United States expands global lead in mobile broadband
How policy actions could enhance or imperil America’s mobile broadband competitiveness
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In 2012 we developed a “Mobile Communications National Achievement Index” to track the relative strength of countries’ wireless sectors, enabling policymakers and industry leaders to evaluate America’s standing compared to the rest of the world. In this paper we offer contrasting spectrum policy scenarios and assess their effect on the index rankings. We demonstrate how, if U.S. policies are insufficient to address carriers’ growing need for spectrum, U.S. wireless development can be constrained, putting America’s mobile broadband leadership at risk over the coming decade, along with the benefits to the U.S. economy that leadership confers.

- As shown by Deloitte’s Mobile Communications National Achievement Index, the United States is in the enviable position of being the global leader in mobile broadband and has recently strengthened its position after losing a significant portion of its lead a few short years ago.

- This leadership has enabled the United States to reap substantial economic and societal benefits that are being enjoyed by consumers and enabling numerous U.S. industries to strengthen their global competitive edge.

- Other countries recognize the importance and value of mobile broadband leadership and are aggressively pursuing capabilities to challenge U.S. leadership, positioning themselves for a time when the United States might become vulnerable due to a mobile broadband supply shortage.

- By applying spectrum policy scenarios to the index, it becomes clear that U.S. wireless development can be constrained and America’s mobile broadband leadership put at risk over the coming decade if U.S. policies fail to provide enough spectrum of sufficient quantity or quality.

- A decline in leadership would not only hurt the U.S. mobile industry and the U.S. mobile ecosystem, but could create a chilling effect on the broader U.S. economy, which increasingly relies on mobile services for both consumer and business use. Moreover, it would constrain wireless capacity just as demand is further increased by the proliferating “Internet of Things.” To promote continued leadership, the United States should redouble its efforts to ensure that sufficient spectrum is placed into the market in the next few years for wireless carriers.

The bottom line

If U.S. wireless development is constrained due to lack of spectrum availability, America’s mobile broadband leadership will be at risk over the coming decade, jeopardizing benefits that extend across the broader U.S. economy. Delays or policy actions that impede the adequate supply of mobile broadband could demote the United States from its current position as global leader to just one of many contenders, resulting in reduced U.S. gross domestic product (GDP) and job growth and diminished global technology eminence.
The United States is benefiting from its world leadership position in mobile broadband

Contrary to concerns about a decline in America’s global economic clout, mobile broadband is one industry in which the United States continues to demonstrate clear leadership. Despite assertions that America’s global influence is on the wane, the U.S. mobile broadband market is dynamic and healthy, placing the United States in the enviable position of global leadership in mobile broadband innovation and performance.

At the center of the U.S. mobile broadband ecosystem, national and regional carriers are aggressively competing and investing in their product offerings and networks. Customers have choices among carriers and pre- or postpaid service options, and the latest devices and innovations typically debut first in the United States.

The United States is also number one in Long-Term Evolution (LTE) deployment, which is critical to the strength and advancement of the mobile ecosystem. By the third quarter of 2013, LTE networks covered approximately 90 percent of the U.S. population, compared to 47 percent of the population in Europe and 10 percent of the population in Asia. While the United States has less than 5 percent of global wireless subscribers, it has 50 percent of 4G subscribers.

The United States has a dominant position in other critical aspects of the ecosystem as well. U.S. companies provide 96 percent of the global mobile smartphone operating systems market based on second-quarter 2013 shipments, and U.S. companies have over 91 percent combined share of mobile app downloads globally. An extensive community of developers supports the U.S. platforms, as 67% of the 680,000 app developers in North America support the Android platform and 60% support iOS. U.S. companies produce roughly 17 percent of all smartphones based on global sales to end users in 2013.
The health and performance of the mobile broadband ecosystem benefits the U.S. economy as a whole

Category leadership is valuable in the context of international telecommunications industry competition, but there is growing evidence that the combined direct, indirect, and induced effects of mobile broadband are significant on a broader macroeconomic basis for the United States. The mobile ecosystem has become a critical component of America’s economy, underpinning productivity, innovation, and growth across a broad swath of U.S. industries. Great potential exists in emerging mobile applications in areas such as telematics, mobile health, and mobile commerce. Whether it be equipping a mobile workforce or simply enabling consumers to be more informed and empowered while on the go, wireless communications have become deeply embedded in industry and society.

