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<On a Pre-SPIRITS Implementation in the KT Internet Call Waiting(ICW) Service>

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Abstract

This document provides the pre-SPIRITS Internet Call Waiting(ICW) Service Implementation developed by Korea Telecom. The document describes the ICW service and service features, the architecture, and the protocols, and illustrates the example scenario.

As such, this document contributes to the future SPIRITS architecture and protocol RFCs.

1. Introduction

The ICW service[1] allows the PSTN user to be notified of incoming calls and properly handle the calls while connected to the internet using dial-up modem.

Korea Telecom provides the Telephone Mail Service(TMS) based on Intelligent Network, which records the directory number or voice message from calling party when the called party(TMS subscriber) is busy or no-answer to complete the call. The ICW service is developed as a supplementary service to TMS. When the called party is busy, the IN system determines whether he/she is PSTN on-line or Internet on-

line and completes the call by forwarding to the TMS at the former case, or notifies the subscriber via internet session allowing he/she processes the incoming call at the latter case.

This document describes the ICW service implemented by Korea Telecom[2] as a supplementary service of KT TMS using PINT Service architecture and service protocol.

The rest of this document is as follows:

Chapter 2 describes the services and service features.
Chapter 3 describers the service architecture and protocols.
Chapter 4 illustrates the service scenario.
Chapter 5 concludes this document.

2. Service

2.1 Service Description

The ICW(Internet Call Waiting) service allows the PSTN user who is connected to the internet using dial-up modem to be notified of incoming calls with calling party number and name via internet connection and properly handle(accept, reject, forward to another number, or forward to VMS(Voice Mail System) of TMS) the calls.

2.2 Service Features

The Key features of the ICW service are following:

1) Internet On-line Trigerring: When an ICW subscriber is using the Internet and an incoming call arrives to the busy line, the IN service will be triggered from the terminating SSP.

2) Incoming Call Notification: The subscriber is notified on the PC that an incoming call is arrived. The notification box is popped up by the ICW Client running on the subscriber's PC. The box is brought to the foreground. The notification includes following information:

i) Calling Party Number Identification: The number of the calling party is displayed.

ii) Calling Party Name Identification: The name of the calling party, if available, is displayed.

iii) Calling Time Identification: The time of the incoming call is displayed.

3) Incoming Call Handling

i) Accept the Call: The ICW subscriber may select "Accept the Call" button on the pop up box, so that the ICW Server routes the incoming

call to the subscriber's line after the ICW Client terminates the internet (modem) connection.

ii) Reject the Call: The ICW subscriber may select "Reject the Call" button on the pop up box, so that the incoming call is rejected.

iii) Forward the Call to Another Number: The ICW subscriber may select "Forward the Call" button on the pop up box with a number being forwarded to, so that the ICW Client routes the incoming call to the number.

iv) Forward the Call to the Voice Mail System(VMS): The ICW subscriber may select "Forward the Call to VMS" button on the pop up box, so that the ICW Client routes the incoming call to VMS provided by KT-TMS.

v) Call Processing on No Response: If the ICW subscriber does not

respond within a pre-specified period of time after the notification dialog box is displayed, then the ICW Client process the "Call Processing on No Response" which is specified by the ICW subscriber on the ICW service profile. Call processing method on No Response can be "Accept", "Reject", "Forward", or "Forward to VMS".

vi) Automatic Call Processing(Call Screening) : The subscriber can pre-define the call processing method for each incoming call based on the calling party number, by configuring "Automatic Call Processing List" like address book in the ICW service profile. The automatic call processing method can be following :

- Do Not Disturb (Reject all calls / Forward all calls / Forward all calls to the VMS)
- Automatic Processing based on the calling party number (Accept the call / Reject the call / Forward the call / Forward the call to the VMS)

vii) Multiple Call Handling : The subscriber can be notified of the multiple calls during the ICW service and process those calls one by one.

4) Call Logging : Logs of incoming calls processed during the ICW service are recorded and maintained both on the ICW Client and server system. The subscriber can access the call log in the ICW Client to determine the number and the name of calling party, the time of call, and the call processing method for each call. The operator can access the call log in the ICW Server for statistics and management purposes.

5) ICW service Activation/Deactivation

i) Automatic Activation/Deactivation : When dial-up internet connection is setup or terminated, the ICW service is activated or deactivated automatically.

ii) Manual Activation/Deactivation : The subscriber can deactivate the ICW service manually when he/she doesn't want to be interrupted by notification during internet on-line, and activate the ICW service when he/she wants.

6) ICW Client Configuration : The subscriber can configure the ICW service profile such as default call forwarding number, automatic call processing list, etc in the ICW Client.

3. Architectures and Protocols

In this chapter, the network architectures and protocols for the ICW service will be described.

