Solutions for Software-Powered Networks

Amdocs 2015 State of the RAN

January 2015

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Contents

Executive summary

In this year's edition of Amdocs' State of the RAN Report, we identify trends affecting global mobile operators as they strive to deliver resilient wireless coverage and capacity, and superior services as subscriber demand for seamless quality of experience (QoE) – especially in indoor environments – continues to grow. The research is based on analysis of more than 25 million voice and data connections at some of the busiest network locations around the world with high smartphone penetration in the past 12 months.

As a bridge between mobile operators and subscribers, the radio access network (RAN) continues to be the biggest driver of mobile network experience. The exponential growth of mobile data traffic will be a long-standing trend as long as wireless coverage is available, and the RAN will continue to be strained by the persistent data demands of today's bandwidth-hungry mobile users.

Mobile operators can continue to invest in increasing capacity by hoarding costly and finite resources such as spectrum, but the rising availability of 4G-enabled devices, the increasing rate of mobile innovation, and the rate of technology evolution will guarantee that operators experience the same network traffic congestion challenges as they did with legacy networks. In order to truly future-proof existing wireless infrastructure and profitability,

it's fundamental that operators use advanced analytics supported by network automation to gain a holistic view of their subscriber needs and address demands before they adversely impact QoE. A proven method to tackle this is to optimize the use of readily-available resources on the network to enhance the customer experience.

Opportunities in the RAN

The continued roll-out of 4G LTE networks has increased broadband speeds around the globe to support a new wave of smart devices with more advanced and bandwidth-intense applications. The increasing use of smart devices, availability of flat-rate voice and data plans, and higher demand for streaming content will drive mobile data traffic to increase at a CAGR of 42.5 percent over the next five years[1]. While this presents substantial monetization potential for mobile operators capable of managing the massive increase in network traffic, the cost of adding new data capacity can rapidly erode profitability.

Operators who are able to control the delivery of mobile data on their networks will be able to translate the increase in data volumes into an opportunity to differentiate. Service providers that can deliver increasingly more data without a complete overhaul of their networks, while continuing to increase revenues and create new revenue streams, will have the competitive advantage. To do this, operators need

"SERVICE PROVIDERS THAT CAN DELIVER INCREASINGLY MORE DATA WITHOUT A COMPLETE OVERHAUL OF THEIR NETWORKS, WHILE CONTINUING TO INCREASE REVENUES AND CREATE NEW REVENUE STREAMS, WILL HAVE THE COMPETITIVE ADVANTAGE."

[1] Analysys Mason, Wireless Network Traffic Worldwide: Forecasts and Analysis 2014-2019, October 2014.

to evolve from delivering *dumb* data to delivering *smart* data. They'll need to deploy intelligent and automated network software to prioritize investment and allocate resources dynamically in order to maximize both customer experience and profitability.

Managing four generations of networks

Though the number of 2G and 3G connections are steadily decreasing, these connections will still continue to dominate overall connections for the next five years. Analysts have predicted that the number of 2G subscribers will decline by 60 percent over the next five years as mobile users migrate to next-generation 3G, 4G, and eventually 5G networks and devices[2].

Operators will eventually find themselves in the arduous situation of having to simultaneously manage four generations of networks. This will stretch their operations and resources thin, ultimately impacting their ability to guarantee a seamless customer experience.

In the short term, LTE will provide relief to network congestion. In many countries LTE acts as a fast lane technology, with a relative small percentage of subscribers having access to 4G networks or devices.

LTE networks are not experiencing capacity issues – yet – since LTE only accounts for 385 million of the global wireless connections today, but it is expected to grow to 2.3 billion by 2019[3]. Most problems with LTE are related to having the infrastructure built upon legacy networks. Some operators may not have deployed sufficient coverage or still have regions where they have yet to expand 4G into, while others haven't put enough resources into preventing interference.

Another issue for many operators is that the addition of a fourth network will greatly increase network complexity. The result is that the RAN continues to be a significant driver of mobile customer experience with 80 percent of voice drops and 50 percent of low-throughput data sessions stemming from this part of the network. This complexity will continue as operators further expand their access networks to include Wi-Fi and small cells in heterogeneous networks (HetNets).

