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Five Faulty Premises in Telecom Policy Debates

by

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In the telecom space, heated debate and controversy are the norm. But the past several months' debates have been particularly heated, with the fever's pitch only likely to increase in 2014. This year's agenda already includes the D.C. Circuit's ruling on the Open Internet order, further work on the IP Transition, Congressional consideration of a new Communications Act, ongoing implementation of the Connect America Fund, continuing planning for the eventual incentive auctions, possible mergers involving TWC and T-Mobile (and, at minimum, ongoing rumors), and, invariably, more debate about how to increase Internet speeds in the U.S. and how those speeds compare to those in the rest of the world.

This list of policy issues is already exhausting to think about, and is certain to grow as the year progresses. It's also exciting – this is a fascinating and challenging time to be working in the telecom policy space. It is also an area that takes a lot of dedication and energy to work in. One of the reasons that it takes so much energy is because faulty premises are repeatedly used to make flawed arguments – but while built on shaky ground, they must be knocked over anew each time they are used. I discuss five of the most pernicious of these recurring faulty premises below.

The five faulty premises are: that everyone needs low-cost access to high speed broadband service; that high-speed broadband is necessary for education, health, government, and other social services; that wireless can't compete with cable; that an open Internet is necessary for innovation and benefits consumers; and that the grass is greener in other countries.

Before turning to these faulty premises, two points should be made at the outset. This first is that the structure of this article – "Five Faulty Premises" – bears resemblance to Public Knowledge's "Five Fundamentals" framework for the PSTN. This isn't a response to or criticism of that framework. If anything, this is a riff on, or homage to, its work, which has been an important contribution to discussions in this field over the past year.

The second point is a reminder of something that should be a guiding principle during the next several years' telecom debates: the consumer must come first. This is a theme that will run, sometimes implicitly, through my critiques of each of the five faulty premises. It is too often the case that policies are advanced, even well-intentioned and seemingly consumer-friendly policies, that do not fully appreciate the complexity of the market, and that, therefore, fail to place the interest of all consumers ahead of the interests of specific, often narrow, groups of consumers or of other private parties.

Faulty Premise #1: Everyone Needs Low-Cost Access to High-Speed Broadband

The first faulty premise is that everyone needs low-cost access to high-speed broadband. This idea is central to contemporary debates in the telecom space, and guides much of current policy. This premise gives rise to several related policy prescriptions: ensuring the availability of service everywhere; ensuring that service is either low-cost or subsidized for those who may not be able to afford access; ensuring that at least one carrier offering such service is available to every consumer (a "carrier of last resort"); and imposing various service-level guarantees and quality of service requirements on every carrier.

As an initial matter, universal telephone service has historically been leveraged to support various important social commitments. Ensuring that everyone has access to some basic communications platform, so that they are able to get access to emergency services and avail themselves of other important government and social programs, is an important value that we should strive to maintain.

The challenging questions are at what level and by what means do we maintain this commitment. Many in the telecom policy space – often those with the loudest voices – have long advocated that every American needs access to high-performance telecommunications (today, that is high-speed Internet service) services at low cost. Indeed, everything the FCC does today is done with this goal, directly or indirectly, in mind.

Historically, the difficulty of these questions has been masked by the nature of telephone technology. The basic unit of connection – the twisted pair of copper wires – that was necessary for any service was also sufficient for most services of interest to ordinary consumers. As a result, by requiring universal provision of the most basic services, we also facilitated the provision of more advanced services.

This no longer holds today. One can get connected to the communications network through various means: fiber, coaxial cable, wireless voice, fixed and mobile wireless data, satellite, and even still good old twisted pairs of copper. Each of these means of connecting to the network offers varying degrees of support for various services and applications. Fiber is very fast but

expensive; cable and (especially) DSL are somewhat slower, but are also somewhat cheaper; wireless is a bit slower still (but still can be rather fast), a bit less reliable, and often somewhat more expensive than cable – but it's mobile, which is pretty great! Some of these technologies are better for voice service, for video service, for downloading large amounts of data, or for playing video games. Some of these services are also better or worse regarding our social commitments: mobile wireless, for instance, is great in that you can bring your connection to emergency services with you wherever you are; but it is problematic that it can be difficult for those emergency services to know your location should you need them to find you.

