

SIP and Multimedia

Multi-Service Networks

ABSTRACT. Ericsson believes that SIP is the key enabler for a wide range of new multimedia service offerings in the next-generation public network. This paper describes the components of those offerings, the suitability and necessity of SIP, and Ericsson's initiatives – including ENGINE Multimedia and ESIPP – in demonstrating the value of SIP-based networks for operators and users.

The rise of SIP-enabled networks, initially as an alternative to existing Voice over IP (VoIP) systems, has been dramatic. At the same time, the applicability of SIP to a wide range of communication needs has been demonstrated by a number of universities, operators and vendors, including Ericsson. This paper explains Ericsson's strong support for SIP in the context of multimedia networks. For the sake of clarity, to have a common understanding of the terminology before proceeding, see last page.

ERICSSON'S HISTORY WITH SIP

Ericsson has had a strong presence in the IETF working groups that have given rise to SIP since 1998. Important milestones in our SIP R&D efforts include:

- Participation in SIP interoperability tests since the days when they were called "bake-offs". Ericsson had two teams at the first bake-off and, by the time of the fourth bake-off, had a third.
- Hosting of the third SIP bake-off in Richardson, Texas. Ericsson was the first vendor sponsor of a bake-off and significantly raised the standard for subsequent events in terms of network support, facilities, and corporate visibility.
- Active participation in the SIP (protocol-specific issues), SIPPING (applications that use SIP), and SIMPLE (support for instant messaging and presence with SIP) working groups. Ericsson employees have co-authored or directly authored several active Internet-drafts in these and other working groups.
- Development of a Media Gateway Controller, part of Ericsson's Open Network Gateway solution.
- Active involvement in the Third Generation Partnership Project's (3GPP) IP Multimedia Subsystem (IMS). The IMS is a SIP-based network for providing multimedia capabilities to 3G terminals, and is a major part of 3GPP Release 5, due at the end of this year. Ericsson will support the IMS specifications in its Core Networks 4.0 system.

Ericsson has played an active role in SIP development in various parts of the world, including Sweden, Finland, Canada, Denmark and the USA. The results of this work have been brought into Ericsson's multimedia solutions in many areas.

Themes

Ericsson's SIP message can be expressed in terms of several important themes, which are described below.

MULTIMEDIA

Ericsson believes that the communication networks of the future will take advantage of the strengths of packet-switched technology, especially the IP-based protocols developed in the IETF. Of the many benefits of migrating from circuit-switched to packet-switched networks, one of the most exciting is the potential for offering multiple, simultaneous media streams to the user.

Although multimedia services have been available in the past using existing technology, they have always proven difficult to deploy, costly and inefficient in their use of network resources. Ericsson believes that state-of-the-art IP-based multimedia technology stands poised to unleash a whole new wave of services, including, but not limited to:

- Voice
- Video
- Presence and Instant Messaging
- Gaming
- Multiparty conferencing with multiple media types
- Interactive TV
- Video on demand
- Text chat

Ericsson has solutions under development for all of these categories of services, and the IETF Multimedia data and control architecture is at the heart of it all.

MOBILITY

Like never before, SIP allows the user – not just the terminal – to have true mobility. Starting from a simple Uniform Resource Locator, such as `lars.magnus@ericsson.se`, SIP networks are able to route session requests to the many places where users have indicated they can be reached. This routing can be done in either serial or parallel fashion, and provides multiple points along that routing path where specialized application logic may reside. As a result, a user can decide (on a dynamic basis, using standard SIP mechanisms) exactly when and where they are available, and the capabilities that they wish to use (such as a video feed or a higher-quality audio feed).

True universal addressing is now possible. A single addressing space can span mobile, fixed, home, corporate, narrowband and broadband networks for the purpose of finding a user and initiating a conversational session with them. This has unprecedented power to change the way we communicate.

Ericsson, as a leading provider of mobile communi-

cations systems, has seen the power that SIP holds for true user mobility, and has engineered both its third generation mobile systems as well as its broadband multi-service fixed network offerings to take maximum advantage of it.

OPEN STANDARDS

One of the chief strengths of SIP is its ability to interact with other communications protocols, and to tie together multiple features into more advanced services. An excellent example of this is the simplicity of a “click to talk” service using SIP.

SIP's heritage of text-based, header-and-body protocols such as HTTP, SMTP, and RTSP is a key to its rapid adoption. Many tools exist today that can be used by application developers to create SIP-enabled or SIP-based services, and many more are on the way.

