White Paper

Mobile Offloading in a 5G and WiFi 6-driven world

ANTlabs Patented Intelligent Mobile Offload Solution Enables Service Providers to Keep Up with Increasing Data Traffic Demands

INTRODUCTION

There is no denying that the increase in mobile device usage is going at a fast rate these days. This covers everything from mobile phones to the rest of the IoT devices people use in their everyday lives. In 2017, there were 9 billion mobile-ready devices, IoT connections, and according to the Cisco Annual Internet Report (2018-2023), nearly two-thirds of the global population will have Internet access. Over 70 percent shall have mobile connectivity by 2023. The ever-changing mix and growth of wireless devices connected to mobile networks are among the main contributors to surging global mobile traffic. It is expected that the number of global mobile devices and connections will grow to 13 billion by 2023. Mobile video will also represent 79 percent of international mobile data traffic, up from 59 percent in 2017. With the rise of 5G and WiFi 6 adoption and the prolonged pandemic that forced more people to stay and work from home, this figure might even be exceeded sooner.

KEEPING UP WITH INCREASING DATA TRAFFIC DEMANDS

Cellular networks currently handle a massive amount of mobile data traffic—and it is skyrocketing each year. Mobile offloading is one of the solutions that has been present since the early 2010s to address this. In 2017, mobile offload exceeded cellular traffic; 54% of the total mobile data traffic was offloaded onto fixed-line networks through WiFi or femtocell. With the explosive growth of the mobile and IoT devices, and high bandwidth video applications usage, mobile offload in a WiFi 6 and 5G world will be even more critical.

MOBILE OFFLOADING IN A WIFI 6 + 5G WORLD

There is a lot of buzz around 5G and WiFi 6 and for a lot of good reasons. 5G networks are expected to provide more efficiency and boost economic gains wherever they are deployed. As countries push for smart cities, smart factories, technological advancement in healthcare, autonomous vehicles, and more, Telco's and Internet service providers will also need to scale as they handle massive data traffic. **To keep up with the demands while keeping the cost down, service providers offload traffic from dual-mode devices that support** cellular and WiFi connectivity, such as smartphones. This way, mobile networks are relieved from congestion data traffic while maintaining its quality, and customers get the connectivity they need wherever they are and whenever they require it. In a WiFi 6-and-5G-driven world where almost everyone and their devices are expected to be continuously connected, mobile offload will play a more significant role in managing the expected rise in traffic.

Mobile offloading these days occur at the device level when one switches from a cellular connection to WiFi or small-cell access. For example, mobile traffic is offloaded to public hotspots or enterprise

and residential WiFi networks. Through offloading, customers make and receive calls over WiFi. The handover is often seamless, and users will not even notice that they are making a WiFi call. Indoor, offloaded networks allow their users to experience using their existing phone with extended connectivity even in areas where cellular and public-safety networks have no coverage.

WHAT DOES THIS MEAN WHEN WIFI 6 IS NOW AVAILABLE?

WiFi 6 has started spreading across the world, and it has fewer interference issues than 2.4/5GHz, low latency, improved capacity, and the ability to support more devices. It is at similar affordable price levels as previous WiFi standards, and easier to deploy compared with indoor BTS solutions. This means that WiFi 6 shall be the new default indoor wireless solution and will be a more cost-effective solution for providers to relieve data traffic congestion.

The new WiFi 6 standards also have technological advancements found in LTE and 5G transmission standards. WiFi 6 uses orthogonal frequency division multiple access (OFDMA) to increase transmission efficiency, and it also adds multi-user multiple input multiple output (MU-MIMO) in the uplink.

With the introduction of WiFi 6 and the deluge of connections that come with it, mobile offloading shall become an even more critical part of the total solution to ease data traffic congestion.

ANTLABS PATENTED INTELLIGENT MOBILE OFFLOADING SOLUTION

ANTlabs provides scalable and intelligent next-generation WiFi offloading via existing WiFi and WiFi 6 technology. Our high-performance 3GPP AAA and DDI (DHCP/DNS/IPAM) Carrier solutions are built with over two decades of R&D and extensive field experience to deliver a suite of reliable and scalable platforms available in an appliance, virtualized or NFV variants.

