



Is Connectivity A Human Right?

For almost ten years, Facebook has been on a mission to make the world more open and connected. For us, that means the entire world — not just the richest, most developed countries. We've made good progress, and today we connect more than 1.15 billion people through Facebook each month.

But as we started thinking about connecting the next 5 billion people, we realized something important: the vast majority of people in the world don't have any access to the internet.

Below, I'll discuss the state of the internet today, why connectivity is such an important problem for the world, the major issues we'll need to solve — technical, social and economic — and then I'll outline a rough plan to accomplish this goal.

I'm focused on this because I believe it is one of the greatest challenges of our generation. The unfair economic reality is that those already on Facebook have way more money than the rest of the world combined, so it may not actually be profitable for us to serve the next few billion people for a very long time, if ever. But we believe everyone deserves to be connected.

The state of the internet

Today, only 2.7 billion people — a little more than one third of the world's population — have internet access. Even more surprising, internet adoption is growing by less than 9% each year, which is slow considering how early we are in its development and that it is expected to slow further.

There are more than 5 billion mobile phones in the world, with almost 4 billion feature phones and more than 1 billion smartphones. As smartphone prices come down, many people who currently have feature phones will be able to afford smartphones over the next 5 years.

It's easy to assume that when people get smartphones they'll also have data access. It's hard to even think of what it means to have a smartphone without data. But it's not a given. Even though projections show most people may soon have smartphones, the majority of them still won't have data access.

This is because, in many countries, the cost of a data plan is vastly more expensive than the price of a smartphone. In the US, for example, an iPhone with a typical two-year data plan costs about \$2,000, where about \$500–600 of that is the phone and ~\$1,500 is the data.

In turn, the vast majority of the prices people pay for data plans go directly towards covering the tens of billions of dollars spent each year building the global infrastructure to deliver the internet. Unless this becomes more efficient, the industry cannot sustainably serve everyone.

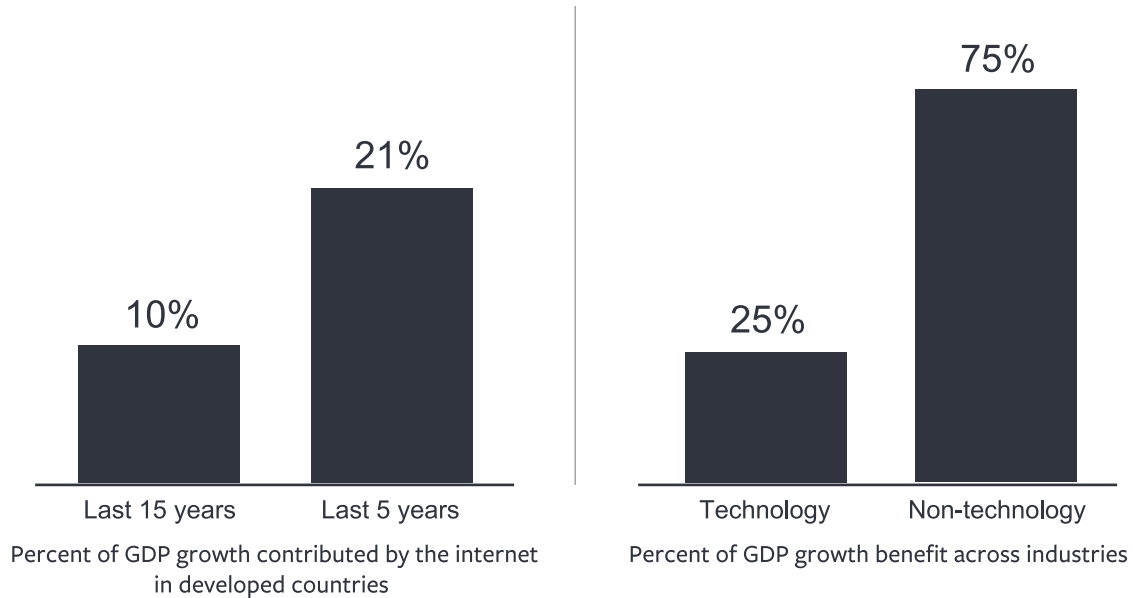
There is no guarantee that most people will ever have access to the internet. It isn't going to happen by itself. But I believe connectivity is a human right, and that if we work together we can make it a reality.

Why is this so important?

The internet not only connects us to our friends, families and communities, but it is also the foundation of the global knowledge economy.

