Studying the Feasibility and Importance of Wireless Intelligent Network (WIN) to Deliver Distinctive Services With Enhanced Flexibility

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Abstract

Today's wireless subscribers are much more sophisticated telecommunications users than they were five years ago. No longer satisfied with just completing a clear call, today's subscribers demand innovative ways to use the wireless phone. They want multiple services that allow them to handle or select incoming calls in a variety of ways.Wireless Intelligent network is developed to drive intelligent network capabilities such as service independence, separation of basic switching functions from service and application functions and independence of applications from lower-level communication details into wireless networks. The primary weapon for empowering providers to deliver distinctive services with enhanced flexibility is Wireless Intelligent Networks (WINs).

Keywords: *Wireless Intelligent Network (WIN), Telecommunications Industry Association (TIA), Interim Standard (IS), Personal Communications Service (PCS), Automatic Speech Recognition (ASR), Voice-Controlled Dialing (VCD), Voice-Controlled Feature Control (VCFC), Voice-Based User Identification (VUI), Calling Name Presentation (CNAP), Calling Name Information (CNA), Calling Number Information (CNI**),** Password Call Acceptance (PCA), Selective Call Acceptance (SCA), Calling Party Numbers (CPN), Short Message Service (SMS), Speech-To-Text Conversion (STC), Service Switching Point (SSP), Mobile Switching Center (MSC), Service Control Point (SCP), Intelligent Peripheral (IP), Signal Transfer Point (STP), Visitor Location Register (VLR), Home Location Register (HLR), Transaction Capability Application Part (TCAP)*

1. Introduction

Wireless intelligent network (WIN) is a concept being developed by the Telecommunications Industry Association (TIA) Standards Committee TR45.2. The charter of this committee is to drive intelligent network (IN) capabilities, based on interim standard (IS)-41, into wireless networks. IS–41 is a standard currently being embraced by wireless providers because it facilitates roaming. Basing WIN standards on this protocol enables a graceful evolution to an IN without making current network infrastructure obsolete. Enhanced services are very important to wireless customers. They have come to expect, for instance, services such as caller ID and voice messaging bundled in the package when they buy and activate a cellular or personal communications service (PCS) phone. Whether prepaid, voice/data messaging, Internet surfing, or location-sensitive billing, enhanced services will become an important differentiator in an already crowded, competitive service-provider market. Enhanced services will also entice potentially new subscribers to sign up for service and will drive up airtime through increased usage of PCS or cellular services. As the wireless market becomes increasingly competitive, rapid deployment of enhanced services becomes critical to a successful wireless strategy.

Intelligent network (IN) solutions have revolutionized wireline networks. Rapid creation and deployment of services has become the hallmark of a wireline network based on IN concepts. Wireless intelligent network (WIN) will bring those same successful strategies into the wireless networks [1] [6] [13].

2. Services

Enhanced services are increasing in popularity. At this point, various carriers within different serving areas are implementing them using available IN protocols and concepts. As WIN standards are implemented, the same enhanced services will be applicable across serving areas so that wireless users will have a more consistent interface for seamless use while roaming.

These WIN standards, which are under development, will make wireless services really successful. Enhanced services are now limited in scope and are not transparent across networks. With standards in place, more wireless carriers will offer more of these services [9]-[15].

Hands-Free, Voice-Controlled Services

Voice-controlled services employ voice-recognition technology to allow the wireless user to control features and services using spoken commands, names, and numbers. There are two main types of automatic speech recognition (ASR). Speaker-dependent requires specific spoken phrases unique to an individual user. Each user is required to train the ASR system by recording samples of each specific phrase. The other is speaker-independent ASR, which requires the use of specific spoken phrases that are independent of the speaker. The individual user need not train the system.

Voice-Controlled Dialing (VCD)

VCD allows a subscriber to originate calls by dialing digits using spoken commands instead of the keypad. VCD may be used during call origination or during the call itself.

Voice-Controlled Feature Control (VCFC)

VCFC permits a calling party to call a special VCFC directory number, identify the calling party as an authorized subscriber with a mobile directory number and personal identification number (PIN), and specify feature operations via one or more feature-control strings. This service is similar to remote feature control (RFC) except that the subscriber is allowed to dial feature-control digits or commands using spoken words and phrases instead of keypad digits.

Voice-Based User Identification (VUI)

VUI permits a subscriber to place restrictions on access to services by using VUI to validate the identity of the speaker. VUI employs a form of ASR technology to validate the identity of the speaker rather than determine what was said by the speaker. VUI requires that the subscriber register the service by training the ASR system by recording a word or phrase. When a user attempts to access a service, the ASR system prompts the user to say the special phrase.

Incoming Call-Restriction/Control

Incoming calls to a subscriber may be given one of the following termination treatments: the call is terminated normally to the subscriber with normal or distinctive alerting; it is forwarded to voice mail or to another number; it is routed to a subscriber-specific announcement; or it is blocked. These kinds of services help subscribers control incoming calls and their monthly airtime bills. From a marketing standpoint, they entice cost-conscious customers who might not want unlimited access from callers.

