IMS: A Critique Of The Grand Plan

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Here are ten reasons why the author thinks IMS is a bad idea.

As a freely accessible overlay to carrier-operated networks, the Internet serves us well. It's an innovation engine for technology, an ecommerce lifeline for businesses and an information treasure for all end users. The Internet's enormous value as a facilitator to innovation and economic growth is rooted in the fact that it was never designed to be controlled or monetized. It is a network that connects almost everyone and allows for unprecedented communication. The Internet has become an enormous ecosystem that has a proven track record of generating wealth for participants and value for end users.

IMS, the IP Multimedia Subsytem (see *BCR*, June 2005, pp. 18–23), threatens both end-user value and the ubiquity of the Internet. It is an attempt on the part of traditional network operators (the incumbent telco and wireless carriers), and their equipment suppliers, to create technology that will let network operators control and bill for Internet activity and otherwise insert themselves into existing Internet-based ecommerce value chains.

Using IMS, the carriers plan to track, charge for or block subscriber access to Internet-based services. They will be able to charge extra for preferred handling of multimedia traffic, and allow preferential treatment for some services and websites over others.

Besides granting network operators the ability to control and monitor Internet usage, IMS could have undesirable economic effects as well. In developing countries, where wireless Internet access is known to provide an economic, social and educational leg-up, operators could find that IMS cost and complexity reduce their ability to serve the public (see www.w2i.org/pages/wifi-conf0603/index.html).

In technologically advanced societies, where broadband Internet provides access to essential services for most businesses, IMS could become a drag on the economy, as operators add surcharges wherever they can and drive up the cost of goods and services obtained over the Internet.

Moreover, instead of making money for the network operators, IMS is fated to become another in a long string of disastrous telco grand plans—OSI, ISDN, IN, B-ISDN. All of them have failed because they were rooted in the mentality associated with telco-controlled, circuit switched business models (also see *BCR*, October 2004, pp. 57–61, March 2005, pp. 38–44 and June 2005, pp. 18–23).

Let me tell you why IMS is in trouble—but first, let's acknowledge three basic facts:

1. We all know that the carriers pushing for IMS are under siege. Voice services have been their mainstay, and voice prices continue to decline. In the data world, the wireline carriers have been little more than access and transport providers. They are desperately seeking survival, not just by creating IMS, but also by consolidating and by lobbying for protective regulation.

2. In the end, applications are what people are willing to pay for. Wireless, wireline and cable are just channels to access applications that end users find valuable. Enhanced flexibility, through multiple access technologies, extends existing application value and keeps end user costs low through competition.

3. The Internet is all about end user value, endpoint innovation and open access. These are the principles that have created the Internet experience we all value today.

Enduring standards have end user value as a common characteristic. Unfortunately, the fatal flaw in the IMS approach is to largely ignore the end user. Unsuccessful standards also have a common characteristic too: The group defining them thinks it can see the future and constructs the standard according to its vision. IMS is about carrier visions of a controlled future focused on billing and restricting user flexibility and innovation.

Here are 10 reasons why IMS will fail:

1. IMS Is Based On Shaky Premises:

The roots of IMS are in the mobile operator domain, where it was justified on the basis of

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improving the user's wireless experience of packet-based services (e.g., voice and video). Mobile users today can—if allowed by the mobile operator—use their packet-switched bearer service (without IMS) to surf the Internet and to make and receive SIP calls. Please notice this provides substantial end user value and works very well today. Ask any wireless Skype user.

Seven years ago, 3GPP felt the need to start down the IMS road because they figured the proper performance of real-time or multimedia traffic would require allocation of limited radio bandwidth and interface configurations to support radio. This is one reason why IMS places such emphasis on quality of service (QOS) and policy.

But this logic also hides a darker purpose. Besides improving the perceived quality of voice (or multimedia) packet flows that IMS decides to "assist"—that is, to control with QOS and policy—IMS could also limit the availability of bandwidth for "unassisted" (raw bandwidth) packet traffic, even when traffic loads are running at less than capacity.

In other words, in IMS, QOS and policy not only ensure a level of bandwidth, but they can also make sure you get no more than that limit. Besides limiting available bandwidth, QOS also adds considerable state-driven complexity to the network. In summary, QOS makes the packet-switched network act like a circuit-switched network.

This is the dark side of QOS: that it can be used to restrict access and limit functionality, unless users pay extra for "assisted" service—regardless of available (and advertised) bandwidth. With IMS, you will never know if you are getting the advertised broadband capacity you think you are paying for. The actual bit rate will be a function of what IMS thinks you are doing. It will provision a QOS-enabled packet bearer (*aka* a circuit) for you with a specific capacity and nothing more, which could be far less than your advertised broadband connection rate.

