Réttur tímapunktur að uppfæra í 10Gig

HádegisfundurSký - desember 2023

mila


Cinema Paradiso
A director returns home after 30 years, reminiscing about his first love and the man who introduced him to film.
MAD MEN
CASABLANCA
HOOSIERS
NEW YORK

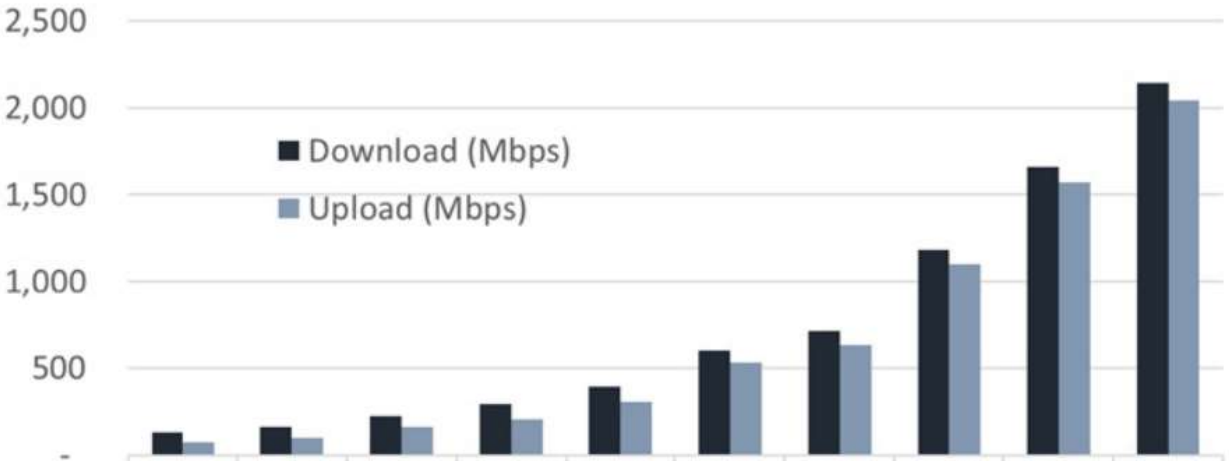
Hefðbundin notkun – hver er þörfin að jafnaði ?

Dæmi um þjónustu	**Hraði til notanda**	**Hraði frá notanda**
2 UHDTV (4k) sjónvörp	50 - 100 Mb/s	2 - 4 Mbps
2 HDTV streymi	8 - 16 Mb/s	0,5 – 1 Mbps
Internetnotkun, fjarvinna og leikir	25 - 50 Mb/s	5-10 Mb/s
IoT smátæki	200 kb/s	200 kb/s
Heildarhraði	**~ 80 - 170 Mb/s**	**~ 7 - 15 Mb/s**

Source : https://www.ncta.com/whats-new/new-study-examines-internet-traffic-patterns-and-bandwidth-requirements

FIGURE 4

PROJECTED PEAK BANDWIDTH REQUIREMENTS - HOUSEHOLD OF 4



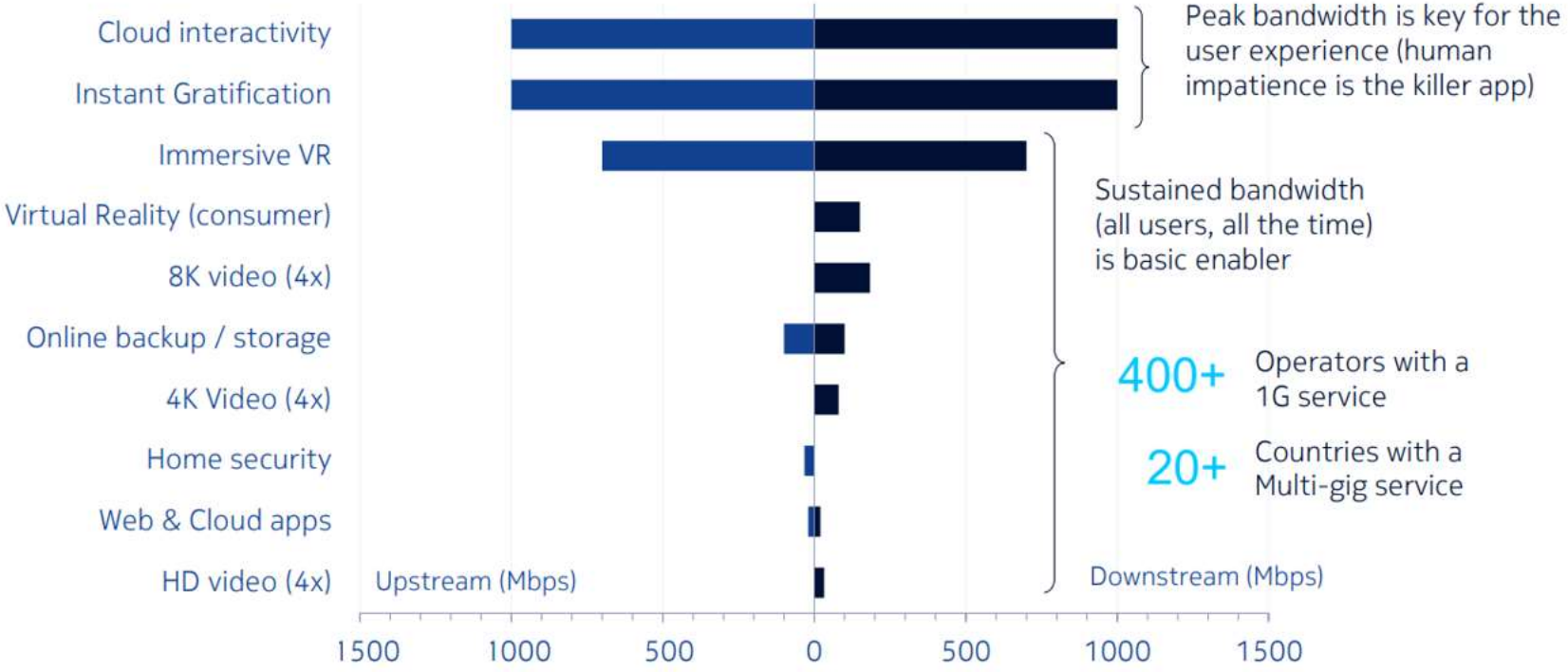
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Download (Mbps)	131	158	222	293	396	601	709	1,182	1,658	2,141
Upload (Mbps)	73	98	160	203	302	529	633	1,100	1,570	2,044

