



RADCOM

Ensuring essential connectivity
and service quality during
COVID-19



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Introduction

As a result, of the way COVID-19 is changing the way we live and work, network connections have become our lifelines to receive the news, keep us working, communicate with colleagues and family as well as function as a society.

According to statistics, there has been an unprecedented growth in global internet traffic over the last few weeks with impacted regions seeing a peak increase of between 20-40%. To put that in perspective, typically, networks see a 30%-40% growth over a year. However, network growth is not the only story. There has also been an extraordinary increase in latency-sensitive applications usage such as teleconferencing apps like Zoom and Skype during traditional business hours. These types of applications require high network performance and constant monitoring to ensure businesses can continue functioning in the age of social distancing and isolation.

Peak times have also been thrown out of sync as people get used to a new reality and adjust workflows. Furthermore, network traffic has shifted from cells located in business districts to residential areas that require the operators to reoptimize and reconfigure radio and backhaul capacity.

With such shifts in usage patterns and the absolute reliance on the network, there is a real responsibility being laid at the door of network operators to assure that we remain connected and receive high-service quality whatever load is placed on the network.

Market challenges

With traditional norms changing, almost daily operators have to continually monitor network performance to ensure that they can handle the demand. In Spain, for example, the increase in traffic has been dramatic. According to [TelecomTV](#), mobile traffic has increased by 50%, voice traffic risen by 25%, and latency-sensitive video-conferencing app usage has increased fourfold. These increases are worldwide, and operators need to maintain vigilance to assure network capacity. Operators also need to monitor these different types of services and applications to sustain the changing usage trends for their customers.

Traditionally network traffic flows according to set patterns. Whereas previously peak periods were at certain times of the day, these peaks are now spread out across a more significant portion of the day. [Vodafone](#) says that the traffic peak (for broadband connectivity) used to run from 18:00 – 20:00 and is now extending back to lunchtime. Operators need to continually monitor their network and critical services to increase the bandwidth and guarantee connectivity.

Main network trends monitored by RADCOM worldwide

The unprecedented growth in global network traffic over the last few weeks is clear to see and impacts us all. RADCOM has been working with our customers worldwide to ensure network performance is optimized, and service quality is maintained throughout this surge in usage and change in subscriber habits. Some of the trends noted by RADCOM's solution are:

- The distribution by technology has shifted
- The amount of traffic per technology has increased significantly
- Home broadband, as well as mobile subscribers, are affected as well due to the increased number of sessions
- A massive increase in the PDP sessions over all regions as more and more subscribers connect to the internet
- The rise in HTTP sessions is causing degradation in throughput, round trip delay, and re-transmitted frames ratio
- Data download increased by ~30%-40%
- Data upload increased by ~60%-100%

It remains to be seen whether COVID-19 permanently changes traffic patterns and subscriber habits after social distancing. However, what COVID-19 has done is to bring home to operators the need to deploy service assurance that smartly monitors and optimizes the network and provides both a high-level and granular view of their end-to-end services. Only then can operators fully know the end-to-end network performance, understand the customer experience, and rapidly perform root cause at a granular level.

Ensuring connectivity and service quality

To assure that we remain connected and receive high-service quality during the changes brought about by COVID-19, operators need to monitor and optimize the network performance continuously, while also gaining visibility into the emerging shifts in usage patterns and application/service usage. The operator can stay on top and manage their network efficiently by taking the following action;

Proactively optimize network performance



Figure 1 – Constantly monitor service and network performance using RADCOM Network Intelligence

With the surge in network traffic, changes in peak usage, and the shift in services and applications using RADCOM Network Intelligence enables operators to monitor their entire network performance and service quality proactively. By using RADCOM's solution, operators can quickly pinpoint and resolve customer-affecting issues and ensure a consistently superior customer experience. By establishing service level thresholds and setting smart alarms, operator teams can monitor the network without being tied to watching screens. Catching traffic increases as they start to rise to assign network resources proactively and before the network reaches maximum capacity. This is essential as traffic today can change quickly with governments informing the public of lockdowns at a moment's notice.