There are many examples of mobile broadband aiding and improving traditional activities in nontraditional ways. For instance, a recent survey found that 80 percent of physicians use tablets or smartphones to directly influence patient care, and those physicians achieved an average productivity gain of 1.1 hours per day. Another recent study of 20,000 commercial fleets showed that the use of telematics in vehicle fleets provided a 20 percent decrease in workday hours and a 15 percent increase in vehicle utilization. These growing applications and uses impart comparative advantages to U.S. companies and collectively are having a growing positive impact on the U.S. economy.

It is clear that the mobile broadband industry is having favorable effects on America’s economy. What is less clear is whether the United States is maintaining a leadership position in the face of global competition and how it may protect or strengthen its position for the coming decade. These are critical questions to answer as the United States becomes increasingly reliant on mobile broadband as strategic infrastructure across much of the U.S. economy and society.
America’s leadership position has recently strengthened but is not assured, as demonstrated by Deloitte’s Mobile Communications National Achievement Index

Deloitte’s “Mobile Communications National Achievement Index” objectively measures how U.S. mobile broadband performance compares to other leading or contending countries. Deloitte has developed a Mobile Communications National Achievement Index to track the relative strength of countries’ wireless sectors, enabling U.S. policymakers and industry leaders to evaluate America’s standing against the rest of the world.

Exhibit 1: Deloitte’s Mobile Communications National Achievement Index

Tracks 20 countries that are established mobile broadband leaders or potential challengers:

- Australia
- Brazil
- Canada
- China
- Denmark
- Finland
- France
- Germany
- India
- Japan
- Mexico
- Netherlands
- Norway
- Portugal
- Singapore
- South Africa
- South Korea
- Sweden
- U.K.
- U.S.

Ranks the countries annually based on 15 global competitiveness indicators that measure end user benefits and the health of the wireless industry for each country. The indicators fall into three broad categories:

- **User engagement.** Measures such as mobile penetration per capita, advanced device penetration, mobile broadband penetration, and voice usage
- **Network performance and affordability.** Measures such as percent of population covered, data speeds, and price per minute
- **Industry ecosystem performance.** Measures such as carrier economic contribution, amount of carrier competition (Herfindahl–Hirschman Index), carrier capital investment, ecosystem patent generation, and share of wireless device sales

Weights indicators to balance contributions from categories with multiple underlying metrics, then averages them into a single, overall score for each country.

When using the index to gauge national competitiveness, what matters for a given country is the index ranking relative to other countries, not the absolute index score. Mobile broadband performance is rising worldwide, and the score gap between countries indicates their relative competitiveness based on share of global performance improvement in mobile broadband. This moving target means that a country can score lower in a particular year, despite making year-over-year progress, if its performance improvement was less than that of the market leader. On a macro scale, the competitiveness rank effectively translates into the relative value-add that a country can produce and then apply in mobile-broadband enabled products and services both in-country and globally through exports.
The index provides evidence of U.S. leadership in mobile broadband
As shown in Exhibit 2, with results reflected through 2012, the index provides evidence of sustained U.S. leadership in mobile broadband over the past decade and a modest strengthening of its position since 2009.

Exhibit 2: Mobile Communications National Achievement Index ratings:
Selected countries and regions

U.S. leadership in mobile broadband peaked around 2006 thanks to relative strengths in voice usage, affordability, competitive balance, capital investment, and patent generation. The continued U.S. lead since that time has been fueled by substantial investment from carriers, an extensive entrepreneurial ecosystem that generated a pipeline of compelling mobile innovations, a broad and involved user base, and a market-oriented regulatory environment. Examples of U.S. leadership include:

- Access to quality spectrum, including the PCS band in 1995, EBS/BRS and AWS-1 bands in 2006, and 700 MHz band in 2009
- Carrier investment of $120 billion during 2008–2012, focused on improving network performance and expanding service offerings
- U.S. wireless patents issued to U.S. companies three times higher in 2012 than for companies in any other country
- Mobile broadband penetration of 89 percent in the United States in 2012 compared to 62 percent in all OECD countries and 690MB of data use per customer per month compared to 140MB globally
The strength of the U.S. position can change quickly as demonstrated by the rapid lead decline during 2006–2009. Continued U.S. leadership is not assured, as other countries are aggressively pursuing developments in this space. The U.S. position has not been consistently strong. In the four years from 2006 to 2009, roughly three-fourths of the U.S. lead vanished. The United States lost ground as other countries and their governments made significant investments in developing and growing their mobile broadband capabilities and usage, improving their relative performance in key areas such as penetration per capita, affordability, voice usage, and capital investment. Also, the United States lagged in advanced device adoption.

