

April 2012
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It's just not Cricket: Number Misuse, WCIT and ITRs

Another twenty five years has just zoomed by, and before you know it, it's all on again. The last time the global communications sector did this was at the WATTC in 1988, when "the Internet" was just a relatively obscure experiment in protocol engineering for data communications. At that time the Rather Grand telephone industry bought their respective government representatives (at the time the generally cosy relationships between governments and their monopoly telephone companies often made it extremely difficult to tell them apart!) to the Rather Grandly titled "World Administrative Telegraph and Telephone Conference (WATTC) in November 1988 in Melbourne, Australia and resolved to agree to the Rather Grandly titled "International Telecommunication Regulations."

At WATTC in 1988 some 178 of the world's nations agreed to a set of International Telecommunications Regulations (ITRs) that supplement the binding regulations of the International Telecommunication Convention. The goals of these regulations were Rather Grand as well. They aspired to promote the "harmonious development and efficient operation of technical facilities, as well as the efficiency, usefulness and availability to the public of international telecommunication services."

If one is prepared to view the rise and rise Internet over the past 25 years as a product of a appropriately liberalised international regulatory regime as much as it was a product of the titanic shifts in computing and communications technologies that also occurred over this period, then it is conceivable to make the case that the Internet of today is a product of these ITRs. And what a prodigious product it has been!

But here, rather than look at the Internet, I was wanting to look particularly at the ITRs and the preparatory activities in the leadup to WCIT.

In Dubai, between the 3rd and 14th of December in 2012 the nations of the world will convene again to consider a review of these ITRs, which define the general principles for the provision and operation of international telecommunications. Again, all Rather Grand stuff.

At the moment the international meeting cycle is ramping up to consider what aspect of the ITRs should be altered, what should stay the same, and what should be dropped. After all much has happened in the past 25 years, and there is an argument to be made that the ITRs should better reflect today's world.

But the world is not exactly aligned at the moment about what should and what should not be folded into a new set of international regulatory obligations. Some countries appear to be advocating for some quite specific measures to be added to the ITR to address what for them are characterised as otherwise unresolvable operational issues. Others are advocating a more general approach to have the ITRs explicitly embrace the Internet and fold references to the Internet in every place where specific carriage and service delivery technologies are references in the ITRs. It's when these two approaches intersect that the situation gets interesting.

What we are seeing at the moment is an effort to fold the concepts of "Number Misuse" and "the Internet" together, with a result that there is some advocacy by some countries to see the ITRs explicitly take on the concept of "IP Address and Routing Misuse" within a the framework of national obligations through common regulatory action. If successful this would oblige governments to take necessary actions to investigate and prosecute such instances of so-called "misuse." Surely we all desire a global public communications network that operates with integrity. Surely we would want to see countries do precisely this. So why is this not exactly the best idea to appear in the ITR negotiation process so far?

Let's look at the motivations for "Number Misuse" in the world of telephone carriers and telephone services, and then look at how this could conceivably map in to the world of the Internet.

To understand the telephone world and where this issue of "Number Misuse" is coming from, it may be useful to understand a little of how money circulates in the phone world.

Telephony: Sender Pays

In many ways the telephone leaned heavily on the telegraph service for its service model, which, in turn, leaned on the postal service, establishing a provenance for the telephone service model that stretched back over some centuries to at least the 1680's and London's Penny Post, if not earlier.

The Postal Service model that gained ascendancy over the preceding centuries was a model where the sender paid for the entire service of delivery of the letter. If the postal service that received the letter in the first place needed to use the services of a different postal service to complete the delivery, then that was not something that was visible to either the sender or the intended recipient. The postal services were meant to divide up the monies received to deliver the letter and apportion this money between them to compensate each service provider for undertaking their part in the delivery of the letter.

The telephone service, for the most part, operates in a very similar fashion. The caller pays for the entire cost of the call, and the called party does not. When both the caller and the called party are connected to the same carrier then this really is quite straight forward. The carrier charges the caller for the cost of the call and, presumably, some small (or often not so small) margin for profit.

