

ETSI/TC GSM

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RELEASE NOTE

Report GSM 03.42

**Technical Realization of
Advanced Data MHS Access**

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ETSI/GSM

GSM REPORT 03.42

Title : **ADVANCED MHS ACCESS**

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Contents:

1. Scope
2. Key definitions and abbreviations
3. Related recommendations
4. Functional Model of the Message Handling System (MHS)
5. Services comprised in the Advanced MHS Access
6. Advantages and disadvantages of the different of ways of accessing MHS
7. Use of GSM bearer capabilities within the Advanced MHS Access
8. Auto-alert auto-action in MS^s using the Short Message Service of GSM

Original language: English

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1 Scope

This report describes how users of GSM MSs may access and use Message Handling Systems (MHS) specified according to the CCITT X.400 Series of Recommendations. The access described is for MSs containing UA-functionality (UA = User Agent). Both MS^{*} (Message Store) access and MTS (Message Transfer System) access are described.

The report also describes how the Auto-alert auto-action within the MS^{*} may be used together with the Short Message Service in GSM for alerting the MHS-user.

2 Key definitions and abbreviations

AU	Access Unit
IPM	Interpersonal Message
IPMS	Interpersonal Messaging System
MHS	Message Handling System
MS	Mobile Station
MS [*]	Message Store
MTA	Message Transfer Agent
MTS	Message Transfer System
OSI	Open System Interconnection
PDAU	Physical Delivery Access Unit
UA	User Agent
mUA	User Agent located at a Mobile Station (MS)
mUser	User making use of a mUA

NOTE: In the CCITT X.400 series of recommendations the abbreviation 'MS' denotes the Message Store. In this report the abbreviation 'MS^{*}' is used to denote the Message Store to avoid confusion with GSM terminology where 'MS' denotes a GSM Mobile Station.

3 Related recommendations

1984: MHS: System Model - Service Elements	X.400
1984: MHS: Basic Service Elements and Optional User Facilities	X.401
1984: MHS: Encoded Information Type Conversion Rules	X.408
1984: MHS: Presentation Transfer Syntax and Notation	X.409
1984: MHS: Remote Operations and Reliable Transfer Server	X.410
1984: MHS: Message Transfer Layer	X.411
1984: MHS: Interpersonal Messaging User Agent Layer	X.420
1984: MHS: Access Protocol for Teletex Terminals	X.430
MHS: System and Service Overview	X.400
MHS: Overall Architecture	X.402
MHS: Conformance Testing	X.403
MHS: Abstract Service Definition Conventions	X.407
MHS: Encoded Information Type Conversion Rules	X.408
MHS: MTS: Abstract Service Definition & Procedures	X.411
MHS: MS: Abstract Service Definition	X.413
MHS: Protocol Specifications	X.419
MHS: Interpersonal Messaging System	X.420
Naming & Addressing for Public MH Services	F.401
The Public Message Transfer Service	F.410
Physical Delivery Service Intercommunication	F.415
The Public IPM Service	F.420
Intercommunication Telex Service/IPM Service	F.421
Intercommunication Teletex Service/IPM Service	F.422
OSI: Basic Reference Model	X.200
OSI: Specification of ASN1	X.208
OSI: Network Service Definition	X.213
OSI: Presentation service definition	X.216
OSI: Association Control: Service Definition	X.217
OSI: Reliable Transfer: Model & Service Definition	X.218
OSI: Remote Operations: Model, Notation & Service Def.	X.219

4 Functional Model of the Message Handling System (MHS)

The Functional Model of the MHS is depicted in Figure 1.

