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White Paper

Understanding today's smartphone user

Demystifying data usage trends on cellular and Wi-Fi networks
Part 2: An expanded view by data plan size, OS, device type and LTE

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Foreword

This work is an extension of a collaborative white paper published in February 2012 by Informa Telecoms & Media and Mobidia. We have been overwhelmed by the positive and constructive feedback we have received to the original paper and the level of debate it has sparked from a truly global audience.

As we outlined in our original work, the analysis and interpretation of such a vast set of data is inevitably an iterative process that evolves over time. Thanks to the continued drive from the team at Mobidia to push the level of detail that can be extracted from their platform, we are delighted to again be able to present new and much-demanded insights into smartphone usage behavior.

The primary objectives of this series of white papers remain unchanged:
• To identify how smartphones are evolving the way users consume services on mobile devices
• To assess the impact of different access technologies, devices and applications on usage
• To highlight and account for variations between and within different global mobile markets

And, most importantly:
• To articulate the implications of such changes for a global audience of industry stakeholders

The insights laid out within the report advance the discussion outlined in the original white paper in a number of ways, including:
• Expanded sample size based upon a sub-segment of 1.4 million My Data Manager users
• Expanded to analyze usage on both Android and iOS devices
• Expanded to assess usage patterns on both smartphones and tablets
• Expanded to assess the impact of pricing plans on consumption patterns
• Expanded to compare emerging usage trends on LTE-capable smartphones

As we clearly stated in the original paper, it is important that the insights contained within this report are always interpreted with a clear sensitivity to and understanding of the methodology used in collating the data and the composition of the sample used. Importantly, the size of the Mobidia sample has expanded significantly in all major markets; more than 1.4 million users globally have downloaded the application and approximately 50% of active users have agreed to share data with Mobidia on a strictly opt-in and anonymous basis. The overall sample analyzed consisted of more than 100,000 users globally.

The significant growth in the sample size lends further confidence to the validity of the trends identified and represents a statistically significant and growing class of today's smartphone users. This may not yet represent the entire mass-market smartphone user base, but there can be no doubt that, as operators continue to educate and notify their customers about data usage, the behavioral traits of the sample will begin to filter through into broader market segments. Furthermore, we have received validation from several external parties that suggest that the Mobidia data closely reflects actual usage statistics taken by operators from their own networks.

In some cases, the analysis is restricted to Android smartphone users only and is clearly stated wherever this is the case. This is due to limitations imposed by inherently closed nature of the iOS operating system that currently prevents the extraction of more granular usage information.

As we have done on numerous occasions since publishing the first white paper, Informa Telecoms & Media and Mobidia will be delighted to take up the discussions presented should any reader wish to:
• Obtain a more detailed overview of the methodology
• Exchange views on the insights elaborated
• Make suggestions for trends that could be explored in future papers
• Request a custom snapshot of usage data for a particular market, operator or application

Finally, I would like to extend a warm thank you to everybody who has interacted with us since the publication of the initial white paper. Your knowledge has been invaluable in helping to unlock the secrets hidden deep inside the vast datasets and to uncover relevant and meaningful relationships that help to take the discussion forward. I would like to give particular thanks to the teams at Mobidia (Chris Hill, Eric Eden, Allison Lenters) and Informa (Shalia Mughal, Olivia Gibney) for their support in making this possible.

I look forward to continuing the discussion.

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Market context: The role of Wi-Fi and the redefinition of the cellular network value proposition

The importance of Wi-Fi to the everyday smartphone user experience is now beyond question. Far from being a technology that is used to back up cellular networks or to "offload" during periods of congestion, Wi-Fi is now established as the primary means of data connectivity for a large and growing base of users. There are already innovative start-up operators emerging, such as Republic Wireless in the US, whose business models are based entirely upon this concept of the primacy of Wi-Fi.

As the adoption of smartphones continues to rise within markets and customer segments globally, so too does consumer and enterprise dependence on Wi-Fi. One of the most fascinating aspects of this reliance upon Wi-Fi has been the fact that the trend has largely been shaped by the users themselves; users came to realize that the Wi-Fi found in their homes and offices could offer a superior and, crucially, lower-cost alternative to cellular networks. And it is becoming increasingly clear that these same users are coming to expect their in-home or in-office Wi-Fi experience to be replicated wherever they go and at every point of their day-to-day lifestyle – from the journey to work on the bus, train or metro, at their favorite lunch or coffee spot and in all their favorite places of leisure – from bars and restaurants to libraries, sports stadia and concert venues.

In fact, research has repeatedly shown that smartphone users are actively voting with their feet and with their phones by reserving their custom for businesses that are able to provide Wi-Fi connectivity when they are on their premises. In the longer term, it's reasonable to expect that most customer-facing businesses will be forced to provide some form of Wi-Fi connectivity to their customers.

With the connected home now firmly the domain of Wi-Fi in markets with high fixed-broadband penetration and Wi-Fi also increasingly blanketing locations associated with portable usage, it is becoming apparent that the key to unlocking the maximum value of cellular networks in these markets is by reverting to their original heritage – the provision of communications and connectivity services in truly mobile situations.

In this context, operators may be forced to redefine and restate the value of cellular networks to their users to differentiate the cellular value proposition from Wi-Fi. This redefinition is likely to be on the basis of characteristics such as always-on availability, the simplicity of access to the network, the reliability and stability of connections and by winning customer trust on the basis of underlying security and privacy.

If operators are able to educate consumers about these inherent advantages, operators will not only be better placed to ensure the continued relevance and importance of cellular networks, but will also be able to justify a continued premium to Wi-Fi, especially compared with access to unmanaged hotspots that are owned and operated outside the domain of the professional service provider.

Mobile network operators should also be encouraged by the fact that cellular networks are typically used for time-critical high-urgency interactions that are of high perceived value to the customer, such as maps, location-centric information, checking sport scores, updating social networks or sending and receiving voice and text communications in real time. Conversely, consumers choose to consume applications or services that have high bandwidth requirements, but which are often of lower overall perceived value to them, on Wi-Fi networks.

Another strategy that many operators are pursuing is the deep integration of Wi-Fi into their existing cellular networks to the extent where their customers would be passed automatically across different access networks with little or no awareness of these transitions taking place. A key goal of this approach will be to reduce any perception of a different experience between the cellular and Wi-Fi networks for the end users. This can deliver customer benefits, but operators have yet to state a clear or convincing case for how they will be able to monetize traffic that will in the future be delivered via Wi-Fi in increasing volumes. There are certainly markets where customers do not perceive public Wi-Fi to be free, but in the world's most advanced Wi-Fi markets, such as the US and UK, operators will have to fight against the fact that the vast majority of their customers today perceive data usage over Wi-Fi to be free. It is certainly no coincidence that major venue owners, such as Starbucks or McDonald's, have switched their entire hotspot footprints to a free-to-end-user model; it is because their customers demand it. The customer experience on a managed public Wi-Fi network will be set apart from unmanaged Wi-Fi in terms of the quality of the experience, security and ease of access, but it is not yet proven that those benefits will be able to ensure that Wi-Fi traffic can be monetized at a level that approaches anything close to the revenue generated by usage on cellular networks.

