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White Paper

Understanding the Role of Managed Public Wi-Fi in Today's Smartphone User Experience:

A global analysis of smartphone usage trends across cellular and private and public Wi-Fi networks

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Foreword

The primary objective of this series of white papers remains to break new ground in the quantification and understanding of smartphone and tablet usage behavior and to make this insight freely accessible to a global audience of industry stakeholders.

The analysis in this paper builds upon the insights and stories outlined in previous papers and, to avoid repetition, makes reference back to conclusions and implications therein.

Any readers that have come across this series of white papers for the first time are urged to refer to previous iterations of our work to build a foundational understanding of the role that cellular and Wi-Fi networks play in the smartphone and tablet user experience for Android and iOS users worldwide. These past papers are available for download from Mobidia: *http://www.mobidia.com/products/whitepaper-download/*

or from Informa Telecoms & Media:
http://www.informatandm.com/white-papers/

Please note that the effect of the growth in the sample size under survey between iterations of the white papers should always be uppermost in any reader's thoughts if any comparisons are being made with the historical analysis published in previous editions of this series of white papers. The addition of hundreds of thousands of additional users into the sample inevitably changes the profile of the average smartphone user under analysis.

All data, unless otherwise stated, has been sourced directly from the usage data shared on a strictly anonymous basis by the users of Mobidia's My Data Manager (MDM) application.

Millions of users worldwide have downloaded the My Data Manager application and more than 50% of those active users continue to choose to share data anonymously with Mobidia on an ongoing basis, providing a large and statistically-robust global sample size. But, as with all our analysis of this data, we repeat our cautionary advice to interpret the findings of this paper with a clear sensitivity to and understanding of the methodology used to collate the data and the composition of the sample used.

The analysis has been conducted using a sample of several hundred thousand MDM users that collectively transmitted hundreds of terabytes of data across cellular and Wi-Fi networks globally during the month of January 2013.

As ever, a heartfelt thank you is extended to the teams at Mobidia and Informa that make this possible. It is thanks to the commitment and drive of individuals such as Eric Eden and Allison Lenters at Mobidia and Lucy Powell, Olivia Gibney and Shalia Mughal at Informa that this paper has been published.

We welcome all feedback and would be delighted to take up the discussion with any reader that may wish to obtain a more detailed overview of the methodology, exchange views on the insights elaborated or simply make suggestions for trends that could be explored in future papers. We may have access to the data, but we don't claim to have all the answers. The debate is only just beginning.

I look forward to continuing the discussion.

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The context

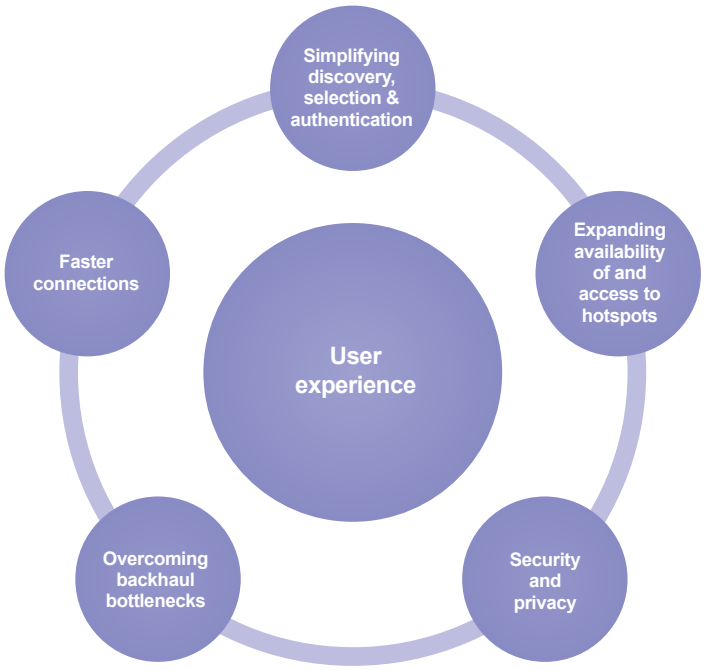
2012 witnessed an unprecedented level of interest and investment into the deployment of public Wi-Fi with a geographic reach that reached truly global proportions. The accelerating pace of expansion in the Wi-Fi market is serving to attract an ever-more diverse set of market participants, including global Internet giants such as Facebook, Skype and Google at one end of the scale and a range of innovative start-ups, such as Wavespot, Instabridge and PurpleWiFi, at the other.

In parallel with the entrance of a variety of new players into the space, the pace of M&A activity among existing market players continued unabated in 2012. Ericsson's acquisition of BelAir Networks, Boingo's acquisition of Cloud Nine and Cisco's US$1.2 billion acquisition of Meraki collectively represented multi-billion dollar bets on the future of public Wi-Fi. A positive stock market flotation for Ruckus Wireless in November 2012 epitomized the positive sentiment felt by investors in this market.

This wave of optimism has mirrored the growing understanding of the critical role played by Wi-Fi in supporting the connectivity needs of a billion-strong community of smartphone, tablet and other connected-device users. The industry no longer has any doubt that Wi-Fi is and will remain the primary form of connectivity to the global smart-device-addicted population.

In fact, a more advanced understanding of Wi-Fi usage has served to directly influence changes to the long-term predictions of traffic growth on cellular networks worldwide made by high-profile vendors serving the industry and, as a consequence, brought a more balanced perspective to the sustainability of cellular traffic growth in the future. The much-heralded traffic "tsunami" did indeed arrive; it just passed over Wi-Fi networks more powerfully than it did the cellular networks.