Before the internet and the knowledge economy, our economy was primarily industrial and resource-based. Many dynamics of resource-based economies are zero sum. For example, if you own an oil field, then I can't also own that same oil field. This incentivizes those with resources to hoard rather than share them. But a knowledge economy is different and encourages worldwide prosperity. It's not zero sum. If you know something, that doesn't stop me from knowing it too. In fact, the more things we all know, the better ideas, products and services we can all offer and the better all of our lives will be.

In a detailed analysis, McKinsey has shown that the internet now accounts for a larger percent of GDP in many developed countries than agriculture and energy. It has also accounted for 21% of GDP growth in developed countries in the past five years, increasing rapidly from just 10% over the past 15 years. About 75% of the gains are experienced by companies outside of the technology industry. And the internet creates jobs, with 2.6 new jobs being created for every job lost to gained efficiencies.



SOURCE: McKinsey Global Institute, Internet Matters: The Net's sweeping impact on growth, jobs, and prosperity, May 2011

The world economy is going through a massive transition right now. The knowledge economy is the future. By bringing everyone online, we'll not only improve billions of lives, but we'll also improve our own as we benefit from the ideas and productivity they contribute to the world.

Giving everyone the opportunity to connect is the foundation for enabling the knowledge economy. It is not the only thing we need to do, but it's a fundamental and necessary step.

Obstacles on the path to connecting everyone

Since the internet is so fundamental, we believe everyone should have access and we're investing a significant amount of our energy and resources into making this happen. Facebook has already invested more than \$1 billion to connect people in the developing world over the past few years, and we plan to do more.

Working with our partners, we've put together a rough vision for what we believe is possible and a rough plan to work together as an industry to get there. I say "rough plan" because, like most long term technology projects, we expect the details to evolve. It may be possible to achieve more than we lay out here, but it may also be more challenging than we predict. The specific technical work will evolve as people contribute better ideas, and we welcome all feedback on how to improve this.

Of course, there are several major practical problems to overcome before it is possible to discuss a plan.

First, most people in the world don't have much disposable income to spend on data access. Any plan to make internet access broadly available will require making significant technology and business model improvements that enable some access to be either very cheap or free for people who can't otherwise afford it.

Second, the global infrastructure required to deliver the internet is extremely expensive and costs tens of billions of dollars every year. This includes the cost of land and electricity to power cell sites, backhaul transport to carry data, licensing spectrum and all the underlying equipment. All of the companies involved need to make a profit to continue building out these networks, so it's important to decrease these costs to pass along savings.

Third, even when they can afford it, many people who have never experienced the internet don't know what a data plan is or why they'd want one. However, most people have heard of services like Facebook and messaging and they want access to them. If we can provide people with access to these services, then they'll discover other content they want and begin to use and understand the broader internet.

Fourth, a lot of people don't have phones. Many are either very young or old, but many just cannot afford one. Over time we'll need to connect them too, but for now we don't yet have a plan for delivering internet to people who don't have phones or computers, so we're not covering that here.

Defining the vision

We believe it's possible to sustainably provide free access to basic internet services in a way that enables everyone with a phone to get on the internet and join the knowledge economy while also enabling the industry to continue growing profits and building out this infrastructure.

Today, the global cost of delivering data is on the order of 100 times too expensive for this to be economically feasible yet. The cost of subsidizing even basic services for free would exceed many people's monthly income and it would be extremely difficult for the industry to build a profitable model.

However, with an organized effort, we think it is reasonable to expect the overall efficiency of delivering data to increase by 100x in the next 5–10 years. This will come from two types of innovation: bringing down the underlying costs of delivering data, and using less data by building more efficient apps. If the industry can achieve a 10x improvement in each of these areas, which we believe is possible, then it becomes economically reasonable to offer free basic services to those who cannot afford them and start to sustainably deliver on the promise of connectivity as a human right.

A key constraint here is to define which basic internet services should have free data, and which require a data plan. If we get this right, then it will be possible to enable the most people to get on the internet while also sustainably generating the most profits for the industry.

There are a few factors that go into our definition of basic internet services:

Basic services need to be non-data-intensive, which means primarily text-based services and very simple apps like weather. Data-intensive experiences like video, streaming music, high resolution photos, websites with media and large files or app downloads consume the vast majority of all data. For perspective, all of the text in this document is less than 0.1MB and a 30 second video can easily be 50–100MB.

Basic services also need to be tools that people use to discover other content. These services should have the property that by making data for them free, people will discover more new content and use meaningfully more data than they would have if they didn't have access to these basic services.

Services like messaging, social networks, search engines and Wikipedia fit this definition well, but we're not prescribing any specific set of basic internet services. Instead, we believe that the more efficient we can make this model, the more access the industry can collectively provide to basic services. And even beyond basic services, all of the technology improvements and efficiencies will make it easier for everyone to access all internet services.

