Technology to drive wireless disruption, with service monetization mired in uncertainty

A survey of mobile operators' view of changes in the wireless industry
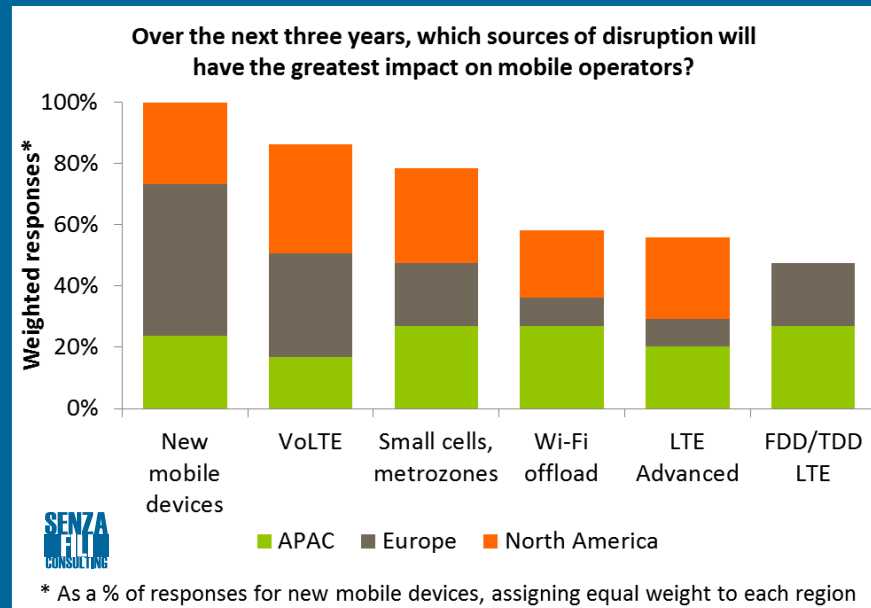
By Monica Paolini

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Executive summary

What will drive disruption in the wireless industry over the next three years? In a survey sponsored by Radisys, we posed this question to decision makers and thought leaders at mobile operators worldwide to get their personal insights. This is what we found:

▪ **New mobile devices.** They will continue to have a disruptive effect both on usage models and on traffic loads. Subscribers will do more with their smartphones and tablets, and feature phone users will drive the next wave of adoption.

▪ **Voice over Long Term Evolution (VoLTE).** Most operators are in no hurry to deploy it, but they do see it as an essential part of LTE. They do not need additional voice capacity, but they want to reduce their dependency on legacy networks.

▪ **Small cells in metrozones.** Traffic growth makes small cells a must-have, but, to extract the cost and performance benefits they promise, operators agree that they have to manage interference with the macro layer, use self-organizing networks (SON), and find cost-effective backhaul solutions.

▪ **Wi-Fi offload.** Already hugely valued, Wi-Fi offload will continue to be a main tool to increase capacity even after small cells are deployed. Increasingly, the value of Wi-Fi offload comes from residential locations, where a growing portion of the traffic comes from.

▪ **LTE Advanced.** Carrier aggregation via LTE Advanced will bring increased spectrum efficiency – i.e., lower per-bit costs and higher capacity. It will take time before the technology is adopted, but operators look forward to its benefits. We found less excitement for higher-order MIMO and beamforming.

▪ **Frequency-division duplexing (FDD) / time-division duplex (TDD) LTE hybrid networks.** Both FDD and TDD LTE will have a strong market presence, but it is too early to say how closely integrated they will be. TDD LTE allows FDD operators to deploy a small-cell underlay to increase capacity, without interference with the macro FDD layer.

Over the next three years, which sources of disruption will have the greatest impact on mobile operators?

Weighted responses*

APAC ▪ Europe ▪ North America

* As a % of responses for new mobile devices, assigning equal weight to each region

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1. Introduction: A look at sources of disruption in the wireless industry

How will the wireless industry change over the next few years? Will there be any disruption in the way mobile operators operate? If so, what will drive it? In this survey sponsored by Radisys, we posed these questions to decision makers and thought leaders at mobile operators worldwide, to get the insider view of those driving our industry instead of relying on the official corporate position.

We asked the participants in this study to complete an online quantitative survey, and we followed that up with interviews to probe more deeply, and get further insight on hot topics. Among 20 disruption drivers, we picked the top six that participants believed will have the strongest impact over the next three years.

Devices will continue to be the main driver of change in our industry. They have fundamentally changed the way subscribers use mobile broadband – why we use it, what we do with it, and how much traffic we generate. Yet there is a pervasive feeling that we have just scratched the surface and further change is coming.

The disruptive impact that smartphones and tablets have had – and will have – on subscribers is matched by a radical change of comparable scale among mobile operators. In a world where subscribers continue to increase data consumption and reduce voice usage, operators need to reexamine how they build their networks and how they sell their services.

Increasing capacity and spectrum utilization are clearly mobile operators' key strategic goals for addressing the explosive growth in data traffic. Not only do operators largely agree on this, they also seem confident that the technology and solutions they need are available or will become so in the near future. Operators feel there is a compelling evolutionary path that includes frequency-division duplexing (FDD) Long-Term Evolution

(LTE), time-division duplex (TDD) LTE, Voice over LTE (VoLTE), LTE Advanced, small cells, and Wi-Fi offload.

This brings us to what is left out from our top-six topics: specific ways to monetize, through new services, the positive disruption brought by devices and technology. Here the confidence that prevailed when talking about devices and technologies starts to wane.

Opportunities exist – machine to machine (M2M), location-based services, and premium-content and value-added video and voice services, to name a few – but no single one seems to make a compelling impression on operators. Instead, operators appear to be diligently pursuing most of these opportunities, because the pressure to generate new revenues is too strong for any of the possibilities to be ignored. But operators are unsure which of these, if any, will deliver the increase in revenues they would like to see in the next three to five years.

At the heart of this, operators feel they are disconnected from subscribers, unable to guess what they want even though operators have access to a wealth of information about them – and in real time. However, by actively managing traffic, operators can use this information to get closer to their subscribers and deliver the quality of experience and services that can support long-term revenue growth.

This paper presents the survey results across three different regions – Asia Pacific (APAC), Eastern and Western Europe, and North America – first introducing the high-level results, then focusing on the six most disruptive drivers, and finally discussing the uncertainties about service monetization and how operators can move beyond them.