Fig. 1: Focus of investments into public Wi-Fi to improve the user experience



Source: Informa Telecoms & Media

Aside from funding the so-called landgrab to acquire premium, high-footfall, high-density locations, the flow of investments into public Wi-Fi today is primarily centered on improving the user experience around public Wi-Fi (see fig. 1).

Analyzing existing sources of data on public Wi-Fi usage

All of this investment into public Wi-Fi comes at a time when relatively little is known about the underlying distribution of the surge of Wi-Fi traffic across different types of private and public hotspots. To date, the hunger for greater market education around this issue has only been fed by the disclosure of intermittent statistics that are often ambiguous and always frustratingly isolated.

AT&T, the US mobile operator giant, has unquestionably been an innovating force behind the renaissance of public Wi-Fi efforts, thanks in no small part to its ground-breaking decision to bundle access to its footprint of organic and newly-acquired public hotspots into its core smartphone plans to alleviate the 3G network-congestion challenges it faced with its initial launch of the first iPhone back in 2007-2008.

On the back of the robust growth in the usage of its hotspot networks by the tens of millions of iPhone users on its network, AT&T regularly disclosed a series of eye-watering statistics related to the volume of unique connections it witnessed. More recently, however, it stopped reporting these statistics: The latest numbers were published by AT&T in January 2012 when it boasted more than 486.9 million unique connections in the final quarter of 2011 alone and over 1.2 billion for the full year. On the face of it, these numbers appear extraordinary in scale, but, without additional context, have little overall

significance and so it is useful to explore the numbers in a little more detail.

During 2011, AT&T presided over an average mobile customer base of approximately 100 million mobile connections and so in that context the 1.2 billion connections to its 30,000-strong hotspot footprint represented the equivalent of just one connection per customer per month. This is, of course, an imperfect analysis given that only a much lower percentage of AT&T's customers are likely to have made use of access to the hotspots. But even if just 10% of AT&T's customers actively used the hotspot service, the average would still equate to just one connection every three days (see fig. 2). Moreover, it should also be remembered that the hotspot network is also open to non-AT&T customers with any type of Wi-Fi-enabled device so the actual average frequency of usage on a per-active-user basis is almost certainly far lower than even this basic quantification implies.

Either way, the overall assertion that the usage of AT&T's public Wi-Fi network by its customers is actually far less impressive than the headline numbers imply is supported by the statement by AT&T's CEO, Randal Stephenson, in an op-ed published in the Wall Street Journal in June 2012 that his company's mobile customers only "offload" about 1% of their total traffic via its footprint of 30,000 hotspots.

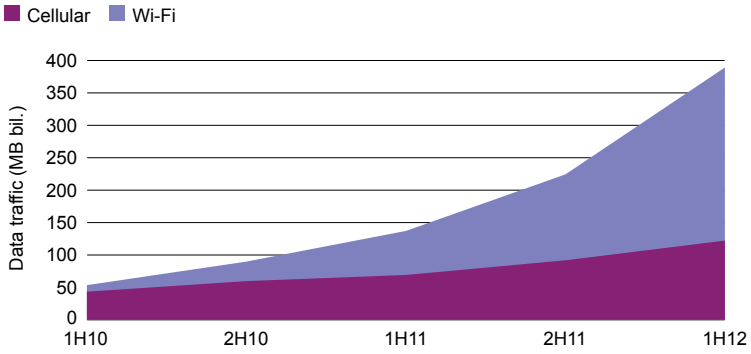
Another interesting set of statistics are those shared by Boingo, which operates an aggregated network of more than 500,000 hotspots globally on a paid-for basis. Given the fact that users pay a subscription fee at the individual or enterprise level for a dedicated service enabling access its huge hotspot network, it is reasonable to expect much higher usage. But the latest numbers released by Boingo for the nine-month period to September 2012 showed that its customer base of 292,000 active users made a total of 16,623,000 unique connections, equating to just 6.3 connections per month or one connection every five days.

Fig. 2: Wi-Fi connections to AT&T's hotspot footprint on a per-customer basis

	Active users as % of total AT&T customer base			
	100%	50%	25%	10%
Connects per customer per year	12	24	48	120
Connects per customer per month	1	2	4	10
Connects per customer per day	0.03	0.07	0.13	0.33
Elapsed days per connection	33.3	14.3	7.7	3.0

Note: Based on 1.2 billion connections in 2011 and 100 million AT&T mobile customers
Source: Informa Telecoms & Media, based on AT&T data.

Fig. 3: Data traffic on China Mobile's cellular and Wi-Fi networks, 1H10-1H12



Source: China Mobile

Perhaps the most transparent example of usage patterns on operator-deployed Wi-Fi networks comes from the world's largest mobile market, where market-leader China Mobile has regularly reported the distribution of traffic across the world's largest public Wi-Fi network by number of hotspots, which at end-June 2012 stood at a total of 2.83 million access points across hundreds of thousands of hotspot locations.

The magnitude of the growth in traffic on its networks since 1H10 is remarkable, most notably for the acceleration of usage of Wi-Fi that has followed its strategic decision to position Wi-Fi as a main component of its mobile broadband service proposition. Wi-Fi accounted for 69% of total data generated by its customers in the first half of 2012, up from just 19% two years previously. Over this period, the total volume of data traffic grew from 53 billion in 1H10 to 389 billion megabytes in 1H12 (see fig. 3).

The data shared by China Mobile highlights the enormous challenge the mobile operators have to monetize Wi-Fi traffic. The most alarming statistic is the discrepancy in the amount of revenue generated per megabyte by China Mobile on traffic that flows across its cellular and Wi-Fi networks (see fig. 4).