Besides the questionable need for QOS, IMS is also based on the assumption that wireless bandwidth will remain scarce for the foreseeable future. This is unlikely, given the constant speed increases promised by the latest wireless technology in both closed radio environments (e.g., GSM and CDMA) and open radio environments (802.11, 802.16 and 802.20). And why should this assumption regarding limited future bandwidth availability be applied to wireline and cable access networks?

If bandwidth capacity continues to grow, and if QOS is unnecessary, then why is it a good idea to deploy QOS and policy technology on a massive scale to mimic circuit-switched network behavior? There is little end-user value, and it can hardly be considered progress to build a complex circuit-emulation environment (called IMS) over a packet-based infrastructure!

2. IMS Will Be Too Complex, Difficult And Expensive To Implement:

After seven years, the growing IMS specifications are still being worked on in ITU and ETSI. As the standards evolve, what is emerging is an increasingly complex and expensive deployment. For example, IMS uses new technologies on a grand scale: the Session Initiation Protocol (SIP), policy, QOS and IPv6. In addition, IMS specifications call for the mobile operators to implement IETF protocols such as Common Open Policy Service (COPS), Diameter and RSVP (Reservation Protocol). Yet there are no new applications to justify the additional investment in these Internet technologies and protocols.

Network operators do not have to install all of IMS to extract some value from its concepts. This means suppliers will offer a proliferation of IMS derivatives, hybrid solutions and optional variations alongside the official specifications of IMS components.

Besides the growing number of IMS-like choices and incremental approaches, there are a number of interworking issues that will need to be resolved as carriers migrate from today's infrastructures to production IMS. These involve IPv4, IPv6, General Packet Radio Service (GPRS), Network Address Translations (NATs), firewalls, private address spaces, Domain Name Service (DNS), DHCP (Dynamic Host Configuration Protocol), and other systems, all of which will hinder migration.

The march toward IMS and circuit emulation can be seen as operators are already installing Back-To-Back User Agents (B2BUAs). These logical devices offer circuit-switched-like controls, by maintaining call state and participating in all call requests. (B2BUAs function as SIP logical entities that can receive and process INVITE messages as a SIP User Agent Server (UAS), and they also can act as SIP User Agent Clients (UACs), determining how requests should be answered and how to initiate outbound calls.)

Finally, IMS borrows the "database dip" model from traditional wireless and wireline telephony call control and billing. Unlike the PSTN, and depending on the activity, IMS wants to "dip" for every *packet*, not for every *call*. A single message in IMS could require more overhead packets to track, send and bill for it than are contained in the message itself. Needless to say, this is a costly and complex approach to packet-based billing.

The "all you can eat" pricing model encourages usage, yet IMS is designed for per-packet routing, tracking and database dips, all of which require user traffic to be routed back to the subscriber's home network. This is needlessly expensive (and complex), especially if there is no reason to trigger billing records. This is an example of how rapidly technology and business markets can change, in this case devaluing the IMS's initial per-packet billing objective.

The dark side of QOS is that it can be used to limit bandwidth and functionality

HTTP traffic is an enormous threat to IMS, as it does not require redirection from the signaling plane

3. Wireline Carriers Won't Like IMS:
Besides its technical complexity, IMS has potential "political" problems. Developed by and for the mobile wireless environment, IMS essentially makes the DSL and cable providers secondary players in a vertically integrated world dominated by the mobile operators and their suppliers. (This second-class citizen status is obvious, as IMS for TISPAN is being developed as an afterthought to the formal UMTS Release 7 specifications via change requests.)

While that's good news for traditional mobile operator suppliers, why would cable and DSL operators want to exchange their current platforms and practices for those dominated by other companies, particularly potential competitors? Instead, the cable and DSL providers seem more likely to prefer something more compatible with their own installed base and infrastructure, rather than something optimized for the mobile operators. That will certainly drive additional derivatives of IMS and affect interoperability—not to mention the frustrating wait for needed functionality via change requests to future IMS specification releases.

4. IMS Doesn't Really Support Infrastructure Convergence:
Even though many mobile operators are embracing the idea of IMS, there are still problems with the volume of control traffic and the inefficiency of transferring voice over IP (VOIP) over the radio interface. Left unresolved, these issues will extend the life of the operators' existing circuit switched (CS) voice infrastructures and further hamper progress toward convergence, i.e., a common packet-switched infrastructure for voice and data.

