3GPP TSG-T (Terminals) Meeting #15
Jeju, Korea, March 2002

Tdoc TP-020013

Agenda Item: 5.2.3

Source: T2

Title: "MExE" Change Requests

Document for: Approval

Spec	CR	Rev	Rel	Subject	Cat	Vers-Curr	Vers-New	T2 Tdoc	Workitem
23.057	107		Rel-5	Adding ARPK to the abbreviation list	F	4.4.0	5.0.0	T2-020054	MEXE-ENHANC
23.057	108		Rel-5	Updating the references	F	4.4.0	5.0.0	T2-020070	MEXE-ENHANC
23.057	109		Rel-5	Replacing MExE application with MExE executable	F	4.4.0	5.0.0	T2-020073	MEXE-ENHANC
23.057	110		Rel-4	Changing the urls for the CLDC/MIDP references	F	4.4.0	4.5.0	T2-020078	MEXE-ENHANC
23.057	111		Rel-5	Classmark 4 non-security	B	4.4.0	5.0.0	T2-020285	MEXE-ENHANC
23.057	112		Rel-5	Classmark 4 security	B	4.4.0	5.0.0	T2-020089	MEXE-ENHANC
23.057	113		Rel-5	Adding MSISDN to the security table	F	4.4.0	5.0.0	T2-020286	MEXE-ENHANC
23.057	114		Rel-5	Making storage of ORPK in ME optional	F	4.4.0	5.0.0	T2-020287	MEXE-ENHANC
23.057	115		Rel-5	Interpretation of user control	F	4.4.0	5.0.0	T2-020288	MEXE-ENHANC
23.057	116		Rel-5	Specify more explicitly the MExE executable definition	F	4.4.0	5.0.0	T2-020289	MEXE-ENHANC
23.057	117		Rel-5	Remove unused abbreviations	F	4.4.0	5.0.0	T2-020290	MEXE-ENHANC

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020054

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **107** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Adding ARPK to the abbreviation list
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	27 Jan 2002
Category:	⌘	**F**
Release:	⌘	Rel 5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Add the ARPK abbreviation to the abbreviation list since it is used in the specification.
Summary of change:	⌘	Added the ARPK abbreviation to the abbreviation list
Consequences if not approved:	⌘	The specification might lead to misinterpretations.

Clauses affected:	⌘	3.2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

3.2 Abbreviations

For the purposes of the present document the following abbreviations apply:

AA	Attribute Authority
API	Application Programming Interface
APDU	Application protocol data unit
ARPK	Administrator Root Public Key
CA	Certification Authority
CC/PP	Composite Capability/Preference Profiles
CGI	Common Gateway Interface
CCM	Certificate Configuration Message
CLDC	Connected Limited Device Configuration
CP-Admin	Certificate Present (in the MExE (U)SIM) - Administrator
CP-TP	Certificate Present (in the MExE (U)SIM) - Third Party
CRL	Certificate Revocation List
DHCP	Dynamic Host Configuration Protocol
Diff-serv	Differentiated Services
DTMF	Dual Tone Multiple Frequency
GSM	Global System for Mobile Communication
GPRS	General Packet Radio Service
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transport Protocol Secure (https is http/1.1 over SSL, i.e. port 443)
IETF	Internet Engineering Task Force
IP	Internet Protocol
JAD	Java Application Descriptor
JAM	Java Application Manager
J2ME	Java 2 Micro Edition
J2SE	Java 2 Standard Edition
JNDI	Java Naming Directory Interface
JTAPI	Java Telephony Application Programming Interface
JAR file	Java Archive File
JVM	Java Virtual Machine
KVM	K Virtual Machine
ME	Mobile Equipment
MIDP	Mobile Information Device Profile
MIDlet	MIDP Application
MMI	Man-Machine Interface
MRPK	Manufacturer Root Public Key
MSE	MExE Service Environment
MT	Mobile Termination
OCF	OpenCard Framework
OEM	Original Equipment Manufacturer
OCSP	Online Certificate Status Protocol
ORPK	Operator Root Public Key
QoS	Quality of Service
PDP	Packet Data Protocol
PKI	Public Key Infrastructure
RDF	Resource Description Format
RFC	Request For Comments
RPK	Root Public Key
SAP	Service Access Point
SCVP	Simple Certificate Verification Protocol
SIM	Subscriber Identity Module
SMS	Short Message Service
SSL	Secure Socket Layer
TE	Terminal Equipment
TLS	Transport Layer Security
TP	Third Party
UDP	User Datagram Protocol
UE	User Equipment

UI	User Interface
UMTS	Universal Mobile Telecommunications System
URL	Uniform Resource Locator
URI	Uniform Resource Identifier
USIM	Universal Subscriber Identity Module
USSD	Unstructured Supplementary Service Data
VM	Virtual Machine
WAE	Wireless Application Environment
WAP	Wireless Application Protocol
WBXML	WAP Binary XML
WDP	Wireless Datagram Protocol
WMLS	Wireless Markup Language Script
WSP	Wireless Session Protocol
WTA	Wireless Telephony Applications
WTAI	Wireless Telephony Applications Interface
WTLS	Wireless Transport Layer Security
WTP	Wireless Transaction Protocol
WWW	World Wide Web
XML	Extensible Markup Language

Further abbreviations are given in 3GPP TS 22.057 [2] and GSM 01.04 [1].

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020290

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **117** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Remove unused abbreviations
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	13-Feb-2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Remove unused abbreviations.
Summary of change:	⌘	Removal of unused abbreviations from the abbreviations list.
Consequences if not approved:	⌘	Unused abbreviations will continue to be listed in the specification.

Clauses affected:	⌘	3.2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

3.2 Abbreviations

For the purposes of the present document the following abbreviations apply:

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API	Application Programming Interface
APDU	Application protocol data unit
CA	Certification Authority
CC/PP	Composite Capability/Preference Profiles
CGI	Common Gateway Interface
CCM	Certificate Configuration Message
CLDC	Connected Limited Device Configuration
CP-Admin	Certificate Present (in the MExE (U)SIM) - Administrator
CP-TP	Certificate Present (in the MExE (U)SIM) - Third Party
CRL	Certificate Revocation List
~~DHCP~~	~~Dynamic Host Configuration Protocol~~
Diff-serv	Differentiated Services
DTMF	Dual Tone Multiple Frequency
GSM	Global System for Mobile Communication
GPRS	General Packet Radio Service
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transport Protocol Secure (https is http/1.1 over SSL, i.e. port 443)
IETF	Internet Engineering Task Force
IP	Internet Protocol
JAD	Java Application Descriptor
~~JAM~~	~~Java Application Manager~~
J2ME	Java 2 Micro Edition
J2SE	Java 2 Standard Edition
~~JNDI~~	~~Java Naming Directory Interface~~
JTAPI	Java Telephony Application Programming Interface
JAR file	Java Archive File
~~JVM~~	~~Java Virtual Machine~~
~~KVM~~	~~K Virtual Machine~~
ME	Mobile Equipment
MIDP	Mobile Information Device Profile
MIDlet	MIDP Application
MMI	Man-Machine Interface
MRPK	Manufacturer Root Public Key
MSE	MExE Service Environment
MT	Mobile Termination
OCF	OpenCard Framework
OEM	Original Equipment Manufacturer
OCSP	Online Certificate Status Protocol
ORPK	Operator Root Public Key
QoS	Quality of Service
PDP	Packet Data Protocol
PKI	Public Key Infrastructure
RDF	Resource Description Format
RFC	Request For Comments
RPK	Root Public Key
~~SAP~~	~~Service Access Point~~
SCVP	Simple Certificate Verification Protocol
SIM	Subscriber Identity Module
SMS	Short Message Service
SSL	Secure Socket Layer
TE	Terminal Equipment
TLS	Transport Layer Security
TP	Third Party
UDP	User Datagram Protocol
UE	User Equipment
UI	User Interface

UMTS	Universal Mobile Telecommunications System
URL	Uniform Resource Locator
URI	Uniform Resource Identifier
USIM	Universal Subscriber Identity Module
USSD	Unstructured Supplementary Service Data
VM	Virtual Machine
WAE	Wireless Application Environment
WAP	Wireless Application Protocol
WBXML	WAP Binary XML
WDP	Wireless Datagram Protocol
WMLS	Wireless Markup Language Script
WSP	Wireless Session Protocol
WTA	Wireless Telephony Applications
WTAI	Wireless Telephony Applications Interface
WTLS	Wireless Transport Layer Security
WTP	Wireless Transaction Protocol
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Further abbreviations are given in 3GPP TS 22.057 [2] and GSM 01.04 [1].

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020289

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **116** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Specify more explicitly the MExE executable definition
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	26 Jan 2002
Category:	⌘	**F**
Release:	⌘	Rel 5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	To make sure MExE executables can execute on any MExE handset
Summary of change:	⌘	Added a more precise definition of MExE executable.
Consequences if not approved:	⌘	That the term MExE executables will be used for all kind of applications etc, whether they can execute on MExE terminals or not.

Clauses affected:	⌘	3.1
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

administrator: administrator of the MExE device is the entity that has the control of the third party trusted domain, and all resources associated with the domain

NOTE 1: The administrator of the MExE device could be the user, the operator, the manufacturer, the service provider, or a third party as designated by the owner of the MExE device.

...

MExE executable: is one or more~~an~~ applet, application, or ~~executable~~ content, which conforms to the MExE specification and may execute on any~~the~~ MExE device, conforming to the appropriate classmark.

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020288

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **115** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Interpretation of user control
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	13 Feb 2002
Category:	⌘	**F**
Release:	⌘	Rel 5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	To remove implementation details concerning user interface from the specification
Summary of change:	⌘	Rewording
Consequences if not approved:	⌘	The specification might lead to misinterpretations.

Clauses affected:	⌘	8.3
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.3 User permission types

Support of user permission types is mandatory.

The term "user permission" is defined to mean that the user can give permission for a specific action in one of the ways defined in table 8 "User Permissions". Support single action permission is mandatory, but support of blanket permission and session permission is optional.

~~All prompts~~ Any request for user permission as described in table 8 "User Permissions" must display a user friendly name identifying the signer of the corresponding MExE executable, if available. T~~he user shall be able to request to see t~~he "subject" field of the certificate of the signer ("subject" here refers to the "subject" fields of WTLS and X.509 certificates and an equivalent field for any other format of certificate) shall be made available to the user upon request. If an application, for which user permission is being sought, is untrusted, the fact that the application is untrusted shall be at least visually indicated to the user, if the MExE device is capable of visual indication, whenever user permission is sought. Other means of indication are additionally permitted. If the MExE device is not capable of visual indication, or is not designed for use by a human user, other means of indication shall be used.

~~The user shall be prompted for user permission relating to all action groups listed in the table 6 "Security domains and actions" that are required by the MExE executable. If a prompt for permission relates to more than one action, e.g. networking and user data, then it shall list the individual action group permissions which will be granted, though the action group permissions can all be granted with a single user action. This condition applies to any prompts relating to user permissions in table8 "User Permissions".~~

The MExE device shall allow user control of permissions relating to all action groups listed in the table 6 "Security domains and actions" that are required by the MExE executable and supported by the MExE device.

Multiple action group permissions may be controlled in a single user action on the MExE device regardless of the permission type as listed in table 8 "User Permissions". In such case, these action group permissions shall be made explicit to the user.

Note that blanket permission cannot be used for uninstalled MExE executables e.g. applets, WMLS.

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020287

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **114** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Making storage of ORPK in ME optional
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	13 feb 2002
Category:	⌘	**F**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Make it optional to store a Operator Root Public Key on the ME itself
Summary of change:	⌘	Modification to make it optional to allow an ORPK to be stored on the ME
Consequences if not approved:	⌘	Mandating storage of the ORPK on the ME might lead to security breaches.

Clauses affected:	⌘	8.5.1
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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8.5.1 Operator root public key

The ME ~~shall~~ may support secure storage for ~~at least~~ one or more certificate~~s~~, each of which contain~~s~~~~ing~~ an operator root public key. The ME shall support the use and management of a certificate containing an operator root public key stored on the MExE-(U)SIM and in the ME. The ME shall behave according to clause 8.5.1.2 "ME actions on SIM insertion and/or power up". For support of public key management on the SIM and the USIM refer to GSM 11.11 [27] and 3GPP TS 31.102 [39] respectively. The certificate contains a root public key generated either by the operator, or by a CA trusted by the operator.

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020286

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **113** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Adding MSISDN to the security table
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	27 Jan 2002
Category:	⌘	**F**
Release:	⌘	Rel 5

Use one of the following categories:
F *(correction)*
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Use one of the following releases:
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R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Add the fetching of the MSISDN to the security table, to remove doubht of who may fetch it through an API.
Summary of change:	⌘	Added the MSISDN to the security table
Consequences if not approved:	⌘	The specification might lead to misinterpretations.
Clauses affected:	⌘	3.2, 8.2.1
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

3.2 Abbreviations

For the purposes of the present document the following abbreviations apply:

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CRL	Certificate Revocation List
DHCP	Dynamic Host Configuration Protocol
Diff-serv	Differentiated Services
DTMF	Dual Tone Multiple Frequency
GSM	Global System for Mobile Communication
GPRS	General Packet Radio Service
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transport Protocol Secure (https is http/1.1 over SSL, i.e. port 443)
IETF	Internet Engineering Task Force
IP	Internet Protocol
ISDN	Integrated Services Digital Network
JAD	Java Application Descriptor
JAM	Java Application Manager
J2ME	Java 2 Micro Edition
J2SE	Java 2 Standard Edition
JNDI	Java Naming Directory Interface
JTAPI	Java Telephony Application Programming Interface
JAR file	Java Archive File
JVM	Java Virtual Machine
KVM	K Virtual Machine
ME	Mobile Equipment
MIDP	Mobile Information Device Profile
MIDlet	MIDP Application
MMI	Man-Machine Interface
MRPK	Manufacturer Root Public Key
MSE	MExE Service Environment
MSISDN	Mobile Subscriber ISDN Number
MT	Mobile Termination
OCF	OpenCard Framework
OEM	Original Equipment Manufacturer
OCSP	Online Certificate Status Protocol
ORPK	Operator Root Public Key
QoS	Quality of Service
PDP	Packet Data Protocol
PKI	Public Key Infrastructure
RDF	Resource Description Format
RFC	Request For Comments
RPK	Root Public Key
SAP	Service Access Point
SCVP	Simple Certificate Verification Protocol
SIM	Subscriber Identity Module
SMS	Short Message Service
SSL	Secure Socket Layer
TE	Terminal Equipment
TLS	Transport Layer Security
TP	Third Party
UDP	User Datagram Protocol

UE	User Equipment
UI	User Interface
UMTS	Universal Mobile Telecommunications System
URL	Uniform Resource Locator
URI	Uniform Resource Identifier
USIM	Universal Subscriber Identity Module
USSD	Unstructured Supplementary Service Data
VM	Virtual Machine
WAE	Wireless Application Environment
WAP	Wireless Application Protocol
WBXML	WAP Binary XML
WDP	Wireless Datagram Protocol
WMLS	Wireless Markup Language Script
WSP	Wireless Session Protocol
WTA	Wireless Telephony Applications
WTAI	Wireless Telephony Applications Interface
WTLS	Wireless Transport Layer Security
WTP	Wireless Transaction Protocol
WWW	World Wide Web
XML	Extensible Markup Language

Further abbreviations are given in 3GPP TS 22.057 [2] and GSM 01.04 [1].

8.2.1 MExE executable permissions for operator, manufacturer and third party security domains

The following table 6 "Security domains and actions" specifies the permissions of operator, manufacturer and third party security domains in the order of restriction.

The actions listed in the security table 6 "Security domains and actions" are generic actions. These actions can only be performed by MExE executables via application programming interfaces (APIs) (which are intrinsically part of the MExE implementation) The security restrictions shall apply to MExE executables whether the API functionality is called directly or indirectly by the MExE executable. Explicit user permission is required for all actions by MExE executables in all domains. Types of user permission are defined in clause 8.3 "User permission types".

Untrusted MExE executables are not permitted access to any actions which access the phone functionality (phone functionality includes all the actions in table 6 "Security domains and actions") except for the exceptions identified in clause 8.2.2 "MExE executable permissions for untrusted MExE executables".

Actions available using interfaces giving access to the phone functionality (either in existence at the time of approval of this specification or not) that are not listed in the security table 6 "Security domains and actions" shall be categorised into one of the groups in the security table 6 "Security domains and actions" by comparing its action against the groups in order as they are listed in the table 6 "Security domains and actions". If an action can be categorised into a more restrictive group near the top of the table, then it shall not be again categorised into another, less restrictive, group further down in the table. For example, if a new action eventually results in forwarding a call, it shall be categorised into Network access. If the action is totally new, it shall be categorised into some of the groups by comparing its functionality to the group description below and by comparing with the list of actions listed in the table within the group.

1. Device core function access includes functions, which are an essential part of the phone functionality .

2. Support of core software download, which allows updating the ME radio, characteristics and properties by changing the core software in the ME (e.g. a new CODEC may be loaded into a ME, a new air interface, etc.)

3. (U)SIM smart card low level access includes functions, which allow communications at the transport service access point (send and receive application protocol data unit).

