Real Time Monitoring in Home Networks

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Overview

Founded 1986
in Berlin

EUR 580 mio. in revenue
890 employees

Management
formed by
shareholders

Development in Berlin
Production based in
Europe

Challenges within the home network

Increasing number of broadband connections

Increasing devices connected via WiFi

Higher Broadband performance required for Home Network

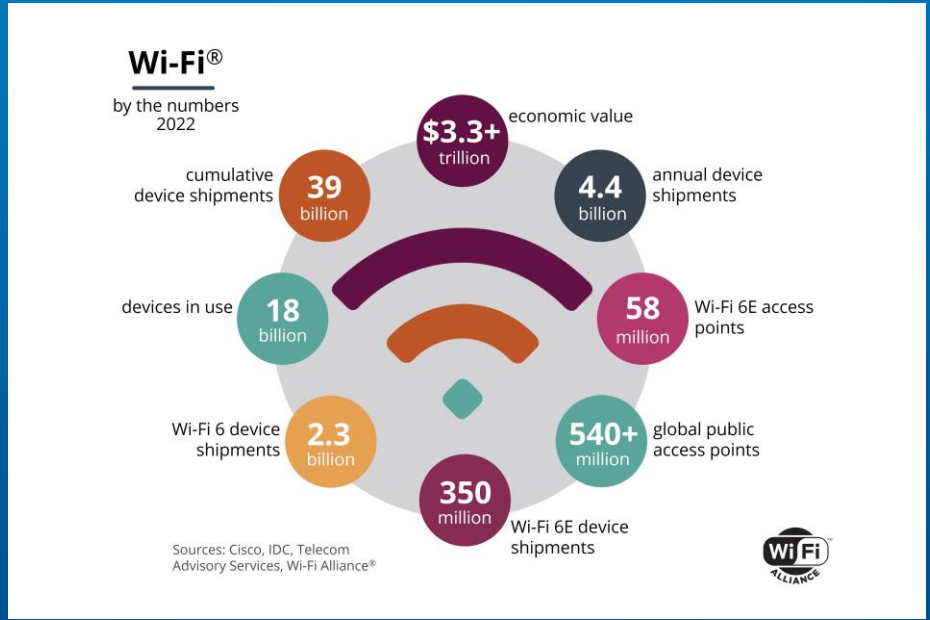
Increasing need for stable, intelligent and fast WiFi in the home network

WiFi as Mass Technology

- Over the last two decades, WiFi has become the primary interface for Internet access and local networking for almost all classes of digital consumer products.
- A typical home has 10 to 20 devices connected to a Wi-Fi network, with the number doubling every 2 years.

Overlaying the transmission services of

- a) WLAN (end device <-> router)
- b) Internet connection (router <-> remote network) and
- c) selected server/website determines the quality perceived by the user
- **Quality of the WLAN interface is critical for the perceived speed of the connection!**



Source: wi-fi.org

WiFi: Limiting factors for the customer

Signal Strength

- Regulatory regulations limit the permissible WLAN transmission power of the router and the end devices
- Lack of Wi-Fi signal strength is by far the most common reason why customers are dissatisfied
- The increasing proportion of Wi-Fi 6E devices in the future makes the issue even more important (higher attenuation, only 23 dBm Tx-Pwr)
- The increasing number of broadband fiber optic lines leads to a growing need to achieve high data rates in Wi-Fi.

Channel Selection

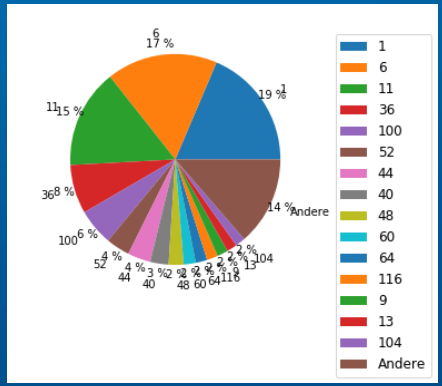
- Correct, automatic WiFi channel selection of the router
- Coexistence of multiple routers in a dense environment is the rule rather than the exception
- WiFi routers choose their channel based on the current wireless environment

Example from the field:

Approximately 190,000 SSIDs scanned to determine channel selection

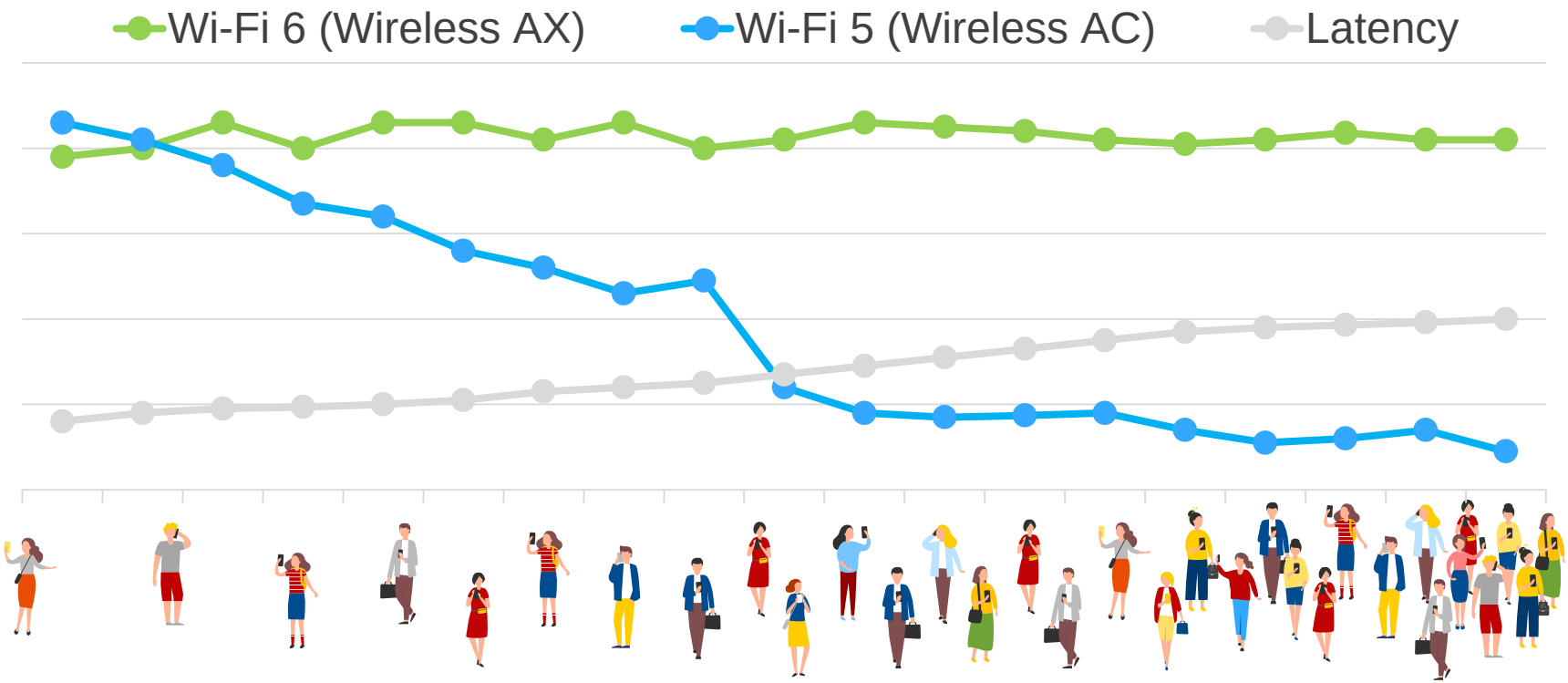
Majority of routers correctly select Ch. 1, 6, 11