It is important to note that U.S. relative performance declined even while the U.S. was actively advancing mobile broadband capabilities — aggressively rolling out 3G, developing and deploying advanced smartphones, and laying the foundation for 4G services. In other words, the U.S. lead did not shrink due to a lack of effort or decline in capabilities, but simply because the global competition got better faster. As described in Exhibit 3, many governments are undertaking substantial efforts to develop and promote mobile broadband development, viewing it as a strategic investment in their future and a foundational capability for economic growth.

Exhibit 3. Efforts to promote 4G deployment or advanced spectrum use: Selected governments

<table>
<thead>
<tr>
<th>Government</th>
<th>Illustrative governmental actions</th>
</tr>
</thead>
</table>
| China          | • A driving force behind the development of a competing version of LTE and is pushing to develop a supporting ecosystem that could give Chinese vendors a competitive edge  
• Providing R&D for a Chinese version of 4G wireless infrastructure  
• Intends to invest $320B in broadband infrastructure through 2020; investment in 4G may reach $16B in 2014  
• Coordinated large-scale LTE trials and issued 4G TD-LTE licenses to all three mobile carriers  
• State-owned banks financing the export of China’s wireless technology |
| European Union | • Funding cognitive radio research for wireless networks  
• Supporting an initiative to develop cognitive radio systems through the introduction and promotion of real-time secondary spectrum trading and the creation of a new spectrum commons regime  
• Collaborating to manage and harmonize spectrum policies across borders  
• Developing the internal market for wireless innovation |
| France         | • Made available 30 MHz of spectrum in the 800 MHz band and 70 MHz of spectrum in the 2.6 GHz band for 4G service  
• Mandated that 90 percent of the population will be covered by 4G by 2025, creating a large market for 4G services  
• Approved re-farming of spectrum for third largest carrier to accelerate 4G rollout in 2013 |
| India          | • Planning an auction of up to 100 MHz of additional spectrum in the 700MHz band that is well-suited to wireless broadband  
• Permitting carriers with 2300 MHz spectrum to swap for 700MHz spectrum at to-be-determined valuations  
• February 2014 auction of the 1800MHz band, split between eight carriers |
This extensive set of country initiatives makes it clear that mobile broadband is widely viewed around the world as a strategic national infrastructure asset. Global leadership in this space imparts significant advantages and attracts substantial attention and investment. The United States has already demonstrated that it is feasible to lose position within a few short years; the challenges of protecting America’s leadership in a highly competitive global environment should not be underestimated.

<table>
<thead>
<tr>
<th>Government</th>
<th>Illustrative governmental actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>• Identified 95 MHz of spectrum to reallocate for broadband mobile wireless access systems</td>
</tr>
<tr>
<td></td>
<td>• Supported NTT DOCOMO, the leading wireless carrier, with LTE field tests</td>
</tr>
<tr>
<td></td>
<td>• Released revised version of Action Plan for Spectrum Reallocation in October 2012 that accommodates increased demand for mobile radio communications by repurposing spectrum</td>
</tr>
<tr>
<td></td>
<td>• Actively promoting the use of radio spectrum in a variety of social infrastructure applications, including public safety, mobile telephony, and medical treatment</td>
</tr>
<tr>
<td></td>
<td>• Allocated 700MHz band to three main carriers; as of 2012, 4G is available in seven bands</td>
</tr>
<tr>
<td>South Korea</td>
<td>• Actively field testing what has been rated the world’s fastest LTE network</td>
</tr>
<tr>
<td></td>
<td>• Providing funds to build a “mobile cluster” industrial zone to support LTE product development</td>
</tr>
<tr>
<td></td>
<td>• Struck a deal to support Ericsson, a leading 4G network equipment vendor based in Sweden, with the development of a 4G R&amp;D facility in the country</td>
</tr>
<tr>
<td></td>
<td>• Auctioned off additional 95MHz of spectrum in 2013</td>
</tr>
<tr>
<td>Sweden</td>
<td>• Deregulated market prior to the United States</td>
</tr>
<tr>
<td></td>
<td>• Made the 2.6 GHz band available to carriers in 2008</td>
</tr>
<tr>
<td></td>
<td>• Auctioned the 800MHz band in 2011 to enable better reach to rural areas; one carrier contract required expanded access to specific rural areas</td>
</tr>
<tr>
<td></td>
<td>• Provided Ericsson an undisclosed level of financial support</td>
</tr>
</tbody>
</table>
Policy actions related to spectrum supply could have a major influence on U.S. mobile broadband leadership in the coming decade

Policies that influence mobile broadband supply have been instrumental in enabling U.S. success in mobile broadband

Measures influencing spectrum supply have arguably been the most instrumental policy force affecting mobile broadband over the last two decades. Over this period the Federal Communications Commission (FCC) supported formation of the mobile broadband ecosystem by making more spectrum available and permitting market forces to operate.

