

# FUTURE FACTS OF A WIRELESS WORLD.



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Karma wants to make internet access so simple you never have to think about it. Every over-complicated WiFi router, unreliable coffeeshop connection, extortionate cellphone bill, and flaky wireless signal gets in between you and the internet. There's a lot of work to be done to make connectivity ubiquitous, humane and wireless.

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**Wherever you are in  
the world your device  
will connect to the  
internet wirelessly.**

So we focus on the little things.

We obsess over every detail of our software and hardware. It has to be simple, it has to be seamless.

Fewer buttons, more action. Clear billing, rational prices.

But sometimes we like to sit back and look further down the road. We want internet access that's better for everyone, in every context, and we think the way forward is clear:

***It's all going to be wireless.***

Wireless as in... open your laptop, turn on your phone, prod at your watch, slide into your smartjeans, and wherever you are in the world your device will connect to the internet wirelessly.

But that's no big revelation, we already see glimpses of that world today thanks to WiFi. Here's the twist:

***We won't be connecting to WiFi, we'll be connecting to cellular towers.***

Where we're going, in roughly the next 10 years, WiFi will be redundant. All the best internet, at least the kind of internet that's fast and affordable for regular

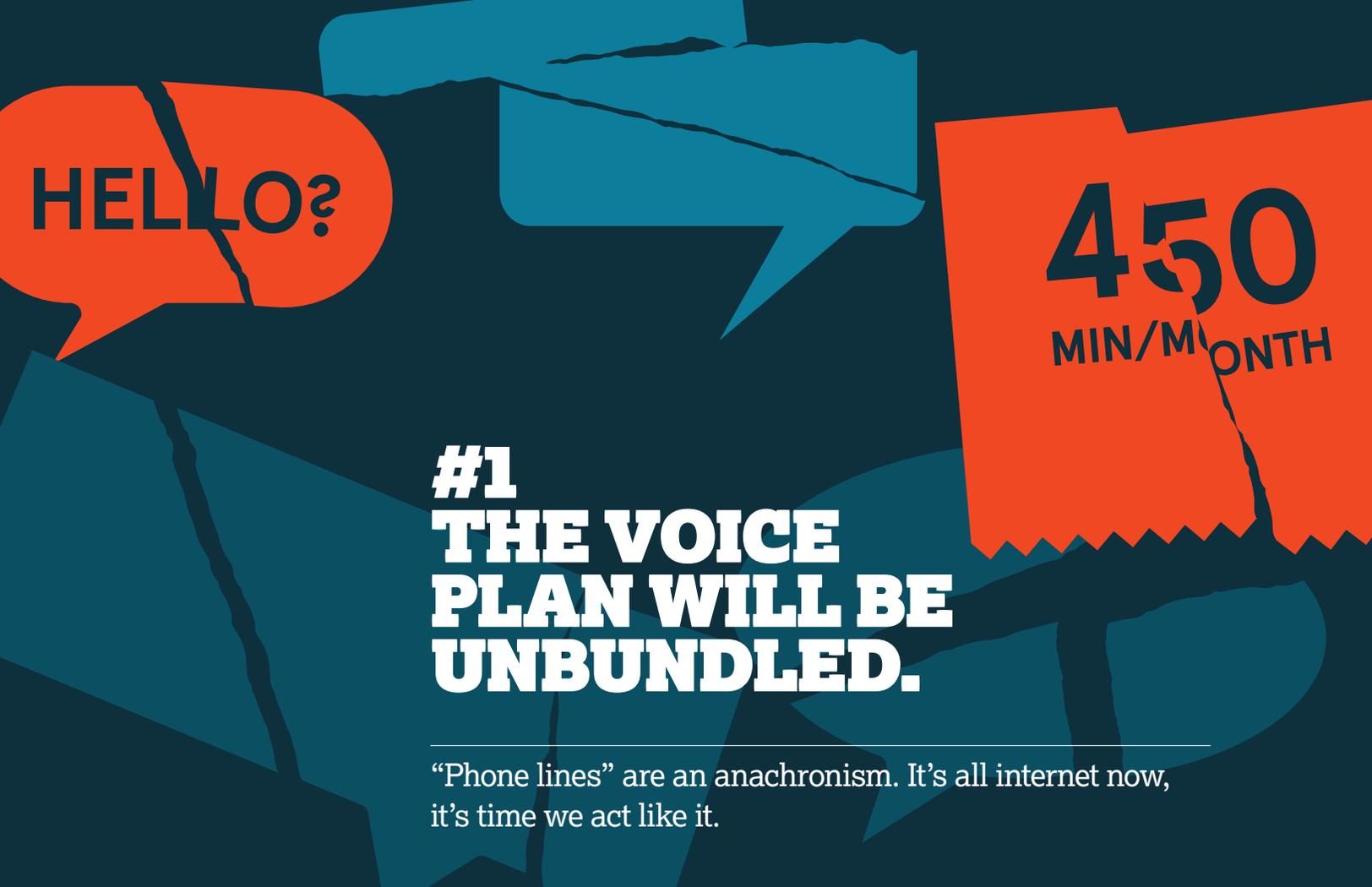


people, will come from millions of miniature cellphone towers. Sure, those towers might be connected to fiber optic cables, or get their connection straight from Elon Musk's space-net, but that won't matter to you... your device will be connected to the internet before you can give it a single thought.

How the internet is delivered to homes and devices right now doesn't make sense. It's too expensive, it's too slow, it's unreliable, it's wasteful, and we don't think it's going to last.

**Here's how it will all go down. It'll take about a decade.**

**And it'll be a lot of fun, we promise.**



HELLO?

450  
MIN/MONTH

# #1 THE VOICE PLAN WILL BE UNBUNDLED.

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“Phone lines” are an anachronism. It’s all internet now, it’s time we act like it.

Telecoms have fought a long, hard fight. They’ve charged us for “long distance calls,” they’ve charged us for “roaming,” they’ve charged us for “text messages,” and they’ve charged us for “voice plans.”

But what they’re really doing is conveying information over variable distances to variable endpoints, and putting cute labels on it. And charging as much as they can get away with, naturally. Conveying information over variable distances to variable endpoints is no easy task, and should not be trivialized. But the end of cute labels and irrational prices is nigh.