When neighbouring access points coexist, proper auto-channeling provides the best result



Innovation

Wi-Fi 6 – Constant throughput for multiple clients



Innovation

Wi-Fi 6 – The advantages at a glance

Stable Wi-Fi
Even with multiple devices
in use simultaneously

More speed
Up to 40 percent higher
data rates compared to Wi-Fi 5

Less latency
Wi-Fi 6 reduces latency
to 10 milliseconds

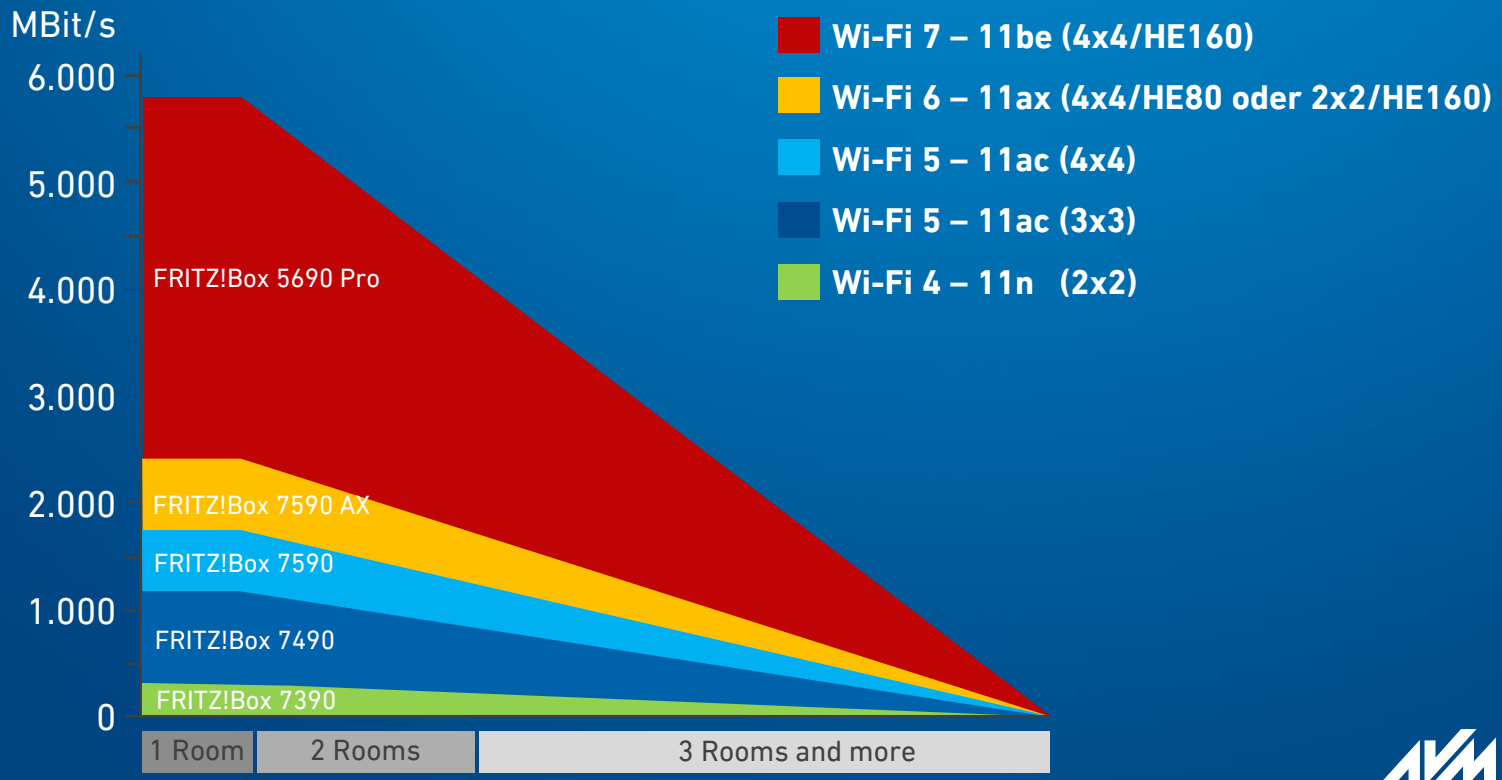
Optimized data transmission
In both the 5 GHz
and the 2.4 GHz band

More data security
The new WPA3 encryption standard
provides better security for data transmission