And there are still other questions that have yet to be addressed. It is difficult to envisage any near- or medium-term scenario where the grip of Wi-Fi over the provision of data access inside the connected home or office is loosened and yet customers will continue to demand cellular network coverage inside these buildings due to their need to be accessible for traditional voice and messaging services delivered over cellular networks. In a world where the perceived and actual value of these "legacy" services is increasingly being eroded through commoditization and fragmentation, operators will need to build a carefully constructed business case to justify the expansion of their 4G networks outside areas of major population concentration, especially if the consumption of data over those networks is likely to be constrained by user dependence on Wi-Fi in the home.

In the first paper, we demonstrated the importance of Wi-Fi to Android smartphone users and speculated that such dependence would be replicated on other advanced, data-centric smartphones. With the expansion of the sample to include iOS devices, we can now confirm that Wi-Fi is as central to the iOS experience as it is on Android smartphones – in fact, even more so.

Fig. 1: Active Wi-Fi users as a percentage of total smartphone users by OS, selected countries, May-12
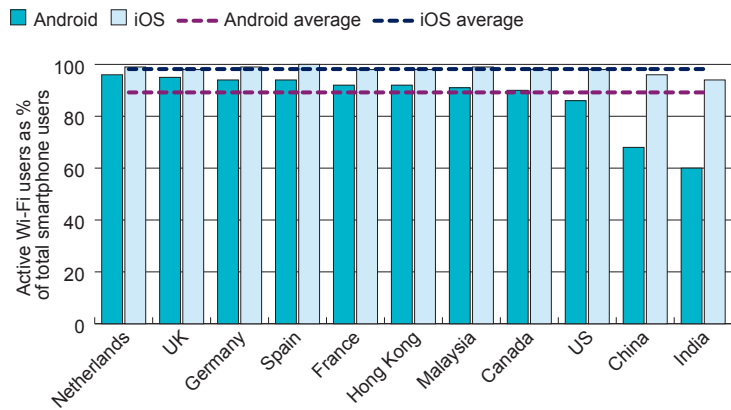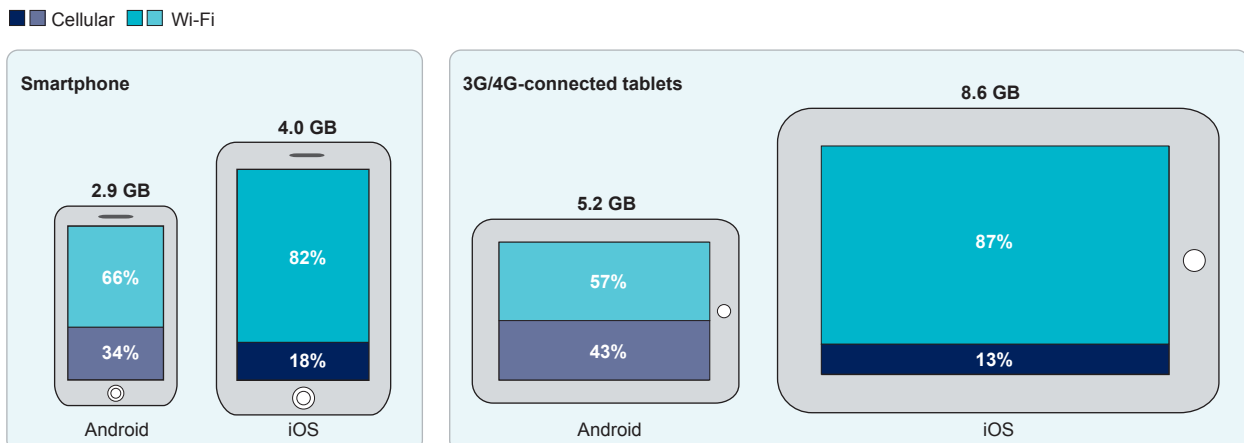

Source: Mobidia

According to the Mobidia sample, 98% of iPhone users are active users of Wi-Fi – this compares with 89% of Android smartphone users. Interestingly, both the iPhone and Android samples show remarkable consistency across markets in terms of the level of Wi-Fi adoption (see fig. 1) by users of those platforms. The near universal use of Wi-Fi on iPhone is not necessarily surprising. The iPhone has always been intended for use with Wi-Fi networks – in fact, there are many important and popular applications or functions that are restricted to use solely when the device is connected via Wi-Fi or to a PC directly. The fact that iPhone is still a distinctly high-end product also means that buyers of these devices are statistically much more likely to have access to Wi-Fi, either at home or in the office, due to the strong correlation between household income levels and fixed broadband availability.

While the same is also true of many smartphones using the Android platform, there are a number of factors that are likely to dilute the overall penetration of Wi-Fi usage on Android, most notably the fact that Android devices have penetrated into a much more diverse range of customer segments and user profiles where the probability of a user's ability to access Wi-Fi may be lower.

Fig. 2: Global average data traffic (MB per month) by access technology by OS by device type, May-12

Source: Mobidia

Comparing usage behavior on iOS with Android smartphones

Until now, smartphone usage data shared by operators has typically shown Android smartphones users to be the heaviest consumers of data compared with all other smartphone platforms. This is supported by the Mobidia sample data, which shows monthly cellular consumption on Android smartphones to be 39% higher on average than on iPhones (see fig. 2). This variation in consumption seemingly flies in the face of the fact that Android devices

