TTC標準
Standard

JJ-22.07

Private Integrated Services Network

(SIP Roaming Supplementary Service)

Specifications for SIP Interface

Edition 1.1

Established on December 10, 2009

THE TELECOMMUNICATION TECHNOLOGY COMMITTEE

Introduction

This document provides the TTC original Standards formulated and put into effect by the Technical Assembly. It contains unabbreviated version of 'JJ-' Standards, which have not been defined as international standards.

In case of dispute, the original to be referred is the Japanese version of the text.

We trust that greater understanding of TTC Standards by a wider range of users will further contribute to the development of telecommunications.

Table of Content

1. Introduction

   The Private Network Interface Sub-Working Group of the Private Network Special Committee has been standardizing IP protocols intended for inter-server linkage private networks (IP networks). Now, taking recent trends of the market and international recommendations into consideration, it is necessary to study supplementary service techniques and application linkage techniques based on SIP (Session Initiation Protocol) in operating agencies. With respect to roaming supplementary services stipulated in this standard, there are needs for services in which legacy PHS and WiFi terminals are linked by servers between SIP networks and the terminals are communicable, traveling from node to node (between SIP networks), thus we determined to state standardization of such services.

   This standard states stipulations, intending the following purposes:

   - Defining new domestically-specific SIP protocols in operating agencies to enable mobile terminal control through IP network domestic operating agencies are demanding.

   - Defining light protocols for better connectivity that are intended for use by not a carrier but an operating agency.

   With the background and reasons mentioned above, this standard stipulates technical specifications on inter-node roaming supplementary service interconnection interface between private SIP networks.

2. Revision History

Edition	Date of establishment	Description
First edition	May 27, 2009	Established.
Edition 1.1	December 10,2009	Revision.

3.Miscellaneous

   (1) Recommendations, standards, etc., referenced

   TTC standard: JJ-22.00 The Guideline for the Architecture of the Technical Specifications for Private SIP in TTC

   TTC standard: JJ-22.01 Technical Specifications on Inter-connection Interface between Private SIP Networks

   TTC standard: JJ-20.60 Private Integrated Services Network(Inter-PBX Roaming Supplementary Service)-Specifications for inter-PBX signalling protocol

   (2) Associations with other domestic standards

   No associations with other domestic standards.

4. Organizational Unit Preparing Standards

   First Edition : Private Network Special Committee

   Edition 1.1 : Private Network Special Committee

1. Scope

This standard stipulates inter-node SIP protocol specifications for "roaming supplementary services between SIP networks" in a private integrated service network (Private-SIP: P-SIP).

Those are inter-node supplementary services that provide location registration, origination/termination, and so forth for personal stations traveling through radio service areas that compose P-SIP irrespective of their locations.

This standard stipulates a location registration procedure, location registration deletion procedure, roaming origination procedure, roaming termination procedure, location information match procedure, and authentication procedure as a set of functions required to provide basic call services for personal stations traveling in a private SIP network.

In this standard, protocols are stipulated in conformity with the inter-server interface specifications defined by JJ-22.01.

Note that the radio interface for personal stations in this standard is intended for <PHS> and W-LAN based on the second generation cordless telephone system standard specification (RCR STD28) and not applicable for other types of radio systems.

2. Position of This Standard

This standard is positioned as illustrated below.
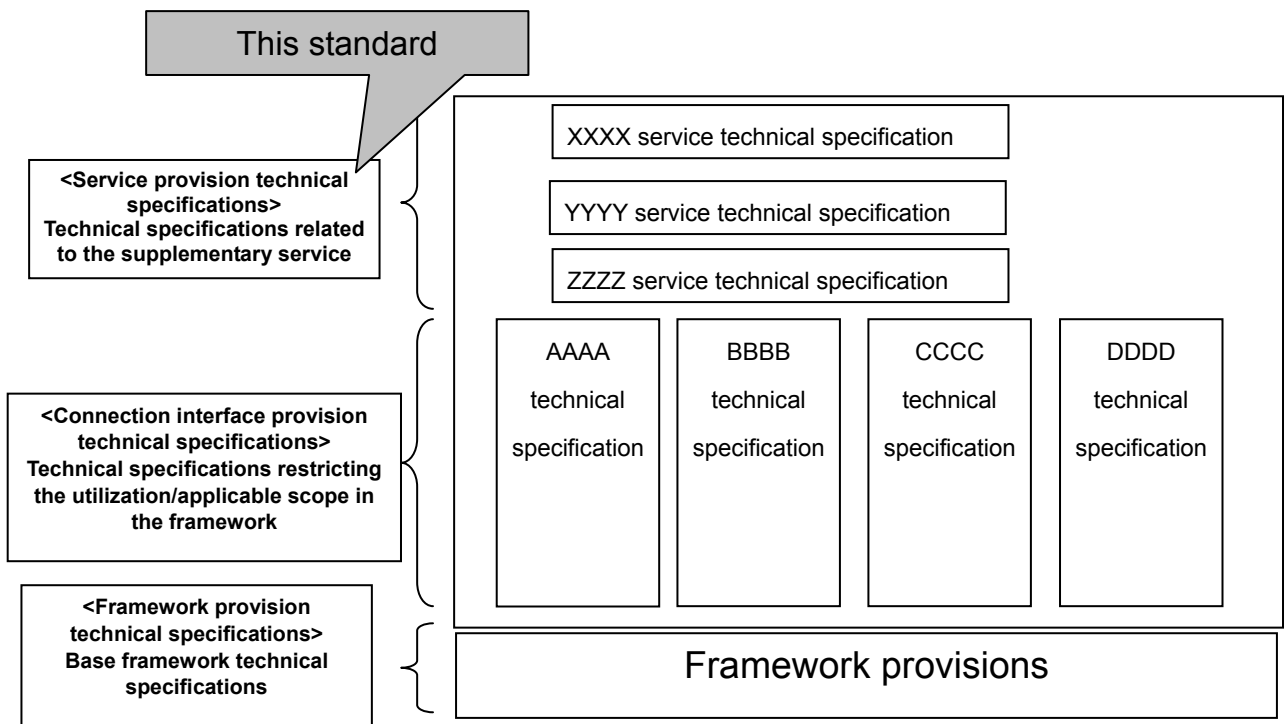
JJ-22.00　Configuration of SIP-related technical specifications

3. Reference Standards

[1] "SIP: Session Initiation Protocol", TTC standard JF-IETF-RFC3261 1st edition, The Telecommunication Technology Committee, June 2005.

[2] "Reliability of Provisional Responses in SIP）", TTC standard JF-IETF-RFC3262 1st edition, The Telecommunication Technology Committee, June 2005.

[3] "An Offer/Answer Model with the Session Description Protocol (SDP)", TTC standard JF-IETF-RFC32641st edition, The Telecommunication Technology Committee, June 2005.

[4] " SDP: Session Description Protocol", TTC standard JF-IETF-RFC2327, The Telecommunication Technology Committee, June 2005.

[5] "A Privacy Mechanism for the Session Initiation Protocol（SIP）", TTC standard JF-IETF-REC3323, The Telecommunication Technology Committee ,2005 年 6 月.

[6] "Private Extensions to the Session Initiaion Protocol（SIP）for Asserted Identity within Trusted Networks", TTC standard JF-IETF-RFC3325, The Telecommunication Technology Committee, June 2005.

[7] "The tel URI for Telephone Numbers", TTC standard JF-IETF-RFC3966, The Telecommunication Technology Committee, June 2005.

[8] "The International Public Telecommunications Numbering Plan", ITU-T Recommendation E.164, ITU-T,1997.

[9] "Technical Specification on SIP to ISUP Interworking", TTC standard JF-IETF-RFC3398, TTC,2005 年 6 月.

[10] "Technical Specification of the Framework on provider's SIP Network", TTC standard JJ-90.21, The Telecommunication Technology Committee, June 2005.

[11] "Technical Specification on Network Asserted User Identity Information Transferring through provider's SIP Networks", TTC standard JJ-90.22, The Telecommunication Technology Committee ,June 2005.

[12] "Inter-Carrier Interface based on ISUP", TTC standard JJ-90.10 6thedition, The Telecommunication Technology Committee, April 2003.

[13] "The Session Initiation Protocol UPDATE Method", JF-IETF-RFC3311, The Telecommunication Technology Committee, June 2005.

[14] "The Reason Header Field for the Session Initiation Protocol（SIP）", TTC standard JF-IETF-RFC3326, The Telecommunication Technology Committee, June 2005.

[15] "Session Timers in the Session Initiation Protocol (SIP)", JF-IETF-RFC4028, The Telecommunication Technology Committee, August 2005.

[16] "Technical on Session Initiation Protocol（SIP）", TTC Report TR-10071st edition, The Telecommunication Technology Committee, March 2003.

[17] JJ-22.01 Technical Specifications on Inter-connection Interface between Private SIP Networks

[18] ITU-T

X.208 SPECIFICATION OF ABSTRACT SYNTAX NOTATION ONE(ASN.1)

X.209 SPECIFICATION OF BASIC ENCODING RULES FOR ABSTRACT SYNTAX NOTATION ONE(ASN.1)

X.219 REMOTE OPERATIONS：MODEL,NOTATION AND SERVICE DEFINITION

[19] JTQ931 ISDN User-Network Interface Layer 3 Specification for Basic Call Control

[20] JT-Q931-a Digital Interface between PBXs (Common Channel Signalling) - Layer 3 - Specification

[21] JT-Q932 Digital Subscriber Signalling System No.1 - Generic Procedures for the Control of ISDN Supplementary Services

[22] JT-Q950 Supplementary Services Protocols Structure and General Principle Service

[23] JT-Q951-a Digital Interface between PBXs (Supplementary Services) - Number Identification Service

[24] JT-Q952-a Digital Interface between PBXs (Supplementary Services) - Call Offering Service

[25] JS-11582 Private Integrated Services Network(Generic Function Protocol for Supplementary services)- Inter-PBX signalling protocol Specification

[26] JJ-20.60 Private Integrated Services Network(Inter-PBX Roaming Supplementary Service)-Specifications for inter-PBX signalling protocol