Longer battery life
Mobile devices go to "sleep“
when they don't need the Wi-Fi

Innovation

Wi-Fi 7 – WLAN 11be



Wi-Fi 7 – Core features

- Wi-Fi 7 brings improvements for 2.4, 5 and 6GHz bands
- Higher modulation type (4096QAM)
- Higher channel bandwidths up to 320 MHz at 6 GHz
- multiple links (multi-link operation “MLO”)
- “Punctured Mode” – “cutting out” frequencies in the event of interference, e.g. radar
- Up to 16 spatial streams
- OFDMA Multi-RU (Resource Units)

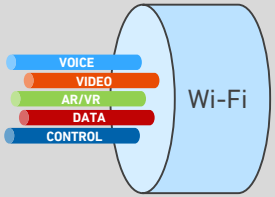
Wi-Fi 7 – Core features: 320 MHz und 4kQAM

Higher capacity through 320 MHz and 4kQAM

Wi-Fi 5

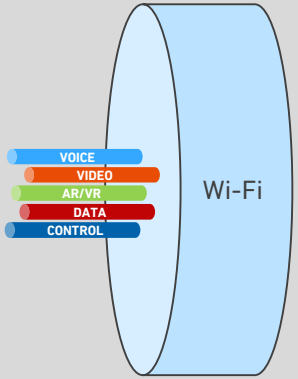
80 MHz
256QAM

Wi-Fi 6/6E



160 MHz
1kQAM

Wi-Fi 7



320 MHz
4kQAM

Gross data rate of one APs with 4 antennas

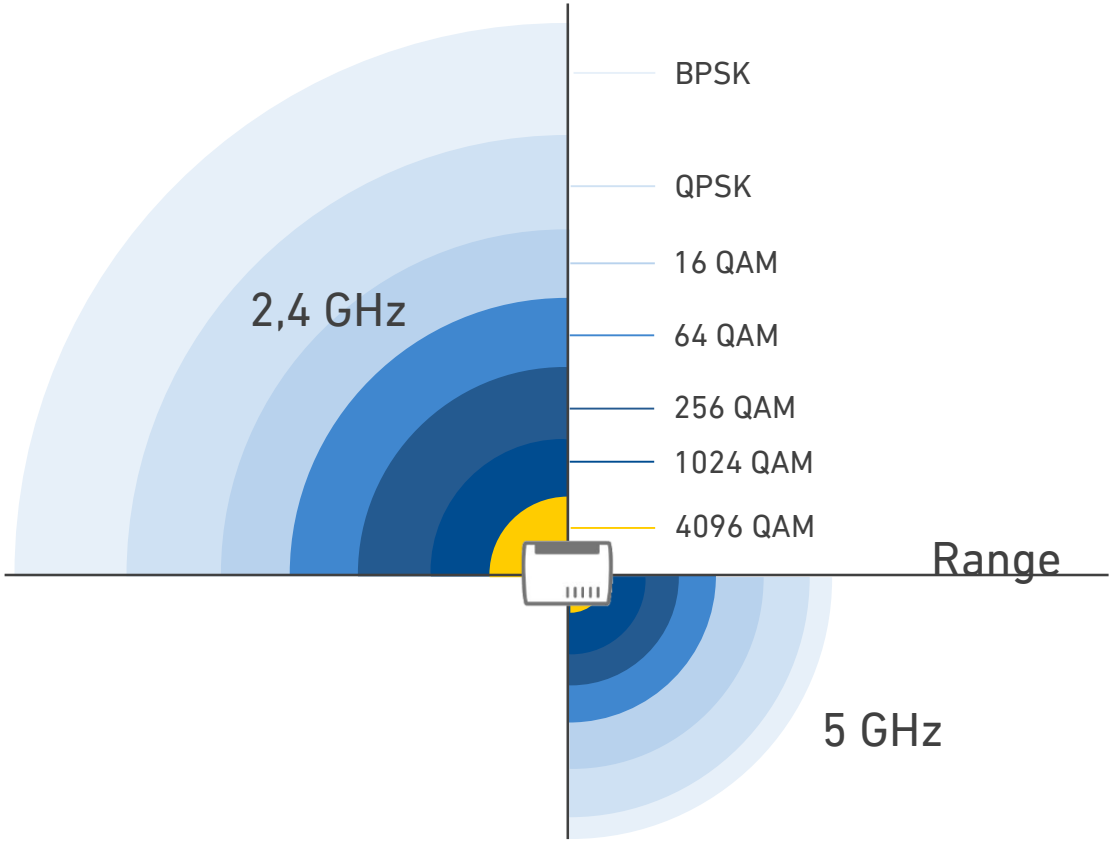
1,733 Mb/s → x 2,77 → 4,804 Mb/s → x 2,4 → 11,530 Mb/s

Compared to a Wi-Fi 6/6E AP, Wi-Fi 7 improves the performance by a factor of 2.4

Modulation and Range

QAM

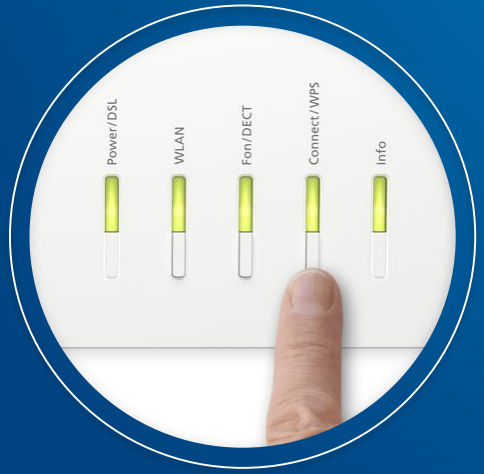
Quadratur
Amplitduen
Modulation



More QAM=
Higher Speed

Customer experience

The customer expects a complete Wifi solution for his home network which is....