- Early adopters, Radiologists, Power Users/Gamers, others may require much more

Source: Fiber Broadband Association Technology Committee

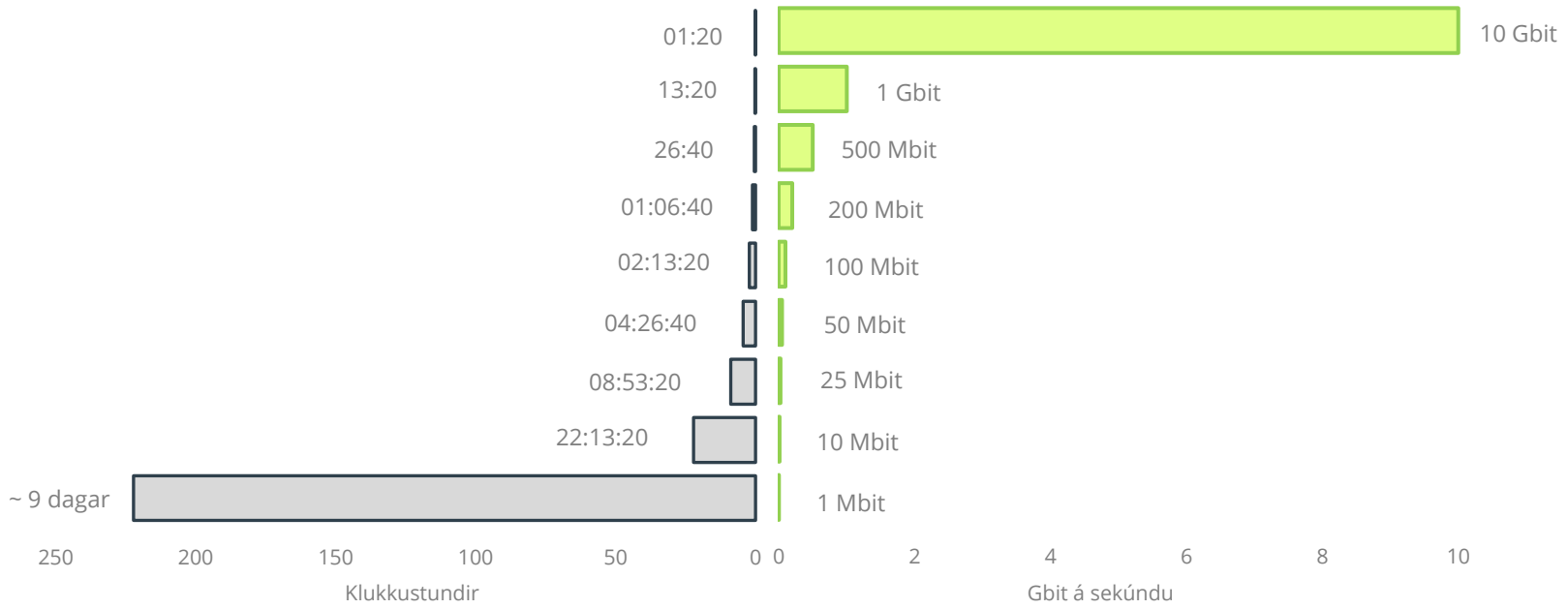
Source : https://www.allconnect.com/blog/broadband-speed-need-to-pass-2-gbps-by-2030

Human impatience is the killer app



Source : Nokia Networks

Áætlaður flutningstími á 100GB skrá



Setjum þetta í samhengi...

How many GB is 20 minute of 4K video?
Using the H.264 codec as an example, here are approximate file size estimates:

Low bit rate (e.g., 20 Mbps): Approximately 1.8 GB to 2.2 GB
Medium bit rate (e.g., 50 Mbps): Approximately 4.5 GB to 5.5 GB
High bit rate (e.g., 100 Mbps): Approximately 9 GB to 11 GB

How many GB is a 2 hour 4K movie?
Below are rough estimates, and the actual file size can be more or less depending on the specific video content and compression settings used.

Low bit rate (e.g., 20 Mbps): Approximately 180 GB to 220 GB
Medium bit rate (e.g., 50 Mbps): Approximately 450 GB to 550 GB
High bit rate (e.g., 100 Mbps): Approximately 900 GB to 1100 GB (1.1 TB)

STORE LIBRARY COMMUNITY CABAL

Updating

1.6 Gbps	1.6 Gbps	16.2 GB	1.7 Gbps
CURRENT	PEAK	TOTAL	DISK USAGE

NETWORK DISK

Baldur's Gate 3

UPDATING 14% — **05:51** REMAINING

15.1 GB / 79.2 GB **17.3 GB** / 122.2 GB

Up Next (0)

Auto-updates enabled

There are no downloads in the queue

Completed (1)

