Appendix A
List of Abbreviations with Full form

Abbreviation	Full form
1G	First generation of mobile phone standards and technology
2G	Second generation of mobile phone standards and technology
3G	Third generation of mobile phone standards and technology
3GPP	3rd Generation Partnership Project
3GPP2	3rd Generation Partnership Project 2
ADSL	Asynchronized Digital Subscriber Loop
AMPS	Advanced Mobile Phone System
APEX	Application Exchange
API	Application Programming Interfaces
APRU	Average Revenue Per User
AR	Application Router
ARPANET	Advanced Research Projects Agency Network
AS	Application Server
AST	Application Server Toolkit
ATM	Asynchronous Transfer Mode
B2BUA	Back to Back User Agent
BGCF	Breakout Gateway Control Function
BICC	Bearer Independent Call Control
BPEL	Business Process Execution Language
CAMEL	Customized Applications for Mobile network Enhanced Logic
CapEx	Capital Expenditure
CBE	Common Base Event
CCXML	Call Control Extensible Markup Language
CDC	Connected Device Configuration
CDMA	Code division multiple access
CDMA2000	Code division multiple access Hybrid of 2.5G/3G Mobile standard
CGI	Common Gateway Interface
CIR	Connection Initiation Request
CLDC	Connected Limited Device Configuration
CLI	Command Line Interface
CLP	Command Line Protocol
CMP	Container Managed Persistence

CN	Core Network
COPS	Common Open Policy Services
CPIM	Common Profile for Instant Messaging
CPP	Common Profile for Presence
CRs	Change Requests
CSCF	Call Session Control Function
CSE	CAMEL Service Environment
CSNs	Circuit Switched Networks
CSP	Client-Server Protocol
CSS	Cascading Style Sheets
DCOM	Distributed Component Object Model
DOM	Document Object Model
DSL	Digital subscriber line
DTDs	Document Type Definition
EAR	Enterprise Archive
EDA	Event Drive Architecture
EDGE	Enhanced Data rates for GSM Evolution
EJB	Enterprise Java Beans
EMS	Enhanced Messaging Service
ESB	Enterprise Service Bus
ETSI	European Telecommunications Standards Institute
EV-DO	Evolution-Data Optimized
FDM	Frequency Division Multiplex
FHoSS	FOKUS HSS
FMC	Fixed Mobile Convergence
FTP	File Transfer Protocol
GGSN	Gateway GPRS Support Node
GLMS	Group and List Management Server
GNU	Genuinely Not Unix
GPL	GNU Public License
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
HLR	Home Location Register
HLR/AUC	Home Location Register and Authentication Center
HSS	Home Subscribe Server
HTTP	Hypertext Transfer Protocol
I-CSCF	Interrogating Call Session Control Function
ICT	Information and Communication Technology
IETF	Internet Engineering Task Force

iFC	initial Filter Criteria
IMAP	Internet Message Access Protocol
IMIN	IMS Interworking Network
IMPP	Instant Messaging and Presence Protocol
IMPP WG	Instant Messaging and Presence Protocol Working Group
IMS	IP Multimedia Subsystem
IMS-MGW	IMS Media Gateway
IM-SSF	IP Multimedia Service Switching Function
IMTS	Improved Mobile Telephone System
IMXP	former to XMPP
IN	Intelligent Network
INAP	Intelligent Network Application Part
IOP	Inter-Orb Protocol
IP	Internet Protocol
IPGW	IP Gateway
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IPX	IP Interworking Exchanged
ISC	IMS Service Control
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
IT	Information Technology
ITU	International Telecommunication Union
J2ME	Java 2 Micro-Edition
J2SE	Java 2 Platform, Standard Edition
JAIN	Java Advanced Intelligent Network
JCP	Java Community Process
JDBC	Java DataBase Connectivity
JDK	Java Development Kit
JPEG	Joint Photographic Experts Group
JSP	Java Server Page
JSR	Java Specification Request
JST	J2EE standard Tools
JTAPI	Java telephony API
JTWI	Java Technology for the Wireless Industry
JVM	Java Virtual Machine
LAN	Local Area Network
LGPL	GNU Lesser General Public License
MAHO	Mobile Assisted Handover

MG	Media gateway
MGCF	Media Gateway Control Function
MH	Mobile Host
MIDI	Musical Iinstrument Digital Interface
MIDP	Mobile Information Device Profile
MIME	Multipurpose Internet Mail Extension
MIPv6	Mobile IPv6
MMD	Multimedia Domain
MMS	Multimedia Messaging Service
MRFP	Multimedia Resource Function Processor
MSA	Mobile Service Architecture
MSC	Mobile Switching Center
MSCF	Media Server Function Control
MSRP	Message Session Relay Protocol
MSRP	Message Session Relay Protocol
MVC	Model View Controller
NAT	Network Address Translators
NGN	Next Generation Network
NGN-FG	NGN Focus Group
N-ISDN	Narrowband Integrated Services Digital Network
OASIS	Organization for the Advancement of Structured Information Standards
ODBC	Open DataBase Connectivity
OMA	Open Mobile Alliance
OMA	Open Mobile Alliance
OPEX	Operating Expenses
OSA	Open Service Architecture
P2P	Person-to-person
PA	Presence Agent
P-CSCF	Proxy Call Session Control Function
PDA	Personal Digital Assistant
PIDF	Presence Information Data Format
PLMN	Public land mobile network
PNG	Portable Network Graphics
POC	Push to talk over cellular
POP	Post Office Protocol
POTS	Plain old telephone service
PRIM	Presence and Instant Messaging Protocol
PS	Presence Server

PSNs	Packet-Switched Networks
PSTN	Public switched telephone network
PTT	Push-to-Talk
QoE	Quality of Experience
QoS	Quality of Services
RAN	Radio Access Network
REST	Representation State Transfer
RFC	Request For Comment
RLS	Resource List Server
RMI	Remote Method Invocation
RMS	Record Management System
RPID	Rich Presence Information Data Format
RPP	Receiving Party Pays
RSVP	Resource Reservation Protocol
RTP	Real-time Transport Protocol
RTT	Round Trip Times
SAR	SIP application resource
SAs	Security Associations
SBC	Single Board Computer
SCP	Service Control Point
SCS	Service Capability Server
S-CSCF	Serving Call Session Control Function
SDP	Service Delivery Platforms
SGSN	Serving GPRS Support Node
SGW	Signalling Gateway
SIB	Service Independent Building Block
SIGCOMP	Signaling Compression
SIMPLE	SIP for Instant Messaging and Presence Leveraging Extensions
SIP	Session Initiation Protocol
SIP–AS	SIP Applications Server
SLA	Service Level Agreement
SLEE	Service Logic Execution Environment
SLS	Service Level Specification
SMCNP	Server Mobile Core Network Protocol
SMIL	Synchronized Multimedia Integration Language
SMS	Short message service
SMTP	Simple Mail Transfer Protocol
SOA	Service Oriented Architecture

SOAP	Simple Object Access Protocol
SRV	Service LookUp
SS7	Signalling System No. 7
SSP	Service Switching Point
SSV	Shared Streaming Video
STUN	Simple Transversal of UDP through NATs
TAPI	Telephony Application Programming Interface
TAPI	Telephony API
TCP	Transmission Control Protocol
TDM	Time Division Mutiplexing
TISPAN	Telecom & Internet converged Services & Protocols for Advanced Networks
TLS	Transport Layer Security
TMF	Tele management Forum
TR	Technical Reports
TS	Technical Specifications
TWSS	Telecom Web Services Toolkit
UAC	User Agent Client
UAS	User Agent Server
UCT	University of Cape Town
UDDI	Universal Description Discovery and Integration
UDP	User Datagram Protocol
UE	User Equipment
UMM	Unified Mobility Manager
UMTS	Universal Mobile Telecommunications System
UOA	User Oriented Architecture
URI	Universal Resource Identifier
USCE	Unified Service Creation Environment
UTRAN	UMTS Terrestrial Radio Access Network
VAS	Value Added Services
VOIP	Voice over IP
VXML	Voice XML
W3C	World Wide Web Consortium
WAN	Wide Area Network
WAP	Wireless Application Protocol
WBXML	Wireless Binary XML
W-CDMA	Wideband Code Division Multiple Access
Wi-fi	Wireless Fidelity
WLAN	Wireless LAN

WSDL	Web Services Description Language
WS-I	Web Services Interoperability Organization
WSIF	Web Services Invocation Framework
WSP	Wireless Session Protocol
WST	Web standard tool
WTK	Wireless Toolkit
XCAP	XML Configuration Access Protocol
XML	Extensible Markup Language
XMLNS	XML Namespaces
XMPP	Extensible Messaging and Presence Protocol
XSD	XML Schema Definition

Appendix B

Testing results for IMS Client

In the square bracket "[ ]" show the sub-clause in 3GPP TS 24.229 Release 6 specification.

• Evaluation at the UE

IMS client

[5.1.1] Registration and authentication

[5.1.1.2] Initial registration

On sending a REGISTER request, the UE populate the header fields with an Authorization header, a From header, a To header, a Contact header, a Via header, an Expires header, a Request-URI, a Supported header that accord with the 3GPP TS 24.229 completely. However, there are some parts are not consistent with the standards.

