INTERNET DRAFT
Category: Informational
Title: draft-neumiller-obast-reqs-01.txt
Date: June 2000

Phillip D. Neumiller
Peter Lei
Qiaobing Xie
Motorola, Inc.
John Loughney
Nokia, Inc.
Randall Stewart
Cisco Systems, Inc.

Open Base Station Transport (OBAST) Requirements

Status of this Memo

This document is an individual contribution for consideration by the CRAPS BOF of the Internet Engineering Task Force. Comments should be submitted to the obast-list@cig.mot.com mailing list.

Distribution of this memo is unlimited.

Abstract

This document outlines the requirements for a set of open IP based protocols enabling seamless mobility across diverse radio access networks. This document begins by stating some architectural tenets upon which the requirements for the OBAST protocol set are based. Furthermore, what the authors currently believe to be the eventual desirable wireless Internet architecture is described. This architecture is shown to enable a common protocol set that we refer to as open base station transport (OBAST).

Table of Contents

1.0 Introduction

This document lists requirements for a protocol set enabling access points and/or base stations, of different radio access network types, to communicate with each such that seamless handovers may occur between these radio nodes. We refer to this protocol set as: Open Base Station Transport (OBAST). There are fundamental architectural tenets that facilitate "seamless roaming". We shall review those first by speaking in terms of what OBAST is and isn't.

1.1 Terminology

```
AP        access point
BTS       base transceiver station
CDG-IOS   CDMA Development Group-Inter-Operability Standard
CDMA      Code Division Multiple Access
GSM       Global System for Mobile communications
OBAST     Open Base Station Transport
IuPs
Macro-mobility
          Inter-IP domain mobility
MAP       Mobile Application Part
Micro-mobility
          intra-IP domain mobility
PSTN      Public Switched Telephone Network
RAN       Radio Access Network
RNC       Radio Network Controller
SDU       Selection Distribution Unit
SS7       Signaling System 7
TIA       Telecommunications Industry Association
UMTS      Universal Mobile Telephone System
WLAN      Wireless Local Area Network
WPAN      Wireless Personal Area Network
```

2 Review of Architectural Tenets

2.1 Simplicity

There is a huge amount of commonality between the SS7 ISUP/IS-41 [1,2] and GSM MAP [9] signaling sets used for inter-system mobility in classical cellular deployments. There is also a large amount of functional overlap at the Telecommunications Industry Association (TIA) reference points above A-bis (the point of base station attachment to the rest of the network), where IuPs [3], GSM A-bis [4], and CDG-IOS (IS-634) [5] all play a role on UMTS, GSM systems, and CDMA systems respectively. There are several micro-mobility proposals including Cellular IP [6], hierarchical Mobile IP [7], EMA [8], HAWAII, and IAPP [10] (now an IEEE standard) for 802.11 access.

The inter-network protocols between deployed cellular systems will likely remain in place for a long time. However, by pushing all radio related behavior down into the BTS or AP, OBAST hopes to simplify the "top of the access point protocol" and eventually provide seamless roaming between wireless personal area networks (WPANs), wireless LANs (WLANs), and next generation cellular networks.

2.2 OBAST is Open and Universal

The current situation in radio access networks is that they are closed and require complicated protocols to inter-network, if internetworking is possible at all. OBAST seeks to open up radio access networks to provide the same kind of internetworking that has been so successful in the wired world. The history of the Internet has proven that open protocols have a distinct technological advantage, because they are developed, reviewed, and implemented, by a broad group of network experts. A distinct economic advantage can be gained from openness, because open protocols tend to encourage competition around the quality of the implementation rather than around comparisons of feature sets that may or may not be of benefit to users. We believe these properties will hold for the wireless Internet as well.

Historically, RANs have been tightly coupled to the core cellular network so that cellular equipment could not be easily replaced without extensive modification to the core network as well. The existing 3G standards are propagating this architectural tendency forward, but in a world where wireless options are multiplying, such closed non-inter-networking solutions become less and less viable.

The OBAST architecture attempts to push "all" radio control and knowledge to the base stations so that a common and universal inter-access point or inter-BTS mobility protocol can be created. We believe that this protocol is only useful if it gains critical mass on the global Internet. We feel it can evolve with the global Internet in such a way as to someday abolish the need for core networks and radio specific standards.

2.3 OBAST is Forward Looking

The momentum behind existing 3G standards may discourage deployment of any OBAST protocols in existing cellular networks. However, we believe greenfield 3G markets and WPAN deployments and WLAN investments could potentially benefit immediately from its adoption. It is our ambition to make OBAST a protocol set supporting the most advanced, scalable, and forward looking wireless Internet architecture.