Understand new traffic patterns and prevent congestion

Operators can gain an understanding of the current usage trends and zoom into specific geolocations, network elements, or even individual cell locations to assure that areas of importance or intense network activity can be optimized for performance. With peak times and the traffic distribution changing, the operator needs to continually monitor and adjust the radio and network to be fully optimized to meet customer needs. Insights provided by RADCOM's solution cover all the layers of the network. The control plane and user plane traffic, as well as all service types from data to voice, enabling operators to monitor the changing usage patterns and receive alerts before congestion happens or network degradations affects too many customers. These insights are provided at a high level per service or customer group and granular level per cell or network element. Enabling the operator to act proactively before congestion or degradation occurs.

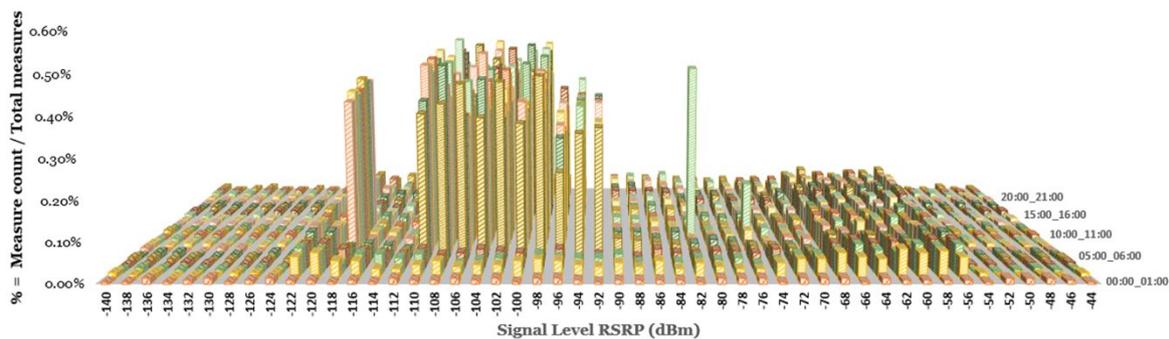


Figure 2 - Essential radio KPIs are part of RADCOM's end-to-end monitoring

Accurate network planning, trending, and optimization are of critical importance today. With RADCOM Network Insights, operators can forecast and optimize for congestion using data down to the cell level, predict usage, and trending with incredible accuracy. By using analytics-driven network planning and capacity management, RADCOM Network Intelligence can play a pivotal role in managing its network capacity in these uncertain times. Through an understanding of network usage and subscriber usage per application/service, operators can engage in asset provisioning using a more knowledgeable approach.



Figure 3 - Monitor specific latency-sensitive applications and services

Monitor latency-sensitive and business-critical applications

Utilizing RADCOM's built-in DPI engine RADCOM Network Intelligence recognizes and monitors over 3000 applications and services, including the latency-sensitive applications and services that customers need for critical business communications such as Skype, WebEx, and Zoom. For each of these apps, RADCOM enables the operator to monitor performance criteria such as latency and throughput as well as understand usage patterns for each application and see when peak usage occurs. This allows the operator to focus on the specific needs of customers as usage changes, optimize their network accordingly to ensure service quality, and plan the allocation of network resources going forward.

RADCOM uses multiple technologies to classify/detect traffic;

- Classification of networking protocols and applications based on
- Flow pattern matching
- Bi-directional flow correlation
- Heuristics
- Statistical analysis

With regular protocol plugin releases that support In-Service Software Upgrade (ISSU) as well as country/region-specific apps being added, each operator can keep tabs on essential services and applications in their network. This data enables the operator to assure the quality of experience for these specific services, so they run efficiently whatever the demand.