As a result of today's changed and more diverse communications technologies, we need to take a more nuanced view of how to provide communications networks to support important social commitments. The historical precedent, that we would provision a connection capable of supporting nearly the full range of possible services, was a happy historical accident.

The most difficult aspect of this more nuanced view is that we need to think seriously about what services are included in the bundle of basic social commitments. Many advocates argue that every American should have access to low-cost Internet service capable of supporting streaming video services. That is quite an upgrade from the basic services historically provided through universal service – basic local voice communications service (long distance was available, but at substantial cost). Many of these advocates justify promoting this class of Internet service as "basic" on the grounds that such high-speed service is needed to ensure access to, e.g., educational, health care, and governmental services – these arguments are addressed below as the second faulty premise. Most (and possibly all) of the services that clearly belong in the bundle of basic commitments – affordable access to a reliable communications platform that provides access to emergency services, essential government services and information, and even basic e-commerce – do not require a class of service sufficient to support high quality streaming video. Those who think that other, more resource-intensive, services do belong in the bundle should face a stiff burden in advancing their argument.

Indeed, the idea that high-speed broadband is necessary in order to meet these social commitments, and also to provide various educational, healthcare, government, and other services, implicitly excludes various disadvantaged communities from these services. The only reason that high-speed broadband is necessary for many of these services is because they have been developed to offer rich multi-media experiences. That is, they use audio and video. This means that they are not accessible to the deaf and blind. In our race to leverage the latest and greatest technologies for various (legitimately important) services, we too often forget that not everyone can avail themselves of those technologies.

Perhaps the most tragic aspect of this is that it is largely needless: there is little reason for many of the services being deployed online to *require* rich multi-media. The push for a resource-intensive user experience is in many cases driven by the existence of the technology, not by the needs of the users. This, in turn, drives up consumer need for high-speed broadband.

A better, more modest, solution would be to require essential services – the sort of applications that would justify ensuring access to high-speed broadband – to be developed so as to not require high-speed broadband. Rather than fueling a race to use more bandwidth-intensive design

practices, the government could instead promote the adoption of more efficient, resource-conscious, design practices. This would serve the parallel goals of improving accessibility and of decreasing reliance on high-speed broadband.

A critical question about these services is often overlooked: where is the consumer in all of this? Those advocating high-speed broadband as a universal service often have more to gain from such programs than median consumers. Firms like Google, that provide services and applications that run over communications infrastructure, are clear beneficiaries, as are networking equipment manufacturers. Politicians, too, often have much to gain from this strategy, as the costs of provisioning these networks are not transparent to voters and indirectly borne. And the "Ivory Tower" is more likely to reward academics who promote regulatory programs that appear to advance social needs than those who argue against programs that appear to benefit the public interest.

But just as communications technologies and the services that they facilitate are diverse, so too are consumer preferences. It is absolutely the case that there are basic services that we should do our best to ensure everyone has reasonable access to. But today we need to think more carefully about what these services are than we have historically needed. Most important, we should resist the urge to treat every American as though they have the same needs and wants as Washington, Silicon Valley, and Ivory Tower policy makers.

Faulty Premise #2: High-Speed Broadband is Necessary for Education, Healthcare, and Other Government and Social Services

A second faulty premise is that high-speed broadband is necessary – and the government must therefore ensure low-cost access – for education, healthcare, and other various government and social services. This premise is problematic both because it is factually inaccurate, and also because it is often used as a scare tactic. It ties supporting a specific broadband policy with supporting education policy, access to healthcare or employment, or concerns about the digital divide. I don't mean to suggest that there is no digital divide – to the contrary, I mean to suggest that calls for government support of low-cost high-speed broadband can exacerbate this divide. As argued above, the focus should be on ensuring access to sufficiently high-performance Internet services to realize basic social commitments.

The first, most important response to this premise is that high-speed broadband connectivity isn't typically needed for these services. It is especially true that the bandwidth sufficient for high-quality streaming video services – a critical benchmark for most broadband advocates – isn't necessary for these services. Consider that today's system requirements for video conferencing applications, including programs routinely used for distance education and MOOCs ("Massive Online Open Courses"), is in the 1-2 Mbps range, far lower than that needed for high-quality streaming video services. Adobe Connect suggests at least a 512 Kbps connection for classroom participants. That is sufficient for many of these applications to stream high-quality video. And, importantly, these speeds are well below the 4 Mbps used by the FCC as the minimum threshold for "high speed" Internet – and are very far below the 10s of Mbps that many advocates insist all

consumers should have access to. Coursera, a popular MOOC platform started by Stanford, Princeton, the University of Michigan, and the University of Pennsylvania and today comprising a consortium of over 100 universities, has recently announced a mobile optimized app, which even further reduces bandwidth requirements.