To minimize the impact of multiple networks and create a seamless customer experience, operators need to deploy intelligent and automated solutions to help them address the increased network complexities within the limits of their operational resources. Such results can be achieved through RAN optimization technologies.

Complex networks require intelligent software

As the convoluted environment of HetNets continue to expand, operators will be forced to adapt to new technologies and approaches as they strive to ensure that maximum voice and data throughput are being delivered, and to maintain the highest possible revenue margins. Many operators are being challenged by the administration of sophisticated interactions between 3G and LTE – as well as 2G in many parts of the world. Aligning 2G, 3G, and 4G RAN technologies while providing subscribers with seamless and uninterrupted services is a difficult feat for even the most seasoned network engineers.

Amdocs recommends that operators adopt advanced network analytics software that links customer experience and demand to network performance. The resulting intelligence combined with self-optimizing network (SON) capabilities empowers operators to automatically address imbalances in network load and performance. This ultimately allows operators to address network complexity, ensure customer experience, and deliver smart capacity where and when it's needed by subscribers.
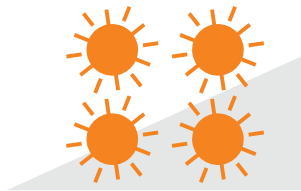
[2] Ovum World Cellular Information Service
[3] Ovum World Cellular Information Service

State of the RAN: by the numbers

Indoor mobile data traffic is growing

20%

faster than outdoor traffic

ANALYSIS

Mobile data is now being consumed when most subscribers are technically *not mobile*. Subscribers are primarily using mobile data services at their desks, on their sofas, sitting and standing at sports and concert venues, and at transport hubs such as airports and train stations. The common denominator is that 80 percent of mobile data traffic consumption is happening indoors. This traffic is growing 20 percent faster than that of outdoor traffic, and this trend is only going to continue to prevail. We found that regardless of how much a service provider increases their indoor capacity, it will *all* be consumed. In one particular indoor deployment, we even saw that the amount of data consumption doubled as the amount of indoor cellular capacity increased.

OPERATOR IMPACT

This trend has a major impact on how operators plan and deploy networks. Most existing cellular networks were established to provide wide area outdoor coverage. Indoor coverage requires much more effort because of the physical barriers – that makes it more difficult to penetrate buildings and walls, but it's something that must be addressed. As subscribers increasingly consume mobile data in indoor environments, effective capacity planning is required of existing network infrastructure in order to provide a seamless mobile experience. Whether it's through distributed antenna systems (DAS), small cells, or offloading solutions, subscribers will utilize any and all capacity if it's available – and more. With the right monetization strategies in place, new revenue streams can easily be realized.

80%
of voice call drops and

50%
of data throughput issues originate in the RAN

RAN

ANALYSIS

It's consistent across all mobile operators worldwide, the RAN remains the biggest influencer of subscriber experience. The RAN is the direct bridge between a mobile operator and its subscribers, and it's no question that any issues within the RAN will ultimately affect customer experience unless it's immediately addressed. In fact, an Amdocs survey conducted in 2013 found that 47 percent of subscriber respondents indicated that a lack of coverage for mobile Internet data was one of their top three annoyances when it came to their carriers.

80 percent of voice call drops are due to mobility issues and 50 percent of data session interruptions are triggered by capacity issues. Today's mobile users are not as forgiving as before and expect the same QoE no matter if they're static or mobile. A single dropped session can mean the difference between unhappy customers and churn, and the optimal way to address this is to understand and analyze subscriber behavior and how it affects the RAN in order to minimize or ideally eliminate coverage issues before subscribers are impacted

OPERATOR IMPACT

Network and subscriber analytics can provide real-time, location-based data from the RAN to help operators monitor network performance and address issues before they affect subscribers. By identifying congestion hotspots, service areas with limited or no coverage, and areas where capacity is over-provisioned in order to meet peak demands at any given time, operators will be able to dynamically allocate radio resources to these areas to maximize the ROI of deployed radio resources. Whether operators are manually programming where radio resources should be allocated to during certain times of the day, or have the process automated, the results are similar: a reduction in the total cost of ownership (TCO) of the network, increased QoE, and more efficient use of limited radio resources.