4. Configuration Supposed for This Standard

    4.1 Location where the protocol is stipulated in the viewpoint of system configuration
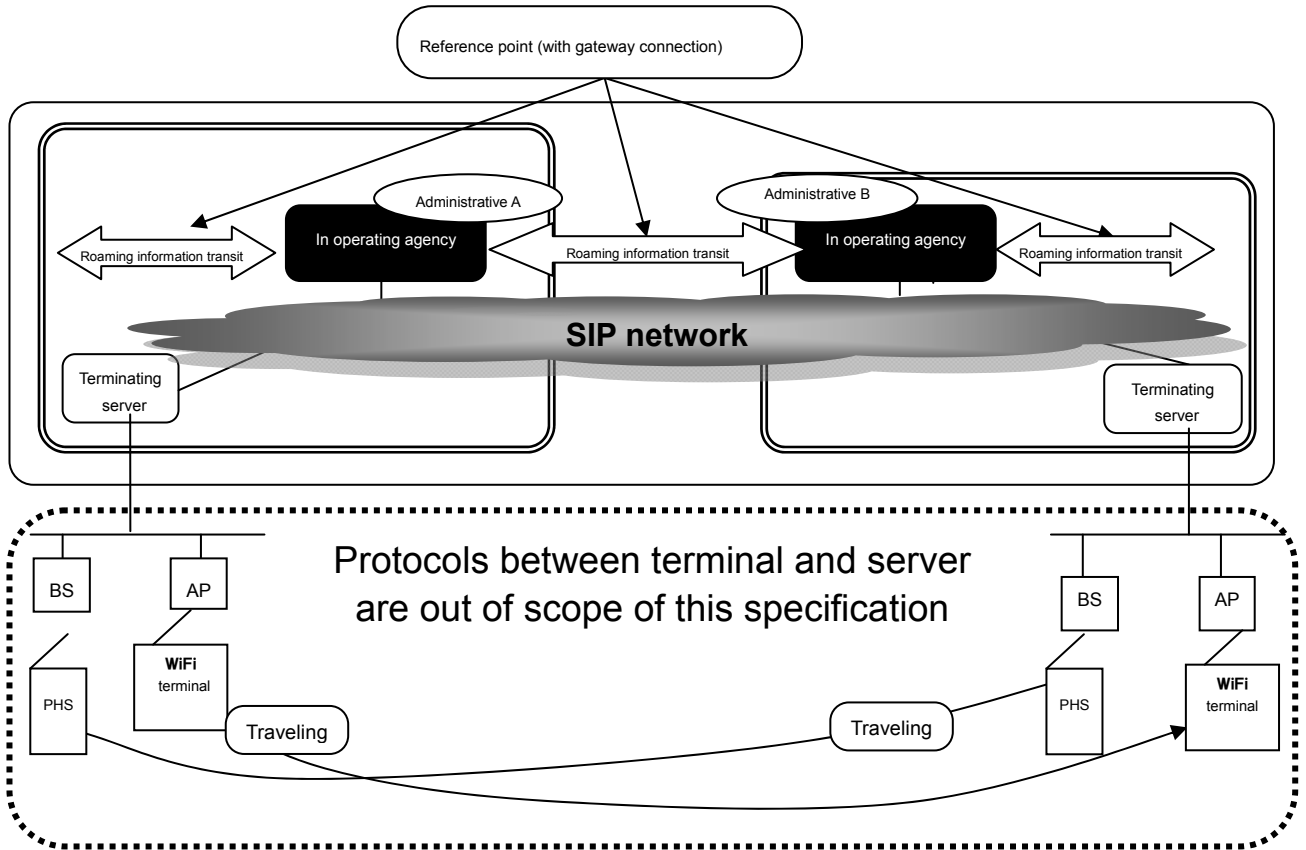
Reference points of SIP roaming connection (scope of the protocol definition)

4.1.2 Transit-type server system

The following shows a schematic network diagram with the interface defined by this standard.

Center server system

**In an operating agency
(center server)
(Proxy/B2B)**

SIP network

Terminating server

Terminating server

Terminating server

SIP roaming linked with JJ-22.01
(this standard)

JJ-22.01 (Private SIP<Basic>)

Center server system

Admini strative A

**In an operating agency
(gateway server)
(Proxy/B2B)**

**In an operating agency
(gateway server)
(Proxy/B2B)**

Admini strative B

SIP network

Terminating server

Terminating server

Terminating server

Terminating server

Terminating server

Terminating server

4.1.3 Endpoint-type system

SIP roaming linked with JJ-22.01
(this standard)

JJ-22.01 (Private SIP<Basic>)

Mesh system

Terminating server

Terminating server

SIP network

Terminating server

Terminating server
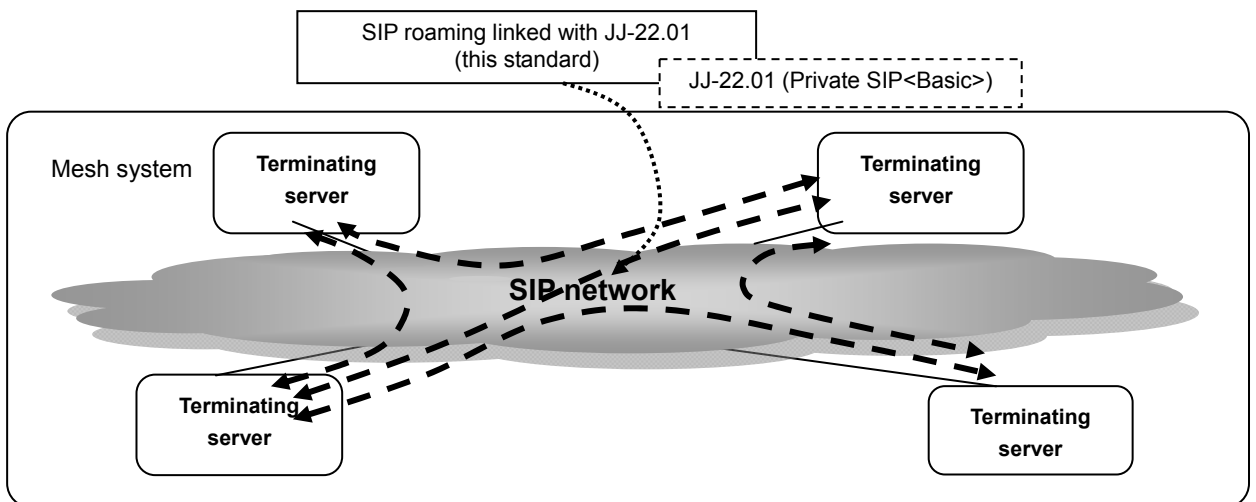
4.2 SIP protocol configuration

Concerning the protocol stipulated this time, interface specifications on the application layer are stipulated.

Application (mobile network)		
Voice encoding / RTP	RTCP	SIP / SDP
UDP		TCP
IP		
Physical MAC		
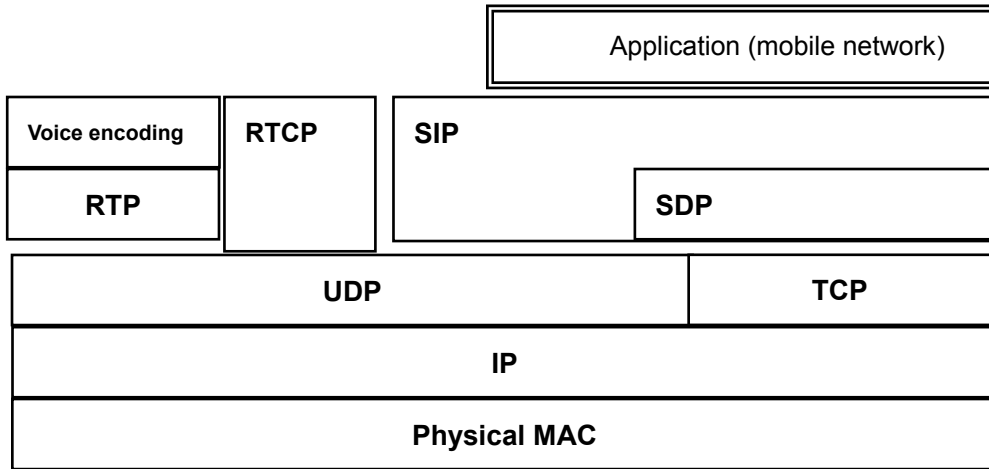
4.3 Radio LAN protocol configuration

It is out of the scope.

Radio LAN	
IEEE802.11 (MAC layer)	
IEEE802.11b	IEEE802.11a
2.4-GHz band	5-GHz band
DSSS	OFDM
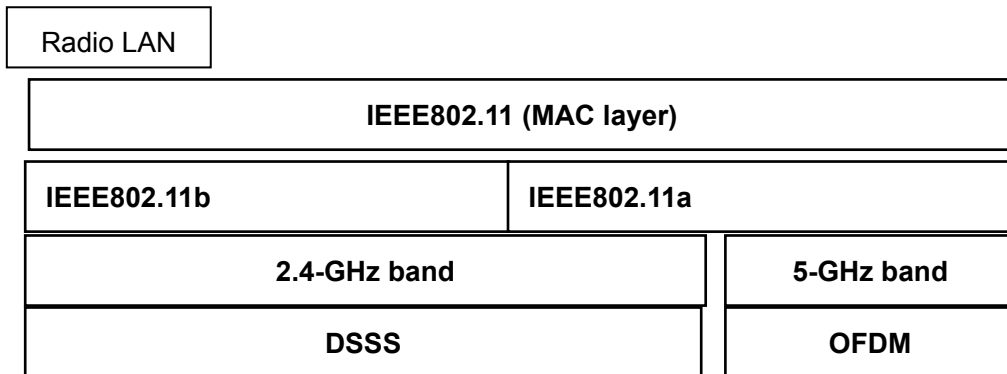
5. Definitions

5.1 Definitions defined in other standards

The terms defined in other standards and used in this standard are as described below.

<SIP network>: Network employing SIP defined in the private network

<server>: IP-PBX, Proxy server, or B2BUA server.

<C Reference point>: Stipulation point defined by this protocol

<PS>: PHS terminal or WiFi terminal (WL terminal).   Those are generically referred to as a PS hereafter.

5.2 Definitions defined in this standard

The terms defined by this standard and used in this standard are as described in the following subsections.

5.2.1 Home server

Server that provides HLR function to a given PS.   To one PS, there is one home server in the SIP network.

5.2.2 Visitor server

Server that is not the home server of a given PS and where the PS stays in its coverage during inter-server roaming.   The visitor server provides mobile communication services for inter-server roaming PSs.

5.2.3 Home location register (HLR)

Database that guarantees the mobility of PS and manages all information required to provide inter-server roaming services for PSs. The HLR of PS is managed by the home server of this PS.

5.2.4 Visitor location register (VLR)

Database that manages information to provide services for an inter-server roaming PS.   As a function equivalent to HLR to an inter-server roaming PS, it is temporarily established while the PS is inter-server roaming.

5.2.5 Inter-server roaming

State of a PS traveling through radio areas between servers composing a SIP network and making access to origination, termination, and other services.

5.2.6 Authentication

Action that a server verifies the validity of a PS.

WiFi terminals and PS terminals employ different authentication methods, thus this document does not describe about authentication this time.

5.2.7 PS (WiFi) number

Number that allows servers in a SIP network to uniquely identify PSs in a SIP network.

5.2.8　Inter-server roaming number

Number temporarily assigned by a visitor server so as to allow the home server to route a call to an inter-server roaming PS.　The inter-server roaming number is registered with the HLR as location information.

5.2.9　Inter-server roaming service profile

Service profile including authentication information and PS information required to provide inter-server roaming services to a PS. When the PS starts inter-server roaming, it is transferred from the HLR to the VLR.