2.4 OBAST is a Protocol Set, However, It Implies Architectural Change

For OBAST to meet its goals, it requires a change in the way wireless networks have been classically designed. The primary architectural changes are (1) the BTS or AP becomes the one and only building block of the radio access network, (2) All radio control terminates at the BTS or AP and nothing radio specific creeps out above the BTS or AP.

2.5 OBAST Promotes Seamless Mobility

Having a common protocol for micro-mobility and macro-mobility, AAA, and QoS, independent of access network type is OBAST's primary end goal. Facilitating the fixed to wireless network transition is also part of the ultimate end goal, but not a primary focus. OBAST will focus first on a protocol set, borrowed from other standards as much as possible and invent only where white spaces exist.

2.6 OBAST Promotes Peer-to-Peer Protocols

Peer-to-peer protocols imply that no master or slave is assumed. OBAST will support the concept of elected call anchors that follow the mobiles as they move through "a sea of BTSs or access points". The call anchor has the responsibility of terminating the radio portion of the call. The call anchor is also responsible for orchestrating handover requests for the mobile. The call anchor is the point of selection and distribution when macro-diversity is required.

2.7 OBAST Promotes IPv6 and MIPv6 Everywhere

OBAST could be made to run over IPv4. However, being a new protocol we wish to architect it to run over IPv6 primarily and this is what we will focus on. We will also promote the use of Mobile IPv6 [12] clients everywhere to enable enhanced macro-mobility.

2.8 OBAST Will not Re-invent or Invent AAA or QoS Mechanisms

Every attempt to will be made to be agnostic to these protocols where possible. OBAST may eventually need to endorse or provide minimal AAA and QoS mechanism negotiation to facilitate seamless handovers. Much work is being done in this area, so OBAST will defer incorporating AAA or QoS mechanisms into its protocol set until after the seamless mobility issues have been resolved.

2.9 OBAST Recognizes Other Important Standards

The pilc [13], Mobile IP [7, 12], cnrp [14], slp [15], zeroconf [16], aaa [17], manet [18], diffserv [19], intserv [20], rsvp [21], pint

[22], sip [23], rohc [24], IETF working groups all contain work useful to making OBAST happen. OBAST does/ will not replace/ dilute/ change efforts under way in 3GPP (www.3gpp.org), 3GPP2 (www.3gpp2.org), MWIF (www.mwif.org), or 3G.IP (www.3gip.org).

2.10 OBAST shall be Air Interface Agnostic

OBAST will enable seamless roaming between WLANs (eg 802.11), WPANs (eg Bluetooth), and macro-cellular (eg EDGE [25], 3G-1X [26], etc). As such, OBAST must not favor any particular radio type over another. OBAST recognizes that there are going to be LOTS of competing radio technologies making their debut over the next few years and many portable devices will support multiple RF interfaces.

2.11 OBAST Shall Work Diligently on Micro-mobility

OBAST supports the ideas behind IAPP (but not necessarily the implementation). OBAST is looking critically at CellularIP, HAWAII, EMA, and the work going on in the mobileip working group that will be speeding up mobileip hand-overs. OBAST will be flexible enough to support multiple negotiable micro-mobility schemes but may have to choose one as a minimum required protocol set to support "seamlessness".

2.12 OBAST Shall Attempt To Remain Agnostic to Call Processing

Session initiation methods like SIP must be somewhat transparent to OBAST. It is not clear how this can be best done and this is considered a challenge.

2.13 OBAST Shall Make the Most out of SCTP

OBAST will support the use of SCTP (sigtran) [11] for inter-radio node signaling and possibly for transport applications (yet to be determined).

3.0 Baseline OBAST Implied Architecture

Using OBAST implies a new (at least to cellular and WLAN standards) view of the "Wireless Internet architecture". This architecture has two component types: routers (that make up the global Internet), and base stations / access points. In this view, the edge routers themselves could possibly have radio cards and be OBAST compliant. We feel that the scalability for routers has been proven on the global Internet. Radios, as edge devices, must respect this fundamental nature of the Internet architecture. The figure below shows the relationship between these simple components.

(Global Internet)

```
        |   . . .   |
        OBAST      OBAST
        |           |
        AP          BTS  <- OBAST enabled Radio Access Nodes
```

The radio coverage, for the OBAST BTS (shown above), may engulf that of the AP, implying a vertical handover being required in this scenario. OBAST must facilitate vertical, horizontal, soft and hard handovers at the radio and at the servicing network layer when required or optimal.

4.0 References

[1] "Cellular Radiotelecommunications Intersystem Operations: Intersystem Handoff Information Flows," IS-41D.2, TIA/EIA, December 1997.

[2] "Cellular Radiotelecommunications Intersystem Operations: Signalling Procedures," IS-41D.2, TIA/EIA, December 1997.

[3] "Technical Specification 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UTRAN Iu Interface: General Aspects and Principles". 3G TS 25.410 V3.1.0, January 2000.