In 1948, Claude E. Shannon (ironically, an employee of Bell Labs) published a [mathematical definition of communication](#), describing the irreducible unit of information: the bit. You know, 1s and 0s. Data.



**Unbundling** → Take a package deal and sell the parts separately. Don't want ESPN? Don't pay for ESPN.

When our communications are performed entirely digitally, it becomes silly for wireless carriers to pretend they do anything other than shuttle data back and forth over the internet. Everything else is just lipstick.

The much-discussed unbundling trend in television, brought on by similar pressures, has already boiled over. Paying for dozens of useless cable channels when all you want is HBO is how dinosaurs purchased entertainment. Modern man pays \$15 a month for HBO Now and enjoys *Game of Thrones* from the comfort of a web browser, app, or internet-connected TV.

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**Phone numbers will die off eventually. Apps have destroyed “international calling,” and now they’re coming for the rest of your calls.**

When we kill the idea of “TV channel,” we get back something much richer: on-demand consumption of everything ever made by HBO, on any device imaginable. Phone service is following a similar trend. “Voice plans,” “phone lines,” and even the vaunted “phone number” will die once we find the better thing on the other side.

Apple’s iMessage, Google’s Hangouts, Facebook’s WhatsApp and Messenger, and a dozen other similar services have already made text messaging seem quaint. Old-fashioned texts are like churning your own butter: inefficient, painful, slow, imprecise, and pointless. Maybe they build character? Who knows. There’s a better option, and people are flocking to it.

In many countries, people use WhatsApp to avoid paying high per-text-message rates, elsewhere people use WhatsApp to talk to that first group, and still other people just use WhatsApp because it’s *better*.

The same thing will happen to voice calls. Phone numbers, too, will die off eventually. Apps have already destroyed “international calling,” and now they’re coming for the rest of your calls.

“The phone number isn’t a bad thing. But the fact that it’s tied to a voice plan, and tied to a single device, is a bad thing,” says Robert Schouwenburg, Karma’s COO. “If you text me on my phone number, an app on my phone rings, an app on my computer rings. It’s no longer tied to a single device, it’s just a way to reach me. And that’s what’s great about it: you need a way to reach me.” As we abandon phone numbers, we’ll lose some of the convenience of the old centrally controlled system.

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**If I don’t have a phone number, how will people reach me? In a million different ways.**

Steven van Wel, CEO and co-founder of Karma, admits as much: “With a phone number, you send a message from any device, any service, to this magical number. Which is a great idea. But we’re still paying for it, which is weird. How many people pay for email?”