The rough plan focuses on three important levers:

- Making internet access affordable by making it more efficient to deliver data.
- Using less data by improving the efficiency of the apps and experiences we use.
- Helping businesses drive internet access by developing a new model to get people online.

Making internet access affordable

Every year, mobile operators around the world invest tens of billions of dollars building out networks that deliver better data access. The pricing plans people ultimately see are dictated by these underlying costs. It isn't sustainable to reduce the price of data plans and therefore operators' revenues without meaningfully improving their costs and the efficiency of the networks. However, if the industry can collectively make progress here, then it is possible for operators to build even more profitable models while offering data at significantly lower costs per megabyte.

Network extension technology

The technology that some of our partners have developed to amplify data signal from inside buildings is a good example of the type of improvement that will help us achieve an order of magnitude improvement. Today, for example, when an operator broadcasts a signal, it loses fidelity as it penetrates building walls. This not only requires operators to build out much more infrastructure in greater proximity than should be necessary, but it also means that data needs to be retransmitted when the signal breaks down, and the overall infrastructure is taxed by sending the same data multiple times.

A few big improvements like this could increase the capacity of our networks by 10x over the next 5–10 years while keeping costs relatively constant. This would of course cause the cost per megabyte to decrease dramatically.

Open Compute Project

At Facebook, we typically take an open approach to solving these problems. For our own infrastructure, we helped create the Open Compute Project to share efficient and cost effective server and data center designs. This has been good for the industry overall and good for us as well. As other organizations provide new ideas and improvements, our infrastructure gets more efficient. And as other companies order the same designs that we do from manufacturers, the scale of producing the machines increases and the price will come down for everyone.

Some of the latest work from the Open Compute Project is important to making global internet access affordable. In addition to servers and data centers, there is now a project to create an open network switch design for internet data centers. Anything that makes networks more efficient will ultimately increase the efficiency of delivering data and bring down costs for people worldwide.

There is even a project to create an open reference design for an extremely low priced, high quality smartphone. If this succeeds, it will reduce the overall cost for a person to have a smartphone with data, and since they come out of the same budget, it goes toward the same goal.

Edge caching

It is also possible to build technology that caches data inside an operator's data center and makes it faster and cheaper for the operator to serve that data. A big part of Akamai's business is to deliver this as a service to companies, but large scale companies like Facebook also build this capacity for their own networks. We are looking into how to do this in a scalable way for other non-data-intensive basic internet services as well to meaningfully improve data performance and efficiency.

White space spectrum

Licensing spectrum from governments worldwide costs tens of billions of dollars and these costs are passed along to consumers through data plans. These costs are high because spectrum is naturally limited and operators bid a lot to ensure they have access. However, not all usable spectrum is actually used, and much of it is used inefficiently.

If it were allocated more efficiently then these costs could meaningfully come down. Specifically, there is a policy movement to reallocate spectrum that has been used as a buffer around TV broadcasting. This is a good example of the industry working together with governments to make these networks more efficient.

Overall, our plan is to work across the industry on many projects that could each deliver a large network efficiency gain. It seems reasonable to expect that some of these will work and that we will increase the capacity of our networks by at least 10x over the next 5-10 years while keeping costs relatively constant. If we do this, then we will have succeeded at bringing the cost per megabyte down by an order of magnitude. This, by itself, will go a long way to making internet access available to all.

Using less data

One often overlooked lever for reducing people's overall data costs is simply using less data. Part of why we overlook this is because most people building large scale internet services live in developed countries where we pay for effectively unlimited data plans. When you have an unlimited data plan, there isn't much of an incentive to use less data. But most of the world doesn't work this way.

Most of the world doesn't even have credit card infrastructure, so even if many operators wanted to bill their customers for their data use at the end of a month, they would have no way to do that. Instead, in most developing countries, people primarily use a pre-paid model, buy a certain amount of data access on their SIM cards upfront and then use that data over time. When your SIM card runs out, you either have to pay to refill it or you no longer have data access.

This creates a data conscious mentality that we often don't see in developed countries, but it will be important to internalize this to efficiently deliver services to the next 5 billion people.

At Facebook, we're investing heavily in opportunities to reduce our overall data use and help other apps reduce their data use as well. Some of the areas we're focused on are caching, data compression and simple efficiency optimizations.

Caching technology

One of our most successful products in developing countries has been Facebook for Every Phone. This is our version of Facebook for feature phones, and it has more than 100 million people using it each month and growing, despite the fact that every month 20% of the people using it leave it to get a smartphone and use one of our smartphone apps instead.