4. Network security access includes all functionalities which relate to CHV, CHV2, UNBLOCK CHV and UNBLOCK CHV2 (verification, management, reading or modifying), GSM authentication, GSM ciphering.

5. Network property access includes functions, which enable the management of operator-related data parameters and network settings.

6. Network services access includes all functionalities which result in or need interaction via the operator's network.

7. User private data access includes all functionalities which relate to management, reading or modifying of data that the user has stored in the MExE device including user preferences.

8. MExE security functions access includes all functionalities which, through an API relate to certificate handling in the MExE device; end to end encryption, signed content, hashing, access to public, private, secret keys stored in the MExE device or in a smart card.

9. Application access includes the functionalities which relate to launch provisioned functionality, MExE executables, external executables ((U)SIM tool kit application,…) usage.

10. Lifecycle management includes the functionalities which are needed for installing or removing MExE executables in the MExE device.

11. Terminal data access includes the functions which relate to accessing terminal data, i.e. not user data.

12. Peripheral access includes the functionalities related to peripherals other than user interface peripherals usage through a high level software application interface.

13. Input output user interface access includes the functionalities related to the user interface and user notification means usage.

Table 6: Security domains and actions

	MExE Security Domains		
Actions	**Operator**	**Manufacturer**	**Third Party**
Device core function access Start/stop radio Turn on/off device Write time and/or date Activate a user profile Modify a user profile	No		
Support of Core Software Download e.g. Update ME software	No	Yes	No
(U)SIM smart card low level access[11] Send APDU Slot management (power on/off, reset, port lock…)	No		
[11] – Access to (U)SIM is provided using more high level API as phonebook, application launching			
Network Security access Run algorithm Verify CHV/2 or UNBLOCK CHV/2 Activate/deactivate CHV Modify CHV/2	No		
Network property access Get IMSI Get home network Select network	Yes	No	
Network services access Initiate a voice/data connection [3] Accept a voice/data connection [3] Call forward [4] Multiparty call [4] Call deflection [4] Explicit call transfer [4] Terminate an existing connection Hold an existing connection Resume an existing connection Send point-point message (e.g. SMS, USSD) [4] Query network status Get signal level Get call list QoS management	Yes		Yes [6]
[3] – A network connection may be via any supported bearer service [4] – Multiparty, deflection, and explicit call transfer shall be permitted only to numbers explicitly supplied by the user to the MExE Executable. Modification of call forward numbers stored in the network shall only be permitted to numbers explicitly supplied by the user to the operator. [6]– The Third Party domain's permission to access the networking action depends on the provisioning mechanism as described in clause 8.8.1 "Determining the administrator of the MExE device"			
User private data access [1] Read Write Get properties Delete Get Location Information Read stored SMS Delete stored SMS Modify user preferences	Yes[2] Yes[2] Yes[2] Yes[2] Yes[2] Yes[2] Yes[2] Yes[7]		
[1] – User private data includes user files, phonebook, MSISDN, etc located on the MExE device. [2] – The user shall be able to specify data access permissions within the capabilities of the MExE device. It is not applied to user preferences [7] – Trusted applications only have permission to modify user preferences, and not to activate or de-activate them. The user shall be able to specify for each domain, the preferences that applications in that domain can access. All other preferences shall not be accessible to that domain. The default shall be that there is no access. Single action user permission is the only type of user permission that shall be possible for changes to User Preferences.			

	MExE Security Domains		
Actions	**Operator**	**Manufacturer**	**Third Party**
MExE security functions access			
Install a certificate for a given domain	Yes [5]		
Uninstall a certificate for a given domain			
Replace a certificate for a given domain	Yes [5]		
Data encryption API			
Verify a signature API	Yes [5]		
Compute a digital signature API			
Hash a content API	Yes		
Non repudiation API	Yes		
	Yes		
	Yes		
	Yes		
[5] – Only the organisation whose public key is certified (or the organisation that certified the public key) can add, delete or replace a particular certificate.			
Application access			
Get application list	Yes[8]		
Launch an application	Yes[8]		
Get application status	Yes[8]		
Stop, suspend, resume an application	Yes[9]		
[8] – ME provisioned functionality access is limited to manufacturer domain. (U)SIM tool kit application access is limited to operator domain. MExE executable access is limited to MExE executable issued by the same issuer (identify by the certificate) of launched MExE executable [9] – Access is limited to MExE executable which launch the application. But the end user, shall have a way to stop the launched application, MExE environment may stop the launched application or launched application may stop itself.			
Lifecycle management	Yes		
Install a MExE Executable			
Uninstall a MExE executable			
Terminal data access			
Get manufacturer software version	Yes		
Read time and date	Yes		
Peripheral access	Yes		
Sound generation to speaker (e.g. via stream)			
Set speaker volume			
printer access			
Monitor the power state			
Change the power state			
Activate/ access Serial port (RS232, IrDA, Bluetooth, USB …) access			
Activate/access Parallel port			
Activate/access Smart card other than (U)SIM card (Send APDU, Slot management)			
Input output User interface access			
Input device (keyboard, mouse …)	Yes[10]		
Output device (display)	Yes[10]		
Output notification device(smart icon, sound, light, vibrator …)	Yes		
[10] – Access request requires no user permission.			

The lists in the groups in table 6 "Security domains and actions" are not exhaustive, and other actions which are of the same category shall be included in the group for the purposes of requesting user permission.

This clause identifies the permissions for MExE executables in the 3 security domains (operator, manufacturer and Third Party). The permissions do not apply to untrusted MExE executables which are not permitted to execute within the domains.

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020089

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **112** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Classmark 4 security
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	13-2-2002
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Introduction of a new Classmark based on CLI, the Common Language Infrastructure. This CR introduces the changes to the security parts of the specification.
Summary of change:	⌘	Modifications to executable permissions for untrusted domains section and code safety verification.
Consequences if not approved:	⌘	Classmark 4 executable permissions not defined and code verification not integrated with MExE framework.

Clauses affected:	⌘	8.2.2 and 8.9/8.10
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

8.2.2 MExE executable permissions for untrusted MExE executables

When the Security Domains are not supported then all executables are untrusted and they execute in the untrusted area for which the executable permissions are defined as follow in table 7 "Executable permissions for untrusted MExE executables".

In order to facilitate untrusted MExE executables having some limited access to MExE device functionality beyond their very limited privileges, some of the access permissions in the previous table 6 "Security domains and actions" are extended to untrusted MExE executables and described in table 7 "Executable permissions for untrusted MExE executables" as well as in clause 8.2.3 "Separation of I/O streams".

The untrusted MExE executables permitted to use these facilities shall be MExE executables the user has downloaded him or herself, and not be MExE executables that have been pushed to the user. MExE executables on the MExE device due to the user having visited a particular Web site are considered to be MExE executables that the user had downloaded him or herself.

Untrusted MExE executables shall not be permitted access to any other functions.

Table 7: Executable permissions for untrusted MExE executables

	Classmark 1	**Classmark 2**	**Classmark 4**	**Classmark 3**
User Interface	An untrusted, uninstalled MExE executable (e.g. an applet) can access the user interface output and input without user permission, but the sending of user data to a server to which the MExE executables has a session connection (e.g. as part of a browser session) requires user permission. An installed untrusted MExE executable shall only be able to access the user interface output and input with user permission (clearly, for the usability of untrusted MExE executables such as games, blanket user permission should be sought and given, and this is permissible).			Untrusted MExE executables can access the user interface output and input without the user permission.
File, Persistent Data	File access is not permitted for untrusted MExE executables.			
	But, untrusted MExE executables can access files only in the MExE executable's own directory.			But, persistent data may be stored via the MIDP record management system (stores are shared between MIDlets in the same MIDlet Suite).
Transmission over the Access Network	Untrusted MExE executables shall be able to exchange data, voice, HTTP requests, etc. over the Access Network under the following conditions: The recipient of a transmission (e.g. a phone number, a URL, a server name, etc.) shall be presented to the user for permission by a provisioned functionality of the MExE device itself, even if this recipient was already presented by the executable (this facility would support, for example, "click to dial" buttons/links in untrusted MExE executables). It shall not be possible for an application to use a transmission channel that it did not initiate (except for MIDlets within the same MIDlet suite).			
Generate DTMF	Untrusted MExE executables shall be able to generate DTMF tones under the following conditions: An untrusted MExE executable is only permitted to send DTMF tones in a currently active call. The request to generate DTMF tones in the currently active call, shall result in the characters which the tones represent being presented to the user for permission by a provisioned functionality of the MExE device.			
Add Phonebook Entry	Untrusted MExE executables shall be able to add a phonebook entry (i.e. name and number only) under the following conditions: The name and the number to be added shall be displayed to the user for permission by a provisioned functionality of the MExE device and not by the MExE executable itself. The phonebook entry shall not be added without user permission. The function shall not be able to modify or delete any phonebook entry.			
Executable Interaction	Executable interaction is not permitted for untrusted MExE executables (except for MIDlets within the same MIDlet suite).			

NOTE: The functionality of "Generate DTMF tones" and "Add Phonebook Entry" is not supported by the MIDP at the moment.

8.9.2 CLDC security

A Java execution environment running on a Classmark 3 MExE device shall comply with the security requirements defined in the CLDC specification [34]. That is, it shall comply with both the low-level virtual machine security requirements and the application-level security requirements.

The application-level CLDC security requirements define a sandbox security model where Java classfiles are verified. Java APIs available to the application are limited to those APIs which have been defined by the configuration and profiles supported by the MExE device. Downloading and management of the Java applications on the MExE device takes place at the native level, no user-definable Java class loaders are provided and the set of APIs available to a MIDlet is closed.

The low-level CLDC virtual machine security requirements define a Java classfile pre-verification mechanism which takes place off- MExE device (e.g. on the server prior to downloading) and inserts a special attribute called a "stack map" into class files to facilitate runtime verification of the same classfiles.

8.10 CLI Security

Support of CLI security in a MExE classmark 4 device, as detailed in this clause, is mandatory.

The CLI specification includes a detailed algorithm to verify the safety and integrity of CLI application code, known as "application verification" [50]. An application is either verified as "safe" or "unsafe". The result of the application verification process is presented to the rest of the CLI runtime environment before program execution. This is distinct from the certificate and signature verification that MExE performs before executing an application inside the MExE environment.

Applications that are verified as unsafe may contain code that could potentially access the environment in an unauthorized manner. For example, code that uses pointer arithmetic or accesses arrays using out-of-bounds indices would be deemed unsafe. An unsafe application shall not be permitted to execute in the MExE environment. Once an application is verified as safe, this information is passed on to the rest of the CLI runtime environment, which will then apply the MExE security policy, as specified under clause 8.1, "Generic Security".

The CLI runtime environment may be able to load libraries that are intrinsically part of the MExE device implementation. Such intrinsic libraries may contain unsafe code, however other libraries containing unsafe code are prohibited.

8.11~~0~~ Signed packages used for installation

If the 3 MExE security domains defined in clause 8.1 "Generic security" are not supported, then the signed packages used for installation described in this clause is optional.

The Java Archive (JAR) file format shall be supported on classmark 2 and 3 MExE devices for securely packaging objects that are to be downloaded and installed on the ME. The method for securely packaging objects for MExE classmark 1 devices may be referenced from the WAP specifications in a future release of this specification. A MExE device may support other proprietary means of downloading and installing objects.

The JAR file shall contain a manifest file that has at least the following attribute:

`MExE-Implementation-Type`
The information contained within the manifest file is represented as so-called "name: value" pairs, where "name" is represented by `MExE-Implementation-Type`. Groups of name-value pairs are known as a "section", where sections are separated from other sections by empty lines.

The `MExE-Implementation-Type` value shall be one of the following:-

- "**`MExENativeLibrary`**"

  in the case of a MExE Native Library (as described in 8.10.1 "Installing MExE native libraries");

- "**`TTPCertificate`**"

in the case of a certificate containing a 3rd party root public key (as described in 8.10.2 "Installation of root certificates in a signed data package");

- "**`ManufacturerCertificate`**"

  in the case of a certificate containing a manufacturer root public key (as described in 8.10.2 "Installation of root certificates in a signed data package");

- "**`OperatorCertificate`**"

  in the case of a certificate containing an operator root public key (as described in clause 8.10.2 "Installation of root certificates in a signed data package");

- "**`AdminCertificate`**"

  in the case of an administrator certificate, which shall consist of a section containing both the administrator certificate and a CCM (as described in clause 8.10.2 "Installation of root certificates in a signed data package"); or

- "**`CCM`**"

  in the case of a CCM (as described in clause 8.10.2 "Installation of root certificates in a signed data package"); or

- *-free-format-value-*

  in the case of proprietary binaries or Java classes such as native DSP code, provisioned functionality upgrades and patches (as described in clause 8.10.3 "Installation of other signed data").

Refer to [42] for full details of how to encode the "name: value" pairs and "section" in a JAR manifest file.

See figure 14 "Signed packages". When a download of a JAR file is completed, the system installer shall read the manifest to determine what types of files are contained in the JAR, and install them appropriately.

Note that a signed package containing a library which does not have a manifest attribute "MExE-`Implementation-Type: MExENativeLibrary`" shall be considered to be some type of upgrade to libraries that are intrinsically part of the MExE device implementation rather than a "MExE native library". E.g.

```
MExE-Implementation-Type: ManufacturerUpgrade (something.dll)
```

(Recommended behaviour for the server is that it uses the capability information supplied from the MExE device to determine how to offer appropriate upgrades.)

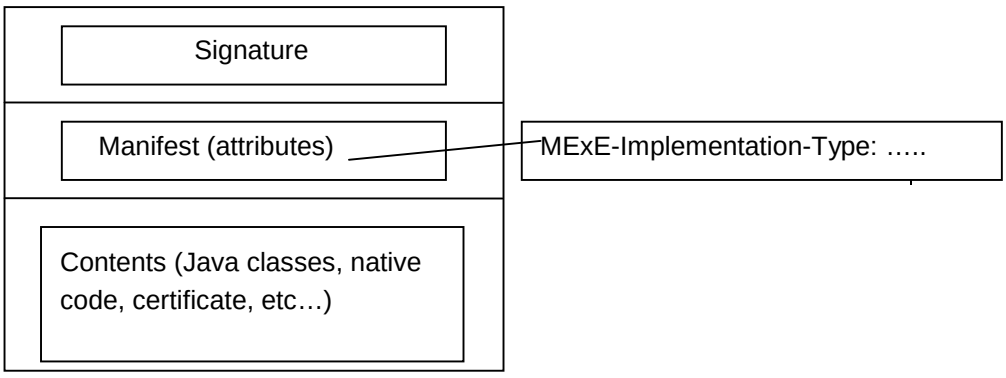

Figure 14: Signed packages

8.11~~0~~.1 Installing MExE native libraries

A signed native library whose signature verifies as describe in clause 8.5.2 "Manufacturer root public key" as belonging to the Manufacturer Domain may be installed as a "MExE native library".

A MExE native library may be called by a MExE executable, and shall not compromise the MExE security system.

Support of MExE native library signed package installation is optional.

8.110.2 Installation of root certificates in a signed data package

Root certificates in a signed package (whose signature verifies as described in clause 8.5 "Root Public keys" to the Manufacturer root, Operator root, or the Administrator root), may be installed to the root public key store on the MExE device. Note that the certificate thus packaged does not necessarily belong to the manufacturer domain. The types of certificate that can be present and installed by packages are given in table 9 "Allowed certificate types in signed packages". The MExE device shall store the root public key as indicated by the certificate type.

When a certificate containing an Administrator root public key is thus contained in a signed package, the signed package (e.g. a JAR file in the case of Java based MExE classmarks) shall contain two files: the Administrator root public key and the CCM.

Table 9: Allowed certificate types in signed packages

Signature on Package	Allowed Certificate types in package
Administrator	Third Party
Manufacturer	Administrator, Manufacturer, Operator, Third Party
Operator	Administrator, Operator, Third Party

8.110.3 Installation of other signed data

A signed package of proprietary binaries or Java classes such as native DSP code, provisioned functionality upgrades and patches, whose signature verifies as described in clause 8.5.2 "Manufacturer root public key" as belonging to the Manufacturer Domain may be installed. The use of such binaries is outside the scope of MExE, but the manufacturer shall be responsible for ensuring that the integrity of MExE is not compromised.

Support of this feature is optional.

8.110.4 Administrator root certificate download mechanism

MExE devices supporting (U)SIMs without certificates shall at least support the following procedure to download the administrator root certificate.

1. Upon sign-up with an administrator the user and administrator will make contact.
2. The administrator service centre will obtain any required information from the user and inform the user by SMS or other means of the location of the administrator root certificate.
3. The user will initiate the download of the Administrator root certificate using a signed package.
4. Once the procedure is complete the MExE device shall compute the hash of the received Administrator certificate containing root public key.
5. The user will contact the administrator and enters on the MExE device at least the first 8 bytes using decimal value of the hash of the Administrator root public key information provided by the administrator . The MExE device compares the beginning of computed hash value and the abbreviated hash value entered by the user If these two values are the same ,the provisioning process will be complete. If the two values are different this shall be indicated to the user who should inform the administrator of this.

Alternative methods to download an administrator root certificate may be used where appropriate but must insure that the certificate is received by the MExE device unaltered.