This reveals another often overlooked aspect of broadband policy debates: bandwidth isn't the only, and often isn't the most important, metric. Latency (the time it takes a packet of data to traverse the network) and packet loss (the percentage of packets of data that never make it across the network) are incredibly important metrics, especially for education and health care applications – applications where the user may need to interact in real time with a teacher, classmates, or healthcare professional. At the risk of treating anecdote as data, having used several of these applications on various devices, I would quite happily substitute a much slower connection for a more reliable one.

The idea that latency and packet loss can be as important as bandwidth is not new. But it is one that plays almost no role in contemporary policy debates. This is one of the gravest mistakes we are making today. It is akin to having a transportation policy focused on miles of highway constructed but paying no attention to whether those highways actually decrease commute times or accidents.

Other issues with the idea that high-speed broadband is necessary for these services become clear when looking at each service individually. In the case of health care, for instance, it is unlikely that residential users would have any need for the sort of telemedicine devices that require high-speed connections. Rather, consumer-grade healthcare applications are more likely to be used for monitoring and reporting – applications that send occasional bursts of data and that do not require particularly high-speed connections. The greater challenge for these applications is likely to come from the multiplicity of such devices – the so-called Internet of Things. There is concern that millions or billions of devices, each sending small bursts of data, will overwhelm networks – even if the network provides sufficient bandwidth, it may not be able to handle the multiplicity of connections.

The alleged need for high-speed broadband for education applications similarly doesn't stand up to scrutiny. There's an appealing and intuitive nexus between the desire to educate a technology literate generation and the need to provide that generation with an education infused with cutting-edge technology. But technology is only a means to the end of providing education. In a recent review of Frederick M. Hess and Bror Saxberg's *Breakthrough Leadership in the Digital Age*, my TechPolicyDaily.com colleague James Glassman explores the role of technology in education. He explains (as Hess and Sexberg argue) that technology is only an educational tool – one that is being misused today. It has potentially great educational value – but realizing that value requires figuring out how to effectively use the technology, not just deploying more of it.

A related point is that smart and motivated individuals can typically learn to use new technology, but technology doesn't necessarily ensure that students will become smart or motivated individuals. As reminded by a recent meme that burned through twitter, many technology luminaries were not exposed to technology until they were older – sometimes not until they were out of school entirely. On the other end of the spectrum is the tale of the Ethiopian children who

were able to teach themselves to hack educational computers in order to improve or add functionality – or the tale from this past year of the homeless man who learned to code in four weeks. Smart and motivated individuals can figure the technology out – and they don't need a decade of technology-infused education to do it. Again, technology can be a useful tool in education, and exposure to technology may help students develop a comfort and facility that will help them embrace technological tools later on – but there is a wide gulf between exposing students to technology and a technology-dependent education.

Faulty Premise #3: Wireless Can't Compete with Cable

A third, more specific, faulty premise is that wireless broadband is unable to offer service comparable to that of wireline broadband services – in particular, cable Internet service delivered over coaxial cable. The basis for this premise is seemingly reasonable: both cable and wireless transmit data over spectrum. Wireless carriers share several hundred megahertz of spectrum amongst themselves, and their signals are subject to interference from both other carriers and natural sources. Coaxial cable gives a cable company roughly 800 MHz of dedicated spectrum – several times the spectrum available to any individual wireless carrier – and transmits signals along a shielded corridor that protects them from most sources of interference.

There are myriad problems with this argument. As an initial matter, it addresses the peak capacity of individual transmission units – e.g., a coaxial cable or cell tower – not the capacity available to individual users. Either service can be used, today, to offer greater than 100 Mbps service to individual users, though the networks are rarely provisioned to ensure that class of service. An individual coaxial cable is typically shared by a couple hundred users; an individual cell sector may be shared by a few to a few hundred active users. The right question isn't the peak capacity of individual transmission units – it's the capacity per user of each transmission unit, and the costs (both monetary and time) of provisioning new resources to add capacity or address congestion.