3.1 Network Architecture

(Figure 3-1) illustrates the hardware and functional architecture for ICW service provision.

The SSP(Service Switching Point), SCP(Service Control Point), and IP(Intelligent Peripheral) are legacy PSTN IN elements with IN CS-1. Both the ICW Server System and the ICW Client System are new elements in the Internet domain for the ICW service.

The functionalities of each element will be described in next section.

3.2 Network Entities

1) SSP
The SSP contains SSF(Service Switching Function) and CCF(Call Control Function). The SSP triggers the service to the SCP when it detects the called party busy(T_Busy), and proceed the call under the control of the SCP.

2) SCP
The SCP contains SCF(Service Control Function) and SDF(Service Data Function). The ICW Service Logic on the SCF/SDF can determine whether the subscriber is PSTN on-line or internet on-line when it receives the T_BUSY trigger from the SSP. If determined that the internet on-line, the ICW Service Logic notifies the ICW subscriber of incoming call via the ICW Server and the ICW Client, and waits for the reply of call disposition from the subscriber. The ICW Service Logic then process and complete the incoming call according to the subscribers response.

In addition, the SCP contains the SCGF(Service Control Gateway Function) for protocol inter-working between PSTN/IN and Internet. It translates the SIP message from the ICW Server to the SLP interface message and vise versa. The SCGF is an end point for internet protocol and behaves as a UAS(User Agent server) or UAC(User Agent client) for the Internet protocol.

3) IP
The IP contains SRF(Service Resource Function). It plays announcements to the calling party during the ICW service before/after receiving the response from the ICW subscriber and records the calling party number or voice message from the calling party when the call "Forward to VMS".

4) ICW Server System
The ICW Server system is a new element for PSTN/Internet inter-working in the Internet domain. It is an SIP entity, which behaves as a proxy or redirect server for message routing between the ICW Client and SCGF.

The ICW Server has management function for the ICW Clients connected to it. When an the ICW Client requests the registration to the ICW service, the ICW Server relays that request to the SCP, waits for the result of authorization from the SCP, and only if it is proved to be a authorized the subscriber, registers that the subscriber in its Database(DB). The ICW Server should monitor all the ICW Clients registered to it, so that if it detects the termination of internet connection for an ICW Client, it deactivate the ICW service for that the subscriber.

The ICW Server manages profiles for each ICW subscribers and also has logs of the call processing results.

5) ICW Client System
The ICW Client System is launched on the subscriber's PC that is connected to the Internet via dial-up modem. It is an application program for the ICW service.

The ICW Client is activated as soon as the subscriber powers on the PC, and monitors the Internet connection status. If the subscriber connects the Internet, the ICW Client detects it and starts REGISTRATION notification to the SCGF via the ICW Server, and that notification eventually transferred to SLP(SCP). In this case, the ICW Client acts as a UAC to the SCGF which acts as a UAS. Thereafter

it notifies the ICW Server periodically that the subscriber during the Internet connection.

When an incoming call is notified to the ICW Client during the Internet on-line, it pops up the notification dialog box including the number and name of calling party, calling time, and the call processing option on the subscribers PC, and waits for the subscribers answer. When the subscriber selects the choice (Accept, Reject, Forward, or Forward to VMS), the ICW Client responds to the SCP. In this case, the ICW Client acts as a UAS.

The ICW Client can screen the incoming call before notifying the subscriberbased on the predefined ICW Service ProfileThe ICW Client manages the ICW Service Profile including following information :

o Subscriber Information : Name, Directory Number, Password

o Service Status(Activation/Deactivation)

o Automatic Call Processing Method

- Call Processing Method on No Answer (Reject/Forward/VMS) : the automatic call completion method in case the subscriber doesn't reply to the pup up dialog box for pre defined period of time
- Do Not Disturb Mode (On/Off) : the subscriber can set the DND mode when he/she does not want to be notified
- Call Processing Method on Do Not Disturb Mode (Reject/Forward/VMS) : the call processing method for all incoming call when the subscriber sets the DND Mode.
- Call Processing List by Calling party numbers (Accept/Reject/Forward/VMS) : the list of calling party number and the automatic call processing method for the incoming call with that number

The ICW Client records the call processing method and the result for each incoming calls in log file on the subscriber's PC. Each call record in the call log includes the following items :

- Calling Time
- Calling Party Number
- Calling Party Name(optional)
- Call Processing Method : Accept / Reject / Forward / Forward to VMS
- Result : Success/Fail

6) Firewall
Packet Filtering Firewall Systems are between ICW server and clients and also between SCGF and ICW server for accessing IN Nodes of KT.

3.3 Network Interfaces

1) SCF-SDF, SCF-SSF, SCF-SRF Interfaces
These interfaces are same as existing PSTN IN Interfaces. They are implemented using KT INAP CS-1.