Moreover, the current IMS standards maintain clear circuit switched (CS) and packet switched (PS) domains. This sets IMS against two presumed carrier objectives: replacing their separate voice and data infrastructures with new, converged ones; and replacing shrinking voice revenues with new data revenues. In reality, carriers are looking at additional investment in packet technologies to support new IMS data services, with no opportunity to reduce voice or existing circuit-switched network costs.

Combining CS real-time services and IMS packet-based data services within a single converged infrastructure is a huge problem. Any solution is likely to require massive architecture changes (leading to an IMS Release 8 or Release 9 or even further out) and expensive modifications to deployed systems. Of course, the IMS label can readily be reused, if only as an attempt to fool us into thinking we are experiencing the migration to a planned future.

5. IMS Complexity Requires Built-in OAM:
Besides the design and build complexities, the combination of CS real-time services and IMS packet data services within a single infrastructure presents a formidable learning curve, additional cost and unknown complexity for operations and maintenance. OAM is an essential component for making IMS successful, but it has been treated, as it always is, as an afterthought by standards bodies. 3GPP currently has no plans to identify and add needed OAM features. This is up to each of the vendors.

While treating OAM as an afterthought has worked in the past, IMS's complexity demands that OAM be built in and not added on. It seems unlikely, however, that convergence and OAM issues will be addressed in any "first-generation" of IMS. These will need to be resolved in future versions. But as most IT professionals know, "phase 2" of most large projects rarely gets done (or even started). Why would IMS, if it ever gets off the ground in the first place, be any different?

6. IMS Won't Be Able To Control Existing Internet Usage:
The basic premise of IMS rests on understanding *what* the data traffic is and *controlling it based on that understanding*—but the very nature of Internet protocols makes this a potentially impossible task. HTTP traffic, for example, is an enormous threat to the IMS business model because HTTP doesn't require the end device to go back to a signaling plane for redirection.

Will IMS, which insists on signaling for any traffic changes so that user activity can be tracked and billed, simply disable HTTP? And how will IMS handle other common and valuable Internet capabilities that do not lend themselves to the IMS tracking and billing process, such as proxies, caches, tunnels, NATs and private address spaces?

7. IMS Doesn't Do IP properly:
Although IP is the "first name" of IMS, IP protocols that are being used are not handled properly, let alone to any end-user advantage. Consider a few particular instances:

- IMS specifies that all user data (including IP packet headers) be encapsulated in GPRS Tunneling Protocol (GPT) tunnels for transport within the carrier's IMS environment (e.g., among the gateway, signaling and access nodes). Tunneling will restrict the use of a number of valuable Internet network functions, including Web caching, multicast and, ironically, the QOS information carried in the IP headers that originated at the application.
- In fact, since the user data IP headers are *never* read or even used for routing in IMS, it really does not support native IP. This is generally true of Universal Mobile Telecommunications System (UMTS) and cdma2000's mobile IP. In contrast, wireless LANs (WLANs) have easily exploited the Internet's plug-and-play characteristics to become integrated into the Internet. The onerous effort to include WLAN in the UMTS architecture

has clearly shown there is no easy integration path for other access technologies and IMS.

- If IMS were to emulate IP multicast, a special bridge called a multicast gateway would be required. Applications would then have to terminate at that gateway, and each participating terminal would require an IP tunnel to the bridge.
- End-to-end session creation is not handled in IMS by the endpoints (as IP specifies), but by the control structure in the IMS domain. This violates the Internet's end-to-end and layering network principles, which place complexity, processing and innovation at the edge.
- A SIP user in IMS always goes to his home SIP server for services (e.g., the Serving Call Session Control Function, or S-CSCF, in his home network). Therefore, the home network always controls the user's access. This contrasts with the "Internet way," in which access registration (authentication and authorization) must be complete before the SIP user issues the INVITE to anyone who offers services—there is no need to go to the home network, or call session controller, for service access.
- Virtually all licensed radio access networks (RANs) today are still based on an ATM/AAL2 switching networks, not IP.

8. IMS Doesn't Use SIP Properly:

IMS proponents claim that IMS is based on SIP, but they are using it only to apply the SS7 (circuit-switched) call model to data "calls." In reality, SIP is far more powerful and offers innovators the true key to end user value.

Fortunately, too, SIP doesn't need IMS to deliver its benefits. A variety of sessions are possible using SIP, and they can operate concurrently among multiple users and devices. For example:

- Separate services within a single session; these may be synchronized (e.g. voice and video for video telephony) or not (e.g. video and chat).
- Multiple simultaneous single sessions of unrelated services (e.g., a voice call in parallel with a presence session).
- Easy switching between point-to-point and point-to-multipoint person-to-person sessions, without the burden of pre-programmed conference services on the PSTN.
- Ease of simultaneously "ringing" a called user's different terminals.