Monitoring specific services, traffic types, and web browsing is critical for operators as they support customers during this challenging time. For example, O2 (in the UK) has said that all National Health Service and some social welfare websites will be 'zero-rated,' meaning any data used on these sites will not count towards customers' monthly allowance. So, the operator must monitor web browsing to enable this zero-rating or other customer benefits during these times.

RADCOM Network Intelligence can be used to analyze the new usage patterns and help align their operators to support customers in these changes with the corporate office now moving to the corporate home. Operators can use the data from RADCOM Network Insights to create new types of packages that fit these new trends, which include secure communication, VPNs, collaboration tools, and "after hours" entertainment packages.

Ensure video streaming quality

Before COVID-19, video streaming already made up over 60% of all network traffic, with a significant portion of usage in the evening or at the weekend. However, with so many people in lockdown at home, video streaming usage has skyrocketed, and peak traffic patterns have changed significantly. To counter this, many video streaming providers such as Amazon Prime, Apple, Disney+ Facebook, Netflix, and YouTube have announced that they have downgraded their video streams from HD to SD. Despite this, with so many families cooped up at home, these services have become an even more significant source of entertainment, so operators must monitor these services and ensure the right quality is delivered to subscribers.

RADCOM Network Intelligence utilizes Artificial Intelligence (AI) capabilities and cutting-edge machine learning and heuristic modeling to provide an understanding of the perceived Quality of Experience (QoE) for encrypted HTTPS and QUIC based video streaming. RADCOM's solution is enabled by algorithms that are fed by mass video streaming samples from the operators' network to create KQI's such as starting delay, rebuffering indication, and the total bytes of effective video throughput. Thus, empowering operators with the ability to monitor the quality of experience even for encrypted traffic.

With these insights, operators can gain visibility across encrypted networks and understand the QoE across their network, which is critical, with different regions being affected in different ways and traffic usage varying. The data provided by RADCOM's solutions enable the operator to understand whether video streaming is a high enough quality that can be consumed and enjoyed by customers while not overburdening the network.

RADCOM provides the following metrics for encrypted adaptive streaming:

- Minimum time to play – Heuristic approach to estimate the elapsed time until the video starts to play. Since the video application uses different video codecs with variable encoding efficiency, RADCOM's metric is an estimation that was verified based on thousands of video downloads with user feedback measurements
- Video rebuffering count and duration – AI heuristic modeling is used to estimate real occurrences of the rebuffered video segments that are detected in the network. The algorithm considers the video segment download history and identifies the rebuffering as a time series problem. The video rebuffering duration relates to the portion of the video

where rebuffering occurred, and the rebuffering count refers to the number of such occurrences

- Video resolution duration – The video segment download duration based on four resolution levels measured in the segment level (mSec)
 - Level 1 - [144P, 240P]
 - Level 2 - [360P, 480P]
 - Level 3 - [720P, 1080P]
 - Level 4 - [1440P, 2160P, 4320P and above]

RADCOM estimates the video resolution as a time series problem and considers the historical download data of the user to provide results with the highest levels of accuracy. The four-level video resolution durations may be used to calculate the relative duration of each tier during the streaming video.

- Video Duration and byte count – duration of the video and DL byte count for the played video
- Effective Throughput – DL throughput based on the aggregated video flows and discarding idle time.