2. Drivers of change: global trends

The increased availability, affordability, and adoption of new mobile devices are seen as the main source of change over the next few years. European survey participants, witnessing a rapid move to smartphones and increased adoption of tablets, but a slower path to LTE than APAC and US operators, give devices the highest rating for disruption potential.
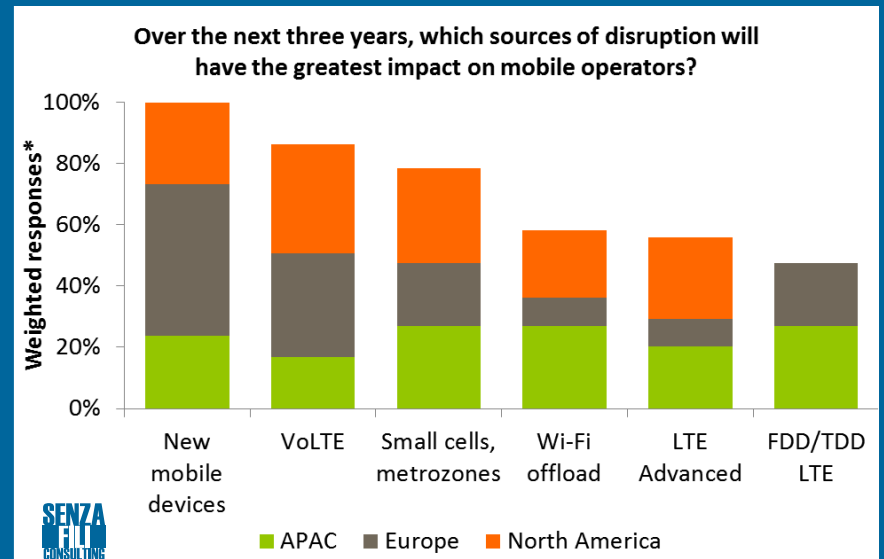
Voice over LTE (VoLTE) is the second–highest–rated driver, with most support coming from North America, which is ahead in planned rollouts, and from Europe, where VoLTE is not perceived as a short-term priority, but as a long-term supporting pillar for LTE.

Another perceived game changer is small cells deployed in high-traffic locations as an underlay to increase capacity density. This applies especially in APAC, where they tie with Wi-Fi offload and FDD/TDD networks as the top source of disruption, and in North America.
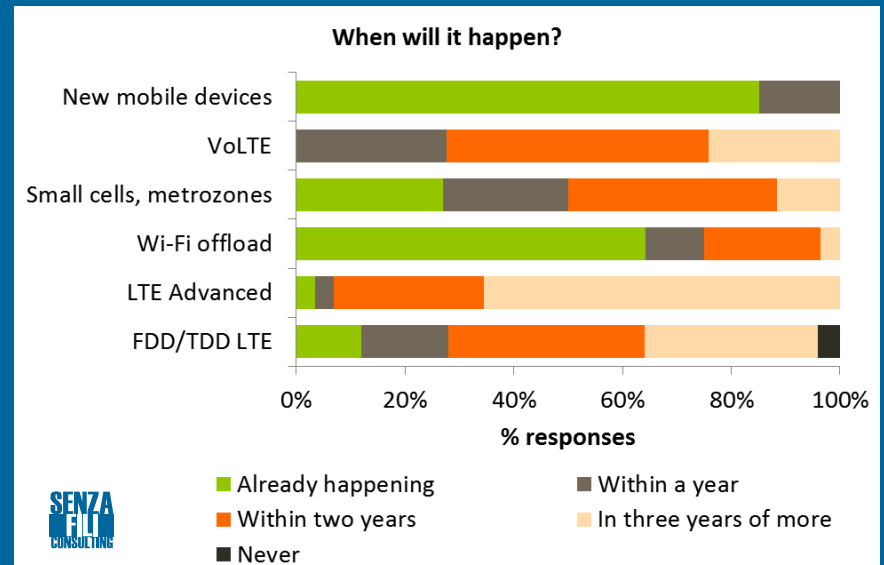
While for most operators commercial small-cell deployments are still a few years away, Wi-Fi offload is already in full swing. If anything, the role of Wi-Fi may be reduced by small-cell deployments, although most operators see the two – Wi-Fi offload and small cells – as complementary, and have no plans to remove Wi-Fi hotspots as small cells are installed.

With plans for LTE already in place, operators are now looking forward to LTE Advanced. The anticipation for LTE Advanced is stronger in APAC and North America, where LTE deployments are farther ahead. Most of the action is expected to start in three years or more – and even then, the adoption of features will be a gradual process.

Operators have a more polarized response to the combination of FDD and TDD in LTE hybrid networks to boost capacity and to create a wider ecosystem for LTE. The response depends on whether the operator has access to TDD spectrum, or operates in a market where TDD LTE is already deployed or is expected to capture many LTE deployments.

Over the next three years, which sources of disruption will have the greatest impact on mobile operators?

Weighted responses*

APAC ■ Europe ■ North America

* As a % of responses for new mobile devices, assigning equal weight to each region

When will it happen?

