CUJOAI

HOME NETWORKS IN 2024:

MAKING WI-FI 7 ROLLOUTS COUNT

DEVICE INTELLIGENCE REPORT

Network service providers (NSPs) continue to face operational challenges due to the growing use of privacy enhancing technologies. While these technologies provide valuable privacy protections for consumers by preventing unwanted tracking, they also restrict NSPs' ability to identify devices, utilize automation, enhance services, optimize network performance, and deliver effective customer care.

The inability to fully understand customer needs and issues due to these limitations can hinder the delivery of personalized support and timely assistance, impacting overall customer satisfaction.

Today's tech environment calls for advanced, reliable, and privacy-respecting solutions to solve device identification. Explorer, CUJO AI's machine learning device intelligence service, uses dozens of data points to identify over 3 billion devices, their manufacturers, types, as well as other contextual data points, such as OS versions. Explorer does this in real-time to help NSPs future proof their services and move away from increasingly unreliable (or no longer available) device identifiers, such as hostnames or MAC addresses.

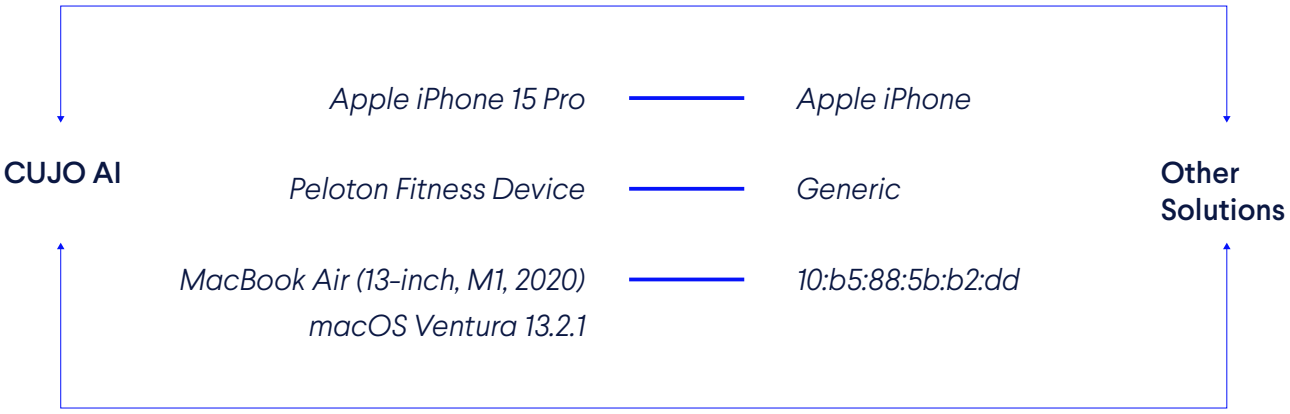

Figure 1. CUJO AI's device intelligence provides greater granularity than other device identification solutions on the market.

Furthermore, CUJO AI identifies devices granularly and uncovers new insights as well as possibilities for both NSPs and their end-users. Where in the past, a MAC address would have provided information on the device's manufacturer and a unique device ID, CUJO AI Explorer is able to determine the device's model and fix an identifier for a device that transmits random MAC address to different Wi-Fi networks.

Accuracy Level	Computer	Phone	Smart TV
Basic Identification Vendor/Brand is identified	Apple Device	Samsung Device	Sony Device
Medium Level Identification Brand, Type, Active Capabilities Identified	Apple Computer, WIFI 802.11 ac	Samsung S23 Series Phone, WIFI 802.11 ac	Sony Smart TV, Streaming, 4K WIFI 802.11 ac
High Level Identification Brand, Type, Model Details, Advanced Capabilities	Apple MacBook Pro M3 WIFI a/b/g/n/ac/ax	Samsung S23 Ultra, WIFI 802.11 a/b/g/n/ac/ax, MU-MIMO, DFS	Sony KD-55x75WL, 4k, Wi-Fi 802.11a/b/g/n/ac

Figure 2. An example of the granularity of CUJO AI Explorer's device model identification, which identifies more than 90% of all devices at medium level or above.