SIP was designed from the outset to be usable in many contexts, with different transport protocols (UDP, TCP and now SCTP), establishing sessions for a variety of content types (using SDP as a generic mechanism for describing them). It works across a wide array of platforms (ranging from hardware phones to desktop soft clients to data center-class and carrier-grade servers), and for many different uses.

As SIP evolves, it spawns further work in the area of services. Initiatives within the Java Community Process, Parlay, the Softswitch Consortium and 3GPP, to name a few, are defining new architectures and developing APIs to allow rapid deployment of SIP-based services to end users with a mix of customizable features. Ericsson is involved in all of these efforts and is helping to move them forward quickly.

FLEXIBLE, COMPONENT-DRIVEN ARCHITECTURES

Ericsson strongly believes in the value of designing architectures that are flexible and scalable, and which can be realized through the re-use of best-of-breed components. SIP facilitates such a network design through the deployment of its various behavioral elements:

USER AGENTS

A User Agent is the signaling endpoint in a SIP network. The fundamental behaviors fulfilled by a User Agent are applicable to a wide range of applications, including but not limited to:

- Hardware- or software-based phone
- IVR application
- Text-to-Speech server
- Voice (or other media) mailbox
- Media Gateway Controller
(for PSTN gateway functionality)

By leveraging the capabilities of SIP User Agent functionality, application developers are able to create a wide range of useful multimedia communication services at low cost and with high added value.

REDIRECT AND PROXY SERVERS

A SIP server has a powerful ability to route or redirect requests according to specialized application logic. This affords the operator a wide range of possible services that enable seamless, always-on, value-added communication for the end user, regardless of their means of network attachment. Examples include:

- Corporate location server, allowing users to be reachable wherever they are registered.
- Spam filtering service, implemented through a proxy, that filters all incoming call requests and blocks those that have been defined as undesirable.
- Universal personal address (such as lars.ericsson@yahoo.com) that resolves to one or more registered locations, either through redirection or proxying.
- Call center applications, where a single address (such as customerservice@company.com) is resolved to one of thousands of operators based on queue size, time of day, type of service request, etc.

Coupled with the fact that a virtually limitless set of media types can be described, the opportunities for rich communication on flexible terms are myriad.

REGISTRARS

The functionality of a SIP Registrar allows dynamic updates of user status from any terminal in the network. When coupled with either redirect server or proxy server functionality, this is a key feature that enables flexible, customized user-profile management according to the user's behaviors and minute-by-minute decisions.

PERSONALIZATION OF USER EXPERIENCE

The use of SIP as the signaling protocol for multimedia systems offers several distinct advantages:

- Clear separation of end user and terminal, which leads to strong support for end-user mobility
- Empowering (but not requiring) the terminal to control session establishment
- Integration with other communication services (such as SMTP and HTTP)
- Re-use of IP-based networking infrastructure

This means many communications services that have been provided in the past can now be offered with a new set of behaviors in addition to new media types.

When considering a multimedia-enabled network, it is natural to focus on the "multimedia"

aspect of the system; however, multimedia services are first and foremost an issue of terminal capabilities. For example, videoconferencing between two parties is fundamentally a SIP session with a video codec that is supported by both endpoints. So it makes sense, when describing the network components of a multimedia system, to consider the "behaviors" aspect of the system, and not just the "multimedia" aspect.

The fact that these behaviors are similar in some respects to traditional telephony services does not mean that multimedia-enabled systems are simply offering a replacement for traditional voice. In fact, these behaviors will only be similar and never identical, because they leverage capabilities that do not exist in the telephony network. Traditional telephony systems identified basic human communication needs and attempted to fulfill them within the capabilities available at the time. With the advent of new capabilities, fulfilling the same basic communications needs in a multimedia context implies a certain outward similarity to what is available in the PSTN, but also many fundamental differences.