More important, in the long run wireless has clear advantages over coaxial cable. This is because anything coax can do wireless can do, too – and there are many things that wireless can do to improve performance that coaxial cannot do. Both technologies transmit a signal over spectrum; both use the same encoding techniques to do this. Any new encoding technique that works for a signal sent via cable will also work for a signal sent via wireless. But cable has a fundamental limitation compared to wireless: a cable transmits its signal in one dimension, along a straight line. A wireless signal is transmitted through space, in three dimensions. This means that wireless can avail itself of transmission and reception techniques using multiple antennas – so-called spatial diversity or antenna arrays. Such systems are often referred to as MIMO ("multiple-input, multiple-output," referring to the number of receiving and transmitting antenna).

MIMO technologies have been taking the wireless world by storm over the past decade – early MIMO technologies have been incorporated into current standards for WiFi and LTE. There are three primary applications for MIMO: interference mitigation, signal multiplexing, and beam-forming. By comparing the signals received at each of multiple antennas, complex algorithms are able to detect, and cancel-out, interference. MIMO can allow wireless transmissions to have

interference characteristics comparable to that of coaxial cable. Using this interference-cancellation technology, MIMO also allows multiple signals to be sent over the same spectrum simultaneously. In other words, a carrier with 40 MHz of spectrum could use a 4x4 antenna to transmit 160 MHz worth of signal (4x 40 MHz carriers) in that spectrum. There is some loss as signals are added – but MIMO systems are already able to increase capacity by 200% to 300% using 4 streams. In other words, 300 MHz of wireless spectrum is approaching the point that it can carry as much as 800 MHz of coaxial spectrum. (The last basic MIMO technique, beam-forming, is a bit too complicated to explain here. Basically, using multiple antennas, a wireless signal can be focused in a single direction (into a "beam") – or into multiple beams, each going a specific direction. The beams don't interfere with each other, such that each can use the full spectrum capacity of the sector, allowing more users to be served by a single cell or access point without reducing speeds available to each.)

Some advocates argue that MIMO does not work well in a mobile setting. This is not a technically accurate statement. The correct statement is that mobile MIMO cannot work better than fixed MIMO. MIMO technologies can work in a mobile setting – and, indeed, they are already being implemented in LTE devices. The number of antennas that can be fit in a cellphone is limited (typically to two) due to the size of the device; and fast-moving devices (e.g., a cellphone in a car) receive reduced benefits from, for instance, interference mitigation and beam-forming. But the basic technologies do work in a mobile setting, are being deployed today, and are improving at a rapid pace. And none of these technologies work in a coaxial setting.

There is a more fundamental problem with the critique that MIMO doesn't work well in a mobile setting: high-speed broadband is generally needed in fixed, not mobile, settings. That is, you are far more likely to need high-speed broadband to watch high quality streaming video on your large television than on your small phone. The proper comparison between cable and wireless capacity is between cable and fixed wireless. Here, given the availability of, and continued development of, MIMO technologies, the long-run advantage is with wireless.

This is particularly true given that the capacity of cable is limited to perhaps a couple of GHz of spectrum. Cable operators cannot change this without massive upgrades of their infrastructure – which would likely require replacing the last mile with fiber instead of coaxial cable. Wireless is not subject to this limitation. As wireless applications are reaching into the millimeter-band ranges (30 to 300 GHz), engineers are developing wireless systems delivering 10 to 100 Gbps class performance over multiple-kilometer distances. Such technologies are likely not well-suited to mobile applications; but they have real potential to dethrone coaxial cable as the dominant residential fixed broadband technology.

Faulty Premise #4: Innovation Requires Open Access

The next faulty premise is a doozey: that innovation requires open access. This is the beautiful premise that launched a thousand ships on the sea of Network Neutrality. But its beauty is skin deep. While it is true that open access can facilitate some types of innovation, it both precludes other forms of innovation and imposes costs of its own. In the telecommunications context, open

access is mostly about network neutrality – the idea that broadband providers should not be able to charge users or service providers for preferential access to specific services, let alone block specific services entirely (absent some compelling legal or technical justification).