However, when we take the same model and apply it to, say, international phone calls, then the model is not so simple. The common desire on the part of the telephone operators was to preserve the same simple model: the caller pays. Now in this case the caller pays the presumably higher price of establishing a voice circuit from carrier in one country in one part of the world to another carrier in another country in another part of the world. But now the caller's carrier should not keep all of the revenue associated with the call. The other end, the "terminating carrier" has also incurred costs in servicing this call. The arrangement that the telephone industry came up with was the concept of "inter-carrier call accounting financial settlements."

To explain this it may be useful to bring in the unit of a "call minute", which is commonly used as a means of measuring a telephone call. What carriers establish between themselves on a bilateral basis are the inter-carrier settlement cost per call minute of a telephone call that originates in one carrier and is terminated by the other carrier.

Now if both carriers can establish a value of a call minute settlement rate where in both directions the call minute termination costs roughly equate to the call minute settlement rate, then in theory at any rate, neither party is relatively advantaged over the other irrespective of whether the callers are predominately located in one carrier or in the other carrier. In theory, in such an arrangement should be financially neutral to both carriers.

However, while in theory practice and theory should align, in practice its rarely the case. What happened in the telephone case was that we saw some carriers set a call minute call termination settlement rate that was well above cost, while at the same time set its international call tariffs such that outbound calls were prohibitively expensive for local subscribers. The result was that the local customers of these carriers found it cheaper to request that the other party call them, which was the desired outcome. The local carrier then generated income not by charging local subscribers but by revenues generated as an outcome of the call accounting settlement payments that were generated by the net imbalance of called vs calling call minutes.

This was a game played by carriers all over the world. For example, in France in the early 1990s it was some 5 - 10 times more expensive to call a US number from France than it was to make a call between the same two numbers in the other direction. If you add in a further consideration, namely that in the 1980's many carriers were part of the public administration and were in effect government-operated national monopolies whose profits contributed to national revenue, then you get an outcome that is described in Opinion No. 1 of the 1989 ITRs, under the heading "Special Telecommunication Arrangements", namely:

"considering further that, for many Members, revenues from international telecommunications are vital for their administrations"

Telephony Special Services and "Number Misuse"

It's often said that the only really major innovation in more than a century of the telephone service was the fax. Perhaps that's a little too unkind, but innovations in the delivered services that industry were few and far between. However, there were a number of innovations that are important to this story, and the ones that are relevant here are number redirect and the so-called "premium" services.

The "premium" services attracted a higher call cost, and the carrier conventionally splits the revenue from the service with the called service. These services traditionally included weather forecasts, sports results, new headlines (until the Internet became all but completely ubiquitous and decimated these services!), and so on. They also attracted the sex industry. However, in many countries such services were not permitted, so a conventional premium service was not an option for this industry.

As ever, we are naturally inventive, and some folk thought about this and came up with a clever solution to use number redirect to redirect the call to this otherwise not permitted premium service to another country. As part of this redirection the premium service provider needed to reach an agreement with the new home carrier of the call termination point to divide the international call accounting revenue provided by callers to this service between the carrier and the service provider. Not only did this arrangement effectively circumvent local regulations relating to locally provided premium services, it also leveraged off the international call accounting arrangements to the benefit of the premium service provider as well as the terminating carrier.

We may be inventive, but all too often we are greedy as well. The next step was to circumvent any arrangement with the destination carrier and redirect the call to an entirely different carrier. One of the side effects of deregulation of the telephone industry in many countries was that in place of a single carrier that would receive incoming all international calls for a given country code there were a number of carriers who were ostensibly competing for the these incoming calls. Instead of routing calls based solely on the dialled country code, carriers now could route calls based on number blocks within the country code, and use different transit routes based on number block rules. What if a premium service provider took a number block from a country code and specified that all incoming calls were to be routed by a third party carrier? That all sounds innocent enough, but what if this third party did not actually route the calls through to the country in question, but instead terminated the calls and still charged the calling carrier the international call accounting settlement rate? No doubt the service

provider has got a better deal, so the service provider is happy, and the carrier that terminates the call is receiving a portion of the call settlement rate, so the terminating carrier is happy. But happiness is not universal here. The carrier in the called country code is getting nothing from this arrangement, even though their country code is being used. From their perspective they are being defrauded of what they might claim is legitimate international call accounting revenue through the "misuse" of the number block drawn from their country code.