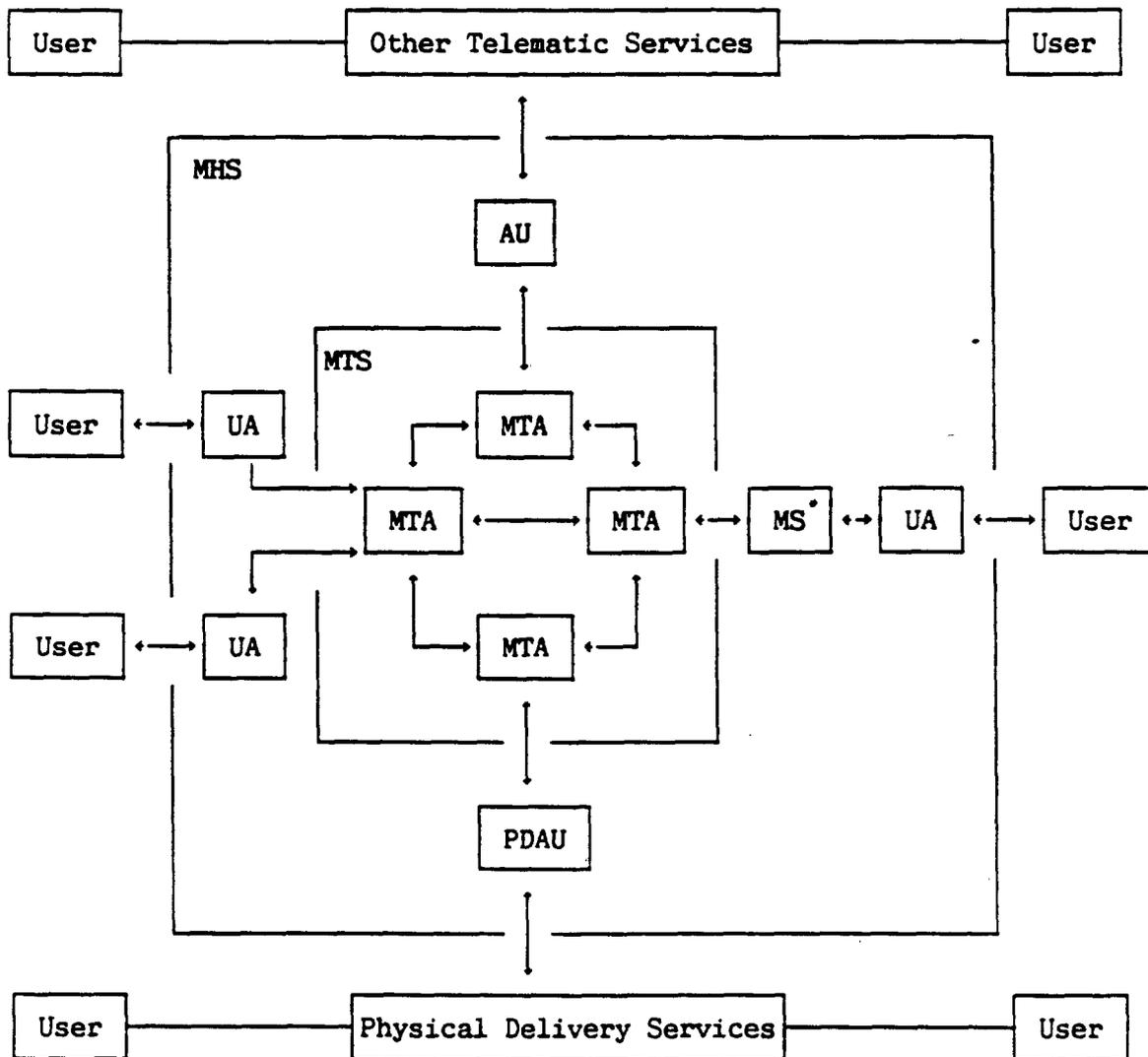


Figure 1 MHS Functional Model

The overall description of the MHS is contained in the CCITT Recommendation X.400 Message Handling: System and Service Overview.

The overall model depicted in Figure 1 will - when adopted to the GSM system - be as shown in Figure 2. There are two cases shown, MS^{*} Access and MTS Access.