According to the data published by China Mobile, it generates US$0.0367 for every megabyte transmitted on its cellular networks, but just US$0.0004 on Wi-Fi, equivalent to a ratio of 84 to

Fig. 4: Cellular and Wi-Fi traffic and revenue patterns at China Mobile, 1H10-1H12

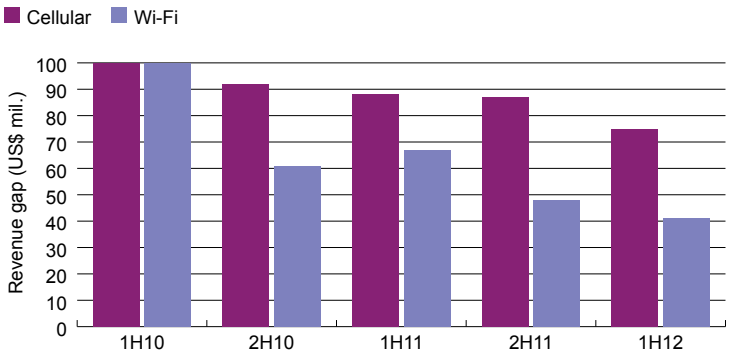
		1H10	2H10	1H11	2H11	1H12
Traffic (MB bil.)	Cellular	43.4	59.7	69.2	91.8	122.2
	Wi-Fi	10.1	30.1	67.9	132.5	267.0
Traffic (% of total)	Cellular	81.2	66.5	50.5	40.9	31.4
	Wi-Fi	18.8	33.5	49.5	59.1	68.6
Revenue (US$ bil.)	Cellular	2.1	2.7	3.0	3.9	4.5
	Wi-Fi	0	0	0	0.1	0.1
Revenue (% of total)	Cellular	99.5	99.3	98.4	98.3	97.5
	Wi-Fi	0.5	0.7	1.6	1.7	2.5
Revenue per MB (US$)	Cellular	0.0489	0.0449	0.0432	0.0424	0.0367
	Wi-Fi	0.0011	0.0006	0.0007	0.0005	0.0004
Cellular/Wi-Fi traffic ratio		4.3	2.0	1.0	0.7	0.5
Cellular/Wi-Fi revenue ratio		198.1	138.1	61.6	57.3	38.6
Cellular/Wi-Fi revenue per MB ratio		46.0	69.7	60.4	82.8	84.4
Revenue for each 1% of traffic on cellular (US$ mil.)		26.0	40.0	59.0	95.0	143.0
Revenue for each 1% of traffic on Wi-Fi (US$ mil.)		569	578	980	1,150	1,693
Cellular/Wi-Fi revenue gap on 1% of traffic (US$ mil.)		25.6	39.7	58.3	94.0	141.3
Annual revenue gap on 5% of traffic (US$ mil.)		255.9	397.0	582.7	940.5	1,413.0

Source: Informa Telecoms & Media calculations using China Mobile data

the dollar across the two networks (see fig. 5). Worryingly, the rate of erosion of the revenue earned per megabyte China Mobile is experiencing on Wi-Fi (-39% year-on-year) is faster than on cellular (-15% year-on-year).

To quantify this in absolute terms, China Mobile would generate an additional US$1.4 billion in annualized revenues for each 5% of data traffic that was monetized via its cellular networks instead of over Wi-Fi (see fig. 6). The trends that are brought to the fore in China Mobile's disclosed earnings and operational metrics pose challenges for the industry as whole. Given the 84x multiple in times of earnings potential on cellular and Wi-Fi networks, even if the oft-promised lower cost of delivery across is crystallized at a 10x or even a 50x level, the profitability of the overall data business would still be challenged unless alternative material forms of monetization can be identified and exploited.

Fig. 5: China Mobile, rebased change in revenue per MB by connectivity type, 1H10 = 100%



Source: Informa Telecoms & Media calculations using China Mobile data

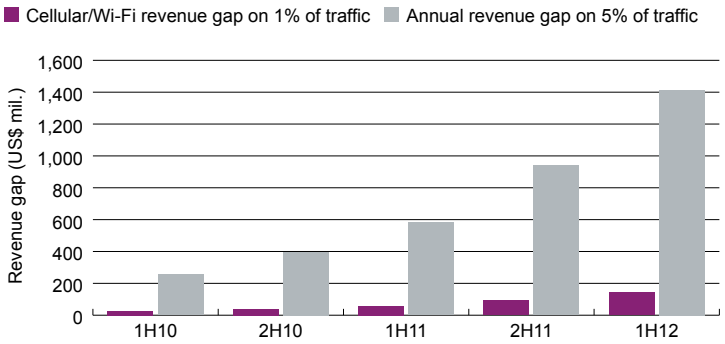
Cutting to the chase

The small amount of data that is available serves to underline the need to be able to balance the aforementioned investment rush into public Wi-Fi with a more detailed and data-driven analysis of actual usage trends. To this end, Mobidia has continued to innovate by launching new iterations of its My Data Manager application and advancing both the data-capturing capability of its application, as well as the power of its analytics platform. These innovations now allow a robust and rigorous examination of usage patterns across all types of Wi-Fi hotspots. But before moving into the analysis of this data, it is critical to understand the specifics of the methodology used to collect,

aggregate and analyze the data. In this regard, Mobidia is commendably transparent in disclosing its approach to data sourcing and analytics.