These SIP service combinations help guarantee session completion, which does not depend on the called party having a compatible service or terminal. For instance, a session can be accepted without the video component, or the video component can be routed to another application.

9. IMS Users Will Not Feel Secure:

Security has huge end-user value—but the security mechanisms that most Internet users rely upon today—e.g., VPNs, encryption and private addresses—will not allow IMS to inspect packets. This would thwart the IMS infrastructure's goal of control and billing for different types and handling of packets.

IMS proponents might argue that their "walled garden" approaches eliminate the need for VPNs, encryption and private addresses, but will users agree? Or will they bypass IMS to obtain the type of Internet experience they value today, with security mechanisms they have learned to trust?

10. Propping Up The Failing Telco Model Is Not The Way To Go:

This discussion isn't about ideals or good vs. bad—at least, it shouldn't be. It's simply economics. Everyone knows that someone must pay for the care, feeding and expansion of the underlying physical communications infrastructure on which the Internet lives. It can't be free. The relationship between the Internet and the underlying networks can certainly be viewed as symbiotic, but, unfortunately for the operators, the applications are where the value is.

How to pay for the infrastructure underneath the Internet is the key question. Can it be done in a neutral fashion, treating all broadband transmission, content and website access equally and making sure that non-interference with IP traffic is the rule? Can it be done in a way that does not also eliminate or repress innovation, reduce end-user value or choice, affect reliability, restrict worldwide information flow, or place any barriers before expanding ecommerce?

It's a tall order—but surely the financing of another costly failure, labeled IMS, is not the way to go! I challenge the industry to think outside the circuit-switched box and find a way to pay for the needed infrastructure and yet give consumers the choice to use whatever they want in order to access services provided by any and all Internet participants.

To those who defend the economic or political necessity of IMS, I offer the following comments:

- Allowing monopoly-based, government-protected service providers (SPs) to enter the ecommerce market, beyond the hauling of bits, and to compete with other *non-monopoly*-based entities does not create a level playing field. Governments should not be in the business of subsidizing telco competition in otherwise free markets.
- Allowing monopoly-based SPs to compete in otherwise free markets can't possibly lower the cost of goods and services, increase the variety of information, products and services, or encourage the market entry of new participants. This a huge barrier to growth in employment, wealth and tax revenues, heretofore generated by everyone in the ecommerce world.
- Just because a service provider has a license for spectrum or owns the wire to a consumer doesn't mean that SP should be allowed to force itself into the transactions that a consumer makes with other service providers. Put another way: Who is really

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the parasite in the relationship between IMS and the ecommerce world?

- "Billing purposes" don't justify the invasion of privacy by service providers to inspect packet contents, record and track detailed usage information. Where are our privacy protections?
- Finally, the health of the existing telcos and the full employment of regulators are not sufficient reason to support an IMS devoid of end-user value. In fact, government regulators should think twice before killing the Internet goose that laid the golden egg: Today's healthy Internet ecosystem is responsible for keeping many of us employed, generating both wealth and tax revenues.

Conclusion

Times change, and those who don't adapt will die. I know it's brutal, but that is how free markets work—survival of the fittest. Do government regulators operate from this standpoint, or are they more interested in devising a future that protects the fortunes of big, slow IMS operators?

If the regulators allow the IMS grand plan to succeed, it will drive us toward a monopoly-based, worldwide environment of telephony/data systems with very little differentiation, and will glacially slow innovation. Of course, this would suit the incumbents just fine, as they would be able to maintain their legacy monopoly business model while evolving to become ecommerce service providers under the umbrella of government protection.

But the incumbents and the regulators are missing the point. They think they can mine the fool's gold of Internet control, yet the Internet wasn't designed for anyone to control or to own. The Internet model is about being part of an ever-expanding ecosystem that generates enormous wealth. It is not about *being* the ecosystem.

Those who "get" the Internet have learned to use it as an enabling tool. Those who are developing a strategy of tolled data circuits on the information highway probably don't "get" the Internet. They selectively ignore the massive ecosystem of Internet-spawned innovation and technology that dwarfs the shrinking world of telephony (see *BCR* March 2005, pp. 38–44).

In conclusion, IMS is a complex and hopelessly misguided circuit emulation effort. Considering its projected cost, complexity and the fact that the ITU bureaucrats are driving the process, it's no wonder the carriers and their suppliers are consolidating, even as they waste time and money on the IMS effort (see Septemer 2005, pp. 57–61.)

IMS is nothing more than a veiled attempt to prop up an aging, monopolistic, circuit-oriented business model. You can't expect free markets to tolerate it, especially if it suppresses ecommerce and taxes the freedoms granted by the Internet as we know it□