Explorer is already used by 11 leading network service providers in North America and Europe. For each of them, device intelligence uncovers unique insights and opportunities, ranging from better personalized services and enhanced customer care to data-driven business decisions, and Wi-Fi optimization.

Higher speeds, better connectivity and services are key investment areas for NSPs, which is why we've decided to look at how device intelligence can help a network operator estimate, plan, and roll out Wi-Fi 7 CPE upgrades.

This report is provided by CUJO AI Labs, the research and development arm of CUJO AI, and is based on the latest device intelligence data from April 2023 – February 2024. During this period, end-users connected:

1.17B new devices

2,632 unique brands

30,274 unique device models

The power of our machine learning device intelligence and cybersecurity solutions stems from the unmatched real-life dataset that our algorithms are trained on. All our solutions are privacy-respecting and adhere to all privacy regulations in our customer's operating locations, including the GDPR, the CCPA, and the Data Protection Act.

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Even though the Wi-Fi Alliance introduced Wi-Fi 7 certification very recently, several network service providers have already started rolling out Wi-Fi 7 CPEs. Not every home will need such powerful and costly devices, and determining which customers would benefit the most from having a Wi-Fi 7 CPE is crucial for a major investment like this.

As device certification ramps up, we can expect massive growth in Wi-Fi 7-capable devices. Those network service providers that use device intelligence will have a significant advantage: the number of devices in a household, their capabilities, and Wi-Fi 6e or 7 capabilities are just some of the data points they will be able to consider before planning a new CPE rollout.

On the other hand, customers that have a substantial number of legacy devices might experience degraded performance if their devices are not able to use WPA3 or even a WPA2/WPA3 mixed mode.

Knowing which customers to prioritize during a Wi-Fi 7 CPE rollout is a significant financial benefit, and device intelligence can provide the insights to make it less of jump in the deep end, and more of a precise, tactical data-driven decision.

Wi-Fi 7 Adoption: Early Days

While it is true that Wi-Fi 7 certification started recently, some devices, like the OnePlus 11 5G and Samsung Galaxy S23 Ultra had now-certified chips in them since early 2023. CUJO AI Explorer allows network service providers to know how many devices that are using a particular technology are on their network and plan accordingly.

By February 2024, relatively few devices with Wi-Fi 7-certified chips were used by consumers, but the numbers are picking up speed as of early 2024.

Wi-Fi 7 Certified Devices

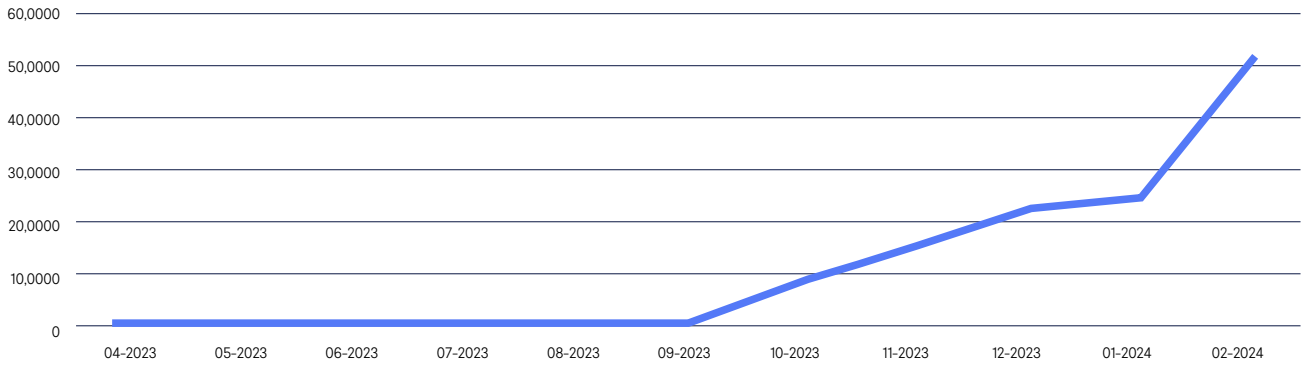

Figure 3. The number of new Wi-Fi 7-certified devices appearing on consumer networks has doubled in a single month.