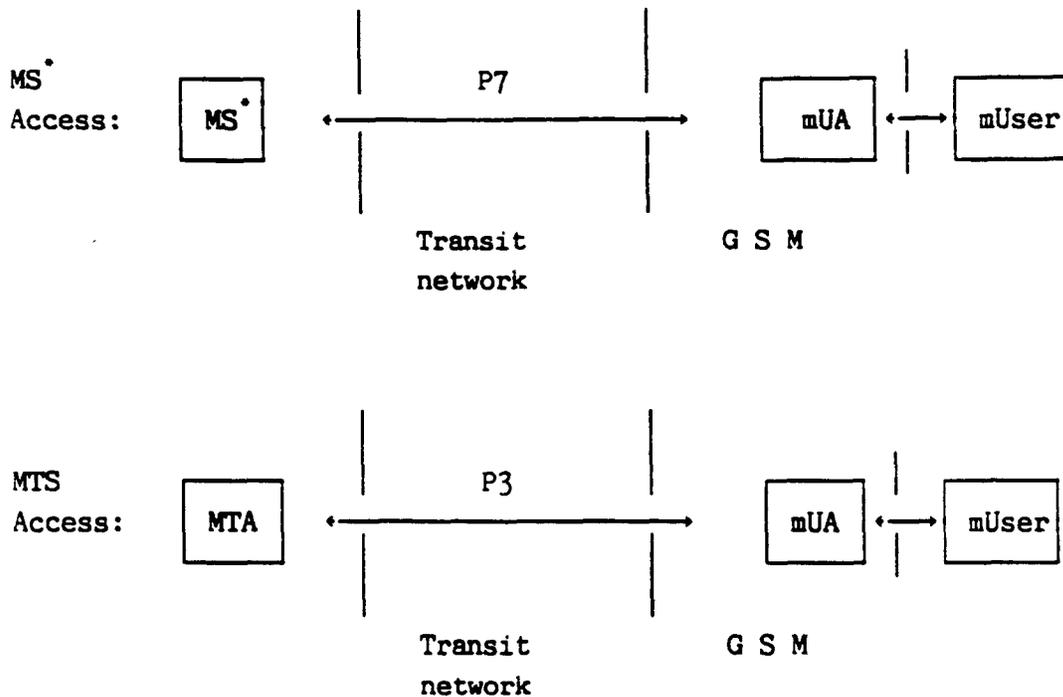


Figure 2 Functional Model of the Advanced MHS Access

5 Services comprised in the Advanced MHS Access

The Advanced MHS Access comprises access to MHS both based on the 1984 and the 1988 versions of the CCITT X.400 recommendations. The MS^{*} Access applies only to the 1988 version while the MTS Access applies to both versions.

5.1 MS^{*} Access

The basic service comprised in the MS^{*} Access enables the mUA to communicate with the MS^{*}. This service is completely described in CCITT Rec. X.413 Message Store: Abstract Service Definition. The protocol used between mUA and MS^{*} is called P7 (MS^{*} Access protocol) and is defined in CCITT Rec. X.419 MHS Protocol Specifications. These recommendations are both 1988 versions.

5.1.1 Model

In Figure 3, the Message Store Abstract-service of MHS is depicted. The User Agent is a MS^{*} Abstract-service user, whereas the Message Store is a MS^{*} Abstract-service provider, offering the services of Retrieval, Submission and Administration to the mUA. The MS^{*} is a MTS Abstract-service user, whereas the Message Transfer System is a MTS Abstract-service provider, offering the services of Delivery, Submission and Administration to the MS^{*}.

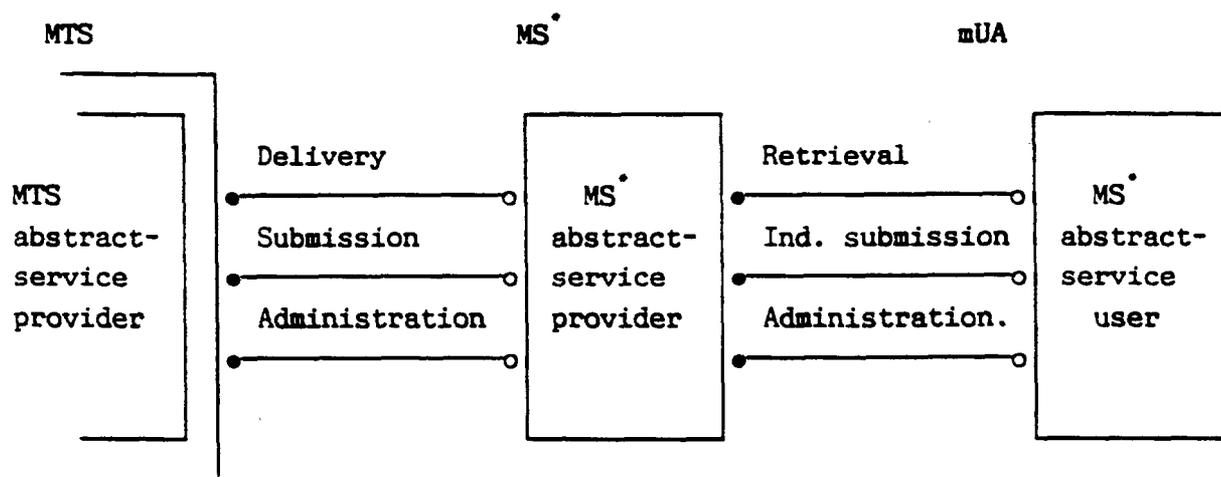


Figure 3 The Message Store Abstract-service of MHS. ('o' denotes consumption of a service, and '•' denotes supply of a service).