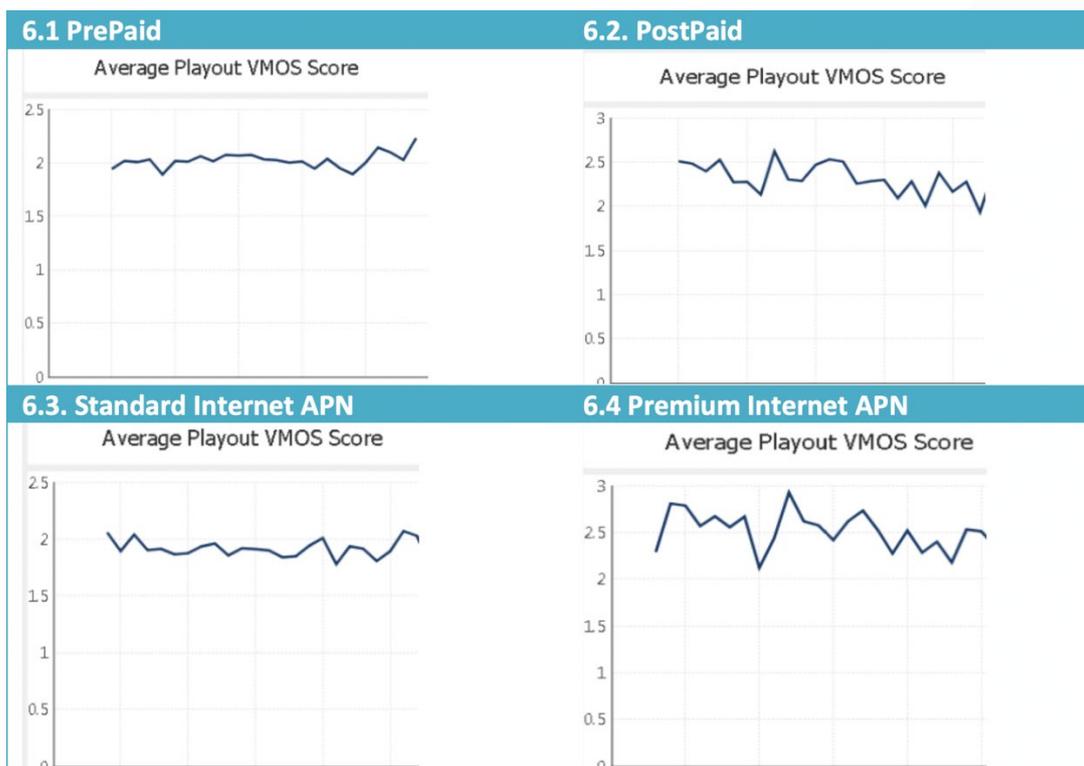


Figure 4 - KPIs for encrypted video streaming

Smartly monitoring VoLTE services

Voice services have taken on a new significance in the last few weeks as businesses and families adjust to the new reality of social distancing. So, operators need to assure and optimize voice services. Often, voice today is delivered via VoLTE, with estimates being that over two billion subscribers use such services. There are also more and more operators offering VoWi-Fi services that complement VoLTE by utilizing IMS technology to provide a packet voice service over IP via a Wi-Fi network. Usually, VoLTE calls are seamlessly handed over between LTE and Wi-Fi and vice versa as the subscriber arrives in the office or to his home.