2) SCGF-SCF Interface
This interface will relay requests either from the IN or the Internet. It is implemented using the SCP internal API.

3) SCGF-ICW Server, ICW Server-ICW Client Interface
These interfaces are implemented using PINT Service Protocol V.1. We adopted UAS-Proxy-UAC relationships as shown in (Figure 3-2).

3.4 Protocols

1) INAP Protocol

The SCP, SSP, and IP support KT INAP V1.0 which is based on ITU-T INAP CS-1 and two CS-2 INAP messages(PRM(PromptAndReceiveMessage) and EM(EraseMessage)) for recording the voice message.

2) PINT Protocol

The ICW service uses PINT Service Protocol 1.0[3] as a protocol between the SCP and the ICW Server System, and between the ICW Server System and the ICW Client System. We adopt the PINT Service Protocol 1.0 defined at the IETF PINT WG for invoking telephone services from an IP network. It is specified as a set of enhancements and addition to the SIP 2.0 and SDP Protocols.

The ICW service uses PINT Service Protocol 1.0 as follows:

o REGISTER
The REGISTER method classified as two folds: One is the first and the last registration to the SCP for notifying the on-line/off-line status changes. The last registration means that it is un-register message from the Client. The other is all the remaining periodic registrations between the first and the last, from the ICW client to the ICW server to notify the liveness of the Internet connection of the ICW client.

In the former case, the ICW Client sends the REGISTER method to the ICW Server with parameters of IP address and phone number. ICW server relays it to the SCP, who updates the DB if it is the authorized subscriber and returns the registration ack to the ICW Server and then Client.

In the latter case, the ICW Client sends the REGISTER method to the ICW Server periodically with predefined intervals (e.g. 20 seconds). The ICW server checks if it is from the authorized subscriber. No further relay to SCP is needed.

o INVITE
The SCP sends the INVITE method to the ICW Client via the ICW Server in order to notify the subscriber which is internet on-line and the ICW service is activated of the incoming call.

o ACK
Both the SCP and the ICW Server sends the ACK method to the ICW Server and Client right after receiving the final response from them in order to confirm.

o BYE
The BYE method releases the session. In addition to this original usage of BYE, we use this method to convey the 'call processing results' from the PSTN. The BYE method uses the Subject: header of value 'success' or 'failure' to indicate the call completion result of PSTN.

o CANCEL

When the calling party release the call before the called party response that call, the SCP sends the CANCEL method to the ICW Client to cancel the INVITE method it sent before.

o OPTION
Not Used

o Response
The SCP sends Response method with state-codes to the ICW Client for REGISTER Method. The State-codes of response for REGISTER request are :
. 100 Trying : Trying
. 200 OK : Registered

The ICW Client sends Response method with state-codes to the ICW Client for INVITE Method in order to deliver the selection of the subscriber. The State-codes of response for INVITE request are :
. 100 Trying : Trying
. 200 OK : Accept the Call
. 303 see other : Forward the Call to Another Number
. 380 alternative service : Forward the Call to VMS
. 603 decline : Reject the Call

4. Example Scenario

4.1 ICW Service Subscription

A PSTN subscriber has to subscribe to the ICW service in order to be provided the ICW service. Both PSTN operator and IN-based ICW service provider is the Korea Telecom, in our case. When the subscription is completed, the Local exchange should update the subscription data for the number to be triggered to the SSP for further trigger to the SCP. This necessity is because we Korea do not have local SSPs but toll SSPs.

4.2 ICW Client Installation

An ICW subscriber should install the ICW Client program in his/her PC. The ICW Client is automatically activated as a daemon when the subscriber's PC's power-on. It monitors and detects the Internet connection status.

4.3 ICW Service Activation

When the subscriber initiates the Internet connection or activates the ICW service manually, the ICW service is activated. That is the ICW Client sends the REGISTER message with directory number and IP address to the SCP

(0A) The ICW subscriber dials ISP access number and establishes PPP connection.

(0B) The ICW Client on the ICW subscriber's PC detects the PPP connection.

(1) The ICW Client sends registration request to the ICW Server in order to register IP address to DN relationship as a result of dial-up access to Internet.

```
REGISTER sip:ICW@147.6.18.169 SIP/2.0
From: SIP:025265262@147.6.18.169
To: SIP:KT-ICW@147.6.18.224
Call-Id: 1-410613070200-ICW@147.6.18.169
CSeq: 1
```

(2) The ICW Server relays registration request to SCGF.

```
REGISTER sip:ICW@147.6.18.224 SIP/2.0
Via: SIP/2.0/TCP 147.6.18.224
From: SIP:025265262@147.6.18.169
To: SIP:KT-ICW@147.6.18.224
Call-id: 1-410613070200-ICW@147.6.18.169
CSeq: 1
Content-type: application/sdp
Content-length: 1
```

(2A) The SCGF translates user registration information from the SIP message to the SCP internal API message.