Operators are experiencing up to a

50%

capacity boost with LTE
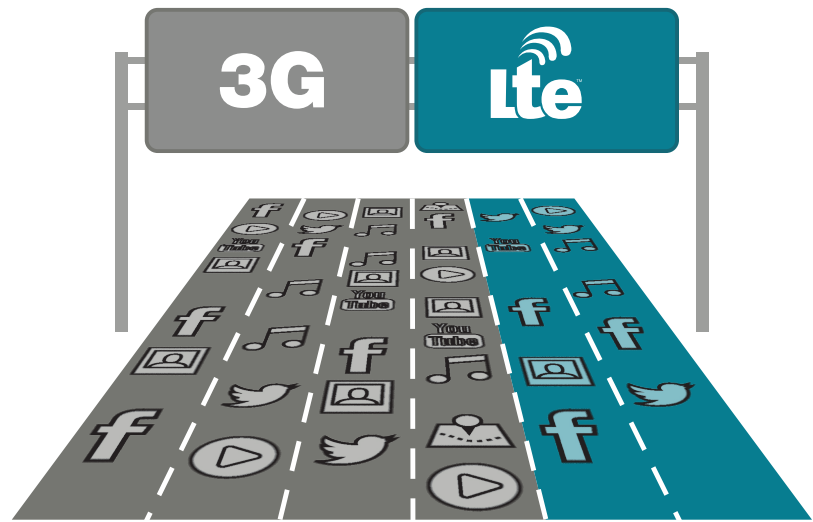
ANALYSIS

Regions where LTE is deployed are witnessing a deceleration of 3G traffic growth with only marginal increases in data throughput year-over-year. Operators running legacy networks are seeing more and more data traffic being absorbed by the LTE network, giving them a temporary 50 percent capacity boost. Though LTE is relieving some of the strain on legacy networks, data demand is insatiable and the traffic strains faced by 2G and 3G infrastructure will eventually be experienced on next-generation networks.

OPERATOR IMPACT

It's imperative that operators consider options to manage the anticipated growth in mobile traffic beyond today's architectures. LTE is still a relatively new access technology and has the potential to shift even more traffic from legacy networks. 80 percent of current LTE challenges are planning-related, but capacity will quickly become an issue as network traffic is expected to double year-over-year. The falling prices of LTE-enabled devices, increasing customer expectations, and exponential rate of technology evolution are driving the saturation of 4G networks.

There are multiple options to expand capacity, including costly investments in infrastructure upgrades and the even more costly option, to purchase additional spectrum. *Re-farming or harvesting* existing spectrum from 2G to 4G is also an alternative. However, the most cost-effective way to future-proof network investment and maximize return-on-investment (ROI) is by capitalizing on existing resources through optimization and automation solutions.

Per subscriber usage is up

100%

Dec 2013
to Dec 2014
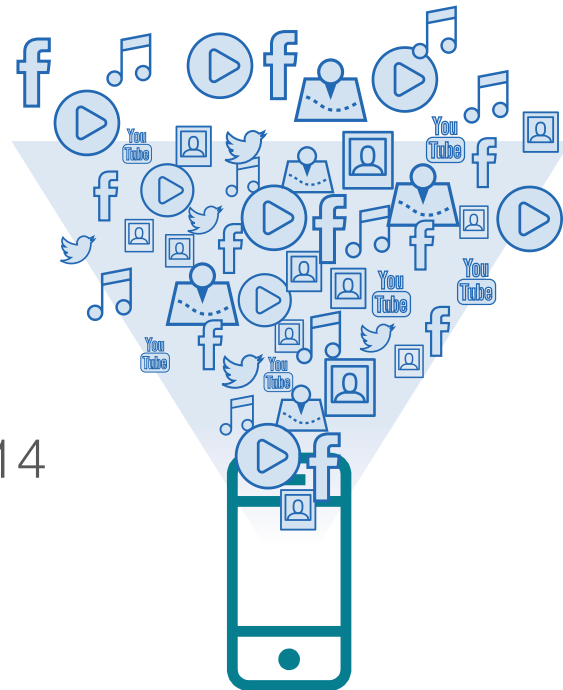
ANALYSIS

Based on analysis in global cities with high smartphone penetration, network data traffic increased by 100 percent from December 2013 to December 2014. Not only are mobile users streaming more content from sources such as YouTube and Facebook, they're also uploading more content to these outlets. The adoption of mobile devices drove the first wave of the data tsunami, but mobile content consumption and generation is currently fueling the second wave.