5.3 Overview of operations

Configuration diagram for an example of PS (WiFi) roaming with SIP
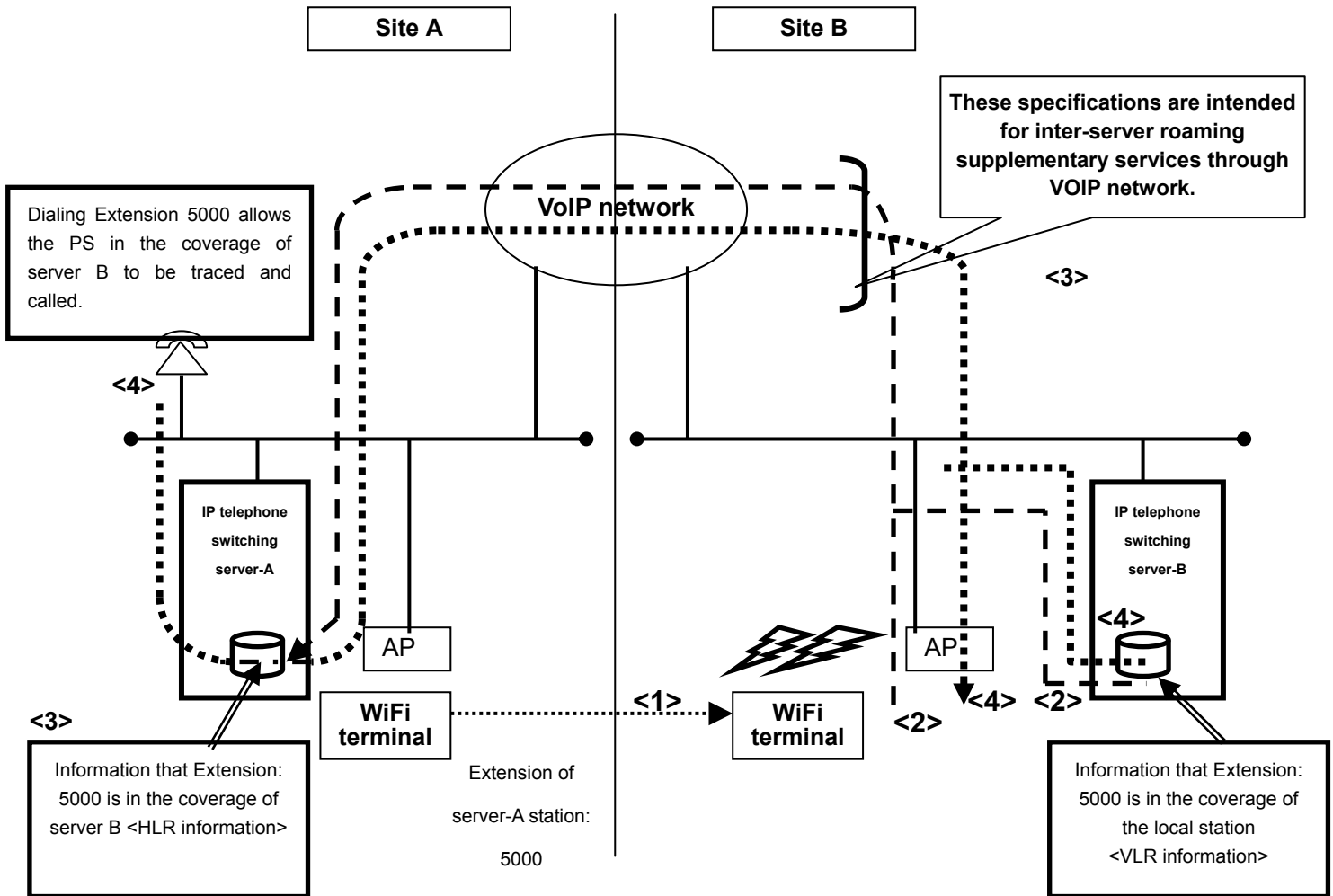
Inter-server roaming supplementary service realized by IP telephone switching servers with SIP
- <1> An extension of Site A travels to Site B.
- <2> On the IP network between IP telephone switching server-A station and IP telephone switching server-B station, the location information of the WiFi terminal is exchanged with the VoIP call control protocol plus SIP (Session Initiation Protocol).
- <3> As the result of <2>, the IP telephone switching server-A station identifies that Extension: 5000 is in the coverage of IP telephone switching server-B station (HLR information) and IP telephone switching server-B station identifies that Extension: 5000 of IP telephone switching server-A station is in the coverage of the local station (VLR information)
- <4> When an extension in IP telephone switching server-A station calls Extension: 5000, the WiFi terminal is traced according to the HLR information with the VoIP call control protocol plus SIP (Session Initiation Protocol) and the WiFi terminal: 5000 in the coverage of IP telephone switching server-B station is called.

Configuration diagram for an example of termination
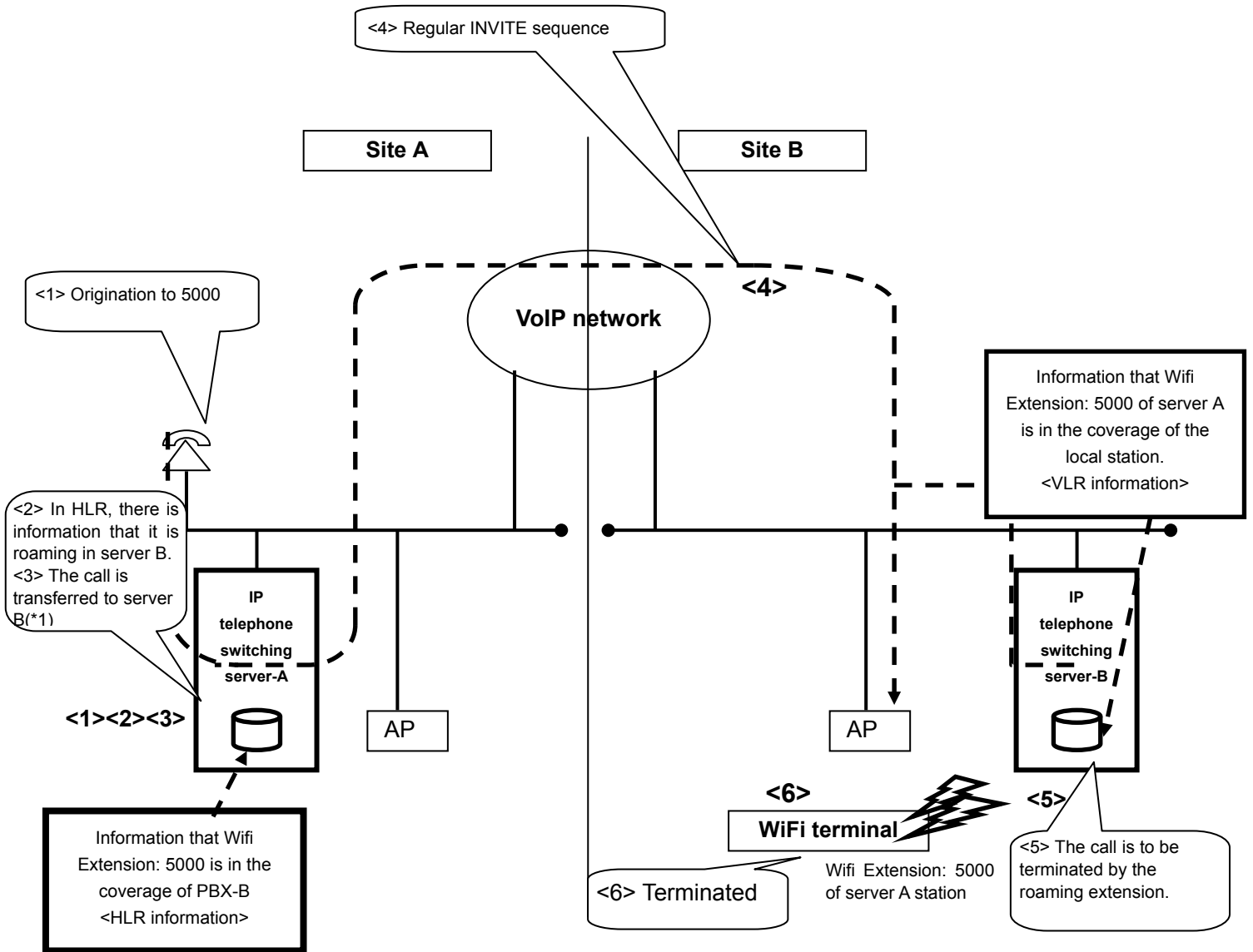
*1: Conversion from SIP-URL to IP address depends on the server database.

6. Signaling Protocol for Inter-Server Roaming Supplementary Service (SS-ISR)

6.1 Description of SS-ISR

SS-ISR provides origination/termination and inter-server location registration for PSs (WiFi terminals) traveling wireless service areas of servers composing an SIP network regardless of the location of the PS (WiFi terminal).

6.2 SS-ISR operation requirements

This standard requires that the home server and visitor server should have the operations listed in Table 6.1.

Table 6.1/JJ-   Operation list

Operation	Operation class	Performer	Description
Inter-server service profile inquiry (GetSerProfInf)	2	Home server	Used to inquire service profile information required for SS-IPR of the home server. This operation is independent of a call.
Inter-server location registration (LocRegUpd)	2	Home server	Used to register the PS roaming number with the home PINX. This operation is independent of a call.
Inter-server location registration deletion (LocRegDel)	2	Visitor server	Used to delete information about a PS in visitor servers. This operation is independent of a call.
Inter-server roaming call forwarding (RomCallFwrd)	3	Visitor server	Used to forward a call to a PS in the coverage of a visitor server. This operation is related with a call.
Inter-server location information match (LocInfChk)	2	Home server/Visitor server	Used to check for a match of location information in a visitor server and that in the home server. This operation is independent of a call.
Inter-server authentication ciphering (AuthCipReq)	2	Home server	Used to make an authentication ciphering request to the home server. This operation is independent of a call. This is used only in Scenario 2. Note: This function is not used for WiFi terminals.

6.2.1 Home server requirements

The home server must employ the call control procedure described in IEFT-RFC3261 (JJ-22.01).   Inter-server connections are established in every procedure.

6.2.2 Visitor server requirements

The visitor server must employ the call control procedure described in IEFT-RFC3261 (JJ-22.01).   Inter-server connections are established in every procedure.

6.2.3 Transit server requirements

The transit server is not to be taken into account, but if a server is to handle transit, a proxy server mainly serves for routing and roaming information is just passed through.

6.3 SS-ISR operation coding requirements

6.3.1 Operations

Table 6.2/JJ shows SS-ISR-intended XML-coded operations.

Table 6.2/JJ- Operation coding (1/3)

{XML: Ver   XXXXX   }

 Inter•Server•Roaming•Operations {ccitt(0) administration(2) japan(440)

  pnw(101) inter•pbx•roaming(2)}

  $\Rightarrow$ To be quoted from JJ-20.60.

Table 6.2/JJ-　Operation coding (2/3)

●● The following operations are common to Scenario 1 and Scenario 2.

GetSerProfInf ::=　OPERATION

　　ARGUMENT　GetSerProfInfArg

　　RESULT　　　GetSerProfInfRes

　　ERRORS　　{userNotSubscribed, notAvailable, insufficientInformation}

LocRegUpd ::=　OPERATION

　　ARGUMENT　LocRegUpdArg

　　RESULT

　　ERRORS　　{notAvailable, insufficientInformation}

LocRegDel ::=　OPERATION

　　ARGUMENT　LocRegDelArg

　　RESULT

　　ERRORS　　{notAvailable, insufficientInformation}

RomCallFwrd　::= OPERATION

　　ARGUMENT　RomCallFwrdArg

　　ERRORS　　{notAvailable, insufficientInformation}

LocInfChk ::=　OPERATION

　　ARGUMENT　LocInfChkArg

　　RESULT　　　LocInfChkRes

　　ERRORS　　{notAvailable, insufficientInformation}

　●●The following operations are used only in Scenario 2.

AuthCipReq ::=　OPERATION

　　ARGUMENT　AuthCipReqArg

　　RESULT　　　AuthCipReqRes

　　ERRORS　　{insufficientInformation, notAvailable }

GetSerProfInfArg ::= SET {psn   [2]IMPLICIT PsNumber}

GetSerProfInfRes ::= SET {ps•id [1]IMPLICIT Ps•Id,

      class [4]IMPLICIT SubscriberClass OPTIONAL,

      callingPartyNumberIETF-RFC3261InformationElement

OPTIONAL   ●● PS (WiFi) terminal calling party number.   Same as the type of the calling party number information element by IETF-RFC3261.

      IMPLICIT CHOICE {

        authkey [3]IMPLICIT AuthenticationKey,

        ●● Used in Scenario 1.

        authkeyinf AuthenticationKeyInformation,

        -- Used in Scenario 1a.

        authinf AuthenticationInformation}}

        ●● Used in Scenario 2.