As a result of its ability to recognize the use of proxy redirects on Wi-Fi hotspots to which a user's smartphone connects, Mobidia is now able to use that signal as a means to distinguish between different types of hotspots. These have been classified into two distinct types: Self-provisioned/private Wi-Fi and managed public Wi-Fi (see fig. 7). In short, managed public Wi-Fi refers to hotspots that make use of a proxy redirect upon connection for the purpose of authentication, payment or terms of use acceptance before granting access to the Internet, while self-provisioned/private Wi-Fi refers to all secured or unsecured Wi-Fi access points that allow direct access to the network.

Fig. 6: The gap in monetization between cellular- and Wi-Fi-delivered traffic on China Mobile's networks, 1H10-1H12



Source: Informa Telecoms & Media calculations using China Mobile data

Fig. 7: Definitions of Wi-Fi hotspot categories

Managed public Wi-Fi	Managed public Wi-Fi hotspots that make use of a proxy redirect upon connection for the purpose of authentication, payment and/or terms of use acceptance before granting access to the Internet.	Public venues, such as hotels, airports, franchised restaurants and coffee shops, retail chains, etc.
Self-provisioned/ private Wi-Fi	Private and/or self-provisioned Wi-Fi hotspots, including all secured or unsecured wireless access points that permit direct access to the Internet.	Private homes, enterprises, self-provisioned independent small- and medium-sized businesses

Source: Informa Telecoms & Media, based on AT&T data.

These two categories could perhaps follow standard industry terminology and be alternatively defined as "Private Wi-Fi" and "Public Wi-Fi", but such a categorization would not be a perfect fit due to the inherent complexities and ambiguities that shape the real-world Wi-Fi market.

In the interests of transparency and reader understanding of the analysis that follows, it is important to highlight a number of factors that may serve to impair the "perfect" allocation of Wi-Fi usage between so-called public and private hotspots:

- Any usage occurring on Managed Public Wi-Fi hotspots via automatic authentication protocols (e.g., EAP-SIM) – that is, where the user does not require redirect or any form of interaction to enable connectivity – may bypass local proxies and therefore be categorized as private usage under Mobidia's usage classification.
- A large number of independent business owners that have self-provisioned their Wi-Fi hotspots using unmanaged private hotspots have, by leaving these open or by sharing the password with customers, effectively created "public" hotspots.
- The lines of what constitutes "private" and "public" Wi-Fi are being blurred by activities such as crowdsourcing of private hotspots into "public" networks open to a closed user community.
- Hotspots deployed in private enterprises are increasingly being made "public" to visitors to their office locations.

In spite of the limitations outlined above, as well as the usual limitations of usage analysis from a self-selected base of customers, the importance and robustness of the insights captured from Mobidia's datasets are strongly deemed to validate the relevance and value of this analysis.

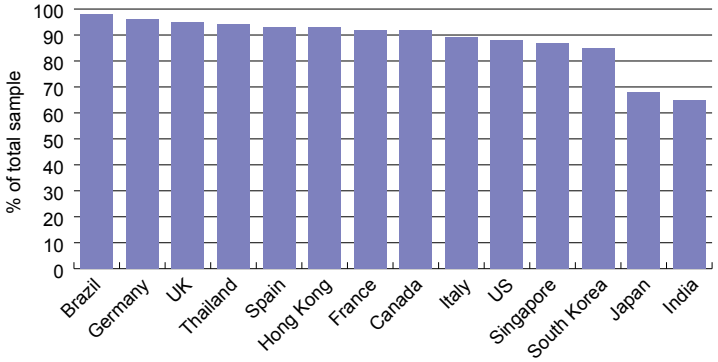
This white paper is, as far as we are aware, the first attempt to analyze smartphone usage behavior with a complete, 360-degree view across all forms of connectivity. The discussion therefore serves as a ground-breaking piece of analysis to inform the broader debate around private and public Wi-Fi investment, propositions and usage.

The insights and conclusions that follow and the resultant implications for a broad set of stakeholders in the Wi-Fi ecosystem (including operators, vendors, regulators, investors and content and service providers) are profound.

Trends in user adoption of managed public Wi-Fi

The ubiquity of Wi-Fi usage among Android smartphone users is striking. In the overwhelming majority of markets, smartphones are used by nearly as many people on any form of Wi-Fi as they are on the cellular networks for which they were primarily designed, manufactured and sold (see fig. 8).

Fig. 8: Penetration of Wi-Fi user adoption on Android smartphones, by country, Jan 2013



Source: Mobidia

As discussed in previous papers (see Part 2, fig. 4), there are a wide range of market- and operator-specific factors that have an impact on the levels of Wi-Fi user adoption, but the single-most important driver is the penetration of and access to fixed broadband in private households and enterprises. Put simply, the higher the level of fixed-broadband deployment, the greater the likelihood of users enjoying access to a private Wi-Fi hotspot used to transmit that broadband connection wirelessly throughout the building premises.

On the face of it, the comparatively low level of Wi-Fi user adoption in Japan is surprising. The majority of the other more advanced mobile markets that may normally be considered its peers, such as Hong Kong or the UK, have a penetration of above 90%. In fact, the level of adoption of Wi-Fi by Japanese Android smartphone users in the sample analyzed puts the country in a group with unfamiliar peers such as India, Indonesia and Kuwait. Leaving aside any potential impact from the underlying average profile of the sample of base of more than 5,000 Japanese Android smartphone users, there are at least two clear contributing factors that help account for this:

- While never a global leader in PC adoption levels, Japan has witnessed more significant declines in PC adoption in recent years, a trend that is likely to have lessened the influence of Wi-Fi in a number of Japanese households.
- Japan has always been the world's leading mobile-centric society with local users more heavily reliant on mobile networks for their connectivity needs (e.g., relative to fixed networks) than any other market worldwide.