are more likely to have been purchased by users in segments that could reasonably be expected to demonstrate lower overall usage compared with the higher-end iPhone.
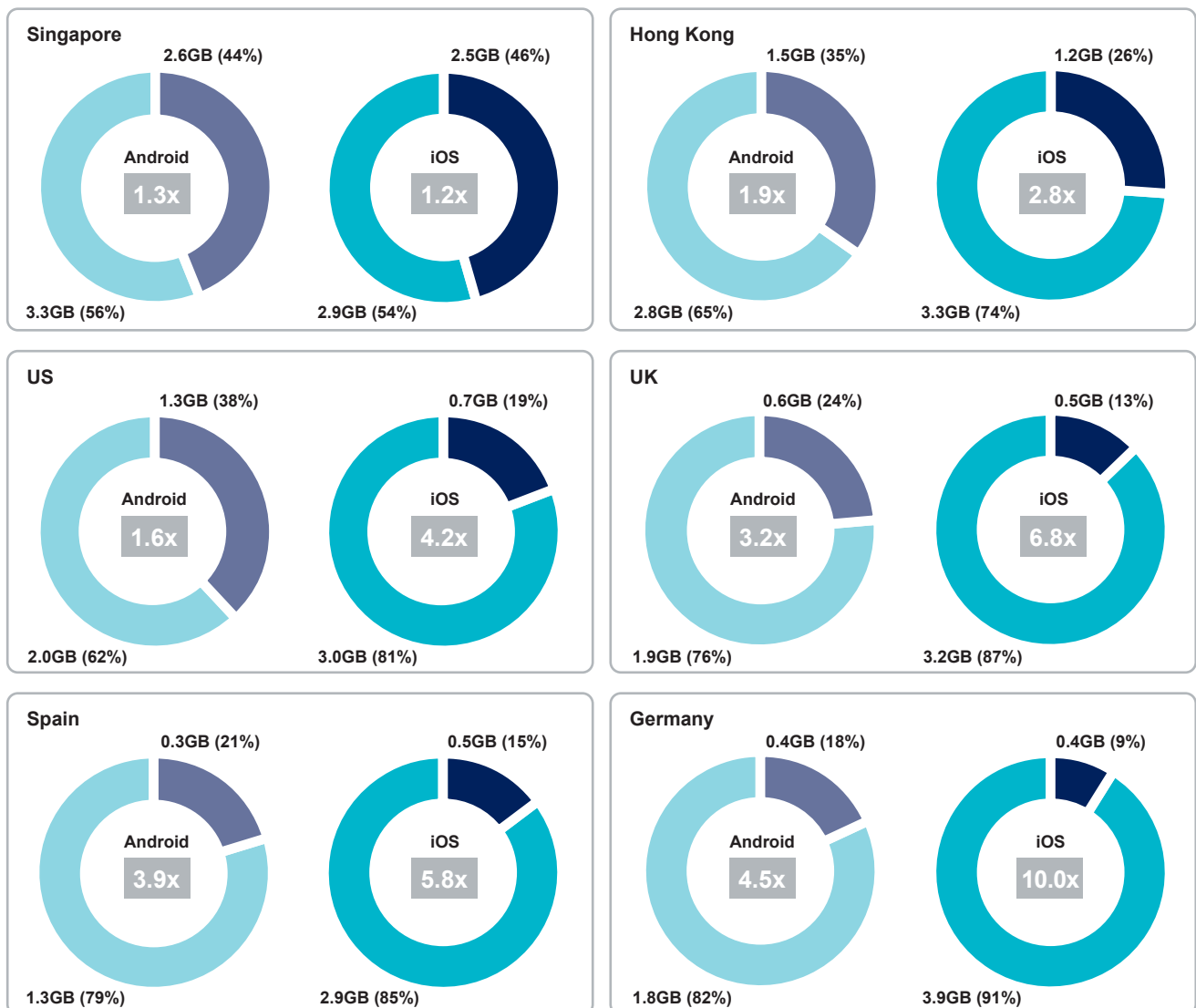
In order to try to square this apparent circle, a variety of reasons have been put forward to explain why Android smartphones may consume more cellular data on average, including: the larger screen sizes and more powerful processors prevalent on many Android devices; their ability to connect to higher peak cellular network speeds via HSPA+; their less efficient or optimized

use of networks; and even being tied to plans with more generous data allowances.

While all of these are indeed contributing factors, it is now clear that the single biggest reason for the difference is that iOS devices simply consume more data over Wi-Fi than Android devices. In fact, it is clear that restricting the analysis of smartphone data usage solely to cellular networks fails to accurately represent the full picture because of the exclusion of comparative benchmarking of variations in Wi-Fi usage across different

Fig. 3: Smartphone-originated data traffic (MB per month) distribution by OS, selected countries, May-12

■ Wi-Fi ■ Cellular ■ Wi-Fi – cellular ratio

Singapore

Android **1.3x**
2.6GB (44%)
3.3GB (56%)

iOS **1.2x**
2.5GB (46%)
2.9GB (54%)

Hong Kong

Android **1.9x**
1.5GB (35%)
2.8GB (65%)

iOS **2.8x**
1.2GB (26%)
3.3GB (74%)

US

Android **1.6x**
1.3GB (38%)
2.0GB (62%)

iOS **4.2x**
0.7GB (19%)
3.0GB (81%)

UK

Android **3.2x**
0.6GB (24%)
1.9GB (76%)

iOS **6.8x**
0.5GB (13%)
3.2GB (87%)

Spain

Android **3.9x**
0.3GB (21%)
1.3GB (79%)

iOS **5.8x**
0.5GB (15%)
2.9GB (85%)

Germany

Android **4.5x**
0.4GB (18%)
1.8GB (82%)

iOS **10.0x**
0.4GB (9%)
3.9GB (91%)

Source: Mobidia

operating systems. In the case of iOS smartphones, this substantially underestimates the overall usage patterns of users.
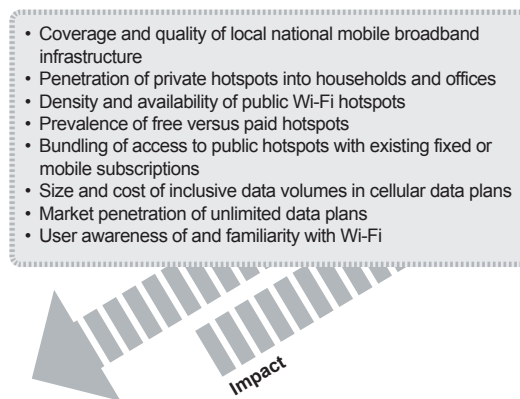
So, although iOS smartphones show lower cellular usage on average, their overall usage is in actual fact materially higher than Android once Wi-Fi usage is factored into the equation. According to the Mobidia data, the average iPhone consumes just over 4GB per month, compared with around 2.9GB per month on Android, a gap of around 37%. This difference is entirely made up by heavier reliance on Wi-Fi-based usage, which averages 3.3GB per month globally and is over two-thirds higher compared with Android (see fig. 2).

It is difficult to generalize about trends across a diverse set of smartphones and markets, but, based upon existing research, the factors that have the most significant impact on overall consumption are:

1. Lower dilution of expansion into prepaid and lower-spending customer segments
2. The impact of the App Store and iTunes in driving greater relative application and content consumption
3. Higher concentration of tech-savvy users on iOS smartphones relative to Android
4. Simplicity and usability of the connection manager for Wi-Fi on iOS smartphones

Interestingly, the trends at a global level are replicated in virtually all markets worldwide. Indeed, iPhones out-consume Android smartphones in total monthly traffic demand in almost all of the markets analyzed in Mobidia's sample data. There are a few notable exceptions to the patterns with Singapore representing the largest divergence from the trends seen elsewhere. In Singapore, smartphone

Fig. 4: Selected factors that have an impact on the distribution of traffic across cellular and Wi-Fi networks

- Coverage and quality of local national mobile broadband infrastructure
- Penetration of private hotspots into households and offices
- Density and availability of public Wi-Fi hotspots
- Prevalence of free versus paid hotspots
- Bundling of access to public hotspots with existing fixed or mobile subscriptions
- Size and cost of inclusive data volumes in cellular data plans
- Market penetration of unlimited data plans
- User awareness of and familiarity with Wi-Fi

Impact

Source: Informa Telecoms & Media

users are not only far more voracious consumers of data (see fig. 3), but also rely more heavily on cellular networks to deliver a greater proportion of their overall connectivity needs.