The service comprises

the possibility to extract information from MS^{*} (i.e. extract information about the messages residing in the MS^{*}), and the possibility to submit messages to MHS via MS^{*}.

5.1.2 Setting up an abstract-association

The mUA invokes an abstract-bind-operation to get access to the Retrieval, Indirect Submission and Administration services of the MS^{*}. The binding is denoted an abstract-association. The abstract-bind-operation comprises an abstract-bind-argument being sent from the mUA to the MS^{*} and an abstract-bind-result or an abstract-bind-error being returned. The abstract-bind error is used if the abstract-association can not be set up and the

abstract-bind-result if the association is established.

5.1.3 The Abstract Service

If an abstract-association exists between the MS^{*} and the mUA, the mUA is now offered an abstract service consisting of the following abstract service elements when extracting information from the MS^{*}:

- Message Submission Service Element (MSSE)
- Message Retrieval Service Element (MRSE)
- Message Administration Service Element (MASE).

The MSSE and the MASE makes use of the MSSE and the MASE of the MTS abstract service (see section 5.2).

The MRSE is provided by the following abstract operations:

- Summarize: Enables the MS^{*}-user to get summary counts of seleted entries in the MS^{*} information-base.
- List: Enables the MS^{*}-user to search an information-base and to return selected information from selected entries.
- Fetch: Returns selected information from a specific entry in an information-base.
- Delete: Deletes selected entries from an information-base.
- Register-MS: Used to register or de-register information in the MS^{*}.
- Alert: Enables the MS^{*} to instantly inform the MS^{*}-user of a new message arrived at the MS^{*}.

5.1.4 Closing an abstract-association

The abstract-unbind-operation is invoked by the mUA to close the abstract-association.

5.2 MTS Access, X.400 1988

The basic service enables the mUA to communicate directly with the MTA. This service is completely described in CCITT Rec. X.411 (1988) Message Transfer System: Abstract Service Definition and Procedures. The protocol between mUA and MTS is denoted P3 (MTS Access Protocol) and is defined in CCITT Rec. X.419 (1988) MHS Protocol Specifications.

5.2.1 Model

In figure 4 the MTS Abstract-service of MHS is depicted. The mobile User Agent (mUA) is a MTS Abstract Service user, whereas the Message Transfer System is a MTS Abstract-service provider, offering the services of Delivery, Submission and Administration to the mUA.

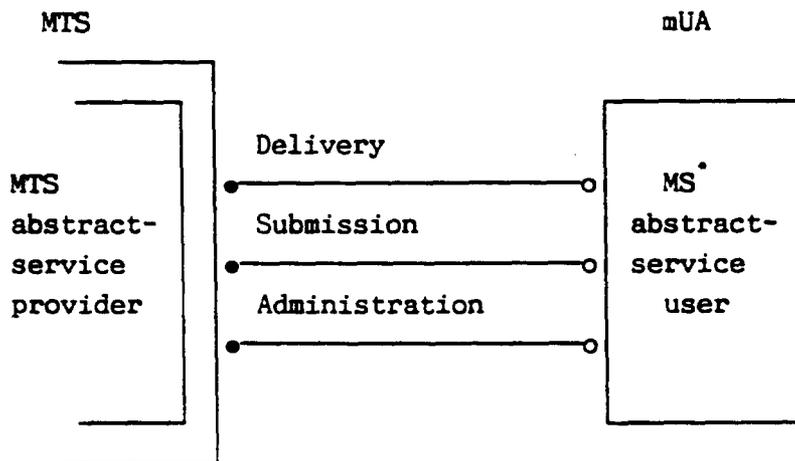


Figure 4: The MTS Abstract-service of MHS. ('o' denotes consumption of service and '•' denotes supply of service.)

5.2.2 The Abstract Service

The MTS or the mUA invokes an abstract-bind-operation to establish an abstract-association between them.

If an abstract-association exists between the MTS and the mUA, the MTS-user is in this case offered the following service elements:

- Message Submission Service Element (MSSE)
- Message Delivery Service Element (MDSE)
- Message Administration Service Element (MASE).

The Service Elements are provided by the following abstract operations:

MSSE: Message-submission: Enables the MTS-user to submit a message.

Probe-submission: Enables the MTS-user to submit a Probe.

Cancel-deferred-delivery:

Enables the MTS-user to abort the deferred delivery of a previously submitted message.

Submission-control: Enables the MTS to limit the abstract operations invoked and messages submitted by the MTS-user.

