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Carriers prepare for life in a SIP-based world

By Matt Kapko

Abstract: Mobile networks are evolving on almost every level – devices, bandwidth, services and underlying technology. As service providers leverage the mobile broadband opportunity, the strengths and weaknesses of their legacy network infrastructure are coming under the spotlight. Depending on each

carrier's upgrade path and rate of investment, there are varying degrees of efficiencies and innovations that can be realized when deploying new technology. Session Initiation Protocol (SIP) is one of those technologies that can positively impact both costs of operations as well as the service portfolio.

Mobility is evolving on almost every level. As service providers leverage the mobile broadband opportunity, the strengths and weaknesses of their traditional network infrastructure are coming under the spotlight. Depending on each carrier's upgrade path and rate of investment, there are varying degrees of efficiencies and innovations that can be realized when deploying new technology.

Session Initiation Protocol, or SIP, sits squarely in the middle of that discussion, primarily when mobile operators make the leap to an all-IP-based infrastructure. Within that framework, carriers are embracing the IP Multimedia Subsystem, or IMS, specification to foster innovation and enable the quick development, deployment and delivery of new applications in a standardized environment.

The SIP protocol, the key technology standard behind IMS, has been identified by the 3rd Generation Partnership Project (3GPP) as the standard that underlies many of the important interfaces between elements and features in an IMS-based network. SIP is not only flexible by nature, but it is also extensible in that it can set up sessions over the network for various types of media, including voice, video, application sharing and chat in a presence-aware environment.

From a technological perspective, SIP takes many well-established Internet standards like HTTP into account, which

makes Web-like features and applications all the more easy to build and deploy in a familiar manner. SIP may not have the same instant pizzazz as some of the more commonly thrown around technology standards, but it more than makes up for that in its feature set and overarching ability to fuse fixed and mobile networks into a more cohesive unit.

Dan Warren, director of technology at the GSMA, has a long history with SIP. He was involved in the buildup and standardization of SIP with 3GPP, an organization that aims to unite telecommunications standards bodies.

Simply put, "it made better sense for everybody to use the same protocol," Warren told RCR Wireless News. With all-IP-based networks in the works, 3GPP has been a strong proponent of SIP because it enables a more pragmatic approach, he added.

The original motivation for SIP was the implementation of soft switching. The eventual evolution of the standard enabled fixed and mobile operators to deploy services beyond voice, Warren said. Operators increasingly were convinced to make this shift as IMS gained a foothold across the telecom community.

SIP lays out a simple framework for session initiation and protection, which falls directly in line with the key attributes that make phone calls work today, but without the expensive equipment, maintenance and rigid architecture that are

part and parcel of most networks today.

"That struck me as a mechanism that lent itself very strongly to the overall direction telecom needed to go in," Warren said. "With minimum variation, everyone uses the same set of protocols."

It's a fundamental requirement that every party adopt a common-sense approach that can be standardized across the board, he added. "SIP gives you the baseline functionality."

When SIP was originally defined as a signaling protocol in 2000 it was part of the beginning of 3GPP. "IMS wasn't even understood yet," said Patrick McLampy, CTO and co-founder of Acme Packet. Once SIP was selected as the standard protocol within the IMS framework, "it was a done deal" that led the way to Acme Packet's founding that same year, he added.

"We never have to convince people that SIP is the right protocol. ... That decision's long been made," he told RCR Wireless News. "We're here today as a testimony to the success of the SIP protocol." At one time there were as many as 40 venture-capital-backed startups in the SIP space, but many have since shuttered operations.

McLampy describes SIP as "HTTP the next version" – a rapidly evolving protocol that establishes and tears down sessions from the edge of the network. "There have been so many changes to this standard. They probably number in the thousands. There's probably 40 or 50 (changes) a year," he said.

SIP is being installed outside of the mobile industry first because fixed operators believe in the convergence of wireline and wireless networks over the long haul, McLampy continued. "The reason why the fixed guys all ran to SIP is because the mobile guys chose it."

While SIP has grown substantially as a standard during the past decade, it's also gotten more complicated because of all the vested interests and strong feelings that companies and technologists hold around architecture. "There's a lot of work that's sort of wasted in a sense," McLampy said.