% responses

Already happening ■ Within a year
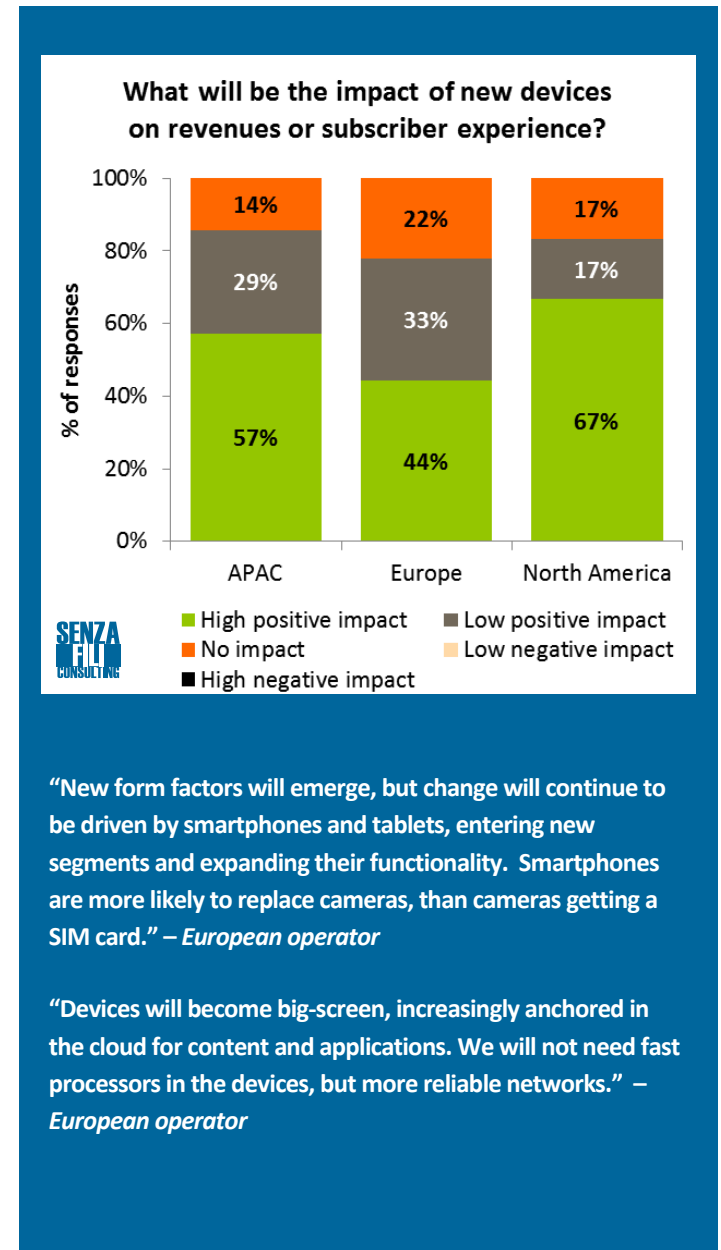Within two years ■ In three years of more
Never

3. New mobile devices

The growth in mobile broadband over the last few years has been primarily and consistently driven by the introduction of new devices and the ecosystem of applications that they were instrumental in creating. Survey participants expect this trend to continue unabated, as subscribers have only started to explore the functionality of the new devices. While new device form factors will be introduced and connectivity may be added to existing devices, the bulk of traffic and adoption, as well as revenues, will stay with updated versions of the current devices.

This is not to say that devices will remain the same. Quite the opposite: mobile devices, operating systems, and applications need to evolve both to keep up with the subscribers' increased expectations (faster devices, longer battery life, and better and larger screens) and to become more efficient in using network resources (support for multiple bands and wireless interfaces, more constrained signaling traffic, bigger antennas). As a result, we are witnessing a trend reversal: devices are no longer getting smaller, they are getting bigger. And in the future they may even be getting dumber, because applications and content will mostly reside in the cloud.

Not only will mobile devices evolve, they will also be targeted at new markets. Smartphones and tablets have become the must-have device for a demographic centered on early adopters, younger users, and developed markets. In the next phase, operators plan to go after the messaging subscribers with feature phones, to turn them into mobile broadband subscribers. It is a much larger market: emerging markets and prepaid customers, with a wider age range and socio-economic spread. But it is also a market that becomes more complex to segment and serve effectively at different price points.

Tablets have potential for creating a new headache for operators. While they operators may now worry about the traffic loads created by smartphones, tablets already generate much more traffic – and this is slated to increase as tablets evolve and more applications become available. Because most tablets today use predominantly or exclusively Wi-Fi, operators do not see the traffic on their network. As users start to see tablets as mobile and need cellular connectivity in addition to Wi-Fi, traffic volume will quickly be added to already congested cellular networks. To make things worse, compressing video traffic becomes less efficient with tablets.

What will be the impact of new devices on revenues or subscriber experience?

High positive impact — Low positive impact — No impact — Low negative impact — High negative impact

"New form factors will emerge, but change will continue to be driven by smartphones and tablets, entering new segments and expanding their functionality. Smartphones are more likely to replace cameras, than cameras getting a SIM card." – *European operator*

"Devices will become big-screen, increasingly anchored in the cloud for content and applications. We will not need fast processors in the devices, but more reliable networks." – *European operator*
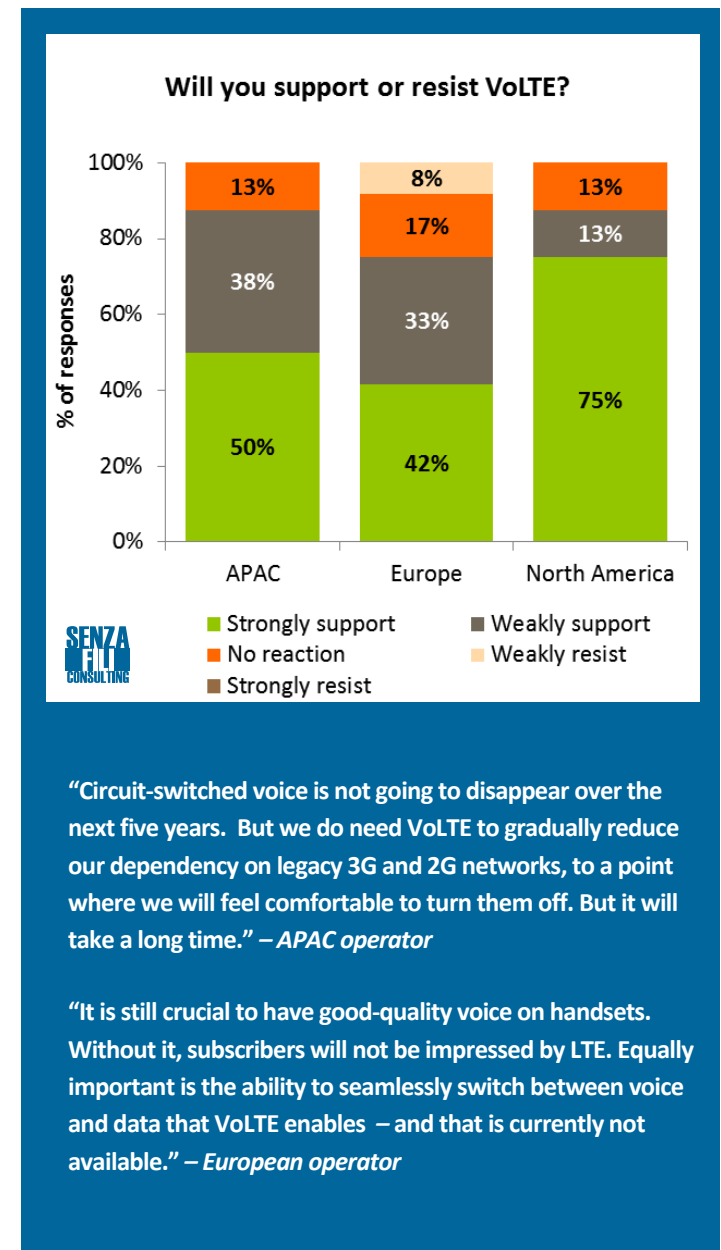
4. Voice over LTE (VoLTE)