Steven points out that kids now start out with an iPad or an iPod Touch, before they graduate to an actual phone. That’s before they can even speak or write. “They don’t have phone numbers!”

Ultimately, the choice, freedom, and functionality of apps and internet services will defeat the old way. As Steven puts it: “If I don’t have a phone number, how will people reach me? In a million different ways.”

## #2 MOBILE PROVIDERS WILL FADE INTO THE BACKGROUND.

Companies this bad at customer service shouldn't be the ones in charge of customer service.

As we find alternatives for services once dominated by carriers – text messages, phone calls – the name and logo of our carrier will matter less and less.

Carrier loyalty in the US is already at an all-time low. In 2014 over 25% of mobile customers [planned to switch carriers](#) within a year.

According to [Consumer Reports](#), small startups are beating the big carriers with better value and better support. Who are the little guys? Companies like Ting and Consumer Cellular, who resell the networks of Sprint, T-Mobile, and AT&T – also known as “MVNOs”. “MVNOs have existed forever,” explains Robert. “It’s in the best interest of the carriers to resell excess capacity to others.” Sometimes the big carriers work with an MVNO to see how different price plans could work in the market, or to target a specific demographic. Because MVNOs provide risk-free revenue for carriers, they’ve yet to become a threat.

  
▶ **MVNO** → A “Mobile Virtual Network Operator” doesn’t own a mobile network, but instead resells access to another company’s mobile network.

But a new offering from Google might signal a whole new flavor of MVNO: the aggregator. Google's "Project Fi" service unites T-Mobile and Sprint service into a seamless experience. A Project Fi phone can jump from WiFi, to Sprint, to T-Mobile, and enjoy the best of all worlds. It's a huge leg up over what either carrier could provide on its own.

Mix in rational, pay-for-what-you-use prices, a simple billing plan, and the software chops of Google to make your phone's services easily accessible from a web browser, and you have a glimpse of a world where brands like Sprint and T-Mobile matter about as much as who built your highway — necessary but invisible.

Of course, they're probably not going to like that.

"Telecoms could become infrastructure providers, reselling their capacity to other providers," says Robert, "but I don't think they want to go there, and I don't think they'll go there of their own volition."

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**If we wanted phones to be truly portable across networks, we would've solved this 20 years ago."**

Scott Allan, one of the founders of Ting, says that the existing network incompatibilities between US carriers are artificial: "If we wanted phones to be truly portable across networks, we would've solved this 20 years ago."

Scott credits pressure from companies like Apple for forcing standardization. "They don't want to manufacture 10 different iPhones."

It's never a slam dunk to predict that huge, multi-billion dollar corporations will fade into the background, but unless they can offer a compelling alternative to the aggregation of Project Fi and the customer service of Ting, it doesn't look like they'll have much of a choice.

"Telecoms have proven time and time again that they are hard to do business with and hard to get rid of," says Robert.

# #3 WIRELESS COMPANIES WILL CONTINUE TO OFFLOAD TO WIFI.

WiFi is cheaper than LTE... for now.



**Wireless infrastructure** → Cell towers, and internet bandwidth for those towers. Towers have limits to how much area they can cover, how many connections they can handle at once, and how much bandwidth they have available to share among those connections.

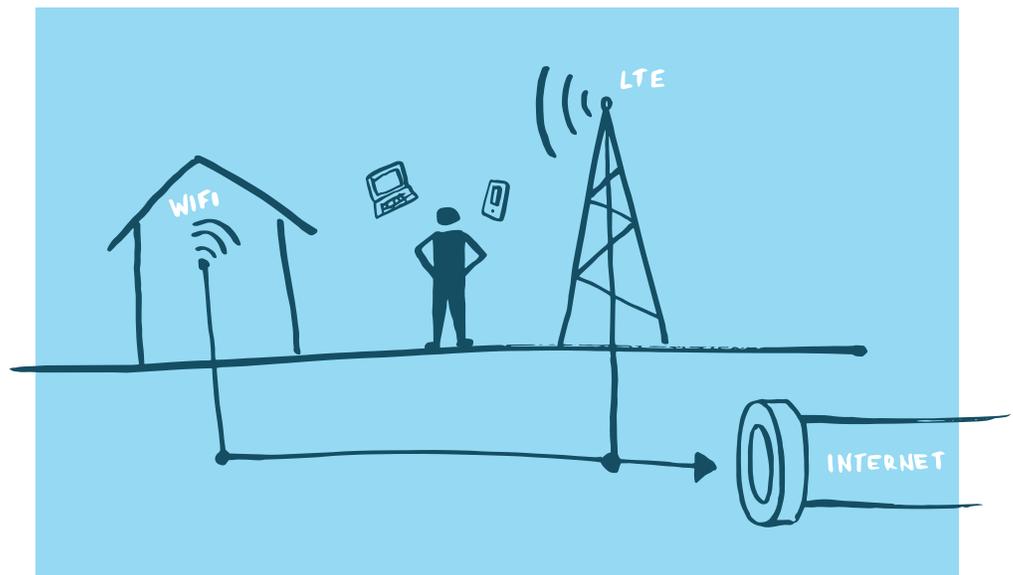
The more time people spend on their mobile devices, and the more data they consume, the more stress they put on existing wireless infrastructure. This leaves mobile carriers with a few options:

1. “Encourage” users to use less data
2. Build more infrastructure
3. Find a way to deliver data over other infrastructure

Once upon a time, the first option was all the rage. Mobile carriers liked offering “unlimited” data plans, and then restricting the sorts of behavior — like video chat, for instance — allowed on those plans. Most mobile providers now just charge “overages” for high data use, but \$300 phone bills don’t win many friends.

“They’re already at the maximum of the amount of money they can extract from a consumer,” explains Robert, “so they’re looking for ways to spend less, not more.”

Building infrastructure to support our crazy data habit costs more. All four major carriers in the US are constantly adding towers, or upgrading old towers, or buying up extra spectrum. But they never quite build *enough*. According to Cisco, [mobile data traffic grew 69 percent in 2014](#). That can’t be easy to keep up with.



And that brings us to option three: push your users onto WiFi.

AT&T, for instance, builds WiFi hotspots in dense areas it can’t serve well enough with its cellular towers. T-Mobile, meanwhile, offers a free WiFi router to its customers to make sure they stay off cellular – even for phone calls – when at home. The carriers also negotiate deals with other WiFi hotspot providers to shuttle their users safely onto the internet. And, of course, many cost-conscious users switch themselves onto available WiFi hotspots whenever possible.

Juniper Research projects 60 percent of mobile data traffic – that’s smartphones and tablets combined – will flow over WiFi by 2019. And it’s simple to figure out why: [WiFi is cheaper for carriers than LTE](#). One rough estimate is it costs a carrier \$1 to deliver 1GB over WiFi, and \$3 to deliver that same GB over LTE.

There's a simple reason for this cost disparity: throughput. WiFi is typically faster than LTE, while it also covers a smaller area. That means you have a "fatter pipe" of bandwidth to share, and fewer people who need to share it. If, for instance, someone needs to download a big file, it might take minutes over LTE, and seconds over WiFi. It doesn't hurt the carrier to send a ton of data over LTE, what hurts the carrier is to have a precious LTE slot occupied for minutes by a single customer. WiFi's speed frees up those slots for quicker, easier transactions.

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## WiFi is cheaper for carriers than LTE.

The speed difference boils down to physics: WiFi operates in a higher frequency than LTE. It's similar to the difference between AM and FM (remember those?). AM's low frequency allows its signal to travel long distances, FM's higher frequency makes it travel less far, but gives it more "bandwidth" to include higher quality audio in the signal.

Carriers can either annoy their customers with overages, incense their customers with bogged down service, or save the day with WiFi. So far, they've chosen WiFi.



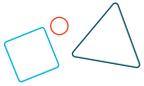
## #4 INTERNATIONAL INTERNET WILL BECOME EASY.

Fragmentation and incompatibility aren't inevitable, barriers are being erased.

"International traveling forces you to live in the future," says Steven. "Shut down your voice plan, shut down your data plan, and hunt for WiFi."

In fact, it was frequent trips to the US from his home in The Netherlands that inspired Steven and his co-founders to start Karma. The whole point of Karma is to avoid fiddly network incompatibilities, SIM cards, and carrier contracts. Just connect your phone, tablet, and laptop to Karma over WiFi, and Karma will figure out the cellular situation to get everything online.

But imagine a future where you pull your phone out in another country, and it's not entirely useless. This is entirely possible in a world where nobody cares about phone numbers, where mobile providers fade into the background, and where most of your internet happens over WiFi anyway.