- From 1994 to 2000, FCC auctions tripled the amount of spectrum available for commercial mobile services\textsuperscript{21}
- In 2003, the FCC removed spectrum caps, making it possible for carriers to aggregate sufficient spectrum for development and deployment of mobile broadband networks
- The FCC permitted U.S. carriers to buy and sell spectrum, enabling more efficient allocation of airwaves by allowing carriers with the greatest value-generation potential to purchase spectrum from those that were less able to use it effectively\textsuperscript{22}

These market-oriented actions collectively created a favorable regulatory environment that permitted industry investments and developments to flourish. Rollout of second, third, and fourth generation network technologies occurred in rapid succession over the last 15 years, laying the foundation for the advanced services, devices, and applications in widespread use today.

Despite significant industry action and innovation, policies that affect supply will likely continue to be key influencers of mobile broadband performance in the coming decade

Continued high-demand growth is threatening to tax the industry’s ability to maintain adequate supply. To keep up with the burgeoning demand, mobile carriers are using a variety of means to manage capacity in their networks, including:

- **Increase in network density:** Mobile carriers have more than doubled the number of cell sites over the last decade, partly to improve coverage but importantly to expand capacity. Carriers are actively adding small cells as a means to reuse spectrum within a given geography.\textsuperscript{23}

- **Rollout of more efficient network technologies:** Each generation of mobile technology — 2G, 3G, and 4G — increases the mobile data capacity per MHz of spectrum. LTE has not yet been fully deployed across the United States, yet the industry is already actively pursuing next generation technologies such as LTE-Advanced and 5G.\textsuperscript{24}

- **Greater use of offloading to alternative networks:** Shifting data traffic to Wi-Fi networks in high-use areas has been effective for reducing traffic loads during
peak hours. Carriers are making strides in expanding their Wi-Fi footprints while enabling simplified user logons and access to increase adoption. A recent survey estimated that 22 percent of all additional data capacity added in 2014 will come from Wi-Fi offload.  

• **Deployment of advanced network management methods:** Initial rollouts of network management solutions such as self-optimizing network (SON) software are underway, enabling carriers to plan, configure, manage, optimize, and manage issues on networks automatically, based on real-time network demands. These types of solutions can permit carriers to better adapt to dynamic changes in traffic loads, such as those that exist during morning and evening rush hours or during major sporting or entertainment events.

• **Redistribution of spectrum between carriers:** Numerous transactions and swaps of spectrum licenses have improved spectrum utilization by putting spectrum in the hands of carriers that most need it. These transactions likely will continue as carriers determine how best to optimize their portfolios of low- and high-frequency spectrum holdings to complement network improvements and meet demand.

Industry actions have yielded significant supply improvements and play a vital role in shoring up U.S. mobile broadband leadership in the near term, but there are limits to how much more industry can accomplish with a finite amount of spectrum. For example, increasing the network density can have a significant impact on operating cost and complexity, since many small cells are necessary to provide coverage equivalent to one larger cell, and obtaining rights and access to new cell locations is often costly and time-consuming. Likewise, continued market-driven sales and swaps of spectrum between carriers can help place spectrum in the hands of carriers that can make greatest use of it, but spectrum redistribution is only a means to provide temporary respite from the capacity squeeze affecting all carriers. Despite significant action and innovation, the industry is becoming more dependent upon pending government actions to avoid a supply shortfall. Given government’s central role in allocating America’s spectrum, it is important that policy be designed to ensure adequate supply to meet demand.

The pace of government action is an issue, given past experience in bringing additional spectrum into the market. History shows that years or even a decade can pass between the initiation of a spectrum reallocation and the point when the spectrum becomes available for use.  

The clear and negative implications of a mobile broadband supply shortage highlight the significance of government policy decisions and implementation. Progress on this front is vitally important to fuel continued investment, innovation, and use by carriers, the rest of the mobile broadband ecosystem, and customers.