VoLTE is almost universally recognized as a must-have, but only at a later stage of LTE deployment. Some operators want to deploy it sooner than others, but for most it is not perceived as an immediate requirement. Today, voice still generates most revenues, while using a relatively small – and decreasing – portion of network resources. Operators, as well as subscribers, are generally happy with voice services. Even if VoLTE will bring lower latency and a wider range of services, operators struggle to justify the cost and effort to deploy VoLTE now.

Operators do not plan to deploy VoLTE because they need LTE to carry voice, but because they want to move to LTE-only devices (or devices less dependent on other interfaces). For Code Division Multiple Access (CDMA) operators, LTE-only devices mean wider choice and lower costs. For all operators, they mean a reduced dependency on legacy networks, which in due time will enable them to turn off these networks, either when their spectrum lease expires or when they want to upgrade. This is a long-term strategy, however, and most non-CDMA operators will try to push VoLTE adoption farther into the future and concentrate on more pressing targets.

Some operators, however, agree that there are reasons to speed up VoLTE adoption. One is that currently LTE networks do not support concurrent legacy voice and LTE data use in the new devices, and this has a negative impact on subscriber experience. Another reason to speed adoption is that VoLTE brings a lower latency and makes circuit-switched fall-back (CSFB) more efficient.

On the other hand, the advantages of VoLTE may be lost on many subscribers. They may not even notice the change. In fact, operators will initially have to replicate the look-and-feel of CS voice in VoLTE to ensure service consistency across networks.

From a revenue perspective, there is little expectation that VoLTE will provide new revenues by allowing operators to roll out new services. On the contrary, VoLTE may put additional pressure on voice revenues if, as expected, voice services increasingly move to flat-fee plans. Indeed, among survey participants, 25% expect VoLTE to have a negative impact on revenues or customer experience.

Will you support or resist VoLTE?

Legend:
- Strongly support
- Weakly support
- No reaction
- Weakly resist
- Strongly resist

"Circuit-switched voice is not going to disappear over the next five years. But we do need VoLTE to gradually reduce our dependency on legacy 3G and 2G networks, to a point where we will feel comfortable to turn them off. But it will take a long time." – *APAC operator*

"It is still crucial to have good-quality voice on handsets. Without it, subscribers will not be impressed by LTE. Equally important is the ability to seamlessly switch between voice and data that VoLTE enables – and that is currently not available." – *European operator*
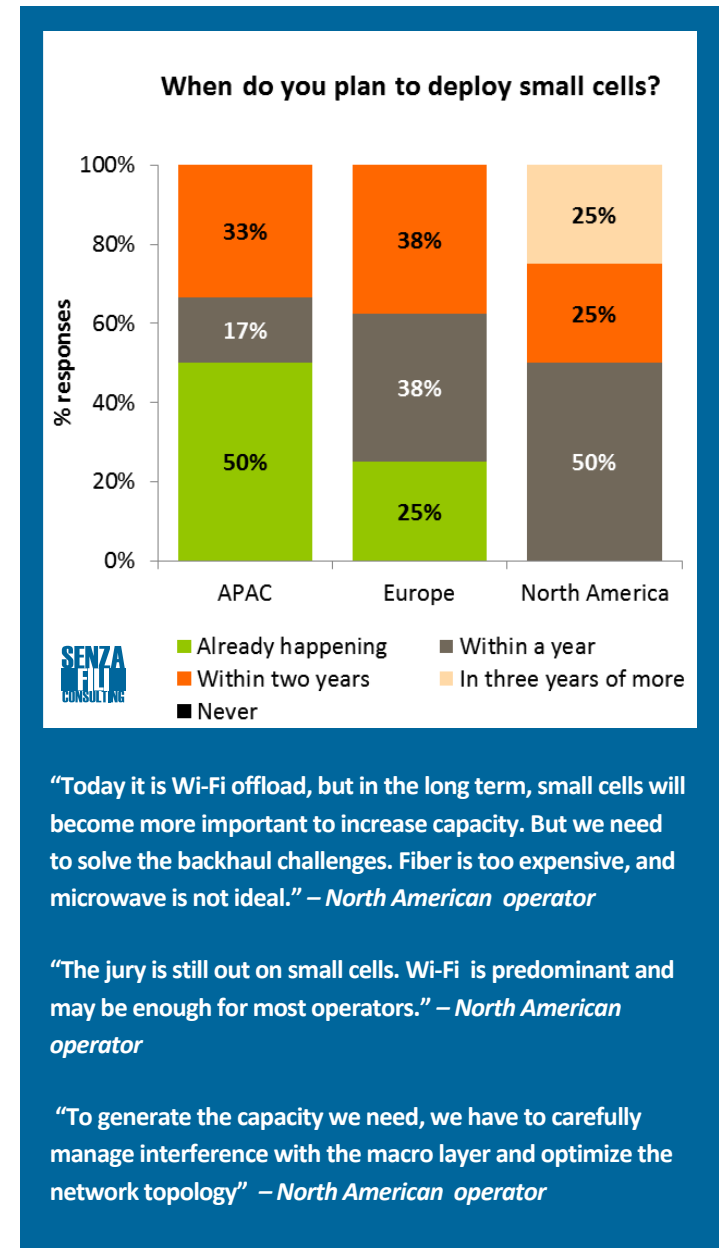
5. Small cells in metrozones

A few years ago, operators were in competition to get faster connections to their subscribers. While fast connections still feature prominently in their advertising, what mobile operators have at the top of their wish list is capacity – initially in high-density areas, but increasingly in residential areas too, where most subscribers are at peak hour, which for data is around 9:00 pm.