If the country code carrier could discover this unauthorised number block diversion, then presumably they could withdraw the number block and stop the international call diversion. Unfortunately this is not always the case. They can withdraw the number block, but at times, and under perhaps somewhat shady circumstances, the premium service provider and potentially the transit carriers, might still be able to convince local carriers that the number block diversion is still legitimate. While the country code carrier might see the problem, their ability to enforce carriers in other countries to respect their authority regarding the use of number blocks drawn from their country code is not always clear. At times they are effectively powerless to enforce a remedy.

And the scheme can be further refined. Why even enter into any form of discussion with the international carrier for a number block? Why not pick one or more of the more obscure national country codes, generate some number blocks from these codes and then get a cooperative transit carrier to enter a number block diversion request into the local carrier? The number block is perhaps drawn from a country code that already makes extensive use of third party transit arrangements, and the local carrier may not question the request, and the carriers in the countries where the number blocks have been drawn from may not have the resources to even detect that this has occurred.

At this point we have arrived at the situation that is motivating some of the proposals to augment the ITRs in this round of negotiation. The position of the nations who have been highlighting this issue as being an important problem in the world of international telephony is that the unauthorised use of phone numbers drawn from their E.164 telephone number block is, in their eyes, a case of "Number Misuse."

The reason why they want to identify this situation and write it into the ITRs this time around is that they would like to involve governments into the role of enforcer of conformance with the conventions of management of telephone country codes. It appears that they would like governments to adopt, as a common convention, that calls made to a country's country code be directed such that the call request is sent to an authorised carrier located in the country, and to ensure that all authorized carriers essentially honour the integrity of the country codes of all other countries that use the E.164 country code number plan.

It's also reasonable to ascribe the motivation for this measure as one that is intended to ameliorate the inexorable revenue leakage of the former rich money tap of international call accounting settlement payments. I'm not sure that the various antics of the international premium service market are the true intended target of this measure. I suspect that the intended targets of this proposed regulatory measure are those carriers who have devised other methods to honour the intentions of their callers when they make an international phone call, and make the phone of the dialled number ring, yet at the same time bypass the traditional call accounting arrangements. Already VOIP trunking is commonplace, where the call is mapped into a Voice Over IP call, and one way to bypass the conventional call accounting measures is to use a VOIP trunk to enter the dialled country, and then pass the call back into the PSTN as a locally originated call, terminating it on the originally dialled number. The call is then subject to domestic inter-carrier call termination tariffs, which are generally far lower than their international counterpart.

The Internet and services such as Skype are exerting massive downward pressure on what carriers can charge for conventional phone services without driving all remaining customers into Internet-based services. In an effort to retain some level of market share it is now evidently more commonplace for carriers themselves to embrace IP-based approaches and bypass these imposed inter-carrier

international settlement charges. But for many countries in the developing world this shift represents a twofold financial blow. Not only are they seeing their foreign-sourced revenue stream disappear at the same rate as the call termination minutes of conventional telephony vaporises, but this revenue stream is being replaced by growing IP traffic volumes which represent a net cost to the national economy.

It should come as no surprise to see some countries attempt to advocate an international regulatory response that is intended to reverse this development, and restore the role of the international telephone network as a means of structural flow of monies from the business sector from the richer economies to the consolidated revenue stream of those not so well off economies.

Internet Number "Misuse"

In and of itself the above discussion is by no means a novel discussion for the telephone world, and the tensions exposed by the continual erosion of the traditional telephone business through the onslaught of new technology is not at all surprising.