There are numerous factors that have an impact on the relative distribution of traffic across cellular and Wi-Fi networks (see fig. 4), but in the case of Singapore the single most important explanation is the cost and size of the cellular data bundles offered by the market's operators.

According to the data-plan information shared by users of My Data Manager in Singapore, more than 80% of Android smartphone users enjoy an inclusive monthly data allowance of more than 5GB compared with less than 5% of Android smartphone users in markets such as the US, the UK, Germany or Spain (see fig. 5).

The impact of the broad market penetration of very large monthly data bundles on usage patterns in Singapore can be witnessed in the consumption levels of popular applications such as YouTube. The average active user of YouTube on an Android smartphone consumes over 300MB per month in Singapore, more than three times the average volumes witnessed in the US.

Fig. 5: Share of Android smartphone users with inclusive monthly data volume of >5GB, selected countries, May 2012	
Singapore	84.9%
US	1.8%
Hong Kong	1.7%
UK	0.8%
Germany	0.8%
Spain	0.3%
Source: Mobidia	

Just as there are variations across different countries and regions dependent upon the technology structure of those markets and the divergent strategies adopted by carriers with respect to mobile broadband, Wi-Fi deployment and mobile data pricing, so it is also possible to assess the impact of different strategic and tactical decision-making within a single market.

One of the clearest demonstrations of the impact of aggressive data pricing strategy on usage is seen in the UK market, where 3 UK's aggressively priced and marketed unlimited plans have resulted in the operator's users consuming higher levels of cellular data to the order of several multiples (see fig. 6).

According to Mobidia data, 3 UK has approximately 31% of its Android smartphone base on unlimited plans,

almost double the next highest competitor (T-Mobile with 18%) and several multiples higher than the remaining operators, all of whom have around 5% or less of their equivalent users on unlimited data plans (see fig. 7).

What is perhaps most fascinating is that, despite the material increase in usage over 3 UK's 3G network due to its aggressive cellular-data-pricing strategy, there is no apparent substitution of demand from users for traffic delivered over Wi-Fi. Indeed, the average Wi-Fi usage amongst 3 UK's Android and iOS smartphone users is broadly in line with the average UK usage of around 2GB per month on Android devices and around 3- 3.5GB per month on iOS (see fig. 6). This helps to indicate a strong case for the fact that in-home usage of Wi-Fi is not significantly impacted by changes in consumption on cellular networks; in fact, it leads to the conclusion that additional or elastic cellular usage stimulated by changes in cellular data pricing models is both complementary and, ultimately, incremental to well-established Wi-Fi-based usage.

The patterns are also repeated when looking at relative consumption on 3G/4G-enabled iOS and Android tablets. Android tablets typically generate higher overall cellular consumption on average, but the overall consumption levels

Fig. 6: UK, average smartphone-originated data traffic (MB per month) by OS and operator, May-12
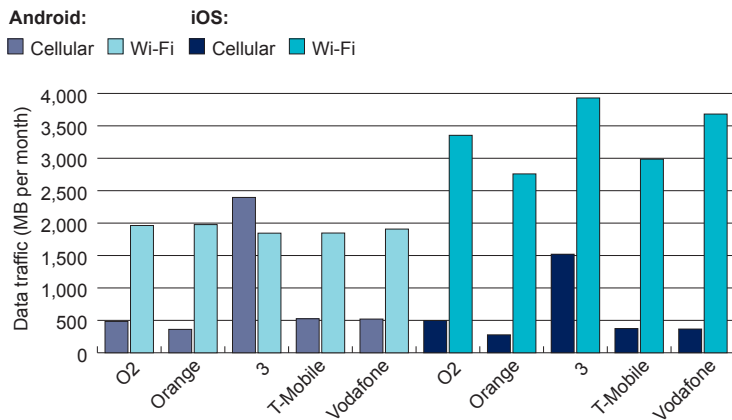
Source: Mobidia

once Wi-Fi is factored in are dwarfed by the usage levels recorded on iPads (see fig. 2). When comparing usage on tablets versus smartphones, there is a clear similarity in terms of the overall distribution of traffic across cellular and Wi-Fi networks, suggesting that consumption patterns on tablets bear a close relationship to their smaller smartphone equivalents. In terms of absolute volumes on tablets, the average monthly usage is approximately double the average recorded on smartphones.

The higher cellular consumption on Android tablets could be due to the popularity of the seven-inch screen form factor (e.g., Samsung Galaxy Tab 7), which would encourage a greater degree of portability and therefore a

more frequent requirement for access to cellular networks.

Understanding the impact of data plan allowances on cellular and Wi-Fi consumption

Mobidia's My Data Manager allows users of Android smartphones to monitor their data usage relative to their monthly subscription plan by inserting details of their inclusive data allowance into the application and receiving regular notifications as they deplete their inclusive data through each monthly billing cycle. This data allows us to derive a range of intriguing insights into variations in smartphone usage behavior between users on different types of price plans. It is also possible to understand previously closely-guarded information about average utilization levels of inclusive data allowances and to estimate the percentage of customers that exceed their monthly plans.

The Mobidia data demonstrates unmistakably that there is a natural increase in cellular-based usage as customers migrate to data plans with higher inclusive allowances. As is perhaps to be expected, there is a

Fig. 7: UK, Android smartphone user distribution by data plan type and by operator, May-12
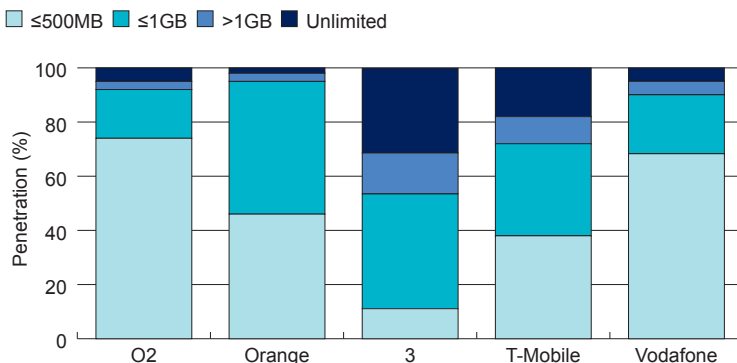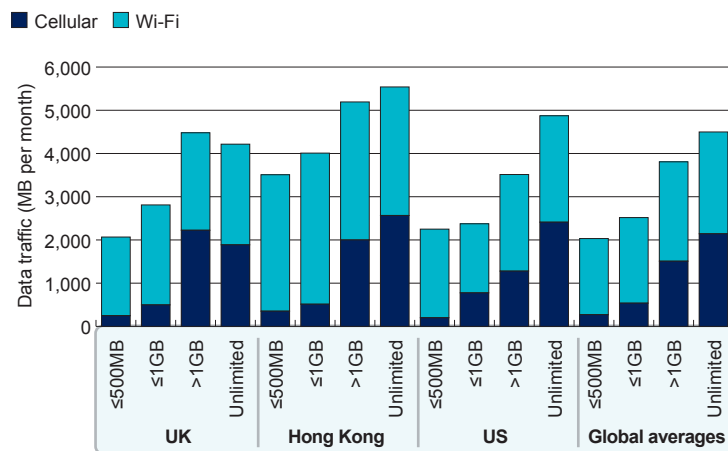
Source: Mobidia