OPERATOR IMPACT

Without a proper data optimization strategy, operators will always be one mobile application away from a resilient network. Mobile devices have evolved from being primarily used for voice calls and simple Internet browsing to being truly smart devices with bandwidth-hogging functionalities. Smart devices are now massive data-generating machines and streaming content portals which cannot be taken lightly or else there will be significant negative impacts on the network and profitability.
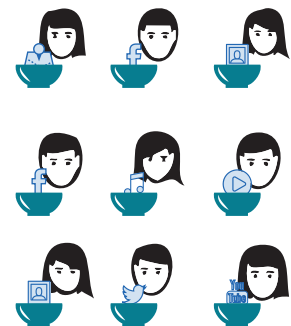
10%
of subscribers -
the Technoratis -
consume
80%
of network data

ANALYSIS

A majority of network data usage is being driven by only 10 percent of subscribers – the *Technoratis*. This segment of heavy data users consumes 3-5 times more data per session than the average user, comprising 80 percent of the overall network data.

Driven by more advanced smart devices including phones, tablets, and phablets, Technoratis engage in 65 percent longer voice and data sessions combined, and they naturally expect more resilience from their networks. If mobile apps, websites and streaming services experience longer-than-usual buffering or latency, Technoratis are quick to be disappointed and put blame on their service providers.

Technoratis are typically device-agnostic, persistently generating demand for network bandwidth regardless of which platforms they're using, whether it's iOS, Android, Windows, or others.

OPERATOR IMPACT

Operators must deliver and monetize all the capacity that Technoratis demand while still addressing the relatively lower network demands of the rest of their customer base. It doesn't make economic sense to invest in infrastructure upgrades or in more spectrum for only 10 percent of subscribers. At the same time, throttling and bandwidth caps will result in decreased QoE and in turn, unsatisfied customers, potentially causing churn.

Operators need to identify which subscriber segments are creating a majority of network demand, empowering them to target specific groups with offload solutions to alleviate demand on macro networks and reduce CAPEX. Operators can concurrently implement intelligent optimization solutions to simultaneously and automatically address this small, yet influential, segment as well as the rest of their subscriber base.

20%

of locations generate

80%

of network traffic... and problems
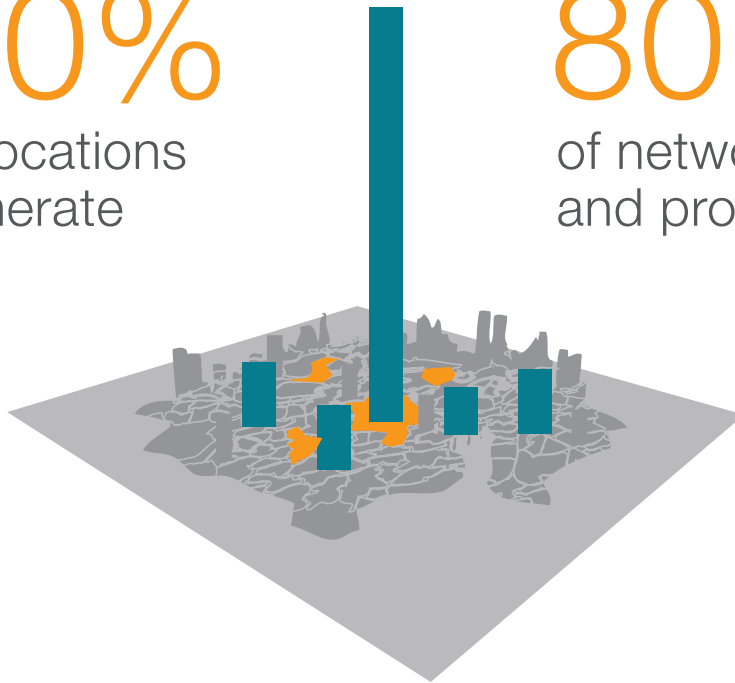
ANALYSIS

Demand for data increases across the entire range of a carrier's service area; however, it's extremely disproportionate at certain locations or "hotspots." 20 percent of service areas in major cities worldwide with high smartphone saturation generate 80 percent of network traffic.