8.121 MExE executable integrity

If the 3 MExE security domains defined in clause 8.1 "Generic security" are not supported, then the pre-verification of MExE executables at launch time described in this clause is optional.

A potential threat is that MExE executables may be securely authenticated at the time of download, but tampered with or corrupted prior to being launched. Further a certificate may be compromised or expired. Authentication of a MExE

executable at the time of download does not ensure that the MExE executable has not been modified when it is subsequently launched. Furthermore, authentication of a MExE executable at the time of launch does not ensure that the MExE executable is not modified during execution. Similarly, verification of the certificate at the time of download may not ensure that the certificate is valid at time of application launch, and verification of the certificate at the time of launch does not ensure that the certificate remains valid during execution.

Therefore, the MExE device shall ensure application integrity immediately prior to application execution.

Application integrity is defined as the state in which:-

- application code has not been modified since authentication; and
- the certificate containing the root public key is checked and known to be valid.

The mechanism by which the device preserves integrity is an implementation detail, dependant on the application storage mechanism and access. Examples of mechanisms that contribute to such application integrity could include :

- Storage of applications in a memory area that cannot be compromised on the device;
- Preventing launch of the application when the MExE device becomes aware that the certificate is invalidated;
- Full signature verification prior to each application invocation (see clause 8.11.1 “Full signature verification”);
- Optimised pre-launch signature verification (see clause 8.11.2 “Optimised pre-launch signature verification”);
- Periodic full signature verification by separate process during application execution.

The list of examples is not exhaustive and any other mechanisms ensuring application integrity may be equally considered.

A MExE device may furthermore ensure that the application code has not been modified during application execution.

~~8.11.1~~8.12.1Full signature verification

Full signature verification assumes that the procedure of validation for downloaded MExE executables and certificates is used. For more details see clause 8.4 “Certification and Authorization Architecture”.

8.1~~2~~1.2 Optimised pre-launch signature verification

This is an optional feature which is used to eliminate the potentially excessive overhead of checking a signature again after initial full certificate verification has already been performed.

To use this process the MExE device shall create a hash of the executable object (executable object fingerprint) as if checking the signature. This shall be stored in a protected verified application list, along with indication of the domain permissions for the application. The hash used shall be the same type as that used for signing the object. When launching an application or downloading an applet, the hash shall be performed as for when computing the signature. The verified application list shall then be checked; if the hash value is present and the entry has not expired then the application or applet may execute. If no list entry exists for this object, or the entry has expired, the process shall then proceed with the full signature verification. Note that the lists for applications and applets should be separate and that an implementation determines management policy for the lists (e.g., ageing policy, which entries to delete when trying to add a new entry to a full list etc.). One restriction imposed that shall be enforced is that the maximum number of uses for an entry before it is marked invalid is limited to some maximum value.

In the event that a new CCM is received by the MExE device, all verified application list entries shall be marked invalid unless some mechanism to determine the validity of an authorising certificate entry for each application is provided by the MExE device implementation.

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020285

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **111** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Classmark 4 non-security
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	13-2-2002
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Introduction of a new MExE classmark based on CLI, the Common Language Infrastructure. This CR introduces the changes to the non-security parts of the specification.
Summary of change:	⌘	Modifications to sections 2, 3, 4, 7 and 8 to introduce CLI.
Consequences if not approved:	⌘	Classmark 4 not defined.

Clauses affected:	⌘	2, 3, 4, 7, 8
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

2 References

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] 3GPP TS 22.057: "Mobile Execution Environment (MExE); Stage 1".

[3] Personal Java 1.1.1 or higher, Sun Microsystems http://www.javasoft.com/products/personaljava/

[4] JavaPhone API version 1.0, http://java.sun.com/products/javaphone/ .

[5] JTAPI 1.2, Sun Microsystems http://www.java.sun.com .

[6] Wireless Application Protocol (WAP) June 2000 Conformance Release http://www.wapforum.org .

[7] vCard – The Electronic Business Card Exchange Format – Version 2.1, The Internet Mail Consortium (IMC), September 1996, http://www.imc.org/pdi/vcard-21.doc .

[8] vCalendar – The Electronic Calendaring and Scheduling Exchange Format – Version 1.0, The Internet Mail Consortium (IMC), September 1996, http://www.imc.org/pdi/

[9] Hypertext Transfer Protocol – HTTP/1.1, IETF document RFC2616, http://www.w3.org/Protocols/rfc2616/rfc2616

[10] Java Mail API version 1.0.2, http://www.java.sun.com

[11] 3GPP TR 22.170: "Universal Mobile Telecommunications System (UMTS); Service aspects; Provision of Services in UMTS - The Virtual Home Environment".

[12] 3GPP TS 22.121: "The Virtual Home Environment; Stage 1".

[13] ISO 639: "Code for the representation of names of languages".

[14] 3GPP TS 22.101: "Service Aspects; Service Principles".

[15] CC/PP Exchange Protocol based on HTTP Extension Framework; W3C http://www.w3.org/Mobile/CCPP

[16] Composite Capability/Preference Profiles (CC/PP):A user side framework for content negotiation; http://www.w3.org/Mobile/CCPP

[17] UAProf Specification http://www.wapforum.org/what/technical.htm

[18] JDK 1.1 security http://www.javasoft.com/products/jdk/1.1/docs/guide/security/index.html

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[21] OCF 1.1.: "Smartcard API specified by OpenCard Consortium http://www.opencard.org

[22] RFC 1738: "Uniform Resource Locators (URL)" http://www.w3.org/pub/WWW/Addressing/rfc1738.txt.

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

administrator: administrator of the MExE device is the entity that has the control of the third party trusted domain, and all resources associated with the domain

NOTE 1: The administrator of the MExE device could be the user, the operator, the manufacturer, the service provider, or a third party as designated by the owner of the MExE device.

best effort QoS (Quality of Service): best effort QoS refers to the lowest of all QoS traffic classes

NOTE 2: If the guaranteed QoS cannot be delivered, the bearer network delivers the QoS which can also be called best effort QoS [28].

certificate: entity that contains the issuer's public key, identification of the issuer, identification of the signer, and possibly other relevant information

NOTE 3: Also, a certificate contains a signed hash of the contents. The signer can be a 3rd. party other than the issuer.

delivered QoS: actual QoS parameter values with which the content was delivered over the lifetime of a QoS session [28].

End Entity: user of PKI certificates and/or end user system that is the subject of a certificate.

fine grain: refers to the capabilities of the Java security system to allow applications, sections of code or Java classes to be assigned permissions to perform a specific set of privileged operations

NOTE 4: The smallest programming element that can be given permission attributes is a Java class [19].

key pair: key pairs are matching private and public keys

NOTE 5: If a block of data is encrypted using the private key, the public key from the pair can be used to decrypt it. The private key is never divulged to any other party, but the public key is available, e.g. in a certificate.

Operator: term operator as used in this specification refers to the term Home Environment, defined as "Home Environment: The home environment is responsible for enabling a user to obtain UMTS services in a consistent manner regardless of the user's location or terminal used (within the limitations of the serving network and current terminal)" in [44].

negotiated QoS: response to a QoS request, the network shall negotiate each QoS attribute to a level that is in accordance with the available network resources

NOTE 6: After QoS negotiation, the bearer network shall always attempt to provide adequate resources to support all of the negotiated QoS profiles [31].

personal certificate: certificate loaded by the user or a user application which is limited to the application that it is intended for, and is not a MExE Certificate

NOTE 7: E.g. an e-mail application could load certificates for its usage. Personal certificates are out of scope for MExE.

phonebook: dataset of personal or entity attributes

NOTE 8: The simplest form is a set of name-number pairs as defined by GSM SIMs. A phonebook may also be supported on a (U)SIM.

Mobile Execution Environment (MExE): is defined in detail in the present document, but the scope of MExE does not include the operating system, or the manufacturer's execution environment

MExE API: consists of interfaces present in the MExE device and exposed to MExE executables

NOTE 9: The APIs which are outside of the scope of this specification, are not part of MExE API.

MExE certificate: used in the realisation of MExE security domains

NOTE 10: A MExE Certificate can be used to verify downloaded MExE executables. Use of the word "certificate" in this document implies a MExE certificate. Other varieties of certificate will be explicitly qualified as a e.g. "Personal Certificate".

MExE device: UE (User Equipment) that supports MExE functionality in the ME (Mobile Equipment)

NOTE 11: The implementation of MExE shall be in the same physical device as the MT (Mobile Termination). Implementation of MExE functionality in the TE (Terminal Equipment) outside of the physical device containing the MT (Mobile Termination) is for further study.

MExE executable: is an applet, application, or executable content, which conforms to the MExE specification and may execute on the MExE device

MExE Java VM: this is a standard Java virtual machine used to execute MExE Java applets and applications

MExE native library: this is a downloaded native library that can be accessed by MExE executables

MExE Server: node supporting MExE services in the MExE service environment

NOTE 12: The MExE server may be a web or WAP server providing services for users to download MExE executables. MExE server is not necessarily a special network element but may utilize the normal Internet service environment.

MExE-(U)SIM: (U)SIM that is capable of storing a security certificate that is accessible using standard mechanisms

MIDP application: MIDP application, or "MIDlet", is one that uses only the APIs defined by the MIDP and CLDC specifications.

MIDlet suite: collection of MIDP Applications, or MIDlets packaged together and share resources within the context of a single Java Virtual Machine

owner: owner of the MExE device

NOTE 13: An owner could be a user, operator (e.g. where the MExE device is obtained as part of a subscription and the cost of the MExE device is subsidised), service provider, or a third party (e.g. the MExE device is owned by the user's company and this company wishes to control how the MExE device is used)

power up event: abstract event that occurs when the MExE device is cold started (i.e. switched on)

QoS session: Lifetime of PDP context, the period between the opening and closing of a network connection whose characteristics are defined by a QoS profile

NOTE 14: Multiple QoS sessions may exist, each with a different QoS profile [28].

QoS profile: comprises of a number of QoS parameters

NOTE 15: A QoS profile is associated with each QoS session. The QoS profile defines the performance expectations placed on the bearer network [28].

requested QoS: QoS profile is requested at the beginning of a QoS session

NOTE 16: QoS modification requests are also possible during the lifetime of a QoS session [28] and [31].

sandbox: sandbox is a safe area to run Java code. Untrusted Java code executing in a sandbox has access to only certain resources [18].

service: service (which may consist of an application or applet, and its related content) is a set of functions offered to a user by an organisation, and may be performed on the MExE device and/or remotely

service name: identifier associated with a service, which could be a string, a fully qualified Java class name, a unique URI or other identifier

session: period between the launching of a MExE executable and its execution termination

NOTE 17: A WAP-session is established between the mobile and the WAP Gateway. The duration of a WAP-session can range from a second to years. The WAP-session can be associated with a particular subscription in the WAP Gateway.

signature: "Signing" is the process of encrypting a hash of the data using a private key

NOTE 18: If the signature can be decrypted using the public key, then the signature is valid.

signed JAR file: archives of Java classes or data that contain signatures that also include a way to identify the signer in the manifest [42] (the Manifest contains a file which has attributes defined in it)

subscribed QoS: network will not grant a QoS greater than that subscribed

NOTE 19: The QoS profile subscription parameters are held in the HLR. An end user may have several QoS subscriptions. For security and the prevention of damage to the network, the end user cannot directly modify the QoS subscription profile data [31].

user: user of the MExE device

valid (U)SIM application: identification by the MExE ME that a valid SIM card, or USIM application on the UICC, has been detected (e.g. through insertion of (U)SIM card, power up of MExE device etc.)

NOTE 20: Whenever this specification refers to valid (U)SIM, it implies a valid SIM card or USIM application on the UICC.

Further definitions specific to MExE are given in 3GPP TS 22.057 [2].

3.2 Abbreviations

For the purposes of the present document the following abbreviations apply:

AA	Attribute Authority
API	Application Programming Interface
APDU	Application protocol data unit
CA	Certification Authority
CC/PP	Composite Capability/Preference Profiles
CGI	Common Gateway Interface
CCM	Certificate Configuration Message
CLDC	Connected Limited Device Configuration
CLI	Common Language Infrastructure
CP-Admin	Certificate Present (in the MExE (U)SIM) - Administrator
CP-TP	Certificate Present (in the MExE (U)SIM) - Third Party
CRL	Certificate Revocation List
DHCP	Dynamic Host Configuration Protocol
Diff-serv	Differentiated Services
DTMF	Dual Tone Multiple Frequency
GSM	Global System for Mobile Communication
GPRS	General Packet Radio Service
HTTP	HyperText Transfer Protocol
HTTPS	HyperText Transport Protocol Secure (https is http/1.1 over SSL, i.e. port 443)
IETF	Internet Engineering Task Force

IP	Internet Protocol
JAD	Java Application Descriptor
JAM	Java Application Manager
J2ME	Java 2 Micro Edition
J2SE	Java 2 Standard Edition
JNDI	Java Naming Directory Interface
JTAPI	Java Telephony Application Programming Interface
JAR file	Java Archive File
JVM	Java Virtual Machine
KVM	K Virtual Machine
ME	Mobile Equipment
MIDP	Mobile Information Device Profile
MIDlet	MIDP Application
MMI	Man-Machine Interface
MRPK	Manufacturer Root Public Key
MSE	MExE Service Environment
MT	Mobile Termination
OCF	OpenCard Framework
OEM	Original Equipment Manufacturer
OCSP	Online Certificate Status Protocol
ORPK	Operator Root Public Key
QoS	Quality of Service
PDP	Packet Data Protocol
PKI	Public Key Infrastructure
RDF	Resource Description Format
RFC	Request For Comments
RPK	Root Public Key
SAP	Service Access Point
SCVP	Simple Certificate Verification Protocol
SIM	Subscriber Identity Module
SMS	Short Message Service
SOAP	Simple Object Access Protocol
SSL	Secure Socket Layer
TE	Terminal Equipment
TLS	Transport Layer Security
TP	Third Party
UDP	User Datagram Protocol
UE	User Equipment
UI	User Interface
UMTS	Universal Mobile Telecommunications System
URL	Uniform Resource Locator
URI	Uniform Resource Identifier
USIM	Universal Subscriber Identity Module
USSD	Unstructured Supplementary Service Data
VM	Virtual Machine
WAE	Wireless Application Environment
WAP	Wireless Application Protocol
WBXML	WAP Binary XML
WDP	Wireless Datagram Protocol
WMLS	Wireless Markup Language Script
WSP	Wireless Session Protocol
WTA	Wireless Telephony Applications
WTAI	Wireless Telephony Applications Interface
WTLS	Wireless Transport Layer Security
WTP	Wireless Transaction Protocol
WWW	World Wide Web
XML	Extensible Markup Language

Further abbreviations are given in 3GPP TS 22.057 [2] and GSM 01.04 [1].

4 Generic MExE aspects

Support of at least one MExE classmark is mandatory. A MExE device may also include optional support for applications from any other MExE classmark (refer to clause 4.4 “Multiple Classmark support”).

This clause defines the common aspects of all MExE compliant devices, independent of MExE technology.

Considering the wide and diverse range of current and future technology and devices that (will) use wireless communication and provide services based thereon a one-size-fits-all approach is unrealistic. Instead the present document categorises devices by giving them different MExE classmarks. In this specification the following MExE classmarks are defined:

- MExE classmark 1 - based on WAP (Wireless Application Protocol) [6] - requires limited input and output facilities (e.g. as simple as a 3 lines by 15 characters display and a numeric keypad) on the client side, and is designed to provide quick and cheap information access even over narrow and slow data connections.
- MExE classmark 2 - based on PersonalJava [3] - provides and utilises a run-time system requiring more processing, storage, display and network resources, but supports more powerful applications and more flexible MMIs.
- MExE classmark 3 – based on J2ME CLDC and MIDP environment [34] and [35] – supports Java applications running on resource-constraineddevices.
- MExE classmark 4 – based on Common Language Infrastructure [50] Compact Profile – supports CLI based applications running on a broad range of connected devices.

Content negotiation allows for flexible choice of formats available from a server or adaptation of a service to the actual classmark of a specific client device.

Bi-directional capability negotiation between the MExE Service Environment and MExE device (including MExE classmark), supports the transfer of capabilities between the client and the server.

4.1 MExE classmark 1 (WAP environment)

Classmark 1 MExE devices are based on Wireless Application protocol (WAP).

The Wireless Application Protocol is a standard to present and deliver wireless information and telephony services on mobile phones as well as other wireless terminals. Supporting mandatory features of WAP, WAP enabled devices provide access to the World Wide Web based content for small mobile devices.

4.2 MExE classmark 2 (PersonalJava environment)

Classmark 2 specifies Personal Java enabled devices with the addition of the JavaPhone API.

The Personal Java[3] application environment is the standard Java environment optimised for consumer electronic devices designed to support World Wide Web content including Java applets. The Personal Java API is a feature level subset of J2SE with some Java packages optional and some API modifications necessary for the needs of small portable devices (for example an optimised version of the Abstract Windowing Toolkit targeted to small displays).

JavaPhone[4] is a vertical extension to the Personal Java platform that defines APIs for telephony control, messaging, address book and calendar information, etc.