Calling Name Presentation (CNAP)

CNAP provides the name identification of the calling party (e.g., personal name, company name, restricted, not available) to the called subscriber. The calling name information (CNA) is derived from the calling number information (CNI), which is generally provided to the terminating network as part of the basic call setup. Optionally, the date and time of the call may be provided to the called subscriber.

Password Call Acceptance (PCA)

PCA is a call-screening feature that allows a subscriber to limit incoming calls to only those calling parties who are able to provide a valid password (a series of digits). Calls from parties who cannot provide a valid password will be given call refusal while PCA is active.

Selective Call Acceptance (SCA)

SCA is a call-screening service that allows a subscriber to receive incoming calls only from parties whose calling party numbers (CPNs) are in an SCA screening list. Calls without a CPN will be given call-refusal treatment while SCA is active.

Data Capability

Short Message Service (SMS)

SMS provides the ability to deliver short messages as a packet of data between two service users, known as short message entities (SMEs). SMS incorporated into PCS networks allows for simultaneous paging and voice. Among its applications are paging via wireless phone screens and voice-mail notification.

Speech-to-Text Conversion (STC)

STC permits a calling party to create a short alphanumeric message by speaking to an ASR device that will perform speech-to-text conversion. The short message may then be distributed by any means available such as short message delivery.

Billing, Prepaid Cellular

Prepaid cellular can take a number of forms. One might be a debit card; one might be a connection to a smart card. These services allow customers to pay before they call and not be billed later. As the subscriber has already paid for the service, the carrier is not burdened with the risk or overhead of payment collection [6]-[20].

3. Functional components

The WIN mirrors the wireline IN mode. But the distinction between the wireless and wireline network is that many of the wireless call activities are associated with movement, not just the actual phone call. In the WIN, more call-associated pieces of information are communicated between the MSC and the SCP or HLR. The WIN moves service control away from the MSC and up to a higher element in the network, usually the SCP (see *Figure*).

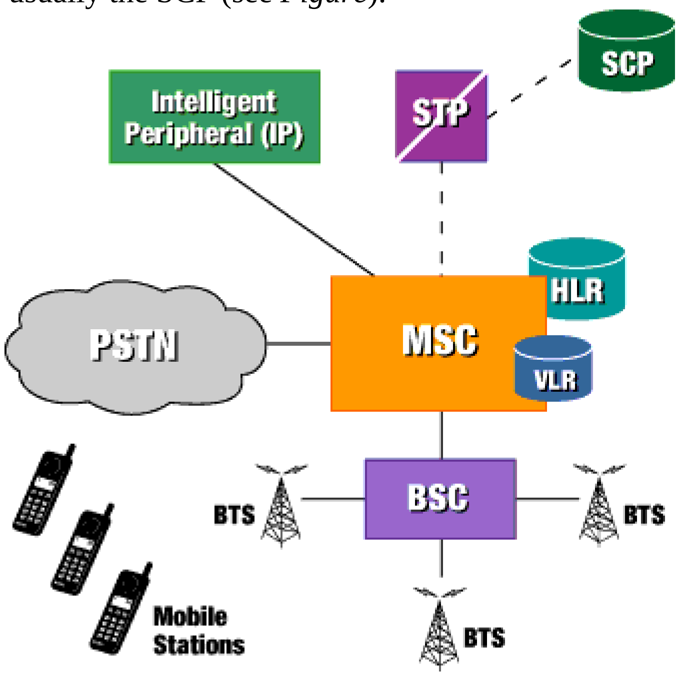

Figure 1. Components of a WIN

- **MSC as service switching point (SSP)**—In the IN, the SSP is the switching function portion of the network. The mobile switching center (MSC) provides this function in the WIN.
- **service control point (SCP)**—This device provides a centralized element in the network that controls service delivery to subscribers. High-level services can be moved away from the MSC and controlled at this higher level in the network. It is cost-effective because the MSC becomes more efficient, does not waste cycles processing new services, and simplifies new service development.

- **intelligent peripheral (IP)—**The IP gets information directly from the subscriber, be it credit-card information, a PIN, or voice-activated information. The peripheral gets information, translates it to data, and hands it off to another element in the network—like the SCP—for analysis and control.
- **signal transfer point (STP)—**This is a packet switch in the signaling network that handles distribution of control signals between different elements in the network such as MSCs and HLRs or MSCs and SCPs. The advantage of an STP is that it concentrates link traffic for the network. It can also provide advanced address capabilities such as global title translation and gateway screening.
- **location registers—**These are used to supplement MSCs with information about the subscriber. The number of subscribers that the switch supports changes as roamers move in and subscribers move to other switches. The database of active subscribers changes very dynamically. Each MSC cannot have the database for all potential users of that switch. The following location registers help to get around that problem:
    - **Visitor location register (VLR)—**Within an MSC there is a VLR that maintains the subscriber information for visitors or roamers to that MSC. Every MSC or group of MSCs will have a VLR.
    - **Home location register (HLR)—**Information on roamers is obtained from that subscriber's HLR. Each subscriber is associated with a single HLR, which retains the subscriber's record. When the subscriber roams to another switch, the VLR queries the subscriber's home HLR to get information about that subscriber. When a phone call goes to a subscriber's MSC, the MSC recognizes that the subscriber is roaming and asks the HLR for the subscriber's location. The HLR will communicate that information to the VLR and relay a temporary location number received from the visited system. In the WIN architecture, the HLR is usually a network element such as an SCP.
- **WIN call model—**The WIN call model enables the network to handle new triggers (which are decision points in a call) and new transaction capability application part (TCAP) messages.