MDSE: Message-delivery: Enables the MTS to deliver a message to an MTS-user.

Report-delivery: Enables the MTS to acknowledge to the MTS-user one or more previous invocations of the Message-submission or Probe-submission abstract operations.

Delivery-control: Enables the MTS-user to limit the abstract operations invoked and the messages delivered by the MTS.

MASE: Register: Makes long-term changes to various parameters of the MTS-user held by the MTS.

Change-credentials: Enables the MTS-user to change its credentials held by the MTS or the MTS to change its credentials held by the MTS-user.

The P3 protocol is based on the principle that the MTS and the UA are both continuously connected by the network service and that the UA is always operational (not the case for P7). To limit the consequences of a temporary fault either in the network service or in the UA (e.g. unnecessary retransmissions) it is recommended to implement the Hold for Delivery element of service in the UA and MTA. The element of service is described in X.400 1988. Its primary function is to give the UA the ability to request the MTS to keep incoming messages or reports for delivery until a later time.

The abstract-association is closed by the MTS or the mUA by invoking an abstract-unbind-operation.

5.3 MTS Access, X.400 1984

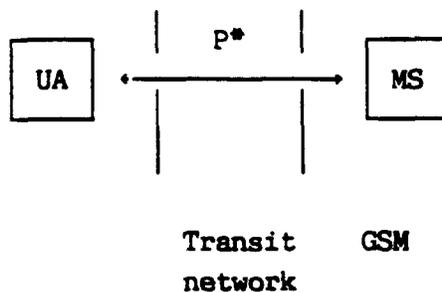
The service offered by the 1984 MTS Access is described in CCITT Rec. X.400 (1984) while the protocol (P3 - Submission and Delivery protocol) used between the UA and MTS is described in CCITT Rec. X.411 (1984). The service is provided by the following operations:

- Register: Allows the UA to make long-term changes to its registration parameters in the MTS.
- Control: Allows the MTS or the UA to temporarily restrict the operations that can be invoked by the other.
- Change Password: Allows the UA or the MTS to change its current password.
- Submit: Allows the UA to request the submission of a message.
- Probe: Enables the UA to submit a Probe.
- Cancel: Enables the UA to request that the MTS stop delivery of a previously submitted deferred delivery message
- Deliver: Enables the MTS to deliver a message to the UA.
- Notify: Provides an indication to the UA from the MTS of successful or unsuccessful delivery of a message.

Abstract-associations between the UA and the MTS are established either by the MTS or by the UA. The operations listed above may only be invoked when an abstract-association has been established.

For the same reasons as indicated in section 5.2.3, the Hold for Delivery service element should be implemented. The service element is described in CCITT Rec. X.400 (1984).

NOTE: MHS can also be accessed via a non-standard, asynchronous character based protocol P*. In this case the UA is not located in the MS. The architecture is as shown below.



6 Advantages and disadvantages of the different ways of accessing MHS

The three ways of accessing MHS described above (MS^{*} Access, MTS Access X.400 1988 and MTS Access X.400 1984) offer the user different levels of feasibility.

The P7 protocol represents a powerful means for the mobile user to inspect, manage and retrieve fractions of his total mail record. Such a mail record may be stored in a device (the MS^{*}) operated and maintained by the MHS operator. He may even be alerted of an incoming message when his UA is not connected to the MS^{*} by an abstract-association (see section 8).

The P3 protocol offers the possibility for the user to attach to the MHS. Together with the Hold for Delivery element of service the MTA will store incoming messages in periods when not attached. However, waiting messages and incoming messages will be transferred to the mobile subscriber in a straight forward fashion, without the means for selective retrieval offered by P7. The storage capacity in the MTA may also be limited.

Without the Hold for Delivery element of service, the MTA will miss also the storing capabilities. When incoming messages arrive at an MTA to a UA which is currently unattached to the MTA, the message will be discarded and a notification will be returned to the originator indicating that the message was never delivered to the recipient.

7 Use of GSM bearer capabilities within the Advanced MHS Access

The only restriction from the X.400 recommendations put upon the network layer is in X.419 1988, where it is assumed an OSI network-service as defined in recommendation X.213.