LocRegUpdArg   ::=   SET {psn   [2]IMPLICIT PsNumber,

      rmnum [5]IMPLICIT RoamingNumber}

RomCallFwrdArg ::=   SET {psn   [2]IMPLICIT PsNumber

      calledpartyNumber IETF-RFC3261InformationElement OPTIONAL}

      ●● **PS (WiFi) terminal** called party number.   Same as the type of the called party number information element by IEFT-RFC3261.

LocRegDelArg   ::=   SET {psn   [2]IMPLICIT PsNumber}

LocInfChkArg   ::=   SET {psn   [2]IMPLICIT PsNumber,

      rmnum [5]IMPLICIT RoamingNumber}

LocInfChkRes   ::=   SET {reply [6]IMPLICIT Reply}

AuthCipReqArg ::=   SET {psn   [2]IMPLICIT PsNumber,

      rnd   [8]IMPLICIT AuthenticationRandomPattern}

AuthCipReqRes ::=   SET {authres [9]IMPLICIT AuthenticationCipheringPattern}

AuthenticationKeyInformation::=IMPLICIT SET{authtype[10]IMPLICIT

      AuthenticationType,

      authkey [3]IMPLICIT

      AuthenticationKey}

AuthenticationInformation ::=IMPLICIT SET {authtype[10]IMPLICIT

      AuthenticationType,

      rndlen [7]IMPLICIT

      AuthenticationRandomPatternLength}

6.3.2   Information elements

6.3.2.1   Facility information element

The facility information element is transmitted between the home server and a visitor server.   For details of facility information element coding, refer to IEFT-RFC3261(JJ-22.01).

6.3.2.2   Called party number information element

The operation of roaming call forwarding relates to a call employing IEFT-RFC3261 (JJ-22.01), and concerning the content of the called party number information element to be handled, RQT-LINE between servers is used.   The other operations are independent of a call.

6.3.2.3   Other information elements

For details on other information element coding, refer to IEFT-RFC3261(JJ-22.01).

6.3.3   Messages

For details of the messages, refer to IEFT-RFC3261(JJ-22.01).

6.4   SS-ISR status definitions

Concerning the SS-IPR procedure, the following conceptual statuses are represented.

6.4.1   Home server statuses

6.4.1.1   Inter-server location registration procedure

6.4.1.1.1   ISR-registration-idle

Status in which the inter-server location registration operation is not activated.

6.4.1.1.2   ISR-registration-wait for location registration

Status in which "Inter-server service profile inquiry" return result XML has been sent to a visitor server.

6.4.1.2   Inter-server location registration deletion procedure

6.4.1.2.1   ISR-deletion-idle

Status in which the inter-server location registration deletion operation is not activated.

6.4.1.2.2   ISR-deletion-request for location registration deletion

Status in which "Inter-server location registration deletion" invoke XML has been sent to a visitor server.

6.4.1.3   Inter-server roaming termination procedure

6.4.1.3.1   ISR-call forwarding-idle

Status in which the inter-server roaming call forwarding operation is not activated.

6.4.1.3.2   ISR-call forwarding-roaming call forwarding

Status in which "Inter-server roaming call forwarding" invoke XML has been sent to a visitor server.

6.4.1.4   Inter-server location information match procedure

6.4.1.4.1   ISR-match-idle

Status in which the inter-server location information match operation is not activated.

6.4.1.4.2   ISR-match-request for location information match

Status in which "Inter-server location information match" invoke XML has been sent to a visitor server.

6.4.1.5   Inter-server authentication ciphering procedure

The procedure is not defined.   (Concerning PSs, refer to JJ-20.60).

6.4.1.5.1   ISR-authentication-idle

Status in which the inter-server authentication ciphering operation is not activated.

6.4.2   Visitor server statuses

6.4.2.1   Inter-server location registration procedure

6.4.2.1.1   ISR-registration-idle

Status in which the inter-server location registration operation is not activated.

6.4.2.1.2   ISR-registration-request for service profile inquiry

Status in which "Inter-server service profile inquiry" invoke XML has been sent to the home server.

6.4.2.1.3   ISR-registration-wait for location registration

Status in which an inter-server roaming service profile has been received from the home server.

6.4.2.1.4   IPR-registration-request for location registration

Status in which "Inter-server location registration" invoke APDU has been sent to the home server.

6.4.2.2   Inter-server location registration deletion procedure

6.4.2.2.1   ISR-deletion-idle

Status in which the inter-server location registration deletion operation is not activated.

6.4.2.3   Inter-server roaming termination procedure

6.4.2.3.1   ISR-call forwarding-idle

Status in which the inter-server roaming call forwarding operation is not activated.

6.4.2.4   Inter-server location information match procedure

6.4.2.4.1   ISR-match-idle

Status in which the inter-server location information match operation is not activated.

6.4.2.4.2   ISR-match-request for location information match

Status in which "Inter-server location information match" invoke XML has been sent to the home server.

6.4.2.5   Inter-server authentication ciphering procedure

The procedure is defined only in Scenario 2.

6.4.2.5.1   ISR-authentication-idle

Status in which the inter-server authentication ciphering operation is not activated.

6.4.2.5.2   ISR-authentication-request for authentication ciphering

Not defined.   (Concerning PSs, quote JJ-20.60.)

6.5   SS-ISR signalling procedure

This section stipulates the SS-ISR signalling procedure.   Note that descriptions about internal operations of the home server and visitor server, processing for PS (WiFi terminal) in a radio section, and so forth that are out of the scope of the signalling procedure are also provided for better understanding as needed.

6.5.1   Inter-server location registration procedure

The inter-server location registration procedure, which is a set of processing of service profile acquisition, PS authentication, and inter-server location registration, is activated by a visitor server when a PS comes in its coverage.

6.5.1.1 Visitor server operations

6.5.1.1.1 Service profile acquisition

6.5.1.1.1.1 Normal procedure

A server, which receives a request of location registration from a PS, recognizes that PS as a visitor server when the PS number of the PS has not been registered in the HLR or VLR and then starts the inter-server location registration procedure.

The visitor server analyzes the PS number of the PS, identifies its home server, sends "Inter-server service profile inquiry" invoke XML to the home server, starts running Timer T1, and then gets into the "ISR-registration-request for service profile inquiry" status.

When "Inter-server service profile inquiry" return result XML is received from the home server, it stops Timer T1 and then gets into the "ISR-registration-wait for location registration" status.

6.5.1.1.1.2 Quasi-normal procedure

If "Inter-server service profile inquiry" invoke XML is unable to be sent to the home server, the visitor server notifies the PS of location registration failure.

When "Inter-server service profile inquiry" return error XML or return reject XML is received from the home server, the visitor server stops Timer T1, notifies the PS of location registration failure, and then gets back to the "ISR-registration-idle" status.

When Timer T1 times out, the visitor server notifies the PS of location registration failure and then gets back to the "ISR-registration-idle" status.

6.5.1.1.2 PS authentication

6.5.1.1.2.1 Normal procedure/Quasi-normal procedure

WiFi terminals depend on Radius protocol authentication.

PSs depend on JJ-20.60.

6.5.1.1.3 Inter-server location registration

6.5.1.1.3.1 Normal procedure

The visitor server sends "Inter-server location registration" invoke XML including the inter-server roaming number assigned to the PS (WiFi terminal) to Home XML, starts Timer T1, and then gets into the "ISR-registration-request for location registration" status.

When "Inter-server location registration" return result XML is received from the home server, the visitor server stops Timer T1, registers the PS (WiFi terminal) to the VLR, notifies the PS of successful location registration, and then gets back to the "ISR-registration-idle" status.

6.5.1.1.3.2 Quasi-normal procedure

If "Inter-server location registration" invoke XML is unable to be sent to the home server, the visitor server notifies the PS (WiFi terminal) of location registration failure, and then gets back to the "ISR-registration-idle" status.

When "Inter-server location registration" return error XML or return reject XML is received from the home server, the visitor server stops Timer T1, notifies the PS of location registration failure, and then gets back to the "ISR-registration-idle" status.

When Timer T1 times out, the visitor server notifies the PS of location registration failure and then gets back to the "ISR-registration-idle" status.

6.5.1.2 Home server operations

6.5.1.2.1 Service profile notification

6.5.1.2.1.1 Normal procedure

When a server receives "Inter-server service profile inquiry" invoke XML, it recognizes that it is the home server.

When the PS number included in the invoke XML has been registered with the HLR and if the inter-server roaming service is allowed, it sends "Inter-server service profile inquiry" return result XML to the visitor server, starts Timer T2, and then gets into the "ISR-registration-wait for location registration" status.

6.5.1.2.1.2 Quasi-normal procedure

If the PS number included in the invoke XML has not been registered with the HLR, the home server sends "Inter-server service profile inquiry" return error XML to the visitor server and then gets back to the "ISR-registration-idle" status.

When the PS (WiFi terminal) number has been registered with the HLR but the inter-server roaming service is not allowed, the home server sends "Inter-server service profile inquiry" return error XML to the visitor server and then gets back to the "ISR-registration-idle" status.

6.5.1.2.2 Inter-server location registration

6.5.1.2.2.1 Normal procedure

In the "ISR-registration-wait for location registration" status, when "Inter-server location registration" invoke XML is received from the visitor server, the home server stops Timer T2 and registers the inter-server roaming number included in the invoke XML with the HLR. After that, it sends "Inter-server location registration" return result XML to the visitor server and then gets back to the "ISS-registration-idle" status.

6.5.1.2.2.2 Quasi-normal procedure

If the inter-server roaming number is invalid, the home server sends "Inter-server location registration" return error XML to the visitor server and then gets back to the "ISR-registration-idle" status.

When Timer T2 times out, the home server gets back to the "ISR-registration-idle" status.

6.5.2   Inter-server location registration deletion procedure

When the inter-server roaming number in the HLR needs to be updated or deleted and if another inter-server roaming number (referred to as the former inter-server roaming number hereafter) has been registered, the home server activates the inter-server location registration deletion procedure.

6.5.2.1   Home server operations

6.5.2.1.1   Normal processing

The home server analyzes the former inter-server roaming number to identify the former visitor server, sends "Inter-server location registration deletion" invoke XML to the former visitor server, starts Timer T1, and then gets into the "ISR-deletion-request for location registration deletion" status.

When "Inter-server location registration deletion" return result XML is received from the former visitor server, it stops Timer T1 and then gets back to the "ISR-deletion-idle" status.

6.5.2.1.2   Quasi-normal procedure

If "Inter-server location registration deletion" invoke XML is unable to be sent to the former visitor server, the home server may activate the inter-server location registration deletion procedure again.

When "Inter-server location registration deletion" return error XML or return reject XML is received from the former visitor server, the home server stops Timer T1 and then gets back to the "ISR-deletion-idle" status.

When Timer T1 times out, the home server gets back to the "ISR-deletion-idle" status.

6.5.2.2   Former visitor server operations

6.5.2.2.1   Normal procedure

When a server receives "Inter-server location registration deletion" invoke XML, it recognizes that it is the former visitor server. When the PS number included in the invoke XML has been registered with the VLR, it deletes the registration and then sends "Inter-server location registration deletion" return result XML to the home server.

6.5.2.2.2   Quasi-normal procedure

If the PS number included in the invoke XML has not been registered with the VLR, the former visitor server sends "Inter-server location registration deletion" return error XML to the home server.