- The UE suppose to associate two parts, a protected client port and a protected server port, but in our situation, we only find the protected server port without association
- We have no Security-Client header
- There is no P-Access-Network-Info header.

On receiving the 200(OK) response to the REGISTER request, as showed in the table, our situation accord with most of the standards, but there are still some differences:

- There is no P-Associated-URI header.
- There is no security association lifetime shows.

When a 401 (Unauthorized) response to a REGISTER is received the UE is barely behave as the standards says. Except that derive the keys CK and IK as described in 3GPP TS 32.203, there is no temporary set of security associations has been set up, no Security-Client header and there is no Authorization header.

SIP client

On sending a REGISTER request, the UE populate the header fields contain an Authorization header, a From header set to the SIP URI containing the public user identity, a To header set to the SIP URI containing the public user identity to be registered, and a Contact header, a Via header, and a Request-URI that are consistent to the standards. But there is no security-client header, no P-Access-Network-Info header, and no Supported header. Besides, the expire parameter in the Contact header set to the value 3600 but

not 600 000 seconds.

On receiving the 200(OK) response to the REGISTER request, as showed in the table, our situation accord with most of the standards, but there are still some differences:

- The UE doesn't store the expiration time of the registration.
- There is no P-Associated-URI header.
- There is no security association lifetime shows.

[5.1.1.3] Initial subscription to the registration-state event package IMS client

On sending a SUBSCRIBER request, the UE populate the header fields with a Request URI set to a SIP URI that contains the public user identity used for subscription, and a From header, a To header, an Event header, an Expires header, a Contact header that are consistent as the standards described. The only difference is that there is no P-Access-Network-Info header.

Upon receipt of a 200 response to the SUBSCRIBE request, the UE stores the information for the established dialog and the expiration time as indicated in the Expires header of the received response.

SIP client

On sending a SUBSCRIBER request, when UE populate the header fields, there are some parts are not consistent of the standards.

- There is no P-Access-Network-Info header
- The Event header set to "message-summary" instead "reg".
- The Expires time set to"300", but not"600000".

2xx response never reached UE, it only forward to the P-CSCF.

[5.1.1.5] Authentication

[5.1.1.5.1] General

The 401 situation is already discussed in 5.1.1.2.

On receiving the 200(OK) response for the protected REGISTER request, for both SIP client and IMS client, there is no security association provided.

[5.1.1.5.2] Network-initiated re-authentication

Since there is no timer F expires at the UE, so we don't consider this situation that described in this sub-clause.

[5.1.1.6] User-initiated deregistration

IMS client

On sending a REGISTER request, the UE populate the header fields with an Authentication header, a From header, a To header, a Contact header, a Via header, an Expires header, and a Request-URI that accord with the description in 3GPP TS 24.229 completely. The differences are: -There is no Security-Client header. -There is no Security-Verify header. -There is no P-Access-Network-Info header.

On receiving the 200 (OK) responses to the REGISTER request, the UE removed all the registration details relating to the public user identity. And since there are no more public user identities registered, the UE deleted the related keys that may towards to the IM CN subsystem.

SIP client

The X-Lite does not support deregistration.

[5.1.1.7] Network-initiated deregistration

Upon receiving the NOTIFY request on the dialog which was generated during subscription to the reg event package, the UE contains a <registration> element with the state attribute set to "terminated". But the event attribute is a little different from the standards: it is set to "unregistrated" but not to "rejected" or "deactived".

[5.1.2] Subscription and notification

[5.1.2.1] Notification about multiple registered public user identities

[5.1.2.2] General SUBSRIBER requirements

The UE doesn't receive a 503 response, so we don't need to consider what described in this sub-clause.

[5.1.3] Call initiation-mobile originating case
[5.1.3.1] Initial INVITE request

For both SIP client and IMS client, our situation is the originating UE does not require local resource reservation.

Upon generating an initial INVITE request, the UE indicates the support for reliable provisional response and the support for the preconditions mechanism by using the Supported header. And it doesn't indicate the requirement for the precondition mechanism by using the Require header mechanism.

- **Evaluation at the P-CSCF**

Generally speaking, the functionality of the P-CSCF is conformant to the specification of 3GPP R6.

[5.2.1] General

As the description of 3GPP TS 24.229, the P-CSCF of OpenIMS support the

Path and Service-Route headers, and the Path header is only used in the REGISTER request and its 200 (OK) response, while the Service-Route header is only applicable to the 200 (OK) response of REGISTER request.

The difference in our case is: there is not P-Charging-Function-Addresses header. Therefore, the functionality of P-CSCF with P-Charging-Function-Addresses header is not considered.

The other difference is without P-Media-Authorization header in our case, because what we concentrate on is just OpenIMS Core, which the AS is not included.

Both IMS Client and SIP Client get the same situation.

[5.2.2] Registration

In the registration, the P-CSCF is preparing to receive only the initial REGISTER requests on the SIP default port values or on the port advertised to the UE during the P-CSCF discovery procedure.

Most procedures in registration are conformant with TS 24.229. But, we don't consider the security, so, the REGISTER request is not protected. And the parameter "integrity-protected" is inserted with the value "no".

Although the REGISTER request is not protected in our cases, the Security-Client header is not existed. The reason is that, the architecture of the OpenIMS Core in our case is too simple to include the security, because all the components are fixed in a single domain.

For the state that P-CSCF receives a 401 (Unauthorized) response to a REGISTER request, the P-CSCF perform almost the same as the specification, but we could not evaluate the security around it, because there are not security associations, Security-Server, reg-await-auth timer in our case.

For the state that P-CSCF receives a 200 (OK) response to a REGISTER request, some of the functionality is different. At first, there is no Contact header can be checked. And then, there is no P-Asserted-Identity header. Next difference is P-CSCF cannot store the values received in the P-Charging-Function-Address header for the reason that in our case, there is no P-Charging-Function-Address header. The last difference is a term-ioi parameter is not received in the P-Charging-Vector header, the security association is not considered.

[5.2.3] Subscription to the user's registration-state event package

For the situation that upon receipt of a 200 (OK) response to the initial REGISTER request, the different cases for P-CSCF performs as following.

The P-CSCF will generate a SUBSCRIBE request but the From header is not set to the P-CSCF's SIP URI. It set as: sip:alice@open-ims.test which is a Public User Identity's SIP URI. And the Expires header is still set to 600000 which is the same as the Expires header indicated in the 200 (OK) response to the REGISTER request.

[5.2.5] Deregistration

For the SIP Client, it doesn't support the functionality of deregistration. For the IMS Client, there are some functionalities of deregistration are different from the specification.

[5.2.5.1] User-initiated deregistration

When the P-CSCF receives a 200 (OK) response to a REGISTER request sent by the UE, the Expires header will be checked, in the situation that the expires parameter equal zero, the difference for the P-CSCF of OpenIMS does not remove the Public User Identity found in the To header field.

[5.2.6] General treatment for all dialogs and standalone transactions excluding the REGISTER method

[5.2.6.3] Requests initiated by the UE

When the P-CSCF receives an initial request for a dialog or a request for a standalone transaction, the request of IMS client contains a P-Preferred-Identity header, so the P-CSCF shall identify the initiator of the request by that public user identity. As to the SIP client, the situation is different. The request of SIP client doesn't contain a P-Preferred-Identity header, so, the P-CSCF shall identity the initiator of the request by a default public user identity.

There is no Service-Route header in our situation, therefore, we don't consider the related cases.

Both of the IMS and SIP client add its own address to the Via header which the situation is conformant to the specifications.

When the P-CSCF receives a 1xx or 2xx response to the before request, the P-CSCF shall not store the values received in the P-Charging-Function-Address header, cause we don't have this header in our cases.

5.2.6.4 Request terminated by the UE

When adding P-CSCF's own SIP URI to the top of the list of Record-Route headers and save the list, the P-CSCF build the P-CSCF SIP URI in a format that contains the report parameter is not conformant to the specifications.

In the situation that P-CSCF receives a 1xx or 2xx response to the request, the P-CSCF performs mostly conformant to the specification. But the case is different for SIP client and IMS client when P-CSCF verifies the list of URIs received in the Record-Route header.

5.2.7 Initial INVITE

5.2.7.1 Mobile-originating case

When the P-CSCF receives from the UE an INVITE request, the P-CSCF shall respond to all INVITE requests with a 100 (Trying) provisional response that is conformant to the specification. But the P-CSCF doesn't insert

the P-Media-Authorization header containing that media authorization token.

5.2.8 Call release

5.2.8.1.2 Release of an existing session

The situation is conformant to the specification, but it is different from IMS client to SIP client here. For IMS client, the P-CSCF serves the *calling* user of the session it shall generate a BYE request based on the information saved for the related dialog. And for SIP client, the P-CSCF serves the *called* user of the session it shall generate a BYE request based on the information saved for the related dialog.

And we don't consider the situation about security association.

• Evaluation at the I-CSCF

[5.3.1] Registration procedure

Generally speaking, the I-CSCF behaves as a stateful proxy during the registration procedure.

[5.3.1.2] Normal procedures

The I-CSCF decides which HSS to query, and possibly as a result of a query to the Subscription Locator Functional (SLF) entity. But in the OpenlMS Core, the SLF is not included.

[5.3.2] Initial requests

The I-CSCF behaves as a stateful proxy for initial requests.