4.3 MExE classmark 3 (J2ME CLDC environment)

Classmark 3 MExE devices are based on the Connected Limited Device Configuration (CLDC) with the Mobile Information Device Profile (MIDP).

Java 2 Micro Edition (J2ME) is a version of the Java 2 platform targeted at consumer electronics and embedded devices. CLDC consists of a virtual machine and a set of APIs suitable for providing tailored runtime environments. The J2ME CLDC is targeted at resource constrained connected devices (e.g. memory size, processor speed etc.).

4.4 MExE classmark 4 (CLI Compact environment)

Classmark 4 specifies CLI Compact Profile enabled devices.

The CLI [50] environment is a programming language neutral, OS and CPU portable environment. The CLI can support applications and services written in a wide range of programming languages, for example Visual Basic, ECMAScript and C#. The CLI Compact Profile specifies a minimal set of class libraries, supporting common runtime library features as well as web services infrastructure, including HTTP[9], TCP/IP, XML[36] & SOAP[51]. Such devices not only may have limited memory and CPU capability, but also limited (or no) display.

4.54 Multiple classmark support

Support of multiple MExE classmarks on a MExE device is optional.

A given MExE Classmark identifies support by a MExE device for a defined level of MExE functionality as defined by that classmark. Support of MExE classmarks by a MExE device shall enable flexible support of MExE functionality. A MExE device may support any multiple combinations of MExE classmarks.

The support of any other functionality by a MExE device is also possible, and is out of scope of this specification.

NOTE: Some implementation issues may arise from the multiple support of classmarks on a device, e.g.:

1) In conforming to all of the requirements, how are mandatory requirements in one classmark compatible with optional requirements for another?

2) With KJava and pJava on one device, MIDP can be on top of a JavaVM. Which of the classmarks will it be then? In conforming with both Classmark 2 and 3 requirements, are 2 VMs required in one device?

4.45.1 Classmark 1 service support in non-Classmark 1 MExE devices

Support of Classmark 1 executables in non-classmark 1 MExE devices is optional.

To allow access to services designed for MExE Classmark 1 devices, MExE devices other than Classmark 1 will need to support full or a subset of WAP protocol as identified below. Due to the fast evolution of new technologies, support of WAP in Classmarks other than Classmark 1 is not mandated by MExE specification. However WAP is a possibility for the integrity of service provisioning as well as quick access to information by feature rich devices (e.g. Java devices).

If Classmark 1 services are supported by non-Classmark 1 devices, Classmark 1 services shall execute in the same manner as they execute in a MExE Classmark 1 device. For that purpose, a MExE non-Classmark 1 device shall comply with data profile class (Class C) of WAP Class Conformance Requirement Specification [6].

NOTE: A more specific reference to the WAP Class Conformance Requirement Specification shall be supplied when available.

4.54.2 Classmark 2 service support in non-Classmark 2 MExE devices

Support of Classmark 2 executables in non-classmark 2 MExE devices is optional.

If Classmark 2 services are supported by non-Classmark 2 devices, Classmark 2 services shall execute in the same manner as they execute in a MExE Classmark 2 device.

4.54.3 Classmark 3 service support in non-Classmark 3 MExE devices

Support of Classmark 3 executables in non-classmark 3 MExE devices is optional.

If Classmark 3 services are supported by non-Classmark 3 devices, Classmark 3 services shall execute in the same manner as they execute in a MExE Classmark 3 device.

4.5.4 Classmark 4 service support in non-Classmark 4 MExE devices

Support of Classmark 4 executables in non-classmark 4 MExE devices is optional. If Classmark 4 services are supported by non-Classmark 4 devices, Classmark 4 services shall execute in the same manner as they execute in a MExE Classmark 4 device.

4.6~~5~~ High level architecture

The following architectural model shows an example of how standardised transport mechanisms are used to transfer MExE services between the MExE device and the MExE service environment, or to support the interaction between two MExE devices executing a MExE service.

The MExE service environment could, as shown in figure 1 "Generic MExE architecture", consist of several service nodes each providing MExE services that can be transferred to the MExE device using mechanisms such as (but not limited to) fixed/mobile/cordless network protocols, Bluetooth, infrared, serial links, wireless optimised protocols, standard Internet protocols. These service nodes may exist in the circuit switched domain, packet switched domain, IP multimedia core network subsystem or in the internet space (e.g. SMS service centres, multimedia messaging servers, internet servers etc.). The MExE service environment may also include a proxy server to translate content defined in standard Internet protocols into their wireless optimised derivatives.

For the versatile support of MExE services, the wireless network shall provide the MExE device with access to a range of bearer services on the radio interface to support application control and transfer from the MExE service environment. As MExE also applies to fixed and cordless environments, MExE device may also access MExE services via non-wireless access mechanisms.

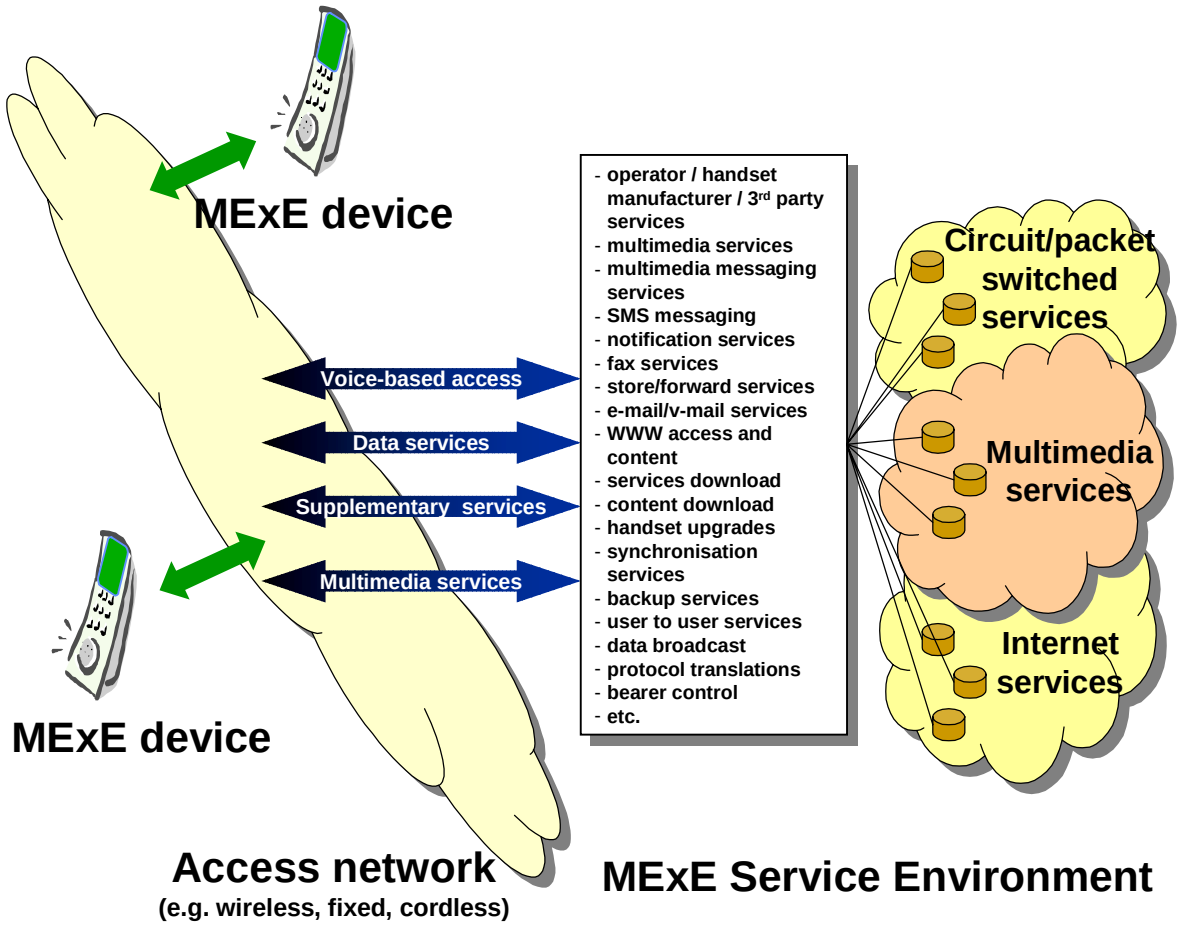

Figure 1: Generic MExE architecture

4.7~~6~~ Capability and content negotiation

Support of capability negotiation for all MExE devices is mandatory, while support of content negotiation is optional.

Interaction between the MExE device and the MSE for WWW/WAP browsing and service discovery shall be supported by the use of the hypertext transfer protocol HTTP/1.1 [9], or an HTTP/1.1 derived protocol (e.g. WSP as defined in Wireless Application Protocol [6]). Communication between the MExE device and the MSE supports:

- Capability negotiation

  The MExE device connects to the MSE by using HTTP/1.1 or an HTTP/1.1 derived protocol. Capability negotiation between the MExE device and the MSE only takes place for the first time after the MExE device has connected to the MSE, and the MSE is informed about the MExE device. Without this first initial contact from the MExE device, the MSE has no knowledge of the MExE device. After the first initial contact the MSE may connect to the MExE device by using HTTP/1.1 or an HTTP/1.1 derived protocol.

  Capability negotiation represents the mechanism by which the MExE device and the MSE interact to inform each other of the specific mechanisms, capabilities and support which each is able to provide or support within the scope of a MExE service interaction. The capability negotiation normally takes place prior to any content transfer between the two entities.

  Capability negotiation is used by the MExE device to inform the MSE of its capabilities. The MExE device may be informed by the MSE of its use of the MExE device's capabilities. The MExE device may also spontaneously inform the MSE of its capabilities (i.e. following a change in MExE support, such as removal of MExE device from a docking station with its keyboard, mouse and monitor). A subset of characteristics which may be transferred between the MExE device and the MSE during the capability negotiation are identified in clause 4.6.1 "Capability negotiation characteristics".

- Content negotiation

  Content negotiation represents the means by which the MExE device and the MSE inform each other of the requested and available form of content. If needed, the content negotiation may take place following capability negotiation between the two. The methods for content negotiation are the basic HTTP/1.1. or WSP methods explained in [9] and [6].

  Content negotiation is used to select the best representation of an entity when there are multiple representations of the entity available from the MSE. The entity (e.g. a service, an image, etc) is located behind a URI, and the application in the MExE device connects to the URI by using HTTP/1.1 or an HTTP/1.1 derived protocol. The best representation of an entity can be decided by the server (server-driven negotiation) or by the client application (agent-driven negotiation).

Both the capability and the content negotiation has the same purpose: to optimise the content according to client's capabilities. The term "content negotiation" has been used e.g. in the HTTP specification and the HTTP/1.1. and the WSP contain headers to perform the content negotiation. However, the capability negotiation in MExE aims at extending the basic HTTP and WSP methods for content negotiation by using CC/PP framework.

The content negotiation transferred between the MExE device and the MSE is identified in clause 4.6.5 "Client content capability report" onwards.

4.7~~6~~.1 Capability negotiation characteristics

The method for capability negotiation is based on the Composite Capability/ Preferences Profiles (CC/PP) specification made by W3C, [16]. The properties and the actual schema, table 1"UAProf properties supported by MExE", is based on the WAP UAProf specification [17]. The CC/PP framework is intended to provide an efficient mechanism for enabling enhanced content and service negotiation through a standardised format for user agent profiles. The use of Resource Description Framework (RDF) [37] in CC/PP allows for interoperable encoding of the profile metadata in XML[36] and supports multiple vocabularies to provide for future extensibility. The WAP UAProf is based on the CC/PP framework. The purpose of the UAProf outlined in this document is to specify:

- an RDF based schema and vocabulary for CC/PP in the context of the WAP UAProf that includes the class definitions and semantics of attributes described in a user agent profile, and

- guidelines for schema extensibility to support a composite profile that enables future additions to the vocabulary and schema.

Not all capabilities have to be reported in the request to the server but instead, the client may point to URL(s) where the server may fetch the properties. An MSE may, or may not, use the client capability information.

The generic set of capabilities which may be negotiated between the client and the server consists of the subsequently identified properties in the UAProf schema, [17].

A MExE device shall support the properties in the UAProf schema for capability negotiation defined in table 1 "UAProf properties supported by MExE" as "mandated properties".

It is recommended that MExE device supports the properties defined in the table 1"UAProf properties supported by MExE" as "recommended properties". It is not required that a MExE device shall send all the "recommended properties", when sending a request, however it should be possible for the MExE device to send one or more of the "recommended properties", with user permission.

The mandatory and recommended properties in table 1"UAProf properties supported by MExE" are specified in WAP UAProf [17].

Support of the properties of the UAProf schema in this specification shall not be limited to those listed in table 1 "UAProf properties supported by MExE". A MExE device may support any other properties from WAP UAProf specification [17].

Table 1: UAProf properties supported by MExE

Mandated Properties				
Attribute	Description		Type	Sample
MexeClassmarks	List of supported MExE classmarks (note)		Literal (bag)	"1", "2", "3"
MexeSpec	The first two digits of the MExE Specification version that the MExE device conforms to		Literal	"3.3", "4.1"
MexeSecureDomains	Indicates whether the device supports the MExE security domains		Boolean	"Yes", "No"
Recommended Properties				
Vendor	MExE device vendor		Literal	"Lexus", "Ford"
Model	MExE device model number		Literal	"Mustang 90", "Q10"
SoftwareNumber	The number of the MExE device specific software.		Literal	"1.0", "2.7.0"
ScreenSize	The size of the MExE device's screen in units of pixels.		Dimension	"160x160", "640x480"
ScreenSizeChar	Size of the MExE device's screen in units of characters (based on the standard font).		Dimension	"12x4", "16x8"
ColorCapable	Whether the MExE device display supports colour		Boolean	"Yes", "No"
AudioInputEncoder	List of audio input encoders supported by the MExE device		Literal (bag)	"G.711"
VideoInputEncoder	List of video input encoders supported by the MExE device		Literal (bag)	"MPEG-1", "MPEG-2", "H.261"
PointingResolution	Type of resolution of the pointing accessory supported by the MExE device		Literal	"Character", "Line", "Pixel"
CcppAccept-Language	List of preferred document languages		Literal (bag)	"zh-CN" "en fr"
Keyboard	Type of keyboard supported by the MExE device as an indicator of ease of text entry.		Literal	"Disambiguating", "Qwerty", "PhoneKeypad"
SupportedBearers	List of bearers supported by the MExE device.		Literal (Bag)	"GPRS", "GUTS", "SMS", CSD", "USSD"
JavaPlatform	List of Java platforms and profiles installed on the device		Literal (Bag)	"Pjava/1.1.3-compatible", "MIDP1.0-compatible", "J2SE/1.0-compatible"
Proposed New Recommended Property				
CLIPlatform +	List of CLI profiles installed on the device		Literal (Bag)	"CLI-Compact/1.0-compatible", "CLI-Standard/1.0-compatible
NOTE: In pre-release 4.0.0 specifications the attribute MexeClassmark (as opposed to MexeClassmarks) which was a literal (as opposed to as Literal, Bag) indicating only one MExE classmark was notified.				
+ NOTE: The property name "CLIPlatform" is proposed as a placeholder. Once a decision has been made the final property name will be proposed to UAProf for UAProf approval.				

Generally, the combination of user profile and MExE device logic will determine the information sent in the capability negotiation from the MExE device to the MExE Service Environment. As an example, for the support of VideoInputEncoder information the user's profile controls if and when VideoInputEncoder information may be sent to the MExE Service Environment (e.g. never sent, always sent, only after user confirmation).

The capability negotiation process shall be used by the client to permit transfer of capabilities from the client to the server. By transferring its capabilities, the client will support efficient use of resources both over the radio interface as well as in the client or server. Capability negotiation shall be performed prior to transfer over the radio interface to verify as far as possible the ability of the client to support any services to be downloaded.

In order to transfer the capability information between the MExE device and the MSE, CC/PP method is used with the schema defined in the WAP UAProf working group.

4.76.2 CC/PP over WSP (Classmark 1)

In Classmark 1, according to the WAP User Agent Profile Specification [17], the CC/PP description is encoded with WBXML [45] after which it is carried over by WSP, [17].

4.76.3 CC/PP over HTTP (Classmark 2)

In Classmark 2 the CC/PP is carried over by using CC/PP over HTTP, [15] and optionally CC/PP over WSP, [17].

4.76.4 Transfer of capability negotiation information in Classmark 3

In Classmark 3 the CC/PP is carried over by using CC/PP over HTTP, [15] and optionally CC/PP over WSP, [17].

Also MIDP itself provides a simple mechanism for applications to indicate the capabilities they require. The Java Application Descriptor File (JAD), which is a file that can be stored and downloaded separately to the application itself, contains information such as application name, version number, JAR file size, data storage requirements etc. The Application Descriptor can accompany the JAR file and can be used to ensure prior to the actual application download that the application suits the MExE device. The JAD file is described in more details in the clause 6.2.2.2.2 " MID Applications (MIDlet)".