6.5.3   Origination procedure

6.5.3.1   Visitor server operations

6.5.3.1.1   Normal procedure

A visitor server that receives a call request from a PS (WiFi terminal) authenticates the PS according to the service profile information registered with the VLR, and only when it is successfully authenticated, call initiation is continued.   If the VLR has registrations of the calling party number and subscriber class in the service profile information, the information may be usable in call initiation.

6.5.3.1.2   Quasi-normal procedure

If the PS could not be successfully authenticated, the visitor server clears the originated call with the regular call control procedure.

6.5.3.2   Home server operations

The home server is not concerned with the PS origination procedure of the visitor server.

6.5.4   Termination procedure

6.5.4.1   Home server operations

6.5.4.1.1   Normal procedure

The home server that receives a call forwarding request to a PS searches the HLR, and when the PS is in the coverage of the home server, it performs the regular call forwarding.   If the PS is not in the coverage of the home server, it obtains the inter-server roaming number from the HLR and performs call forwarding to the inter-server roaming number.   On that occasion, the home server sends "Inter-server roaming call forwarding" invoke XML to the visitor server, starts Timer T3, and gets into the "ISR-call forwarding-roaming call forwarding" status.   The home server may set the called party number of the received call forwarding request to the called party number information element of "Inter-server roaming call forwarding" invoke XML to notify the visitor server of it.

When Timer T3 times out, the home server gets back to the "ISR-call forwarding-idle" status.   If the call forwarding to the visitor server is unsuccessful, the home server stops Timer T3, and then gets back to the "ISR-call forwarding-idle" status.

6.5.4.1.2   Quasi-normal procedure

When "Inter-server roaming call forwarding" return error XML or return reject XML is received from the visitor server, the home server stops Timer T3, and then gets back to the "ISR-call forwarding-idle" status.   After that, the home server may perform HLR recovery processing as needed.

6.5.4.2   Visitor server operations

6.5.4.2.1   Normal procedure

When a visitor server receives "Inter-server roaming call forwarding" invoke XML, it checks if the PS number included in the XML information and the inter-server roaming number are the same sa those stored in the VLR.   When they match, it starts call forwarding to the PS.

Note that the visitor server authenticates the PS (WiFi terminal) according to the service profile information registered with the VLR during call forwarding and continues call forwarding only when the authentication is successful.

6.5.4.2.2 Quasi-normal procedure

If the PS matching results of the PS(WiFi terminal) number and inter-server roaming number are positive, the visitor server sends "Inter-server roaming call forwarding" return error XML to the home server and perform call clearing by using response #41 "404".   After that, the visitor server may perform VLR recovery processing as needed.

(Note) Operation "Inter-server roaming call forwarding" in the visitor server successfully ends when the result of matching is determined as consistent.   Therefore, PS busy, PS no-reply, or another incident causes call forwarding to the PS to be incomplete, operation "Inter-server roaming call forwarding" sends nothing to the home server.

If PS authentication is unsuccessful, the visitor server clears the call with the regular call control procedure.

6.5.5   Inter-PINX location information match procedure

6.5.5.1   Activation by visitor PINX

6.5.5.1.1   Visitor PINX operations

6.5.5.1.1.1   Normal procedure

A visitor server sends "Inter-server location information match" invoke XML to the home server, starts Timer T1, and gets into the "ISR-match-request for location information match" status.

When "Inter-server location information match" return result XML is received from the home server, it stops Timer T1 and then gets back to the "ISR-match-idle" status.   If the result included in the return result XML indicates a mismatch, the PS may be deleted from the VLR.

6.5.5.1.1.2   Quasi-normal procedure

If "Inter-server location information match" invoke XML is unable to be sent to the home server, the visitor server may activate the inter-server location information match procedure again.

When "Inter-server location information match" return error XML or return reject XML is received from the home server, the visitor server stops Timer T1, and then gets back to the "ISR-match-idle" status.   After that, it deletes the PS from the VLR.

When Timer T1 times out, the visitor server gets back to the "ISR-match-idle" status.

6.5.5.1.2   Home server operations

6.5.5.1.2.1   Normal procedure

When the home server receives "Inter-server location information match" invoke XML, it checks whether the PS number included in the invoke XML has been registered with HLR, and when it has been registered, the home server checks the other information included in the invoke XML with the HLR and sends "Inter-server location information match" return result XML to the visitor server with information of those matching.

6.5.5.1.2.2 Quasi-normal procedure

If the PS number included in the invoke XML has not been registered with the HLR, the home server sends "Inter-server location information match" return error XML to the visitor server.

6.5.5.2 Activation by home server

6.5.5.2.1 Home server operations

6.5.5.2.1.1 Normal procedure

The home server sends "Inter-server location information match" invoke XML to the visitor server, starts Timer T1, and then gets into the "ISR-match-request for location information match" status.

When "Inter-server location information match" return result XML is received from the visitor server, stops Timer T1, and then gets back to the "ISR-match-idle" status. If the result of matching included in the return result XML is inconsistent, the inter-server roaming number of the PS in the HLR may be invalidated.

6.5.5.2.1.2 Quasi-normal procedure

If "Inter-server location information match" invoke XML is unable to be sent to the visitor server, the home server may activate the inter-server location information match procedure again.

When "Inter-server location information match" return error XML or return reject XML is received from the visitor server, the home server stops Timer T1, and then gets back to the "ISR-match-idle" status. After that, it initializes data of the PS in the HLR.

When Timer T1 times out, the home server gets back to the "ISR-match-idle" status.

6.5.5.2.2 Visitor server operations

6.5.5.2.2.1 Normal procedure

When a visitor server receives "Inter-server location information match" invoke XML, it checks whether the PS number included in the invoke XML has been registered with the VLR, and when it has been registered, the visitor server checks the other information included in the invoke XML with the VLR and sends "Inter-server location information match" return result XML to the home server with information of those matching.

6.5.5.2.2.2 Quasi-normal procedure

If the PS number included in the invoke XML has not been registered with the VLR, the visitor server sends "Inter-server location information match" return error XML to the home server.

6.5.6 Inter-server authentication ciphering procedure

This procedure, which does not related to WiFi terminals, is not described.

Concerning PS operations, refer to JJ-20.60.

6.6   SS-ISR parameter values

6.6.1   Timer T1

Servers must run Timer T1 whenever sending invoke XML of operation class 2 defined by SS-ISR in order to monitor a response to the invoke XML.

Timer T1 is to start when invoke XML of operation class 2 defined by SS-ISR is sent and stop when return result XML, return error XML, or return reject XML is received in reply.   When Timer T1 expires, the procedures stipulated in Section 6.5 must be followed.

Timer T1 is to default to 30 seconds.

6.6.2   Timer T2

Concerning the inter-server location registration procedure, the home server must run Timer T2 in order to monitor activation of the inter-server location registration operation.

Timer T2 is to start when "Inter-server service profile inquiry" return result XML is sent and stop when "Inter-server location registration" invoke XML is received in reply.   When Timer T2 expires, the procedures stipulated in Section 6.5 must be followed.

Timer T2 is to default to 30 seconds.

6.6.3   Timer T3

Servers must run Timer T3 whenever sending invoke XML of operation class 3 defined by SS-ISR in order to monitor an error response to the invoke XML.

Timer T3 is to start when invoke XML of operation class 3 defined by SS-ISR is sent and stop when return error XML or return reject XML is received in reply.   When Timer T3 expires, the procedures stipulated in Section 6.5 must be followed.

Timer T3 is to default to 30 seconds.

6.7   Interaction with other services

6.7.1   Calling line identification presentation (CLIP)

No interaction

6.7.2   Calling line identification restriction (CLIR)

No interaction

6.7.3   Connected line identification presentation (COLP)

No interaction

6.7.4   Connected line identification restriction (COLR)

No interaction

6.7.5   Call forwarding unconditional (CFU)

No interaction

6.7.6   Call forwarding busy (CFB)

No interaction

6.7.7   Call forwarding no reply (CFNR)

No interaction

6.7.8   Call deflection (CD)

No interaction

Appendix A (Reference)　XML Definition

Framework of the entire message body

The following shows an example of a new header in a method.

Session Initiation Protocol
　　Request-Line: INVITE sip:XXXXXXXX@domain.ne.jp;user=phone SIP/2.0
　　　　Method: INVITE
　　　　Resent Packet: False
　　Message Header
　　　　Via: SIP/2.0/UDP 100.50.20.170:5060;branch=z9hG4bK-a52f26-496736.761
　　　　From: <sip:XXXXXXXX@domain;.ne.jp;user=phone>;tag=14748c89
　　　　To: <sip:XXXXXXXX@domain.ne.jp;user=phone>
　　　　Call-ID: 722df03a@100.50.20.170
　　　　CSeq: 787025002 INVITE
　　　　Contact: <sip:XXXXXXX@100.50.20.170:5060>
　　　　　　Contact Binding: <sip:XXXXXXX@100.50.20.170:5060>
　　　　　　　　URI: <sip:XXXXXXXX@100.50.20.170:5060>
　　　　　　　　　　SIP contact address: sip:XXXXXXXX@100.50.20.170:5060
　　　　Max-Forwards: 55
　　　　Supported:
　　　　Session-Expires: 180
　　　　P-Preferred-Identity: <tel:XXXXXXXXXX>
　　　　Privacy: none
　　　　Allow: INVITE, ACK, BYE, CANCEL, PRACK
　　　　Content-Type: application/ENTERNAT
　　　　Content-Length:　　　153
　　Message body
　　　　Enterprise Native Protocol
　　　　　　Enterprise Native Protocol Version(v):0

```
{XML: Ver0.0.1 roaming supplementary service       }

  / GetSerProfInf ::=   OPERATION/

  / ARGUMENT   GetSerProfInfArg/ direction of location registration

 / Wifi (PS number) 5000/ roaming number

      . . . . .
```
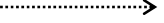

Supplementary description
　　Concerning ENTERNAT of Content-Type, TTC standards (Private SIP) shall be applied.

Appendix B (Reference)　Examples of Message Sequences

This Appendix provides examples of major SS-ISR message sequences.

1.　The following representations are employed in this Appendix.

Message of a signal relating to a call including information dedicated for SS-ISR

Message of a signal relating to a call not including information dedicated for SS-ISR

Message of a signal independent of a call including information dedicated for SS-ISR

Message of a signal independent of a call not including information dedicated for SS-ISR

xxx.inv　Invoke XML of operation xxx

xxx.res　Return result XML of operation xxx

xxx.err　Return error XML of operation xxx

2.　Examples of message sequences with SS-ISR inter-server protocol control are provided.

3.　In the message sequences, above transmission-representing arrows, message names are indicated, and below them, operation names are indicated.

However, information not relating to SS-ISR is not provided.

B.1　Inter-server location registration (normal)

Examples of normal messages sequences of the endpoint-type inter-server location registration procedure are provided.

