In the near future, growing older will never be the same again.
65 Member Cable Companies

200M Subscribers

Roughly Half Mobile Providers

Services on 5 Continents

© CableLabs 2021.
10x Speed
More Reliable
Better Security
Lower Latency
Cable’s Hybrid Fiber-Coax Networks

1. Fiber

2. Coax

3. Wireless
Cable Networks: Then and Now

Then: Coax only, video only, ~2000 homes passed

Coaxial Cable

Amp

Amp

Amp

Amp

Amp

Amp

Headend

Now: Substantially fiber, video/data/phone, ~400 homes passed per fiber node

Analog Fiber Optics

Fiber Node

Amp

Amp

Amp

Amp

Fiber Node

Amp

0.2-5 km

5-80 km

0.2-2 km

Headend

Hub

Redundant Fiber Ring

CCAP

CCAP
HFC Continuing Evolution – Fiber Deep

Traditional DOCSIS/HFC (Centralized CCAP)

0

Hub

CCAP

Analog Fiber Optics

Fiber Node

Amp₁

Amp₂

Ampₙ

“Fiber Deep” w/ Remote PHY, Remote MACPHY

1

Hub

CCAP Core

Digital Fiber Optics

Aggregation Node

RPD₁

Amp₁

Ampₘ

RPDₙ

Aggregation Node

Fiber Deep, “N+0” w/ Remote PHY, Remote MACPHY

2

Hub

CCAP Core

Digital Fiber Optics

RPD₁

RPDₙ
Convergence: Network and Services
10G Speed
Gigabit Broadband Now A Reality

Availability to US Housing Units

© CableLabs 2021.
Source: CableLabs
Cable Broadband: Minnesota

- **Cable Broadband**: Available to **almost 2 million Minnesota Housing Units** (approx. 79% of Total Minnesota Housing Units)

- **Cable Gigabit Broadband**: Availability to **over 96%** of Minnesota housing units passed by cable broadband

- **CableLabs Members Operating in Minnesota**:  
  - Cable One, Inc.  
  - Charter Communications  
  - Comcast Corporation  
  - Mediacom Communications Corp.  
  - Midcontinent Communications (Midco)  
  - Schurz Communications  
  - Sjoberg's Inc.  
  - Telephone and Data Systems, Inc. (TDS)

# DOCSIS Evolution

<table>
<thead>
<tr>
<th>Highlights</th>
<th>DOCSIS 1.0</th>
<th>DOCSIS 1.1</th>
<th>DOCSIS 2.0</th>
<th>DOCSIS 3.0</th>
<th>DOCSIS 3.1</th>
<th>DOCSIS 4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial cable broadband technology, high-speed internet access</td>
<td>Initial cable broadband technology, high-speed internet access</td>
<td>Added voice over IP service, gaming, streaming</td>
<td>Higher upstream speed, capacity for symmetric services</td>
<td>Greatly enhances capacity, channel bonding, IPv6</td>
<td>Capacity and efficiency progression, OFDM, wideband channel</td>
<td>Symmetrical streaming and increased upload speeds</td>
</tr>
<tr>
<td>Downstream Capacity</td>
<td>40 Mbps</td>
<td>40 Mbps</td>
<td>40 Mbps</td>
<td>1 Gbps</td>
<td>10 Gbps</td>
<td>10 Gbps</td>
</tr>
<tr>
<td>Upstream Capacity</td>
<td>10 Mbps</td>
<td>10 Mbps</td>
<td>30 Mbps</td>
<td>200 Mbps</td>
<td>1-2 Gbps</td>
<td>6 Gbps</td>
</tr>
</tbody>
</table>

*The DOCSIS Evolution table describes the maximum capabilities of the specifications.*
Peak Network Capacity Comparisons

DOCSIS over Hybrid Fiber Coax keeps pace with fiber technologies

- DOCSIS/HFC
- Fiber to the Home/Passive Optical Networks (PON)
Coherent Optics

COMB + Coherent = 50Tb/s Capacity

ACHIEVED
2,000 Gbps

ACHIEVED
8,000 Gbps

ACHIEVED
15,000 Gbps

TODAY
50,000 Gbps

- Four dimensions: Amplitude, frequency, phase, and polarization
- Significant increase in capacity per fiber
- Typically used in long haul and metro links – moving into access
Reliability
National Peak Internet Growth During COVID-19

Observed Increase in Peak Consumer Usage Since Early March 2020

Overall change in pre-COVID internet usage since 3/1/20

Source: https://www.ncta.com/COVIDdashboard
Covid-19: How Cable's Internet Networks Are Performing

Select your state to display network information.

**Downstream Growth** (% of usage)
- **Overall** since 3/1/20: 30.7%
- **Weekly** 2/6-2/13/21: -3.6%

**Upstream Growth** (% of usage)
- **Overall** since 3/1/20: 45.5%
- **Weekly** 2/6-2/13/21: -1.8%

**Network Performance** (% of network)
- 98.9% Normal Peak Usage
- 1.0% Elevated Peak Usage
- 0.1% Substantially Elevated Peak Usage
- 0.0% Significantly Elevated Peak Usage

**Internet Service Providers**
- CHARTER
- COMCAST
- MEDIACOM
- MIDCO
- SJOBERG’S

Source: [https://www.ncta.com/COVIDdashboard](https://www.ncta.com/COVIDdashboard)
Security Elements:

- Device Identity
- Onboarding/AAA
- Confidentiality
- Integrity
- Availability
- Lifecycle Management
- Upgradeability & Future Security
- Assessment & Conformance

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Driving Increased Security:

• DOCSIS Public Key Infrastructure (PKI)
  • 20+ years
  • Largest PKI outside finance and DoD
  • Over 750,000,000 consumer device certificates under CableLabs management

• Mitigating Insecure IoT Devices
  • Wi-Fi Easy Connect
  • Micronets
  • Transparent Security
Low Latency

- **DOCSIS 3.1 AQM**: 10 milliseconds
- **Low Latency DOCSIS**: 1 millisecond latency for a range of applications
- **Wi-Fi**: Applying low latency technologies to the home network
- **Improving UX**: Video conferencing, gaming, web page loading will all benefit
- **Enabling New Apps**: Real-time cyber-physical systems, interactive immersive VR experiences
Under A Conducive Policy Environment

• 10G will be the next leap forward in broadband connectivity
  ➢ Faster speed, lower latency, better security, increased reliability

• The cable industry will further empower consumers and the digital economy via the 10G platform

• Requires a policy climate that fosters and incentivizes investment and innovation
The Future of Connectivity

CableLabs

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