Clear All

Counter-Strike: Global Offensive

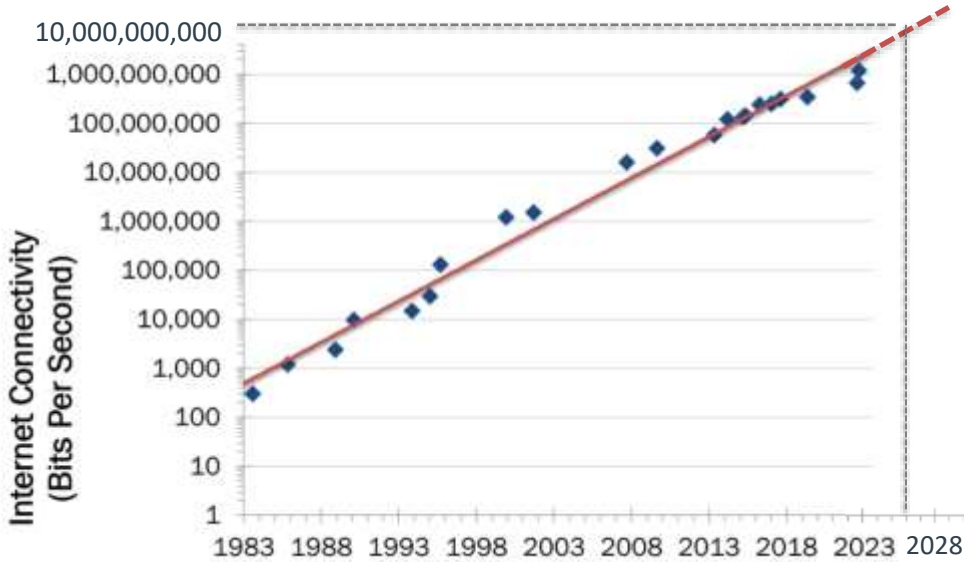
20.5 MB / 20.5 MB

COMPLETED: TODAY 19:16

▶ PLAY

Add a Game — Updating 14% — Friends & Chat

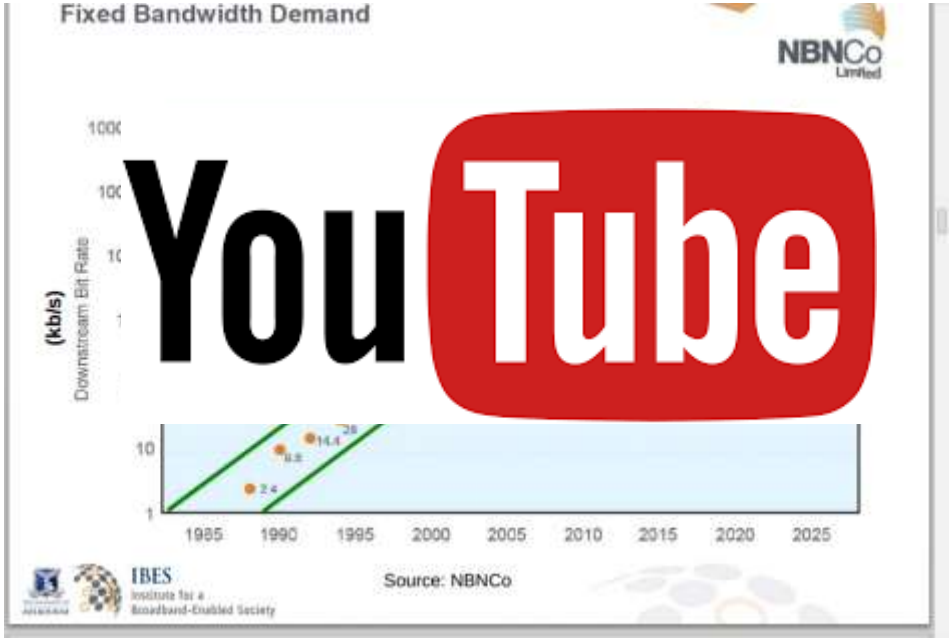
Bitahraði í aðgangsnetum Regla Nielsen – 50% árlegur vöxtur



		Annualized Growth Rate	Compound Growth Over 10 Years
Nielsen's law	Internet bandwidth	**50%**	57×
Moore's law	Computer power	**60%**	100×

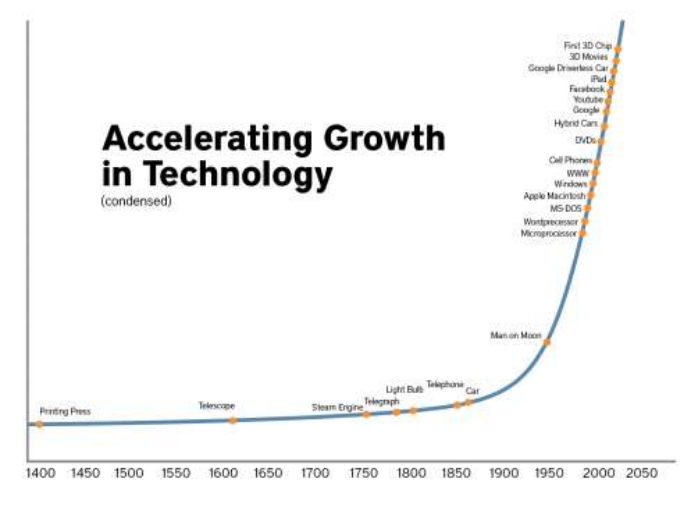
Heimild : https://www.nngroup.com/articles/law-of-bandwidth/

Spá um bitahraða í aðgangsnetum
- Gömul spá frá 2004 gerði ráð fyrir 10 Mbit hámarki



Heimild : https://ipcarrier.blogspot.com/2014/02/bandwidth-growth-nearly-what-one-would.html

Veldisvöxtur í tækniframförum á öllum sviðum



Örari breytingar í tækni

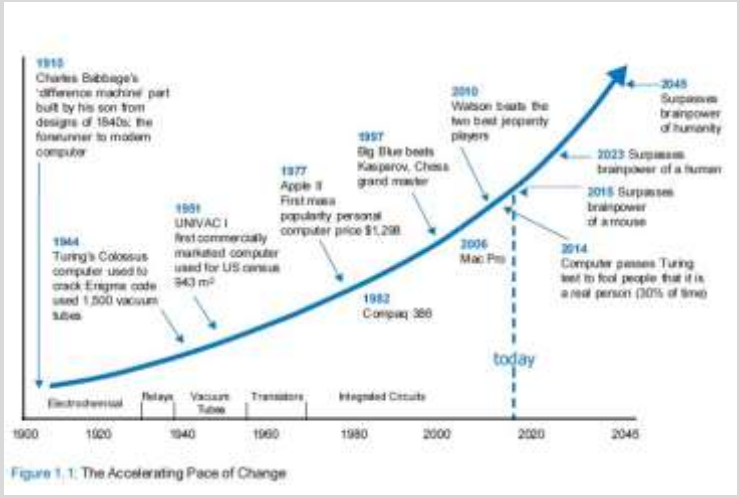
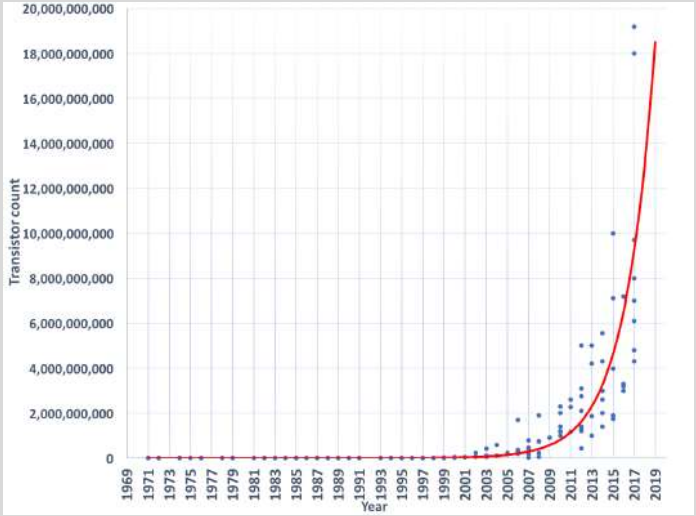