[4] "Base Station Controller - Base Transceiver Station (BSC-BTS) interface; Layer 3 specification", GSM 08.58, ETSI

[5] CDG-IOS (IS-634)

[6] A. Campbell et al., "Cellular IP", draft-ietf-mobileip-cellularip-00.txt. IETF Work in Progress, January 2000.

[7] C. Perkins, Editor. "IP Mobility Support". RFC 2002, October 1996.

[8] A. O'Neill, G. Tsirtsis, S. Corson, "Edge Mobility Architecture", draft-oneill-ema-01.txt, IETF Work in Progress, March 2000.

[9] "Mobile Application Part (MAP) specification", GSM 09.02, ETSI

[10] IEEE Pending Standard.

[11] R. Stewart et al., "Simple Control Transmission Protocol". draft-ietf-sigtran-sctp-10.txt, IETF Work in Progress, June 2000.

[12] David B. Johnson, C. Perkins, "Mobility Support in IPv6". draft-ietf-mobileip-ipv6-12.txt, IETF Work in Progress, April 2000.

[13] S. Dawkins, G. Montenegro, M. Kojo, V. Magret, "Performance Implications of Link-Layer Characteristics: Slow Links". draft-ietf-pilc-slow-03.txt, IETF Work in Progress, March 10, 2000.

[14] N. Popp, M. Mealling, L. Masinter, K. Sollins, "Context and Goals for Common Name Resolution", draft-ietf-cnrp-goals-01.txt, IETF Work in Progress, April 28, 2000.

[15] E. Guttman, C. Perkins, J. Veizades, M. Day, "Service Location Protocol, Version 2", RFC 2608, June 1999.

[16] M. Hattig, "Zeroconf Requirements". draft-ietf-zeroconf-reqts-03.txt, IETF Work in Progress, March 2000.

[17] Aboba et al., "Criteria for Evaluating AAA Protocols for Network Access". draft-ietf-aaa-na-reqts-05.txt, IETF Work in Progress, April 2000.

[18] S. Corson, J. Macker, "Mobile Ad hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation Considerations". RFC 2501, January 1999.

[19] S. Blake et al., "An Architecture for Differentiated Services". RFC 2475, December 1998.

[20] J. Wroclawski, "The Use of RSVP with IETF Integrated Services", RFC 2210, September 1997.

[21] B. Braden et. al., "Resource Reservation Protocol (RSVP) - Version 1 Functional Specification", RFC 2205, September 1997.

[22] S. Petrack, L. Conroy, "The PINT Service Protocol: Extensions to SIP and SDP for IP Access to Telephone Call Services". RFC 2848, June 2000.

[23] M. Handley, H. Schulzrinne, E. Schooler, J. Rosenberg, "SIP: Session Initiation Protocol". RFC 2543, March 1999.

[23] Mikael Degermark, "Requirements for robust IP/UDP/RTP header compression". draft-ietf-rohc-rtp-requirements-02.txt, IETF Work in Progress, June 2000.

[25] "ETSI Technical Report: Digital cellular telecommunications system (Phase 2+); Enhanced Data Rates for GSM evolution (EDGE)". BSS GSM 10.59-1, January 1998.

[26] "Introduction to cdma2000 Standards for Spread Spectrum Systems", IS-2000.1.A, EIA/TIA

5.0 Acknowledgements

Special thanks to James Kempf of Sun Microsystems for much input on MWIF activities and contributions to the OBAST mail list.

Special thanks to Pat Calhoun also of Sun Microsystems for editing and formatting this document and his countless contributions to the OBAST mail list.

6.0 Authors' Addresses

Questions about this memo can be directed to:

Phillip Neumiller
Wireless Personal Area Networking
Motorola, Inc.
1750 Golf Road 6th Floor - IL103
Schaumburg, IL 60173
USA

Phone: +1 847-576-9624
E-Mail: Phillip.Neumiller@Motorola.com

Randall R. Stewart
Cisco Systems, Inc.
24 Burning Bush Trail
Crystal Lake, IL 60012
USA

Phone: +1 815-479-8536
E-Mail: rstewart@flashcom.net

Qiaobing Xie, Ph.D
Network Architecture & Technology
Motorola, Inc.
1501 W. Shure Drive, Room 2309
Arlington Heights, Illinois 60004
USA

Phone: +1 847-632-3028
Fax: +1 847-632-6733
E-mail: QXIE1@email.mot.com

Peter Lei
Network Architecture & Technology
Motorola, Inc.
1501 West Shure Drive, #1301

Arlington Heights, Illinois, 60004
USA

Phone: +1 847-632-5654
E-mail: Peter.Lei@motorola.com

John Loughney
Nokia Research Center
PO Box 407
FIN-00045 Nokia Group
Finland

Phone: +358 40 749 9122
E-mail: john.loughney@nokia.com

7.0 Full Copyright Statement