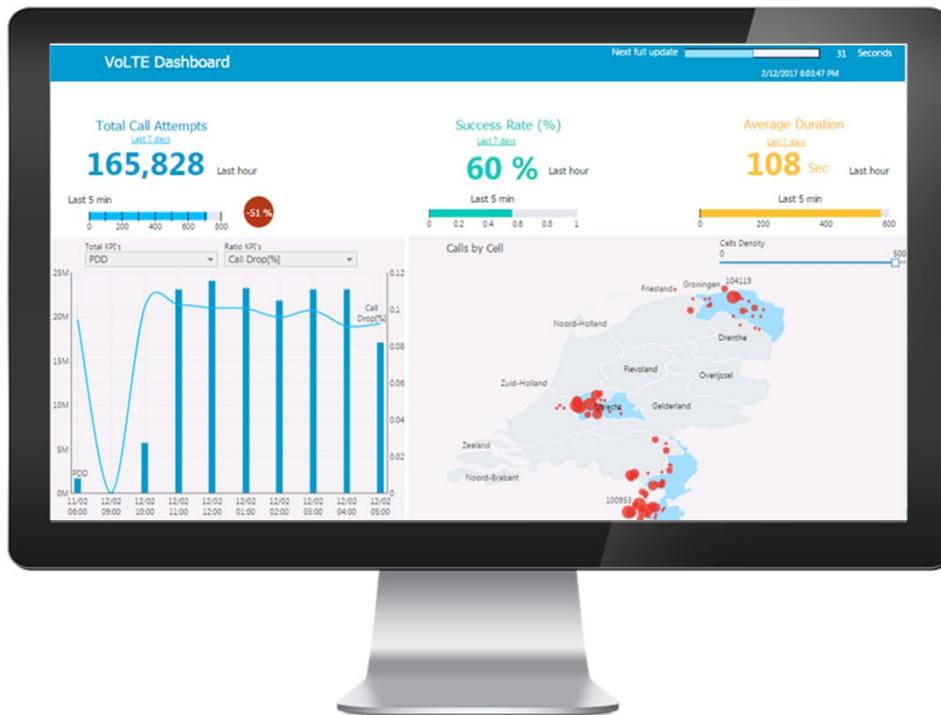


Figure 5 - Monitoring critical VoLTE using RADCOM Network Intelligence

RADCOM Network Intelligence enables operators to assure their VoLTE service quality, pinpoint issues quickly, rectify customer-affecting issues and monitor interoperability with legacy networks. RADCOM correlates end-to-end VoLTE sessions (from LTE session establishment to SIP session termination) with SIP signaling analysis and multimedia quality measurements based on RTP protocol analysis such as Mean Opinion Score (MOS) perceptual MOS (PMOS) and R-factor.

If issues in the VoLTE service are found RADCOM's cloud-based call tracing application can be used to quickly execute root cause analysis of VoLTE sessions displayed in a single view, with all the various parts of the session (voice, messaging or video session) from the LTE radio interface to the IMS core. This correlation applies to net IMS sessions as well as interoperability with legacy voice and LTE 3G fallback (SRVCC).

In VoLTE, the performance of the radio network is critical, and with RADCOM's end-to-end solution, operators gain visibility across the complete VoLTE service. RADCOM Network Intelligence efficiently monitors VoLTE and VoWiFi service quality to provide operators with the following capabilities:

- Correlate the end-to-end VoLTE customer experience with network, device, cell and service performance in real-time
- Present network element issues on a map with quick drill-downs to KPI analysis over time, and accessible analysis of other related KPIs
- Cross-protocol visibility into the call to ensure all call legs including signaling, subscriber registration, identification, authentication, policy and charging, networks interconnectivity and others, all function correctly
- Real-time traffic analysis to examine calls as they take place using versatile call trace filtering
- End-users perceptual voice call quality – P-MOS, R-Factor, packet loss and jitter to ensure VoLTE service customer satisfaction
- Multiple KPIs for optimizing the network performance for VoLTE such as worst performing elements, low performing functions using continuous calls and signaling analysis overtime, network-wide performance insights
- Support for advanced HD codecs such as EVS (Enhanced Voice Services) to gain visibility into the complete VoLTE service offering

RADCOM's voice quality engine for VoLTE and VoWiFi uses an extended ITU G.107 E-model. The PMOS engine adds the effects of loss bursts and burst recency in addition to the traditional E-model parameters. By providing a voice quality measurement that is closest to a subscriber, perceived quality operators can identify issues and optimize their VoLTE and VoWiFi services to ensure high customer satisfaction.