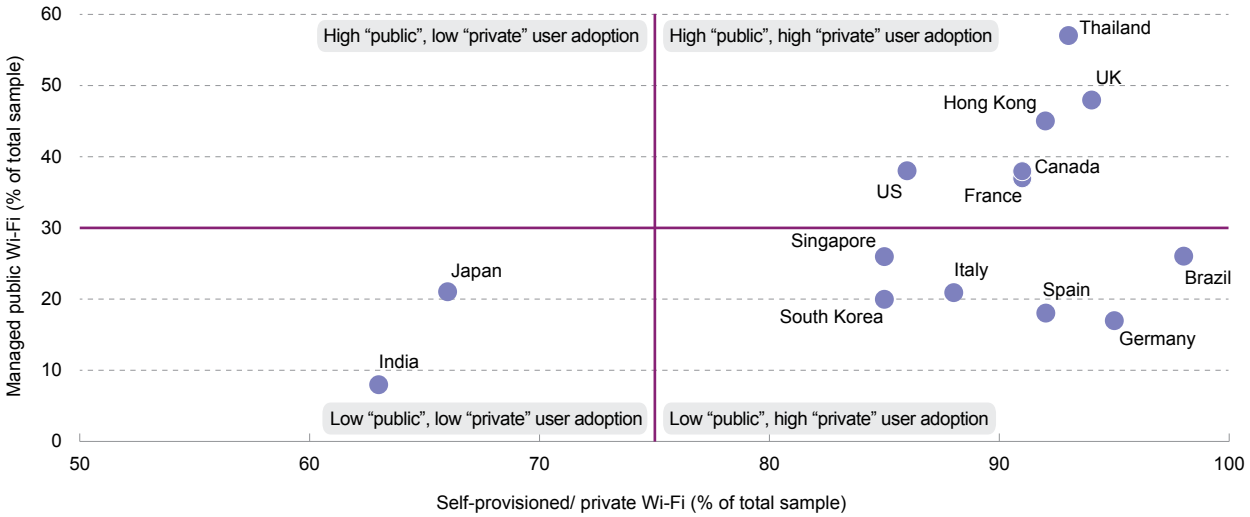
The other surprising fact is that Brazil tops out the list. This can in part be attributed to the strong correlation between the characteristics of the Brazilian smartphone users and those user segments that would be expected to have high levels of access to Wi-Fi via fixed broadband in their home or office. But this is not just about the user sample; the Brazilian Wi-Fi market has exploded in the past 12 months – a trend that is most symbolically represented by the acquisition of local Wi-Fi network operator Vex by mobile operator Oi – and this investment activity, together with the continued network issues experienced on Brazilian 3G networks as well as the relative high cost of cellular data in the market, has created a market ripe for Wi-Fi.

An analysis of overall Wi-Fi usage adoption is interesting, but it does little to increase the industry's understanding of the rate at which users make use of the managed public Wi-Fi hotspots that have been deployed at great expense by a broad range of players that have committed to deploying large-scale public Wi-Fi networks.

Mobidia's data can quantify and benchmark the relative rate of user adoption of managed public Wi-Fi against the take-up rate of self-provisioned/private Wi-Fi. Unsurprisingly, the data reveals a major gulf in adoption rates across the two core types of Wi-Fi hotspots (see fig. 9). The adoption levels of self-provisioned/private Wi-Fi mirror those seen for overall Wi-Fi usage, but active usage of managed public Wi-Fi trends materially lower in all markets. Only one market in the sample recorded a level of adoption that surpassed the 50% level, while in a large number of markets (including many advanced economies), the usage has barely reached mass-market proportions, which are typically seen once a market surpasses the 20% adoption level.

The UK market, however, does cement its reputation as one of the world's leading markets for public Wi-Fi with nearly one in two of the total sample of UK Android smartphone users having connected to at least one managed public Wi-Fi hotspot during January 2013.

Fig. 9: Mapping managed public and self-provisioned/private Wi-Fi user adoption on Android smartphones, by country, Jan 2013



Source: Mobidia

The large variations in managed public Wi-Fi adoption between markets can be attributed to a number of underlying market characteristics:

- The integration of access to managed public Wi-Fi into local smartphone plans.
- The extent of market education and user awareness of the availability of managed public Wi-Fi.
- The overall density and reach of managed public Wi-Fi within a market.
- The degree of simplification of the authentication process on managed public Wi-Fi.
- The stringency of local regulation governing access and management of managed public Wi-Fi.

Looking specifically at the ratio of user adoption on the two different hotspot categories (see fig. 10), the overall ratio is highest in India, where the density of managed public Wi-Fi is low and the cost still relatively high, but it is the disparity in Germany that is most noteworthy. The German authorities have implemented particularly stringent regulations relating to the responsibilities of business owners if and when providing public Wi-Fi services to their customers. The effect of this regulation has, quite simply, been to stifle the deployment of managed public Wi-Fi hotspots and resulted in a much lower hotspot density when benchmarked against other comparable European markets.

The quantification of the impact of local German regulations on the use of managed public Wi-Fi by German smartphone users leads us towards a number of important conclusions and implications that have resonance across any other market that may have enforced similarly tough regulation.

Firstly, the reluctance of small business owners to assume the risk or challenge associated with the security and privacy aspects of hotspot management highlights a huge potential opportunity. This friction in the market could easily be eliminated the introduction of simple, hassle-free "managed" public Wi-Fi propositions for small venue owners that eliminate any of the time and cost overhead related to local regulatory compliance.