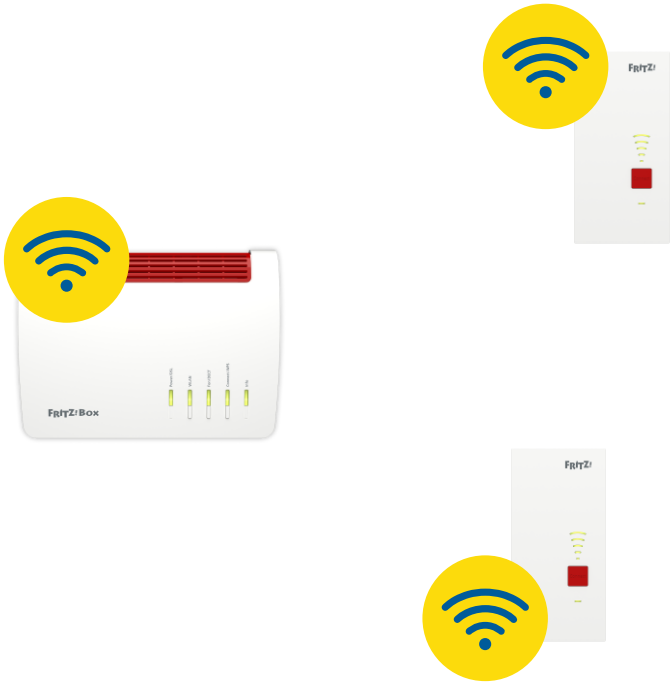
... easy to install

... reliable and fast

... easy to extend

FRITZ! home network – best wireless LAN with mesh convenience

Only with FRITZ!



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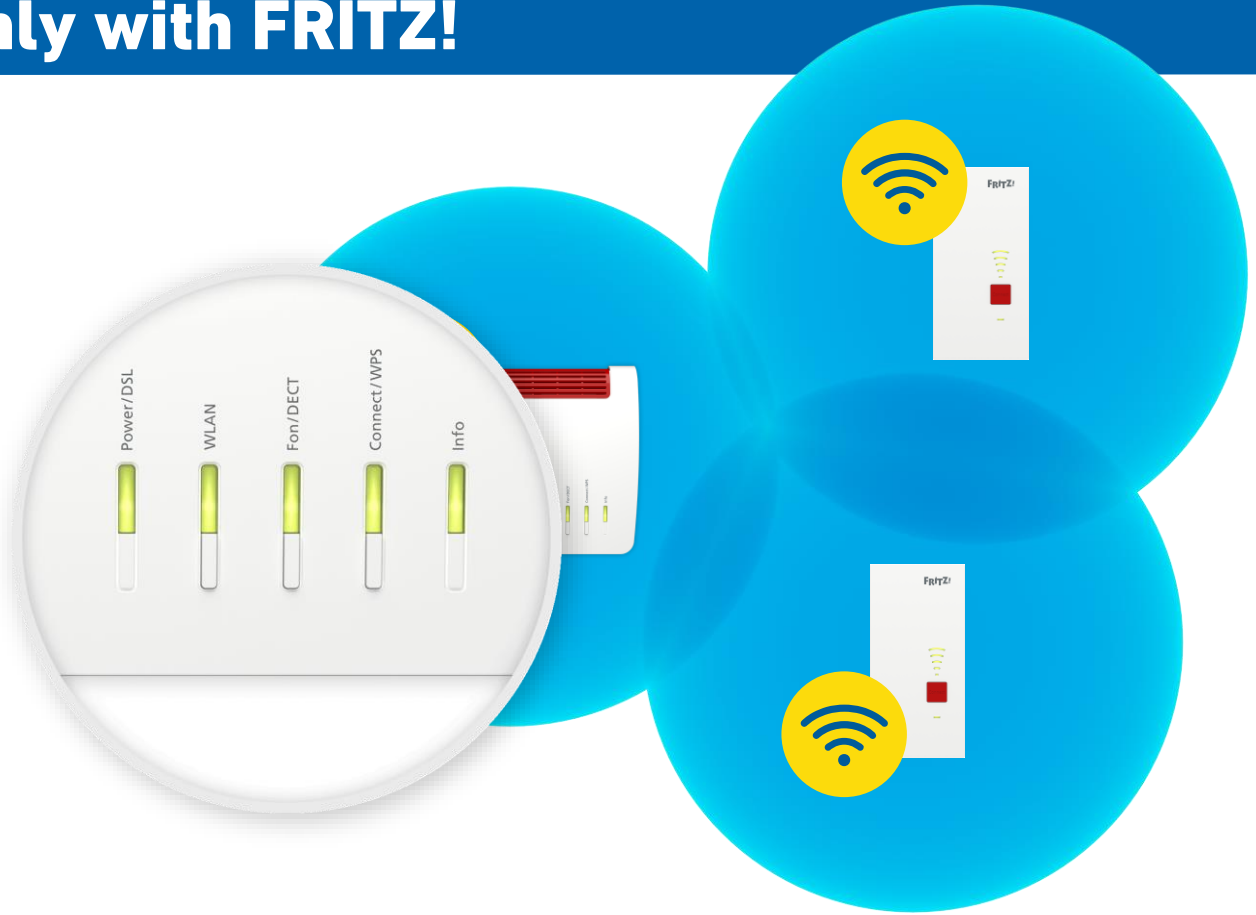