(3) The SCGF relays the user registration message to the SCF/SDF.

(3A) The SCF/SDF authorizes the subscriber with directory number using user registration information.

(3B) The SCF/SDF stores the IP address relating to the ICW Client for the DN1 and sets the status as the Internet on-line.

(4) The SCF/SDF sends the result of registration to the SCF/SCGF.

(4A) The SCGF translates user registration response of SCP internal API message to the PINT message.

(5) The SCGF relays sends back the user registration response to the ICW Server.

```
SIP/2.0 200 OK
From: SIP:025265262@147.6.18.169
To: SIP:KT-ICW@147.6.18.224
Call-Id: 1-410613070200-ICW@147.6.18.169
CSeq: 2
```

(5A) The ICW Server records the user registration information and the internet on-line status for the ICW Client(the subscriber) in DB.

(6) The ICW Server sends the user registration response to the ICW Client.

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP 147.6.18.224
From: SIP:025265262@147.6.18.169
To: SIP:KT-ICW@147.6.18.224
Call-Id: 1-410613070200-ICW@147.6.18.169
CSeq: 2
Content-type: application/sdp
Content-length: 1
```

(6A) The ICW Client notifies the subscriber that the registration is completed successfully and the ICW service is in active state.

4.4 Incoming Call Notification

When a calling party makes a call to the ICW subscriber, the SCP notifies the ICW Client of incoming call and waits for the subscriber's response.

(1) The calling party of DN2 (a telephone user) makes a call to the ICW subscriber (PC user) with DN1. The Connection is setup using existing ISDN signalling.

(1A) The SSF/CCF is detected the called party(the ICW subscriber) busy.

(2) The SSF/CCF sends InitialDP (T_Busy) to SCF/SDF.

(2A) The SCF/SDF determines whether the user of DN1 is PSTN on-line or Internet on-line. (The SCF/SDF performs PSTN TMS service logic in case of PSTN on-line or performs the ICW service Logic in case of internet on-line. In this document, we assume internet on-line.)

(2B) The SCF/SDF retrieves the IP address related with DN1.

(2C) The SCF/SDF may play the announcement to the calling party, to wait for called party answer after connection establishment with SRF.

(3) The SCF sends incoming call notification to the SCGF.

(3A) The SCGF translates incoming call notification of SCP internal API message to the PINT message.

(4) The SCGF relays the notification to the ICW Server.

```
INVITE sip:ICW@147.6.18.224 SIP/2.0
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.224
Call-Id:949896649@147.6.18.211
Cseq:1
```


(4A) The ICW Server double-checks the subscriber's status using the ICW subscribers profile in its own DB.

(5) The ICW Server sends trying message to the SCGF.

```
SIP/2.0 100 Trying
Via: SIP/2.0/TCP 147.6.18.224
From: SIP: 0428708467@147.6.18.211
To: SIP:025265262@147.6.18.224
Call-Id: 949896649@147.6.18.211
Cseq:2
Content-type: application/sdp
Content-length: 1
```

(6) The ICW Server relays the notification to the ICW Client.

```
INVITE sip:ICW@147.6.18.169 SIP/2.0
Via: SIP/2.0/TCP 147.6.18.224
From: SIP: 0428708467@147.6.18.211
To: SIP:025265262@147.6.18.169
Call-Id: 949896649@147.6.18.211
Cseq:1
Content-type: application/sdp
Content-length: 1
```

(6A) The ICW Client consults the ICW service profile in order to process the incoming call in pre-defined method. If the incoming call

is specified in the ICW service profile, then the procedure for automatic call processing is performed.

(6B) If the incoming call has not been screened by the automatic call processing, the ICW Client displays the notification dialog box on the subscribers PC.

(7) The ICW Client sends trying message to the ICW Server.

```
SIP/2.0 100 Trying
Via: SIP/2.0/TCP 147.6.18.224
From: SIP: 0428708467@147.6.18.211
To: SIP:025265262@147.6.18.224
Call-Id: 949896649@147.6.18.211
Cseq:2
Content-type: application/sdp
Content-length: 1
```

4.5 Incoming Call Processing

The incoming call can be accepted, rejected, forwarded to another number, or forwarded to VMS by the automatic call processing method pre-defined by the ICW subscriber or by the subscribers selection. In this document, the information flows of "Accept the call" and "Forward the call to another number" choice cases are illustrated.

4.5.1 Accept the Call

(0A) The ICW subscriber chooses to "Accept" the incoming call.

(1) The ICW Client sends the "Accept" indication to the ICW Server.

```
SIP/2.0 200 OK
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.169
Call-Id:949896649@147.6.18.211
Cseq:3
```

(1A) The ICW Client records the subscriber's selection for incoming call in the call log.

(1B) The ICW Client terminates the Internet connection of user's PC.

(2) The ICW Server sends the "Accept" message to the SCGF.