It is unquestionably the case that open access can facilitate some sorts of innovation. It reduces R&D and other transaction costs (especially search and negotiation costs to get permission or access to use existing infrastructure) and reduces opportunities for rent extraction by those who otherwise control an infrastructure. On the other hand, it makes some forms of innovation more expensive or difficult to implement. There are substantial literatures showing the benefits of vertical integration and the importance of defining proper modular boundaries. Nowadays, however, this point can be made more simply: Apple's hardware and software designs are part of a tightly-controlled, vertically integrated, closed product ecosystem. Apple would not exist if we had the equivalent of network neutrality for computer hardware or software. This does not mean that either an open or a closed model is necessarily better in any given case; it does mean that we want a more nuanced approach than one that mandates either approach in every situation.

The scale is tipped even further against mandated open access in the case of the Internet. This is because the Internet is a two-sided market – a market in which two or more distinct groups of consumers are brought together via some intermediary platform. That is, users and Internet service providers (e.g., firms like Google, Facebook, and Netflix) reach each other via the Internet. I looked at this issue in some depth in a prior FSF Perspectives piece; indeed, I first explored some of the early literature on multi-sided markets and the implications multi-sidedness has on the Network Neutrality debate in a 2006 article.

The crux of the two-sided markets analysis is that the platform that brings the different sides together – that is, broadband Internet access providers – ordinarily charge either or both sides of the market for access to the other. How much to charge each side, including whether to charge either side nothing or even to subsidize one side's access to the platform, involves a complex set of tradeoffs – and, most important, how much each side is charged can have substantial effects on the social value of the network. Critically, and I will say this in italics because it is so important, *the literature studying two-sided markets consistently shows that there is no reason to believe that a network neutrality rule benefits consumers, and consistently shows that such a rule can harm consumers*.

A network neutrality rule is really little more than a subsidy from the consumer side of the market to the service provider side of the market. Some, but not all, service providers benefit from this rule. Other service providers may be harmed by such a rule – especially those who offer, or would like to develop, services that would benefit from enhanced quality of service features or other features that may require some integration with broadband access providers.

Even more problematic, a network neutrality rule can harm consumers. It prevents broadband providers and service providers from working together to offer innovative new products that consumers want. More tragic, it prevents these providers from developing lower-cost service packages – packages that could expand opportunities for access to currently underserved and

disadvantaged communities. These rules likely increase cost of access and limit the development of potentially cheaper offerings that are more responsive to consumer demands – this is exactly the opposite of good telecom policy.

This point relates back to a concern in the first faulty premise: the paramount importance of respecting consumer preferences, and not substituting the Washington-Silicon Valley-Ivory Tower views of what consumers should want for what they actually do want. By requiring that every consumer's Internet connection offers full-fare, first-class service, complete with movies, television, and free drink service, we price consumers who would be happy with discounted-fare economy Internet service out of the market.

I don't mean to give away the barn. The key takeaways from the literature in this field are all nuanced – different price structure "can" or "may" benefit or harm consumers. In some cases, "non-neutral" price structures may benefit consumers, in some it may harm them, and conversely. (Noted paraleptically, my own reading of the literature suggests that, given current market structures, non-neutral pricing is likely to be better for consumers than neutral pricing.) But this does not mean that we should prescribe *ex ante* prophylactic pricing rules – rather, it means that we should monitor conduct and pricing in the Internet ecosystem and be ready to bring *ex post* actions against pricing decisions that are demonstrably harmful to consumers.

Faulty Premise #5: Things are Better in Europe, Asia, or Somewhere Else

The final faulty premise considered here is that the Internet grass is greener in Europe, Asia, or somewhere else. A corollary faulty premise is that such a comparison matters at all.

Comparative rankings of global Internet speeds are a staple of telecom debates. They feature prominently in the work of advocates across the political spectrum. Every year, firms like Akamai release new numbers. And 2013 saw at least three major efforts to study the relative costs and speeds of Internet access around the world: the ITIF, ITU, and OTI studies.

As amply and ably documented by my TechPolicyDaily.com colleagues Richard Bennett and Roslyn Layton (and also see her seven part series), and FSF's Sarah Leggin, the idea that the U.S. is "falling behind" is debatable at best. We might not have the fastest Internet in the world – but those that do often lament the low adoption rates seen after tens of billions of dollars of state-sponsored investment. We might not have the cheapest very-high-speed Internet access in the world – but we have some of lowest prices for access to entry-level high-speed Internet in the world. And, as much as we lament how much better everything is in other countries, those other countries lament how much better things are in the United States – especially since our mobile Internet access is blowing the rest of the world out of the water.