This situation raises questions as to how U.S. mobile broadband leadership might be affected by U.S. government actions over the next few years, specifically the repercussions of failing to increase spectrum supply sufficiently to meet demand. Could delay in or lack of policy support for increasing spectrum supply have a material impact on:

• Carrier investment and network performance?

• Innovation in the broader mobile ecosystem?

• Affordability for and usage by mobile broadband consumer and business customers?

Understanding the potential implications of different policy outlooks is crucial for establishing priorities and considering new actions to sustain or strengthen U.S. mobile broadband leadership. Delay in policy implementation or the enactment of counterproductive policies could not only stall but potentially reverse U.S. gains in mobile broadband leadership, with negative implications for the U.S. economy.
If U.S. policy does not produce adequate spectrum supply, America’s leadership in mobile broadband could be eroded or lost as other countries close the gap.

Past performance is no guarantee of future success

Thus far, the United States has benefited tremendously from its leadership position in mobile broadband. However, the future could be different from the past — for better or worse. Deloitte’s Mobile Communications National Achievement Index can serve as a useful tool for estimating future rankings under different policy scenarios.

Although the Mobile Communications National Achievement Index demonstrates a nation’s past and present positioning in mobile broadband, it can also be used on a forward-looking basis to help policymakers understand how mobile broadband performance might evolve under different policy scenarios.

As illustrated in Exhibit 4, different policies are likely to affect U.S. performance in distinct ways, resulting in shifting key performance indicator (KPI) values that collectively result in a different index score. For example, policies that affect broadband supply will indirectly have an impact on pricing, affordability, and usage. Supply restrictions will necessarily lead to higher equilibrium pricing per unit of use and lower equilibrium usage. This in turn affects the potential for industry returns, reducing investment levels and innovation.

Exhibit 4. U.S. policy relationship to mobility index rankings

<table>
<thead>
<tr>
<th>Description</th>
<th>Example</th>
<th>U.S. policy related to mobile broadband...</th>
<th>...Affects actions of players in the ecosystem...</th>
<th>...Which are manifested in KPIs for mobile broadband...</th>
<th>...Which determine the U.S. index rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government policy related to the quantity, quality, and conditions around spectrum and cell site deployments</td>
<td>Government streamlines cell site approvals</td>
<td>Players in the ecosystem (carriers, OS providers, app developers, etc.) make investment and business decisions taking into account policy</td>
<td>Outcomes of business decisions manifest themselves in mobile broadband KPIs (capex, connection speed, etc.)</td>
<td>The KPIs are aggregated to determine the index score, which is ranked relative to other countries for comparison</td>
<td>U.S. index score increases relative to other countries</td>
</tr>
</tbody>
</table>
Two contrasting index scenarios provide a useful picture of how U.S. supply policy can affect America’s ability to defend its mobile broadband leadership position

By considering two supply scenarios — a “favorable” scenario in which U.S. policy actions and timing are sufficient and supportive to meet America’s supply needs and an “unfavorable” scenario in which policy actions are insufficient or unsupportive — we can project plausible outcomes in U.S. mobile broadband global competitiveness over the coming decade. A growing index score edge favoring the United States over other countries would indicate the United States is achieving exceptional global performance growth by innovating and capturing value from the growing consumer and business uses of mobile broadband. A declining edge would indicate just the opposite, reducing the motivation and incentive for mobile broadband investment to flow into the United States and into the mobile broadband industry. Even if America’s lead is reduced but not lost, other countries might be able to overtake the United States in certain mobile broadband segments by capitalizing on their inherent advantages. For example, a country with a strong public health system could use that advantage to lead innovation in the area of mHealth and capture a disproportionate share of performance growth in that segment.

These two divergent policy directions would have substantial but opposite effects on the industry’s ability to meet demand — effects that can be quantified using the mobile broadband key performance indicators. By assuming other countries continue their current mobile broadband actions and trends, we can isolate the influence of U.S. policy actions and estimate America’s ability to fend off global competitors in mobile broadband under both scenarios.

Scenario 1: A favorable and supportive policy approach enables sufficient mobile broadband supply

In this first scenario, spectrum of suitable quantity and quality is made available to wireless carriers in a timely manner:

- Much or all available spectrum is auctioned off within the next three to five years, helping to ensure that the total amount of spectrum is sufficient to consistently meet demand over the decade.

- Spectrum bands are of sufficient quality, accounting for factors such as frequency range, block size, national coverage, and international alignment.