There are multiple ways to address the capacity crunch – more macro cells, Wi-Fi offload, small cells, and traffic management – and operators increasingly agree that all these solutions have to be concurrently deployed. While there are some dissenting voices, most operators have come to accept the need for small cells, even though some questions still hang on the business case, with a stronger sense of urgency in Asia and Europe.

While an increasing number of solutions are available, there are still multiple challenges:

- **Management of interference between the small-cell and macro-cell layers, if the same spectrum band is used.** Most survey participants are confident that it is only a question of time before this issue is addressed, and in many cases they are actively engaged with vendors in finding such a solution.

- **Network optimization.** To make small-cell deployments manageable and cost effective, self-organizing networks (SONs) are needed to automatically optimize network performance. Interoperability, a requirement in multi-vendor deployments, is perceived to be still elusive.

- **Cost-effective backhaul.** While fiber is the ideal solution, it is frequently not available or affordable in dense environments. Multiple wireless solutions are available, but none has emerged to consistently address the business-case constraints.

While most survey participants see small cells as a powerful response to traffic growth, they do not see small cells as leading to a radically new network topology, at least in the short term. Instead, they see small cells as a gradual, opportunistic solution to address capacity pressure points as operators identify them.

When do you plan to deploy small cells?

"Today it is Wi-Fi offload, but in the long term, small cells will become more important to increase capacity. But we need to solve the backhaul challenges. Fiber is too expensive, and microwave is not ideal." – *North American operator*

"The jury is still out on small cells. Wi-Fi is predominant and may be enough for most operators." – *North American operator*

"To generate the capacity we need, we have to carefully manage interference with the macro layer and optimize the network topology" – *North American operator*
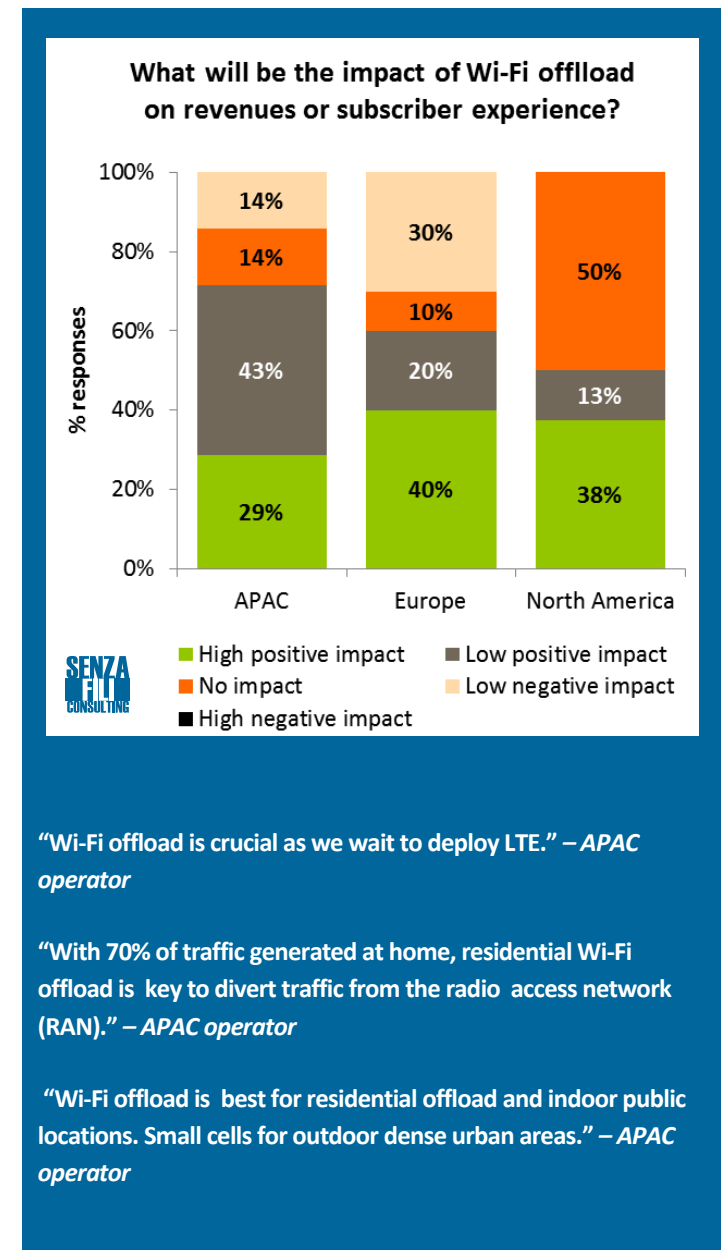
6. Wi-Fi offload

As operators wait for their LTE networks and their small-cell deployments, many have a Wi-Fi offload solution already in place to relieve some of the congestion in their networks. Even though in some cases Wi-Fi was initially deployed as a temporary solution, the operators we talked to are keen to retain their Wi-Fi infrastructure and/or roaming agreements after deploying LTE and small cells.

Wi-Fi and cellular are seen as fundamentally complementary technologies, each contributing to increased capacity density. For many operators, the Wi-Fi and cellular interfaces address different targets, with Wi-Fi expected to cover indoor locations primarily, and small cells preferred for outdoor locations.

But the paramount value of Wi-Fi does not come from public hotspots. It comes from residential environments, where the ubiquity of Wi-Fi in mobile devices and in the subscriber's home makes Wi-Fi offload effectively free to the mobile operator. Of course, this is bad news for residential femtocells, which are more expensive to provide and more complex to operate than Wi-Fi. Most of the surveyed operators view femtocells as a niche solution that is nice to have, but with limited disruptive power.

The impact of Wi-Fi offload is widening, and the way operators integrate Wi-Fi within their networks is changing. Some operators that have not yet deployed their own Wi-Fi hotspot infrastructure plan to do so soon, or to establish partnerships with Wi-Fi access wholesalers. Those that already have Wi-Fi offload in place continue to expand the locations where they offer Wi-Fi access and extend the network of partners to provide domestic and international roaming.

Because Wi-Fi carries an increasing portion of the traffic generated by mobile subscribers, survey participants indicated the need to make Wi-Fi connections more transparent, to enable subscribers to seamlessly move between cellular and Wi-Fi, and also to be able to retain more control over the subscribers' experience of Wi-Fi offload. In this context, survey participants mentioned the ability to provide SIM-based authentication, improved standards for traffic management across Wi-Fi and cellular interfaces, and access-aware applications on the devices as useful tools to improve the Wi-Fi experience.