[5.3.2.1] Normal procedures

All components in our situation are in a signal domain, therefore, we don't consider the IP connective access network. That's the reason why we don't have *P-Access-Network-Info* headers

Besides, as the same reason, we can not see the procedures about I-CSCF shown in the Wireshark log messages.

There is a situation is different on IMS Client and SIP Client:

When the I-CSCF receives an initial request for a dialog or standalone transaction, we trace the log messages about IMS Client, and found that, the I-CSCF remove its own SIP URI from the topmost *Route* header, and route the request based on the *Request-URI* header field. While the trace on SIP Client, the situation is different. I-CSCF contains more than one *Route* header, and I-CSCF at first remove its own SIP URI from the topmost *Route* header, and then forwarding the request based on the topmost *Route* header.

[5.3.3] THIG functionality in the I-CSCF

We don't consider the situation about THIG, as the reason that the visited network and the home network are the same in our case

- Evaluation at the S-CSCF

[5.4.1] Registration and authentication

[5.4.1.1] Introduction

The S-CSCF acts as the SIP registrar for UA belonging to the IM CN subsystem.

IMS client

For IMS client situation, the S-CSCF supports the Path header, the Service-Router header, the Require header, and also the Supported header. But it still cannot accord with the standards completely. Because according to the standard, the Path header should only applicable to the REGISTER request and its 200OK, and the Service-Router header should only applicable to the 200OK of REGISTER, but in our situation, both of the header also appears when S-CSCF receiving the "401 Unauthorized-Challenging the UE".

SIP client:

In accordance with the 3GPP TS 24.229, the S-CSCF supports the Path header (only applicable to the REGISTER request and its 200OK), the Service-Router header (only applicable to the 200OK response of REGISTER), and also support the Require header. However, it does not support the Supported header.

[5.4.1.2] Initial registration and user-initiated reregistration

[5.1.1.2.1] Unprotected REGISTER

As says in NOTE 2, if a REGISTER request with Expires header value equal to zero should always be received protected, but for both SIP client and IMS client, the Expires header value are not equal to zero, so our REGISTER request is unprotected.

IMS client

When receiving a REGISTER request with the "integrity-protected" parameter set to "no", the IMS client accord with the standards better than SIP client. Except the timer reg-await-auth haven't been started, others are consistent to 3GPP TS 24.229.

SIP client:

Upon receipt of a REGISTER request without the "integrity-protected" parameter, the S-CSCF behave almost as the standards says, but there is no IK, CK parameters in the WWW-Authenticate header, and because is SIP client, so the security mechanism is MD5 but no AKAV1-MD5. Besides, in

normal case, the S-CSCF doesn't start the timer reg-await-auth.

[5.4.1.2.2] Protected REGISTER

Since our REGISTER request is unprotected, so we don't consider this sub-clause.

[5.4.1.3] Authentication and re-authentication

This situation we already discussed in 5.4.1.2.

[5.4.1.4] User-initiated deregistration IMS client

Since the "integrity-protected" parameter in Authorization header set to "no", according to the standard, S-CSCF apply the procedures described in sub-clause 5.4.1.2.1

SIP client

X-Lite cannot been deregistered by user.

[5.4.2] Subscription and notification

[5.4.2.1] Subscriptions to S-CSCF events

[5.4.2.1.1] Subscription to the event providing registration state

When an incoming SUBSRIBER request addressed to S-CSCF arrives containing the Event header with the reg event package, the S-CSCF shall check if a subscriber who is authorized to subscribe to the registration state of this particular user generated the request. For both SIP client and IMS client, the S-CSCF can find the identity for authentication of the subscription in the P-Asserted-Identity header received in the SUBSRIBER request. And the S-CSCF stores the value of the orig-ioi parameter received in the P-Charging-Vector header.

IMS client

When generate a 200 response to the SUBSCRIBER request, the S-CSCF populate an Expires header set to the same value as the Expires header in SUBSCRIBE request which is accord with the standards.

SIP client

When generate a 200 response to the SUBSCRIBER request, the S-CSCF populates an Expires header set to a value that is higher than the Expires header in SUBSCRIBE request, this is the opposite as described in the 3GPP TS 24.229.

[5.4.2.1.2] Notification about registration state

IMS client

For each NOTIFY on all dialogs which have been established due to subscription to the reg event package of the user, the S-CSCF set the Request-URI and Router header to the saved route information during subscription, and set the Event header to the "reg". In the body of the NOTIFY request contains a <registration> elements and for each <registration> element, the S-CSCF set the or attribute to one public user identity, and set the<uri> sub-element inside the <contact> sub-element of the <registration> element to the contact address. Under this situation, if the public user identity has been deregistered, then S-CSCF sets the state attribute in the <registration> element to "terminated", sets the state attribute in the <contact> element to "terminated" and set the event attribute in the <contact> element to "unregistered".

However, there is no P-Charging-Vector header for the NOTIFY request which is different as the standard says.

SIP client

For SIP client X-Lite, we got "487 Event Package Not Supported".

[5.4.3] General treatment for all dialogs and standalone transactions excluding requests terminated by the S-CSCF

[5.4.3.1] Determination of mobile-originated or mobile-terminated cases

For both IMS client and SIP client, upon receipt of an initial request or a target refresh request or a stand-along transaction, the S-CSCF perform the procedures for the mobile-originating case as described in 3GPP TS 24.229 sub-clause 5.4.3.2, and the S-CSCF remove the "orig" parameter from the topmost Route header.

[5.4.3.2] Requests initiated by the served user IMS client

When S-CSCF receives an initial request for a dialog or a request for a standalone transaction from the served user, the S-CSCF first determines whether the request contains a barred public user identity in the P-Accessed-Identity header field of the request or not. For our situation, there is non-barred public user identity.

Our example accord with most of the situations as described in standards, but there are still some differences:

- The S-CSCF stores the value of the orig-ioi parameter received in the P-Charging-Vector header, but it doesn't remove it from the forwarded request.
- The S-CSCF doesn't insert a P-Charging-Function-Addresses header and have no knowledge that the SIP URI contained in the received P-Asserted-

Identity header is an alias SIP URI for a tel URI (We didn't use tel URI).

- Since the networking is not needed, so the S-CSCF doesn't put the address of the I-CSCF to the topmost route header.
- The S-CSCF doesn't remove the P-Access-Network-Info header based on the destination user (Request-URI) or when it receives a target refresh request from the served user.
- There is no access-network-charging-info parameter in the P-Charging-Vector header field.

SIP client

Almost all the situations are have the same result as IMS client example except that there is no original dialog identifier that the S-CSCF previously placed in a Router header is present in the topmost Route header of the incoming request.

[5.4.3.4] Original dialog identifier

As described before, our SIP client example doesn't show the original dialog identifier.

[5.4.4] Call initiation
[5.4.4.1] Initial INVITE

For both SIP client and IMS client, when the S-CSCF receives an INVITE request, the S-CSCF processes the initial INVITE request without examining the SDP.

[5.4.4.2] Subsequent requests
[5.4.4.2.1] Mobile-originating cases

According to the 3GPP TS 24.229, when the S-CSCF receives 1xx or 2xx response, the S-CSCF shall insert a P-Charging-Function-Addresses header and store the access-network-charging-info parameter in it when receiving the request containing the access-network-charging-info parameter in the P-Charging-Vector. But in our situation, for both SIP client and IMS client. The S-CSCF doesn't insert the P-Charging-Vector header.

When the S-CSCF receives any request or response (excluding ACK requests and CANCEL requests and responses) related to a mobile-originated dialog or standalone transaction, the S-CSCF may insert save value into P-Charging-Vector and P-Charging-Function-Addresses headers before forwarding the message within the S-CSCF home network, however in our testing, the S-CSCF didn't insert it.

[5.4.4.2.2] Mobile-terminating case

For both SIP client and IMS client, our situation is not consistent to the standards. When S-CSCF receives the any 1xx or 2xx response, the S-CSCF

doesn't insert te P-Charging-Function-Addresses header, and when the S-CSCF receives 180(Ringing) or 200OK(to INVITE) response, the response are not contain the access-network-charging-info parameter, and not contain the P-Charging-Vector.

- **Evaluation at the Cx**

In the square bracket "[ ]" show the sub-clause in 3GPP TS 24.229 Release 6 specification.

[6] Diameter application for Cx interface

[6.1] Command-Code values

In our situation, there are several commands appear which are User-Authorization-Request (UAR), User-Authorization-Answer (UAA), Server-Assignment-Request (SAR), Server-Assignment-Answer (SAA), Location-Info-Request (LIR), Location-Info-Answer (LIA),Multimedia-Auth-Request (MAR), Multimedia-Auth-Answer (MAA). For both IMS client and SIP client, our examples are mostly accord with the 3GPP TS 29.229. We have all the mandatory AVPs and most optional AVPS in those commands. However, there are no "Registration-Termination-Request (RTR)", "Registration-Termination-Answer (RTA)", "Push-Profile-Request (PPR)" and "Push-Profile-Answer" commands in our examples.

[6.2] Result-Code AVP values
[6.2.1] Success

For both IMS client and SIP client in our example, there are two values stand for success that are "DIAMETER_RIRST_REGISTRATION" (2001) and "DIAMETER_SUBSEQUENT_REGISTRATION"(2002).