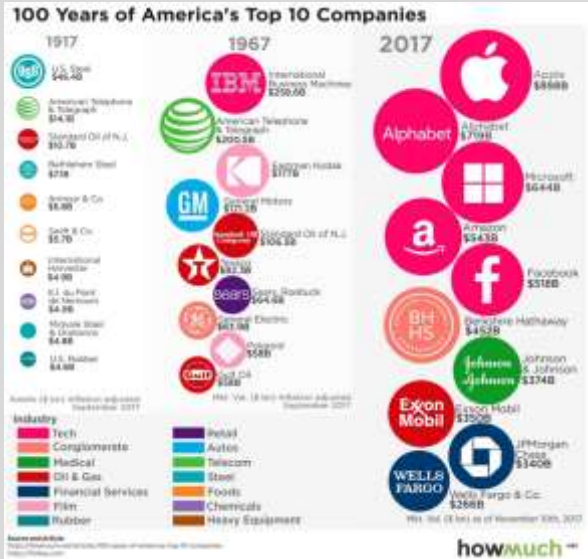
Figure 1.1 The Accelerating Pace of Change

Framfarir í gervigreind

Margföldun í hinu smæsta sem í hinu stærsta

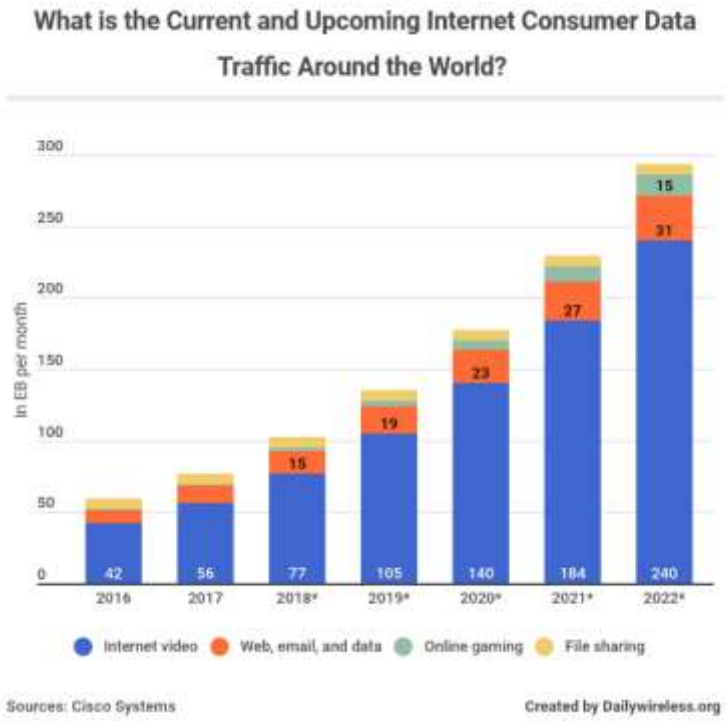


Fjölgun smára í örgjörvum á 50 ára tímabili 1970-2020

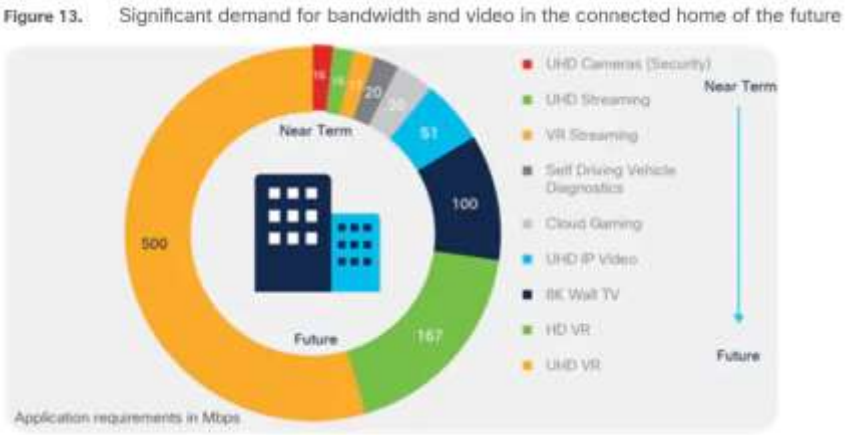


Virði 10 stærstu á föstu verðlagi 1917 - 2017

Vídeó keyrir áfram þörfina fyrir aukinn afköst



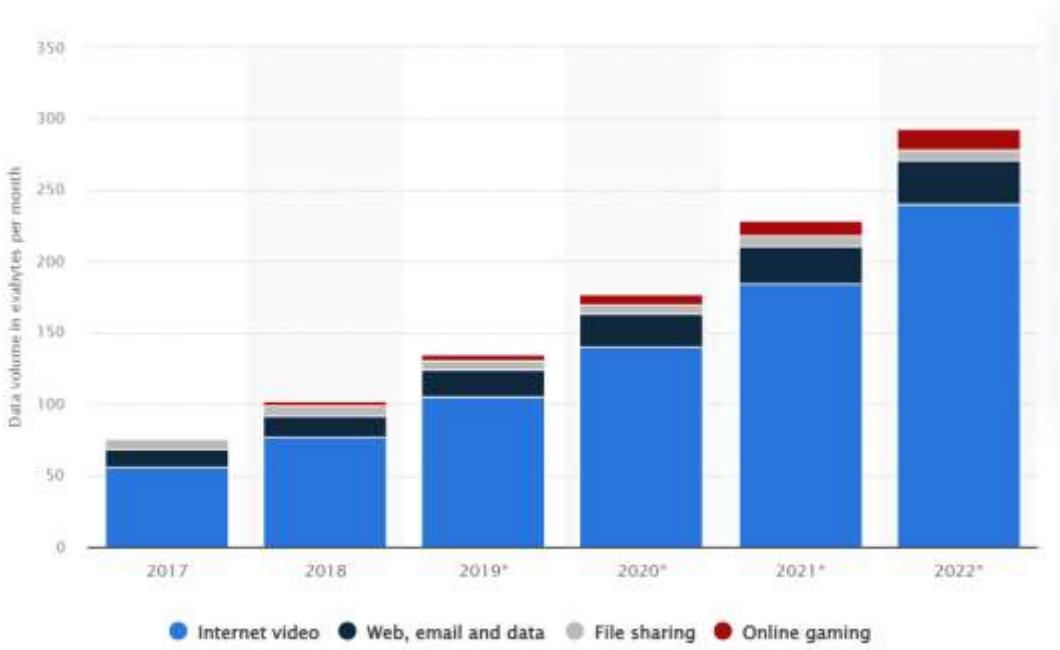
Umferð/mánuð
EB = Exabyte
1 EB = 10^{18} bæt = 1000 PB (Petabæt)
1 PB = 1000 TB (Terabæt)
1 TB = 1000 GB (Gigabæt
1 GB = 1000 MB (Megabæt)