"3GPP gave us the edge notion and that's pretty powerful," he said, adding that the edge of the network brings new power and meaning to the network overall. Once 3GPP looked at media processing functions under the umbrella of a



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border gateway function, everything that Acme Packet does became defined as the edge of the network.

However, one area that 3GPP has not addressed with SIP is security. “They forgot to identify any security functions or what comprises the right amount of security at the edge,” McLampy said. “The essence of our value is that we don’t only embody all of those edge functions,” but Acme Packet has also defined a whole architecture for security standards and protocols.

Motivations for SIP

“At the end of the day, there are two reasons why businesses do anything. The first is to save money, the other is to make money,” Seamus Hourihan, VP of marketing and product management at Acme Packet, told RCR Wireless News.

“The whole movement to IMS for these providers is because” they are attracted to the “goal of one single infrastructure that supports not only your mobile environment, but your fixed environment as well.”

The mobile service provider networks that are deploying SIP in the core are usually driven by the cost-saving opportunity.

“In some of these networks, we’re seeing savings of \$1 million plus a month,” Hourihan said.

Acme Packet makes equipment, generally the equivalent of a router, that delivers applications that ensure interoperability, security and reliability, he said. “We have a tremendous experience in the fixed-line environment” and LTE has many of the same issues. Acme Packet’s role is to manage the SIP applications that run on top of the network while maintaining security, regulatory compliance, quality of service controls in a contentious IP network and interoperability with other carriers.

The all-IP equation equals cost savings

IMS is seen as future for services, but SIP can be used now for cost savings. Those cost savings are found in the core and interconnect parts of mobile networks.

“Obviously the world is going to IP, but it’s not something that happens overnight, whether you’re a fixed operator or a wireless operator,” Diane Myers, directing analyst on VoIP and IMS at Infonetics Research, told RCR Wireless News.

There is a big thrust to IP and many industry insiders see it happening around Long Term Evolution (LTE) technology, but Myers sees it taking place even before that transition takes place on some levels. “Some of the adoption of SIP is, quite frankly, to lower costs,” she said.

Indeed, the first driver of SIP is lowering costs, which happens primarily around service provider interconnects.

“Hands down what it really comes down to is you have two operators that want to exchange traffic,” Myers said. “Traditionally these have been done with time-division multiplexing (TDM) interconnections,” but “when you do that you have to pay a lot of access fees.” Every country has its own regulatory framework that sets up and defines these charges, but SIP does away with much of that by taking these functions out of the network core and deploying SIP on the edge of the network.

Installing SIP gives operators an opportunity to reduce TDM interconnect fees that are set by governments and third parties in some cases, Myers added. Using SIP to interconnect mobile service controllers saves money, reduces routing complexity and give service providers a faster time to market.

Myers shares one example of a U.S. wireless carrier that quickly started saving \$20 million a month once it deployed SIP on its network. In the process of that carrier’s transition to SIP, it was able to eliminate thousands of interconnects down to 10 and let SIP-based infrastructure manage network traffic.

“That’s a significant cost savings,” Myers said.

is the answer because we have this tremendous lead,” particularly with all the momentum in LTE’s favor.

Operators are stuck back in the TDM world while the transition to an all-IP world promises a framework that will lower costs and make for a more flexible transport of sessions flow on network traffic.

Anything that isn’t designed for a global network will simply come up short, Troshynski told RCR Wireless News. Legacy technologies and applications are not ideal for an IP framework.

“Once you build out the SIP network you no longer need the legacy protocols,” he added. “SIP is an intelligent path forward for every IP operator.”

Take cable operators, for example. “They are a perfect example of an operator with an IP infrastructure” that went down a different technology path to deliver voice services, but when it comes down to interconnecting they resoundingly choose SIP. It simply makes sense to negotiate end to end with the end device, he added.

SIP doesn’t necessarily free up bandwidth, but rather it gives operators a more effective method to manage it.

By their very nature, core access networks need to be told what sessions get flagged as a priority. SIP can round out that loop, eliminating the need for a soft switch and 100 different modems that make for a tricky management scenario.