B.1.1　Roaming operation 1 (sequence)

Sequence in the case where a WiFi terminal (AAAA) of Point Code 62 roams to the node of Point Code 47

a)　Roaming location registration information sequence

Server (Point Code 47)　　　　　　　　　Server (Point Code 62)

<VLR>　　　　　　　　　　　　　　　　　<HLR>

Terminal roams

WiFi terminal
(roaming permitted)
AAAA
(power-on)

Reg: AAAA

INVITE (roaming: RQT<SIP: 62AAAA>
XML　GetSerProfinf.inv: 62AAAA)

100　Trying

200 (roaming:)
XML: GetSerProfinf.res: 62AAAA<home station number>

200

ACK

INVITE (roaming: RQT<sip:62AAAA>
XML:LocRegUPD.inv: <routing number>62AAAA
<Visitor station number + Temporary extension number
at the visitor station (virtual number)
47-5000

100 Trying

487 (roaming)
XML: LocRegUpd.res

ACK

Completion of location registration

B.2   Sequence for connection in VLR point after roaming location registration (1)

・Call forwarding from the roaming terminal (62-AAAA) to the extension (BBBB) of the VLR point

Concerning the called number, BBBB is dialed.
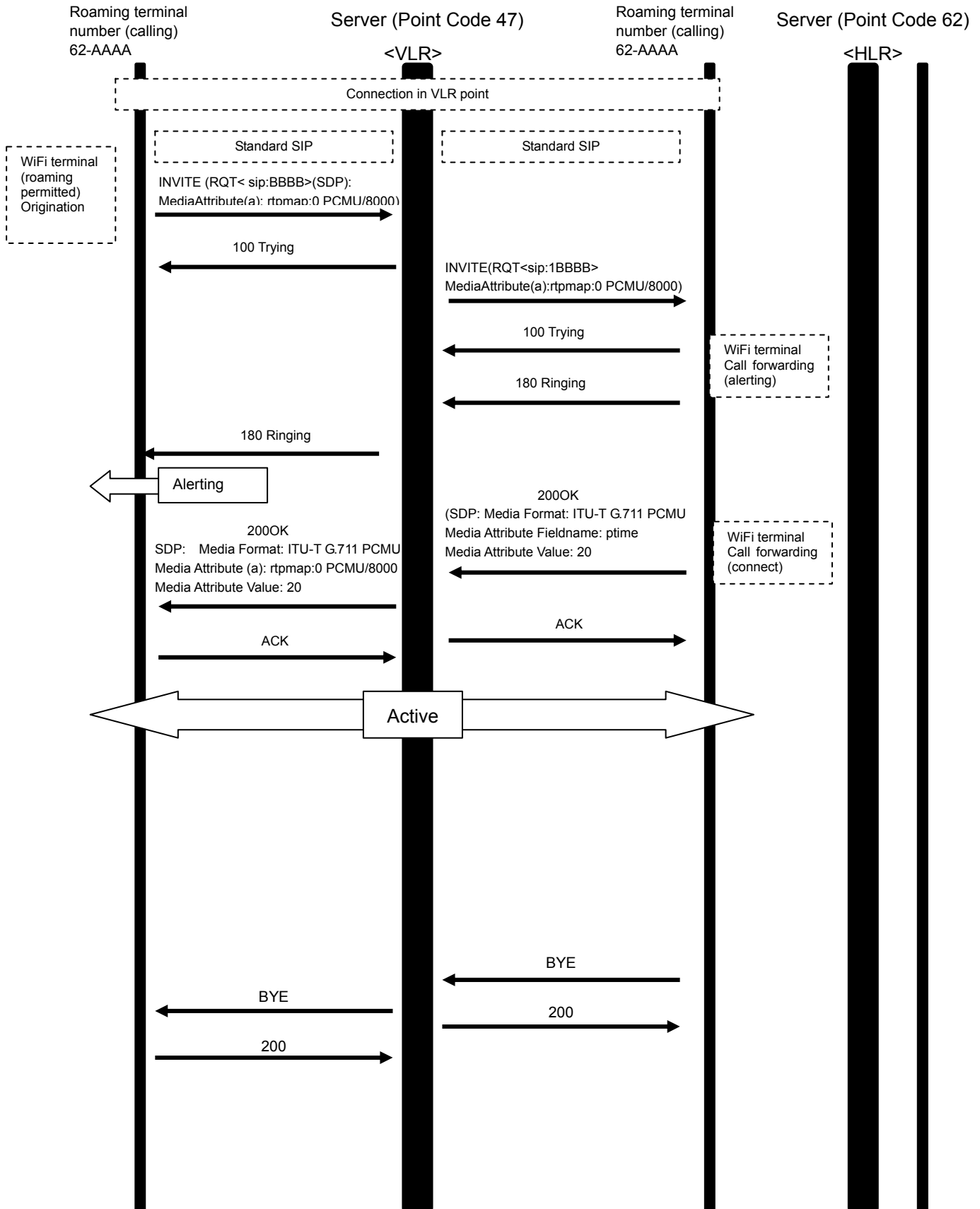
B.2   Sequence for connection in VLR point after roaming location registration (2)

・Call forwarding from Extension (BBBB) in the VLR point to the roaming terminal (62-AAAA)

Concerning the called number, 62-AAAA is dialed.

Continued from the previous page

WiFi terminal
(roaming
permitted)
Call forwarding
(connect)

200OK

ACK

200OK

ACK

200OK

ACK

200 OK

ACK

Active

WiFi terminal
Calling (disconnect)

BYE

200

BYE

200

BYE

200

BYE

200

B.3　Ringing of the roaming terminal in HLR point after roaming location registration

