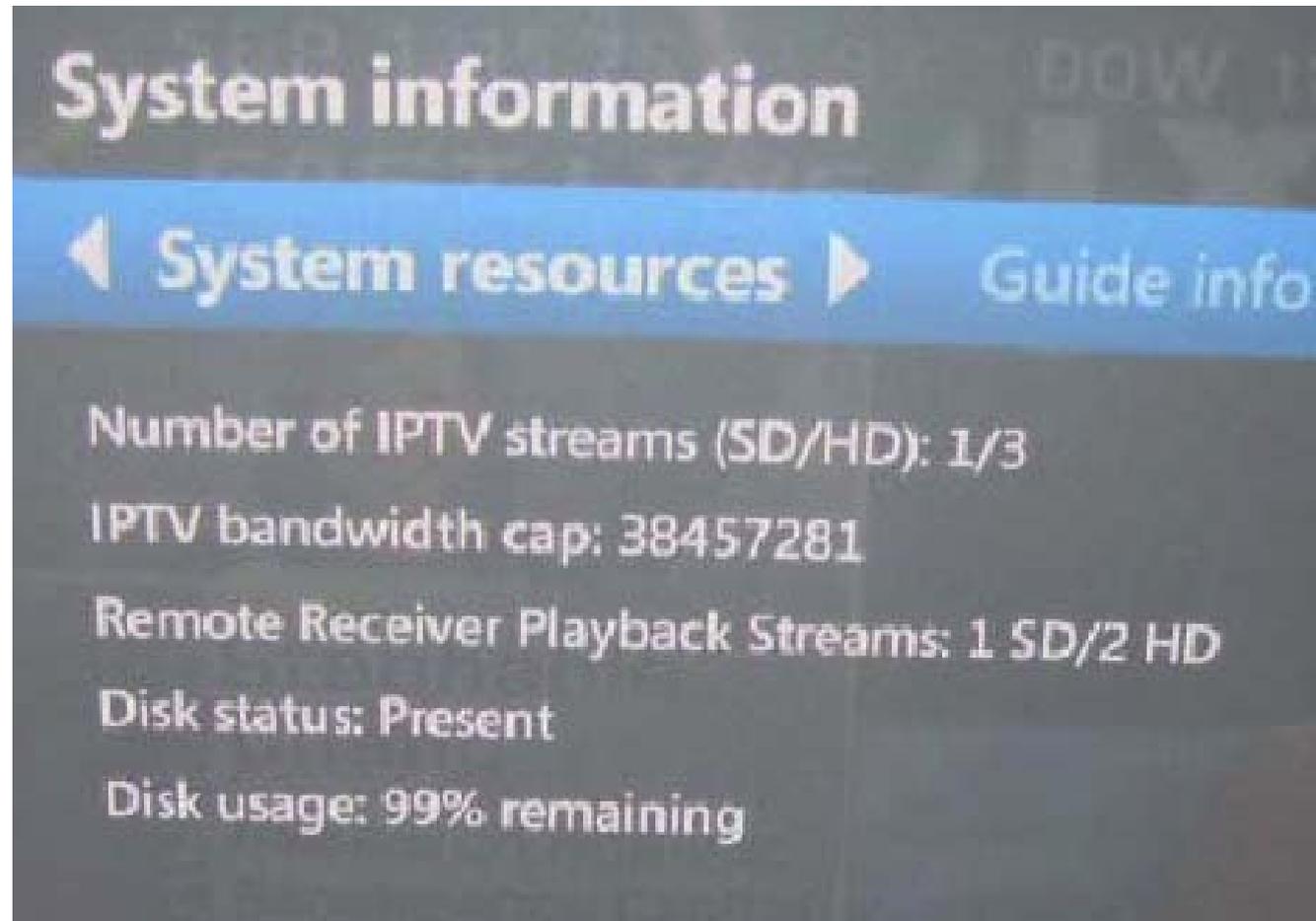- Mix of HD+SD: 2 SD + 1HD & 2SD+2HD

Statistical analysis of data

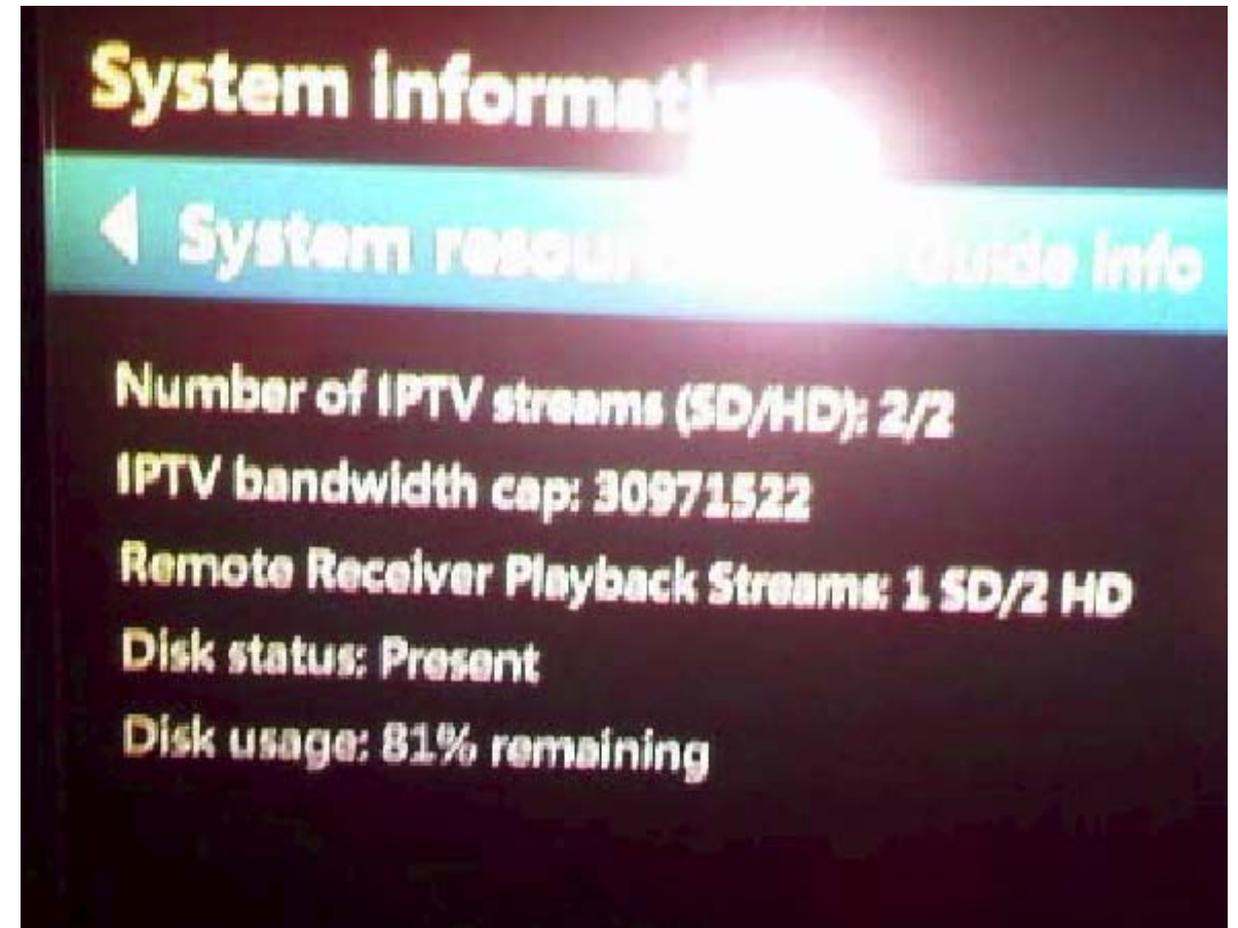# Example In HomeScreen Shots

System information
◀ System resources ▶ Guide info
Number of IPTV streams (SD/HD): 1/3
IPTV bandwidth cap: 38457281
Remote Receiver Playback Streams: 1 SD/2 HD
Disk status: Present
Disk usage: 99% remaining

System information
◀ System resources ▶ Guide info
Number of IPTV streams (SD/HD): 2/2
IPTV bandwidth cap: 30971522
Remote Receiver Playback Streams: 1 SD/2 HD
Disk status: Present
Disk usage: 81% remaining

Short Loop Households
Up to 3 HD Channels

Longer Loop Households
Limited 2 HD Channels

October 21-23 2014

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Findings & Conclusions

Findings & Conclusions

	Baseline Bell Speedtest (M b/s)	One HD (M b/s)	Two HDs (M b/s)	Three HDs (M b/s)	2HDs + 1 SD (M b/s)	2HDs+2SDs (M b/s)
Mean Average	25.44	19.62	13.44	7.56	11.16	8.81
Standard Deviation		0.74	0.47	0.33	0.41	0.43
Maximum Data Rate at 95% Probability Level		20.85	14.23	8.11	11.84	9.53