“When you have SIP, it’s a lot cleaner approach to the network framework,” Troshynski said.

“They’re enjoying a much leaner operation,” MeLampy added. The biggest savings comes from moving from TDM thinking to all-IP thinking because it’s not just about going to SIP, but also about how calls are routed and more.

“We believe when the LTE networks are out there, they’re just another IP access network,” he said. “It makes no difference what your IP access network is.”

SIP carries a special importance with LTE end points because operators can no longer run a GSM control channel in LTE and SIP provides them with a standard way to setup how a phone is going to initiate a service or make a call. In the early stages, many CDMA operators already have SIP inside their networks and part of their transcoder-free operations have

been converted to SIP as well. GSM operators, on the other hand, are moving slower because the cost of upgrading is high, but they are committed eventually nonetheless to make the switch.

“It all has to do with suppliers and how much they charge for updates,” MeLampy explained.

On a comparative size scale, SIP equipment handily beats out circuit switches. A typical circuit switch that handles about 75,000 phone calls at a time will easily fill 30 to 40 floor-to-ceiling racks. A DNS server and Acme Packet solution can replace all of that, MeLampy said. Better yet, it all fits into the space of less than half of a rack and uses two light bulbs worth of power.

“It’s just unbelievably different. ... The efficiencies are mind blowing,” he added.

Security and reliability in a SIP based world

IP networks open the door to amazing new services, but they also expose service providers to new threats. With voice and messaging migrating to SIP, service providers need to protect their service and application infrastructure against malicious attacks designed to cripple a network element by overloading it with service requests.

“In addition to purposeful attacks, non-malicious overloads (such as the flood of calls during “American Idol” voting) can also cause increases in call-signaling rates that exceed what the service provider infrastructure can support, resulting in network conditions that are similar in effect to denial-of-service (DoS) attacks,” Mitchell said.

Other threats include malware, eavesdropping, service fraud and identity theft. While the private, licensed spectrum access network for mobile service providers may give a sense of security, the IP services infrastructure can be vulnerable; using the Internet for fixed mobile convergence further heightens those risks. “Regardless of the type of attack, a successful attack can result in a variety of losses including service level agreement (SLA) promises, customers, a reputation and revenue. The solution to this daunting challenge includes network design that incorporate elements that can provide DoS attack prevention, signaling rate limiting, policing, and encryption,” he added.

“The reality is that we live in a multi-protocol signaling world. ... While all these different options for SIP provide tremendous choice and flexibility, they also guarantee incompatibility and a lack of interoperability between networks,” he continued.

“LTE dramatically increases access bandwidth for subscribers. However, seemingly excessive speeds will be consumed, and an increase in bandwidth at one network point moves the bandwidth bottleneck to another part of the network. Similarly, the servers delivering interactive communication services also have finite capacities for call handling – fat pipes do not alleviate signaling constraints. If a link or a server is at capacity, and more traffic – just one more call – is placed on the link, the quality of all active calls will deteriorate, not just that last call. The network must take into account both the bandwidth and signaling constraints for the admission of SIP services and be able to respond to quality degradations to assure service level agreements and high quality of experience.”

Points of disruption

Virtually every up-and-coming technology hinges its success on its ability to disrupt some incumbency and the status quo. Where SIP stands to disrupt the telecommunications industry most is on the signaling protocols.

SS7 or Signaling System No. 7 is a set of telecommunications signaling protocols that are used to establish and disconnect most of the world’s phone calls.

“The shift toward an all-IP network ... certainly threatens the SS7 network,” Troshynski said. With a protocol that can communicate globally now, there is no longer a need for point-to-point access, he added.

“I think it’s probably SS7 infrastructure that’s most threatened,” and gateway vendors are seeing their business disrupted as well, Troshynski said.

“It’s a major simplification that takes place, but it’s also an enhancement,” he said. “Once you take that TDM gateway out of the flow, you open up the opportunity for media sessions.”

As such, TDM to IP infrastructure will largely go away, Troshynski said. If things start IP and end IP, there’s no need to have TDM in the mix.