Heimild : https://dailywireless.org/internet/usage-statistics/

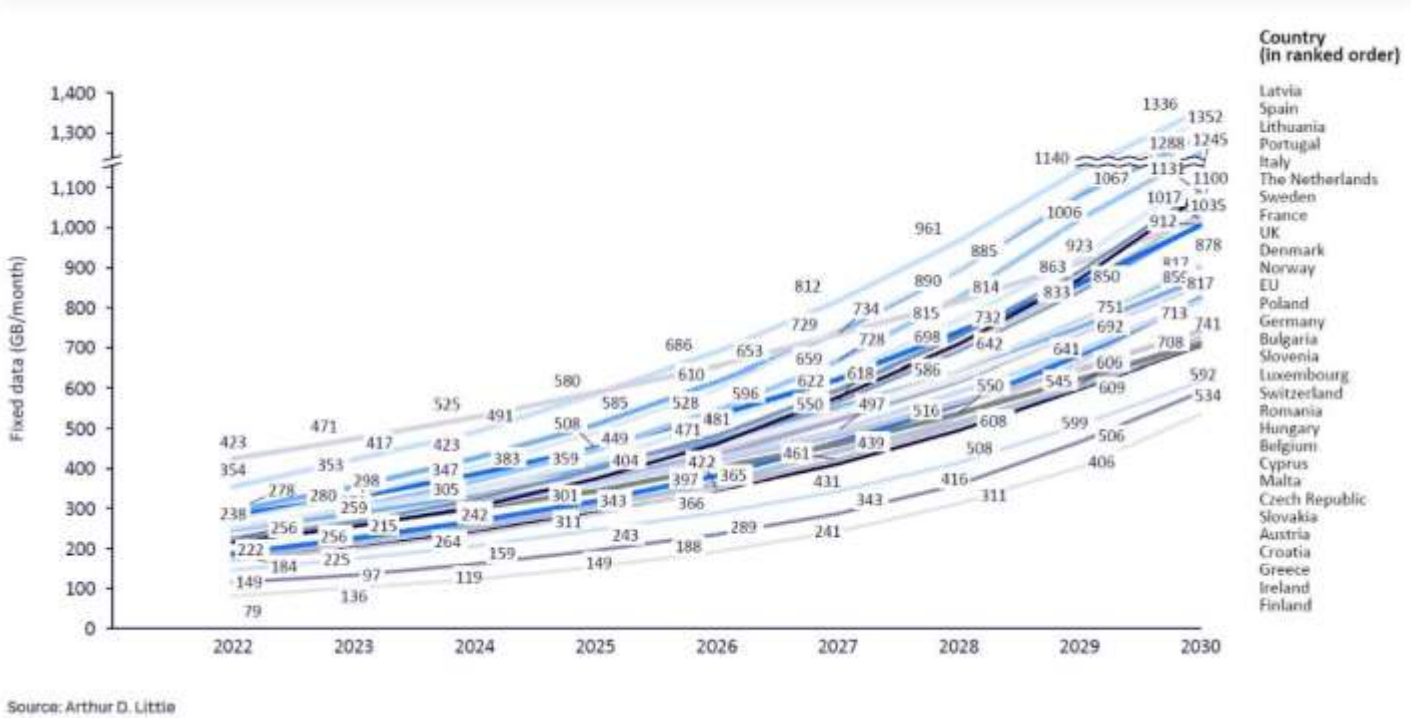
Data volume of global consumer internet traffic from 2017 to 2022, by subsegment

(in exabytes per month)



https://www.statista.com/statistics/267194/forecast-of-internet-traffic-by-subsegment/

Margföldun í netnotkun heimila framundan á næstu árum



Source: Arthur D. Little

https://www.adlittle.com/en/insights/report/evolution-data-growth-europe

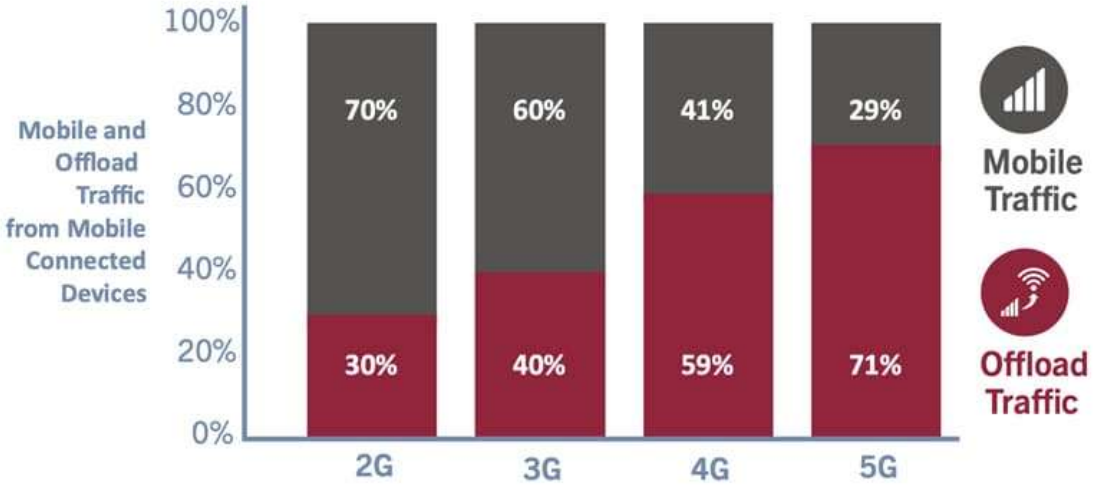
https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20230829-1