- Shared spectrum contribution to supply is properly accounted for, factoring in impairments from sharing constraints.

- Terms and conditions for spectrum access and use are market-oriented, with limited regulatory restrictions.

Outcome: Mobile broadband spectrum supply matches demand, enabling the United States to strengthen and extend its mobile broadband lead

Under these conditions, U.S. policy provides spectrum that responds to mobile broadband supply needs, creating commercial incentives and investment returns that promote continued innovation and expansion in the use of mobile broadband. The additional supply allows wireless carriers to continue offering robust and compelling service to consumers and businesses.

- Available performance levels (e.g., data speeds, capacity, reliability, coverage, and latency) spur additional investment and innovation by wireless carriers and across the broader mobile ecosystem.

- Many mobile ecosystem companies participate in and contribute to this growth opportunity, spanning areas such as network infrastructure and operational support systems, devices, operating systems, and applications.

- Consumer and business uses grow as service performance remains strong and ecosystem innovation creates compelling new offerings, manifested in new devices, applications, and services.
The wireless ecosystem and industries with embedded wireless solutions (e.g., automotive telematics, mHealth, and mCommerce) gain from the strong home field advantage of U.S. mobile broadband leadership. The United States enjoys export advantages from the resulting innovations and new business models and is able to capture a growing share of global value in the respective market segments.

As illustrated in Exhibit 5, these combined performance improvements would likely position the United States to sustain its lead in the near term and within a decade even extend its lead to nearly match the levels of the early 2000s.

Exhibit 5. Mobile Communications National Achievement Index ratings — Scenario 1

Projection: 2013–2022
Scenario 2: An unfavorable or insufficient policy approach results in the mobile broadband market being throttled by supply shortages

In this second scenario, sufficient spectrum is not made available to wireless carriers in a timely manner:

- The total amount of spectrum lags demand — auctions are further delayed and allocated spectrum is insufficient.
- Spectrum bands are of lesser quality (e.g., higher frequencies, smaller blocks, limited national coverage, and less international alignment than in scenario 1).
- A substantial amount of new spectrum is shared, and the shared spectrum is incorrectly assumed to boost supply nearly as much as exclusive spectrum.
- Terms and conditions for spectrum access and use are restrictive and prescriptive, limiting the ability of market mechanisms to alleviate supply shortages.

Outcome: Demand exceeds supply, mobile broadband performance suffers, and the U.S. leadership position erodes

In this scenario, the policies enacted and executed in the United States are not sufficient to meet mobile broadband supply needs, leading to a shortfall relative to rising demand.

- Mobile broadband becomes less robust and reliable as localized performance issues (e.g., reduced speeds, increased latency and outages) increase in both geography and time.
- Wireless carriers must focus their efforts and resources on alleviating the spectrum and supply shortfalls, siphoning investments away from new products and services.
- Prices rise in order to keep demand from exceeding supply, dampening consumer and business use of mobile broadband and limiting purchases of the latest generation devices and applications.
- Ecosystem investment and innovation in the United States are reduced as investors pursue opportunities in more attractive countries and industries.
- Wireless ecosystems and mobile-enabled industries in other countries gain advantages over U.S. companies in innovation and exports. U.S. exports suffer.

As shown in Exhibit 6, the United States would likely maintain its leadership position for the next few years thanks to momentum from current capabilities and performance levels. However, mobile broadband supply and performance shortfalls would soon begin to take their toll, causing the U.S. lead to shrink over the latter half of this decade. By 2020 the U.S. lead would be modest at best, with increasing challenges from competing countries that are gaining ground with positive trends in their mobile broadband performance. The United States would become just one of several targets for global investment in mobile broadband and would risk losing its leadership position to other countries.
Supply shortages leading to the Scenario 2 outlook are plausible, as U.S. government actions to avoid a shortage appear to be falling behind
Significant progress has been made by the U.S. government to avoid a supply shortage, but the collective set of completed and planned actions appears to be falling behind relative to the objectives and timetable established in the 2010 National Broadband Plan. The FCC and NTIA continue to pursue a variety of initiatives to re-allocate commercial or federal spectrum on an exclusive or shared basis, with the most notable action being the pending auction to re-allocate broadcast TV spectrum. However, the United States appears to be substantially behind schedule in achieving the stated 2015 objective. As illustrated in Exhibit 7, current plans indicate that approximately 225–265 MHz of spectrum will be newly classified, auctioned, or planned for auction for mobile broadband use through 2015, which at the lower range estimate is roughly three-fourths of the National Broadband Plan 2015 goal. As important, 100 MHz of spectrum or approximately one-fourth of the total 395–435 MHz planned or identified to date is stipulated as shared-use, which due to the inherent nature of sharing will not be equivalent in supply value to exclusively licensed spectrum.
Exhibit 7. U.S. outlook for additional spectrum for commercial wireless services