In 2019, as a testament of ANTlabs' continued innovation and R&D, the US Patent and Trademark Office granted ANTlabs the patent for Intelligent Mobile Data Offloading. This patent relates to offloading mobile data on end-user devices to WiFi networks. This technology's fundamental value proposition is to ensure that devices unloaded to the WiFi network receive enough network quality for good network usage experience.

In addition to the patent, to handle the massive increase in mobile offload authentication requests, ANTlabs deploy three unique ways to overcome critical issues:

- **Smart EAP-SIM Re-authentication to reduce load towards HLR/HSS**

ANTlabs Smart EAP-SIM re-authentication mechanism limits the number of transactions that the HLR/HSS shall receive by still maintaining the complete Full EAP-SIM authentication from UE's perspective. This mechanism drastically limits the number of transactions that the HLR/HSS shall receive for authentication. Upon a new, successful authentication of a UE device with the HLR/HSS, ANTlabs Tru'Auth retains the GSM triplets for a configurable period, termed TTL securely. ANTlabs Tru'Auth AAA can keep as many triplets as their subscribers' accounts capacity. By default, the retention period is set to 24 hours. The TTL value has three other configurable parameters that define how long the GSM triplets need to be retained at the ANTlabs Tru'Auth. With this mechanism, in one hour, the ANTlabs Tru'Auth can handle 1.5 Million login subscriber sessions and up to 2000 TPS.

- **Thwart WiFi-based IMSI snooping and increase security**

  There are two peer policies which affect the behavior of EAP-SIM/AKA authentication mechanisms:

  - Liberal Peer – Responds to any requests for permanent identity (IMSI)
  - Conservative Peer – Only responds to permanent identity requests when no Pseudonym identity (TIMSI) is available.

  ANTlabs Tru'Auth AAA deploys using a "Conservative" Peer mechanism wherein the translation from the Permanent Identity to the Pseudonym Identity is handled dynamically and in real-time, thereby thwarting WiFi-based IMSI snooping.

- **Control authorization based on the device after authentication by certificates**

  For devices without SIM Cards, Certificates are the alternatives to simulate the seamless authentication. EAP-TLS/EAP-TTLS uses certificate-based authentication to authenticate the user. However, unlike SIM Cards, the certificates can be shared among different users, thereby compromising unique user identification.

  ANTlabs Tru'Auth AAA employs additional security mechanisms to authorize based on the user's device and the certificate-base authentication. By way of this, carriers can uniquely identify each users' like SIM-based authentication.

  Furthermore, Tru'AUTH AAA is future-proof as it also supports EAP-AKA authentication with different caching considerations compared with EAP-SIM authentication. It supports Diameter protocol that will streamline the interface to the mobile core networks.

CONCLUSION

As the world welcomes 5G, WiFi offloading becomes even more crucial as it will provide ubiquitous indoor coverage at a fraction of the deployment cost of 5G. ANTlabs' carrier-grade products and patented Intelligent Mobile Offloading delivers high performance and scalability that service providers need.

ANTlabs helps customers optimize the business value-chain from an end-to-end perspective with our high-performance 3GPP AAA and DDI (DHCP/DNS/IPAM) Carrier solutions. Our solutions range from the agile deployment of IoT (Internet of Things) devices and network services in homes and offices to network visibility and monitoring for remote troubleshooting and network problem resolution of network access equipment. With ANTlabs' solution, service providers can also give their customers the connectivity quality they expect while ensuring advanced security at reasonable cost, thus helping to seal the gap between network availability and consumer demand.

ABBREVIATIONS

The following table lists the terminologies used in this document:

Terms	Definition
AAA Protocol	Authentication, Authorization, and Accounting Protocol
AuC	Authentication Centre. The GSM network element that provides the authentication triplets for authenticating the subscriber.
Authentication Vector	GSM triplets can be alternatively called authentication vectors.
EAP	Extensible Authentication Protocol
GSM	Global System for Mobile communications.
GSM Triplet	The tuple formed by the three GSM authentication values RAND, Kc, and SRES.
HLR	Home Location Register

REFERENCES

Cisco Annual Internet Report (2018-2023). (2020). https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html

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