clear step-change in the volume of consumption with each transition to a higher bundle (see fig. 8), but what is more surprising is the fact that even low-volume cellular users, i.e. those with an average cellular data bundle size of 500MB per month, or less, show a healthy appetite for Wi-Fi. In fact, there is surprisingly little variation in monthly Wi-Fi usage between users in all cellular data-plan categories. So, while a cellular-only analysis reveals an eight-fold multiple in average cellular usage between users in the 500MB or less per month category and those on unlimited cellular plans, an analysis of combined demand across cellular and Wi-Fi networks highlights that the gap in usage is much less pronounced at a multiple of just over two.

The data appears to support the theory that there is a ceiling for indoor demand for data on small-screen devices in each market, if we reasonably assume that the vast majority of Wi-Fi usage today takes place indoors. In the UK, this ceiling is quantified by the Mobidia data at around 1.8-2.2GB per month, a level that is mirrored by usage levels measured in the US. It is, however, clear that in some markets this ceiling can be pushed higher as is the case in Hong Kong, where the numbers suggest a cap at around 3.0-3.5GB per month. The higher overall usage in markets such as Hong Kong, Singapore and other developed Asian economies can be explained by the advanced development of the mobile data markets, and also because of the relative importance of mobile-centric Internet usage compared with fixed-Internet alternatives. There is no question that a material proportion of in-home Wi-Fi usage on smartphones can be accounted for by the migration or substitution of usage from laptops or PCs that would otherwise have been the go-to device of choice.

Fig. 8: Smartphone-originated traffic by access technology by user data plan type, selected countries and global average, May-12

Source: Mobidia

In absolute terms, the data shows that an increase in cellular usage also coincides with an increase in the absolute volume of Wi-Fi consumed, although a user's reliance on Wi-Fi as a percentage of overall traffic consumed diminishes in parallel. Whereas users on data plans with an inclusive allowance of 500MB per month or less in the UK use Wi-Fi for 87% of their total usage, this drops to 50% for users with plans including 1GB or more of cellular data. In the US, there is a similar drop-off from around 80% to 55%, while in Hong Kong the decline is from 89% to 61%.

What the data also appears to show is that, where it is available, Wi-Fi remains the default choice of the consumers – perhaps largely down to the tendency of the device to switch automatically to "home" or "preferred" hotspots whenever in range. The fact that Wi-Fi usage remains largely unchanged also implies that the majority of incremental cellular usage that is stimulated by changes in a user's price plan takes places away from locations where demand had typically been concentrated, i.e., the incremental usage is generated in situations that are either mobile or portable.

The expansion of Wi-Fi to cover a growing percentage of locations typically associated with "portable usage" must therefore be considered carefully since it is very likely that any rise in Wi-Fi usage in these locations will come at the direct expense (i.e., substitute) cellular usage due to the fact that well-entrenched user behavior gravitates users towards Wi-Fi wherever it is available and where it is freely and easily accessible. That is not to say that this is necessarily an undesirable impact since this could well be the explicit aim of the carrier to drive usage onto carrier-owned or managed Wi-Fi networks and thereby relieve some burden on cell sites that are perhaps more heavily loaded during busy hours.
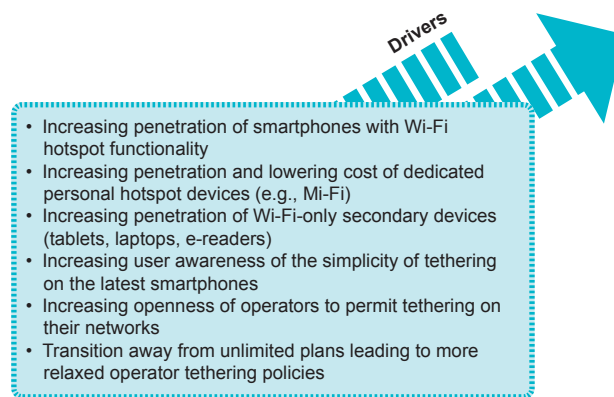
The impact of tethering on smartphone data usage patterns

Tethering is the process of connecting secondary devices (e.g., laptops, tablets, e-readers) to the Internet via a shared connection that is established by a smartphone, either by setting up a personal Wi-Fi hotspot or by using a USB cable to connect (or tether)

the devices. Tethering has been a complex and pressing issue for many operators globally due to an inherent lack of understanding of its impact on usage behavior and, ultimately, the undetermined potential impact on the profitability of carefully nurtured large-screen Internet access revenue streams. Indeed, such has been the fear of cannibalization of these revenue lines that operators have introduced a number of defensive policies designed to shape customer behavior around tethering. These policies have also been influenced by the threat of abuse by users on unlimited data plans. Clearly, the ability to connect multiple devices to a single cellular plan could significantly raise the ceiling of the potential usage demand of any given customer. The policies adopted by operators that seek to preserve their interests include blocking tethering entirely, blocking tethering on selected tariffs (e.g., unlimited data plans) or charging users a considerable premium for the ability to tether secondary devices to their smartphones.

The rate of user adoption of tethering is still relatively low among smartphone users today, but there are a number of factors that are likely to drive the short- and medium-term growth in the penetration of tethering into operators' smartphone bases (see fig. 9), irrespective of whether that is a

Fig. 9: Principal market drivers for tethering adoption amongst smartphone users

- Increasing penetration of smartphones with Wi-Fi hotspot functionality
- Increasing penetration and lowering cost of dedicated personal hotspot devices (e.g., Mi-Fi)
- Increasing penetration of Wi-Fi-only secondary devices (tablets, laptops, e-readers)
- Increasing user awareness of the simplicity of tethering on the latest smartphones
- Increasing openness of operators to permit tethering on their networks
- Transition away from unlimited plans leading to more relaxed operator tethering policies

Source: Informa Telecoms & Media

trend that is proactively encouraged by operators or not.

According to Mobidia's data, the rate of tethering adoption among Android smartphone users is typically around the 10-20% mark in the majority of markets, although there are some outlying countries, such as Malaysia where tethering adoption has reached almost half of the total sample base of smartphone users (see fig. 10). The data also demonstrates a clear preference among users to tether their smartphone to secondary devices using Wi-Fi and not via USB cable. The clear advantage of Wi-Fi-centric tethering is that it is very simple and easy to use and, importantly, can be performed without the need to carry around a cable to connect devices together. There are

disadvantages in terms of the impact on smartphone battery life from Wi-Fi-based tethering, but this inhibiting factor seems to be outweighed by the positives for users.