4.7.5 CC/PP over HTTP or WSP (Classmark 4)

In Classmark 4 the CC/PP is carried over by using CC/PP over HTTP [15] and optionally CC/PP over WSP, [17]

4.76.65 Client content capability report

The client may perform content negotiation capabilities to the server by using appropriate HTTP/1.1 or WSP request headers. The following methods are available for content negotiation:

- Client software (product): `User-Agent` header;
- MIME media types: `Accept` header;
- Character set: `Accept-Charset` header;
- Content encoding: `Accept-Encoding` header;
- Language: `Accept-Language` header.

There is no need for MExE to specify any tokens for content negotiation, as these headers are already defined in HTTP and WSP. The formats for these headers are specified in [9] and [6].

4.76.76 Server role in capability negotiation

The server may request the capabilities of a client whenever required, and shall enquire of the client's capabilities prior to making each transaction resulting in a set of transfers to the client; the characteristics which may be reported in the client capability report are identified in the list above.

In server-driven negotiation the server signals to the client that the response entity was selected from a set of available representation.

4.76.87 Client-driven negotiation

If the server cannot specify an optimal version for the client basing on the CC/PP sent over to the server, the server may also indicate to client which type of versions are available and let the client make the decision. This method is already available in HTTP1.1. In client-driven negotiation the client selects the best representation after having received an initial response from the server.

4.87 User profile

Support of the user profile is optional.

NOTE: The user profile is not yet specified in an interoperable way. Support of the user profile will be defined when it has been fully specified in a fully interoperable way.

The user profile (which may consist of sub user profiles for a user) contains the characterisation of the MExE device as defined by the user and service provider. Further, it is also possible for multiple users of a MExE device to each have their own user profiles. The user profile is not unique to the MExE device, and this clause identifies the usage and content of the user profile from a MExE perspective only, and does not identify the generic support of user profiles in general. Refer to 3GPP 22.101 [14] for further details on the user profile.

4.87.1 Location of, access to, and security of, the user profile

As multiple user profiles may be defined, the user is able to set up or receive calls/connections associated with different user profiles simultaneously by securely activating a user profile (with each user profile being associated with at least one unique identifier). Refer to table 6 "Security domains and actions" in the Security clause 8.2 "MExE executable permissions" for further details on user profile activation.

The user's characterisation of the MExE device in the user profile may be modified at any time by the user and the service provider, and changes affected at the earliest possible opportunity.

The security clause shall apply to all user profiles at all times, whether activated or not

The user profile shall be securely managed by the MExE device, and stored in a secure area of the MExE device (either (U)SIM or ME). The service provider may also retain the user profile in the network for service optimisation. User private data in the user profile may also be stored in the network, however only with the user permission.

The support of more than one user profile is not mandatory.

4.87.2 User profile and capability negotiation relationship

The user profile contains the user's preferences. Support of the user's preferences will depend on the capabilities of the MExE device. If the capabilities change, then the degree of support of the user's preferences may change too.

The capability negotiation between the MExE device and the MSE, as shown in figure 2 "Model of user profile and capability relationship", contains those user preferences which the MExE device is able to support.

In this way the MSE will serve a MExE device with the lowest common denominator of the users preferences, the MExE device capabilities and the provided service characteristics and support the user's preferences to the maximum degree.

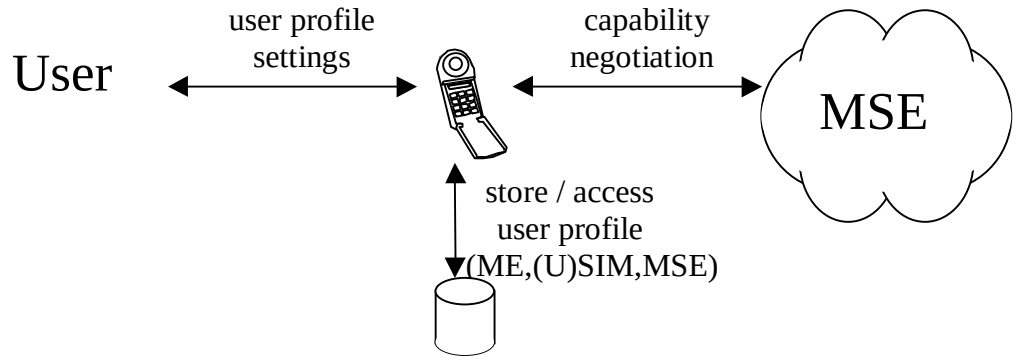

Figure 2: Model of user profile and capability relationship

4.8~~7~~.3 Support of the user profile

The user profile acts as a repository (which is always available in the MExE device) defining the MExE device behaviour.

MExE preferences and personalisation are supported in the user profile (e.g. UMTS portability and support of VHE defined in [12] and other 22-series specifications), which in turn is based on the Composite Capability/Preference Profile (CC/PP) specification from W3C [16].

MExE preferences and personalisation may not only be recorded directly in the user profile as supported by CC/PP (the direct referencing mechanism), but may also be retrieved from a URL (the indirect referencing mechanism).

Generally, the user profile's CC/PP framework provides the mechanism for the standardised format of preferences, and its use of Resource Description Framework (RDF) permits the interoperable encoding of MExE preferences and personalisation. Future extensions will be supported by the W3C mechanism, allowing for evolution and development of MExE preferences and personalisation.

The set of preferences which are supported in the user profile consists of the following:

- user interface personalisation;
- the user's personalisation of the user interface;
- service personalisation and management;
- the user's generic service management information.

The coding and presentation of the above characteristics in the user profile is defined by the Composite Capability/Preference Profile (CC/PP) specification from W3C [16], and referenced by the MExE capability negotiation in clause 4.6 "Capability and content negotiation".

The following user preference information is supported by UAProf [17]. A MExE device shall support the following property in table 2 "Mandatory UAProf properties" of the UAProf schema for user preference information.

Table 2: Mandatory UAProf properties

Attribute	Description	Resolution Rule	Type	Sample Values
AcceptDownloadableSoftware	Indicates the user's preference on whether to accept downloadable software	Locked	Boolean	"Yes", "No"

It is recommended that a MExE device supports the following UAProf properties in table 3 "Recommended UAProf properties":.

Table 3: Recommended UAProf properties

Attribute	Description	Resolution Rule	Type	Sample
CcppAccept-Language	User's preference for document language. Property value is a list of natural languages, where each item in the list is the name of a language as defined by RFC 1766 [46].	Append	Literal (Bag)	"zh-CN", "en fr"
PreferenceForFrames	User's preference for displaying frames	Locked	Boolean	"Yes", "No"
WapPushMsgPriority	User's settings for WAP Push message priorities	Locked	Literal	"critical", "low", "none"

Also, there is in UAProf [17] support for indicating MExE device's capabilities related to UI features, e.g. capability for displaying images or frames, as well as capability information about input and output methods.

4.8~~7~~.4 Virtual home environment

Virtual Home Environment (VHE) (see [11] and [12]) is defined as a concept for personalised service portability across network boundaries and between terminals. MExE is identified by VHE as one of the mechanisms which may be used to support VHE.

The characteristics of the VHE (to reflect any user or home environment modification of the user's VHE) shall be stored as part of the user profile.

4.9~~8~~ User interface personalisation

Support of user interface personalisation as detailed in this clause is optional.

The MExE device interface consists of the buttons, menus, screens and MMI as designed and provided by the MExE device manufacturer; the nature of this MExE device interface is naturally evolving, MExE device specific and proprietary to the individual manufacturers of the industry. This interface is the one normally seen by the user in normal operation of his MExE device. This specification does not place any requirements or limitations on the individual manufacturers' MExE device interface.

The MExE MMI, in turn, is the interface available to the user to support MExE services and functionality on the MExE device. The nature of the MExE MMI interface, like the normal MExE device interface described above, is not standardised in any way, to allow for manufacturer innovation, cater for evolving market needs, and permit manufacturer differentiation. The MExE MMI, depending on different manufacturer implementations, may consist of the normal MExE device interface, the normal MExE device interface with modifications, a different interface to the normal MExE device interface, or some combinations thereof etc. MExE services operate within, and using the capabilities of, the MExE MMI.

User interface personalisation consists of two parts. The first part refers to the user's ability to request, and verify, the preferred changes to the user interface; thus the user's preferences, as supported by the specific MExE device, require to be recorded. The second part refers to the MExE device's support of the user's preferences for the interface, within the capabilities of an MExE device. By defining the user interface personalisation to consist of two stages, the preferences which have been recorded by the user may be transferred (as part of the user profile, e.g. CcppAccept-Language and/or PreferenceForFrames), and thereby provide portability of the user's preferences.

4.9~~8~~.1 MExE user interface personalisation

Personalisation of the user interface offers the MExE Service Environment and or the user, the ability to inform the MExE device of the desired extent of personalisation. All support of the user interface personalisation is optional, not mandatory on any class of MExE device, and subject to the capabilities of the MExE device. Depending on the capability of the MExE device, the personalisation may be fully supported, partially supported, interpreted or ignored.

Personalisation of the user interface is not restricted to modifying the appearance of the MMI, but also the modification of MMI parameters (e.g. programming of the voicemail number). The user's personalisation of the interface is retained as part of the user profile.

4.98.2 Support of MExE user interface personalisation

MExE user interface personalisation is supported via the preferences in the user profile, which in turn is based on the Composite Capability/Preference Profile (CC/PP) specification from W3C [16].

User interface personalisation may not only be reported in the CC/PP request to the server (the direct referencing mechanism), but indeed the client may point to a URL (the indirect referencing mechanism) from where the user interface personalisation preferences may be retrieved.

Generally, the user profile's CC/PP framework provides the mechanism for the standardised format of preferences, and its use of Resource Description Framework (RDF) permits the interoperable encoding of user interface personalisation. Future extensions will be supported by the W3C mechanism, allowing for evolution and development of MExE user interface personalisation.

4.109 Provisioning and management of services

Support of management of services as detailed in this clause is mandatory.

The MExE device shall be capable of supporting services in a standard (WAP or Java) execution environment independently of the MExE device manufacturer. Service provisioning provides a standardised method for a MExE device to discover and install services. It includes download and installation of the service's client application. Once discovered and delivered, services are managed by the user, under the principles stated in 3GPP TS 23.227 [48]. Management of services provides the user with the capability to:

- control the transfer of services;
- install and configure services;
- control the execution of services;
- terminate or suspend executing services;
- delete services;

on his MExE device.

4.109.1 Service discovery

A MExE user is able to request (or be informed about) the range of MExE services available from the MExE server to which it is connected. To be able to interactively discover the services via standard mechanisms such as WSP or HTTP, a MExE device should feature a browser which is a common tool for service discovery. The request, and transfer of information on MExE services from the MExE server is supported by the use of the capability negotiation mechanism.

All services available in the network continue to be available to the user, in addition to MExE services.

An example of an alternative means of receiving information on MExE services, is the use of an application on the MExE device which the user interrogates to provide services information (from various sources), and which in turn then obtains such information and presents it to the user. Such an example is not subject to standardisation.

4.109.2 Service transfer

The standardisation of the transferral of MExE services to a MExE device is outside the scope of this specification.

Examples of possible ways of supporting service transfer are from a MExE server or from another user MExE device (e.g. using wireless and standard protocols and mechanisms such as HTTP, FTP, proprietary protocols and mechanisms, via a serial link, infrared, Bluetooth data exchange, etc.).

The above examples are not exhaustive. Regardless of the means of transfer, all services are required to conform with the security requirements in clause 8 "Security".

4.10~~9~~.3 Service installation and configuration

Installation of a service may result in changes to the MExE device user interface using icons, browsers or menus as applicable depending on the capability of the MExE device to support them. The name of the installed service may be contained in the package in which it was received (i.e. a JAR file or script), assigned by the user during configuration, or some other means. After installation, the service may be configured. Configuration of the service includes setting the user permissions that apply to the service (e.g. blanket permission for call origination). Configuration may be performed automatically based on the user profile.

The user controls whether a service transferred to the MExE device is automatically configured and installed in the MExE device. If automatic configuration and/or installation is enabled, the user is notified once it is completed. In the event that there is no authorisation for the automatic installation and/or configuration of a transferred service, the user is notified.

Subsequent user modification of a service's configuration (e.g. by modification of user profile settings) shall take effect at the earliest possible opportunity thereafter.

4.10~~9~~.4 Service management

The MExE device shall support the ability to determine which services are transferred to, resident, installed or executing on the MExE device. The information relating to the services shall include the name as a minimum and the version number if available.

The user controls which services are permitted or denied to be transferred, resident, installed, configured or executing on the MExE device via the user profile, e.g. AcceptDownloadableSoftware. The user profile permits characteristics such as security level, identification of specific services etc. to manage services on the MExE device.

4.10~~9~~.5 Service termination

A MExE device shall support the termination of services.

A service may terminate by itself, or be terminated by the provider of the service or by the user. The user is in charge of the service, except when the service provider may appropriately control the service as part of user support.

The mechanism for terminating a service is out of scope of standardisation and shall be provided on a service by service basis by the provider of the service.

4.10~~9~~.6 Service deletion

A MExE device shall support the deletion of services.

A service may be deleted (i.e. removed) from the MExE device with the authorisation of the user. The deletion may be initiated by the authoriser of the service or by the user.

4.11~~0~~ User control of application connections

Support of the user control of application connections is mandatory and shall follow the principles and requirements stated in 3GPP TS 23.227 [48].

This clause addresses the generic aspects of connection control supported by both WAP and Java classmark MExE devices.

In order to allow the user to maintain control over connections on his MExE device and the ability to initiate connections, the user shall be able to terminate or suspend any active connection associated with an application in the MExE environment of the MExE device. The user shall be able to obtain information about all connections associated with applications on the MExE device (e.g. requesting information, being informed by the MExE device etc.). Behaviour of the application following termination or suspension of its connection is undefined.

The specific support of connection control by WAP classmark MExE devices is identified in subsequent clause 5.3 "Call control", the security aspects of connection control are identified in clause 8 "Security", and the user control of connection authorisation is identified in clause 4.7 "User profile".

4.12~~1~~ Journaling of network events

Support of the journaling of network events is mandatory.

To support the user in monitoring (potentially chargeable) network events initiated by services in the MExE environment, the MExE device shall maintain a record of network events initiated by MExE executables on the MExE device.

Network events for the purposes of journaling, are defined as events which result in the origination of connections by a service in the MExE environment of the MExE device. Examples of such events (any (potentially chargeable) network event initiated by services in the MExE environment) are:

- Sending an SMS message;
- Sending an USSD message;
- Initiating a circuit switched connection;
- Initiating a packet switched connection;
- Sending data over a packet switched connection.

The length, format and longevity of the journal is undefined and subject to manufacturers' discretion.

The journal shall be managed by the MExE device, and not be accessible by MExE executables.

4.13~~2~~ User notification

Support of user notification is optional.

It is recommended that the MExE device should clearly display an indicator whenever network activity is in progress.

Ideally, this would be an icon on the phone's screen which is displayed whenever the MExE device is sending/receiving SMS, USSD, data call, voice call, or packets.

However, there are certain cases when this indicator need not be displayed, especially if it is obvious by some other means that the MExE device is performing network actions.

4.14~~3~~ Quality of service

Support of Quality of Service is optional.

Quality of Service (QoS) [28] is seen by the end user as a measure of the amount of network resources given to an application by the underlying network. The network may employ a number of QoS mechanisms, but the end user / MExE executable is not involved in these. The end user / MExE executable requires an interface into the network QoS through a visible set of standard parameters.

A QoS aware MExE executable may request a QoS from the network at the beginning of a QoS session. Changes in the level of QoS provided shall be notified to the end user / MExE executable. An end user may request a change in the QoS through the MExE device MMI. A MExE executable may have several QoS streams open simultaneously.

When the MExE execution environment supports QoS, the MExE executable shall be able to dynamically request a change in the level of QoS at connection setup request or subsequently during the connection. The end user / MExE executable may receive a rejection to a QoS modification request, upon which the end user / MExE executable must be notified.

The end user's service level QoS subscription parameters are stored in the network, they identify the maximum permissible QoS that a user may negotiate with the network. Several QoS subscriptions may be possible for one user. MExE is neither aware nor able to determine or modify the end user's service level QoS subscriptions.

Clause 9 "Quality of Service" defines the necessary functions for a MExE device to accommodate QoS management and provisioning. QoS management may be available directly to the MExE executables themselves, or to the MExE environment.

4.154 Core software download

Support of core software download is optional.

Core software download enables the MExE device radio, characteristics and properties to be updated by changing the software in the MExE device. E.g. a new CODEC may be loaded into a MExE device, a new air interface, etc. This process could include the transfer of executable code and software patches over the air.

This updating of core software (e.g. the Software Defined Radio (SDR) concept) can in principle be generically supported within the MExE framework by a MExE service that executes in the manufacturer security domain, and uses handset manufacturer proprietary APIs. Possible scenarios for the support of this functionality include:

- A MExE service that can be transferred to, and executed in, the manufacturer domain. The service would use manufacturer APIs to perform the software update, radio re-configuration, etc.

- A core software download application that executes in the manufacturers' domain that acts like a user agent in conjunction with a server to transfer software as needed or requested by the user. The core software download application uses manufacturer APIs to perform the software update, radio re-configuration, etc.

Similar functionality may be supported by a downloaded MExE service using manufacturer's OEM classes. All such OEM classes shall comply with the MExE security requirements in table 6 "Security domains and actions" and table 7 "Executable permissions for untrusted MExE executables".