The "DIAMETER_RIRST_REGISTRATION"(2001) is appeared in MAA, SAA and LIA commands while the "DIAMETER_SUBSEQUENT_REGISTRATION" (2002) is appeared in UAA command during the registration process.

[6.2.2] Permanent Failures

When we use GXP-2000 as SIP client to register, there are "DIAMETER_ERROR_USER_UNKNOWN" (5001) stand for permanent failures. It appears in the last UAA command in the process of registration.

[6.3] AVPS

There are several AVPs that are showed in the table 6.3.1 of 3GPP TS 29.229 appeared in our examples. We describe them individually below.

[6.3.1] Visited-Network-Identifier AVP (600)

For both IMS client and SIP client, it appears in the UAR command, and the values is: open-ims.test.

[6.3.2] Public-Identity AVP (601)

IMS client

The Public-Identity appears in UAR, MAR, SAR and LIR commands when using IMS client to register. The value is "sip:alice@open-ims.test".

SIP client

When using X-Lite as SIP client, it appears in UAR, MAR, SAR and LIR commands and the value is "sip: user2@open-ims.test".

When using GXP-2000 as SIP client, it appears in UAR command and the value is "sip: user1@open-ims.test".

[6.3.3] Server-Name AVP (602)

When using IMS client and using X-Lite as SIP client to register, the Server-Name AVP appears in UAA, MAR, SAR and LIA commands and the value is

"sip:scscf.open-ims.test:6060".

When using GXP-2000 as SIP client to register, it only appears in UAA command and the value is also "sip:scscf.open-ims.test:6060".

[6.3.7] User-Data AVP (606)

For both IMS client and X-Lite as SIP client, the User-Data AVP appears in SAA commands. When using GXP-2000 as SIP client, there is no User-Data AVP appears.

[6.3.8] SIP-Number-Auth-Items AVP (607)

For both IMS client and X-Lite as SIP client, the SIP-Number-Auth-Items AVP appears in MAR, MAA commands. When using GXP-2000 as SIP client, there is no SIP-Number-Auth-Items AVP appears.

[6.3.13] SIP-Auth-Data-Item AVP (612)

For both IMS client and X-Lite as SIP client, the SIP- Auth-Data-Items AVP appears in MAR, MAA commands. The value for IMS client is" Digest-AKAv1-MD5" while the value for X-Lite is "Digest-MD5". When using GXP-2000 as SIP client, there is no SIP-Auth-Data-Item AVP appears.

[6.3.15] Server-Assignment-Type AVP (614)

For both IMS client and X-Lite as SIP client, the Server-Assignment-Type

AVP appears in SAR command. When using GXP-2000 as SIP client, there is no Server-Assignment-Type AVP appears.

[6.3.19] Charging-information AVP (618)

For both IMS client and X-Lite as SIP client, the Charging-information AVP appears in SAA command. When using GXP-2000 as SIP client, there is no SIP-Number-Auth-items AVP appears.

[6.3.24] User-Authorization-Type AVP (623)

Only when using GXP-2000 as SIP client to register the User-Authorization-Type appears. And the value is "REGISTRATION (0)".

[6.3.25] User-Data-Already-Available AVP (624)

For both IMS client and SIP client, it appears in SAR command.

Appendix C
Messages from call session for "client-based" solution

- **(1) INVITE**

Session Initiation Protocol

Request-Line: INVITE sip:user1@imstestbed.net SIP/2.0

Message Header

Via:SIP/2.0/UDP192.168.1.13:2668;branch=z9hG4bK-d87543-8409b2001c6c9c59-1 --d87543-;report Max-Forwards: 70

Route: <sip: user2@imstestbed.net:4060;lr>

Contact: <sip:user3@192.168.1.13:2668>

To: " user1@imstestbed.net "<sip: user1@imstestbed.net >

From: "user2"< user2@imstestbed.net >;tag=ce7c1c2f

Call-ID: ZWZiZjVIMTJkM2E3ZWJkMDI5ZmUxOTZiNTM1 MzhhNDY.

CSeq: 1 INVITE Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY, MESSAGE, SUBSCRIBE, INFO

Content-Type: application/sdp User-Agent: X-Lite release 1006e stamp 34025 Content-Length: 325

- **(10) 300 Redirect**

Session Initiation Protocol

Status-Line: SIP/2.0 300 Redirect

Message Header

Via:SIP/2.0/UDP192.168.1.13:2668;branch=z9hG4bK-d87543-8409b2001c6c9c59-1 ~d87543-;rport=2668

To: "user2@imstestbed.net"<sip:user1@imstestbed.net>;tag=b27e1a1d33761e85846 fc98f5f3a7e58.fc09

From: "user2"< user2@imstestbed.net >;tag=ce7c1c2f

Call-ID: ZWZiZjVIMTJkM2E3ZWJkMDI5ZmUxOTZiNTM1 MzhhNDY.

CSeq: 1 INVITE

Contact: sip: user2@imstestbed.net

Server: Sip EXpress router (0.9.6 (i386/linux))

Content-Length: 0

Warning: 392 128.39.145.104:5060 "Noisy feedback tells: pid=12415 req_src_ip=128.39.145.250 req_src_port=51836

in_uri=sip: user2@imstestbed.net out_uri=sip: user1@imstestbed.net

via cnt==2"

- **(11)ACK**

Session Initiation Protocol

Request-Line: ACK sip:user1@imstestbed.netSIP/2.0

Message Header

Via:SIP/2.0/UDP192.168.1.13:2668;branch=z9hG4bK-d87543-8409b2001c6c9c59-1 --d87543-;rport

Route: <sip:orig@scscf2.open-ims.test:4060;lr>

To:" user2@imstestbed.net "<sip:user1@imstestbed.net>; tag=b27e1a1d33761 e85846 fc98f5f3a7e58.fc09

From: "user2"<sip: user2@imstestbed.net>;tag=ce7c1c2f

Call-ID: ZWZiZjVIMTJkM2E3ZWJkMDI5ZmUxOTZiNTM1 MzhhNDY.

CSeq: 1 ACK Content-Length: 0

- **(12) INVITE**

Session Initiation Protocol

Request-Line: INVITE sip: user2@imstestbed.net SIP/2.0

Message Header

Via:SIP/2.0/UDP192.168.1.13:2668;branch=z9hG4bK-d87543-5a2372669626033f-1 -d87543-;rport Max-Forwards: 70

Route: <sip: user2@imstestbed.net:4060;lr>

Contact: <sip:user3@192.168.1.13:2668>

To: "user1@imstestbed.net"<sip: user1@imstestbed.net>

From: "user2"<user2@imstestbed.net>;tag=ce7c1c2f

Call-ID: ZWZiZjVIMTJkM2E3ZWJkMDI5ZmUxOTZiNTM1 MzhhNDY. CSeq: 2 INVITE Allow: INVITE, ACK, CANCEL, OPTIONS, BYE, REFER, NOTIFY, MESSAGE, SUBSCRIBE, INFO Content-Type: application/sdp User-Agent: X-Lite release 1006e stamp 34025 Content-Length: 325

- **(13) 300 Redirect**

Session Initiation Protocol

Status-Line: SIP/2.0 300 Redirect

Message Header

Via:SIP/2.0/UDP192.168.1.13:2668;branch=z9hG4bK-d87543-8409b2001c6c9c59-1~d87543-;rport=2668

To:"user1@imstestbed.net" <sip: user1@imstestbed.net>; tag=b27e1a1d33761

e85846 fc98f5f3a7e58.fc09

From: "user2"<user2@imstestbed.net>;tag=ce7c1c2f

Call-ID:ZWZiZjVlMTJkM2E3ZWJkMDI5ZmUxOTZiNTM1MzhhNDY.

CSeq: 1 INVITE

Contact: sip: user1@imstestbed.net

Server: Sip EXpress router (0.9.6 (1386/linux))

Content-Length: 0

Warning: 392 128.39.145.104:5060 "Noisy feedback tells: pid=12415 req_src_ip=128.39.145.250 req_src_port=51836 in_uri=sip: user1@imstestbed.net out_uri=sip: user2@imstestbed.net via cnt==2"

Appendix D
AddUser.java file

```
public final class AddUser
{
    public static void main(String[ ] args)
    {
        System.out.println("use hssdb;");

        for (hit i= l;i<= 100; i++)
        {
        String num = "" + i;
        int zeroesToAdd = 4 - num.lengthQ;

        for (int j = 0; j < zeroesToAdd; j++)
        { num = "0" + num;
        }
        System.out.println("insert into imsu(name) values ('alice" + num +
        "_imsu');");
        System.out.println("insert into impi(impi_string, imsu_id, imsi,
        scscf_name, s_key, chrg_id, sqn) values('alice" + num + "@open-
        ims.tesf, (select imsu_id from imsu where imsu.name='alice" +
        num + "_imsu'), 'alice" + num + "_ISDN_User_part_ID',
        'sip:scscf2.open-ims.test:4060',
        '616c6963650000000000000000000000', (select chrg_id from
        chrginfo where chrginfo.name='default_chrg'), '000000000000');");
        System.out.println("insert into impu(sip_url, tel_url, svp_id) values
        ('sip:alice" + num + "@open-ims.test','tel:00491234" + num + "',
        (select svp_id from svp where svp.name='default_sp '));");
        System.out.println("insert into impu2impi(impi_id, impu_id) values
        ((select impi_id from impi where impi.impi_string='alice" + num +
        "@open-ims.test'), (select impu_id from impu where
        impu.sip_url='sip:alice" + num + "@open-ims.test'));");
        System.out.println("insert into roam(impi_id, nw_id) values((select
        impi_id from impi where impi.impi_string='alice" + num + "@open-
        ims.test'), (select nw_id from networks where networks
        .network_string='open-ims. test'));");
        }
    }
}
```