```
SIP/2.0 200 OK
Via:SIP/2.0/TCP 147.6.18.224
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.169
Call-Id:949896649@147.6.18.211
Cseq:3
Content-type: application/sdp
Content-length: 1
```

(2A) The SCGF translates the "Accept" message to the SCP internal API message.

(3) The SCGF sends "ACK" message to the ICW Server.

```
ACK sip:ICW@147.6.18.224 SIP/2.0
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.224
Call-Id:949896649@147.6.18.211
```

Cseq:4

(4) The SCGF sends the "Accept" message to SCF.

(5) The SCF instructs SSF/CCF to route the call to DN1.

(6) The SSF/CCF initiates the connection setup to DN1.

(6A) The bearer connection between the calling party(DN2) and the ICW subscriber(DN1) is setup.

(7) The Connection results are returned to the SCF through ERB.

(8) The SCF sends the call completion message to the SCGF.

(8A) The SCGF translates the call completion message to the PINT message.

(9) The SCGF sends "BYE" message to the ICW Server.

BYE sip:ICW@147.6.18.224 SIP/2.0
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.224
Call-Id:949896649@147.6.18.211
Cseq: 5
Subject: Success

(9A) The ICW Server records the call completion result to the log file.

4.5 2 Forward the Call to Another Number

(0A) The ICW subscriber chooses to "Forward to another number of DN3" for the incoming call.

(1) The ICW Client sends the "Forward to another number" indication to the ICW Server.

SIP/2.0 303 See Other
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.169
Call-Id:949896652@147.6.18.211
Contact: SIP:025266444@147.6.18.169
Cseq:3

(1A) The ICW Client records the subscriber's selection for incoming call in the call log.

(2) The ICW Server sends "ACK" message to the ICW Client.

ACK sip:ICW@147.6.18.224 SIP/2.0
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.169
Call-Id:949896649@147.6.18.211
Cseq:4

(3) The ICW Server relays the "Forward to another number" message to the SCGF.

SIP/2.0 303 See Other
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.169

Call-Id: 949896652@147.6.18.211
Contact: SIP:025266444@147.6.18.169
Cseq:3
Content-type: application/sdp
Content-length: 1

(3A) The SCGF translates the "Forward to another number" message to the SCP internal API message.

(4) The SCGF sends "ACK" message to the ICW Server.

ACK sip:ICW@147.6.18.224 SIP/2.0
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.224
Call-Id:949896649@147.6.18.211
Cseq:4

(5) The SCGF sends the "Forward to another number" message to SCF.

(6) The SCF instructs SSF/CCF to route the call to another number of DN3.

(7) The SSF/CCF initiates the connection setup to DN3.

(7A) The bearer connection between the calling party(DN2) and the forwarding number(DN3) is setup.

(8) The Connection results are returned to the SCF through the ERB.

(9) The SCF sends the call completion message to the SCGF.

(9A) The SCGF translates the call completion message to the PINT message.

(10) The SCGF sends the call completion message to the ICW Server.

BYE sip:ICW@147.6.18.224 SIP/2.0
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.224
Call-Id:949896649@147.6.18.211
Cseq:5
Subject:Success

(10A) The ICW Server records the call completion result to the log file.

(11) The ICW Server sends the success of "Forwarding to another number" to the ICW Client.

BYE sip:ICW@147.6.18.169 SIP/2.0
Via:SIP/2.0/TCP 147.6.18.224
From: SIP:0428708467@147.6.18.211
To: SIP:025265262@147.6.18.169
Call-Id:949896649@147.6.18.211
Cseq:5
Subject:Success

(11A) The ICW Client records the call completion result to the log file.

4.6 ICW service Deactivation

The ICW Server detects disconnection from the ICW Client when the ICW subscriber terminates the internet connection, and then notifies the SCP of the ICW service deactivation for that the subscriber. When the ICW subscriber deactivates the ICW service manually, the ICW Server receives the unregister message from the ICW Client, and then notifies the SCP of the ICW service deactivation for that the subscriber. In this document, the service deactivation scenario caused by internet disconnection is illustratead.

(0A) The ICW subscriber terminates the internet connection.

(0B) The ICW Server decides that the internet connection has been terminated when it does not receive the periodic notification of internet on-line from the ICW Client.

(1) The ICW Server sends unregister message to SCGF

```
REGISTER sip:ICW@147.6.18.224 SIP/2.0
From: SIP:025265262@147.6.18.169
To: SIP:KT-ICW@147.6.18.224
Call-Id: 025265262-949897072-SVR
Expires:0
CSeq: 1
Content-type: application/sdp
Content-length: 1
```

(1A) The SCGF translates the unregister message to the SCP internal API message.

(2) The SCGF sends the unregister message to SCF.

(2A) The SCF/SDF authorizes the subscriber with directory number using the unregistration information.

(2B) The SCF/SDF records the internet off-line for that ICW Client.

(3) The SCF/SDF sends the user unregistration response to the SCF/SCGF.

(3A) The SCGF translates user unregistration response to the PINT message.

(4) The SCGF relays sends back the user unregistration response to the ICW Server.