There is a similar 80/20 rule when it comes to network problems, with 20 percent of locations responsible for 80 percent of customer experience issues. There is correlation between data demand and customer experience issues based on the impact of congestion. At the same time, poor coverage and mobility issues also cause problems where demand is low

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OPERATOR IMPACT

With the proper analysis and tools, operators can identify demand and problem hotspots outside of the obvious transport hubs, stadiums and arenas, and educational institutions.

By focusing in on the areas where most network traffic is concentrated, operators will be able to dynamically allocate capacity to where it's needed, when it's needed. At the same time, operators will be able to identify and address network issues before they impact subscribers in order to provide a seamless and superior mobile experience.

Live events cause surges in *second screens,* increasing data demand by 50%

DATA DEMAND INCREASED BY
50%

ANALYSIS

Live events are significant generators of mobile demand in a unique way. By their nature, live events put a significant load on mobile networks as tens of thousands of people congregate within a small setting. We've seen traffic surges of 50 percent at some stadiums. In certain cases, the influx of masses of subscribers into a city to attend live events, together with a general rise in chatter from city inhabitants about an event can increase network demand across the entire city by 20 percent.

The load they put on the network is distinctive. In the lead-up to events, voice and data traffic show patterns consistent with the growth and mobility of subscribers. As the event commences, we begin to witness the manifestation of second screen behavior. Voice traffic typically decreases by 50 percent during the live event while data traffic continues to grow as subscribers turn to social media and streaming video to complement their experience.

OPERATOR IMPACT

The expectation of the second screen to complement their live experience is evidence that subscribers expect the same experience they get at home watching the event as they do in-person, live at the venue. During times of major live events when subscribers demand consistent network experiences, automatic and dynamic allocation of capacity provides operators with the opportunity to demonstrate their prowess by delivering the highest levels of performance, coverage, and QoE.

iPhone 6 plus
consumes

40%

more data than the iPhone 6

ANALYSIS

When advanced users – Technoratis – switch quickly to the latest device, we see a higher uptake in data consumption. We saw this with iPhone 6 Plus users using 40 percent more data than users on the iPhone 6. However, iPhone 6 users consume 20 percent more data than users on the iPhone 5s.

Technoratis are typically early adopters of new smart devices and technologies, tend to be heavy data users, and are the catalyst for increased volumes of data consumption and greater demand for capacity.

OPERATOR IMPACT

As smart devices continue to increase in screen real estate and are becoming capable of running more bandwidth-intensive applications, it's going to generate more data traffic and contribute to network congestion. Operators must acquire actionable intelligence through subscriber analytics in order to keep up with higher data demands. By identifying subscriber segments – such as Technoratis – that utilize more advanced mobile technologies, applications, and larger screen real estate, operators can more accurately predict a service area where coverage and capacity is needed, anticipate network demands, and dynamically allocate radio resources to address these demands to ensure a consistent QoE.

Apple users consume

50%

more data per subscriber than Android users
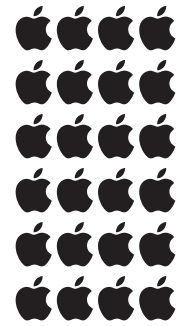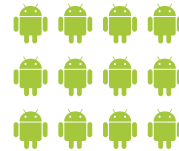
ANALYSIS

In markets with high Apple penetration, iOS devices are the key drivers of baseline mobile data demand. Technoratis aside, the Apple ecosystem lifts every subscriber's usage. (This stat is skewed slightly by the fact that our research includes higher-end Android devices comparable to iPhones all the way through to lower-end handsets.)

On average, iOS devices show 50 percent more data consumption than Android devices. Although Apple users are more consistently concentrated on higher-end devices while the Android OS is installed on a broad range of devices – from affordable handsets to premium smart devices – Apple users are typically on stand-by to engage in any offerings made by the company, whether it's a new product launch or the availability of an updated iOS.