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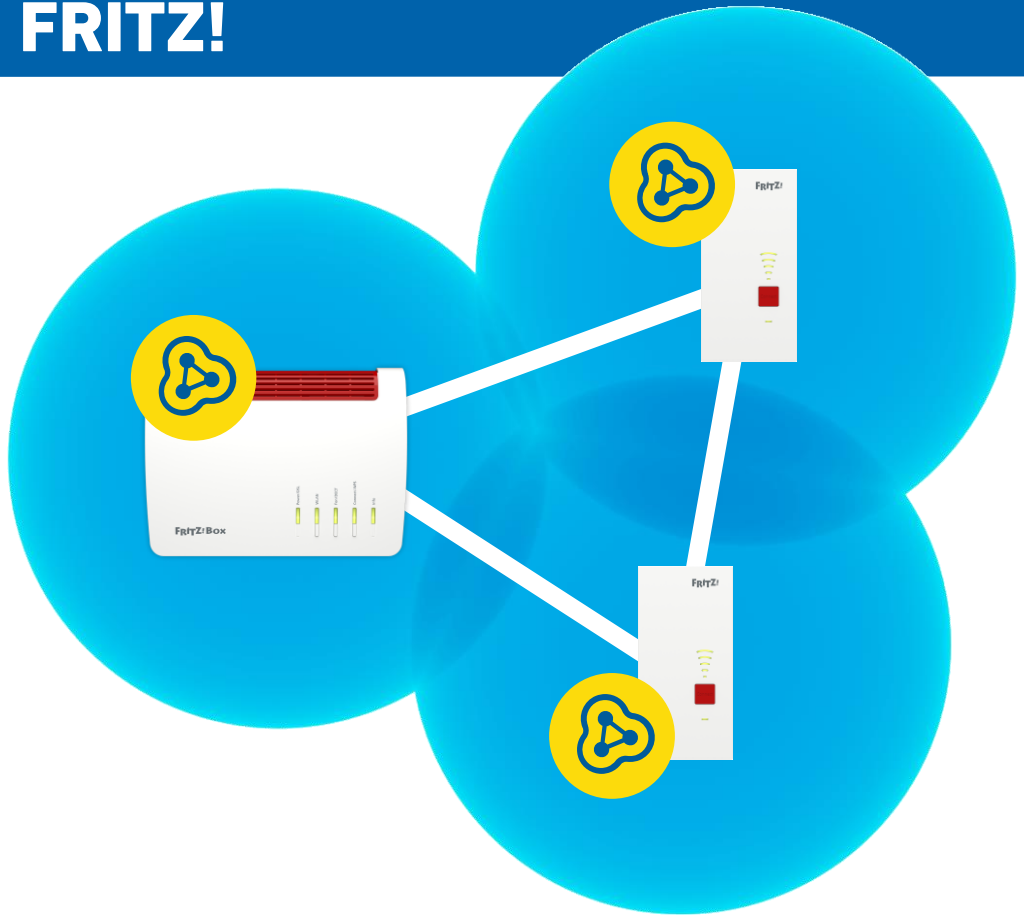


FRITZ! home network – best wireless LAN with mesh convenience

Only with FRITZ!

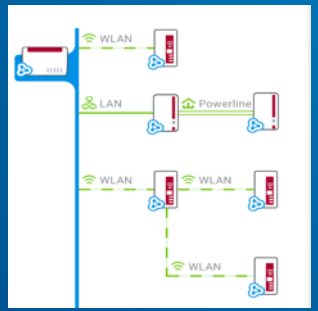
FRITZ! home network – best wireless LAN with mesh convenience

From S to XL

FRITZ!Apps

comfortable Remote Control for FRITZ! Smart-Home-Devices

Apps complementing the Fritz!Ecosystem



MyFRITZ!App

- Displaying MESH Topology
- Informs about poor network or missing connections.
- Offering insight how to improve the network.

FRITZ!App Wi-Fi

- Suggesting the best Repeater-Position
- Measures the wifi throughput,
- Shares Wifi credentials for Guest Access Point,
- Connects through scanned QR Code

FRITZ! Wi-Fi MESH

FRITZ! Producst offer easy Solutions to all customers

One (SSID) and Password throughout the network

Modular System Easy to extend

Connected with a touch of a button

Guest Access Point / FRITZ!Hotspot

Remote Access

Centralized updates for the Mesh network

Apps for Wifi, Smarthome, Telephony

The Challenge:

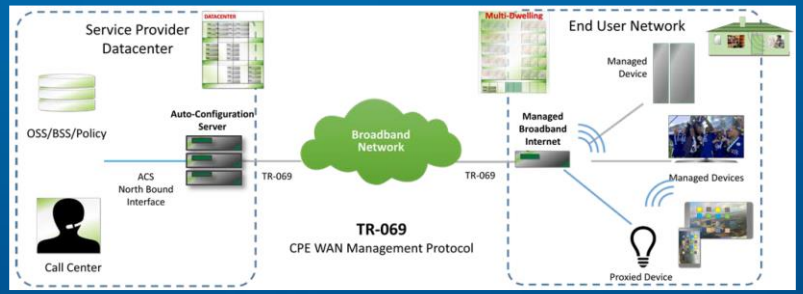
- “Range” (attenuation) is by far the most common reason for user dissatisfaction with WLAN
- One of the main support requests: “Your internet connection is too slow” Triggers support effort and anger.
- Question of customer satisfaction
- Often based on the WLAN situation on site at the customer's premises, but difficult to check and argue.

The Solution: Wi-Fi Management

- Industry-wide increased interest from providers to better understand the WLAN situation for customers
- Naturally, AVM has the same objective and has been working on the use and optimization of WLAN for customers for a long time
- Various proprietary cloud solutions have emerged in the past, such as Airties, Plume, prplMesh, SoftAtHome, ASSIA
- Most recently, welcome development of industry standards such as EasyMesh, Broadband Forum, for greater investment security, better interoperability and transparency

Wi-Fi management based on open industry standards

- The Broadband Forum's (BBF) CPE WAN Management Protocol (CWMP) enables comprehensive management of the customer's routers and has been used successfully by almost all providers worldwide for many years
- CWMP is specified in BBF TR-069 and is available across technologies and scale-tested for DOCSIS, DSL, fiber optic and mobile communications
- Comprehensive access to a standardized data model for device management (https://cwmp-data-models.broadband-forum.org/), including parameters for assessing the WLAN
- The data model specified in BBF TR-181 contains a very extensive, standardized representation of the WLAN (https://cwmp-data-models.broadband-forum.org/tr-181-2-11-0.html)
- The BBF offers certification programs to demonstrate conformity to the specification



Source: Broadband Forum

USP – the new industry standard

TR-369, also known as User Service Platform (USP)

Successor to TR-069 & TR-064

Standardized by the Broadband Forum as TR-369

Uses the standardized data model TR-181

Also describes smart home, WiFi mesh and WiFi environment

Allows more flexible compatibility between providers

TR-369 (USP) vs. TR-069 (CWMP)