What is perhaps a bit more of a surprise is the recent moves within the ITR preparatory activities where a number of nations are advocating pulling Internet addressing and routing into the same category of telephone number regulation and also fold this into this matter of "number misuse" that would apply to both E.164 numbers and IP addresses.

Now some things do not readily translate from telephony to the Internet: there is no "national IP address plan" as a counterpart to the E.164 number plan, as the IP address plan is aligned to networks, as distinct from countries. However one could take a broad view and find some form of mapping from the proposed recommendations regarding the use of E.164 networks to IP addresses. It would appear that the application of the proposals regarding "number misuse" would see a regulation to the effect that IP packets should be routed to the destination address specified in the packet, and not rerouted and terminated elsewhere. Surely this is part of the way the Internet works in any case. For the network to actually function, packets need to be passed to their addressed destination. Or so one would've thought.

And that is indeed what happens a lot of the time within the Internet. But by no means all of the time. As part of the normal course of operation of IP networks many operators deploy equipment that intercepts packets and forms a synthetic response using the address of the intended destination. And many national administrations either operate, or mandate the operation of, equipment that inspects packets in transit and discards packets addressed to certain number blocks.

What is going on?

Why do network operators regularly "misuse" IP addresses by deliberately intercepting packets and generating a synthetic response?

Packet Diversion

The most prevalent reason is the use of proxies, and, in particular, web proxies. These devices sit "on the wire" and intercept web fetches and cache the downloaded data. When another user requests the same URL the proxy will use the cached version of the content, rather than forwarding the request on to the original site. This is by no means unusual: it is typical for web browsers to cache the most recently visited web pages and when the user returns to the page, the local cached copy is used rather than re-performing the download. For the browser and the network operator the rationale for this form of "address misuse" is the same: it is both a desire to improve performance for the end user and a desire to increase the efficiency of the network by reducing the data volumes being shifted across the transit links. So the outcomes are, on the whole, positive outcomes; users see improved performance

and potentially lower costs for the service, using an interception technique that is generally transparent to the user.

Is the deployment of a web proxy an instance of fraud?

Here's where another critical difference between the Internet and the telephone world comes into play. In the Internet the sender does not "pay all the way" to get a packet from its source to its intended destination. In general, every IP packet could be thought of as being partially funded by both the sender and the receiver.

The user who generated the packet pays for an ISP service, and the ISP may, in turn, purchase transit services from another ISP, and so on for sequenced transit services. However, at a peering exchange point, or within a provider network, the sender's money runs out. However the packet is not unfunded, for at this point the receiver's services take over, and the packet transits a path that is funded by the receiver's ISP's transit services, and there to the receiver's ISP and there to the receiver.

If a packet is diverted to a proxy then who wins and who loses? Can we make that case that there is a party that is out of pocket here?

As long as the proxy is a faithful proxy then the user wins in so far as the user experiences improved performance and the benefits of a more efficient network while still seeing precisely the same content. And the content provider wins in so far as the content is delivered to the user without incremental cost of packet handling at the content site. In this case there is no end-to-end service payment on the part of the user that would trigger an inter-carrier settlement payment, so it is difficult to make the case that this action necessarily damages any party involved in the network transaction.

Given the widespread deployment of these devices across the entire Internet, the beneficial outcomes of improved performance and network efficiency, and the option for content providers to use techniques that in effect mark content as not cacheable, it's extremely challenging to sustain a case that the use of proxies is a case of address misuse. So the use of traffic diversion and intercepting proxies are not generally regarded as an example of intentional fraud or even an accepted case of address misuse. It's just what we do today in the Internet.

Packet Interception

What about the deliberate interception and discarding of packets in flight. Surely this is a case of "misuse" of IP addresses?

That's a very hard case to make when you consider that such actions are exactly how firewalls work, and almost every network uses firewalls in some manner or other. The action of a firewall is to intercept all packets, and discard those that match so pre-determined set of rules relating to acceptable and unacceptable packets.