“The market that SIP is addressing is quite substantial. It is disruptive to all the major telecom vendors,” he said. “All those equipment vendors are IMS and SIP proponents, but it’s also part of a struggle they’re going to have with the billions in revenue they’re trying to protect.”

While this transition opens up new opportunities for vendors, there’s also “a lot of tension there in how the big players want to manage that,” Troshynski added.

Voice is only the beginning

Once an operator has SIP infrastructure in place, it can enable so many tools beyond voice. “We’re not there yet, but that’s where it’s going,” noted Hourihan.

SIP enables cost savings and new services. “When I think about SIP in the mobile network, I think about it in those two buckets,” Myers said.

“There’s a whole suite of different services. Some are probably going to be a lot more widespread and others might be niche,” she said. VoIP or an alternative standard for the deployment of voice over LTE will be incredibly important if carriers want to be in the voice business in this new world. “Things will continue to migrate there and that’s a great opportunity for SIP,” she added.

Some operators in Europe and Asia are already offering Rich Communication Suite (RCS) services over their SIP-based IMS networks. The core tenant of RCS is an address book that is enriched with multimedia, location and presence awareness. It enables a growing set of features that make perfect sense for the mobile environment and frankly seem like they should have been there all along. The GSMA RCS initiative is an active group of operators and key vendors aiming to bring these services to market.

While RCS may give operators a new opportunity to bring some of these features and services in-house, the pace of change that is coming out of the mobile development industry is a challenge that mobile operators will find difficult to compete directly against.

Plenty of third-party groups are building and launching competing services and applications, but they’re not all being delivered in SIP per se. While some carriers might not think it worthwhile to compete with third-party apps, some carriers may focus on the services front as a window to differentiate themselves from the pack.

“The benefit is once you do it in IP or SIP, the possibilities can potentially be endless,” Myers said. But when you open up the process to third-party developers, “you just never know when a developer’s going to come up with something.”

The RCS project is meant to complement the IMS specifications within 3GPP, Warren said. “Initially the investment in IMS for just the messaging service ... was too onerous. The cost was too high initially.”

Operators have the ability to add on tailored services and individuality through RCS. It follows a larger trend in the industry to move away from hardware and software implementation as well.

“There’s a stark comparison taking place between the speed at which operators move and the speed at which app developers move,” Warren said.

For starters, carriers have much more to lose when they offer something that doesn’t work out. “IMS gives them opportunity to deploy new fully interoperable services with that same level of control and flexibility,” he said.

That said, operators don’t have the luxury of developing thousands of apps to find out what the next killer app might be. Instead, they can implement familiar services, albeit refined, in a straightforward manner.

Once operators start to implement and offer a wider range of services, they will cross the boundaries that online companies are limited to today, Warren continued. More importantly, carriers have an opportunity with SIP to gain greater mind share if they can convince their customers to embrace features in the RCS and move away from the likes of Skype Ltd. and Google Inc. for IM and voice calls.

It’s precisely why the availability of an open standard is so important. “It requires operators to act as a community,” Warren said.

Gaining new revenue streams from RCS is unlikely because of the tough sell carriers would have to close in order to convince customers that they should pay for a service that they already use for free with their existing data plans. “You can’t offer a service and expect them to pay a specific premium on top,” Warren said. Carriers are likely to package these services into some newer data plans.

The presence awareness has the potential to especially change the way people interact with each other, he said. “The availability of presence information makes people interact more with each other rather than less.”

Similar to the fixed-line world, SIP started in the core and is now moving outward, said Mitchell at Acme Packet. The new services being defined under the RCS umbrella are on the two-to five-year roadmaps of most service providers.