```
SIP/2.0 200 OK
From: SIP:025265262@147.6.18.169
To: SIP:KT-ICW@147.6.18.224
Call-Id: 025265262-949897072-SVR@147.6.18.169
CSeq: 2
```


(4A) The ICW Server records the status of internet off-line for the ICW Client(the subscriber) in DB.

5. Conclusion

We design and implement the ICW service whose main features are Internet call waiting, Internet call notification, and Internet call processing including connection to the same telephone after modem disconnection, forwarding to the other number, or connection to the VMS. This service is designated as a supplementary service of the TMS, which purpose is to increase the call completion rates. After implemented last year, the field trial tests are under going and the service feasibility is almost proved.

Since KT's VOIP service is not fully deployed yet, the ICW service does not have the virtual second line feature, but it will be added in the near future.

Our main advantages are

- ICW service is ISP independent.

- Automatic modem disconnection feature when the incoming call is accepted.

- After the call disposition, the processing result (e.g. VM success, or Call forwarding fails because no-answer, etc) can be delivered to the Client to be logged through the enhanced BYE message,

- Intermediate ICW server filters the service accesses

Our specific features are

- It is supplementary service of the TMS which is dedicated to the subscriber's telephone number: The ICW client could not support subscriber's mobility.

- The REGISTER method has used for two purposes: One is to update the Internet on/off-line status. The other is to show the liveness of the Client. The latter may burden the ICW Server: This scheme was chosen to support IAP(Internet Access Provider) independent service provision.

Our further challenges are

- to extend it to general messaging notification services such as unified messaging or community services.

We should support the SIP-based ICW service architecture and will adopt the further SPIRIT protocol specification as we would follow the standardized approach.

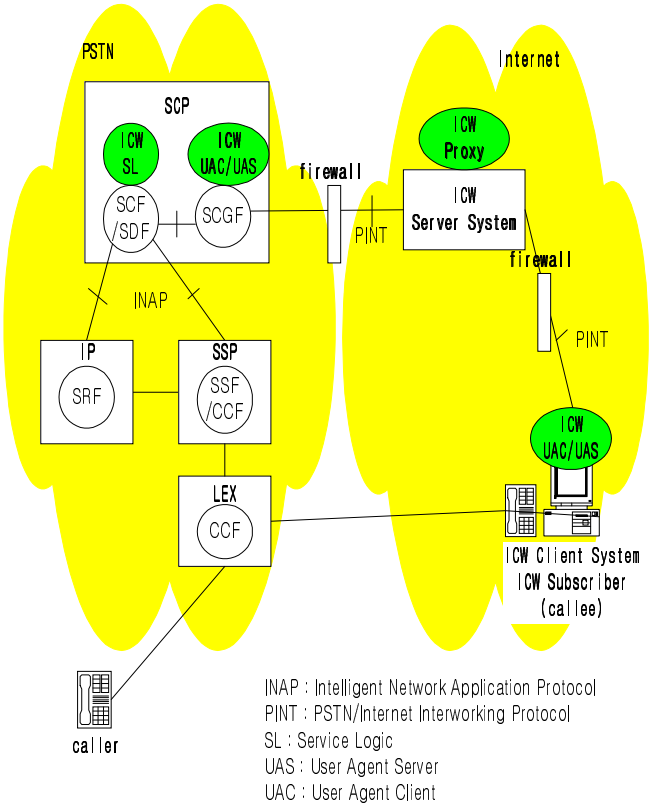
6. References