Wi-Fi 7 Certified Devices as a Percentage of All New Connected Devices

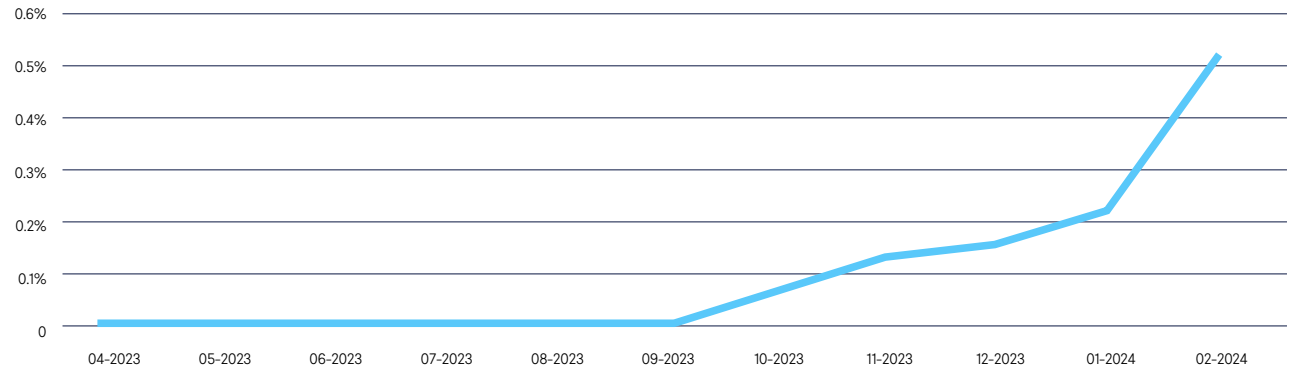

Figure 4. As a percentage of all new devices, Wi-Fi 7-certified devices are still niche, but growing rapidly.

NSPs are motivated to lead in Wi-Fi connectivity, aiming to be at the forefront with Wi-Fi 7 launches. While the number of end-users with Wi-Fi 7 capable devices is currently limited, forward-thinking NSPs see an opportunity in targeting these early adopters. This group, keen on the latest technology enhancements, often has more to spend, making it an attractive segment for NSPs looking to differentiate themselves through advanced Wi-Fi solutions.

Wargaming a Wi-Fi 7 CPE Rollout: Evaluating Opportunities and Risks

We used a random sample of 1,000 home networks out of over 50 million networks running CUJO AI Explorer to show how a network service provider could run a Wi-Fi 7 CPE upgrade analysis.

This sample had tens of thousands of unique devices – a daunting number that showcases the growing number of devices on consumer networks. Furthermore, we identified 2,177 distinct device models.

Of the 2,177 distinct device models identified in our dataset, 407 were encountered 10 or more times, representing 89% of all devices. Our analysis concentrated on these prevalent models to ensure we didn't get sidetracked by rare or exceptional cases. It's important to note that the dataset includes devices belonging to friends, guests, and other visitors connected to the network during the analyzed period.

Even though the following analysis focuses on more common devices, device intelligence data allows network service providers (NSPs) to delve into as much detail as they wish. For example, NSPs can pinpoint which customers possess devices compatible with Wi-Fi 6E/7, aiding in strategically planning Wi-Fi 7 CPE deployments. Furthermore, device intelligence data allows them to avoid homes where end-users still use legacy devices with known compatibility issues.

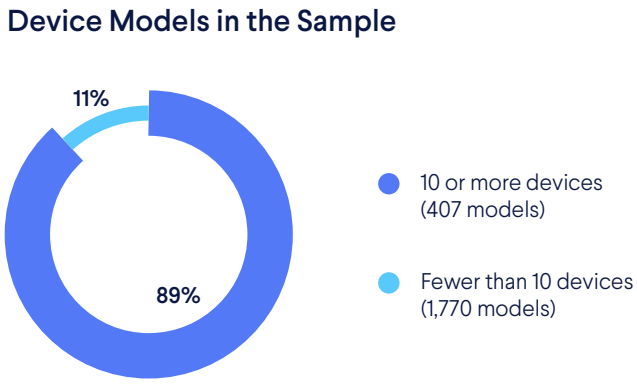

Figure 5. Out of 2,177 distinct device models, just 407 models make up 89% of tens of thousands of devices on 1,000 networks in our sample.