What will be the impact of Wi-Fi offload on revenues or subscriber experience?

- ■ High positive impact ■ Low positive impact
- ■ No impact ■ Low negative impact
- ■ High negative impact

"Wi-Fi offload is crucial as we wait to deploy LTE." – *APAC operator*

"With 70% of traffic generated at home, residential Wi-Fi offload is key to divert traffic from the radio access network (RAN)." – *APAC operator*

"Wi-Fi offload is best for residential offload and indoor public locations. Small cells for outdoor dense urban areas." – *APAC operator*
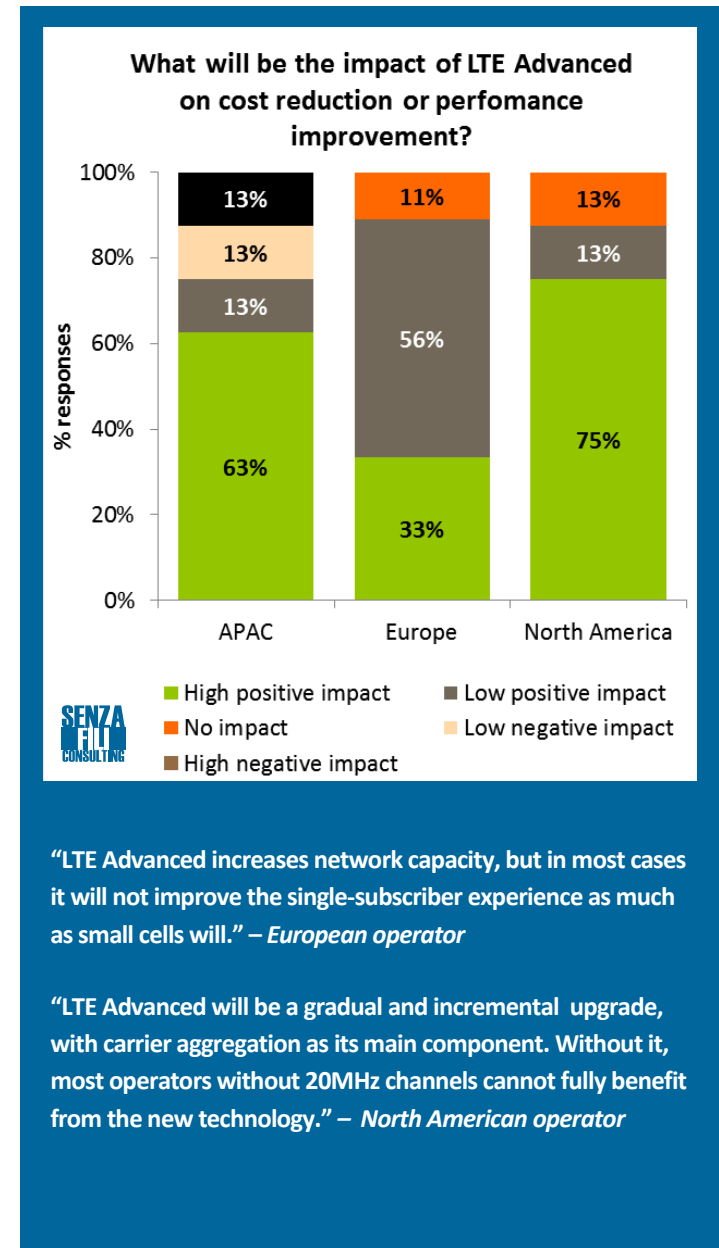
7. LTE Advanced

Again, capacity comes to the fore as the main driver to deploy LTE Advanced, as it was for small cells and Wi-Fi offload. As the next step in the evolution of LTE, surveyed operators see LTE Advanced as a clear step forward, and they expect to adopt it. However, they do not expect to see much happening for another two to three years, if not more. For operators still planning their LTE networks or in the early deployment phases, there is no sense of urgency. Their current focus is still on LTE, and they see no need to move to LTE Advanced yet, even if it were available.

Overall, North American survey participants are more optimistic about the opportunity that LTE Advanced offers, both in terms of improving subscriber experience and revenues, and in reducing costs and improving performance. And they expect to deploy it earlier: 67% of North American survey participants expect LTE Advanced to be deployed in two years, compared to 33% in Europe and APAC. This is in line with the more accelerated LTE deployment timeline in North America.

LTE Advanced will not be a one-step upgrade, but rather it will include a set of tools, from which operators will decide which ones to adopt. As a result, the impact on costs, performance, and revenues will vary greatly across operators: they may select a small set of software upgrades or choose more extensive upgrades, such as higher-order multiple-in multiple-out (MIMO) or beamforming, which require new hardware installations as well.

While many operators are skeptical about the benefits of higher-order MIMO and beamforming, there is wide consensus that carrier aggregation will be widely deployed from the beginning because of its improvement of spectrum efficiency and consequent lowering of per-bit costs.

A major strength of LTE is its ability to use wide channels, but, to benefit from this feature today, operators need to have large spectrum allocations. In most cases, they do not have the required amount of spectrum, or the financial resources to buy it if available. Carrier aggregation allows operators to combine multiple narrow spectrum bands to create the wide channels that optimize LTE performance.

What will be the impact of LTE Advanced on cost reduction or perfomance improvement?

Legend:
- High positive impact
- Low positive impact
- No impact
- Low negative impact
- High negative impact

APAC: High positive impact 63%, Low positive impact 13%, Low negative impact 13%, High negative impact 13%
Europe: High positive impact 33%, Low positive impact 56%, No impact 11%
North America: High positive impact 75%, Low positive impact 13%, No impact 13%

"LTE Advanced increases network capacity, but in most cases it will not improve the single-subscriber experience as much as small cells will." – *European operator*