[1] <Draft-brusilovsky-icw-00.txt> A. Brusilovsky, E. Gausmann, V. Gurbani, A. Jain, "A Proposal for Internal Call Waiting Service using SIP", Jan. 1999

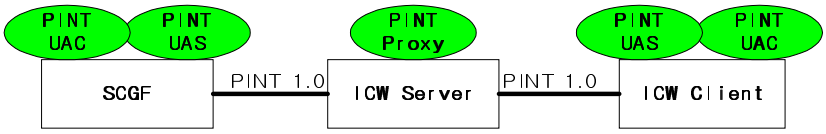
[2] ICW Service Requirements & Specifications, Oct.1999, Korea Telecom

[3] <draft-ietf-pint-protocol-02.txt> S. Petrack, L. Conroy, The PINT Service Protocol : Extensions to SIP and SDP for IP Access to Telephone Call Service Oct.1999

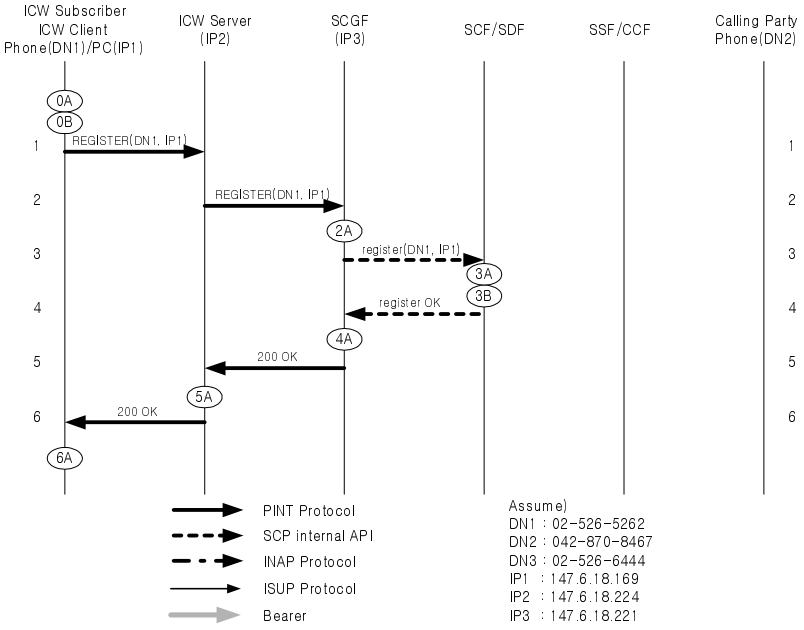
7. Appendix



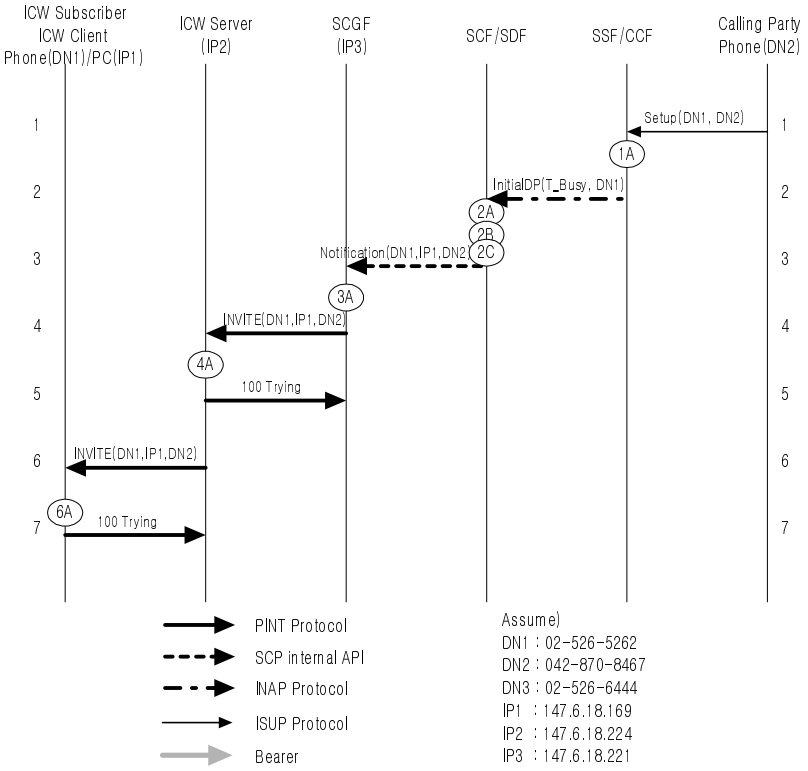
(Figure 3-1) Network and Functional Architecture for the ICW service



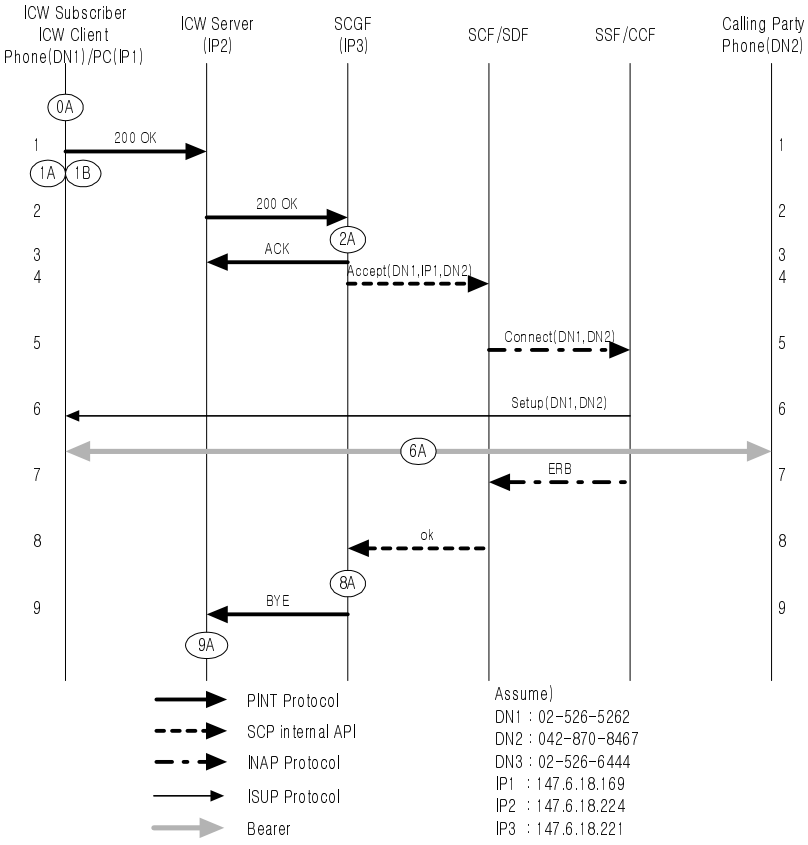
(Figure 3-2) PINT protocol architecture



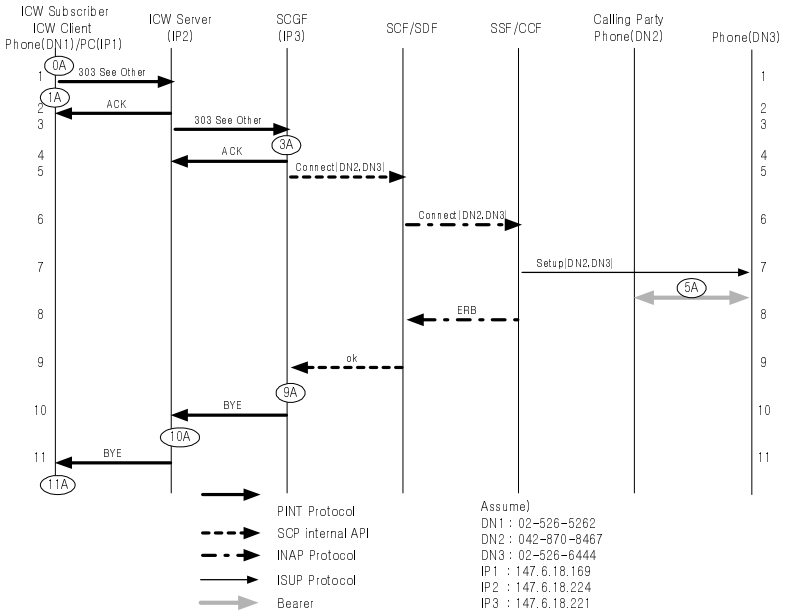
(Figure 4-1) ICW Service Activation



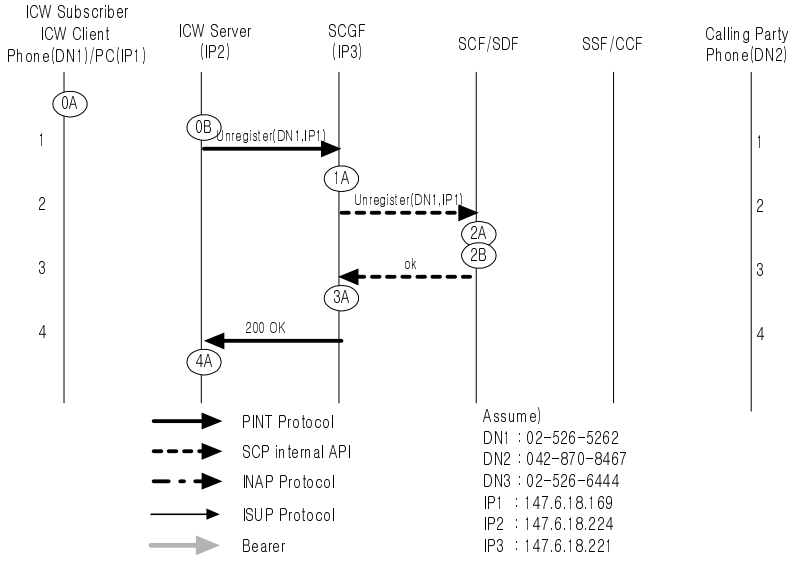
(Figure 4-2) Incoming Call Notification



(Figure 4-3) Incoming Call Processing - Accept the Call



(Figure 4-4) Incoming Call Processing - Forward the Call to Another Number



(Figure 4-5) ICW Service Deactivation

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