Prioritizing Wi-Fi 6E/7 Compatibility

Modern Wi-Fi standards not only improve the connectivity speed of the end-users' networks, but they also enable better security standards, such as WPA3. Knowing whether a household has a significant number of devices that support tri-band and 6 GHz connections is a primary consideration in planning a CPE roll out.

Just 3% of devices in our sample of home networks could use the 6 GHz band, i.e., Wi-Fi 6e or Wi-Fi 7. But these devices were found on more than 34.2% of home networks!

On the other hand, at least **a third of the devices we examined did not support Wi-Fi 6**. Some extremely popular devices, e.g., the Nintendo Switch, older iPhones, or the PlayStation 4, were present in many homes (35%, over 25%, and 24.6%, respectively). Some of these devices have known issues with connectivity standards. For example, the Switch might not connect to a network that has Protected Management Frames enabled.

Older devices that have issues with WPA2/WPA3 mixed mode are still in use. To name just a few, we've selected Apple devices that had an operating system version earlier than iOS 12, which are known for not supporting the mixed mode.

5.7% of home networks in our sample used legacy devices that might not be compatible with WPA2/WPA3 mixed mode.

Surprisingly, we found 57 home networks (5.7% of our sample) with legacy devices still in use, including various models from the iPad 2, iPad 4 (released in 2011 and 2012, respectively), or the iPhone 5 and 6 series (released 2012 and 2014, respectively). Three home networks had an iPod Touch 6 from 2015 still in use. Even though the latter two device models can be updated to iOS 12, an NSP might not want to upgrade these customers to a Wi-Fi 7 CPE to avoid possible issues. With incompatible devices still in use, a CPE upgrade might degrade these customers' connected experiences and increase customer care costs.

In conclusion, device intelligence gives network service providers key data points to plan their CPE rollouts and allows them to target end-users who would benefit most from enhanced routers. On the other hand, it also lets them avoid known problematic devices or preemptively help end-users to set their network up around these devices to improve the customers experience and control support costs. Additionally, offering upgrades as part of a bundle to replace legacy devices could open new avenues for sales revenue.

Moreover, by identifying devices and chipsets with known compatibility issues with newer Wi-Fi standards, device intelligence allows NSPs to anticipate customer support demands and develop comprehensive troubleshooting guides for the most common problematic devices ahead of a rollout. This proactive approach not only streamlines the introduction of new technologies like Wi-Fi 7 but also ensures a smoother, more satisfying customer experience.

The Connected Device Landscape in 2023-2024: Statistics and Trends

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Overall, the connected device landscape continues on a trajectory we observed in last year's report. Some niche IoT device types are becoming more common, but no single category currently makes up more than 0.5% of all new connected devices.

Mobile devices, particularly smartphones and tablets, continue to make up over 50% of all devices connected every month. Overall, the top 10 device types made up around 75% of all new devices connected in April 2023-February 2024. Note: smartphones are not only the most frequently upgraded devices, they are also the devices that are most likely to 'visit' a network when a guest connects to their host's network.