USP

- Permanent connection
- No NAT connection problems
- Minimal overhead
- Multiple controllers possible
- Multiple protocols supported
- Real-time communication
- Notifications possible

TR-069

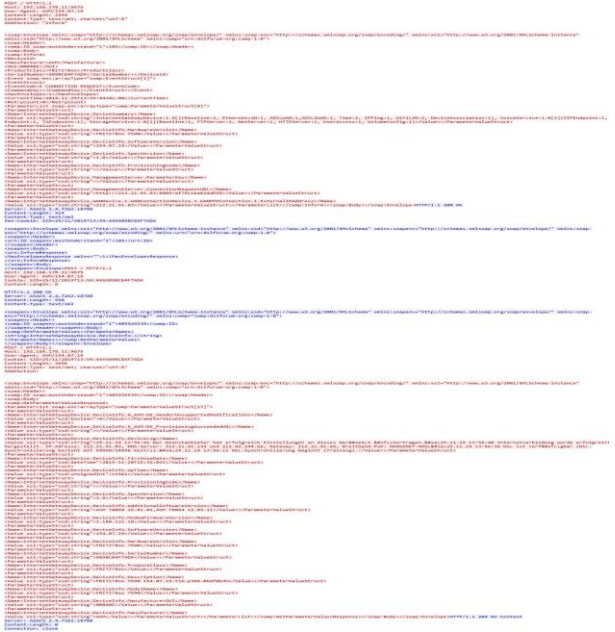
- Connection on request
- Connection request
- Large XML structures
- HTTP protocol
- Only an ACS connection
- No real-time communication
- Notifications possible

USP vs. TR-069 – less network traffic

USP

(0.5 kB)

TR-069



~8 kB

Wi-Fi Monitoring for ISPs

The home network of the custumer is visible for support in realtime

TR-369 / USP is the next evolutionary step from TR-069

Data available in real time

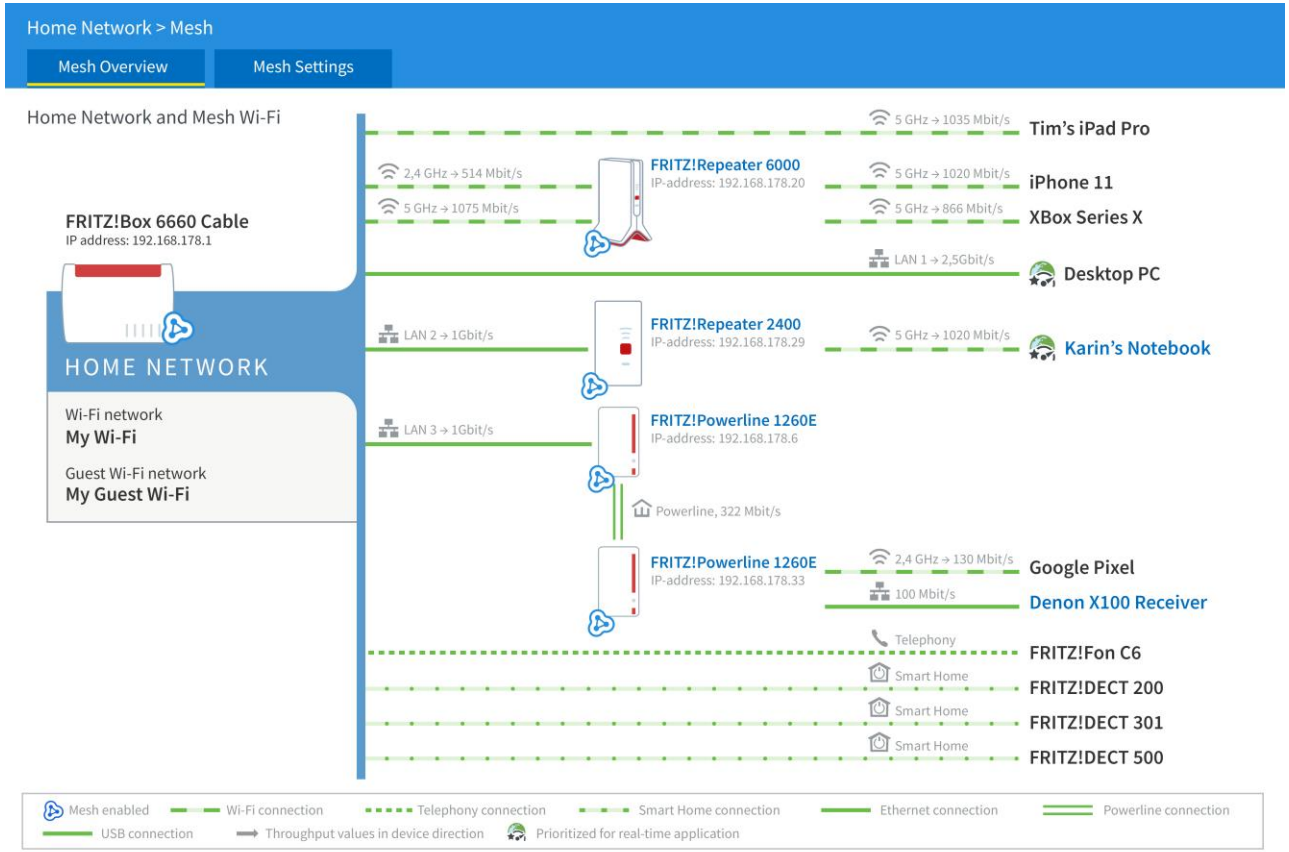
Support for both stacks
(USP und TR-069)

No NAT connection problems

USP Support since Firmware 7.50

- Improved Troubleshooting
- Improved Remote Mangement
- Improved Customer Monitoring
- Ownership of Data stays with the ISP