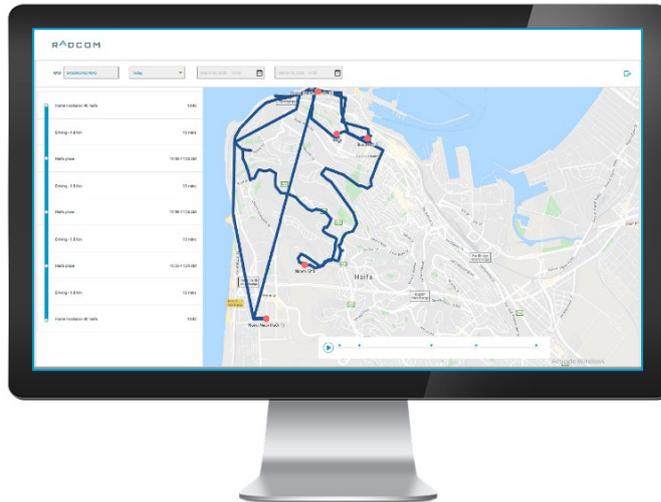
Utilizing geolocation data

RADCOM Location Tracking (RLocate) is an advanced innovative solution built for subscriber location tracking. RLocate has been adapted to support the preventive measures of the pandemic virus by enabling operators to track and analyze the location of suspected subscribers and their virus transmission spread. By utilizing RLocate operators can view historical data that shows the places visited by infected subscribers as well as understand the amount of potentially infected/isolated subscribers in a defined area. RADCOM's solution is used to help operators;

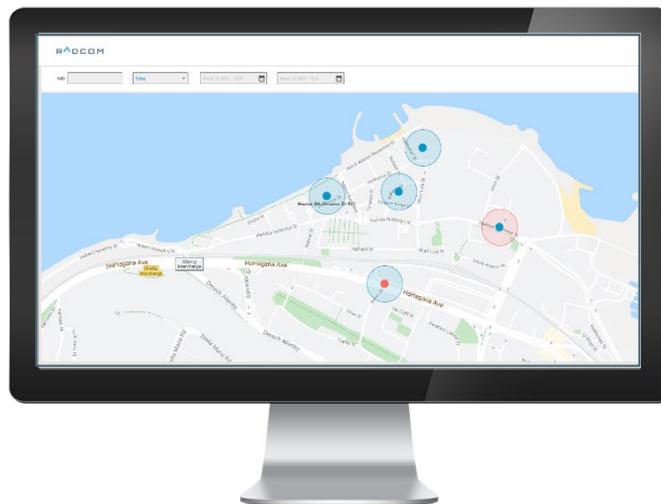
- Identify potentially infected locations
- Identify which other subscribers shared the same position at the same time
- Understand if an "isolated" subscriber stayed in the one location

There are two solutions modes available: timeline and geofencing:

- Timeline – View subscriber (IMSI\MSISDN) locations over time. Used to identify districts with high infection risk and subscribers who were in these areas.
 - Areas in which infected subscribers have visited over time.
 - High-risk locations that can help identify potentially infected subscribers.



- GeoFencing – Identify subscribers that moved out of a defined area. May be used for isolated subscribers to identify movement out of their designated area.



For more information on our RADCOM Location Tracking solution, please refer to the RLocate brochure.

Delivering a closed-loop approach to network optimization

With so much data traversing the network, the increased complexity, traffic distribution changing, and usage patterns evolving, operators need to transition to a closed-loop approach in order to optimize the network performance smartly. RADCOM Network Intelligence provides operators with such an approach by its tight integration into orchestration and the Policy and Charging Rules Function (PCRF).

Operating in real-time, the PCRF has significant importance in today's network and plays a crucial role in VoLTE as a mediator of network resources for the IMS network in establishing calls and allocating the requested bandwidth to the call bearer. RADCOM Network Intelligence proactively monitors the operators' end to end services and pinpoints network degradations before customers are impacted. This data is streamed to the PCRF, which automatically acts to optimize the network and resolve possible degradations, without manual intervention. The seamless combination of RADCOM Network Intelligence with the PCRF expedites and automates not only the detection but also the resolution of network degradations.