"LTE Advanced will be a gradual and incremental upgrade, with carrier aggregation as its main component. Without it, most operators without 20MHz channels cannot fully benefit from the new technology." – *North American operator*
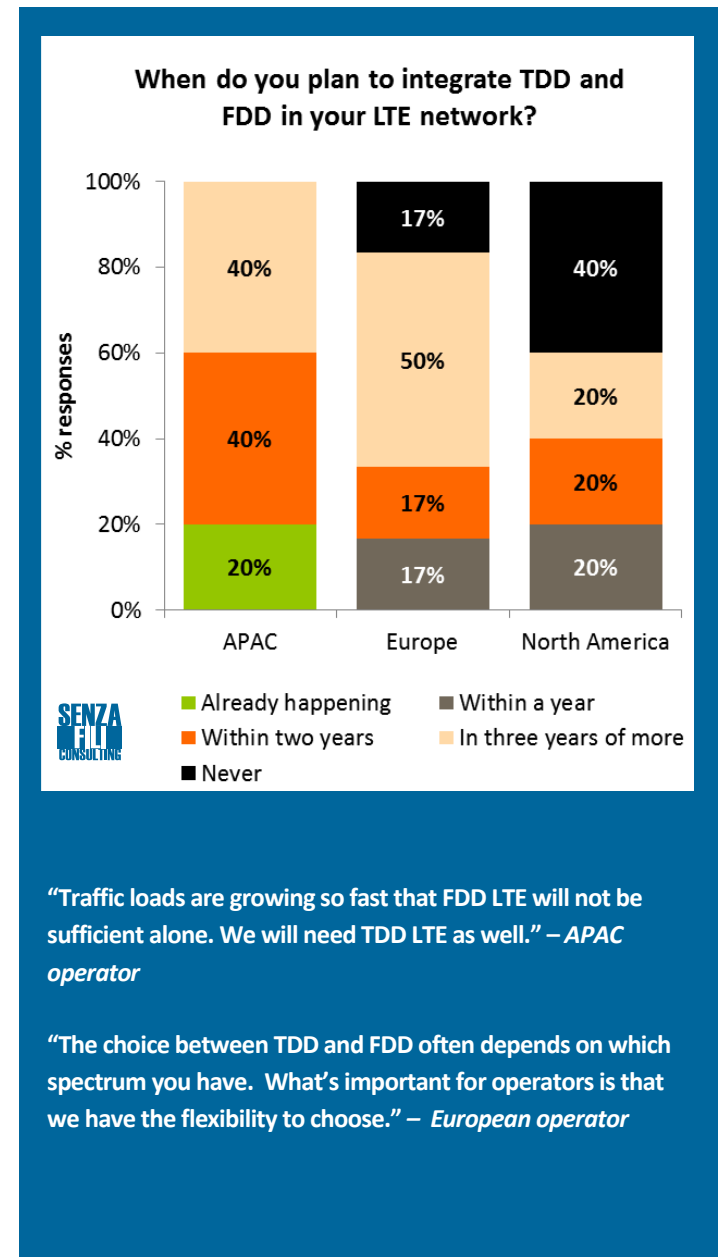
8. FDD and TDD coexistence within LTE

As with small cells, Wi-Fi offload, and LTE Advanced, the major drive to deploy a hybrid TDD and FDD LTE network is capacity. Operators may deploy one version of LTE and, then, plan for a second network when needed and if they have spectrum. In particular, some FDD LTE operators consider TDD LTE to inject capacity in dense areas using less-expensive and higher-frequency spectrum than that used for FDD. This approach allows them to avoid the interference between the macro-cell and small-cell overlay in networks that use a single spectrum band.

Vendor and mobile operator commitments make clear that there is room in the market for both versions of LTE. And while the strongest supporters of TDD LTE are in APAC, and of FDD LTE are in Europe and North America, both technologies are, and will continue to be, adopted worldwide. The two interfaces are complementary, and typically operators do not get to choose whether to use TDD or FDD in their allocated spectrum – regulators usually decide this. Regardless of operators' preference, the availability of both TDD and FDD LTE gives operators more flexibility in the adoption of LTE.

The underlying commonalities between the two versions of LTE mean that devices can support both TDD and FDD modes, and that TDD and FDD networks can be integrated. Will it happen? Or will TDD and FDD networks develop in parallel along separate tracks? It is too early to tell how close TDD and FDD LTE will grow, but we received interesting insight from our survey participants.

Geography clearly plays a role. APAC operators have shorter-term plans to deploy TDD LTE, and in some cases they are actively focused on both versions. Many European and North American operators are still evaluating the technology and deciding whether or not to support TDD LTE.

Even operators that plan to deploy just one or the other face the issue of how the two versions will coexist, because the development of a common LTE ecosystem will benefit them, and a market split between TDD and FDD may increase costs and reduce choice for everyone. For operators that are considering both technologies, the development of a common ecosystem is crucial to their decision. They do not want to have handsets that support only one version, because they cannot expect subscribers to have two phones – or even two dongles.

When do you plan to integrate TDD and FDD in your LTE network?

"Traffic loads are growing so fast that FDD LTE will not be sufficient alone. We will need TDD LTE as well." – *APAC operator*

"The choice between TDD and FDD often depends on which spectrum you have. What's important for operators is that we have the flexibility to choose." – *European operator*

9. A conspicuous absence: Service creation and monetization

No specific driver related to service creation and monetization made it to the top six, but during the interviews, this was the general topic that survey participants most consistently indicated as the one that worries them most. So why didn't it make it to the top? Possibly because survey participants do not believe that they – or their competitors, for that matter – see a clear path forward. Today's uncertainty means that service creation and monetization are seen as a challenge, but not (yet) a source of disruptive change. Although everybody agrees that change is necessary, there was little clarity as to what will bring on change or on how sweeping that change will have to be to address the current imbalance between increasing costs and performance, on one hand, and decreasing revenues, on the other.

Operators feel that they are offering more, but receiving less. Competitive pressure in nearly saturated markets leaves them without the ability to simply increase prices. They want to introduce new services and charging models, enter new markets like M2M, and improve subscriber segmentation, but they do not know the most effective way to reach these goals. This is where disruption is most needed – and yet a wait-and-see attitude prevails.

This reaction may strike an outsider as quite odd. After all, mobile data in terms of traffic and subscribers is growing at an amazing pace, especially in comparison with the slow but unstoppable decline in voice revenues. Subscribers rave about the devices and applications in ways that are rare to see in other industries. Why do mobile operators find it so difficult to capitalize on the growth in mobile data?

From the interviews, we got a sense that operators are actively exploring many opportunities, solutions, and approaches, but that they are not confident that any of them will bring in sufficient revenues to justify a big bet. However, as they continue trialing and assessing different solutions, they risk spreading attention over too many targets and delaying the launch of new services, charging plans, or applications.