Appendix E
XML file of REGISTER using in SIPp

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE scenario SYSTEM "sipp.dtd">

<scenario name="sip-to-sip call">

<send retrans="500">
<![CDATA[
REGISTER sip:open-ims.test SIP/2.0
Via: SIP/2.0/[transport] [locaUp]:[local_port]
Route: <sip:pcscf.open-ims.test:4060;lr>
Max-Forwards: 70
From: "user2" <sip: user2@imstestbed.net:4060>
To: "user2" <sip: user2@imstestbed.net:4060>
P-Access-Network-Info:3GPP-UTRAN-TDD;utran-cell-id-
3gpp=C359A3913B20E
Call-ID: [call_id]
Contact: <sip:user1@[local_ip]:[local_port]>;transport=[transport]
Content-Length: 0
Supported: path
Expires: 300
CSeq: 1 REGISTER
User-Agent: Sipp v1.1 -TLS, version 20061124
]]> </send>

<recv response="401" auth="true" rtd="true">
<action>
<ereg regexp=".*" search_in="hdr" header="Service-Route" assign_to="1" />
</action>
</recv>

<send retrans="500">
<![CDATA[
```

```
REGISTER sip:open-ims.test SIP/2.0
Via: SIP/2.0/[transport] [local_ip]:[local_port]
Route: <sip:pcscf.open-ims.test:4060;lr>
Max-Forwards: 70
From: "user2" <sip: user2@imstestbed.net >
To: "user2" <sip: user2@imstestbed.net >
P-Access-Network-Info:3GPP-UTRAN-TDD;utran-cell-id-
3gpp=C359A3913B20E
Call-ID:[call_id]
CSeq: 2 REGISTER
Contact: <sip:user2@[local_ip]:[local_port]>
Expires: 300
Content-Length: 0
[authentication username= user1@imstestbed.net password=12345]
Supported: path
User-Agent: Sipp v1.1 -TLS, version 20061124
]]> </send>

<recv response="200">
</recv>

</scenario>
```

Appendix F
XML file of INVITE using in SIPp

UAC

```
<?xml version="1 .0" encoding="ISO-8859-1" ?>
<!DOCTYPE scenario SYSTEM "sipp.dtd">

<scenario name="sip-to-sip call”>

<send retrans="500">
<![CDATA[
INVITE sip:user1@open-ims.test SIP/2.0
Via: SIP/2.0/[transport] [local_ip]:[local_port];branch=[branch]
Route: <sip:orig@scscf2.open-ims.test:4060;lr>
From: "user2" <sip:user2@open-ims.test:4060>;tag=[call_number]
To: "user1" <sip: user1@open-ims.test:4060>
Call-ID: [call_id]
CSeq: [cseq] INVITE
Contact: <sip: user2@[local_ip]:[local_port]>
Max-Forwards: 70
Subject: Performance Test
Content-Type: application/sdp
Content-Length: [len]

v=0
o=-02IN IP4 192.1 68.1. 3
s=-
c=IN IP4 192.168.1. 3
t=00
m=audio [media_port] RTP/AVP 0
a=rtpmap:0 PCMU/8000

]]>
</send>
<recv response="100" optional="true"/>
```

```
<recv response="180" optional="true"/>
<recv response="200" rtd="true"/>
<send>
<![CDATA[
ACK sip:user1@[local_ip]:[local_port] SIP/2.0
Via: SIP/2.0/[transport] [local_ip]:[local_port];branch=[branch]
Route: <sip:mo@pcscf.open-ims.test:4060;lr>
Route: <sip:mt@scscf.open-ims.test:6060;lr>
Route: <sip:mt@scscf.open-ims.test:6060;lr>
From: "user2"<sip: user2@open-ims.test>;tag=[call_number]
To: "user1"<sip: user2@open-ims.test>[peer_tag_param]
Call-ID: [call_id]
CSeq: [cseq] ACK
Contact: <sip: user2@[local_ip]:[local_port]>
Max-Forwards: 70
Subject: Performance Test
Content-Length: [len]
]]>

</send>
<![CDATA[
BYE sip: user2@[local_ip]:[local_port] SIP/2.0
Via: SIP/2.0/[transport] [local_ip]:[local_port];branch=[branch]
From: "user1"<sip: user1@open-ims.test>;tag=[call_number]
To: "user2"<sip: user2@open-ims.test>[peer_tag_param]
Call-ID: [call_id]
CSeq: [cseq] BYE
Contact: <sip: user2@[local_ip] :[local_port]>
Max-Forwards: 70
Subject: Performance Test
Content-Length: [len]
]]>
</send>

<recv response="200"crlf="true"/>
</scenario>
```

UAS

```
<?xml version="1 .0" encoding="ISO-8859-1" ?>
<!DOCTYPE scenario SYSTEM "sipp.dtd">

<scenario name="uac-uas(sip-sip call), server-side">

<recv request="INVITE">
</recv>

<send> <![CDATA[ SIP/2.0 180 Ringing

[last_Via:]

[l ast_Reco rd- Route:]

[last_From:]

[last_To:];tag=[call_number]

[last_Call-ID:]

[last_CSeq:]

Contact: <sip: user2@[local_ip] :[local_port]>

Content-Length: [len]

]]>

</send>


<pause milliseconds="2000"/>


<send retrans="500">

<![CDATA[

SIP/2.0 200 OK

[last_Via:]

[l ast_Reco rd- Route:]

[last_From:]

[last_To:];tag=[call_number]

[last_Call-ID:]

[last_CSeq:]

Contact: <sip: user2@[local_ip] :[local_port]>

Allow:

INVITE,REGISTER,ACK,BYE,INFO,REFER,NOTIFY,SUBSCRIBE,MESSA
GE,CAN

GEL

Content-Type: application/sdp

Content-Length: [len]
```

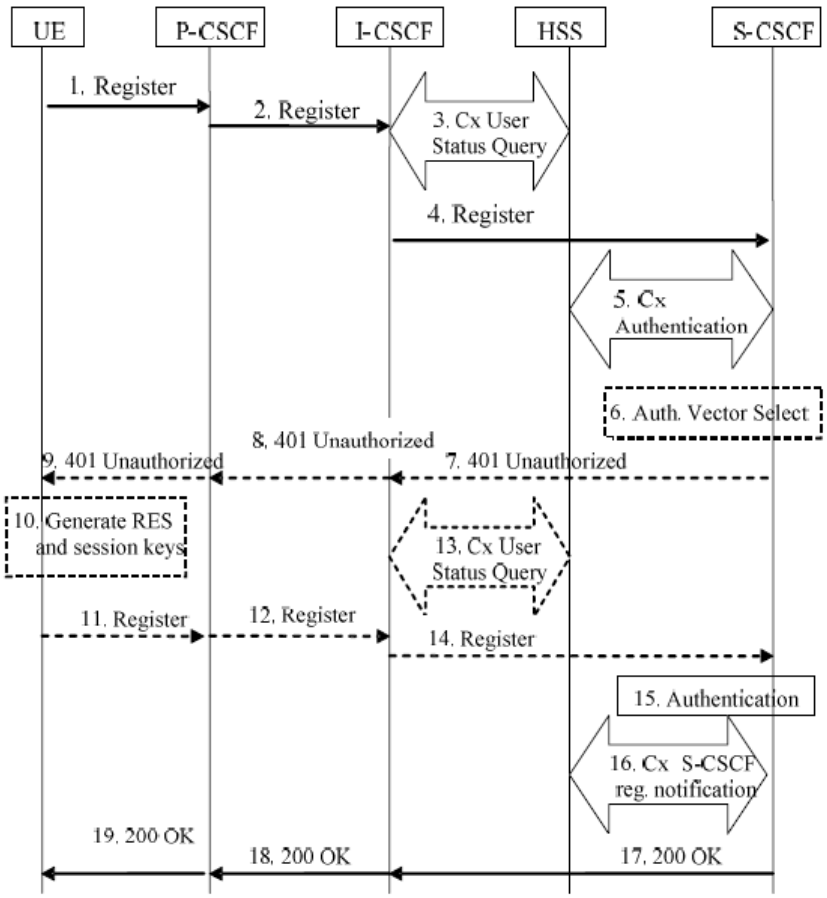
```
v=0
o=- 0 2 IN IP4 [localjp]
s=-
c=IN IP4 [media_ip]
t=00
m=audio 40000 RTP/AVP 8018
a=rtpmap:8 PCMA/8000
a=rtpmap:0 PCMU/8000
a=rtpmap:18 G729/8000
]]> </send>
<recv request="ACK" crlf="true">
</recv>
<recv request="BYE">
</recv>
<send>
<![CDATA[
SIP/2.0 200 OK
[last_Via:]
[last_From:]
[last_To:]
[last_Call-ID:]
[last_CSeq:]
Content-Length: 0
]]> </send>
</scenario>
```

Appendix G
SIP MESSAGE FLOW

The SIP message flow shown in Appendix A was adapted from the 3GPP TS24.228 Release 6.

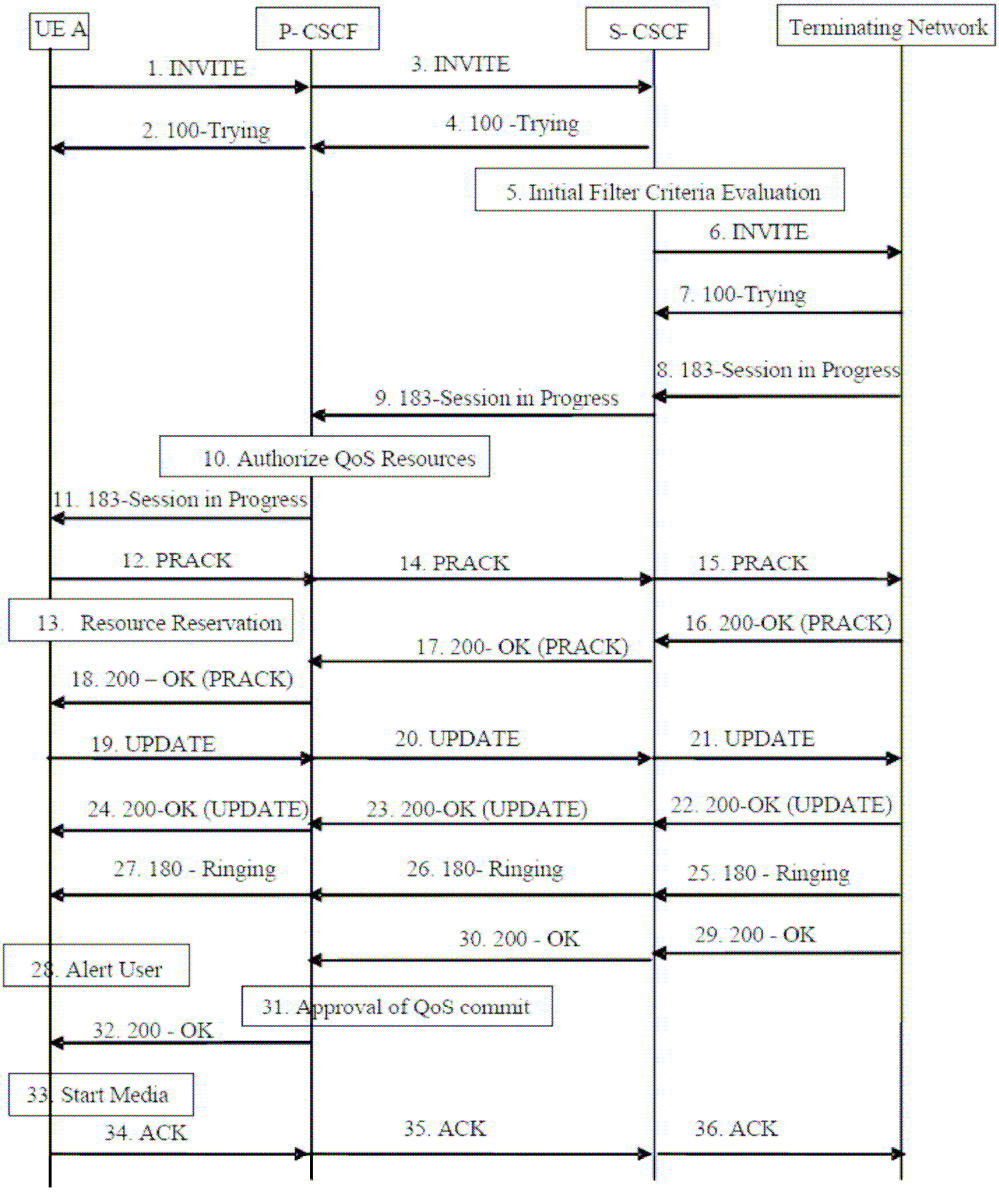
G.1: SIP Registration Message Flow

The dotted lines in show messages and procedures to be followed based on the 3GPP specification. These dotted line functionalities are not supported by the INT IMS testbed yet, therefore they will not be implemented by this IMS Client. As the INT IMS testbed is still work-in-progress, such functionalities will be supported in future. The IMS Client will be registered only when the initial SIP REGISTER request has been sent, as shown by the solid lines.



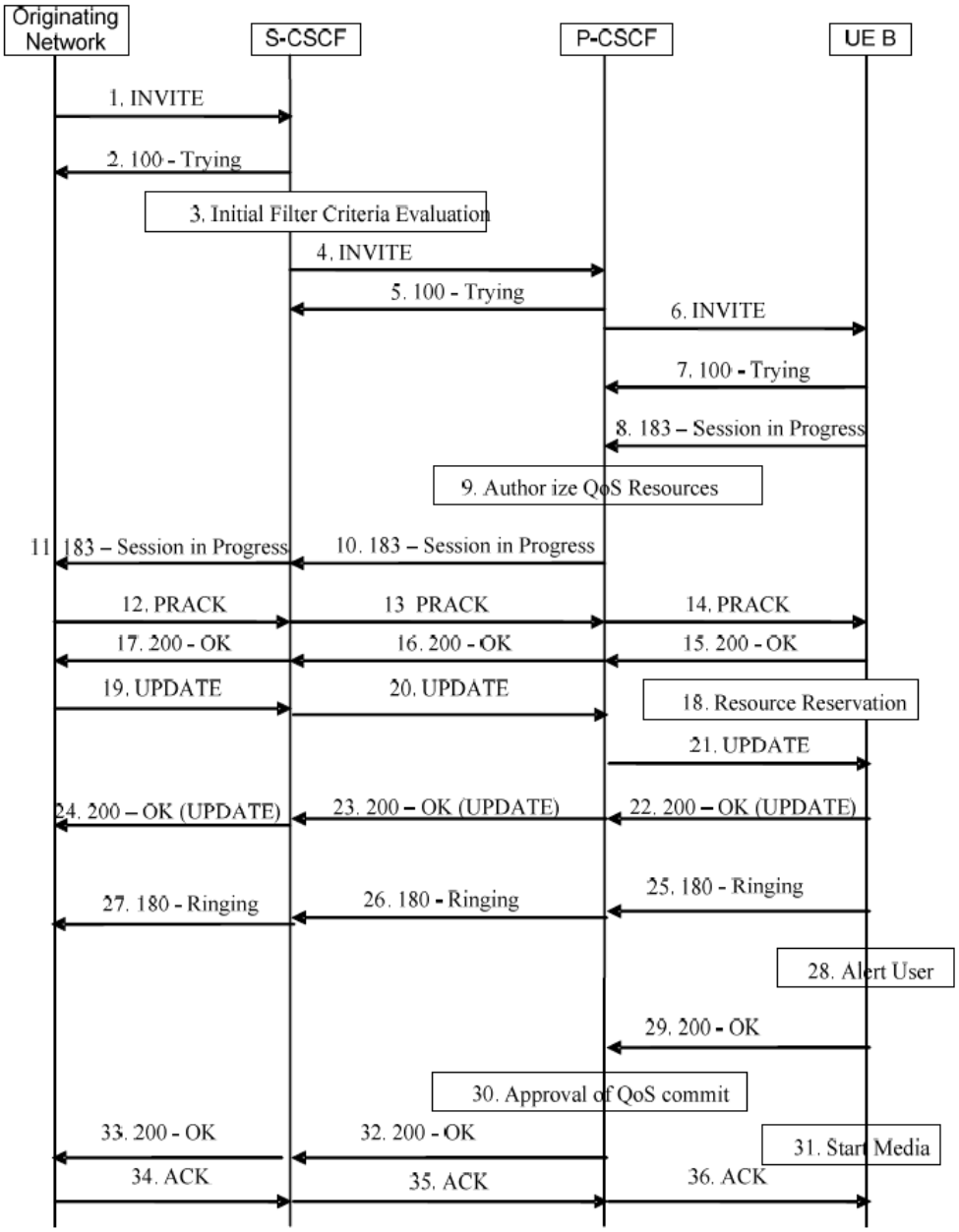
G.2: Session Establishment Message Flow

Appendix G.2 is the sequence diagram indicating the establishment of the session from UE A to the terminating network [135]. The terminating network, which belongs to UE B, is shown in Appendix G.3. An I-CSCF is not shown in the diagram. It is important to note that the terminating network can also be the same network, if the same IMS network operator serves both UEs.



G.3: Session Termination Message Flow

Appendix G.3 is the sequence diagram indicating the termination of the session from the originating network to UE B [135]. The originating network may be similar to the one shown in Appendix G.2, but it can also share the same network with the terminating network.

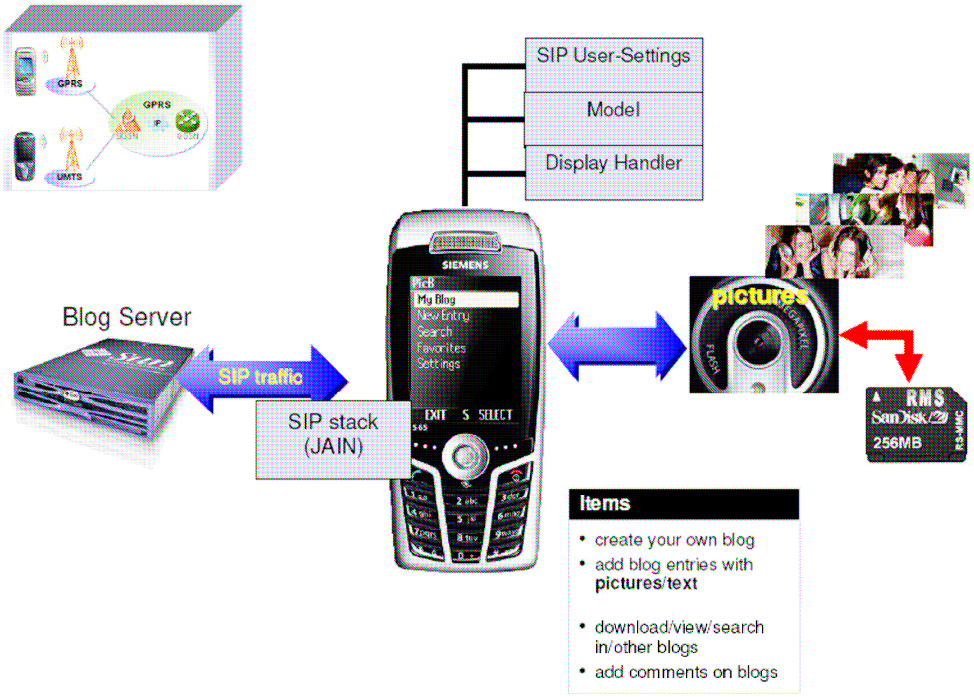


Appendix H

JAVA CODE TO CREATE A DISPLAY OF J2ME