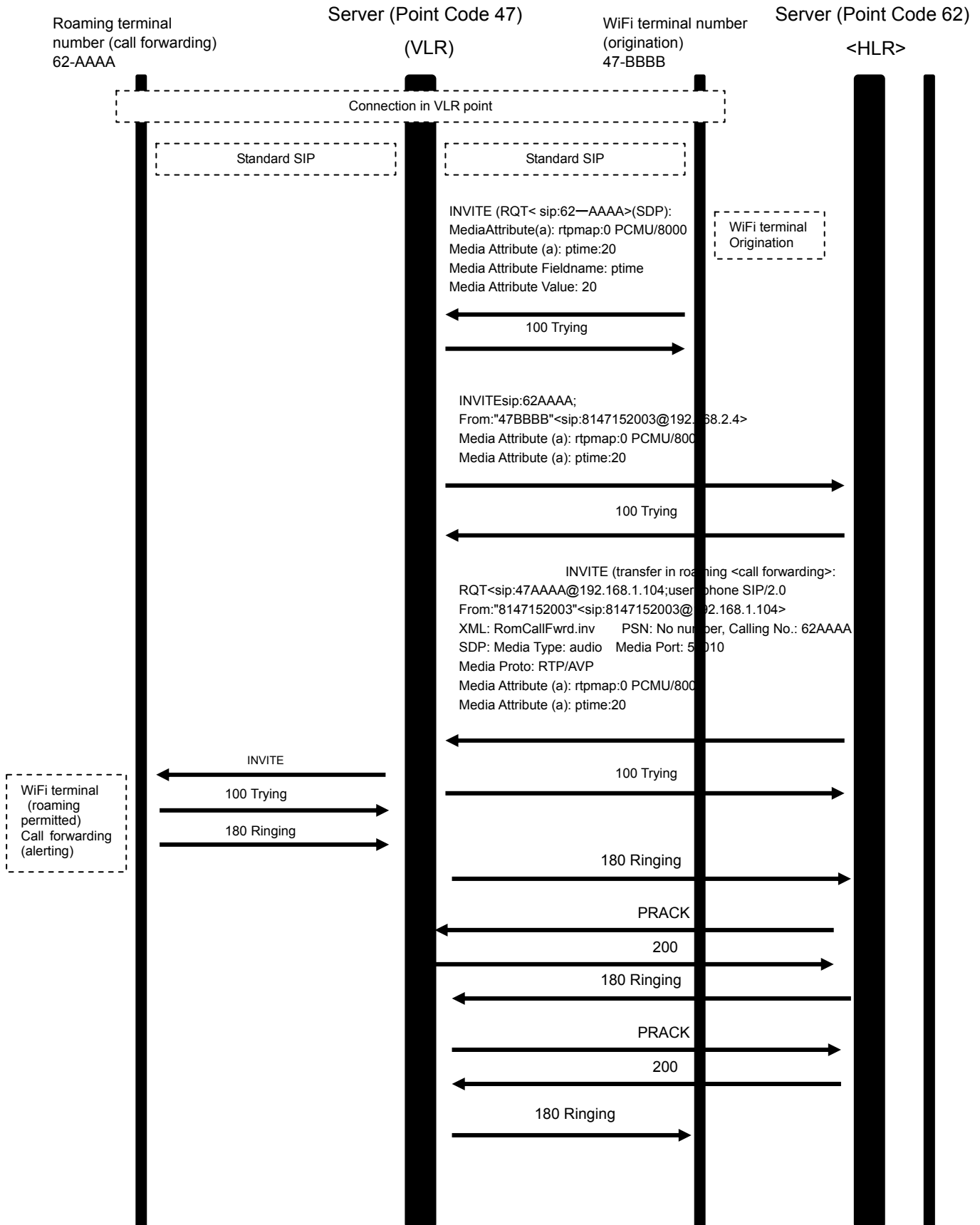・Call forwarding from the fixed terminal (62-AAAA) to the extension (62-BBBB) in the VLR point
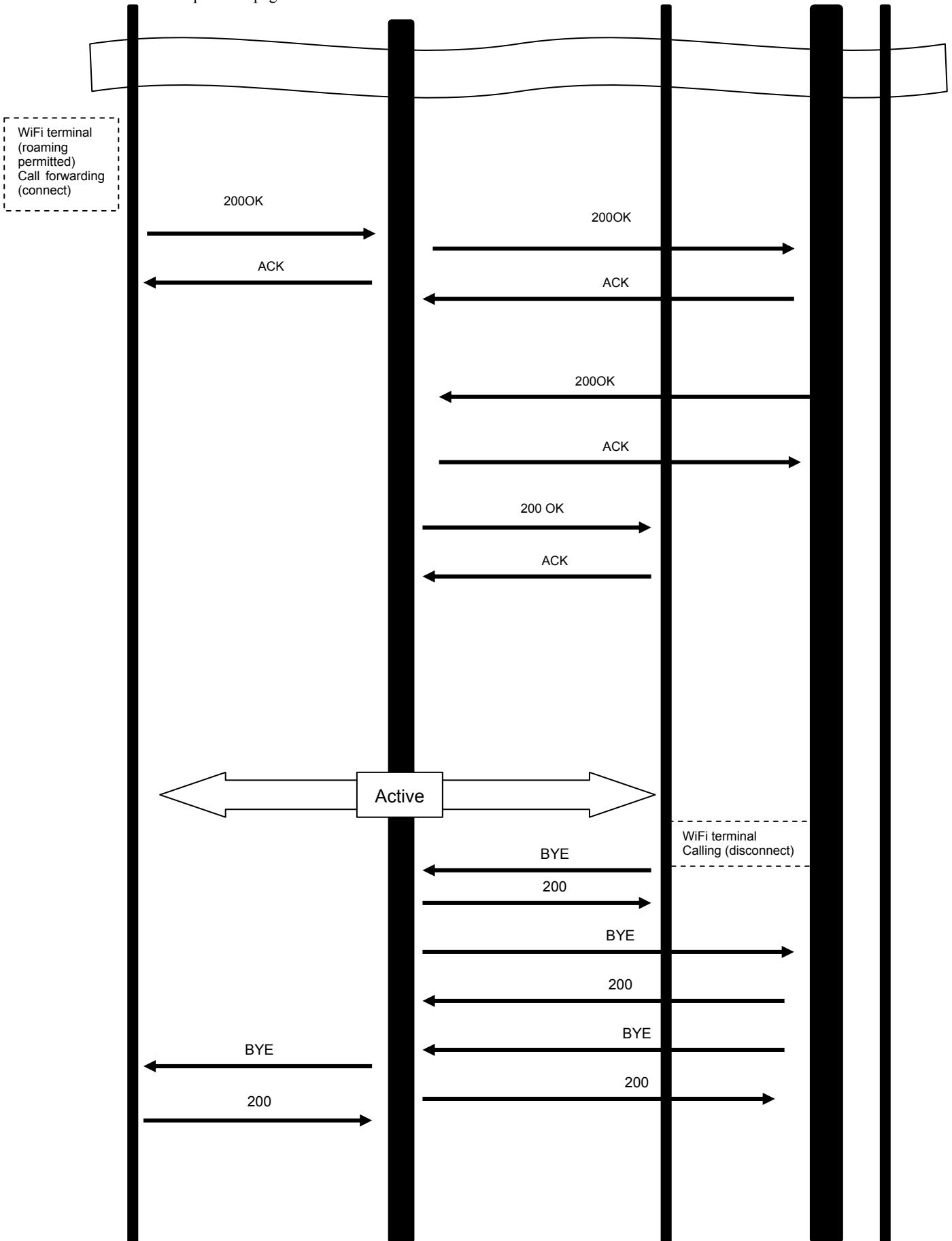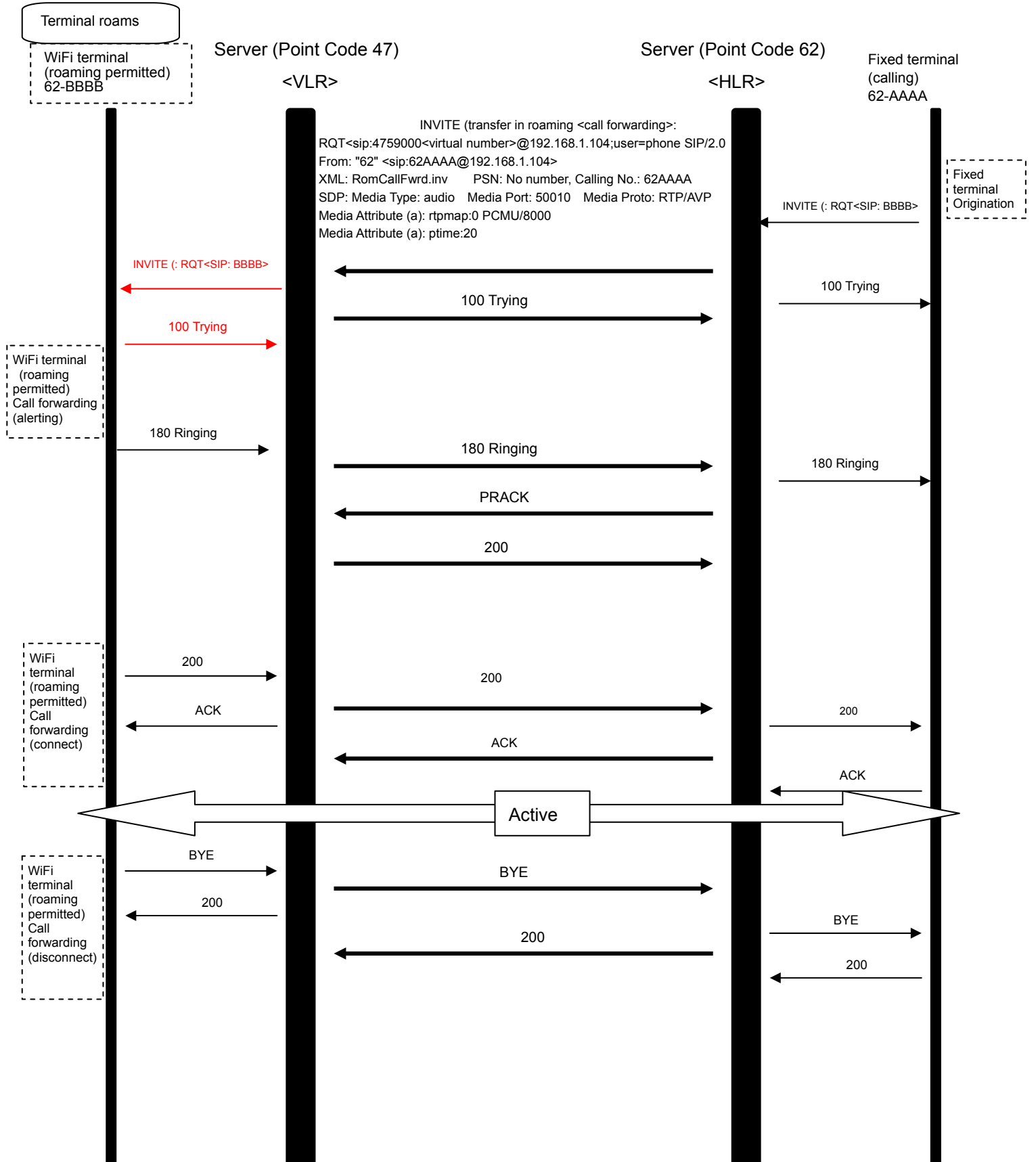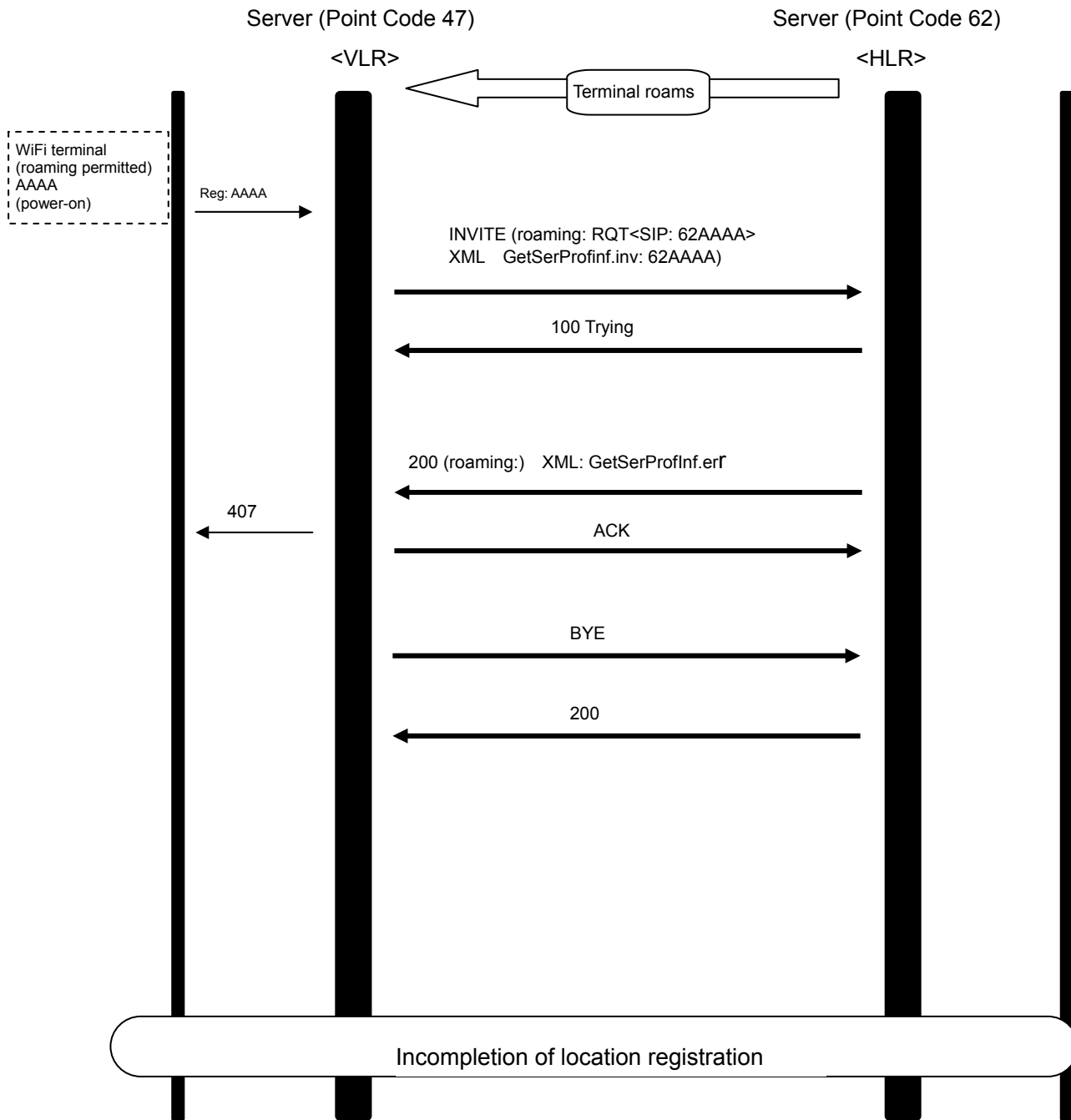
Concerning the called number, BBBB is dialed.

Terminal roams

WiFi terminal (roaming permitted) 62-BBBB

Server (Point Code 47)
<VLR>

Server (Point Code 62)
<HLR>

Fixed terminal (calling) 62-AAAA

INVITE (transfer in roaming <call forwarding>:
RQT<sip:4759000<virtual number>@192.168.1.104;user=phone SIP/2.0
From: "62" <sip:62AAAA@192.168.1.104>
XML: RomCallFwrd.inv　　PSN: No number, Calling No.: 62AAAA
SDP: Media Type: audio　　Media Port: 50010　　Media Proto: RTP/AVP
Media Attribute (a): rtpmap:0 PCMU/8000
Media Attribute (a): ptime:20

Fixed terminal Origination

INVITE (: RQT<SIP: BBBB>

INVITE (: RQT<SIP: BBBB>

100 Trying

100 Trying

100 Trying

WiFi terminal (roaming permitted) Call forwarding (alerting)

180 Ringing

180 Ringing

180 Ringing

PRACK

200

WiFi terminal (roaming permitted) Call forwarding (connect)

200

200

ACK

200

ACK

ACK

Active

WiFi terminal (roaming permitted) Call forwarding (disconnect)

