

An Architectural Framework for Network Convergence through Application Level Presence Signaling

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Abstract. Over the past few years we have witnessed steady progress toward convergence in communications. We believe we are now witnessing convergence beyond just media transport. Further, abstract application level signaling technologies are poised for takeoff and will serve as the unifying fabric for multi-dimensional convergence. Our research shows that such a signaling mechanism known as “presence”, combined with advances in namespace and security technology, will enable ultimate service innovations.

Keywords: presence management, SIP, application layer signaling, network convergence

1. CONVERGENCE—THE CHALLENGE & OPPORTUNITY

The future of convergence in communications is the unification of, and interoperation across media, networks, devices, services and namespaces. Today, we are able to detect some of the key elements forming around the various evolving technologies and business models.

We have started to see evidence of progress in this phenomenon. Some network providers have begun to differentiate with value added services like universal registries, hosting, transaction based [1], and leveraging other services like overlay signaling [2] and namespace enablement [3], with a vision of even tighter integration of such services [4]. Abstract application level signaling through presence management has the power to unify networks, devices, services and namespaces to unleash service innovation that will have long-lasting impact.

2. PRESENCE SIGNALING DRIVES CONVERGENCE

The best way to understand presence is to recognize that a person has a context, or state, at every given instant in time. Technically, this context can be captured and reflected through the devices, networks and applications with which a person interacts. This context can then define the information space and hence a person's service needs. A user's context changes over time and space and can be thought of as fractal iterations over a base context, or set of states. The figure below illustrates this concept of presence.

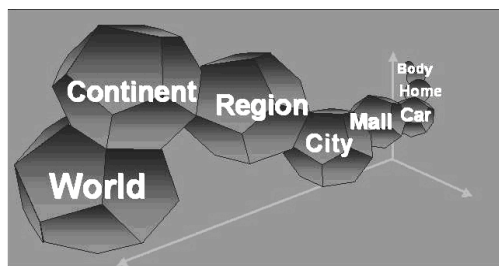


Fig. 1. User demands change in Time and Space

Presence - A Definition: More formally, “Presence” is defined as the subscription to and notification of changes in communication states of a user, where the communication states consist of a set of communication means, such as communication devices, location, willingness to communicate, preferences, and the personal state of the user.

Presence management technology captures the dynamically changing state of the user as evinced by the end user's interaction with the devices, applications and the network, abstracts that state information using a simple and easy to understand mechanism, and disseminates it to the subscribing application/services, based on an opt-in model. The richness of presence information consumed by an application depends on the number and precision of attributes that the network is capable of capturing and reporting between the two ends of a potential communications session.

The key principles that drive a robust application level presence signaling architecture are:

- **Automatic And Dynamic Capture Of Presence** – To the extent state information can be automatically captured by a presence management solution, presence becomes meaningful, accurate and rich. This requires that the presence management software be able to capture state information from devices and the network. Automatic and dynamic capture of presence information across multiple networks, device types and proxies is the key differentiator for the rich convergence applications and services of the future.

- **Event Based Signaling Model** – Presence must be captured and disseminated using an event-driven asynchronous design, rather than a query based model. An event-driven publication and subscription model provides accurate updates in near real-time and has the capacity to provide “carrier class” accuracy. The presence information can then be queried by an application, like a naming service discussed earlier, with updates in the presence servers triggered by events.
- **Abstract Signaling** – Presence information must be abstracted to be of value to a broad set of applications and services. To create the proper abstraction, activities in devices and networks must be correlated with other attributes, like location, preferences and willingness to communicate, and this aggregated compilation of state must be signaled to the end application or service.
- **Simplicity** – Applications and services must be able to consume presence information in a simple way. Presence payload definitions using XML signaled over SIP is an elegant and simple way for transporting presence information.
- **Scaling** – Capture of presence transactions, and the subsequent processing and dissemination, must scale to multiples of millions in near real-time. This presents challenges in the design of the software, which must be architected and designed using the principles of distributed systems for carrier class scaling.
- **Fine Grained Access Control** – Dissemination of presence information, by definition, must follow an opt-in model. But that alone is not enough. An end user must be able to specify who has access to what level of the user’s state information in a simple intuitive way. [5]

A Framework for Presence Signaling

The following schematic outlines the high level architecture of presence signaling

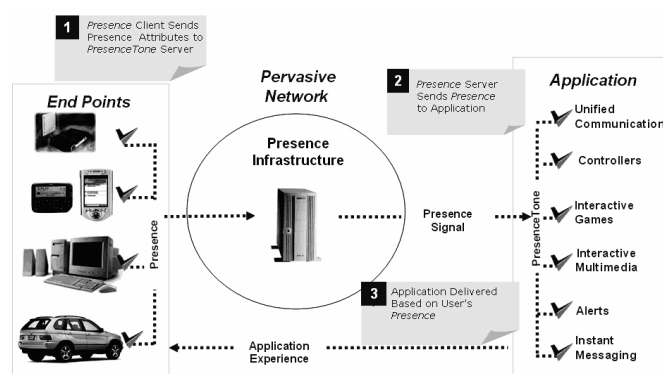


Fig. 2. Using SIP to Signal Presence

3. CONCLUSION

In conclusion, the business of offering abstract application signaled presence-based converged services is the next big opportunity in global communications. Enabling such an environment with seamless real-time communication and massively secure scalable interaction, while fostering open innovation, requires underlying middleware architecture. The presence architectural framework lays the groundwork for enabling such pervasive converged networks and provides the platform to create new product and service innovations for next generation carriers and service providers. Limitations exist only in the imagination and only limited vision can thwart the growth and ultimate success of the emerging converged communications industry.

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