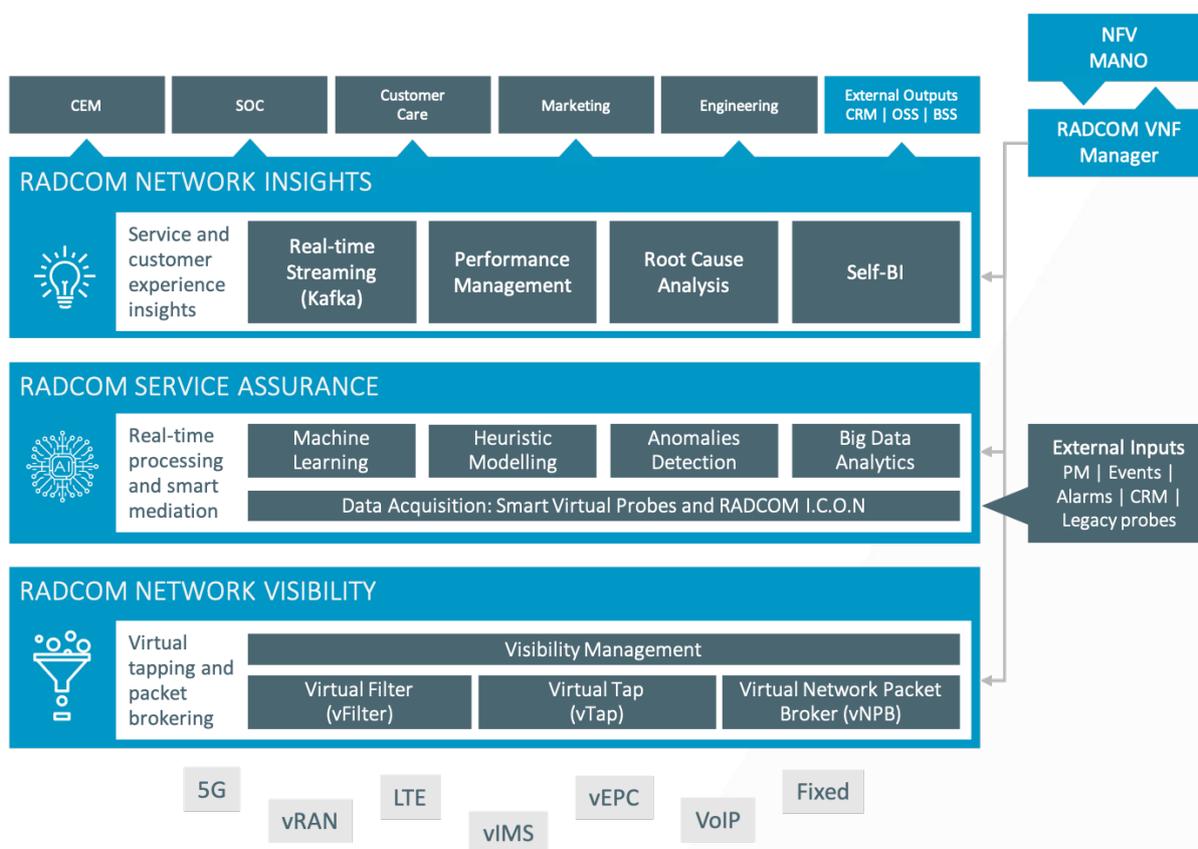
RADCOM Network Intelligence delivers a fully cloud-native, container-based architecture that seamlessly integrates within an operators' cloud orchestrator. Kubernetes (K8s) controls RADCOM's containerized components lifecycle starting from the initial day-0 instantiation and throughout the overall platform lifecycle. Being dynamic and fully integrated with the operators' orchestrator enables operators to take an on-demand, closed-loop approach to assuring and optimizing the network in these challenging times with network usage skyrocketing and subscriber habits changing.

This closed-loop approach will also be critical as more and more operators move forward with 5G and implement advanced use cases as manually optimizing the network performance will not be viable.

RADCOM's solution for telecom operators

RADCOM Network Intelligence includes; RADCOM Service Assurance, delivering virtual probe-based, service assurance using an automated, containerized solution. RADCOM Network Visibility for smart filtering of traffic from a specific service or application, as well as load balancing, and sampling. RADCOM Network Insights for business-critical intelligence and real-time information on the customer and service experience.