While not necessarily surprising, the impact of tethering on stimulating changes in smartphone usage behavior is nonetheless stark. In the UK, the average cellular consumption of an active tethering user is more than five times higher than the average Android smartphone user that does not tether. There is, however, a marked difference between the country's operators (see fig. 11). At 3 UK, tethering drives a seven-fold increase in average monthly cellular data consumption, but at Orange UK the rate of increase is far lower at 1.7 times. These differences underscore again the material impact that the individual operators' pricing strategies and policies have in shaping the behavior of their respective customers.

The Mobidia data is also able to show how tethering usage evolves according to the type of data plan to which a user is subscribed. Not only does the overall cellular consumption increase in line with the size of inclusive data bundles, but so too does the overall rate of adoption amongst users. In the UK, while only 11% of users that have a data

Fig. 10: User penetration of tethering in Android smartphone users, selected countries, May-12
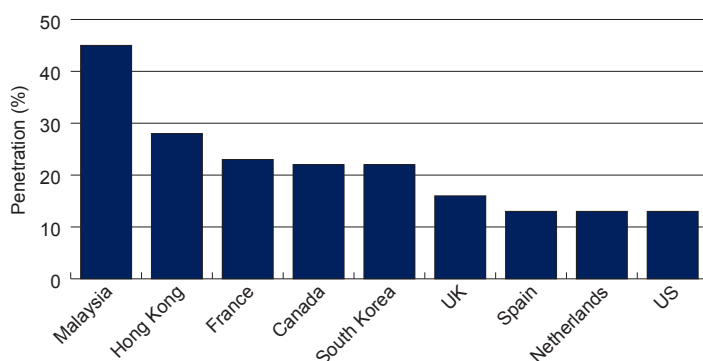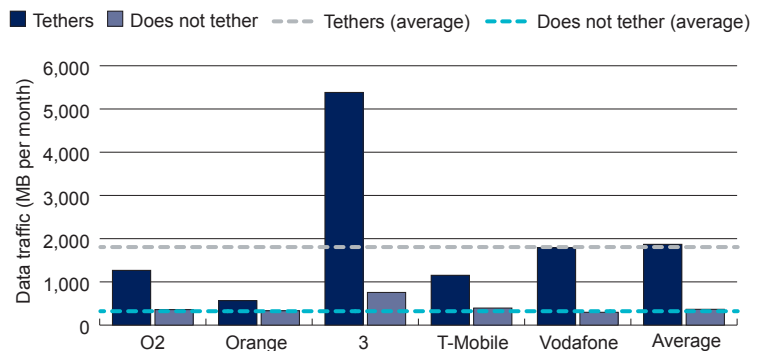

Source: Mobidia

bundle of less than 500MB are active tetherers, this percentage rises to more than one-third (36%) amongst those with an allowance of greater than 1GB per month (see fig. 12).

The active use of tethering does not appear to have an impact on overall consumption of Wi-Fi, which averages 2.0GB per month for tethering users in the UK compared with 1.9GB for those that do not tether. There are two clear reasons for this: firstly, tethering usage is likely to be concentrated in portable scenarios, not in the home where the vast majority of today's smartphone Wi-Fi usage is generated. Secondly, with tethering adoption only at the 10-20% level in most markets, it has still largely been confined to early-adopter customer segments that are heavier consumers of data compared with the more mass-market smartphone user.

So what does this mean for operators? The insights indicate that operators should arguably relax restrictive tethering policies in order to proactively stimulate an increase in usage that can then be monetized most effectively in two principal ways:

- Firstly, by driving customers to more expensive tiered data plans with higher inclusive monthly data

Fig. 11: UK, average cellular data consumption of smartphone users, tethering vs. not tethering, by operator, May-12

Source: Mobidia

allowances that provide the "comfort blanket" that users will seek when connecting multiple devices via a single subscription.

- Secondly, it can be argued that it is more effective to monetize tethering via smartphone per-MB charges than it is via dedicated per-MB plans for tethering as the price or revenue-per-MB ratio will typically be far higher on smartphone data plans compared with dedicated connected device or tethering data add-ons.

There may well be some short-term risk of cannibalization from revenue streams built from separate large-screen connections or from charging an add-on for tethering. However, this revenue

stream and addressable market is likely to be significantly smaller than the revenue upside available from driving users to increase their overall usage on their day-to-day smartphone plan and then migrate to more expensive data plans. It is, in effect, monetizing large-screen usage at small-screen prices. The move towards shared data plans where a single bucket of data can be consumed across multiple devices is also likely to accelerate a relaxation of tethering policies.

Understanding adoption and consumption rates of selected smartphone apps

The level of mobile adoption of well-known Internet applications and services is impressive in some cases. Facebook enjoys close to one billion users in total and boasts a mobile user base of more than 425 million. Its global appeal is underscored by its adoption rates among Android smartphone users: According to Mobidia data, Facebook was actively used by 71% of Android smartphone users during May 2012.

One of the most important aspects of understanding smartphone usage is to not make generalizations about trends in different markets. Even within a market there are differences in

Fig. 12: UK, tethering adoption and usage (MB per month) by Android smartphone users, by data plan volume, May-12
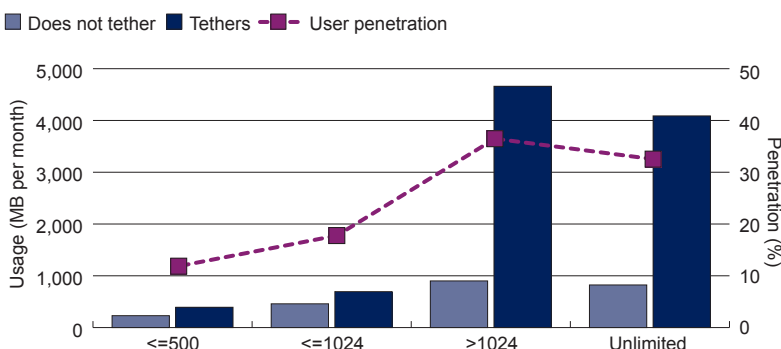
Source: Mobidia

adoption and usage patterns between different operators that, while usually subtle, can be quite blatant. In that context, the global adoption numbers for popular applications mask major differences at the regional, country and even operator level. The reasons for these differences derive from a variety of factors, including national demographic and socioeconomic structures, competitive dynamics and local pricing and marketing strategies (see fig. 13).

It is only by understanding the impact of these factors that one is able to reconcile, for example, the fact that WhatsApp has penetrated Android smartphones at levels over 90% in some cases, but has only seen a fraction of that take-up in the US (see fig. 14), where the service has yet to explode or be aided by the viral adoption seen in other parts of the world.