New Devices Connected in 2023-2024

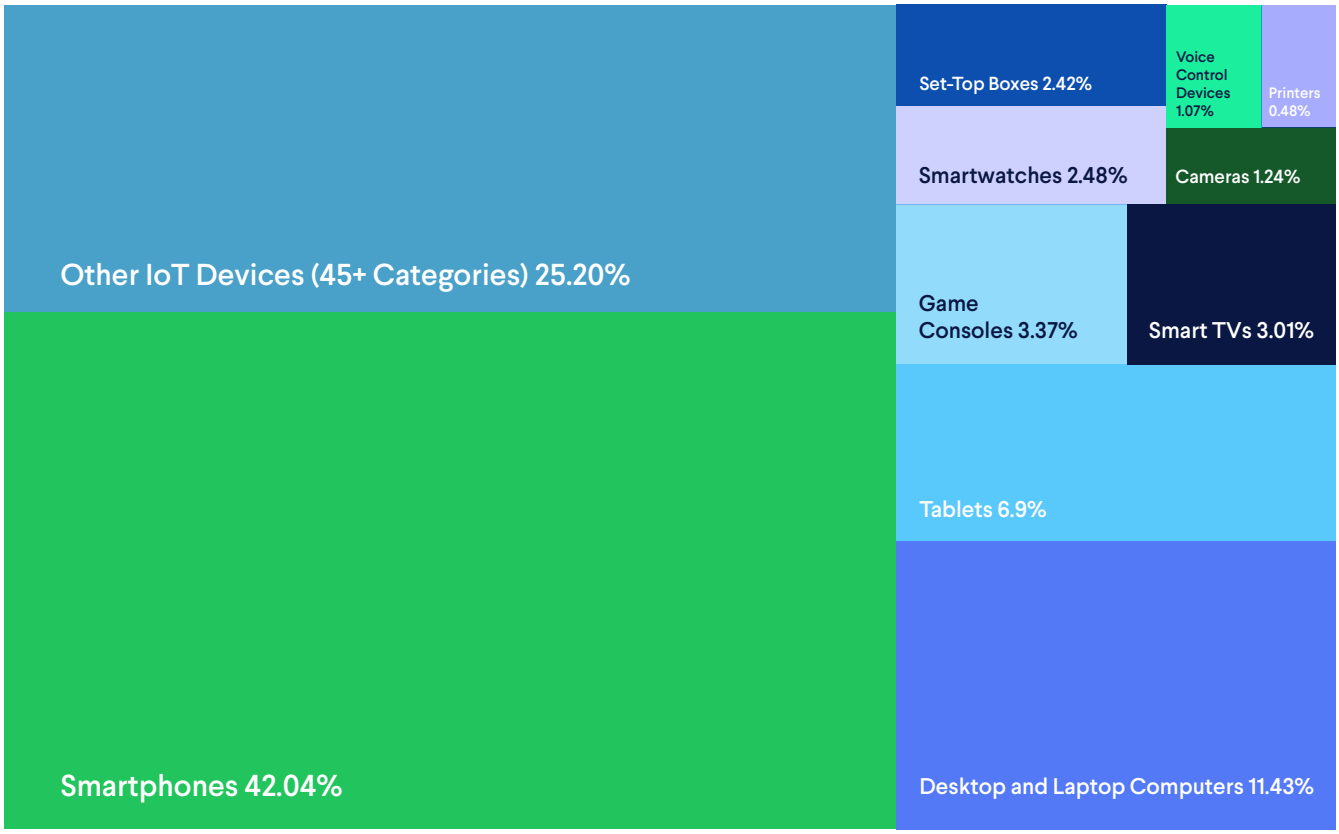

Figure 6. The 10 most popular device categories make up close to 75% of all new devices connected in April 2023-February 2024.

Extended Reality Device Trends

In May 2023, we decided to add a new category – Extended Reality – for AR and VR devices. Over the coming 8 months, these devices made up 0.27% of all new connected devices. As expected, the Holiday season saw a massive boost of new Extended Reality devices coming online.

While our data includes only the first weeks of the Apple Vision Pro release, it should be noted that the device's initial release shipments are estimated at just 200,000 units. Even if all these devices had joined our customers' networks, it would have made only a minor impact, as our algorithms identified 106 million new devices on average every month, with over 653,000 new Extended Reality devices coming online in December.

Extended Reality Devices as a Percentage of All New Connected Devices

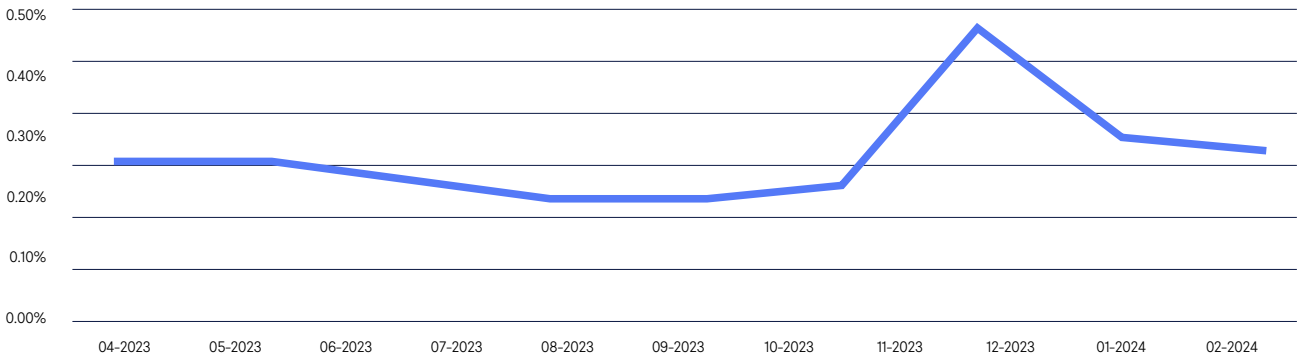

Figure 7. Extended Reality devices had a significant boost during the Holiday season. Apple's Vision Pro release kept it at an elevated level in February.