Desktop vs Mobile vs Tablet Market Share Worldwide

Jan 2009 - Jan 2023


% of each platform's average daily impressions by hour
TABLET
DESKTOP
PHONE
LATE NIGHT
12am – 7am
EARLY MORNING
7am – 10am
DAYTIME
10am – 5pm
EARLY EVENING
5PM – 8pm
PRIME
8pm – 12am

The share of offloaded traffic will only increase



The increasing percentage of traffic 'offloaded' from mobile networks to Wi-Fi networks as a function of the cellular generation. **Source: Cisco.**

Heimild: https://www.enea.com/insights/the-market-need-for-wi-fi-6-and-wi-fi-6e-in-the-5g-era/

The evolution of a wireless revolution

Wi-Fi 4
IEEE 802.11n
Bands:
2.4 GHz, 5 GHz
Channel Bandwidths
20, 40 MHz
64 QAM

KEY ADVANCES:
- WPA2 Security
- 4x4 MIMO
- LDPC Error Correction

Wi-Fi 5
IEEE 802.11ac
Bands:
5 GHz
Channel Bandwidths
20, 40, 80, 160 MHz
256 QAM

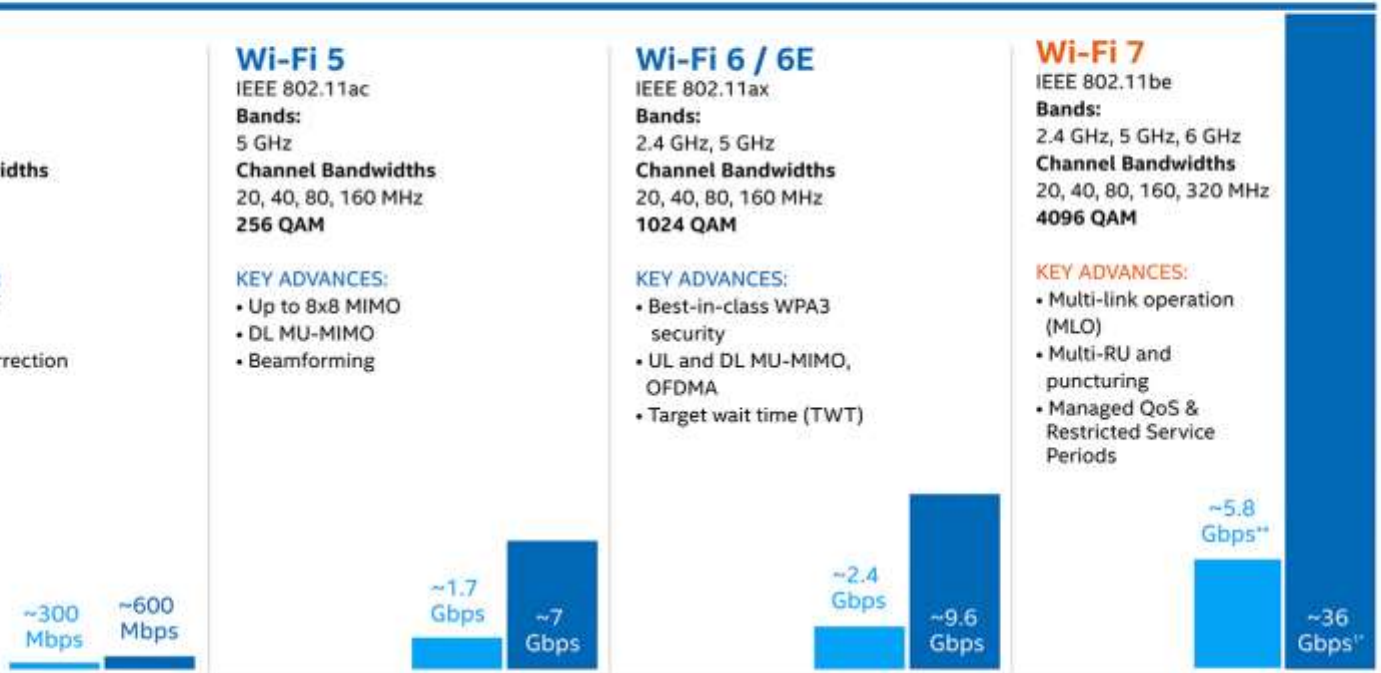
KEY ADVANCES:
- Up to 8x8 MIMO
- DL MU-MIMO
- Beamforming

Wi-Fi 6 / 6E
IEEE 802.11ax
Bands:
2.4 GHz, 5 GHz
Channel Bandwidths
20, 40, 80, 160 MHz
1024 QAM

KEY ADVANCES:
- Best-in-class WPA3 security
- UL and DL MU-MIMO, OFDMA
- Target wait time (TWT)

Wi-Fi 7
IEEE 802.11be
Bands:
2.4 GHz, 5 GHz, 6 GHz
Channel Bandwidths
20, 40, 80, 160, 320 MHz
4096 QAM

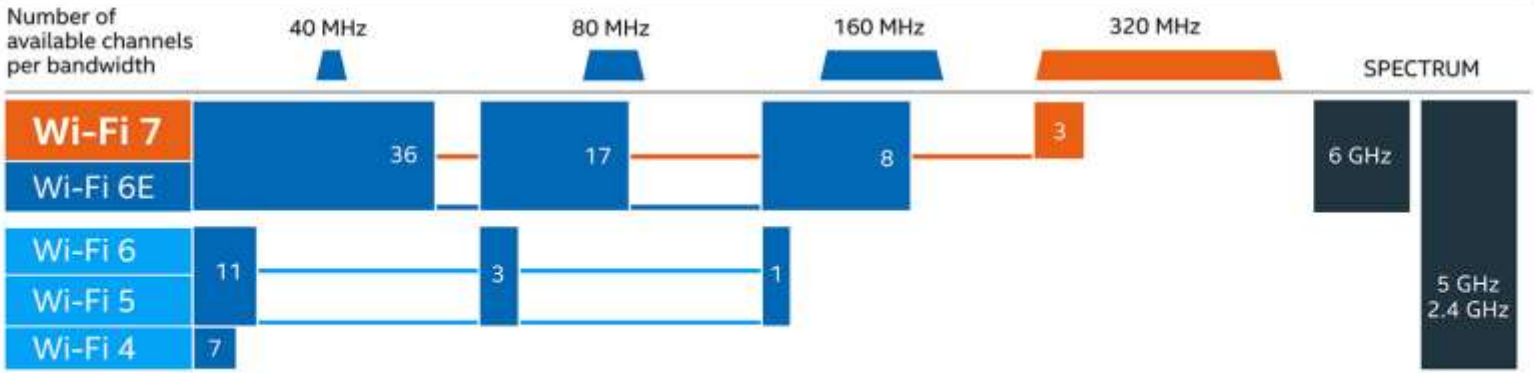
KEY ADVANCES:
- Multi-link operation (MLO)
- Multi-RU and puncturing
- Managed QoS & Restricted Service Periods