In order to gain a deeper understanding of the impact of different applications on smartphone users, it is important not only to assess the relative adoption of different applications, but also to compare applications on the basis of overall volume of usage generated and also the split of usage across different access technologies.

In Facebook's case, smartphone-based usage averages around 185MB with a near equal distribution of users' traffic between cellular and Wi-Fi networks. The strong reliance on cellular data to feed Facebook demand is a reflection of the fact that social networking is used heavily in mobile situations and is therefore strongly reliant on the availability and immediacy that an always-on cellular connection provides relative to Wi-Fi. Leaving aside the impact of differences in prevailing smartphone data-pricing models, the variations in Facebook usage volumes across markets (see fig. 15) can be

| Fig. 13: Understanding differences in adoption of applications across and within markets	
Key factors that have an impact on adoption across different markets	Key factors that have a relative impact on adoption across operators in a single market
Extent of viral adoption within market	Brand positioning of different operators
Extent of local advertising and marketing	Pre-installation of applications on devices
Relevance of content to local audience	Customer profile and demographics
Local language support	Operator-specific marketing and advertising
Geographic sales focus of application	Operator pricing strategy
Popularity of competing services	Operator-specific usage policies
Demographic and socioeconomic profile	
Political or regulatory restrictions	

Source: Informa Telecoms & Media

Fig. 14: User penetration of selected popular smartphone applications in Android smartphones, selected countries, May-12				
Cellular user penetration (%)	Facebook	Skype	WhatsApp	YouTube
Canada	78	23	19	72
Hong Kong	81	13	96	66
Malaysia	92	28	87	74
Netherlands	70	15	94	58
South Korea	34	5	1	66
Spain	67	15	99	66
UK	74	20	33	63
US	76	16	5	72

Source: Mobidia

Fig. 15: Average monthly Facebook consumption (MB per month) on Android smartphones by access technology, selected countries, May-12
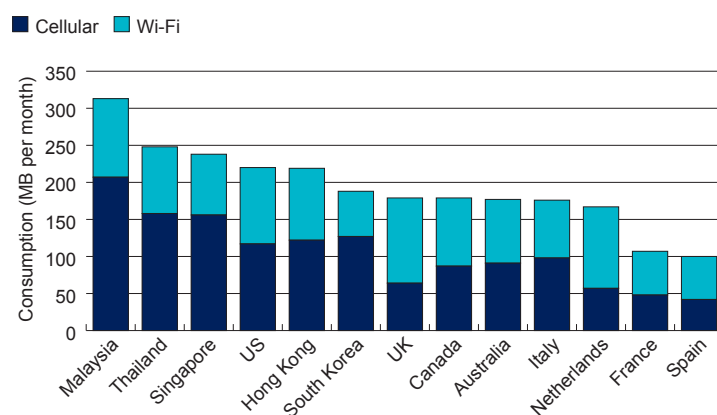
Source: Mobidia

accounted for by: the impact of differing demographic structures; the relative importance of the desktop Internet; the varying levels of usage distribution across smartphones, tablets and other Internet-enabled devices; and,

importantly, an underling "dilution effect" as service adoption penetrates more deeply into the mass market.

While some services may only have limited adoption levels today (see fig.

16), it is clear nonetheless that they can drive volumes of usage in amounts hugely disproportionate to their user base. Netflix, for example, is today used by only 17% of Android users on Verizon Wireless' network in the US, but each of those customers generates around 472MB of cellular data per month from Netflix alone. Netflix adoption is even lower in the UK, just 1.7% of O2 UK's users, but those customers are averaging more than 584MB per month. The implication is clear – operators must develop strategies to prepare for the broader adoption of such bandwidth-heavy services. Moreover, if operators thought YouTube was a heavy drain on network resources, it will be sobering to learn that YouTube compares relatively benignly in terms of average monthly usage compared with other OTT video services.

The impact of migration to 4G LTE on smartphone usage behavior

There is a strong demand in the telecoms sector to understand the impact that migration of users to 4G LTE networks will have on smartphone usage behavior. Since Mobidia is able to capture usage data at the device and application level for individual users, it is possible to identify LTE-capable devices within the dataset and to flag usage patterns for a specific group of smartphones.

In order to analyze trends, we selected a sub-segment of the most popular LTE smartphones in terms of user numbers and compared usage on these devices relative to usage on non-LTE-enabled smartphones in the US market. We chose the US market since it is by far the world's most advanced market in terms of the number of subscribers connected to LTE networks.

Fig. 16: Global active user penetration in Android smartphones, selected applications, May-12
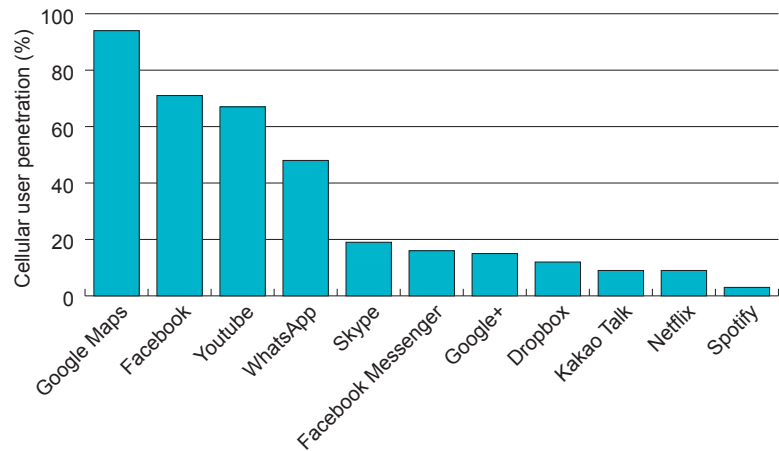
Source: Mobidia

Fig. 17: US, smartphone-originated traffic by access technology on LTE and non-LTE Android smartphones, May-12
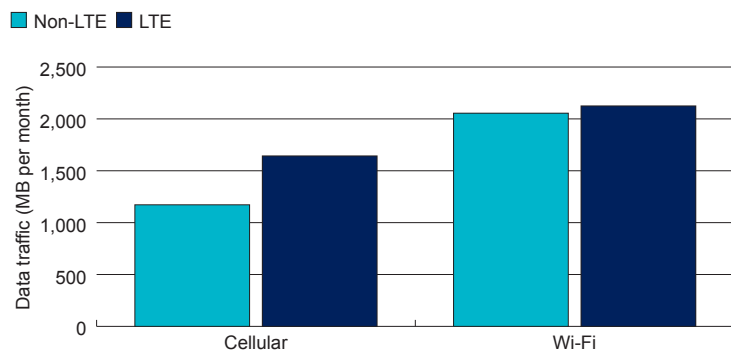
Source: Mobidia

The usage data demonstrates explicitly that the migration to LTE is helping to stimulate incremental traffic demand on cellular networks. According to the sample data, the average LTE-capable smartphone generates 1.6GB of monthly cellular data, an increase of 50% compared to an average of 1.1GB on non-LTE-capable smartphones. There is again further evidence that it is difficult to shift or "onload" traffic from Wi-Fi networks back onto cellular networks: The average usage of Wi-Fi is virtually identical at 2.1GB per month on both LTE and non-LTE smartphones. When cellular and Wi-Fi usage is combined, therefore, LTE smartphones show a total increase in aggregate

demand of 16% (see fig. 17). While all incremental usage is positive for operators, it helps to provide somewhat more realistic boundaries in terms of the effect of LTE in changing usage behavior.