<table>
<thead>
<tr>
<th>Category</th>
<th>Spectrum block</th>
<th>Per NBP/Fast Track/other</th>
<th>Indicated sale date/timing</th>
<th>Spectrum quantity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCS</td>
<td>2305–2320; 2345–2360</td>
<td>FCC Order</td>
<td>October 2012</td>
<td>15 MHz</td>
<td>Paired and unpaired 5 MHz blocks</td>
</tr>
<tr>
<td></td>
<td>2000–2020; 2180–2200</td>
<td>FCC Order</td>
<td>December 2012</td>
<td>20 MHz</td>
<td>Uplink</td>
</tr>
<tr>
<td></td>
<td>1695–1710; 1755–1780</td>
<td>Fast Track</td>
<td>November 2014</td>
<td>15 MHz</td>
<td>Unpaired, uplink only</td>
</tr>
<tr>
<td></td>
<td>2155–2180</td>
<td>NBP</td>
<td></td>
<td>25 MHz</td>
<td>Paired</td>
</tr>
<tr>
<td>Broadcast Auction</td>
<td>600 Block</td>
<td>NBP</td>
<td>Mid-2015</td>
<td>~80–120 MHz</td>
<td>Incentive auction</td>
</tr>
<tr>
<td>Identified</td>
<td>3550–3650; 1780–1850</td>
<td>Fast Track</td>
<td>Unspecified</td>
<td>100 MHz</td>
<td>Shared spectrum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NBP</td>
<td></td>
<td>70 MHz</td>
<td>Agency constrained</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>~395–435 MHz</td>
<td></td>
</tr>
</tbody>
</table>

* ~225–265 MHz of spectrum reclassified, auctioned, or planned for auction through 2015 versus the National Broadband Plan (NBP) goal of 300 MHz
* ~75–88% of NBP 2015 goal for mobile use
* ~79–87% of NBP 2020 goal including shared spectrum; ~59–67% of goal excluding shared spectrum

It is also worth emphasizing the complexity of U.S. spectrum allocations, most of which reflect decisions made during the twentieth century, and the time delays that can result in making spectrum available after it has been designated for commercial use. Reclaiming or sharing spectrum for mobile use is especially difficult and time-consuming, with some federal agencies indicating that it will take up to a decade to move their operations out of the designated bands. Developing economies have fewer challenges in this regard, and thus have the potential to make progress at the expense of the United States.

Whether viewed from the U.S. or global perspective, Scenario 2 is a disconcerting yet plausible outlook. U.S. mobile broadband leadership is by no means assured.
If the U.S. lead in mobile broadband is eroded or lost, it could result in substantial damage to U.S. economic development and technology leadership. Applying industry-specific multipliers to estimate the U.S. economic impact of reduced capital expenditure by carriers, a mobile broadband spectrum supply shortage could result in a direct loss of $67 billion in GDP and 344,000 jobs through 2022. However, the indirect and induced impacts of a mobile broadband supply shortage on other industries might be more significant. Mobile business applications are already used extensively in nearly every industry and are becoming increasingly indispensable for standard business activities. Further, even as human use of mobile data continues to expand, it pales in comparison to anticipated growth in the “Internet of Things” — much of which will be wirelessly enabled. Bullish industry forecasts include an estimate of 26 billion installed Internet of things units by 2020, impacting the global supply chain, and a prediction of 24 billion connected devices globally by 2016, resulting in a $1.2 trillion impact to North American economies from revenues, cost reductions, or service improvements.

If the United States mobile broadband position becomes diminished and weak, it could create opportunities for other countries to gain traction in areas of the mobile-enabled Internet of Things. Other countries, by tapping into their unique assets or characteristics — such as a higher population density or a leading public infrastructure — could overtake the United States in specific industries or applications such as telematics, mHealth, mCommerce, or mLogistics. Scale this effect across all global competitors and industries and it is likely the collective impacts of conceded leadership in mobile broadband would be substantial for the United States and its economy.