Secondly, this unforeseen or unintended consequence of must call into question the desirability of regulation of this type. It is right to question whether a market is operating more "successfully" with fewer secure hotspots or whether it would be preferable for consumers to enjoy broader access to Wi-Fi, but with some inherent, yet small risks to security that could be addressed in other ways. Whatever is decided, it is certain that new participants will seek to enter the Wi-Fi market to address the opportunity that exists to meet the needs of small- and medium-sized enterprises that wish to offer Wi-Fi as an amenity to their customers.

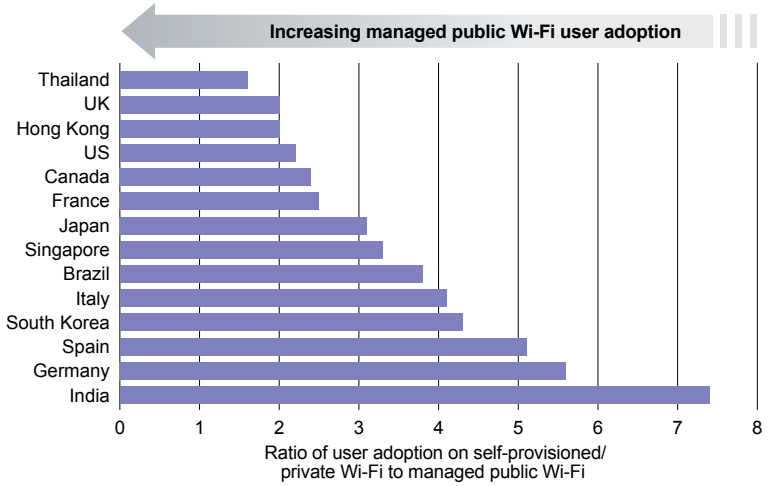
Aside from the regulatory implications discussed, the overall data on managed public Wi-Fi user adoption highlighted a number of broader conclusions and challenges on the state of the market as it stands today:

- The extent of managed public Wi-Fi hotspots as a proportion of overall Wi-Fi hotspot deployments is much lower than many may think.
- User awareness of the value of access to managed public Wi-Fi is not as entrenched as the industry may care to believe.
- The affordability of access to managed public Wi-Fi for some

smartphone users in certain markets is still hindering access in some markets.

- Smartphone users are heavily reliant on access to unmanaged "public" hotspots that have been self-provisioned by independent business owners themselves.
- Users are still heavily reliant on cellular network connectivity when outside the home even if their usage behavior when on the move is adapted from in-home usage patterns.

Fig. 10: Ratio of Android smartphone user adoption of self-provisioned/ private Wi-Fi versus managed public Wi-Fi, by country, Jan 2013



Source: Mobidia

Smartphone-originated traffic trends on managed public Wi-Fi

The fact that cellular traffic typically accounts for just one-third (or, in many cases, less than 20%) of overall smartphone-originated traffic is no longer a surprise to those that have studied global smartphone data usage patterns in detail. Other papers in this series (Part 1, in particular) have analyzed in huge depth the distribution of traffic across cellular and Wi-Fi networks in aggregate to the extent where readers were left in little doubt as to the importance of Wi-Fi to the overall smartphone user experience.

Although the rate of penetration of user adoption on self-provisioned/ private Wi-Fi is at least double that of managed public Wi-Fi in every market analyzed (see fig. 10), a gap of this size should not necessarily be surprising given the friction and challenges posed by the cumbersome and complicated authentication processes that still dominate as barriers to successful access. More astonishing, however, is the vast gulf that exists between the volumes of traffic transmitted over self-provisioned/private Wi-Fi hotspots compared with those under professional management.

In the first paper produced in this series, an analysis of Wi-Fi traffic distribution by time of day (see Part 1, fig. 9) lent robust support to the oft-stated, but rarely statistically-proven perception that overall Wi-Fi traffic volumes are dominated by in-home usage. The mapping of traffic using a busy hour distribution method (see Part 1, Fig. 10) demonstrated that the highest and most sustained peaks in busy traffic occurred during the evening hours, thereby aligning to those periods when users can be expected to be at home. This trend was further supported by the a much "flatter" distribution of traffic on weekend days where usage is much more evenly spread due to fact that users are much less mobile or "out of the home" during these periods.

The analysis of the effect of in-home usage on overall Wi-Fi patterns can now be taken forward and quantified thanks to the additional layers of granularity provided in Mobidia's usage data.

Given the sheer extent of investment and interest in the deployment of managed public Wi-Fi in customer-facing venues on a genuinely global basis, it is arguably sobering to note just how little users are reliant upon this expensively-deployed service in terms of their absolute bandwidth requirements. A question posed to all but the most informed stakeholders in the Wi-Fi ecosystem would only very seldom yield an answer that correctly pegged managed public Wi-Fi usage in the low single digits as a proportion of overall smartphone usage. But that is the reality in all markets sampled using Mobidia's data (see fig. 11).

As the home to the AT&T as well as to other leading players in the public Wi-Fi market such as Boingo, iPass and Devicescape, not to mention leading vendors such as Cisco and Ruckus Wireless, the US is rightly characterized as one of the world's leading public Wi-Fi markets.