† Includes PHY and multi-link data rate improvements
* Theoretical maximum data rates based on the latest draft of the IEEE 802.11be standard.
** "~5 Gbps Wi-Fi 7 2x2 client speed" - is based on the current draft of the 802.11be specification which specifies the theoretical maximum data rate for a 2x2 device that supports 320 MHz channels, 4096 QAM, and Multi-Link Operation is 5.76 Gbps. Based on an industry-standard assumption of 90% efficiency for new Wi-Fi products operating in the exclusive 6 GHz band, the resulting estimated maximum over the air 2x2 client speed would be 5.19 Gbps.

Wi-Fi 7 – More lanes and a wider VIP highway

Wi-Fi 7 **doubles available bandwidth** compared to Wi-Fi 6E, with three super-wide 320 MHz channels on the dedicated 6 GHz band, in addition to all of the channels on the legacy 5 GHz and 2.4 GHz bands.



More densely packed cargo

When combined with the new 320 MHz channel bandwidths, 4K QAM delivers 2.4X faster speeds than Wi-Fi 6, with PC users experiencing maximum speeds over 5 Gbps**.

BANDWIDTH
The maximum transfer capacity of a network

vs.

THROUGHPUT
The density of the data at which it is transferred

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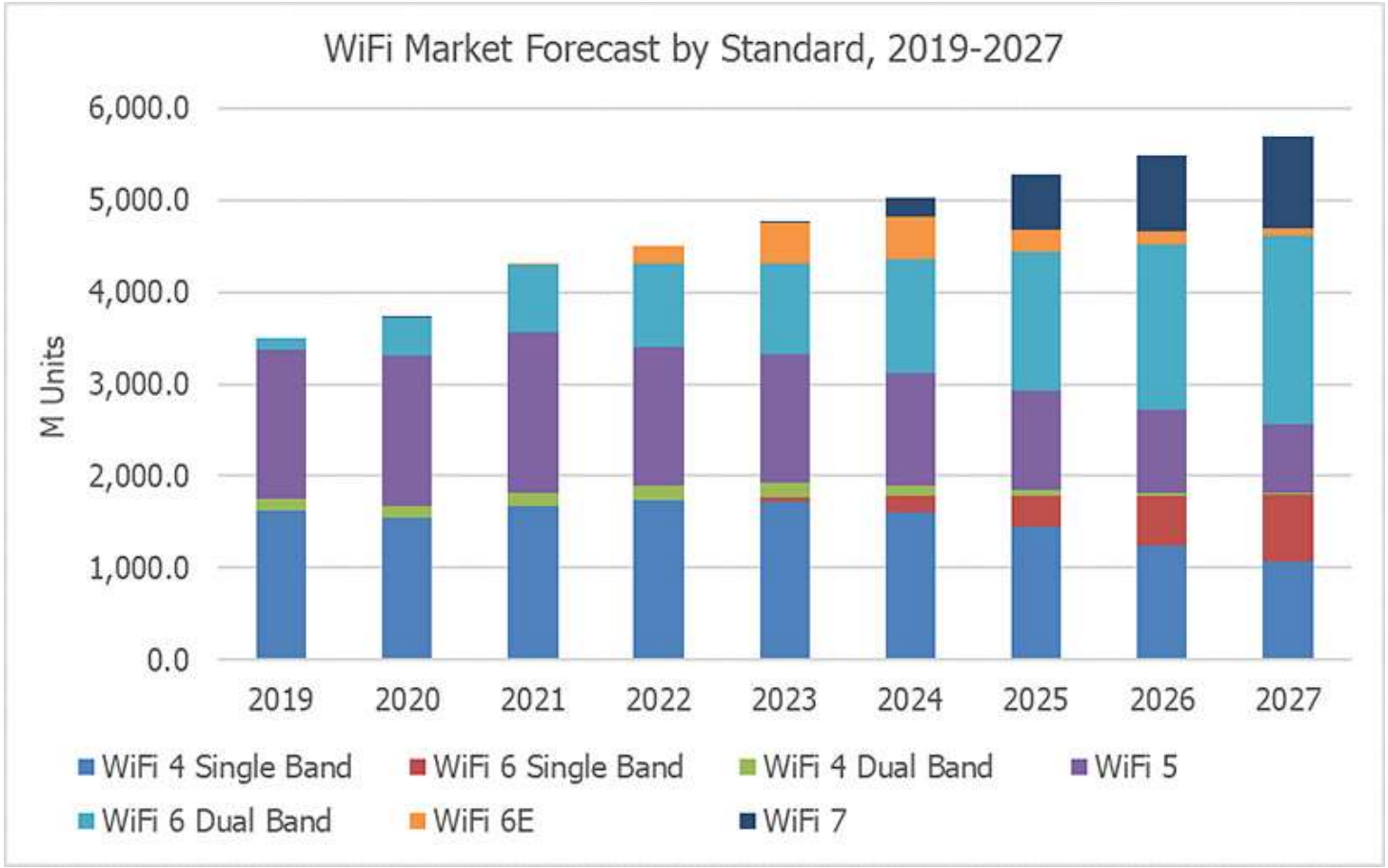
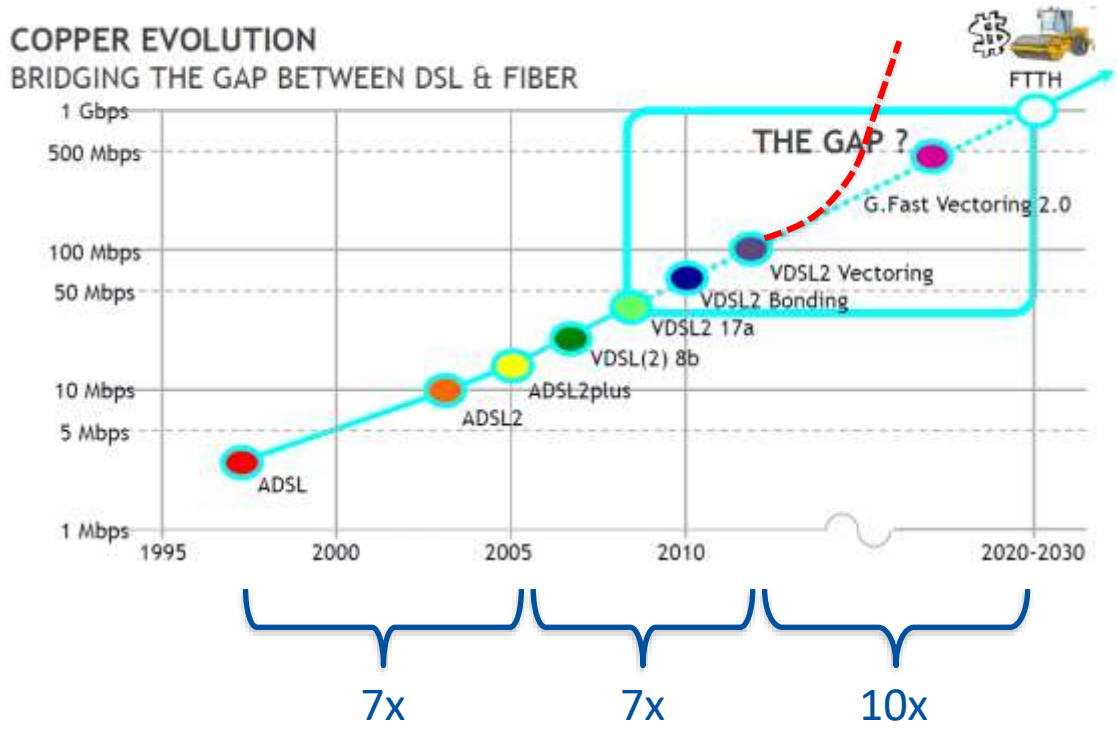