People with feature phones are very cost conscious, so one of the most important things we've done has been to make this experience use as little data as possible by caching data efficiently so we can be very careful about which data we ever have to request from our servers. And when we do make requests, we make sure they're very efficient as well.

The technology behind Facebook for Every Phone is generally applicable, and we're looking at ways to make this available so other apps can be as data efficient as well.

Data compression

Compression is another big lever for reducing overall data use. The main reasons many app developers don't compress the data they serve is that doing so requires some effort to build, makes code marginally harder to debug and has a small negative impact on performance. However, in data conscious developing countries, this is a large opportunity.

Modern text compression frequently yields results of 70–80% — or almost 5x savings — and in some cases even more. Implementing compression in large scale apps or developing services that you route all your data through and compress everything would yield large data use savings.

Efficiency optimization

Another, less elegant but necessary tactic is just focusing on making the most frequently used apps consume less data in the first place. Since most developers of large scale services are based in developed countries where data usage is a less important aspect of performance than, say, speed or server efficiency, we've found that many frequently used apps have had little or no data usage optimization.

For example, at the beginning of this year, our Facebook for Android app used about 12MB per day on average. This is a lot, but it's not completely unreasonable given the number of photos in the typical experience. By simply focusing on improving data usage, we expect to be able to

reduce this to about 1MB per day. If we offer a special variant with fewer photos in developed countries, we will be able to reduce it even further. But even without that, we expect to be able to reduce our data usage by more than 10x through this effort alone.

Future approaches

There are also more speculative approaches we're investigating, including enabling people to download some News Feed stories and photos from their friends' nearby phones over Wifi Direct and other local network technologies. This will not eliminate the need for mobile data, but it can further reduce the associated costs here, as well as enable people to load content when they have spotty connections.

Overall, it seems reasonable to expect that over the next few years we can deliver many of the same basic services using at least 10x less data than we're using today. If we can do this, then these services will become at least 10x cheaper for people buying pre-paid data plans in developing countries. Again, doing this by itself will go a long way towards making internet access affordable and available to all.

Helping businesses drive access

In addition to all the technology improvements that are necessary to make internet access available to everyone, there are also social and cultural issues that are necessary to overcome.

If you've grown up in an area where you've never had a computer or access to the internet, then if someone asks you if you want a data plan, chances are you wouldn't know what they're talking about. The internet and data are abstract concepts. Most people don't want data; they want the services you can use it for.

However, if you ask the same person if they want Facebook access, they're more likely to say yes. Besides communicating through phone calls and text messages, which you can already do with any phone, connecting with the people around you through a social network is a basic human behavior. It's not a surprise that people intuitively want this even if they don't understand what data is.

The question is: can we align everyone's incentives? Can more people get the services they want and then discover new uses for the internet, so that phone makers can get better phones into people's hands and mobile operators can get more customers and more profits to further invest in building out infrastructure?

Zero-rating data

We think this model exists. We've already seen results where attaching free data for Facebook — what we've historically called zero-rating — increases both phone sales profits and data plan profits.

From there, it shouldn't be much of a stretch to also offer a broader set of basic internet services as well once the industry achieves the kinds of cost efficiencies described above. Most people in developing countries probably consume more data using Facebook than from all other non-data-intensive services combined.

Credit and identity infrastructure

Over time, we may be able to help improve some of the social infrastructure that is still nascent in many developing countries. The lack of credit infrastructure prevents operators from offering post-paid models that could enable them to make longer term investments in their customers. And while operators know some information about their customers, the pre-paid model prevents them from knowing who their customers are. Giving people the ability to link their Facebook or other accounts with operators could help solve these problems and make it easier to provide better service.

Incentive alignment

This is good for people because they'll have an affordable way and a reason to connect to the internet and join the global knowledge economy.

This is good for mobile operators because they'll have more customers who want to buy more data, which will increase their profits and help them invest in building out the networks.

This is good for phone manufacturers and technology providers because more people will want better devices, which will push the industry forward.

This is good for internet services because the efficiencies we'll all drive will make it easier and cheaper for the next 5 billion people to access their services.

This is good for the world because everyone will benefit from the increased knowledge, experience and progress we make from having everyone connected to the internet.

Conclusion

I hope this rough plan can serve as a blueprint for some of what we'll all need to do to connect the next 5 billion people.

We are excited to hear your feedback and ideas. We know this plan will evolve, but we are deeply committed to finding a path to connect everyone in the world.

I think that connecting the world will be one of the most important things we all do in our lifetimes, and I'm thankful every day to have the opportunity to work with all of you to make this a reality.