```
//Create the commands to be attached to the register
     display
protected Command exitCmd = new Command("Exit",
     Command.EXIT,1);
protected Command registerCmd= new Command("Register",
     Command.OK,0);
//Create registerFrm: Allow the user to register
private Form getRegisterFrm()
{
if (registerFrm == null)
{
registerFrm = new Form("Unregistered to IMS", new Item[]
     { new TextField("You have to register first\nPress
     Register to register\n\n Registrar IP address:"
     ,registrar, 30, TextField.ANY) });
registerFrm.addCommand(exitCmd);
registerFrm.addCommand(registerCmd);
registerFrm.setCommandListener(this);
}
return registerFrm;
}
```

Appendix I
Global Diagram of MoBlog



Appendix J

XML MESSAGE STRUCTURE

New Blog

Subject: NBL;

```
<body>
     <date>date in long format</date>
     <title>blog title</title>
     <keywords> (optional) category of the blog</keyword>
</body>
```

Delete Blog

```
     Subject: DEL;
```

New entry

```
Subject: NBE;
<body>
     <date>date in long format</date>
     <topic>subject of the entry</topic>
     <text>entry text</text>
</body>
```

New Comment

```
Subject: NCE;blog_id(int);entry_id(int);
<body>
     <date>date in long format</date>
     <text>comment text</text>
</body>
```

Request Blog list

```
Subject: REQ;BL;page_nr(int) ;
```

Edited entry

```
Subject: EBE;blog_id(int);entry_id(int);
<body>
```

```
     <date>date in long format</date>
     <topic>subject of the entry</topic>
     <text>entry text</text>
</body>
```

Requesting an entry list

```
Subject: REQ;EL;blog_id(int);page_nr(int);
```

Requesting a comment list

```
Subject: REQ;CL;blog_id(int);entry_id(int);page_nr(int);
```

Requesting an entry

```
Subject: REQ;BE;blog_id(int);entry_id(int);
```

Requesting a comment

```
Subject: REQ ;CE ;blog_id(int) ;entry_id(int)
;comment_id(int);
```

Requesting multimedia

```
Subject: REQ;DT;blog_id(int);entry_id(int);
```

Search

```
Subject: REQ;SR;page_nr(int);
<body>
     <type>title|date|keywords</type>
     <value>search value</value>
</body>
```

List of blogs

```
<body>
     <pages>number of pages</pages>
     <blog>
          <id>identification number of the blog</id>
          <title>blog title</title> </blog>
</body>
```

List of subscribed blogs

```
<body>
     <pages>number of pages</pages>
     <blog>
          <id>identification number of the blog</id>
          <title>blog title</title>
     </blog>
</body>
```

List of entries

```
<body>
     <pages>number of pages</pages>
     <author>name of the author</author>
     <entry>
          <id>identification number of the entry</id>
          <topic>topic of the blog</topic>
          <extra>0I 1 I 2|3</extra>
     </entry>
</body>
```

List of comments

```
<body>
     <pages>number of pages</pages>
     <comment>
     <id>identification number of the comment</id>
     <title>title of the comment</title>
     </comment>
</body>
```

Blog Entry