Many users run firewalls that deliberately block all incoming connection requests unless they match quite specific rules.

Many ISPs run firewalls that deliberately block access to ISP's services from users who are not direct customers of the ISP.

Many countries have content regulations that block access to certain content, enforced either through government-operated facilities, or through obligations imposed through the conditions associated with the carrier license within that country. The country I live in, Australia, imposes such constraints on its carriers for certain types of content, as does China through its much-reported national firewall facilities.

Users, service providers and carriers and governments all use various forms of packet interception. Are we all guilty of "Number Misuse"? Should we support changes to the ITRs to obligate governments to completely stop this practice?

Aside from many other motivations for firewalls, security is a continuing concern in the Internet, and there is little doubt that while firewalls have not eradicated all forms of toxic traffic and associated abuse and attack, they are an important part of a larger story about securing the Internet. Irrespective of the various views that get expressed at a national level about censorship, intellectual property rights and the position of common carriers and users, it seems counter-intuitive to me that we would want to obligate governments to pull down our firewalls and filters as a necessary consequence of a revised set of ITRs.

WCIT and the ITRs - Where to From Here?

The international call accounting arrangements used by the telephone world, and the use of structurally embedded imbalances in call accounting settlement rates is still a major factor in the ITR discussions. This accounting imbalance is sanctioned in the resolutions of the 1988 World Administrative Telegraph and Telephone Conference, where Resolution 3, concerning the apportionment of revenues provided for structural cross subsidisation of the developing world through asymmetric fixing of call accounting rates between the so-called developed and developing economies.

But in an increasing commercial world of telecommunications, where it is no longer a relatively exclusive collection of publicly funded monopolies that were an integral part of public utility service providers that in effect were an instrument of national governments, pushing the onus of an international developmental agenda onto an increasingly privatised commercial activity has been a less than comfortable fit. Private operators see this as in a more dispassionate light as a business cost input, and seek to find ways to minimize this cost in order to improve the competitive position of their business.

However, the changes in this industry over the past 25 years are so much larger than even this significant broad scale shift in the onus of capital injection and operation from the public to the private sector. At the same time we are seeing an even more fundamental shift in technology foundations, from circuits to packets with the introduction of the Internet into the picture. This has brought about profound shifts in both the engineering of communications infrastructure and, as we've seen, it also has triggered profound shifts in the pricing of the consumer service, shifting from transactional pricing to a "connection rental" model where packet transit costs are bundled into the service. This, in turn, has led to profound shifts in the manner in which money moves between the network operators themselves.

And perhaps of even greater and more lasting significance in this industry is the decoupling of carriage and content. We have now seen the rise of highly valuable content-centric enterprises whose business model relies on a ubiquitous and abundant underlying communications infrastructure, but who are not financially beholden to the infrastructure operators. They have been able to forge direct relationships with consumers without having to deal with any form of mediation or brokerage imposed by carriage providers. The current value of these content enterprises dwarf the residual value of the carriage service sector, and the outlook for this sector is one of continuing shift in value away from carriage service providers and into the areas of content-based services.

Given the sheer scale of these changes in this industry over the past quarter century it seems to me that the view that one can simply fold the Internet seamlessly into the current framework of the ITRs by the prolific insertion of "and the Internet" into the text of the regulations is simply not viable.

Packets are not circuits, and the mechanisms used to engineer packet networks are entirely different than those used with the circuit switches that supported traditional telephony services. This difference encompasses far more than engineering. The way in which users pay for services differ, and this shift in the retail tariff structure of the Internet service implies a forced change in the way in which carriers interact to support a cohesive framework of network interconnection. The concept of a "call" really has no direct counterpart in the Internet. To extend this further into the area of "call accounting" and "caller pays" is again an extension that does not clearly map into the Internet. So when the existing ITRs refers to inter-carrier call accounting financial settlements there is no clear translation of such a concept into the Internet. When we extend this inter-carrier interconnection framework into structural imbalances in call accounting settlement rates, and extend this further into the concepts of "number misuse" all forms of connection between traditional telephony and Internet are completely lost.