BYE

BYE

200

BYE

200

200

- 37 -

JJ-22.07

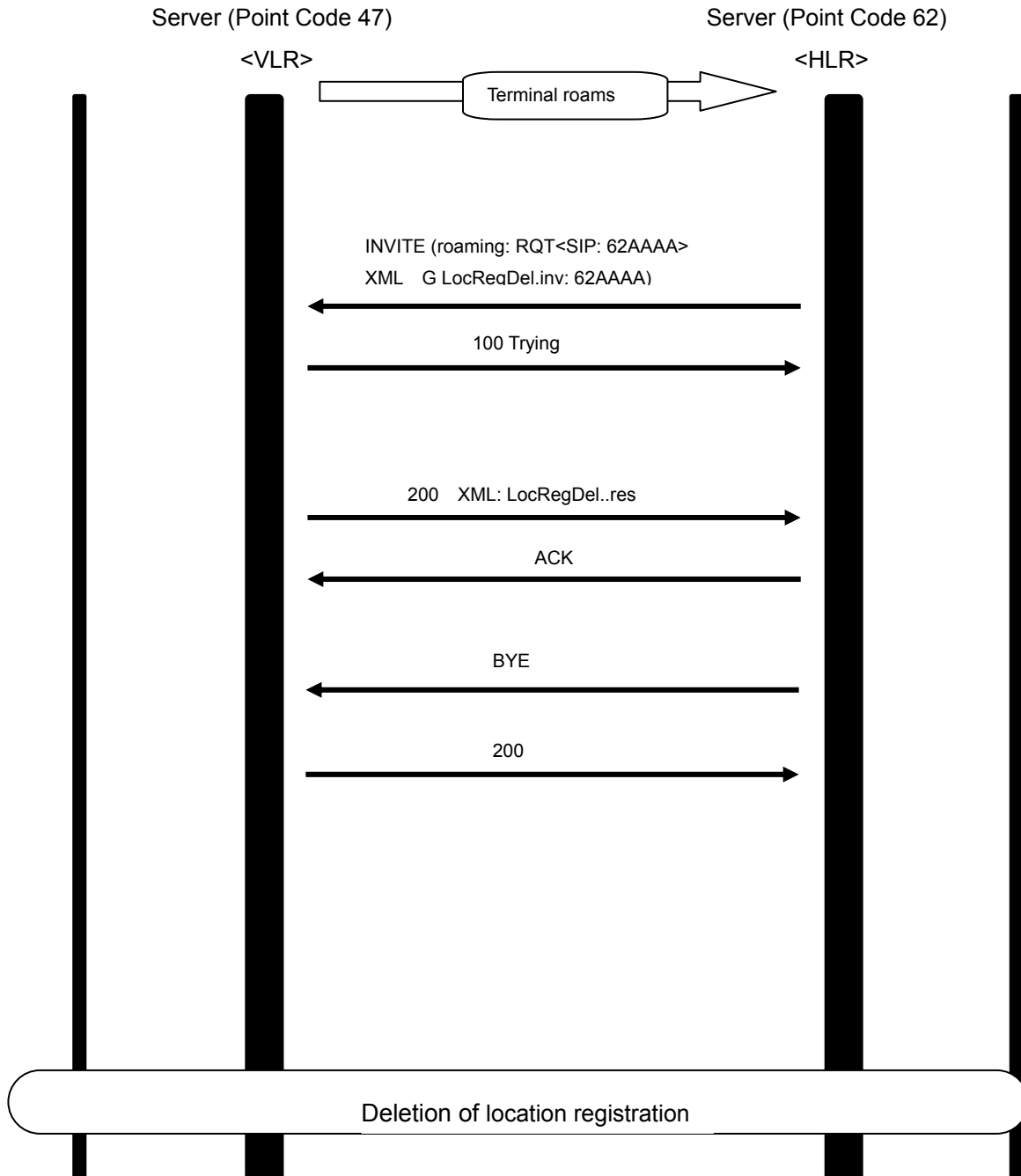B.4 Inter-server location registration (quasi-normal)

An example of the quasi-normal message sequence of the inter-server location registration procedure is provided.

This sequence example is employed for SS-ISR restriction or the like in the home server.

Server (Point Code 47)
<VLR>

Server (Point Code 62)
<HLR>

Terminal roams

WiFi terminal
(roaming permitted)
AAAA
(power-on)

Reg: AAAA

INVITE (roaming: RQT<SIP: 62AAAA>
XML   GetSerProfinf.inv: 62AAAA)

100 Trying

200 (roaming:)   XML: GetSerProfInf.err

407

ACK

BYE

200

Incompletion of location registration

B.5 Inter-server location registration deletion (normal)

An example of the normal message sequence of the inter-server location registration deletion procedure is given below.

Server (Point Code 47)   Server (Point Code 62)

<VLR>   <HLR>

Terminal roams

INVITE (roaming: RQT<SIP: 62AAAA>
XML   G LocRegDel.inv: 62AAAA)

100 Trying

200   XML: LocRegDel..res

ACK

BYE
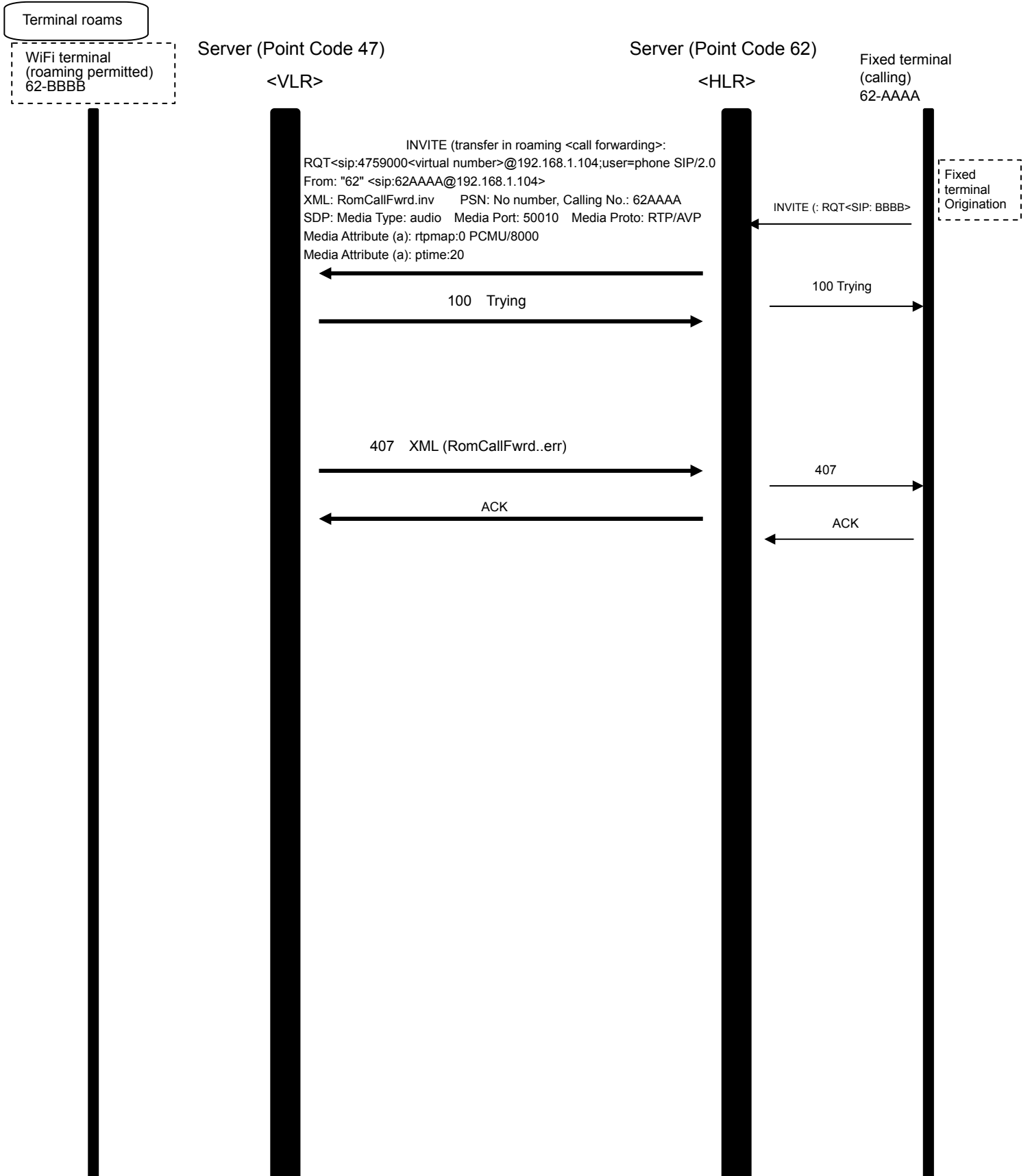
200

Deletion of location registration

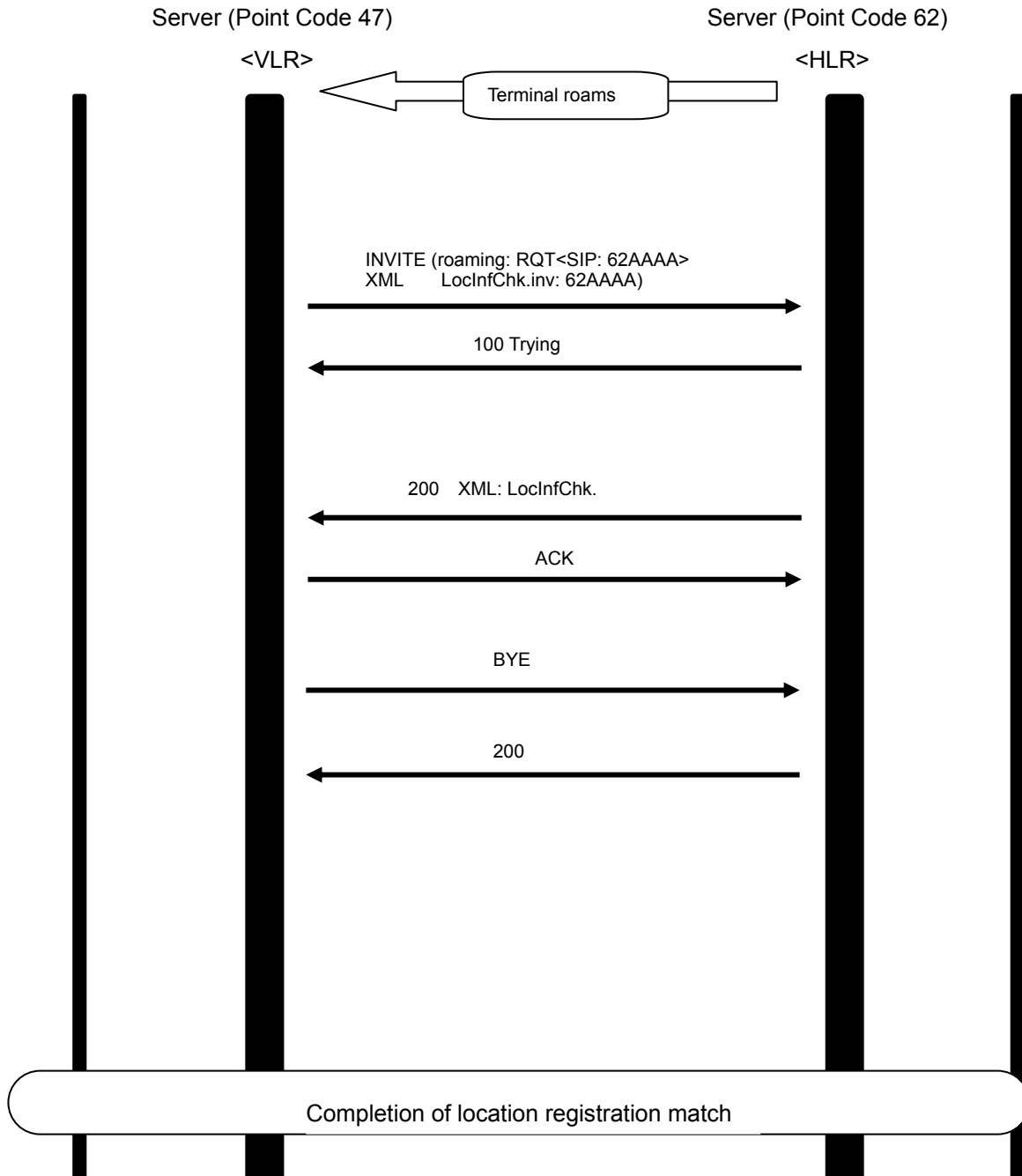B.6　Inter-server roaming call forwarding (quasi-normal)

An example of the quasi-normal message sequence of the inter-server roaming termination procedure is provided below.

This sequence example is employed in a case like where a visitor server cannot recognize a roaming WiFi terminal.

B.7   Inter-server location information match (normal)

An example of the normal message sequence of the inter-server location information match procedure activated by a visitor server is provided below.

Server (Point Code 47)   Server (Point Code 62)

<VLR>   <HLR>

Terminal roams

INVITE (roaming: RQT<SIP: 62AAAA>
XML   LocInfChk.inv: 62AAAA)

100 Trying

200   XML: LocInfChk.

ACK

BYE

200

Completion of location registration match

Private Integrated Services Network
(SIP Roaming Supplementary Service)
Specifications for SIP Interface

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TTC Original Standards [JJ-22.07]

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