An application-centric analysis of usage on LTE smartphones is particularly insightful. This is able to credibly demonstrate how the adoption of LTE is encouraging users to migrate their usage of applications that were previously largely restricted to Wi-Fi onto 4G LTE networks. Interestingly, there is also evidence of an elasticity-of-usage effect demonstrated by the fact that increased usage stimulated on

cellular networks is also accompanied by an increase in the average consumption on Wi-Fi networks. In the case of Netflix, a premium video-streaming application and one of the most popular applications, its cellular-centric usage jumps from 243MB per month to 499MB on LTE-capable smartphones, while its average Wi-Fi usage jumps significantly from 584MB to 1.1GB (see fig. 18).

It is clear from analyzing the applications that rank highest in terms of overall share of data usage (see fig. 19) that the superior network speeds available via LTE smartphones are also migrating applications and services such as peer-to-peer applications and tethering in greater volumes. It is unfortunately not possible to quantify the precise substitution effect that may be generated on LTE smartphones, but it is highly likely that some of the incremental demand displayed on LTE devices is due to usage of some applications or services migrating from other devices. These devices may be owned by the user, including laptops and tablets, but may also be application-specific, entertainment devices such as e-readers, music players and games consoles.

Conclusions

1. The expansion of the sample to data include iOS devices confirms that Wi-Fi is as central to the iOS experience as it is on Android smartphones – in fact, even more so. The data has also been able to correct a commonly-cited view that Android smartphone users are more data hungry than users of iPhones. This assumption had been based on a flawed cellular-centric measurement of usage across the competing smartphone platforms. In the case of iOS smartphones, this

Fig. 18: US, smartphone-originated traffic distribution by access technology on LTE versus non-LTE Android smartphones, selected applications, May-12
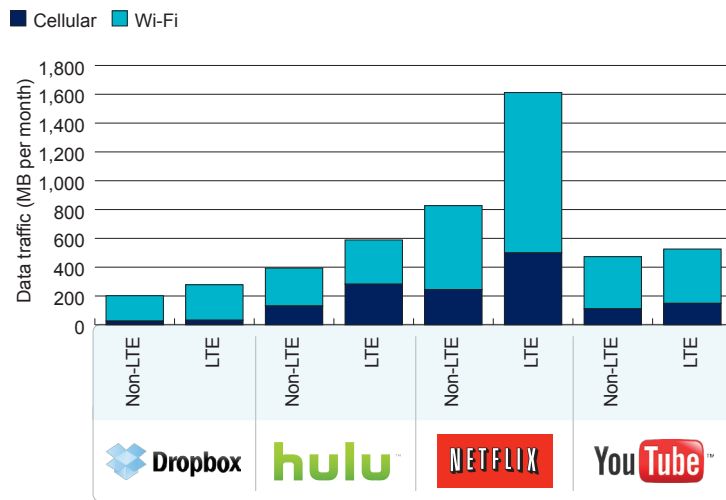
Source: Mobidia

limited view of customer behavior substantially underestimates overall usage patterns. So, although iOS smartphones do indeed show lower cellular usage on average, their overall usage is in actual fact materially higher than Android once Wi-Fi usage is factored into the equation. According to the Mobidia data, the average iPhone consumes just over 4GB per month, compared with around 3GB per month on Android, a gap of nearly 40%.

2. There is now clear evidence that the connected home is not only enabled, but completely dominated by Wi-Fi where it has penetration into households connected through fixed broadband. The importance of Wi-Fi in the connected home is only set to grow as an increasing range of devices and appliances are connected in order to capture the inherent value that comes from being connected. It is also apparent that users now expect their in-home and in-office Wi-Fi experience to be replicated wherever they go, forcing a growing number of customer-facing businesses to offer access to Wi-Fi to their customers or else face

Fig. 19: US, top eight most consumed (average MB per month) applications on LTE-capable Android smartphones, May-12

1. Browsing
2. Wi-Fi tethering
3. YouTube
4. Facebook
5. Netflix
6. Pandora
7. Google Maps
8. Google Play Music
Source: Mobidia

the consequence of those customers voting with their feet.

3. As Wi-Fi expands rapidly to cover more and more portable locations, it is likely that operators will need to redefine and restate the cellular network value proposition in order to ensure it is sufficiently differentiated from Wi-Fi-based connectivity. It is likely that the redefinition of the value of cellular networks will drive it back towards its heritage – as a means to provide services in truly mobile contexts. This redefinition is likely to be on the basis of characteristics such as always-on availability, the simplicity of access to the network, the reliability and

stability of connections and by winning customer trust on the basis of underlying security and privacy. If operators are able to educate consumers about these inherent advantages, operators will not only be better placed to ensure the continued relevance and importance of cellular networks, but will also be able to justify a continued premium to Wi-Fi.

4. The analysis in this white paper has demonstrated that operators do possess the means to stimulate incremental usage on their cellular networks. The key to successful stimulation and monetization of

additional usage will be the need to invest in and enhance the capabilities of existing mobile networks, to identify and prioritize applications that are reliant on the inherent benefits of cellular networks and, most importantly, to develop pricing strategies that allow operators to realign the price of access with the undoubted value perceived by the vast majority of customers.

5. The process of extracting the maximum value from the smartphone and tablet usage data continues. This second white paper has been able to articulate many aspects of smartphone usage

behavior that have not previously been examined in public discourse, but once again the analysis only begins to scratch the surface of what is possible by mining big datasets for customer insight. We firmly believe that the time is now for operators to invest in the analytics capabilities that can deliver such insights and more to ensure they are able to keep pace with new players in the mobile value chain, such as Google, Amazon or Facebook – analytics capabilities that have been built from the bottom-up to harvest, analyze and act upon the most granular of information about their customers.

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Mobidia develops and delivers intelligent, client-based solutions for enhancing wireless data with leading mobile operators around the world. Mobidia's popular My Data Manager application has been downloaded over 1.4 million times by subscribers around the world looking to better manage their mobile data usage and data plans. Mobidia offers a white-labeled version of the application to mobile operators for customizing to increase subscriber satisfaction and decrease care costs, to increase the efficiency of up selling and cross-selling promotions, and to develop a unique view of usage trends across cellular, roaming, and Wi-Fi networks. A cloud-based architecture allows for integration with back end billing and analytics systems.

Mobidia is headquartered in Vancouver, British Columbia with local presence in the U.S., Europe and Asia. For more information, visit www.mobidia.com or call 604-304-8640

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