The support of core software download functionality in a MExE device shall only be under the control of the MExE device manufacturer.

5 WAP MExE devices

Support of WAP in a MExE classmark 1 device as detailed in this clause is mandatory.

WAP MExE devices shall be based on the WAP specifications [6]. In addition to the base specifications in [6], further developments made in the WAP specifications shall form part of this MExE specification.

WAP MExE devices shall implement the WAP version as specified in reference [6], or a later version, under the condition that the version of WAP is backward compatible with the version specified in reference [6].

The existing WAP specification covers security, creation and transfer of WAP executables and content, access, and execution.

5.1 High level architecture

The WAP architecture provides a scaleable and extensible environment for application development for mobile communication devices. This is achieved through a layered design of the entire protocol stack.

The key features of WAP include:

- Markup language (WML) and a script language (WMLScript) designed to create applications on the small displays of handheld devices. WML does not assume that a QWERTY keyboard or a mouse is available for user input. Unlike the flat structure of HTML documents, WML documents are divided into a set of well defined units of user interactions. One unit of interaction is called a card, and services are created by letting the user navigate back and forth between cards from one or several WML documents. WML has a smaller set of markup tags that makes it more appropriate to implement in handheld devices, than, say, HTML.

- Light-weight protocol stack to minimise the required bandwidth and to guarantee that a maximum number of wireless network types can run WAP applications. For example, GSM SMS/USSD, circuit switched data (CSD), and GPRS.

- A framework for Wireless Telephony Applications (WTA) allows access to telephony functionality such as call control, phone book and messaging from within WMLScript scripts. This allows operators to develop telephony applications integrated into WML/WMLScript services.

Since WAP is based on a scalable layered architecture, each layer can develop independently of the others. This makes it possible to switch onto new bearers, to use new transport protocols, without major changes in the other layers.

5.2 WAP components

Mandatory and optional components of WAP are specified in the WAP specifications. Services and applications shall be able to determine the presence of optional parts of the functionality.

5.3 Call control

WAP telephony services are written in WML and WMLScript. The WAP Telephony API (WTAI) exposes telephony functions to service authors as a set of libraries. The WTAI function libraries can be accessed from WML as URIs, and from WMLScript as script functions. The following libraries have been specified:

- Public library
  This includes functions that are available in all networks, and can be provided by any third party service provider; and not only the network operator. The user must acknowledge the function before it is carried out. Functions have been specified, which can be used e.g. to initiate a mobile originated call, send DTMF tones and add phonebook entry.

- Network Common library
  This includes functions that are available in all networks, and can be provided only by the network operator. E.g. functions for advanced call control, accessing the phonebook, and sending and reading network text (SMS) have been specified.

- Network Specific library
  Functions that are only available in certain types of networks, and can be provided only by the network operator. For GSM, e.g. functions for call reject, call hold, call transfer, multiparty, getting location information and sending USSD have been specified.

The WML and WMLScript author uses the WTAI libraries to create web services for mobile phones with telephony capabilities.

Call control shall be performed using WTA.

5.4 Local phonebook

WAP Telephony API (WTAI) is used to access the information stored in the phonebook on the MExE device or the (U)SIM. Phonebook entries consist of name, number and identity. Phonebook entries can be read, written, deleted, and searched for.

5.5 Services

WAP is a general purpose application based on World Wide Web (WWW) technologies and philosophies. Many services can be provided to both WAP clients and traditional WWW clients, from the same server. Services are created based on the same information space. The major difference is the user interface. The user interface of WAP services is realised by the Wireless Markup Language, WML [6], and has a menu tree oriented structure, instead of the traditional flat structure of HTML pages.

Typical WAP services provided to mobile phones may include (this list is not exhaustive):

- News
- Telephony Services
- Weather information
- Time Tables
- Package Tracking
- Access to corporate databases
- Stocks
- Sports

5.5.1 User interface

The user interface of WAP services is realised by the Wireless Markup Language, WML [6]. WML does not define the user interface itself, the implementation of the browser defines how the WML data is presented to the user (e.g. hyperlinks are blue and underlined). The script language, WMLScript [6], may be used to enhance the standard browsing and presentation facilities of WML with behavioural capabilities, and to access the device and its peripheral functionality.

5.5.2 Access points

Services may be hosted on standard HTTP servers and can be created with proven technologies; CGI, Java Servlets. URLs are used to address services.

The WAP network topology is shown in figure 3 "WAP network topology".

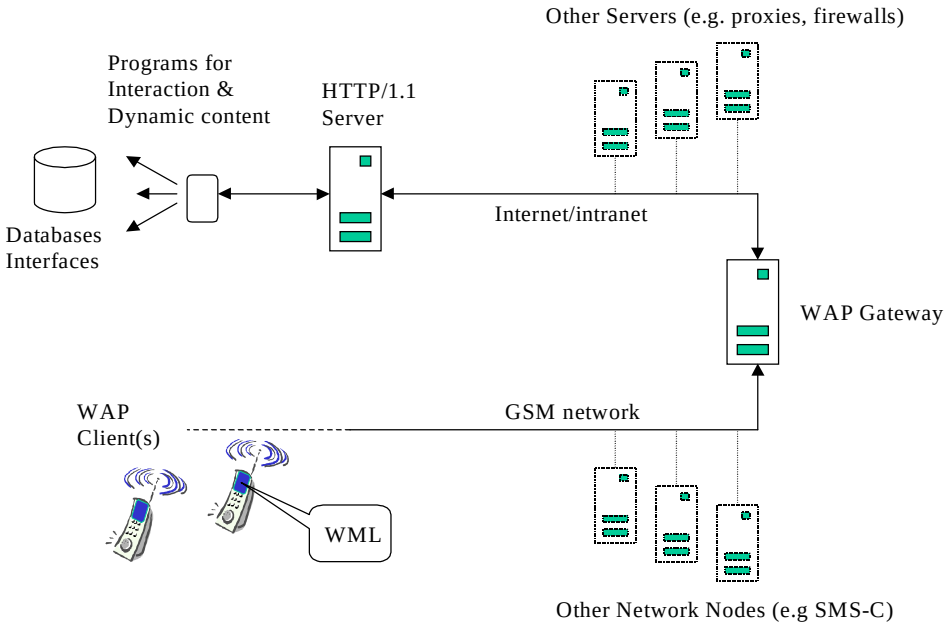

Figure 3: WAP network topology

Mobile phones access services by sending a request with a URI to the WAP gateway. The URI is used to identify the origin server on which the service is available. The request is sent from the mobile phone by the WAP protocols over one of the available bearer networks. The WAP Gateway is a WAP to HTTP/1.1 proxy that translates the WAP request into an HTTP/1.1 request (from binary form to text). The HTTP/1.1 request is passed on to the server identified by the URI.

The HTTP server may have multiple access points to various databases and other services available in the infrastructure network. Once the request has been serviced a response is sent back to the WAP Gateway, which in turn translates it into a WAP response (from text to binary form) and sends it down to the mobile phone.

Note that WAP does not specify anything "behind" the WAP Gateway. However it is assumed that the origin server is an HTTP/1.1 server, and that the WAP Gateway has access to the TCP/IP network on which the origin server is hosted.

5.5.3 Transferring

The core of WSP [6] is a binary version of the Hypertext Transfer Protocol - HTTP/1.1 [9]. The core function of WSP is the same as for HTTP/1.1. A client sends a request to the server using an appropriate request method with a URI and information about the client. The server responds with a status code and possibly (if success) the requested content.

There is a differentiation between an origin server and a WSP server. The origin server is where the content is stored, and the WSP server is where the WSP session terminates. The WSP server is also typically the WAP gateway.

In addition to the basic HTTP/1.1 function, WSP has some functions that can not be found in HTTP/1.1, they are:

- Session Establishment and Management
  Before a request is sent, the WSP client can establish a session with the server. During session establishment the client and server exchange static headers. The header are cached for the duration of the session, thus they need to be sent in every single request within the session. Static headers may be: `Accept` headers, `User-agent` header, etc. In addition, capabilities such as supported optional protocol functions, the maximum service data unit the protocol can handle, the maximum number of simultaneously outstanding requests, supported header code pages, etc. can also be exchanged during session establishment.

- Header encoding
  WSP is using a compact binary header encoding to minimise the number of bytes sent over the air.

- Asynchronous transactions
  WSP allows for multiple asynchronous transactions, that is, unordered transactions.

- Transaction Abort
  WSP support abortion of an outstanding transaction.

- Datagram transport
  WSP together with the helper protocol Wireless Transaction Protocol, WTP [9], can run over a datagram transport such as SMS or UDP. The WDP can also be used for non-IP bearers.

- Push
  WSP supports the push of data from server to client. This can be done within and outside of a session. It can be done with and without acknowledgement from the client. Push of indications down to mobile phones is an essential function many wireless applications.

5.5.3.1 WSP and HTTP/1.1 Proxy Function

The WAP Architecture is a client-proxy-server architecture. The client is typically a mobile phone, the data gateway is the WAP Gateway and the server is the origin server (a standard HTTP server). The WAP Gateway translates the binary WSP header into text formatted HTTP/1.1 headers and passes them on to the origin server. In the opposite direction the WAP Gateway translates the text formatted HTTP/1.1 header into binary WSP headers. If the WAP Gateway receives a header it does not recognise it simply passes it on as an unknown header. Unknown headers that are not part of the WSP Header Code page or Extended code pages (negotiated at session establishment) are sent in plain text for the client to interpret as best it can.

6 Java MExE devices

6.1 Classmark 2 MExE devices

Support of PersonalJava in a MExE classmark 2 device as detailed in this clause is mandatory.

MExE Classmark 2 devices shall be based on the API for Personal Java, which defines the required and optional components of Personal Java /JavaPhone APIs that shall be used to realise a Classmark 2 compliant MExE device.

The APIs primarily define the functions available to a Personal Java based MExE device such that services (specified in the form of Java classes and interfaces) can control such a MExE device in a standardised way.

Many aspects of the MExE Classmark 2 API specification are optional. Services and applications shall be able to determine the presence of optional parts of the functionality. When optional parts of the functionality are implemented, the API shall be supported.

6.1.1 High level architecture

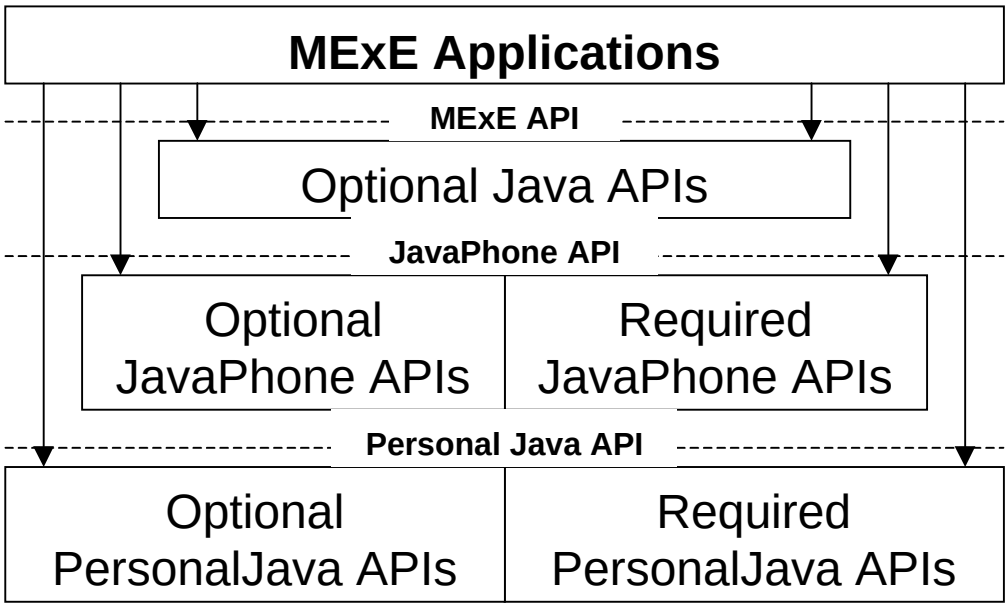

Figure 4: Basic functional architecture of a PersonalJava MExE device

The functional architecture of a Java MExE classmark 2 device is shown in figure 4 "Basic functional architecture of a PersonalJava MExE device". Java applets, applications, and services access functionality via the MExE PersonalJava API. The MExE PersonalJava API is based on a combination of optional Java APIs and the Wireless Profile of the JavaPhone API [4]. The JavaPhone API is based on the PersonalJava API [3].

6.1.2 High level functions

6.1.2.1 Optional Java packages

The use of Java encourages development of modular interfaces and minimal required functionality. Additional functionality is provided by optional APIs specified in terms of the Java language. Java packages are containers for the highest level of functionality in the Java language. In some cases, optional Java packages are specified in terms of Java classes and interfaces. Classes and interfaces are elements contained inside packages.

The following table 4 "Optional Java packages of the Wireless Profile of the JavaPhone APIs" specifies the defined optional Java packages of the Wireless Profile of the JavaPhone APIs [4]. Within some of the packages, certain classes and methods may be individually specified as optional by the JavaPhone API specification.

Where a mandatory package is identified, it is implicit that any packages called by that mandatory package are also mandatory.

Table 4: Optional Java packages of the Wireless Profile of the JavaPhone APIs

JavaPhone API	Java package	Optional/Mandatory
Addressbook	Javax.pim.addressbook	Mandatory
User Profile	Javax.pim.userprofile	Mandatory
Calendar	Javax.pim.calendar	Mandatory
Network	Java.net	Mandatory
Datagram	Javax.net.datagram	Mandatory
Power Monitor	Javax.power.monitor	Mandatory
Power Management	Javax.power.management	Optional
Install	Javax.install	Optional
Communications	Java.comm	Optional
SSL	Javax.net.ssl	Optional
JTAPI Core Package	Javax.telephony	Mandatory
JTAPI Core Capabilities Package	Javax.telephony.capabilities	Mandatory
JTAPI Core Events Package	Javax.telephony.events	Mandatory
JTAPI Call Control Package	Javax.telephony.callcontrol	Optional
JTAPI Call Control Capabilities Package	Javax.telephony.callcontrol.capabilities	Optional
JTAPI Call Control Events Package	Javax.telephony.callcontrol.events	Optional
JTAPI Phone Package	Javax.telephony.phone	Optional
JTAPI Phone Capabilities Package	Javax.telephony.phone.capabilities	Optional
JTAPI Phone Events Package	Javax.telephony.phone.events	Optional
JTAPI Mobile Package	Javax.telephony.mobile	Mandatory
	Java.math	Optional
	Java.rmi	Optional
	Java.rmi.dgc	Optional
	Java.rmi.registry	Optional
	Java.rmi.server	Optional
	Java.security	Optional
	Java.security.interfaces	Optional
	Java.sql	Optional
	Java.io	Optional

6.1.2.2 Required and optional PersonalJava APIs

MExE classmark 2 devices shall support the PersonalJava specification [3]. The PersonalJava APIs provide a standardised and readily implementable execution environment as a means for applications, applets, and content:

- to access and personalise the user interface via the java.awt packages;
- to utilise both Internet and Intranet connections via the java.net package.

6.1.2.3 Required and optional JavaPhone APIs

The JavaPhone APIs extend the PersonalJava APIs to provide functionality unique to telephony devices. MExE classmark 2 devices shall support the Wireless Profile of the JavaPhone API specification [4]. MExE classmark 2 devices shall support all APIs specified as required by the Wireless Profile in the JavaPhone API specification. All APIs that are optional in the Wireless Profile shall be optional in MExE classmark 2 devices.

6.1.2.3.1 Application installation

MExE classmark 2 devices shall support the following JAR file manifest entries (as described in the JavaPhone specification) as described below:

- Implementation-Title

  the Implementation-Title shall be used in any textual description of the application which is displayed in the UI element used to launch the application. E.g. the text displayed with an icon.

- Main-Icon

  the use of icons to launch applications is optional, however if icons are used as elements to launch the application, then the icon file within the JAR file named by the Main-Icon attribute shall be displayed, and may be scaled if desired.

- Main-Class and Class-Path

  when the application is launched, the MExE Java VM shall be supplied with the classpath and shall call the main() method in the class named by the Main-Class attribute.

6.1.2.3.2 Power

MExE classmark 2 devices shall support the Power Monitor package (javax.power.monitor) as specified by the JavaPhone API to access the power level of the MExE device and receive notifications concerning changes in power states.

Note that the Power Monitor package does not specify the minimum required events that should be generated under certain circumstances. MExE classmark 2 device shall at least implement the following event generation:

- BatteryCritical

shall be generated when the battery is at a critically low level.

- BatteryNormal

shall be generated when the battery is no longer low.

All the other event generation should be supported by the implementation.

6.1.2.3.3 Datagram recipient addressing

The syntax described in Concrete Addressing [4] specifies the format to be used for raw text-only GSM SMS messages, UDP datagram via IP, and WAP datagram via GSM SMS message(s).

As a minimum, the formats above shall be supported if the MExE device supports the relevant bearer/transport combination.

NOTE: For the purposes of this clause, "GSM SMS" means SMS as defined by the 3GPP specifications including 3GPP TS 23.040.

