Mobile Technologies Index
Device connectivity speed: One half of an equation

From the user's perspective, the mobile experience starts with the speed at which the device receives data and applications. That speed is, of course, the combined result of the speed capability of the modem technology inside the device, which is fixed, and the speed capability of the infrastructure, which can vary.

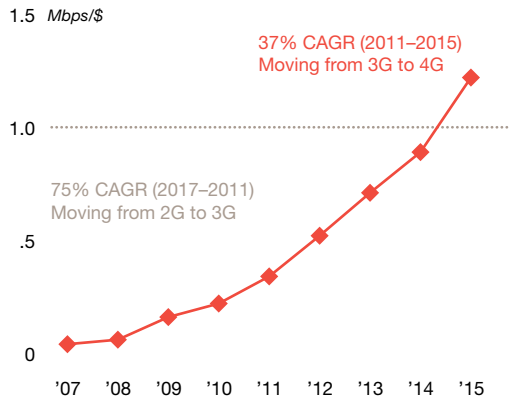
Thus, wireless speed is a complicated component to measure. So complicated, in fact, that we break it into two components, each with its own metric, in the PwC Mobile Technologies Index:

- Device connectivity speed in Megabits per second per dollar (Mbps/$)
- Infrastructure speed in average Megabits per second (Mbps)

In this article we offer our forecast for device connectivity speed, explain the metric and how we calculate it, and explore some implications for mobile innovation. In the next article we post [see, "Coming soon" at www.pwc.com/ca/mobileinnovations], we will offer our forecast for infrastructure speed, and identify a pattern we see that involves both wireless speed components and that signals a future innovation inflection point.

PwC forecasts a compound annual growth rate (CAGR) of 37 per cent for average aggregated device connectivity speed as measured in Mbps/$ through 2015. [see Figure 1] Put another way, average aggregated device connectivity speed will be four times greater in 2015 than in 2011.

Figure 1: Device speed capability CAGR, 2011–2015



Source: IHS iSuppli Mobile and Wireless Communications Service

The device connectivity speed metric is actually an aggregation of metrics for all wireless generations in use, plus the improvements we anticipate for each generation during their period in use.

Device connectivity speed is defined as the theoretical maximum speed at which a mobile device can operate using a particular air interface technology, also known as a generation of radio transmission. The theoretical speed of each air interface is fixed, but the average speed realized within each generation of technology can improve through the optimisation of handsets, base stations and air interface protocols.

In addition to these variables, average aggregated speed in each generation will improve as OEMs shift production mix to faster protocols that exist within the generation. Shifts within generations will deliver the following improvements in Mbps/$ from 2011 to 2015:

- 2G speeds will improve at 3 per cent CAGR as the mix moves from Global System for Mobile Communications to Edge.
- 3G speeds will improve at 6 per cent CAGR as mix moves from evolution-data optimized and Wideband Code Division Multiple Access to High Speed Packet Access+.
- 4G speeds will improve at 8 per cent CAGR as the mix moves from early Worldwide Interoperability for Microwave Access to mature Long term evolution.

37%

Annual increase in mobile device connectivity speed

These incremental gains may appear to be modest, but there is another dynamic at work: the mobile device production mix shifts as the industry moves from 2G to 3G to 4G. So we take the average speeds and weight them based on mobile handset production for each generation, and wind up with the Mbps/$ of "total devices produced" each year improving at a 55 per cent CAGR, 2011 through 2015.

However, this 55 per cent CAGR omits the cost of the main components in a handset that enable communication over the multiple air interfaces that end devices must support. After factoring in these costs, the actual Mbps/$ in the next four years will increase by 37 per cent—which is the device connectivity speed CAGR we use in our Index.

This is just half the rate of improvement we saw in the period 2007-2011, when the CAGR was a staggering 75 per cent. The slower increase in Mbps/$ is primarily due to the baseband chipset costs being significantly greater for the move from 3G to 4G than they were in earlier transitions.

Nonetheless, we anticipate that 37 per cent CAGR is enough improvement to enable continuing mobile innovation at a rapid pace. A review of recent history explains why we are confident in saying this.

When the original 2G iPhone was launched in 2007, Apple proved that consumers would accept iTunes on handsets and the Apps Store concept. However, 2G connectivity was slow enough to risk failure for the original iPhone if the faster 3G version had not been launched one year later. By the time the 3G iPhone was introduced, the mobile handset supply chain was already producing more than 200 million 3G phones per year. Apple didn't have to create the 3G technology, it just had to put it to use.

By the time Apple needed a faster connection to support its vision, the electronics industry was already devoting 20 per cent of production to 3G handsets. Consumers were buying the faster handsets before many applications existed that needed the speed, and in many cases before infrastructure speed had fully transitioned. In contrast to classic "pent-up demand," consumers were priming the pump for demand by pre-purchasing capabilities ahead of actual use cases, with the expectation that when 3G applications and 3G networks were available, their handsets were ready.

We anticipate this trend will continue, and we use this as an example of the following rule of thumb for timing the launch of a disruptive mobile venture:

When new capabilities reach a penetration level of 20 per cent, game-changing services can be launched, and market disruption can ensue. At the 20 per cent level, the market has begun transitioning from a relatively few early adopters to a mass market, and the entire ecosystem, including new entrepreneurs, are developing and positioning for game-changing solutions.

In 2007 and 2008, 20 to 25 per cent of device production was dedicated to 3G [see Figure 2]; this period coincided with the initial surge of 3G applications development. From the standpoint of infrastructure capital expenditure, 3G coverage had reached at least 53 per cent of what carriers were spending on 2G during that time. (We will say more about this in the upcoming infrastructure article.)

All the 3G-related factors—device production, applications development and infrastructure investment—set the stage for the success of Apple's iPhone, Google's Android, apps stores and other key mobile device phenomena that have contributed to the mobile ecosystem as we know it in 2012. 4G will offer even faster speed and less latency, which makes the speed more useful.

Together, improved device connectivity speed and improved infrastructure speed will deliver another wave of innovation and disruption (to be further explored in the next article). The move from 3G to 4G will enable new business models for carriers, and new use models for the mobile device, including more and better streaming video, mobile video conferencing, voice-over-Internet services and other applications involving the movement of large amounts of information, including the growing mass of data collected by the mobile device itself and transferred wirelessly to the cloud for analysis, and back again for action by the user.

Figure 2: 4G poised to drive the industry in 2015

Device Production	2007	2008	2009	2010	2011	2012	2013	2014	2015	CAGR (2011–15)
2G	80%	75%	71%	66%	58%	51%	44%	37%	31%	**-14%**
3G	20%	25%	29%	33%	41%	45%	47%	49%	45%	**3%**
4G	0%	0%	0%	0%	1%	4%	9%	14%	23%	**121%**

Source: IHS iSuppli Mobile and Wireless Communications Service

Let's talk

If you have any questions about the Mobile Innovations Forecast or would like to discuss any of these topics further, please reach out to us.

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