**Cellular frequencies** → Portions of the radio frequency spectrum allotted for cellular phone use. Mobile network companies buy spectrum "real estate" in huge FCC auctions.

The European Union is [already working on a set of rules](#) to allow its citizens to roam freely within member countries without incurring roaming fees. For US customers, T-Mobile offers unlimited mobile data and text messaging in over 100 countries as part of its "Simple Choice" plan.

One reason this is possible is thanks to the wild number of cellular frequencies modern flagship phones can support. Instead of just one or two default frequencies, and one extra frequency for roaming, modern phones typically support a dozen or so frequencies.

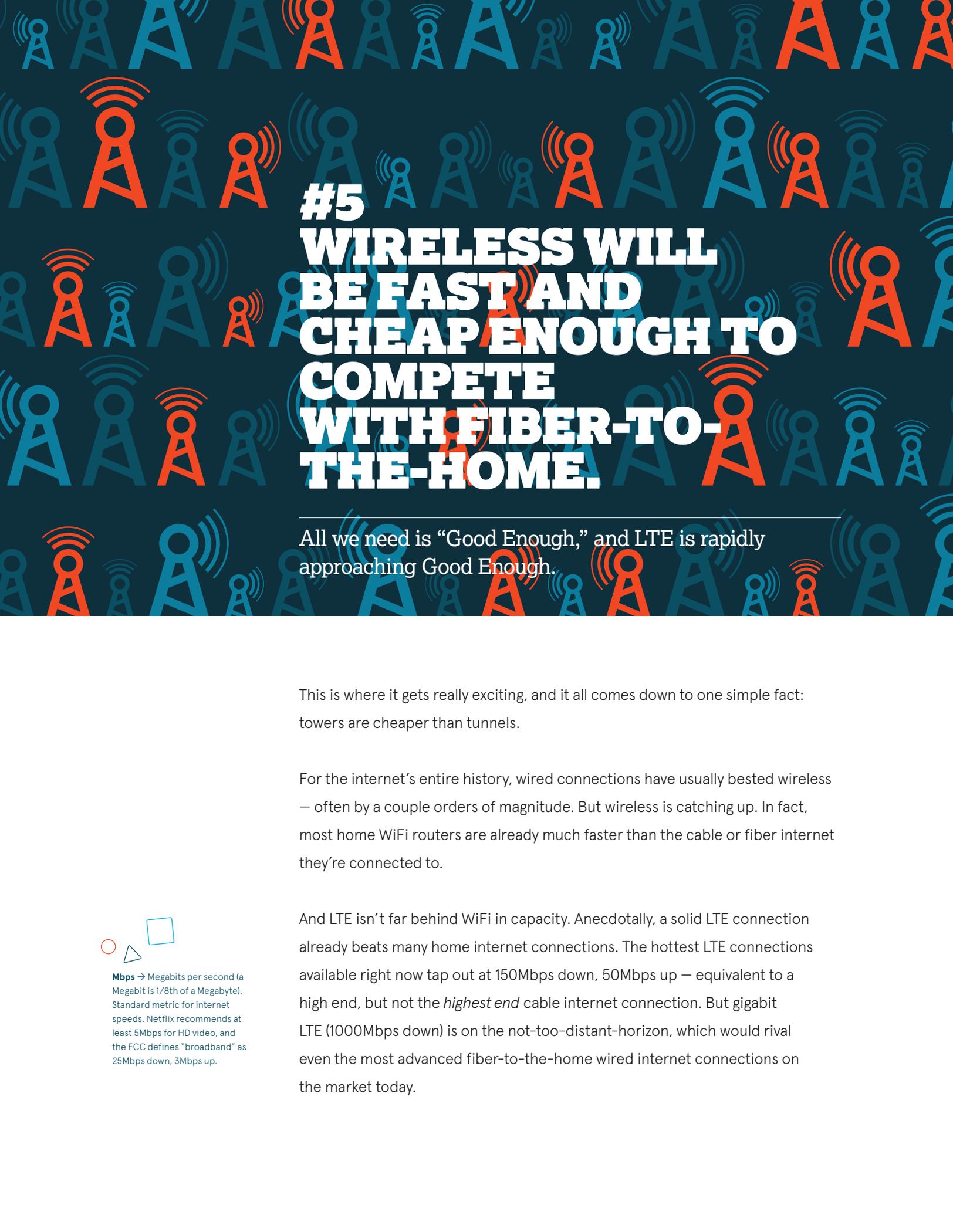
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**Imagine a future where you pull your phone out in another country, and it's not entirely useless.**

But it's also an ideological shift: it means instead of you swapping out SIM cards, or buying a burner phone for your vacation, your phone carrier is going to figure out roaming for you.