6.1.2.4 Required and optional MExE PersonalJava APIs

MExE classmark 2 devices shall not be required to support any other Java APIs.

MExE classmark 2 devices may optionally support any other Java APIs which comply with the MExE security requirements in table 6 "Security domains and actions", such as:

- OCF SmartCard API OpenCard, available from [21]. If the MExE device supports smartcards other than the (U)SIM, and the smartcard is open to 3rd party applications, then the opencard.core.terminal section of the OpenCard API may be used to access the card.

6.1.2.5 Mandated services and applications

6.1.2.5.1 Network protocol support

Support for network protocols in MExE classmark 2 devices is specified in the following table 5 "Support for network protocols":.

Table 5: Support for network protocols

Protocol	Optional/Mandatory
HTTP/1.1 [9]	Mandatory
HTTPS	Mandatory
Gopher	Optional
ftp	Optional
mailto [25]	Mandatory
File	Optional

6.2 Classmark 3 MExE devices

Support of CLDC/MIDP in a MExE classmark 3 device as detailed in this clause is mandatory.

MExE Classmark 3 devices are based on the J2ME Connected Limited Device Configuration (CLDC) with the Mobile Information Device Profile (MIDP).

All APIs defined by CLDC and MIDP shall be supported by a MExE classmark 3 device.

6.2.1 High level architecture

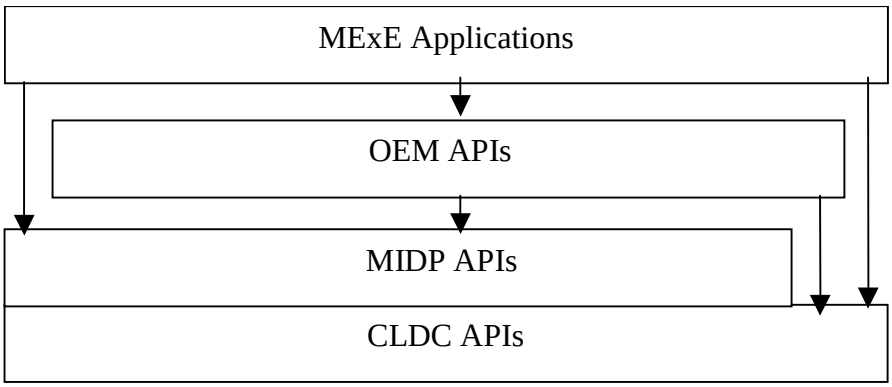

Figure 5: Functional architecture of a Classmark 3 MExE device

The functional architecture of a Classmark 3 MExE device is shown in figure 5 "Functional architecture of a Classmark 3 MExE device". The MExE API is based on the combination of CLDC APIs and MIDP APIs. OEM specific APIs are outside the scope of MExE specification. CLDC and MIDP APIs are defined in J2ME [34] and [35].

6.2.2 High level functionality

J2ME CLDC and MIDP addresses a large market of resource-constrained devices and is aimed to provide complete end-to-end solution for creating dynamically extensible networked products and applications. It allows the use of Java programming language as the standard platform for secure delivery of dynamic content for the extensible next-generation devices.

In order to fit into various types of the devices and support extensibility, J2ME defines in *Configuration* a minimum platform with a virtual machine features and minimum libraries which are available on all devices of similar class. In a *Profile* J2ME addresses the specific demand of a certain category of the devices allowing additional APIs. Profile is

implemented on top of configuration (see figure 5 "Functional architecture of a Classmark 3 MExE device"). Classmark 3 MExE device shall be based on the following types of configuration and profile: Connected Limited Device Configuration (CLDC) and Mobile Information Device Profile (MIDP).

6.2.2.1 Connected Limited Device Configuration (CLDC)

Classmark 3 devices shall support CLDC specification [34].

CLDC provides only high level libraries without focus on any specific device categories. Defining "the lowest common denominator" of Java technology all features included in CLDC must be generally applicable to a wide variety of the devices. CLDC does not address to a certain device category. Such features are specified in a profile. CLDC does not define any optional features.

The classes provided by CLDC are either subset of J2SE (Standard Edition) classes or CLDC specific classes which can be mapped onto J2SE. Classes belonging to the packages: Java.io, Java.lang, Java.util are a subset of corresponding Java2SE libraries, while classes specified in Javax.microedition.io are specific CLDC classes, which, however, can be mapped onto Java2SE.

Javax.microedition.io provides generic connection framework for supporting input/output and networking in a generalized and extensible manner. The framework is a functional subset of Java2SE classes which can be mapped to common low-level hardware or to any Java2SE implementation. It does not provide a set of different kinds of abstractions for different forms of communications, but rather a set of related abstractions are used at the application programming level.

The framework uses a hierarchy of Connection interfaces that group together classes of protocols with the same semantics. The actual supported protocols or implementation of the specific protocols is outside the scope of CLDC Generic Connection Framework and is maintained at the profile level.

The basic set of available Connection interfaces is the following:

- Connection;
- ContentConnection;
- Datagram;
- DatagramConnection;
- InputConnection;
- OutputConnection;
- StreamConnection;
- StreamConnectionNotifier

6.2.2.2 Mobile Information Device Profile (MIDP)

MExE classmark 3 devices shall support MIDP specification [35]. MIDP is based on CLDC. Some of the features of CLDC are modified or extended by MIDP [35].

6.2.2.2.1 Networking

While CLDC specifies only a generic Connector used for all types of connections, MIDP extends connectivity support by providing support of the subset of the HTTP protocol. HttpConnection API provides the additional functionality to set request header, parse response headers and perform HTTP specific functions. The API must support RFC 2396 [40] and RFC 2616 [41].

The MIDP does not provide support for datagrams. If a Datagram API is to be implemented, the DatagramConnection interface defined in CLDC shall be used.

6.2.2.2.2 MID Applications (MIDlet)

A MIDP application (or MIDlet) uses the APIs defined by the MIDP and CLDC specifications. One or more MIDlets may be packed in one JAR file. Sharing of data between MIDlets is controlled by the individual APIs (e.g. Record Management System API).

Application Management Software provides an environment in which a MIDlet is installed, started, stopped and uninstalled. Each JAR file can be accompanied by an Application Descriptor (a text file consisting of name/value pairs), which is used to manage MIDlet and is used by MIDlet for configuration specific attributes. With the help of descriptor file, verification prior to software download is done to ensure that the MIDlet is suited to the device: Java Application Manager checks if the application already exists on the device, verifies the version number (whether an update is needed or not) and reading the JAR-file-size information ensures that there is sufficient amount of memory on the device to save the file. The minimum attributes which the Application Descriptor must contain are the following:

- MIDlet-Name;
- MIDlet-Version;
- MIDlet-Vendor;
- MIDlet-Jar-URL;
- MIDlet-Jar-Size.

Mandatory and optional attributes are defined in [35]. If the mandatory attributes are not identical in the descriptor file and in the manifest file, the JAR file shall not be installed.

6.2.2.2.3 MIDlet Suites

MIDlets may be packaged together in a single JAR file, forming a MIDlet suite. MIDlets in a MIDlet suite share the classes in the JAR file and the persistent storage is the MIDP Record Management System.

MIDlets in a MIDlet suite may be discovered, transferred, installed and deleted together as a packaged set of MIDlets. The deletion of a MIDlet in a MIDlet suite may result in the deletion of the entire MIDlet suite, in which case the user shall be notified of the deletion of the MIDlet suite.

6.2.2.2.4 Record Storage

The MIDP provides a mechanism for MIDlets to persistently store data and later retrieve it. The persistent storage mechanism is called Record Management System. Record stores are created in platform-dependent locations and are not exposed to MIDlets. The record store maintains a version number, which is incremented each time the content of the record store is modified. A record store is shared between all MIDlets in a MIDlet suite.

6.2.2.3 Required and optional MExE APIs

Support of any other Java APIs besides CLDC and MIDP is not mandated in a Classmark 3 MExE device. A Classmark 3 MExE device may optionally support any other Java APIs which comply with the MExE security requirements.

6.2.3 Service discovery and management

A browser installed on a MExE device should support MIME type text/vnd.sun.j2me.app-descriptor. This support allows the user to browse and discover a Java application which can then be downloaded. Capability negotiation information in the request header can determine which application to present. MIDlets and MIDlet suites should be indicated to the user, and if the MExE device has a display, may be presented as an icon and a tag or as a textual tag only.

A JAD file can be downloaded and used to determine if the MIDlet is deemed suitable for download and installation. If it is suitable, the JAR file can be downloaded and installed. If not, the MExE device should be able to prompt the user so that the user might choose to take such actions such as deletion of some existing applications if there is not enough space to install the new application. If the application chosen to be installed already exists on the device, the user should be notified so that he could take further actions either to download the chosen version or to retain the existing one.

The user should be able either to launch the MIDlet immediately or later.

7 CLI MExE Devices

Support of CLI Compact Profile in a MExE classmark 4 UE as detailed in this subclause is mandatory.

MExE Classmark 4 devices shall be based CLI Compact Profile specifications [50]. The specifications define the runtime environment and APIs available to a CLI based MExE device such that services (specified in the form of language independent classes and interfaces) can control such a device in a standardised way.

All mandatory components of the CLI compact profile shall be included. Additional CLI APIs or OEM APIs may be available. It shall be possible for services and applications to determine the presence of additional parts of the functionality. When an additional optional CLI component is implemented, the component shall be fully implemented.

7.1 High level architecture

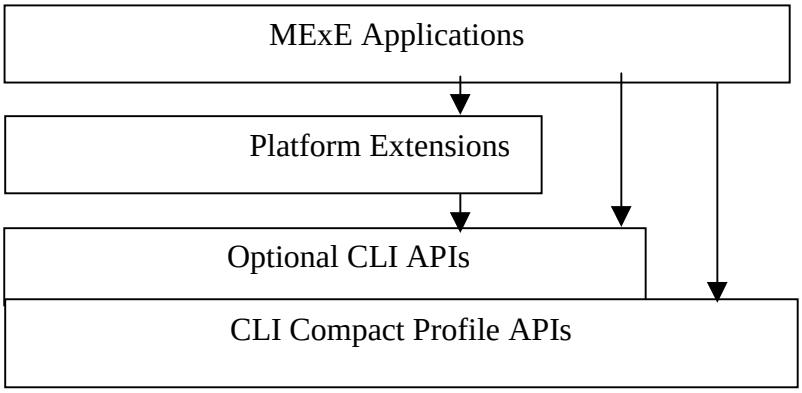

Figure X: Basic functional architecture of a CLI MExE device

The functional architecture of a CLI MExE classmark 4 device is shown in Figure X "Basic functional architecture of a CLI MExE device". CLI based applications and services access functionality via the MExE CLI Compact Profile API. Additional CLI APIs and OEM specific APIs are outside the scope of the MExE specification. The CLI Compact Profile APIs are defined in CLI specified by ECMA [50].

7.2 High level functionality

CLI provides a language-neutral, CPU and OS portable, secure infrastructure for executing applications and services that interoperate seamlessly with highly available web services. The CLI Compact Profile provides a mobile client-focussed subset of these services on a broad market of connected devices. Using multiple programming languages for application and service creation allows adoption of a large pool of programming talent, as well as interoperability between existing service components.

Functionality is exposed to applications and services in the form of classes and interfaces. Classes can be written in any supported language. APIs can be exposed to the developer using the language syntax of choice. Classes and interfaces are collected into namespaces, which aim to represent a coherent, mutually-dependant set of functionality.

The following Table Y "CLI Compact Profile Namespaces" specifies the defined mandatory namespaces, ie the namespaces defined in the CLI Compact Profile containing classes which are required for CLI Compact Profile conformance.

Table Y: CLI Compact Profile Namespaces

CLI Compact Profile Namespaces
System
System.Collections
System.Globalization
System.IO
System.Text
System.Threading
System.Runtime.CompilerServices
System.Reflection
System.Net
System.XML

The namespaces outlined in Table Y define the core of the CLI programming model. The System namespace defines data types, including simple data types such as integers, collections such as arrays, and string data types with methods for textual manipulation. System.Globalization enables applications to adapt at runtime to user and cultural UI preferences by modifying list sorting order, currency symbol selection, date and calendar formats, input methods, and language presentation within text strings. The programming model supports threads, with thread manipulation primitives defined in System.Threading. System.Reflection enables progammatic inspection of application metadata such as class structure, properties, and data types on method parameters. System.Net includes support for transport-independent sockets, HTTP connections, and infrastructure for consuming web services. System.XML enables simple parsing and construction of XML objects.

7.2.1 Network protocol support

Support for network protocols in MExE classmark 4 devices is specified in the following Table Z "Support for network protocols in Classmark 4 devices":

Table Z: Support for network protocols in Classmark 4 devices

Protocol	Optionality
HTTP/1.1 [9]	Mandatory
HTTPS	Mandatory
SOAP [51]	Mandatory
Gopher	Optional
ftp	Optional
mailto [25]	Optional
File	Optional

7.2.2 Power Management

MExE Classmark 4 devices have no application or service accessible APIs to detect the power level of the device. Classmark 4 applications or services may be paused by the MExE device if power passes below a certain threshold. Such an activity is implementation dependant.

8~~7~~ Charging

Support of charging is outside the scope of MExE standardisation.

The following informative clauses provide a brief overview of the charging possibilities enabled by MExE.

87.1 Generic charging support

The standard GSM/UMTS charging records contain information sufficient to associate bearer usage and SMS/USSD messages with a subscriber.

Third party service providers and/or service providers may define charging regimes for MExE services (e.g. on a MExE or WAP server).

87.2 WAP charging support

The WAP protocol suite in [6], with upgrades as identified in this specification, does not specify mechanisms for charging (e.g. charging records) or subscription management. WAP is bearer independent and is running as an application on top of the bearer network. However the WAP architecture suggests that appropriate charging information can be collected in the WAP Gateway; the point of convergence for all WAP traffic.

The WAP security protocol can be used for authentication of the subscriber.

87.3 Java charging support

MExE Java devices do not require any additional specific charging (e.g. charging records) or subscription management. Java usage of network resources is bearer independent and runs as applications on top of the bearer network.

8.4 CLI charging support

MExE CLI devices do not require any additional specific charging (e.g. charging records) or subscription management. Use of network resources from a CLI application or service is bearer independent and runs as applications on top of the bearer network.

3GPP TSG-T2 #15
Sophia Antipolis, France
11-15 February 2002

T2-020078

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **110** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Changing the urls for the CLDC/MIDP references
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	1/30/02
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	This CR entails a change of the current urls to a different url which provides access to a more comprehensive set of relevant documents.
Summary of change:	⌘	Sections 2: A url is an electronic means to access a referenced document. The proposed url points to the referenced documents and additional relevant whitepapers, data sheet, text book, Japanese translated version and more.
Consequences if not approved:	⌘	Supportive documents to provide a full implementation will not be provided.

Clauses affected:	⌘	2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

2 References

[34] Connected Limited Device configuration, J2ME version 1.0,
~~http://java.sun.com/aboutJava/communityprocess/final/jsr030/index.html~~
http://java.sun.com/j2me/docs/

[35] Mobile Information Device Profile, J2ME version 1.0,
~~http://java.sun.com/aboutJava/communityprocess/final/jsr037/index.html~~
http://java.sun.com/j2me/docs/

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020073

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **109** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Replacing MExE application with MExE executable.
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	30 Jan 2002
Category:	⌘	**F**
Release:	⌘	Rel 5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Clean up the specification in terms of MExE application/executable terminology.
Summary of change:	⌘	Changed the wording MExE application to MExE executable.
Consequences if not approved:	⌘	The specification might lead to misinterpretations.

Clauses affected:	⌘	8.7
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.7 Certificate configuration message (CCM)

If the 3 MExE security domains defined in clause 8.1 "Generic security" are not supported, then the certificate configuration message described in this clause is optional.

The MExE device shall use the CCM to determine the third party certificates (and only the Third Party certificates) that are trusted for use on the MExE device. The CCM shall only be used to enable or disable third party certificates and can not be used to delete certificates. The CCM may be periodically fetched or downloaded to a MExE device by the Administrator to dynamically configure the third party list using the mechanisms defined in clause 8.7.4 "Authorised CCM download mechanisms".

The Certificate Configuration Message shall be as shown in figure 9 "Format of a CCM". This message is essentially a simplified version of a certificate revocation list to satisfy a particular use case. More complex usage requires a full certificate revocation list.

The MExE device may additionally support other means of enabling/disabling root certificates.