> "We cannot afford to manage traffic growth without a corresponding increase in revenues. We have ways to increase capacity, but we can not necessarily afford it."
> – *European operator*

> "We look forward to LTE and the ability to prioritize traffic to target the high-end market with services such as video conferencing, content delivery, and gaming. Subscribers see mobile as a gateway to content." – *APAC operator*

> "Counting packets is not the way to make money." – *North American operator*

> "We need new, more dynamic, application-based revenue models. Using a tonnage-based charging system is not sustainable in the long term. You do not want to charge everybody the same way: it has to depend on subscribers' behavior." – *North American operator*

> "We have to move away from flat, speed-based plans; these are blunt instruments. We need to gain a more granular ability to provide to customers what they want. It may be off-peak pricing or application-based options. I do not think anybody has figured it out yet, but thinking broadly about the industry, once we have figured it out there will be a cascade effect." – *North American operator*

> "Real-time rating is needed, but difficult to implement. Many operators still stick to unlimited plans because they do not know how to implement real-time rating, or have not even tried." – *North American operator*
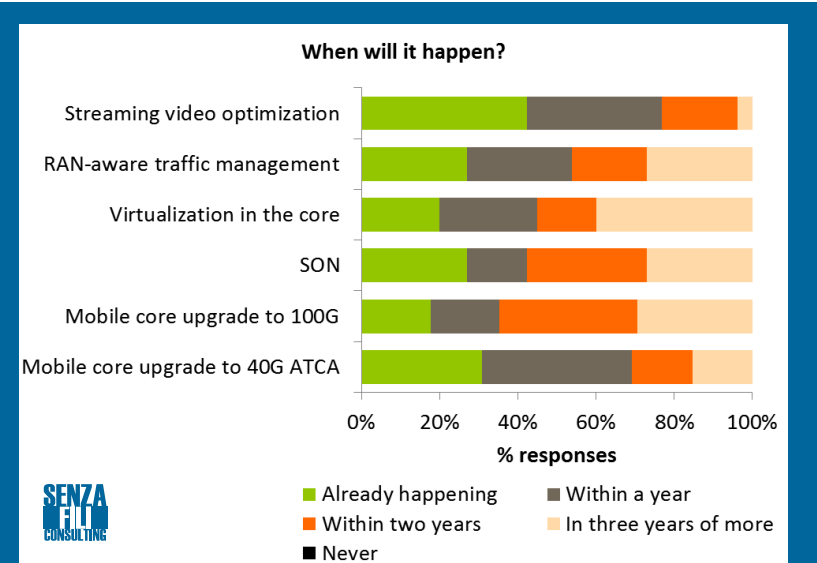
10. Conclusions: Taking charge of the mobile broadband experience

A common concern operators expressed is that they feel distant from their subscribers, unable to predict what they want and to shape services in a personalized way. Yet, among all the players in the value chain, from device vendors to content providers, mobile operators are the closest to subscribers – they know where they are, what they do, and what devices they use. Nobody else has the same granularity of information on mobile users in real time, along all these dimensions. Facebook may know all about our social life, but not as much as operators about what we do with our mobile devices.

This information is crucial to improving the mobile broadband experience and to fine-tuning services to match network resources to subscriber expectations and behavior. To date, mobile operators have largely failed to actively leverage this precious information asset by actively managing traffic all the way from the devices to the core network. And they have had many good reasons for this: they initially had no need and no desire to increase the complexity of their systems, and they lacked the tools to do so.

The availability of tools has increased in the last few years and changes are afoot in traffic management and service enablement. The increasing load on the network was the first driver for exploring traffic management tools such as streaming video optimization or policy, and enablers such as the 40G Advanced Telecommunications Computing Architecture (ATCA) platform or 100G transport in the core. Increasingly, however, the attractiveness of traffic management comes from a reversal in the mobile operators' approach. Rather than containing data growth (i.e., data caps and throttling), we should expect operators to promote more services and increased data consumption.

This is the right call. Restricting traffic growth blocks service monetization. More services and more traffic create more pressure on the network, though, and require a more sophisticated take on traffic management, one that is attuned – in real time – both to what subscribers want and to what the networks can do. Better network utilization and user experience are the best ways mobile operators have to sustainably increase their revenues, and to keep up with the network improvements needed to further drive growth.

When will it happen?

Streaming video optimization
RAN-aware traffic management
Virtualization in the core
SON
Mobile core upgrade to 100G
Mobile core upgrade to 40G ATCA

% responses

Legend:
- Already happening
- Within a year
- Within two years
- In three years of more
- Never

"RAN-aware real-time traffic management brings the operator closer to what subscribers wants to do, when and where they are." – *European operator*

"We are currently upgrading to 40G ATCA. Enablement in the core is key to provide a fast service. Every link in the transport chain needs to be high-speed." – *North American operator*

"A major challenge in the network today is to optimize network performance to give the best service that is possible. Right now, operators spend a lot of money and resources to tune the network, with unsatisfactory results. Automatic network tuning with SON brings a reduction in costs, better network tuning, and minimized disruption." – *European operator*

"In five years, we will no longer have the static machines we have today. Virtualization in the core provides the resources and flexibility needed in future networks, where change is endemic." – *European operator*

About Radisys

Radisys (NASDAQ: RSYS) is a leading provider of embedded wireless infrastructure solutions for telecom, aerospace, defense and public safety applications. Radisys' market-leading ATCA, IP Media Server and COM Express platforms coupled with world-renowned Trillium software, services and market expertise enable customers to bring high-value products and services to market faster with lower investment and risk. Radisys solutions are used in a wide variety of 3G & 4G / LTE mobile network applications including: Radio Access Networks (RAN) solutions from femtocells to picocells and macrocells, wireless core network applications, Deep Packet Inspection (DPI) and policy management; conferencing and media services including voice, video and data, as well as customized mobile network applications that support the aerospace, defense and public safety markets.

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About the author

Monica Paolini, PhD, is the founder and president of Senza Fili. She is an expert in wireless technologies and has helped clients worldwide to understand technology and customer requirements, evaluate business plan opportunities, market their services and products, and estimate the market size and revenue opportunity of new and established wireless technologies. She has frequently been invited to give presentations at conferences and has written several reports and articles on wireless broadband technologies. She has a PhD in cognitive science from the University of California, San Diego (US), an MBA from the University of Oxford (UK), and a BA/MA in philosophy from the University of Bologna (Italy). She can be contacted at monica.paolini@senzafiliconsulting.com.