The Smart MDU

Edging ahead with the Internet of Things and Wi-Fi 6
The Rise of IoT

The internet of things market size 2020 was $244.47 billion and is expected to grow to $286.9 billion in 2021 at a compound annual growth rate (CAGR) of 17.4%.
Certified IoT?

An industry alliance sponsored by Apple, Google, Amazon and other tech companies will begin certifying smart home devices later this year, a potentially important step toward making the technology easier to develop and use and therefore more widely accepted.
The Home Smart Gym

Most Smart Gym Gear require customers to sign up for a $40-a-month membership.

Millions of people have already made the leap with at-home fitness since the lock down, creating a demand surge Smart Gym Gear which caused months long delays for some Internet–Connected fitness companies. In February, Peloton announced it would spend $100 million to fix the shipping logjams.
Security Awareness

IoT devices permeate virtually every aspect of business today and are making rapid inroads into the consumer sector as well.

Each sensor that links to the internet creates another potential vulnerability for its user.

So, it’s no surprise that the current state of IoT security “is probably not very good,” as Gary Kinghorn, managing director with Tempered Networks, describes it.
Human Voice to Get More Commanding

The projected smart home digital assistant (voice) market intelligence study data gleaned from Statistica shows, the global valuation is expected to climb to US$ 13.5 Bn by 2030.
Who is Controlling Who?

By 2030, WGSN has predicted that we will be using 50 billion connected devices around the world, creating smart networks in and outside of the home.

"It's a big change in your relationship with Alexa, if it starts to decide things for you," Sarah Housley, head of consumer technology.
The Roots of the Smart Home

The 1980s were a game changer for everyday consumers.

Motion-sensing lights, automatic garage door openers, programmable thermostats, and security systems were now commonplace and affordable.

In 1984, the term “smart house” was coined by the American Association of Home Builders.
What Makes the Home Smart?

A smart home refers to a convenient home setup where appliances and devices can be automatically controlled remotely from anywhere with an internet connection using a mobile or other networked device.
Domination of Mobile Apps
A smart apartment is defined by three key characteristics:

- **Smart Amenities** - Amenities include devices like smart lights and smart locks, as well as integrated services like home cleaning and package delivery. However, amenities alone do not make an apartment smart.

- **Connectivity** - Buildings are connected from the inside-out to connect devices, building systems, residents, and management.

- **Community Management** - Create a better living experience for residents by incorporating services that save time, money, and hassle.
Smart Amenities
Introduction of Intelligence – Thinking for Itself
Evaluation of the Home Router

Wide adoption of Wi-Fi. Wi-Fi becomes mainstream.

Wi-Fi home Router reaches over 1 Gigabit speeds.

Intelligence built-in the Wi-Fi Router managing the home network.
A self-organizing network (SON) is an automation technology designed to make the planning, configuration, management, optimization and healing of mobile radio access networks simpler and faster.
Industry Trends with Mesh

Adopted out of the consumer retail market
Creating a Home Wi-Fi Network - EasyMesh

Wi-Fi EasyMesh technology brings both consumers and service providers additional flexibility in choosing Wi-Fi EasyMesh devices for home deployment.
What EasyMesh Offers

Wi-Fi EasyMesh uses a controller to manage the network, which consists of the controller plus additional APs, called agents.

- Increased network capacity
- Wi-Fi 6 Flexible design
- Easy Setup - Wi-Fi Easy Connect
- Network intelligence
- Service prioritization
- Scalability
Cloud Wi-Fi Management
Managed Wi-Fi with Cloud Management

One Single Network for All Your Devices

Mesh Wi-Fi System

From room to room, 100% seamless connection:
Service Providers and the Vendors

In the recent years, several other vendor’s products in the Service Provider market offer a mesh system solution in the Router and Extenders.

Now Mesh software vendors have opened door for managed mesh Wi-Fi and cloud management to be integrated into Wi-Fi products.
What is Cloud Managed Wi-Fi?

Cloud Managed is a software that delivers and manages your Subscribers home Wi-Fi. Cloud Managed Wi-Fi acts as “glue” between CPE and cloud connection between the in-home hardware devices, and the Service Provider.

Use the Cloud to collect measurements and statistics from the connected user devices and network management elements, and to enable customized connectivity services.
What Cloud Managed Wi-Fi Delivers

Enables new services to be deployment quickly

Reporting on vital statistics from the Subscriber’s network

Works with multiple vendors and on multiple levels for open interoperations

Scalable and ready for new services that often require only Cloud Management
Creating your Smart Network
Nucleus in the Smart Network
Wi-Fi Routers do have a lot of features built-in to enhance your online experience.

However, enabling these features is a manual process which does require a level of knowledge to enable.

Basic Wi-Fi Router lacks the intelligence to fully manage the connected Wi-Fi clients.