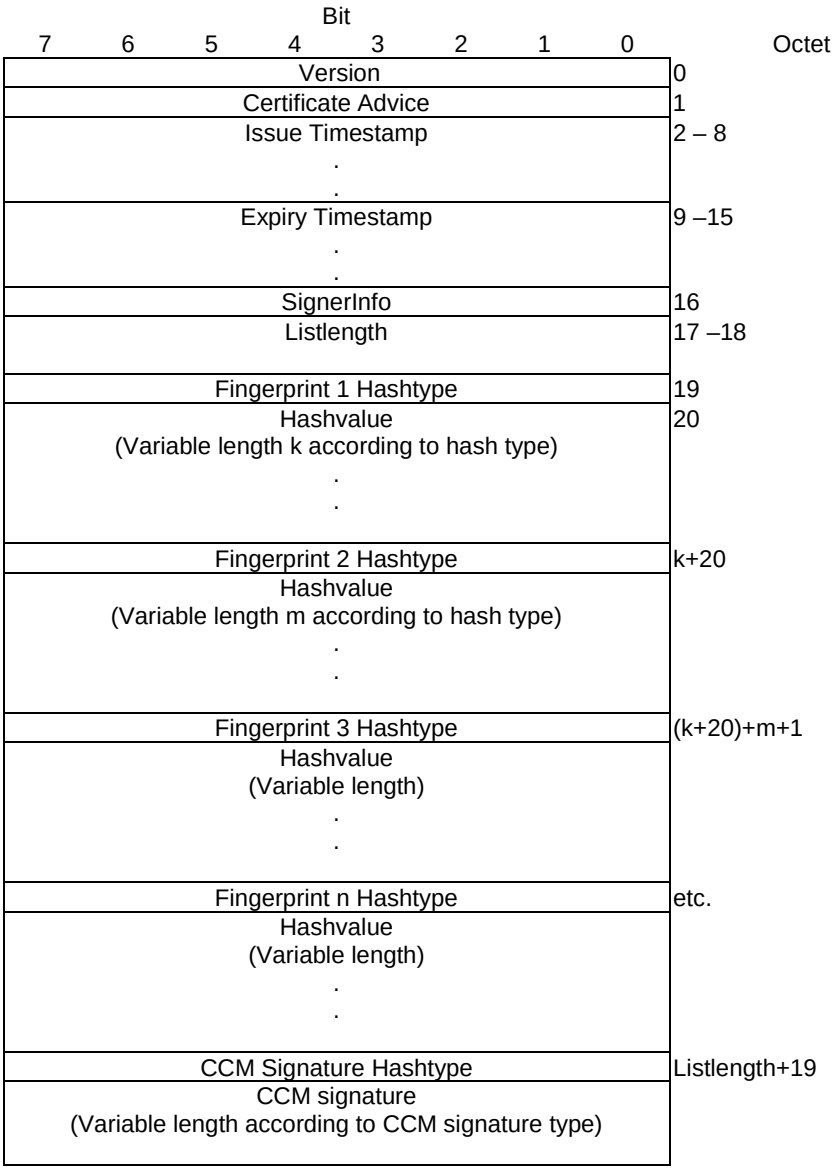

Figure 9: Format of a CCM

Version = The CCM format version is 0. All other values are reserved for future use.

Certificate Advice = enumerated { enable all present and future Third Party certificates (0), disable all present and future Third Party certificates (1), enable present list only (2),enable CCM list (3), disable CCM list (4) }. All other values are reserved for future use.

Issue and Expiry Timestamps = Fields used to identify the issue and expiry date of the CCM. The issue timestamp indicates a time before the current time of day (GMT) when a CCM message must be considered invalid. The expiry timestamp (GMT) identifies the time when a CCM is to be deemed no longer valid. The receiver shall use these parameters to detect a replay attack. A MExE device maintains information on the last valid CCM message received. A replay attack is an attacker replaying a previous valid CCM message to a MExE device in order to change the security settings. This is particularly dangerous for CCM messages used to enable certificates. Administrators should try and set the expiration time to be no longer than the next expected system update time of CCM information. CCM messages used to enable-all (rather than disable-all) certificates should be very short lived as the danger of these being used in a replay attack should be considered serious.

The encoding of time (GMT) shall be coded as an OCTET SEQUENCE of seven octets in length as follows:

Octet 0	1	2	3	4	5	Octet 6
Year		Month	Day	Hour	Minute	Second

Element	Size (bits)	Range
Year	16	$(0 – 65535)_{10}$
Month	8	$(1 – 12)_{10}$
Day	8	$(1 - 31)_{10}$
Hour	8	$(0- 23)_{10}$
Minute	8	$(0 – 59)_{10}$
Second (see note)	8	$(0 – 60)_{10}$
NOTE: The second field range includes the value 60 in order to accommodate leap seconds.		

For example, 1st January, 2001 00:00:30 would be encoded as: 07 d1 01 01 00 00 1E.

SignerInfo = one octet indicating the type of signer information for this CCM. The only currently defined value is device-admin = 0. In this case, no further signer information follows as it is implicit. All other values are reserved for future use.

Listlength = The total length of the fingerprint list not including the final CCM signature. Shall be zero when certificateAdvice = enable-all, disable-all or enable present list.

Hashtype = enumerated { signature (0), MD5 (1), SHA-1 (2) } All other values are reserved for future use.

The length of the Hashvalue field, number of octets output by the selected hash type, is 16 for MD5 [23] or 20 for SHA-1 [24].

The list entries shall contain certificate *fingerprints* in the form of hashes of the encoded signed certificates. The full hash output for the specified algorithm shall be used to generate the fingerprint. A list generator shall check to insure that no two list entries match when creating a list. For an X509v3 [26] or X9.68 (currently being drafted) certificate the fingerprint hash shall be computed over the ASN.1 encoded signed certificate object, first octet to last octet. For WTLS certificates the hash shall be computed over the signed WTLS certificate in network transmission format, first octet to last octet.

The signature type and length shall be indicated by the administrator certificate, which shall be present on the MExE device. If no administrator certificate is on the MExE device or if the signature is not verified, the message shall be rejected.

Upon receipt of a valid certificate configuration message the MExE device shall go through the third party certificate list, computing fingerprints if they are not stored with the certificate and enabling or disabling each certificate according to the following conditions:

- certificateAdvice is enable-all all Third Party certificates shall be enabled;
- certificateAdvice is disable-all all Third Party certificates shall be disabled;

- certificateAdvice is enable present list only	enable all Third Party certificates currently on MExE device, do not enable any future certificates (this option allows the list to be frozen at time of manufacture) until Administrator changes;
- certificateAdvice is enable-list	if its fingerprint occurs in the CCM, it shall be enabled, otherwise it shall be disabled;
- certificateAdvice is disable-list	if its fingerprint occurs in the CCM, it shall be disabled, otherwise it shall be enabled.

For future releases, the setting of fine grained permissions for each certificate is expected to be supported.

An implementation shall keep track of the domain that authorised a given executable~~application~~. If a CCM message is received while MExE executables~~applications~~ are currently executing~~running~~, the implementation shall check to ensure that any executables~~applications~~ no longer in the Third Party domain, have their permissions re-configured appropriately and actions that are no longer permissible are terminated.

3GPP TSG-T2 #16
Sophia Antipolis, France
11-15 February 2002

T2-020070

CR-Form-v5

CHANGE REQUEST

⌘ **23.057** **CR** **108** ⌘ **rev** **-** ⌘ Current version: **4.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Updating the references
Source:	⌘	T2
Work item code:	⌘	MEXE-ENHANC
Date:	⌘	29 Jan 2002
Category:	⌘	**F**
Release:	⌘	Rel 5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Remove unused and out of date references, and add unsused references to the text.
Summary of change:	⌘	Removed the unused references and changed the out of date and added new references in the text.
Consequences if not approved:	⌘	The specification might lead to misinterpretations.
Clauses affected:	⌘	2, 3.2, 4.7.3, 8.5.1, 8.5.3, 8.5.4, 8.6
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

2 References

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] ~~GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".~~Void.

[2] 3GPP TS 22.057: "Mobile Execution Environment (MExE); Stage 1".

[3] Personal Java 1.1.1 or higher, Sun Microsystems http://www.javasoft.com/products/personaljava/

[4] JavaPhone API version 1.0, http://java.sun.com/products/javaphone/ .

[5] ~~JTAPI 1.2, Sun Microsystems http://www.java.sun.com~~ Void.

[6] Wireless Application Protocol (WAP) June 2000 Conformance Release http://www.wapforum.org .

[7] ~~vCard – The Electronic Business Card Exchange Format – Version 2.1, The Internet Mail Consortium (IMC), September 1996, http://www.imc.org/pdi/vcard-21.doc .~~Void.

[8] ~~vCalendar – The Electronic Calendaring and Scheduling Exchange Format – Version 1.0, The Internet Mail Consortium (IMC), September 1996, http://www.imc.org/pdi/~~ Void

[9] Hypertext Transfer Protocol – HTTP/1.1, IETF document RFC2616, http://www.w3.org/Protocols/rfc2616/rfc2616

[10] ~~Java Mail API version 1.0.2, http://www.java.sun.com~~ Void

[11] 3GPP TR 22.170: "Universal Mobile Telecommunications System (UMTS); Service aspects; Provision of Services in UMTS - The Virtual Home Environment".

[12] 3GPP TS 22.121: "The Virtual Home Environment; Stage 1".

[13] ~~ISO 639: "Code for the representation of names of languages".~~Void

[14] 3GPP TS 22.101: "Service Aspects; Service Principles".

[15] CC/PP Exchange Protocol based on HTTP Extension Framework; W3C http://www.w3.org/Mobile/CCPP

[16] Composite Capability/Preference Profiles (CC/PP):A user side framework for content negotiation; http://www.w3.org/Mobile/CCPP

[17] UAProf Specification http://www.wapforum.org/what/technical.htm

[18] JDK 1.1 security http://www.javasoft.com/products/jdk/1.1/docs/guide/security/index.html

[19] Java 2 security http://www.javasoft.com/products/jdk/1.2/docs/guide/security/index.html

[20] Java security tutorial http://java.sun.com/docs/books/tutorial/security1.2/overview/index.html

[21] OCF 1.1.: "Smartcard API specified by OpenCard Consortium http://www.opencard.org

[22] RFC 1738: "Uniform Resource Locators (URL)" http://www.w3.org/pub/WWW/Addressing/rfc1738.txt.

[23] The MD5 Message Digest Algorithm", Rivest, R., RFC 1321, April 1992. URL: ftp://ftp.isi.edu/in-notes/rfc1321.txt

[24] ISO/IEC 10118-3 (1996): "Information technology - Security techniques - Hash-functions - Part 3: Dedicated hash-functions".

[25] IETF RFC 2368: "The mailto URL scheme".

[26] ITU-T Recommendation X.509: "Information technology – Open Systems Interconnection – The Directory: Public-key and attribute certificate frameworks".

[27] ~~GSM 11.11: "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM-ME) interface".~~3GPP TS 51.011 Specification of the Subscriber Identity Module – Mobile Equipment (SIM - ME) interface

[28] 3GPP TS 23.107: "QoS Concept and Architecture".

[29] 3GPP TS 24.007: "Mobile radio interface signalling layer 3; General Aspects".

[30] 3GPP TS 24.008: "Mobile radio interface layer 3 specification, Core Network Protocols; Stage 3".

[31] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service Description; Stage 2".

[32] PKCS #15 "Cryptographic Token Information Syntax Standard" version 1.1, RSA Laboratories, June 2000
URL: ftp://ftp.rsa.com/pub/pkcs/pkcs-15/pkcs-15v1_1.doc

[33] RFC 2510 (1999): "Internet X.509 Public Key Infrastructure Certificate Management Protocols".

[34] Connected Limited Device configuration, J2ME version 1.0, http://java.sun.com/aboutJava/communityprocess/final/jsr030/index.html

[35] Mobile Information Device Profile, J2ME version 1.0, http://java.sun.com/aboutJava/communityprocess/final/jsr037/index.html

[36] eXtensible Markup Language (XML) 1.0, W3C Recommendation.
URL: http://www.w3.org/XML

[37] Resource Definition Framework (RDF) Model and Syntax, W3C Recommendation.
URL: http://www.w3.org/RDF

[38] UML Partners: Unified Modelling Language. URL: http://www.omg.org.

[39] 3GPP TS 31.102: "Characteristics of the USIM applications".

[40] RFC 2396 (1998): "Uniform Resource Identifiers (URI): Generic Syntax". T. Berners-Lee, R. Fielding, L. Masinter.

[41] RFC 2616 (1999): "Hypertext Transfer Protocol -- HTTP/1.1". R. Fielding, J. Gettys, J. Mogul, H. Frystyk, L. Masinter, P. Leach, T. Berners-Lee.

[42] Description of the "JAR Manifest" file encoding, Sun Microsystems. URL: http://java.sun.com/j2se/1.3/docs/guide/jar/jar.html

[43] RFC 2459 (1999): "Internet X.509 Public Key Infrastructure Certificate and CRL Profile". R. Housley, W. Ford, W. Polk, D. Solo.

[44] 3GPP TR 21.905: Vocabulary for 3GPP Specifications.

[45] WAP Binary XML Content Format Specification (WBXML), http://www.wapforum.org/what/technical.htm

[46] RFC 1766: "Tags for the Identification of Languages".

[47] WAP Certificate and CRL Profiles, WAP-211-WAPCert http://www.wapforum.org/what/technical.htm

[48] 3GPP TS 23.227 “Applications and User interaction in the UE-Principles and specific requirements”.

[49] PKCS#1 “RSA Cryptographic Standard” " version 2.0, RSA Laboratories, October 1998 URL: http://www.rsasecurity.com/rsalabs/pkcs/pkcs-1/index.html

3.2 Abbreviations

For the purposes of the present document the following abbreviations apply:

AA Attribute Authority

...

XML Extensible Markup Language

Further abbreviations are given in 3GPP TS 22.057 [2] and 3GPP TS 21.905 ~~GSM 01.04~~ [~~441~~].

4.7.3 Support of the user profile

The user profile acts as a repository (which is always available in the MExE device) defining the MExE device behaviour.

MExE preferences and personalisation are supported in the user profile (e.g. UMTS portability and support of VHE defined in [12] and other 22-series specifications), which in turn is based on the Composite Capability/Preference Profile (CC/PP) specification from W3C [16].

MExE preferences and personalisation may not only be recorded directly in the user profile as supported by CC/PP (the direct referencing mechanism), but may also be retrieved from a URL (the indirect referencing mechanism) [22].

Generally, the user profile's CC/PP framework provides the mechanism for the standardised format of preferences, and its use of Resource Description Framework (RDF) permits the interoperable encoding of MExE preferences and personalisation. Future extensions will be supported by the W3C mechanism, allowing for evolution and development of MExE preferences and personalisation.

8.5.1 Operator root public key

The ME shall support secure storage for at least one certificate containing an operator root public key. The ME shall support the use and management of a certificate containing an operator root public key stored on the MExE-(U)SIM and in the ME. The ME shall behave according to clause 8.5.1.2 "ME actions on SIM insertion and/or power up". For support of public key management on the SIM and the USIM refer to 3GPP TS 51.011 ~~GSM 11.11~~ [27] and 3GPP TS 31.102 [39] respectively. The certificate contains a root public key generated either by the operator, or by a CA trusted by the operator

8.5.3 Third party root public key

The ME shall support secure storage for at least one certificate containing a third party root public key. The ME shall support the use and management of certificates containing Third Party root public keys stored on the MExE-(U)SIM and in ME. For support of public key management on the SIM and the USIM refer to 3GPP TS 51.011 ~~GSM 11.11~~ [27] and 3GPP TS 31.102 [39] respectively. The MExE device may contain root public key (s) generated by CA(s) implicitly trusted by the user. The user will be able to securely install (using a secure transport) or remove Third Party root public keys at any time using a system administrative tool.

8.5.4 Administrator root public key

To help with the control of Third-Party certificates, the ME shall support secure storage for a certificate containing an administrator root public key. The ME shall support the use and management of a certificate containing an Administrator root public key stored on the MExE-(U)SIM and in the ME. The ME shall behave according to clause 8.8.1 “Determining the administrator of the MExE MS”. For support of public key management on the SIM and the USIM refer to 3GPP TS 51.011 ~~GSM 11.11~~ [27] and 3GPP TS 31.102 [39] respectively.

8.6 Certificate management

If the 3 MExE security domains defined in clause 8.1 "Generic security" are not supported, then the certificate management described in this clause is optional. The manufacturer may load initial third party certificates on the ME. Downloaded certificates shall be verified by an existing trusted certificate and placed in the domain defined by the root public key at the top of the verification chain for the downloaded certificate.

The administrator root certificate shall be provided on the (U)SIM if support for certificate storage on the (U)SIM exists (e.g. MExE-(U)SIM) or in the MExE device. For (U)SIMs not having certificate storage the administrator root may be downloaded using the root download procedure described in clause 8.10.4 "Administrator root certificate download mechanism".

The actions that may be performed for a given certificate are:

- addition;
- deletion;
- mark un-trusted (un-trusted certificates cannot be used to verify applications or other certificates. This process may be preferred to certificate deletion as there is a chance that the certificate may become trusted again in the near future);
- mark trusted (marking as trusted is the process of allowing an untrusted certificate to come into use again);
- modify fine grain access permissions (proposed as a future enhancement).

The ability to perform these actions depend on the certificate type being modified as well as the access level of the entity performing the operation.

Users may add a third party certificate as long as it is certified by an existing trusted certificate. Using a provisioned functionality, users may delete Third Party certificates.

The Administrator may mark trusted/untrusted Third-Party certificates using Certificate Configuration Messages (see clause 8.7 “Certificate configuration message (CCM)”.

Users cannot add or delete any Operator or Manufacturer certificate containing a root public key.

An example of public key infrastructure certificate management protocols can be found in [33].