However, this should not imply that the ITRs are now an historic relic, completely overtaken by comprehensive shifts in both the technology and service models of today's global communications network. Irrespective of the fine level of detail in these 25 year old documents, the ideals behind the ITRs are indeed worthy ideals, and should not be discarded lightly. Ultimately, what we are dealing with here is the role of individual nation states with respect to a public communications service for the entire world. In setting forth a framework for supporting an efficient, effective and capable global communications system, the obligations stated in the current ITRs relating to the promotion of international telecommunications services, and the endeavours to make such services generally available to the public remain thoroughly worthwhile objectives. The concept that widely respected technology standards are critical to interoperability are also critically important aspects, and again their recognition in the ITRs are worthwhile considerations.

But, as we both review the changes of the past quarter century and try to peer into what may emerge over the next quarter century, perhaps less is best in this area. Rather than seeking to explicitly add various regulations that attempt to address specific incidents of number misuse, and the rather clumsy efforts to include the Internet into the already detailed provisions relating to inter-carrier settlement models of the increasingly historic traditional telephone network, perhaps the best set of ITRs we could have for tomorrow's world are national obligations that support a common regulatory framework that is both more minimal with respect to describing or relying on particular technologies and service frameworks, and more encompassing in scope in stating the overall objectives and common aspirations all nations share in supporting this unique incredibly valuable common resource of a common communications service that truly embraces the entire world.

Further Reading:

World Conference on International Telecommunications (WCIT-12)

<http://www.itu.int/en/wcit-12/Pages/default.aspx>

The Current ITRS (1988)

http://www.itu.int/dms_pub/itu-t/oth/3F/01/T3F010000010001PDFE.pdf

Postscript: "It's all just Telecoms"

I received a comment soon after I posted this article, which I thought would provide some further insight to the WCIT process, so here is the comment and some further thoughts on the topic.

The comment was in the form of a report from a preparatory meeting for WCIT that evidently there is a mood within certain parts of the ITR drafting process to simply say: “The ITRs should apply to the Internet in full, because the Internet is nothing more than a telecom service and should be treated that way.”

In one sense its true that the Internet is nothing more than a telecommunications service, but in the same way that the post, radio, television, and of course the telephone are also all just telecommunications services. But the nature of the particular service has many consequences, and the attempt to lump telephony and the Internet into the same form of regulatory handling is at best a somewhat misguided effort.

I truly wonder if, more than a century ago, the counterparts of today’s government delegates, in a meeting of that august body, the Universal Postal Union, would’ve argued that a telephone conversation was just an exchange of letters without the artifice of paper, and that the telephone was indeed just a part of the postal service, because its just “a communications service.” Indeed I’m pretty sure their counterparts did precisely that and for the next 80 years or more in many countries the Postmaster General operated the telephone service, and operated the wireless spectrum administration and regulated radio and television broadcasts, as well as operating the national postal service, the telegraph service and telex services, all because “its all just communications.”

But, ultimately we changed all this. We created distinct entities to administer different communications media and services because its actually not all just communications and its not all just telecoms, and effective regulatory handling of these different communications mechanisms, using distinct forms of investment and finances, and at times entirely distinct regulatory frameworks and often distinct organisations and associated participatory arrangements allows us to realise the true potential of these various services and do so efficiently and effectively. This recognition of a need for distinction in the regulatory frameworks for various services avoids the unfortunate situation of the stultifying dead hand of history misapplying one form of regulation on an entirely distinct and very different medium.

I suspect the best thing the postal folk, in the form of the UPU, ever did was to tell the telephone folk “hail and farewell” and let them get on with their role using an organisation specifically designed to meet their collective needs in supporting telephony.

It may be well and truly time for the telephone folk, in the form of the ITU, to come to a similar arrangement in its dealings with the Internet!

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