No End-User App to provide a connection between the Wi-Fi Router and the user.
Anatomy of a Wi-Fi Router

- No External Antennas
- Wired Gigabit LAN ports
- Internet port (WAN)
- WPS button, on boarding Wi-Fi clients
- The LED indicators
Wi-Fi AP/Extenders – Satellites

- **WPS button, on boarding Wi-Fi clients**
- **Gigabit LAN ports**
- **The LED indicators**
- **Link Quality Site Survey LED**
Wi-Fi Router or Just an Extender?
What a Wi-Fi Router Offers

Wi-Fi Router

It’s connection to the Internet

Shares the Internet with all your connected devices

Connects directly to Cable, DSL, Fiber or Satellite services

Includes protection with built-in firewall

Wi-Fi Access Point built-in to the Router

Most current Wi-Fi Router have two wireless bands 5GHz and 2.4GHz

Works with most current Wi-Fi devices – 11N and 11AC

Wi-Fi Protected Setup with a push of a button
What a Wi-Fi Extender Delivers

Wi-Fi Extenders

Bridge the gap between the wired and Wi-Fi world

Extends the coverage and distance, helps with “Dead Spots”

Current Extender have two wireless bands 5GHz and 2.4GHz

Connect with a Wi-Fi Router with or without Wi-Fi

Does not share the Internet connection, the Extender needs a Router

Extenders do not have any firewall security protection
Setting Up your Wi-Fi Network
Wi-Fi is Not an Exact Science

There can be many factors associated with Wi-Fi.

Setting the right expectations on what the subscriber could experience with Wi-Fi in their home is key.

Wi-Fi networks have a range that's limited by the transmission power, antenna type, the location they're used in, and the environment.
Site Survey

Most Wi-Fi installation

Connecting with a Wi-Fi Router and Wi-Fi client is all you need to do, It just works
Getting an Expert Opinion

There are a lot of Wi-Fi analyzer tools and utilities available.

Heatmaps, Wi-Fi pucks, and Android Apps to help with your site survey.

These tools work well however, are complex and expensive.

More than likely have to train a group of install and repair techs to be experts on this equipment.
Extending your Coverage

- Up to 2,000 ft
- Up to 3,000 ft
- Up to 4,000 ft
- Up to 5,000 ft
Wi-Fi 6 and Mesh Networking
Highlighted Features & Benefits of Wi-Fi 6

- **Increased Wi-Fi Bandwidth**
  - 4 x times faster speed

- **Connected device capacity**
  - 4 x the amount of connected devices

- **Lower latency for time sensitivity applications**
  - Airtime techniques to improve the Wi-Fi 6 performance

- **Improved battery life for mobile connected devices**
  - Target Wakeup Time to ensure best use of mobile transmission times
Faster Wi-Fi, the Better

Wi-Fi 6 is reportedly up to 30% to 40% faster than Wi-Fi 5

Maximum speed is around four times faster than current speeds of Wi-Fi 5 standard

The maximum wireless data transfer rate is derived from IEEE Standard 802.11 specifications. Actual data transfer rate will vary from network environment including: distance, network traffic, building site materials/construction, interference from other wireless devices, and other adverse conditions.
## Wi-Fi 6 Classification

<table>
<thead>
<tr>
<th>Device Classification</th>
<th>802.11AX 2.4GHz</th>
<th>802.11AX 5GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>AX11000</td>
<td>1148 Mbps</td>
<td>4804 Mbps x 2 (10Gbps)</td>
</tr>
<tr>
<td>AX6000</td>
<td>1148 Mbps</td>
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<td>AX5700</td>
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<td>AX1800</td>
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<tr>
<td>AX1500</td>
<td>300 Mbps</td>
<td>1201 Mbps</td>
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</table>
Wi-Fi 6 improves over crowded Wi-Fi with an additional technologies with more radios and antennas to improve the overall Wi-Fi experience.
Connecting the New and the Legacy Wi-Fi

Wi-Fi 6 Routers are designed to handle existing Wi-Fi 4/5 Client devices at the same time as Wi-Fi 6 Client devices.
Aggregation of the Wi-Fi Clients

Wi-Fi 6 improves over crowded in Wi-Fi network by utilizing all connected clients push communication like a giant hive.
Overall Performance Improvement

Instead of increasing speed for a single Wi-Fi Client, Wi-Fi 6 improves the overall network performance when several Wi-Fi Clients are connected.
Wi-Fi 5/4 Clients also Benefit

Current Wi-Fi client devices performance won’t be as fast connecting with a Wi-Fi 6 Router.