OPERATOR IMPACT

With a strong and dedicated follower base, any changes made by Apple to iOS and mobile app providers that target the ecosystem will have an immediate impact on network demand outside out of the generational upgrade cycle of smart devices. As a result, operators must track data consumption, particularly on Apple devices, and adapt their networks to deliver the best iOS backhaul experience to ensure network resources are sufficient to address demand from a high concentration of Apple devices.

The Amdocs solution

Operators must address the challenges posed by sophisticated HetNets head-on. In today's hyper-connected world, manual processes and fragmented tools are insufficient in allowing operators to effectively manage the subscriber experience.

Gaining actionable intelligence into subscriber needs and managing the RAN in ways that enhance the subscriber experience requires advanced network analytics combined with the ability to automate actions on the network. This guarantees that the network is always-on and ready to address any issues that may impact and enhance the subscriber experience.

Amdocs offers proven independent solutions for RAN management and optimization. Our primary value proposition is to deliver more capacity, better coverage, and improved customer experiences from a mobile operator's network infrastructure.

Increase network visibility and transparency

We give operators control over their network through increased network visibility and transparency. Our multi-vendor, multi-technology software provides full visibility of network configuration, performance and customer experience.

This visibility provides actionable intelligence that enables operators to make intelligent decisions around when and how to manage and optimize their networks in order to deliver the right coverage and capacity, where it's needed, when it's needed.

Automate common management and optimization activities

A layer of customizable SON automation delivers ongoing management and optimization to improve network performance and reduce manual effort which are prone to errors.

Automation enables operators to reduce network performance problems by automatically optimizing key network parameters. It also dynamically allocates network capacity to maximize resource utilization and reduce congestion.

Tackle key pain points

We empower operators to identify priority activities in network integration, management and optimization that need to be not just done but done optimally. Amdocs' advanced software-powered services means that we deliver more efficient and effective services than anyone else.

Bridge IT departments and the network

This increases the effectiveness of operations, customer care and marketing through access to detailed network and customer intelligence. At the same time, RAN departments

"AMDOCS OFFERS PROVEN INDEPENDENT SOLUTIONS FOR RAN."

can leverage business insights to accurately plan their networks and prioritize their responses to issues.

This allows Amdocs to segment network demand and experience by subscriber, allowing a much more accurate assessment of how network performance impacts customers and how to allocate network resources for maximum ROI.

Conclusion

Our analysis of more than 25 million voice and data connections at some of the busiest network locations around the world with high smartphone penetration revealed invaluable insights to the challenges operators face in providing ever-increasing network capacity, greater coverage and consistent customer experiences. The trend of unprecedented growth of mobile data traffic will persist as long as wireless coverage is available and RAN will continue to be the biggest driver of the mobile network experience. To continually meet growing demand and address increased network complexities, operators need to deploy intelligent and automated network software to prioritize investment and dynamically allocate resources. Advanced analytics supported by network automation delivers the holistic subscriber view that operators need to address demands before they adversely impact QoE, while future-proofing their existing wireless infrastructure and profitability.

Learn how **Amdocs' Self-Optimizing Networks solution** can help mobile operators manage and monetize the increasing volumes of mobile network traffic and optimize the subscriber experience.

"ADVANCED ANALYTICS SUPPORTED BY NETWORK AUTOMATION DELIVERS THE HOLISTIC SUBSCRIBER VIEW THAT OPERATORS NEED TO ADDRESS DEMANDS BEFORE THEY ADVERSELY IMPACT QOE, WHILE FUTURE-PROOFING THEIR EXISTING WIRELESS INFRASTRUCTURE AND PROFITABILITY."

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About Amdocs

For more than 30 years, Amdocs has ensured service providers' success and embraced their biggest challenges. To win in the connected world, service providers rely on Amdocs to simplify the customer experience, harness the data explosion, stay ahead with new services and improve operational efficiency. The global company uniquely combines a market-leading BSS, OSS and network control and optimization product portfolio with value-driven professional services and managed services operations. With revenue of $3.6 billion in fiscal 2014, Amdocs and its more than 22,000 employees serve customers in over 80 countries. Amdocs: **Embrace Challenge, Experience Success**. For more information, visit Amdocs at www.amdocs.com.

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