While US Android smartphone users rely on Wi-Fi to meet just over two-thirds (68.4%) of their overall data connectivity needs on average and almost four out of 10 users connected at any one time connected to a managed public Wi-Fi hotspot during the period under analysis, the absolute volume of traffic transmitted by users when connected to a managed public Wi-Fi

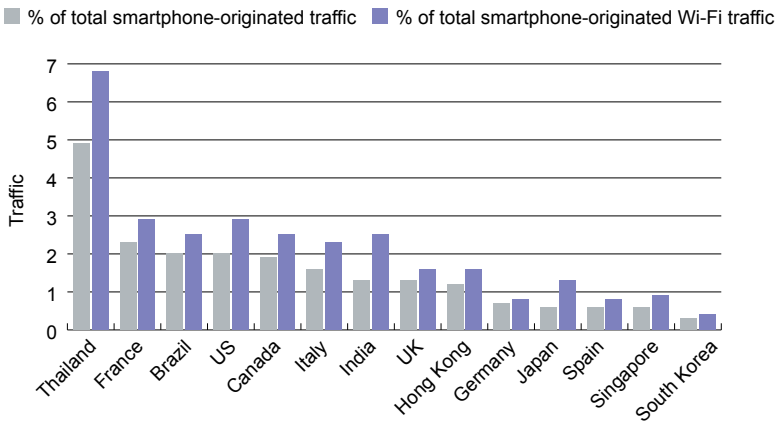
Fig. 11: Distribution of Android smartphone-originated traffic across cellular and Wi-Fi networks, by hotspot type, selected countries, Jan 2013

Source: Mobidia

hotspot amounted to just 2.0% of the overall total traffic generated across all forms of cellular and Wi-Fi connectivity (see fig. 12).

While 2% may not appear to reflect the hallmarks of a leading market, at that level, the US can actually be considered to be in the leading pack of markets in terms of the distribution of smartphone-originated traffic to managed public Wi-Fi hotspots (see fig. 13). At the lower end of the scale are a large group of markets, where usage across managed public Wi-Fi has failed to break out from beyond the realms of a rounding error when compared with overall traffic demand. Given the hurdles to the development of the German public Wi-Fi market outlined earlier, it is not surprising to see Germany amongst these "laggard" markets. But the more surprising presence of the trio of Asian markets of Japan, Singapore and South Korea in that group can be tied to more subtle and forward-looking local market developments.

Fig. 12: Managed public Wi-Fi traffic as a percentage of Android smartphone-originated total traffic and of Android smartphone-originated Wi-Fi traffic, by country, Jan 2013



Source: Mobidia

Singapore, Japan and South Korea are all markets that have seen very strong investment into the deployment of managed public Wi-Fi.

Fig. 13: Distribution of total Android smartphone traffic by connectivity and hotspot type, selected countries, Jan 2013

	Distribution (%)			
Country	Cellular	Self-provisioned/ private Wi-Fi	Managed public Wi-Fi	Managed public Wi-Fi as % of total Wi-Fi
Thailand	27.9	67.2	4.9	7.0
France	20.6	77.1	2.3	3.0
Brazil	19.2	78.9	2.0	2.0
USA	31.6	66.4	2.0	3.0
Canada	22.9	75.2	1.9	3.0
Italy	29.2	69.2	1.6	2.0
India	47.0	51.7	1.3	3.0
UK	18.3	80.4	1.3	2.0
Hong Kong	27.5	71.3	1.2	2.0

Source: Mobidia

In Singapore, this investment has been spearheaded by the Singapore government with the establishment of a city-wide municipal public Wi-Fi network dating back several years. But, despite the availability of a broadly-deployed and historically free-to-access hotspot network, smartphone users in Singapore are more heavily dependent on cellular connectivity than smartphone users in most other markets: Cellular accounted for 31% of total smartphone-originated traffic in January 2013. This is explained by the fact that smartphone users enjoy more generous monthly data allowances than in any other country globally. According to data provided by Mobidia based upon user-supplied insights on their monthly data plan allowances, 51% of the country's smartphone users have a plan that is either unlimited or contains a monthly allowance of 5GB or more. The "comfort blanket" provided by such tariffs, together with the strong investment into and rapid deployment of evolving cellular broadband technologies (HSPA+/LTE) in the country, have had an impact on the overall relevance of access to managed public Wi-Fi to Singapore's smartphone users. The poor experience that many users have experienced on the managed public Wi-Fi network in terms of slow connections has also served to push users towards the cellular networks to obtain a superior user experience.

In contrast, the title of the "King of Managed Public Wi-Fi" goes to a surprising, but deserving, winner in the shape of Thailand: Almost 5% of total smartphone-originated traffic flows over managed Wi-Fi hotspots there, more than double the share seen in any other market globally. It is not just usage, but also user adoption of managed public Wi-Fi that benchmarks highly. Aside from the UK and Hong Kong (see fig. 11), the rate of user adoption of managed public Wi-Fi by Thai smartphone users exceeds all other market by more than 20 percentage points, an extraordinary margin.

The fact that Thailand stands apart in this way from all other markets can be explained in relatively simple cause-and-effect terms. Thailand is home to arguably the world's longest-running and most controversial 3G licensing saga, outstripping even China and India in terms of delays, setbacks and general political chaos. As a result, the 3G market, in terms of network deployment and user uptake, has grown only in fits and starts with 3G adoption at only 10% of the total cellular subscription base, compared to 35% in Malaysia and 78% in Singapore, according to data from Informa Telecoms & Media.

Thailand's answer to this challenge has been to embrace Wi-Fi as an alternative approach to high-speed data connectivity and accelerate the mass deployment of managed public Wi-Fi hotspots across the country; an investment led by both the Thai government and the market's incumbent mobile operators. By way of proof of its commitment to managed public Wi-Fi, the Thai Ministry of Information and Communication has committed to deploying 250,000 managed public Wi-Fi hotspots in Bangkok alone within the next two years (by 2015).

Thailand is far from alone in suffering the frustration of a late or inferior cellular broadband infrastructure using 3G or 4G technologies. In that context, markets such as India, Bangladesh and Pakistan represent just a few examples of the enormous potential opportunity for broader managed public Wi-Fi deployment to meet a larger proportion of users' connectivity requirements.