In this light, we can see the benefit in providing a personalized means for handling multimedia session establishment from within the network. The basic intent is that:

- The network generally should support (and where possible augment) what the terminal is attempting to do. Most multimedia services will be controllable through the terminal (in the case of a SIP-capable terminal) and dependent on its capabilities.
- The network offers a centralization of features and capabilities that an end user wants regardless of the capabilities supported by each or any terminal. A good example would be a speed-dial list: to have a consistent speed-dial list regardless of the terminal in use, it makes sense to provide a centralized means of storage and retrieval. Therefore, the network plays a valuable role in providing end users with an omnipresent feature set.
- By having a centralized location for delivering value-added functionality, operators can offer both simple and sophisticated packages of services, appealing to a range of customers (including avid technologists as well as people who never bother to learn how to program their VCR). By making the network as flexible as possible, Ericsson enables operators to tailor their own service offerings to match the needs of their customers.
- The network is intended to be omnipresent, meaning it is available even when the terminal is not. This means that, as far as possible, a multimedia system should be able to provide an in-built means of delivering the services and features that end users would expect to have on their terminal. In this way, the system sometimes acts as a stand-in for an absent or unavailable end user.

The Ericsson Solution: ENGINE Multimedia

As mentioned, Ericsson believes that SIP is the superior protocol for multimedia communication. At the moment Ericsson is developing ENGINE Multimedia, a SIP-based, complete carrier-class network solution for the provisioning of multimedia services to fixed broadband and/or narrowband subscribers. Compared to the solutions for multimedia services today, ENGINE Multimedia will enable the provisioning of multimedia services with security and Quality of Service, as well as flexible billing possibilities. ENGINE Multimedia builds on the same architecture as 3GPP, the standard for third-generation mobile networks, using SIP. This means that the same platform can be used for multimedia services to both fixed and mobile subscribers, and that the service transparency between fixed and mobile networks will be complete.

SIP will enhance the end user's experience of multimedia services by enabling attractive combinations of them. By combining, for example, video on demand with real-time audio and video, and presence and messaging services, an attractive interactive television solution can be achieved. ENGINE Multimedia will include a number of key multimedia services, such as on-line gaming, video-conferencing, interactive TV, and presence and messaging services. However, most important for the operators' ability to differentiate their offerings in the market place, is that it will include an open service platform with open APIs and SIP servlets for unlimited service creation and integration of any in-house or third-party applications.

ESIPP

Ericsson is a leader in developing and integrating solutions for the new world of multimedia communications. One of Ericsson's many ongoing activities in this area is ESIPP (Ericsson SIP prototype). The purpose of ESIPP is the establishment of a SIP-prototype laboratory where Ericsson can show and explore SIP functionality and applications together with its customers. As of today, the following features are available in the ESIPP lab. These can be used in different combinations to provide the potential for a wide range of more advanced services. These features will continue to expand depending on the trends in the multimedia market, and include, although are not limited to:

- Basic Audio and Video Call
- Personal Mobility, as referred to in RFC2543 (personal mobility as the ability of the end-user to originate and receive calls and access-subscribed telecommunica-

tions services on any terminal, in any location, and the ability of the network to identify end users as they move)

- Non Call-related Presence (indirectly defined in RFC2778 as subscription and notification of changes in the communications state of a user)
- Parlay based Service Creation Environment (SCE)
- Video Wake-up Call. This service provides a wake-up call including a video message (such as weather or traffic information) to the end user. This service is developed using the Parlay SCE
- Video on Demand (iTV)
- Third-party call-control
- Conferencing
- Application-layer security solution based on a SIP Application Layer Gateway (SIP ALG)
- ENUM-based routing
- SIP-based P-IVR
- Registrand authentication

TERMINOLOGY

This paper will use the following definitions.

MULTIMEDIA: A combination of two or more media elements — text, speech, audio, still images, slide shows, animations, videos and others — related to each other and synchronized in time and/or context.

USER: The entity on whose behalf terminals operate, most often a person. There can be many terminals associated with a single user, and many users may operate a single terminal (though not concurrently). In the context of this paper, a user is identified by either a sip: or tel: URI.

SESSION: An association between two or more parties for the exchange of real-time multimedia information. A session is created using SIP. A session can be thought of as somewhat analogous to a telephone call, but with far richer capabilities and the ability to support a wide variety of exchanged media types.

SUBSCRIBER: The responsibility for payment of charges incurred by one or more users may be borne by another entity designated as a subscriber.

OPERATOR: In various contexts, either a public telephony carrier, Internet service provider, or other provider of communications services to the general public. Most of the content of this paper has applicability to enterprises as well, but they are not in focus here.

TERMINAL: A hardware device and/or software application that is capable of sending and receiving media on behalf of a user.

Ericsson is shaping the future of Mobile and Broadband Internet communications through its continuous technology leadership. Providing innovative solutions in more than 140 countries, Ericsson is helping to create the most powerful communication companies in the world.

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