https://iotbusinessnews.com/2022/08/09/48205-new-wifi-6e-and-wifi-7-standards-market-and-applications/

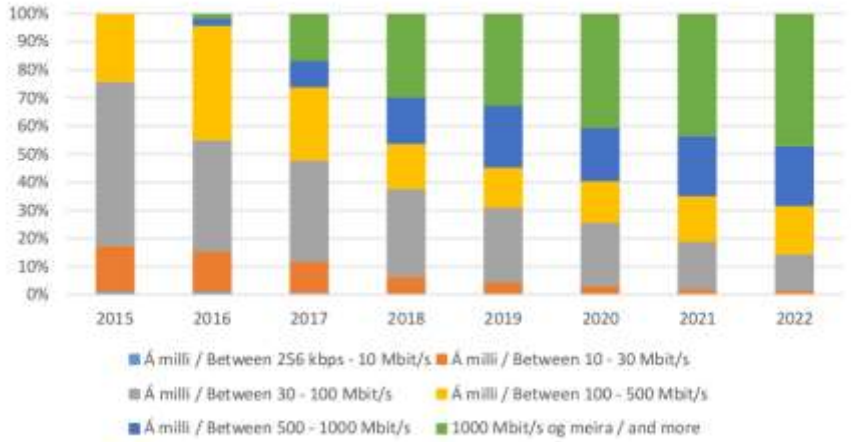
10x er ekki fyrsta stökkið í afkastagetu



Hraði í aðgangsnetum eykst jafnt og þétt samhliða ljósleiðaravæðingu

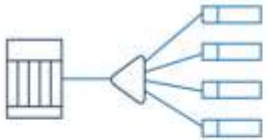
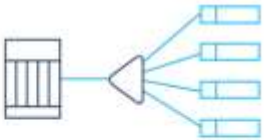
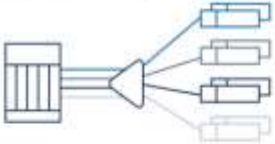
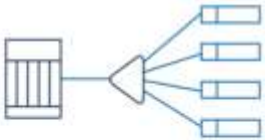
Mynd 31. Fjöldi xDSL og ljósleiðara internettenginga
Picture 31. Total xDSL and fiber internet connection

Mynd 32. Hlutfall tenginga eftir niðurhalshraða tengingar
Picture 32. Total subscriptions by downstream speeds



Heimild: Tölfræðiskýrsla Fjarskiptastofu 2022

10x er ekki áfangastaður heldur vegferð til framtíðar

GPON	XGS-PON	TWDM-PON	25G PON
Gigabit PON	10G symmetrical PON	Time wavelength division multiplexing	25G symmetrical PON
2.5 Gb/s 1.2 Gb/s 	10 Gb/s 2.5 or 10 Gb/s 	4 x 10 Gb/s 4 x 10 Gb/s 	25 Gb/s 10 or 25 Gb/s 
Upstream: 1.2 Gb/s	Upstream: 2.5 or 10 Gb/s	Upstream: 4 x 10 Gb/s	Upstream: 10 or 25 Gb/s
Downstream: 2.5 Gb/s	Downstream: 10 Gb/s	Downstream: 4 x 10 Gb/s	Downstream: 25 Gb/s
One fiber feeder is split to connect multiple users. Total bandwidth is shared between all users. Uses one wavelength in upstream and one in downstream.	Same principals as GPON - but faster. Enables dual rates: symmetrical or asymmetrical. Can co-exist with GPON, 25G PON and TWDM-PON on the same fiber network.	Uses 4 wavelength pairs (4 in upstream, 4 in downstream). Multiple users share a wavelength pair. Can co-exist with GPON and XGS-PON on the same fiber networks.	Same as GPON and XGS-PON but much faster. Enables dual rates: symmetrical or asymmetrical. Can co-exist with GPON, XGS-PON on the same fiber network.
Deployments: Most widely deployed PON worldwide	Deployments: Accelerating worldwide	Deployments: Limited	Deployments: For premium services

Við tengjum þig


mila