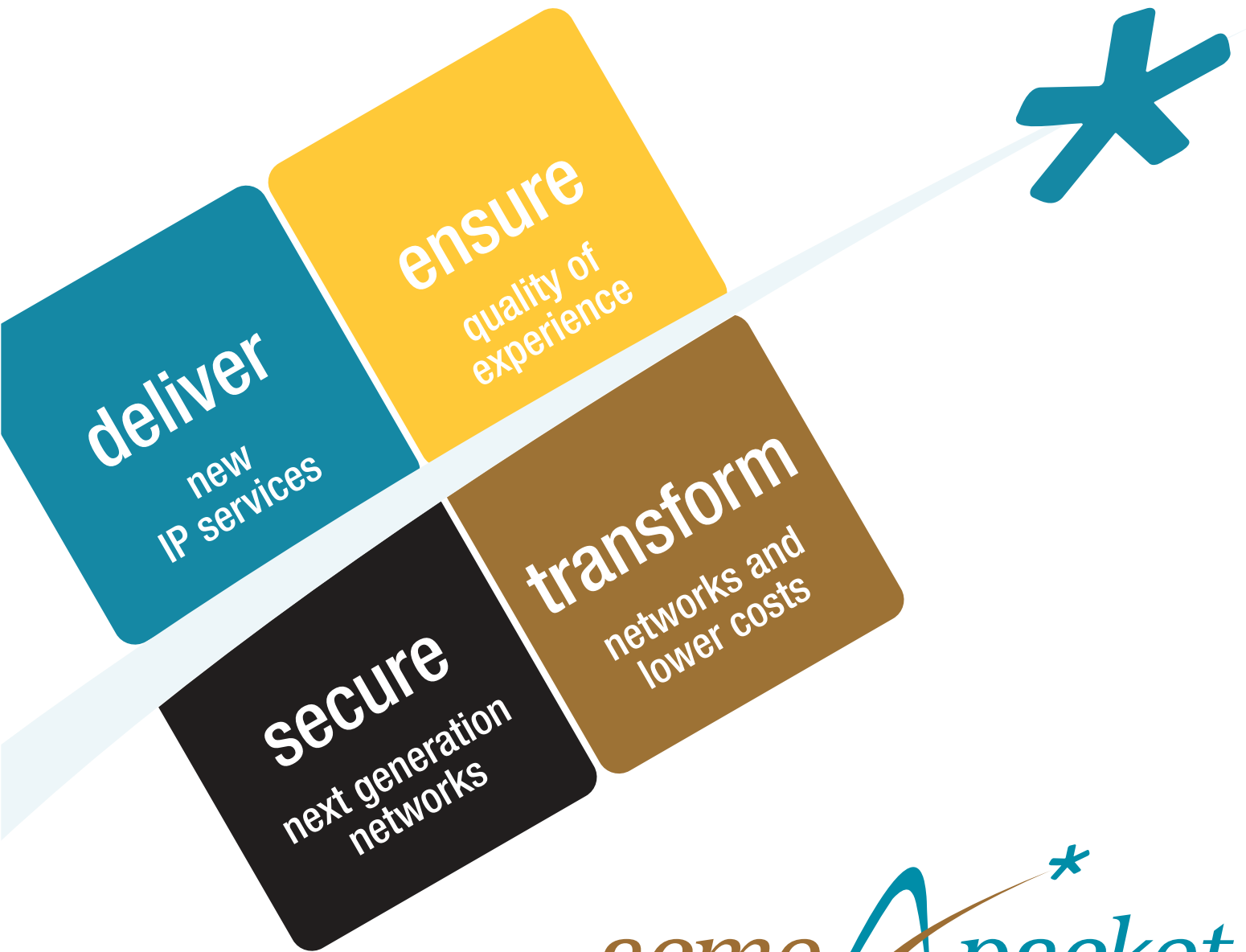
“It’s not a walled garden,” Mitchell said. The RCS experience can work seamlessly across any carrier.

“SIP services can generate new revenues, and SIP architectures, including IMS, can dramatically lower costs and improve business models and competitive viability,” Mitchell added.

SIP is so much more than a narrow protocol. It doesn’t necessary have to be the protocol that establishes voice; SIP can also establish sessions for video, presence information and more.

To be successful in this endeavor, service providers will require control mechanisms, “essentially a signaling network for the Internet era,” Mitchell said. “We believe in the whole power of SIP” to drive down costs and present new revenue streams.

“This transition is really picking up pace. ... It’s really picking up speed in the fixed world and now the mobile world is walking into this transition that is taking place,” he said. “It’s a 10-year transition at least, but it’s getting underway.”



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