Wi-Fi 4/5 client devices would maintain their top performing speed even in a heavily congested home network.
Wi-Fi is a constant communication that constantly drawing power from the battery

Target Wakeup Time in Wi-Fi 6 communicates when to wakeup a client device, reduced contention between the client device and Wi-Fi 6 Router
Wi-Fi 6 Battery Life Improvements

Client devices negotiate a specific time to access

Reduced contention and overlap between client devices

Sleep time of client devices to reduce power consumption
Wi-Fi Intelligence
Single SSID

Wi-Fi 6

SSID: xxxxxxx
Wireless Key: xxxxxxxxxxx

One Device

One SSID

Both Bands
Load Balancing – Band Steering
Roaming from Place to Place

One Wi-Fi Network

One SSID

2.4GHz/5GHz

Wi-Fi 6
Differences Between Wi-Fi 5 vs. Wi-Fi 6

**Wi-Fi 5**
- 802.11ac
- Dual-Band Wireless AC Gateway
- **AC2400**
  - 4 x 4 5GHz / 3 x 3 2.4GHz
  - 1700Mbps / 600Mbps
  - 20MHz 40MHz 80MHz
  - MU-MIMO DL
  - WPA2-PSK
- **Star Hub & Spoke Mesh**

**Wi-Fi 6**
- **AX5700**
  - 4 x 4 5GHz / 3 x 3 2.4GHz
  - 4804Mbps / 860Mbps
  - 20MHz 40MHz 80MHz 160MHz
  - MU-MIMO DL / UL
  - WPA3-SAЕ*
- **Daisy Chain Mesh Wi-Fi Hop**

*Under development. Function will be supported through firmware upgrade*
High Performance with Wi-Fi 6

*The maximum wireless data is derived from IEEE standard 802.11 specifications. Actual data transfer rate will vary from network environment including distance, network traffic, building site materials/construction, interference from other wireless devices, and other adverse conditions.
What’s Under the Wi-Fi 6 Technology Hood

- MU-MIMO
- OFDMA
- Quadrature Amplitude Modulation
- Beamforming
- 160MHz Channel Width
MU-MIMO in Both Directions

11AC/11N
Single User MIMO

11AC WAVE 2
Multi User MIMO

Wi-Fi 6 MU-MIMO Bi-Directional Communication
Airtime Transmission Techniques

User #1: Web Page
User #2: Streaming Video
User #3: Social Media

Orthogonal Frequency-Division Multiple Access
Increased Data Paths, Improved Communications

Quadrature Amplitude Modulation

Wi-Fi 6

1024 QAM
10 Bit Per Symbol

Wi-Fi 5

256 QAM
8 Bit Per Symbol
Active Beamforming

Omni-Directional Wi-Fi Broadcast Signal

Beamforming connection to individual Wi-Fi Clients
Increase the Bandwidth with 160MHz

Wi-Fi 6 performance increase with the use of Channel Width

20MHz 40MHz 80MHz 160MHz

Channel width doubling to increase 5GHz performance

5 GHz Channelization

<table>
<thead>
<tr>
<th>20 MHz</th>
<th>40 MHz</th>
<th>80 MHz</th>
<th>150 MHz</th>
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</tr>
<tr>
<td>150 MHz</td>
<td>50</td>
<td>64</td>
<td>64</td>
</tr>
</tbody>
</table>
Not Much Difference at First Glance

A single Wi-Fi 6 Client connecting to a Wi-Fi 6 Router may only be slightly faster than a single Wi-Fi 5 (11AC) Client connected to a Wi-Fi 5 Router.
Things will start to change….

The home network performance will start to change as more Wi-Fi client devices are added especially Wi-Fi 6 client devices.
Wi-Fi 6 Security

Wi-Fi started getting its biggest security update in a decade, with a new security protocol called WPA3.

**WPA 3 Wi-Fi**

WPA3 makes it harder for hackers to crack passwords by constantly guessing them, and it makes some data less useful even if hackers manage to obtain it.

WPA3 adds new features to simplify Wi-Fi security:

- Use the latest security methods
- Disallow outdated legacy protocols
- Require use of Protected Management Frames (PMF)

WPA3 security is a requirement for Wi-Fi 6 certification, but it may not be included in all uncertified devices.
Managing the Wi-Fi Expectation
Managing Wi-Fi 6

Manage and Maintain the Subscriber’s Home

Monitor the connected Wi-Fi Client devices

Update the Wi-Fi Password

Add guest Wi-Fi networks

Add a new device

Instant Troubleshooting

Wi-Fi Parental Controls
Zero-touch configuration

Manage and Maintain your Subscribers

Remotely perform day to day routine maintenance

TR-069 saves time and resources in supporting your Subscribers

HTTPS://ISP.Com/ACS
IoT, Smart Home, and TR-369

TR-369 or USP (User Services Platform) is a standardized protocol for managing, monitoring, upgrading, and controlling connected devices.
The Smart MDU

Edging ahead with the Internet of Things and Wi-Fi 6

Interested in learning more? Contact us

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