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Rural broadband: let them eat wireless?

Spectrum allocations give the government an off-budget option

Eli Noam JUNE 14 2011

My previous column "The Incredible Shrinking National Broadband Plan" dealt skeptically with the question whether that important blueprint – which aims to upgrade the internet connectivity of America – would work out, given its focus on wireless.

This was strenuously disputed by the architect of the FCC plan, Blair Levin, and by Jonathan Spalter, head of a busy Washington wireless business association.

Spalter hardly engages my article but uses it as a hook to advocate his industry's wish list. I wish that he had taken a little time for some due diligence before attacking me as anti-wireless. He would have found that I have been a wireless enthusiast for decades, as a licensed radio amateur, Advanced Class. I have operated mobile radio transmitters and receivers before mobile wireless became a consumer product. He would have further found that just on this FT site alone there are half a dozen columns by me on the topic – celebrating the progress of wireless in the US; advocating more government spectrum for civilian usage; opening up underutilized spectrum; accelerating the move away from analog broadcasting; and identifying the superiority of mobile-based TV.

With an open mind, such a critic would have also seen that my article does not argue against the shift of spectrum to mobile operators, quite to the contrary. They need more and they should get more. But one must question the likelihood that broadcasters in metropolitan areas will give up enough such spectrum voluntarily to do the job. To make them leave by their free will would require giving them a significant share of the auction revenues. Remaining broadcasters (including those who would keep a slice of their spectrum) would have to be relocated to other bands, which would have to be cleared. Subsidies for yet another set of digital boxes would have to be paid. Low-income TV viewers who would lose free TV would need to receive subsidised access to satellite of cable. All this will be expensive. That, plus other factors, makes suspect the claimed numbers of auction revenues, of which about $10bn would go towards reducing the budget deficit.

Levin, too, fires a salvo rather than addresses the argument. He engages in generalities ("Plan is better than no plan", etc.) and complains that I address only 5 per cent of the plan, skipping a lot of admittedly good things that the plan promises to do. But it is hard to address and analyse a 376-page plan in a column of two-three pages. So you pick and choose and focus on the heart of the matter, which to me (as it is to Koreans, Japanese, Singaporeans, Australians and many Europeans) is infrastructure – upgrade and expansion to all, and the role of wireless in it. Maybe Levin is addressing other critics from the past, but only slightly my column. What I like about Levin – in addition to his competence and dedication to the public interest – is his willingness to declare his plan a 'beta', i.e. in the process of analysis and improvements. So let us do just that.

There is no question that in metropolitan areas, spectrum must be added in order to make the next generation of wireless – 4G – operate at its high speeds for millions of people simultaneously. But the problem is not the same in rural areas. The shortage of spectrum exists primarily in metropolitan areas, but it is being promoted politically as a rural-support issue.

Yet 4G as the platform for broadband connectivity is not all that good for rural areas beyond a transition period. 4G speed is modest relative to that of fibre, cable modem, or DSL service. It might get a bit faster with technology, but without a huge extra allocation of spectrum or vast array of cell sites – both unlikely and costly – the wireline technologies will leave wireless in the dust. It is basic physics.

Fibre and cable are 50-100 times as fast, and DSL is about seven times as fast, with room to grow.

There are many people who do not conceive of the need for more speed than 4G. This is short-sighted. If millions of people were to stream movies over wireless, the networks would come to a crawl. The only way to counteract this would be by constructing a very large number of additional cell sites. This is not a matter of better engineering. Again, it is physics.

Also, applications will continue to grow rapidly in their needs for speed. An uncompressed, HD-quality TV has a transmission speed requirement of about 10 Gbps. The next generation of TV resolution – 4K – has about 12.7m pixels. This and related requirements add up to 44 Gbps. With better sound, 3D and two-way interactivity, this results in a transmission requirement of about 200 Gbps. Three such channels per households would bring it to over half of a Terabit. This is about 200,000 as much as the speed of 4G under normal utilisation, and even more if 4G is heavily utilised and thus slowed down! Even if we compress and reduce bandwidth by a factor of 1000, it would still require 600 Mbps per household, 200 times as much as 4G.

The point is that we should not underestimate the continued push towards superior video quality. And we should not expect rural areas to sit by, while their free over-the-air-broadcast TV gets squeezed off, and instead stare into their little 4G laptop screens while their metropolitan brethren enjoy two-way, 3D, 4K, 5.1 sound, six-foot screen television. Yesterday's vision becomes today's commonplace , tomorrow's entitlement, and the-day-after's human right.

At first, 4G would of course be an improvement for those who currently have no broadband access at all, and provide competitive alternatives to others. But soon, the reality of a second-grade quality of connectivity will sink in. It is basic politics. Thus, 4G wireless is only a temporary substitute.

Moving more spectrum to mobile and fixed wireless users is a laudable goal and deserving support. But it is hardly a national broadband push. It is foremost a mobile enhancement. Its main contribution would be to improve the coverage for every smartphone user in the country to higher data speeds, to make broadband ubiquitous geographically, and to create competitive alternatives to the existing cable-telco duopoly. These are important accomplishments. But they do not solve the rural broadband problem.

Why then not move the national effort to fibre (with possible tails of coax or fixed wireless), which is future-proof, in contrast to wireless? The practical problem is that the Federal budget deficit does not permit the funding of a national fibre or rural network upgrade initiative. With no public money to spend, this leaves the government with the fallback to use an off-budget currency – spectrum allocations – to advance its goals, and it shapes its preference to the wireless platform.

The national plan presents numbers that are so huge that they serve as deal-breakers: about $660bn, of which $320bn would be incremental governmental support. Yet by other estimates, the necessary subsidy to support fibre across the country is much lower.

This does not replace the wireless approach but adds a strong wireline alternative dimension. The most constructive approach needed here, given budget realities, is to generate clever off-budget strategies beyond the auctions of broadband spectrum, while not excluding them.

There is no doubt in my mind that within 20 years, virtually all American households that are today reached by a wireline will use bandwidth well above 200 Mbps. Much of it will be provided on a commercial basis, but some will have to be generated by a variety of public support policies. In 20 years there will be fibre connectivity pretty much wherever there is copper today, using the same rights of way, utility poles, and ducts. And people will then wonder how, 20 years earlier, we thought that 3 Mbps wireless would be enough, just as we wonder today how our parents or grandparents got along on three or four TV channels.

Notes:

1. An HD quality TV today has 1080 horizontal lines and 1920 vertical lines, i.e. 2m pixels; three primary colours are required for each pixel at 8 bits/color; and 60 frames per second is the TV standard. This means that such HD TV requires 3 Gbps of speed, plus some for audio. A household will realistically require a second and third channel for other simultaneous uses such as TV watching, games, or channel surfing by other members of the household, or by multi-taskers.

2. There are three colors per pixel, and they will require an increase to 16-bits color to deal with the greater sharpness. The frame rate will be at least 60 frames per second, and more likely 72 or more.

3. And this does not even include a future TV of immersion, which would wrap around the viewer and require 10n times as much.)

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