It's been long-rumored that Apple wants to get rid of SIM cards altogether, and make the whole idea of which carrier you belong to entirely virtual. Apple already offers this experience with iPads you buy outside of a specific mobile carrier store. It's so logical! When you need mobile data on your iPad, you shop for a mobile data provider directly from that iPad.

All the specific handshake deals and technical bits might take a long while to pin down. Nobody is suggesting it's *simple* to make a device that works everywhere in the world, or devise a billing arrangement for such a device which wouldn't suck. But seen from the perspective of a user, it feels inevitable. We already have one global internet standard, one standard for WiFi, one standard for email. Why can't a globally compatible cellular network be next?



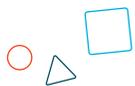
# #5 WIRELESS WILL BE FAST AND CHEAP ENOUGH TO COMPETE WITH FIBER-TO- THE-HOME.

All we need is “Good Enough,” and LTE is rapidly approaching Good Enough.

This is where it gets really exciting, and it all comes down to one simple fact: towers are cheaper than tunnels.

For the internet’s entire history, wired connections have usually bested wireless – often by a couple orders of magnitude. But wireless is catching up. In fact, most home WiFi routers are already much faster than the cable or fiber internet they’re connected to.

And LTE isn’t far behind WiFi in capacity. Anecdotally, a solid LTE connection already beats many home internet connections. The hottest LTE connections available right now tap out at 150Mbps down, 50Mbps up – equivalent to a high end, but not the *highest end* cable internet connection. But gigabit LTE (1000Mbps down) is on the not-too-distant-horizon, which would rival even the most advanced fiber-to-the-home wired internet connections on the market today.



**Mbps** → Megabits per second (a Megabit is 1/8th of a Megabyte). Standard metric for internet speeds. Netflix recommends at least 5Mbps for HD video, and the FCC defines “broadband” as 25Mbps down, 3Mbps up.

Remember why WiFi is cheaper than LTE? The throughput? Well, LTE is co-opting WiFi's techniques, in order to offer the best of both worlds. In the future, LTE will encompass everything from low-power, low-bandwidth signals that travel for miles, to high-power, high-bandwidth signals that only travel a few hundred feet – just like WiFi. In fact, some carriers want to start using the exact same unlicensed 5GHz band WiFi uses. That's a controversial proposal, but would undeniably give LTE the best of both worlds: licensed, interference-free spectrum, and unlicensed, ultra-fast spectrum.

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**It's silly if you think about it. We bring cable to every apartment. You put a modem on it. You put a wireless router on it. All that work, just to use the internet without wires.**

For people who feel starved for home broadband choice, with no alternative to a rude, unreliable, or slow cable internet connection, cellular internet could be a godsend.

"It's kind of silly if you think about it," says Robert. "We bring cable to every home and apartment. You put a modem on it. You put a wireless router on it." All that work, just to use the internet without wires.

With a cellular connection there's no need to run a soon-to-be-obsolete wire into every single residence on the planet, and no need for redundant hardware to hook up to that wire. "There are 450 apartments in my building," says Robert. "450 internet connections. Three cell towers could do the same thing, which would mean only three backhaul connections."

The key word is "densification." It's a broad term, and already a bit of a buzzword in the wireless world, but here's a simple way to think of it: instead of a few huge towers covering an area, you have a few dozen small towers, or a few hundred tiny towers, cover the same area. The smaller a tower is, the more targeted it can be – big towers often interfere with each other, or risk gaps in coverage in order *not* to interfere with each other.

South Korea's best-in-the-world LTE networks are the poster child for densification, and are closely followed by Japan. It makes sense in countries that are well known for being far more "into" phones than the rest of the world, but it also means cellular in those countries could be a completely viable replacement for a wired home internet connection.

Sprint has hinted recently about building out its network to compete with home broadband. Verizon's recent pause in its FiOS fiber-to-the-home rollout might imply they see the writing on the wall as well. There's even gossip about Comcast buying T-Mobile, to form the ultimate union of wired and wireless service.