Conclusions and future implications

- The first and most important point to make is that absolute usage of any form of connectivity does not equate to the value perceived by the user. Indeed, users' perceptions of value are built upon a broad range of blocks, including – but far from limited to – value drivers such as the cost of access, the quality of experience, the urgency of any action and its intended purpose (e.g., time-wasting versus an urgent business-related matter). Consumers are used to making network selection choices themselves based upon these criteria and this well-entrenched user behaviour should and must be respected by device vendors, operators, network manufacturers and as they seek to improve today's Wi-Fi user experience.

- On this basis, the analysis should absolutely not be interpreted as an indictment of the value of managed public Wi-Fi to smartphone users, but rather a ground-breaking quantification of the breadth and depth of user adoption of this form of connectivity. The fact that managed public Wi-Fi usage is so low in relative terms to cellular or self-provisioned/private Wi-Fi usage and yet is clearly valued on other terms by users, such as by deliberately picking tariff plans that contain bundled managed public Wi-Fi access or by being more loyal to providers of such services, is perhaps a reflection of the fact that it is precisely on those rare occasions that managed public Wi-Fi is used that the value perception is built.

- Nevertheless, as the industry enters a crucial commercialization phase of networks and devices using Passpoint and Next-Generation Hotspot technology in 2013, it is undoubtedly time for operators to realistically evaluate the role they will be able to play in providing an enhanced Wi-Fi user experience to their customers. The distribution of traffic over managed public Wi-Fi networks is small thanks in no insignificant part to the fact that managed public Wi-Fi networks built and operated by mobile operators, integrated operators, cable operators and others account for just a tiny fraction of the enormously complex and fragmented "public" and "private" Wi-Fi market.

- A key issue for operators that are heavily committed to the integration of Wi-Fi into their overall network architecture and that believe strongly in building an experience aligned "seamlessly" to cellular propositions is how they can construct and bring this message to market in a way that does not over-promise or mislead the customer. User expectations are notoriously challenging to manage effectively and any operator that boasts loudly about offering a "seamless Wi-Fi and cellular experience" will need to think carefully about how to respond to customers that rightly question why this will only apply to the 5% or fewer occasions when usage is actually taking place over the operator's own managed public Wi-Fi.

- It is also evident that the pressure on cellular networks has largely been alleviated by the usage of self-provisioned/private Wi-Fi outside the operator domain. Indeed, the term "offload" is left looking even more misplaced than it already did.

- The piece begun by analyzing the level of investment and commitment to the broader deployment of public Wi-Fi. The question of whether this investment can be justified on the basis of mobile network congestion alleviation looks increasingly shaky. Not only are cellular traffic growth forecasts now subject to major revisions downwards, it is clear that where Wi-Fi is being used to serve connectivity needs it is, for today and in the short- and medium-term, being primarily driven by usage of self-provisioned/private Wi-Fi hotspots.

- The deployment of managed public Wi-Fi to meet the intense traffic demand found in certain venue types with unusual levels of footfall and traffic demand, especially those with short-term, time-limited spikes, such as sports stadia and other entertainment venues, represents a clear and justifiable economic business case. Similarly, the use of managed public Wi-Fi to serve indoor locations unreachable by cellular macro networks is another entirely logical and ROI-driven investment. But the race to grab any venue anywhere without a clear understanding of the substitution effect on the cellular network should be resisted, unless of course players have no cellular networks to worry about. In that context, cable players, fixed-only or standalone Wi-Fi operators absolutely should and will remain at the forefront of investment into public Wi-Fi expansion.

- It has yet to become the focus of public discourse in the industry, but through snatched conversations in the corridors and private meeting rooms of some mobile operators, doubts about the role that Wi-Fi plays in supporting mobile data monetization strategies are likely to start to emerge. As the China Mobile case has served to highlight, there is a major monetization gulf between the ability of mobile operators to generate returns from managed public Wi-Fi traffic compared with when it flows over their cellular networks.

- The emergence of advertising, sponsorship and other interesting new business models to monetize managed public Wi-Fi are positive, but operators must question and then find the right path to maximize returns from the provision of connectivity-on-the-go. The example from Singapore highlighted in this paper suggests that great mobile broadband infrastructure and generous smartphone data allowances can entice traffic back onto the cellular networks – but will operators be able to build the pricing models that maximize the profitability of such moves? This is very much in question, giving the pricing ill-discipline that has dominated the first and second phases of the mobile broadband market.

- Mobile operators must start to answer a number of important questions. What is the impact of a seemingly unstoppable transition to free-to-end-user Wi-Fi in public locations on users' perceived value of Internet access on the go? What impact is user dependency on Wi-Fi having on their willingness to pay for bigger data plans or to deliberately avoid incurring (lucrative) overage charges? These questions are now more timely than ever, given the transition underway to 4G LTE and the promises of a superior user experience and the opportunity to deploy fatter and, importantly, empty mobile networks. What impact will this migration to 4G LTE have when the typical experience, on today's under-used networks, is demonstrably superior to the managed public Wi-Fi hotspot?

- Whatever the answer to these questions, there is no doubt that the relentless march of both self-provisioned/private and managed public Wi-Fi will carry on regardless. Too many players with too much at stake remained too committed to growing the Wi-Fi ecosystem for its position as the primary form of Internet connectivity to be anything other than cemented, both in the hearts of operators and vendors and, importantly, in the hearts of venue owners and users. An interesting debate – with definite winners and losers – is starting to take shape and we are delighted to be able to share this insight to inform that debate.

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