Mesh Wi-Fi@FRITZ!Box

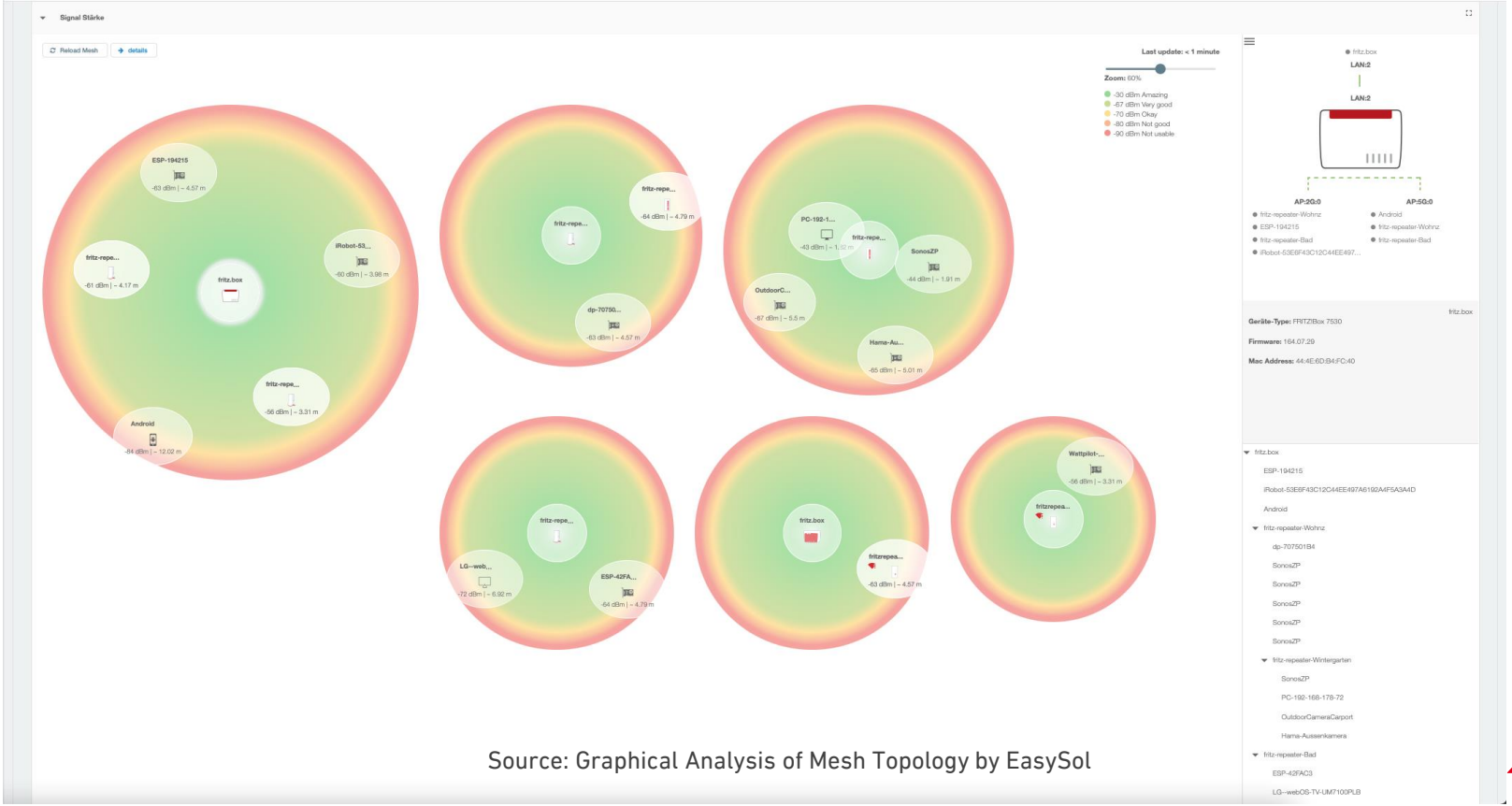


Central Provision of Mesh Wi-Fi Data for Backend Retrieval

- CPE collects data on all devices and connections in the Mesh Wi-Fi and makes them available for simple retrieval from a simple location
- Example:

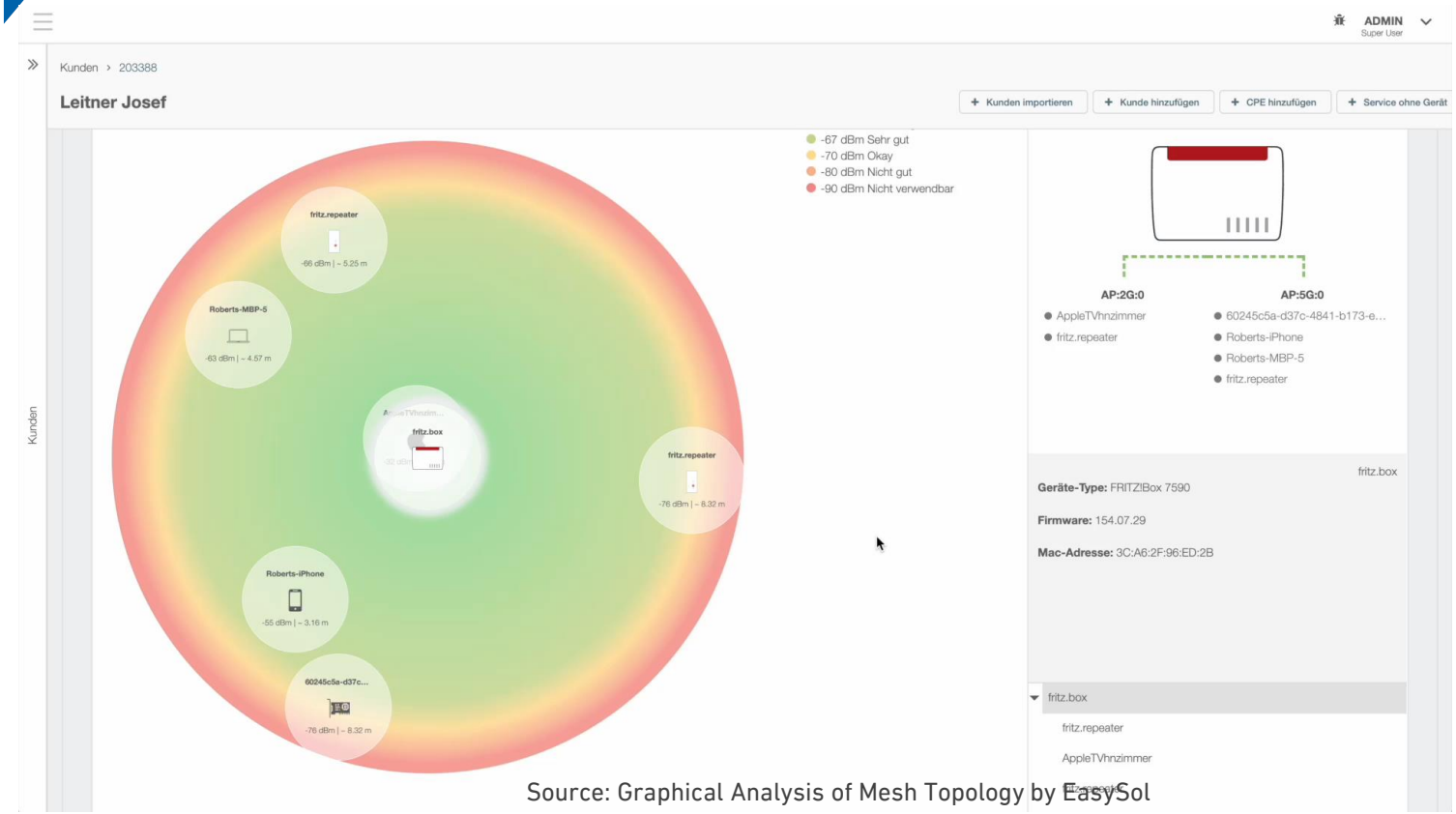
Source: Graphical Analysis of Axiros

Central Provision of Mesh Wi-Fi Data for Backend Retrieval



Source: Graphical Analysis of Mesh Topology by EasySol

Central Provision of Mesh Wi-Fi Data for Backend Retrieval

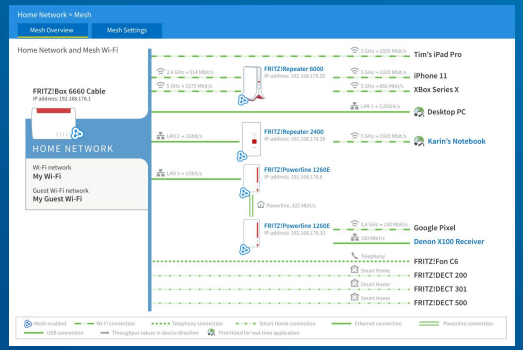


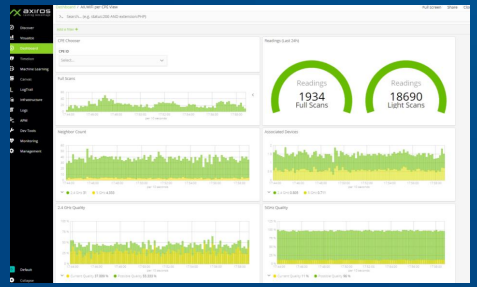
Source: Graphical Analysis of Mesh Topology by EasySol

Central Provision of Mesh Wi-Fi Data for Backend Retrieval

- CPE collects data about all devices and connections in the mesh Wi-Fi and makes it available (across manufacturers) for easy retrieval from a central location
- Examples:

Mesh@FRITZ!Box



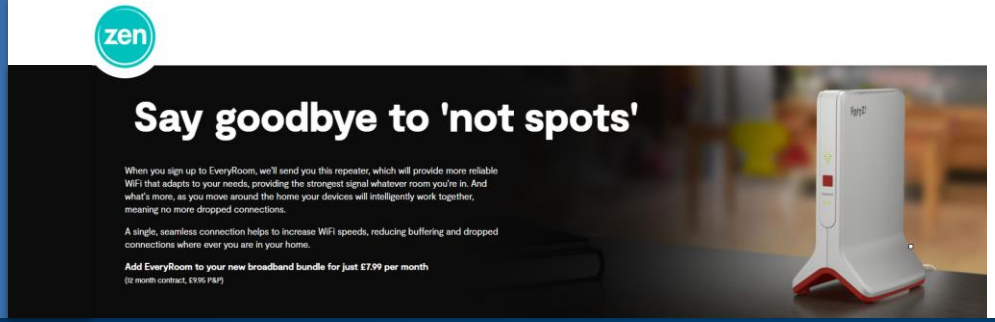


Mesh-GUI based on USP by **AXIROS**

Mesh-GUI based on USP by **EasySol**

Customer References

Millions of Customers are using our products for the best Internet Experience

FACTS AND NUMBERS	Millions of Repeaters sold since 2018	Over 150 ISPs are using our Repeaters to improve Customer Experience of their customers	Business Model to improve ARPU
HAPPY CUSTOMERS	vodafone · TIM · Telekom Slovenije · 1&1 · kpn		
EXAMPLES			

MESH Topology-Data

This is what we can offer for ISPs today

We transfer MESH Topology-Data as raw data

We manage the wifi inernally. All Wi-Fi information stays at the CPE.

ISPs are able to pull and process MESH data

MESH Topologie-Data are send as Snapshot of current situation

No external Instances required to controll our CPEs

Conclusion on TR069/TR-369

- Standardized procedure that covers all types of networks (DSL, DOCSIS, fiber optic, ...)
- Implemented since FRITZ!OS 7.5x and can be used free of charge by any ISP
- Freedom of Choice - Protocol is supported by all major ACS vendors
- RSSI (range) is the most common problem due to legal restrictions.
- Use of AP/repeaters/PLC adapters as “problem solvers” is inevitable
- Very detailed insight into the Wi-Fi apartment network, for data analysis, statistics and troubleshooting
- Available out of the box, no additional software required on the gateway, no cloud required
- The required infrastructure (USP ACS) can also be used for many other applications (Internet, telephony, smart home, ...)

Thanks you

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