Perhaps more important than whether the U.S. has the fastest Internet in the world is whether it even matters whether it does. These rankings and comparisons tend to focus almost exclusively on two metrics: speed or speed per dollar. As explained previous (in faulty premise #2), speed and cost are only two of many metrics important to understanding the value of broadband Internet access. Latency and jitter are also important – in many cases they are more important, and especially more important than mere speed.

The true fault in the premise that things are better in other countries is the idea that these speed comparisons matter. We talk about these comparisons because we don't have a better way to assess our spending on broadband infrastructure. But we could unquestionably have the world's fastest broadband service if we wanted – all it takes is money. Would such an investment at a scale to ensure we would top the Internet speed rankings make sense? Probably not. We could also have the world's fastest roads, highest literacy and graduation rates, safest schools, largest airports, and cleanest energy – if we were willing to pay for any of these things. Figuring out how much to spend on any of these priorities requires a complex set of tradeoffs that is completely ignored by advocates concerned with whether average broadband speeds in the United States are a few percent slower than our friends in Europe.

If we are to have a coherent discussion about how fast our Internet architecture should be, we need to have a more sophisticated goal than "faster than anyone else." In particular, we need a more sophisticated metric than just speed. More speed will always be better than less speed, and more speed can always be acquired by expending more resources. The race to have the fastest Internet in the world, therefore, is little more than a race to spend resources. Maximization always needs to be done subject to some constraint. Rather than comparing speeds, we should instead think about why we value high-speed (and, then, higher-speed) Internet service, and how marginal increases in Internet speeds affect that goal. As a proxy, for instance, we could ask how incremental changes in infrastructure investment affect GDP.

Conclusion

Telecom policy debates are always contentious. In recent years, as the Internet has come to the fore, the landscape has splintered between several different platforms and the relationship between content and distribution has become more dynamic as these debates have grown in complexity and intensity. This is a trend that will only continue into 2014 (and likely beyond).

Telecom policy is also, unquestionably, important. These debates are necessary to the wellbeing and prosperity of our country. As we think about what policies to adopt, our eyes must always be on the proper bottom line: how policy choices affect consumers. Good ideas in telecom policy can benefit consumers nationwide; bad ideas can be terribly costly. Perhaps most important, ideas that can be beneficial to some consumers can be terribly costly to many other consumers.

One of the most problematic aspects of telecom policy debates is that bad ideas don't die. Advocates, often representing narrow interests, continually use good-sounding but fundamentally flawed arguments. Unfortunately, every time they are made, they need to be rebuffed. They turn a policy debate into a war of attrition. They shift attention in the debate from what is good for consumers to what is good for the interests they represent – and the residual consumers, those with median interests and who are most likely harmed by policy decisions, are left without a voice in these debates.

In this article, I have looked at five of the most pernicious of these recurring faulty premises: that everyone needs low-cost access to high speed broadband service; that high-speed broadband is necessary for education, health, government, and other social services; that wireless can't

compete with cable; that an open Internet is necessary for innovation and benefits consumers; and that the grass is greener in other countries. Some of these ideas may contain nuggets of truth – but those nuggets do not support the broad policy prescriptions that have been built upon them.

Where these nuggets are found, they usually reflect some of the basic social commitments that we really do need our telecommunications regime to support. But they attempt to build overly broad policy prescriptions around these basic commitments, losing track of the forest for the leaves. The challenge of telecom policy is building an affordable network that simultaneously supports these social commitments without being hamstrung by an impossibly expensive and innovation-hampering regulatory edifice.

Hopefully, identifying these faulty premises here will help us move beyond them in the debates to occur over the next year. This is an exciting time in telecom policy. It is also a challenging time, given the fundamental shifts in technology and the industry that have occurred since the 1996 Telecom Act. If we can move beyond the superficial aspects of these debates, overcome these faulty premises, and keep our eyes focused on what benefits consumers and on ensuring that basic social commitments – the things that we all need, not that some of us merely want everyone to have – are met, then we are poised to make great progress in the coming year.

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