RADCOM's solution enables the operator to monitor its end-to-end network and service quality smartly. While also presenting an understanding of new traffic patterns, service usage, and offering troubleshooting tools for customer-affecting issues to ensure superior customer experience during these challenging times, whatever the demand.



As RADCOM Network Intelligence is fully containerized, the solution is elastic and flexible to grow and shrink with the needs of the network. It is highly efficient when utilizing network resources and adjusting itself to the needs of the operators as the traffic fluctuates. Being cloud-based, RADCOM Network Intelligence is quick to deploy even if the operator has not yet transitioned to a virtual environment.

Conclusion

As COVID-19 is changing the way we live and work, operators need to provide reliable communication platforms for people and businesses to ensure their network serves their customers in the new market conditions. To do this, operators need access to real-time, high-level, and granular information about their networks and customer experience. They need assurance solutions that provide deep insights into the network performance and correlate and visualize data in real-time.

RADCOM Network Intelligence provides critical information in a fully containerized solution empowering the operator with granular, accurate data about their network, services, usage patterns, and customer experience. While also providing cloud-based, next-generation tools such as packet analysis and call/session tracing for a low-level examination of the traffic for rapid root cause analysis. RADCOM's end-to-end suite will enable operators to adjust, plan proactively, and optimize their network during the shifts taking place due to COVID-19 to assure customers stay connected, whatever the demand.

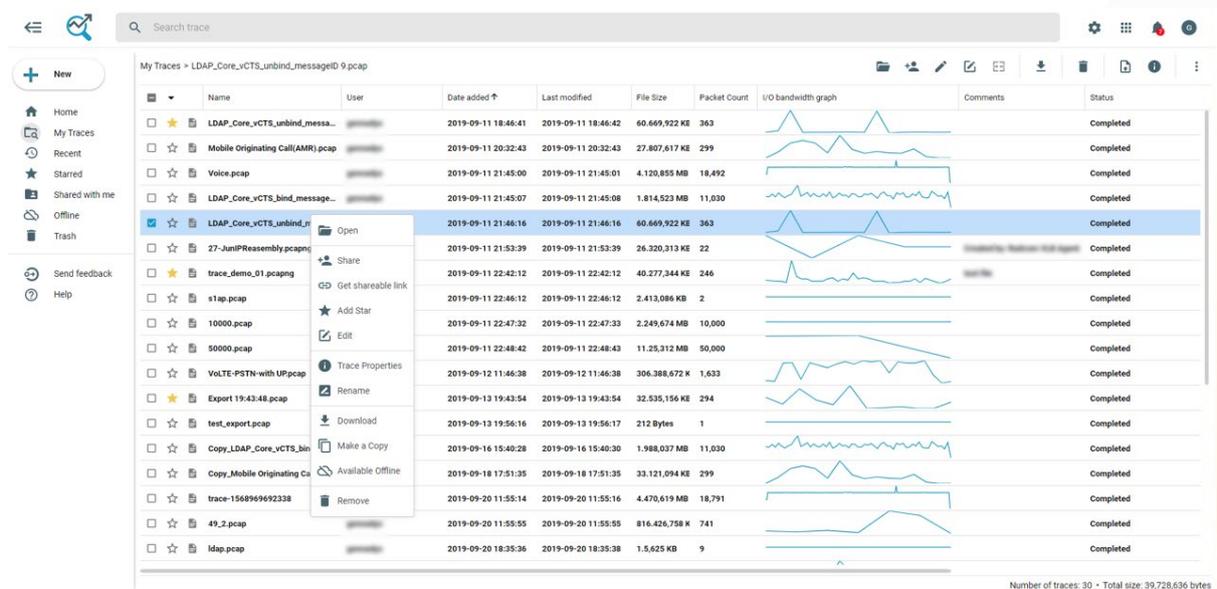


Figure 6 - RADCOM's cloud-based call/session tracing application

For a smart approach to network monitoring, choose RADCOM Network Intelligence.