"If I was Comcast I would buy T-Mobile tomorrow," says Robert.

LTE home broadband won't supplant cable and fiber in the home overnight. First, cellular capacity will have to catch up with existing mobile usage on smartphones. Only when carriers have enough excess capacity, and start searching around for a new revenue stream, will home broadband become attractive. Home users need fast, unlimited, and relatively cheap internet.

Even in South Korea, which has what's believed to be the best LTE network in the world, wired broadband in homes is commonplace. But wired broadband is also dirt cheap in South Korea — \$20 or \$30 for an internet plan that costs \$50 or more in the US. If competition from wireless broadband simply managed to make incumbent wired internet providers slash prices to keep customers, we certainly wouldn't complain.



# #6 EVERY DEVICE YOU OWN WILL BE ABLE TO CONNECT TO THE INTERNET EVERYWHERE.

Once LTE is cheap, fast, and everywhere, our devices will always be connected.

“Being able to always grab a signal, no matter where you are, is the end goal,” says Steven. “The only way to do that is to make it as accessible as a radio.”

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You don't ever expect your FM radio to be incompatible.

The old fashioned FM radio is such a good analogy for the glorious future awaiting all our mobile devices. You don't ever expect your FM radio to be “incompatible,” you don't expect your FM radio to be “out of data,” you just expect your FM radio to work.

Doc Searls is the co-author of [The Cluetrain Manifesto](#) and a fount of wisdom about the nature of the internet. He says, “What the internet does by design, is everything has a functional distance of zero, and essentially zero cost.”

Not to say the internet will be cost-free, or barrier-free, but it *trends* that way. The only way to blanket an area in with 100% coverage for every single device is cellular. The only way to do it cost-effectively is cellular. The only way to do it with one single protocol is cellular.



**Unlicensed spectrum** → Informal term for set of wireless bands reserved for non-cellular use. Used for cordless phones, Bluetooth, WiFi, NFC, microwaves, and many scientific purposes.

WiFi is great, but it has a few insurmountable issues holding it back. For one, WiFi operates in unlicensed spectrum. It's a wild west of bouncing radio waves, and it's a marvel of engineering that it works at all. Second, WiFi uses very high frequencies (2.4GHz and 5GHz) which don't travel very far, and don't travel through walls very well.

Meanwhile, LTE has the advantage of being "owned" by a specific carrier, so each little bit of radio frequency can be used optimally without interference. LTE chips are also relatively advanced, power hungry, and expensive in comparison to WiFi chips. That's a problem in the short term, but ultimately it gives LTE a leg up – the extra technology crammed into LTE pays off.

And LTE is quickly becoming more than just a chip for giving your smartphone or tablet a fast internet connection. Forthcoming LTE standards will include device-to-device communication (WiFi already does this, as does Bluetooth), low-power modes (for devices which value battery life over high speeds), and even a "broadcast" mode (remember radio and TV? It's like that).

Once carriers build enough capacity to cover every home with high-speed, affordable, unlimited LTE, it will be only natural to make sure all your devices have LTE built-in. A WiFi router, an extra hop, just seems silly, right? And there, all of a sudden, every device you own can connect to the internet anywhere.

# #7 WIFI WILL DIE.

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WiFi is great, but eventually it will be redundant.

There's nothing wrong with WiFi. In fact, it's marvelous. More than any technology before it, it's given us the freedom to work and play and connect in any way we'd like. On the couch, on the porch, in a coffeeshop, in a meeting... WiFi has been there for us, and we're grateful.

But some day, it'll simply be redundant. Some motherboard designer will be trying to fit some quantum-hologram thingy into that year's hottest model and she'll ask herself, "Hey, what if we just ditch the WiFi?" And nobody will object. The end of an era, just like that.

Ultimately, people want to be connected wherever they are. They don't need the world's fastest internet connection, it just has to be good enough. They're willing to pay a bit more for convenience. And they'll cut any "cord" that's no longer useful.

Naturally, WiFi has a lot of use left. Until we have LTE built into every device, it will still be the perfect bridge from an internet connection (wired or wireless) to our “legacy” devices. As long as the combination of WiFi and wired internet are cheaper, more convenient, and more reliable than LTE, they won’t even feel the breeze of competition.

But if you could open your laptop anywhere in the US. Or in any city in the world. And it got online without you thinking about it. Would you sign up?

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