```
<body>
     <date>date in long format</date>
     <topic>title of the entry</topic>
     <text>entry text</text>
     <data>flag indicating the presence of
pictures</data> </body>
```

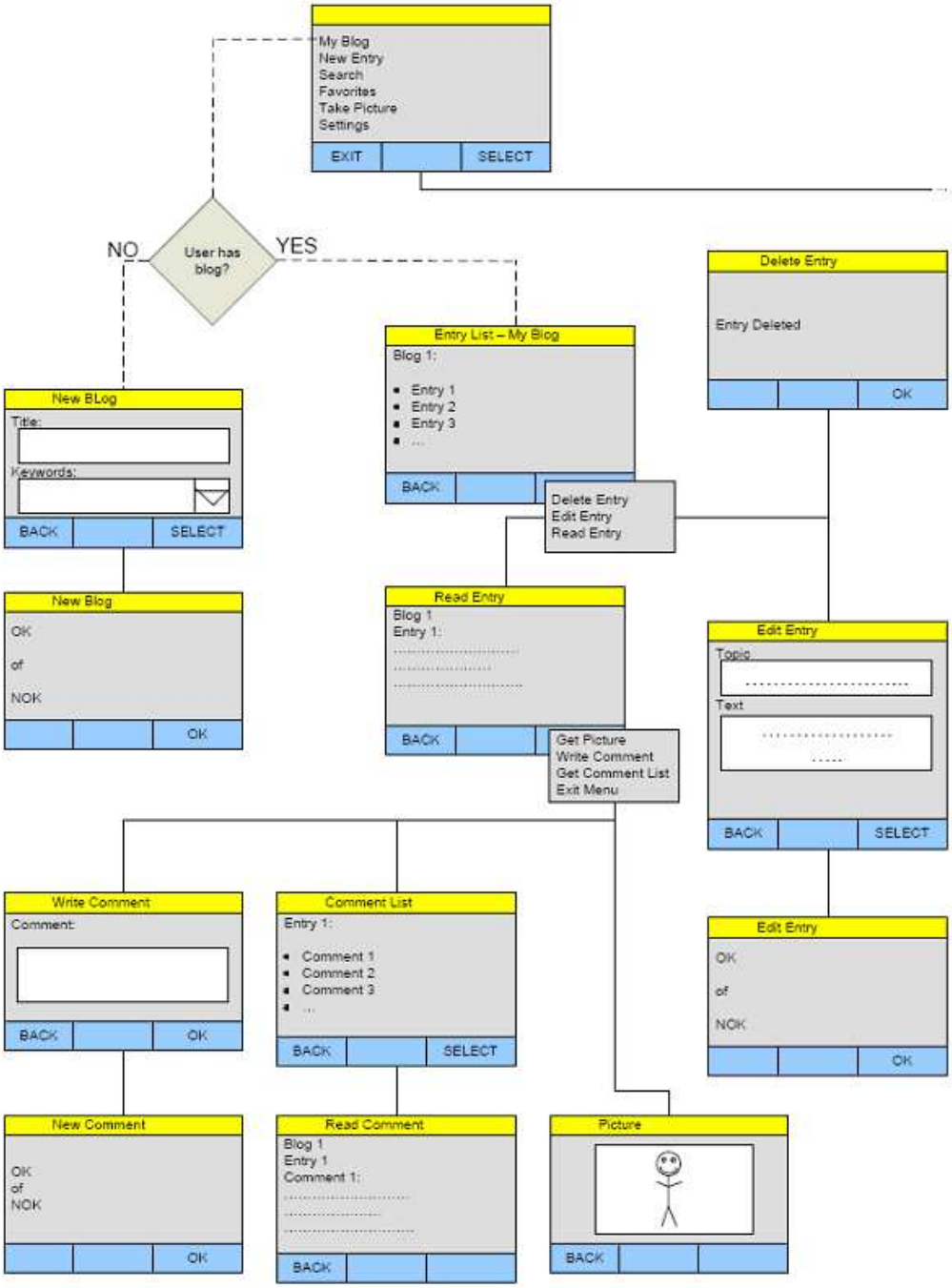
Comment on an Entry

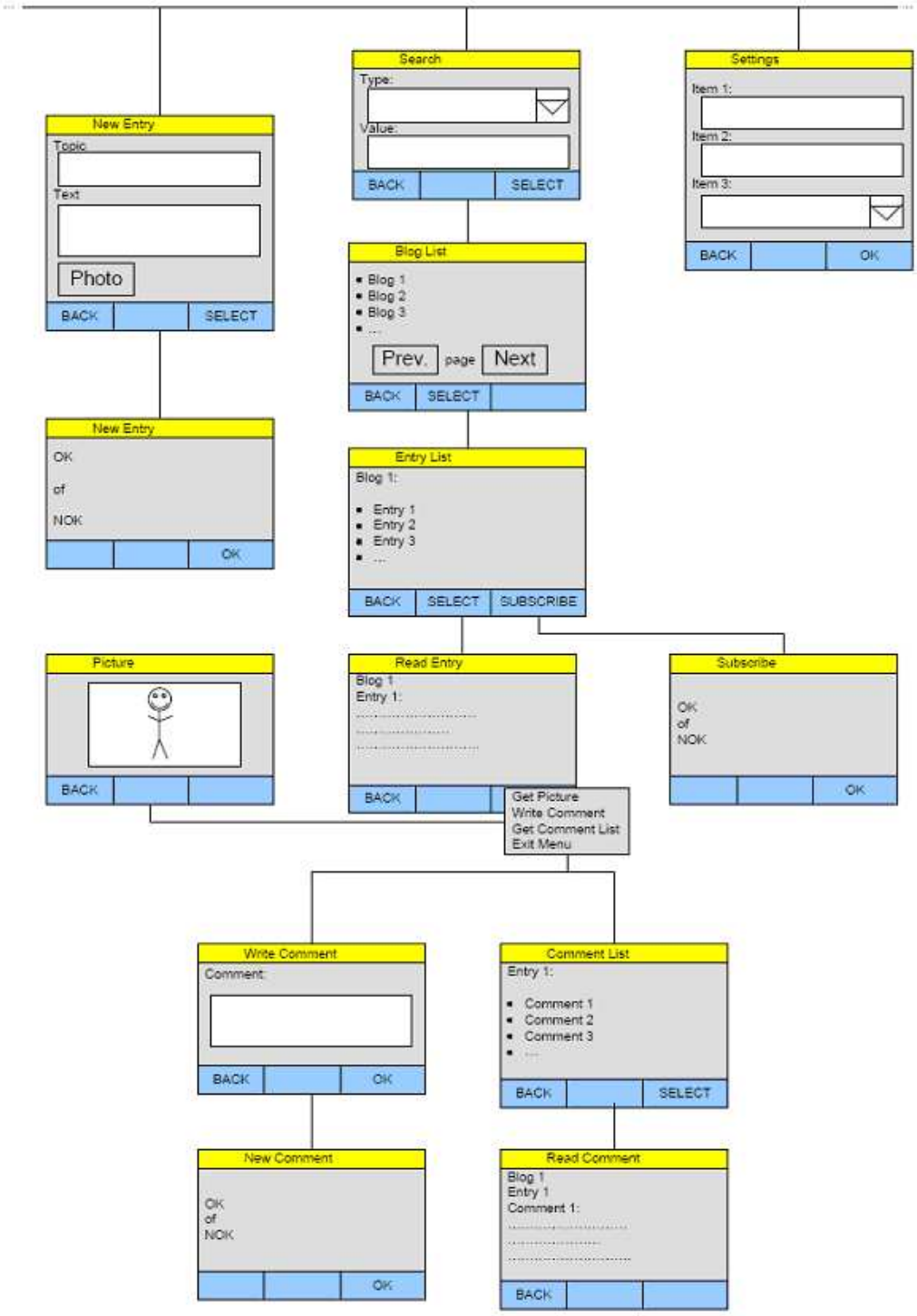
```
<body>
     <author>name of the author</author>
     <date>date in long format</date>
     <text>text of the comment</text>
</body>
```

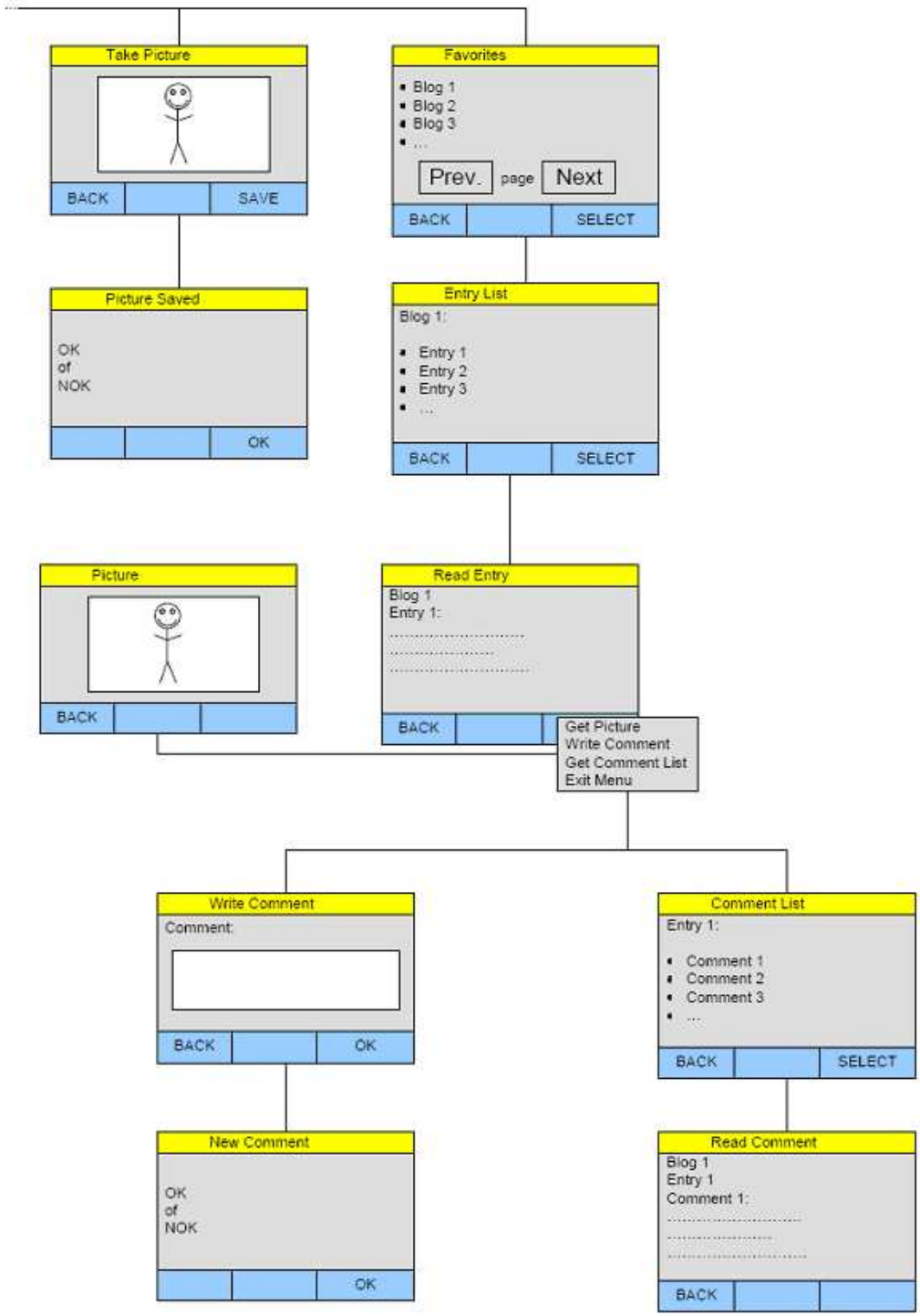
Search

```
<body>
     <blog>
          <id>identification number of the blog</id>
     <title>title of the blog</title>
     </blog>
</body>
```

Appendix K
MoBlog Menu Structure




Search
Type:
Value:
BACK
SELECT
Settings
Item 1:
Item 2:
Item 3:
BACK
OK
New Entry
Topic:
Text:
Photo
BACK
SELECT
Blog List
Blog 1
Blog 2
Blog 3
...
Prev.
page
Next
BACK
SELECT
New Entry
OK
of
NOK
OK
Entry List
Blog 1:
Entry 1
Entry 2
Entry 3
...
BACK
SELECT
SUBSCRIBE
Picture
BACK
Read Entry
Blog 1
Entry 1:
Get Picture
Write Comment
Get Comment List
Exit Menu
Subscribe
OK
of
NOK
OK
Write Comment
Comment:
BACK
OK
Comment List
Entry 1:
Comment 1
Comment 2
Comment 3
...
BACK
SELECT
New Comment
OK
of
NOK
OK
Read Comment
Blog 1
Entry 1
Comment 1:
BACK


Take Picture
BACK
SAVE
Favorites
Blog 1
Blog 2
Blog 3
...
Prev.
page
Next
BACK
SELECT
Picture Saved
OK
of
NOK
OK
Entry List
Blog 1:
Entry 1
Entry 2
Entry 3
...
BACK
SELECT
Picture
BACK
Read Entry
Blog 1
Entry 1:
BACK
Get Picture
Write Comment
Get Comment List
Exit Menu
Write Comment
Comment:
BACK
OK
Comment List
Entry 1:
Comment 1
Comment 2
Comment 3
...
BACK
SELECT
New Comment
OK
of
NOK
OK
Read Comment
Blog 1
Entry 1
Comment 1:
BACK