The evolution to WIN will be a major step forward for North American wireless networks. It involves an industry-wide consensus among equipment vendors and service providers to incorporate IN concepts into existing wireless networks [11] [16].

The following steps will need to occur before WIN will be a reality:

- incorporation of SCP, IP, and SN into the wireless network architecture
- evolution of the MSC to a SSP
- separation of call control and transport from service control
- development of generic call models, events, and trigger points

4. Conclusion

The first phase of WIN standards was published in 1999 and established the fundamental call models and operations required to support this flexible service architecture. Many service providers currently implement WIN Phase 1 in their networks. Examples of WIN Phase 1 services are calling name presentation and restriction, call screening, and voice-control services. Nearing completion are WIN Phase-2 standards that provide both additional service capabilities for wireless operators as well as greater harmonization of network capabilities and operations with emerging third-generation network requirements. WIN Phase 2 includes MSC triggers for an IN prepaid solution. WIN Phase 3 is currently in requirements review by the WIN standards group. This phase incorporates enhancements to support location-based services. These requirements are based on four service drivers: location-based charging, fleet and asset management service, enhanced call routing service, and location-based information service.

5. References

1. Gerry Christensen, Robert Duncan, and Paul G. Florack, Wireless Intelligent Networking, Artech House Mobile Communications Library,Nov 2000,Pp 69-112.
2. *John G. Proakis, Wiley Encyclopedia of Telecommunications - Technology & Engineering , 2003.*
3. Ambrosch, W.D., Maher, A., Sasscer, B. *The Intelligent Network: A Joint Study by Bell Atlantic. IBM and Siemens*, Springer-Verlag, 1989. ISBN 3-540-50897-X. ISBN 0-387-50897-X. Also known as the *green book* due to the cover ,Pp 97-189.
4. Faynberg, I., Gabuzda, L.R., Kaplan, M.P., and Shah, N.J. *The Intelligent Network Standards: Their Application to Services*, McGraw-Hill, 1997, ISBN 0-07-021422-0,Pp 45-156.
5. Magedanz, T., and Popescu-Zeletin, R.. *Intelligent Networks: Basic Technology, Standards and Evolution*, Thompson Computer Press, 1996. ISBN 1-85032-293-7,Pp 67-112.
6. F. A. Tobagi, "Modeling and Performance Analysis of Multihop Packet Radio Networks," *Proc. IEEE*, Vol. 75, pp. 135-155.
7. W. H. Tranter and K. L. Kosbar, "Simulation of Communication Systems," *IEEE Communications Magazine*, July 1994, Pp 22-28.
8. W. Turin, "Simulation of Error Sources in Digital Channels," *IEEE J. on Selected Areas in Comm.*, Vol. 6, pp. 85-93 (January 1988).
9. K. Walsh and E. G. Sirer, "Staged Simulation for Improving the Scale and Performance of Wireless Network Simulations," *Proc. 2003 Winter Simulation Conference*, New Orleans.
10. N. Abramson, "The Throughput of Packet Broadcasting Channels," *IEEE Trans. on Communications*, vol. COM-25, pp. 117-128.
11. Agarwal and P. R. Kumar, "Improved Capacity Bounds for Wireless Networks," *Wireless Communications and Mobile Computing*, May 2004, pp. 251-261.
12. P. Bender et al., "CDMA/HDR: A Bandwidth-Efficient High-Speed Wireless Data Service for Nomadic Users," *IEEE Communications Magazine*, July 2000, pp. 70-77.
13. G. W. Bernas and D. M. Grieco, "A Comparison of Routing Techniques for Tactical Circuit-Switched Networks," *Proc. ICC '78*, pp. 23.5.1-.5.
14. B. W. Boehm and R. L. Mobley, "Adaptive Routing Techniques for Distributed Communications Systems," *IEEE Trans. on Communications*, vol. COM-17, pp. 340-349.
15. B. Jabbari, et al, "Network Issues for Wireless Communications," IEEE Communications Magazine, January 1995, pp. 88-98.
16. C.A. Rypinski, "Standards Issues for Wireless Access," Business Communications Review, August 1992, pp. 40-45.
17. G. Fay, "Wireless Data Networking," International Journal of Network Management, 8 March 1992, pp. 8-17.
18. D.J. Goodman, "Second Generation Wireless Information Networks," IEEE Transactions on Vehicular Technology, Vol. 40, No. 2, May 1991
19. D. Buchholz, et al, "Wireless In-Building Network Architecture and Protocols," IEEE Network Magazine, November 1991, pp. 31-38.
20. R.H. Katz, "Adaptation and Mobility in Wireless Information Systems," IEEE Personal Communications, First Quarter 1994, pp. 6-17.

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