Nevertheless, our data shows that Apple's Vision Pro managed to make a dent in Meta's grip on the Extended Reality device category. It will be interesting to see whether the lackluster response to the device diminishes its popularity and whether (any) subsequent models make Apple a major competitor in the space.

New Extended Reality Devices Connected in February 2024

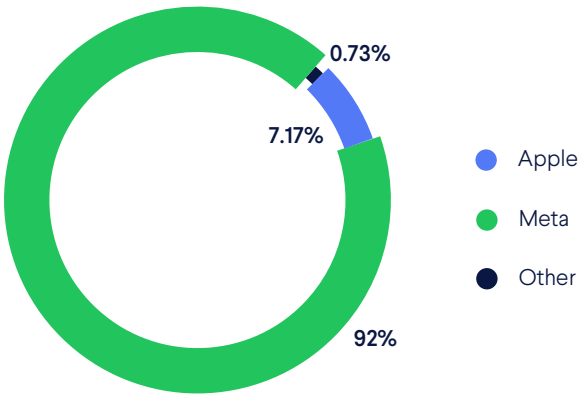

Figure 8. Apple has entered the Extended Reality device category with only 7% of new devices in February. The category is thoroughly dominated by Meta's Oculus device line.

Conclusion

Device intelligence is a powerful tool that allows network service providers to improve many aspects of their business. This report showcased a few data points that would be crucial when planning a Wi-Fi 7 CPE rollout. Thanks to the granularity of our data, a network service provider can focus the initial rollout for those customers that would benefit the most and avoid owners of problematic legacy devices.

Monitoring new trends and finding the best time to accommodate a growing end-user need is a critical differentiator in today's telco business. As noted in our overview of the new Extended Reality category, network service providers can use device intelligence data to be on point and ready to react to any significant changes in the connected device landscape.

CUJO AI Explorer, the data source for this report, is a machine learning solution that identifies devices with granular precision and allows network service providers to continue operating their services without major disruption from privacy-enhancing technologies, such as MAC address and hostname obfuscation.

Our algorithms are constantly learning to identify devices in the most efficient way from the largest real-life dataset of its kind. Explorer identifies over 106 million new devices every month. It identifies more than 90% of these devices down to their type (category) and brand.

Explorer has identified over 3 billion devices on tens of millions of end-user networks by being a trusted partner of 11 leading network service providers in North America and Europe. It is a privacy-respecting solution that is fully compliant with every privacy regulation, including the GDPR, CCPA, and UK's Data Protection Act.

CUJO AI provides advanced multilayered cybersecurity and device intelligence as a product for Internet Service Providers, which allow them to protect end users' devices and home networks. Major mobile and broadband providers partner with CUJO AI to offer security as a value-added service to their clients.

As the only platform of its type deployed to in tens of millions of homes and covering over 3 billion connected devices, CUJO AI offers advanced AI algorithms to help its clients uncover previously unavailable insights and raise the bar on customer experience & retention with new value propositions and superior operational services. Fully compliant with all privacy regulations, CUJO AI services are trusted by the largest broadband operators worldwide, including Comcast, Charter Communications, TELUS, Sky Italia, Rogers, Cox, Shaw, and Videotron.

About CUJO AI Labs

CUJO AI Labs is an advanced research department of CUJO AI specializing in IoT threat research and NSP customer cybersecurity. Labs researchers use the largest scale real-world device behavior database of over 3 billion anonymized consumer devices to empower advanced machine learning technologies that protect tens of millions of households around the globe. Every year, CUJO AI Labs publishes in-depth data-based reports, such as this one, on the IoT ecosystem and cybersecurity.

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