Should the United States relinquish its lead in mobile broadband and become just one of several global players, the economic consequences could be severe. On the other hand, if the United States retains its leadership position in mobile broadband, it could also become the market leader in a variety of new industry segments that sprout within the Internet of Things. In fact, it is not hard to envision a future in which the leading indicators of mobile broadband performance are also leading indicators of overall economic performance.

As shown by Deloitte’s Mobile Communications National Achievement Index, the United States is in the enviable position of being the global leader in mobile broadband and has recently strengthened its position after having lost much of its lead a few short years ago. More importantly, this leadership has enabled the United States to reap substantial economic and societal benefits that are being enjoyed by consumers and enabling numerous U.S. industries to strengthen their global competitive edge. However, other countries are aggressively positioning themselves for a time when the United States might become vulnerable due to a mobile broadband supply shortage. A scenario-based index analysis suggests that if U.S. policies are insufficient to address the problem, either because they fail to provide enough spectrum or more broadly fail to provide spectrum with sufficient quality or with sufficient timeliness, U.S. wireless development will likely be constrained and its mobile broadband leadership can be at risk over the coming decade. This outcome would have negative consequences for U.S. mobile carriers and the wireless ecosystem and would have a chilling effect on the overall U.S. economy, which increasingly relies on mobile services for both consumer and business uses. To ensure continued leadership, the United States should redouble its efforts to put sufficient spectrum into the market in the next few years for wireless carriers. Delays or policy actions that impede the supply of mobile broadband could demote the United States from its current position as global leader to just one of many contenders, resulting in reduced U.S. GDP and job growth and weaker global technology eminence.
Endnotes

1 See Deloitte, Airwave overload? Addressing spectrum strategy issues that jeopardize U.S. mobile broadband leadership, October 2012 for more information on the Mobile Communications National Achievement Index.


12 Deloitte, The impact of 4G technology on commercial interactions, economic growth, and U.S. competitiveness, August 2011: “U.S. Investment in 4G networks could fall in the range of $25–$53 billion during 2012–2016; conservatively, these investments could account for $73–$151 billion in GDP growth and 371,000–771,000 new jobs”.

13 This can be viewed as following the Red Queen Principle: “For an evolutionary system, continuing development is needed just in order to maintain its fitness relative to the systems it is co-evolving with.” Proposed by the evolutionary biologist L. van Valen. See F. Heylighen (1993): “The Red Queen Principle,” in F. Heylighen, C. Joslyn and V. Turchin (editors): Principia Cybernetica Web (Principia Cybernetica, Brussels). URL: http://cleamc11.vub.ac.be/redqueen.html. Or, as the Red Queen said in Lewis Carroll’s Through the Looking Glass, “It takes all the running you can do, to keep in the same place.”


16 Public filings and Deloitte analysis.


How policy actions could enhance or imperil America's mobile broadband competitiveness


23 Roger Cheng, “The carriers’ not-so-secret weapon to improve cell service,” CNNT, June 9, 2013


26 Phil Goldstein, “AT&T plans small cell push for 2014 that is actually quite large,” FierceWireless, December 19, 2013

27 Phil Goldstein, “Report: T-Mobile looking to scoop up 700 MHz A Block spectrum from smaller carriers,” FierceWireless, June 18, 2014

28 FCC, National Broadband Plan; Presidential Memorandum: Unleashing the Wireless Broadband Revolution, June 28, 2010

29 Projected figures in the index for other countries besides the United States were extrapolated from historical data in conjunction with analysis on macro trends. These projections were held constant across the two supply scenarios to isolate the influence of U.S. policy actions.


32 FCC, National Broadband Plan, March 2010


34 Table excludes 22 MHz of spectrum in the 2.4 GHz band pending FCC consideration of a rule change to allow terrestrial broadband use

35 Of the 30 MHz of WCS spectrum, 20 MHz may be used for mobile broadband services and 10 MHz for fixed broadband services, with possible future use as downlink spectrum to serve mobile broadband devices. See www.fcc.gov/encyclopedia/wireless-communications-service-wcs

36 Industry analysts estimate that the voluntary broadcast auction may yield less than the FCC goal of 120 MHz. See for example, Larry Downes, “FCC Chairman Wheeler to the Communications Industry: Father Knows Best?,” Forbes, May 5, 2014


38 For further explanation of the methodology, see Deloitte’s The impact of 4G technology on commercial interactions, economic growth, and U.S. competitiveness, August 2011, pp.7-8

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