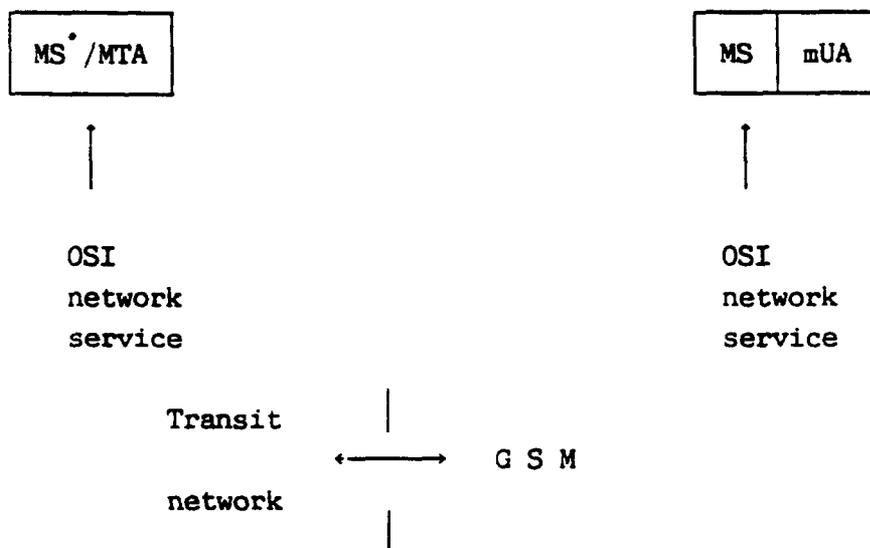


Figure 5: Use of the network service.

The interworking and bearer capabilities required within GSM for Advanced MHS access are described within Rec. GSM 09.01, 09.03, 09.06, 09.07 and 09.09. As stated in Rec. GSM 03.10, the Packet Service, transparent or non-transparent, 2,4 kbit/s, 4,8 kbit/s or 9,6 kbit/s are recommended for the Advanced MHS access. Another possible solution to offer an OSI network-service is to use the 'Circuit mode unstructured with unrestricted digital capability transparent synchronous' bearer service and an OSI link-layer and network-layer on top of it (X.25, ISO 7776/8208 or other).

8 Auto-alert auto-action in MS* using the Short Message Service of GSM

The Auto-alert auto-action is a feature of the MS*, consequently this section only concerns systems based on the 1988 CCITT X.400 recommendations. The Auto-alert feature is independent of whether the MS* is accessed by the UA via GSM or by other means.

8.1 Stored-messages information-base

All delivered messages and reports to the MS^{*} are stored in this information-base as entries. Each entry consists of a set of attributes. Each attribute provides a piece of information about, or derived from, the data to which the entry corresponds. An attribute consists of an attribute-type, which identifies the class of information given by an attribute, and the corresponding attribute value(s), which are particular instances of that class appearing in the entry. Examples of attributes for a delivered message are: Content-type, creation-time, originator-name. The complete list of attributes is given in CCITT Rec. X.413.

8.2 Auto-alert auto-action

The auto-alert auto-action is fully described in the CCITT Rec. X.413. It enables the MS^{*} to automatically alert the user of the arrival of a message at the MS^{*} being destined for this user.

One or more sets of auto-alert parameters are registered in the MS^{*} by the MS^{*}-user by invoking the Register-MS^{*} abstract operation. Each parameter has an auto-alert-registration-identifier. The parameter consists of a criteria (filter) to determine whether it applies to a particular delivered message, zero or more alert-addresses and an indication of which attributes from the selected entries is to be included with the auto-alert. The auto-alert parameter set by the Register-MS^{*} abstract operation is the means for the MS^{*}-user to control the auto-alert auto-action in the MS^{*}.

An alert-address identifies the type of alert (e.g. a short message within the GSM Short Message Service) to be invoked, together with any information required to access the particular instances of those alert services (i.e. addresses), and any further information that needs to be conveyed during those alerts.

Each type of alert must be assigned an object-identifier to ensure that it is distinct from other alert types. The ASN.1 data-type of the auxiliary addressing information must also be defined.

When a new entry is created in the MS^{*} (e.g. when an incoming message arrives), this is matched against the filter of each auto-alert parameter specified. If there is a match, an attempt is made to alert the MS^{*}-user directly over the abstract-association between the MS^{*} and the MS^{*}-user i.e. invoking the Alert abstract operation. If there exists no abstract-association, the alert-addresses of the auto-alert parameter are invoked.

8.3 Auto-alert via the Short Message Service (SMS) defined in GSM

If an alert over the Short Message Service is invoked, the alert message is transferred to the SC. In the alert message is contained the information needed by the SC to reach the MS (MS-address) and also the requested attributes from the MS. The MS is then alerted from the SC via a message on the SMS.

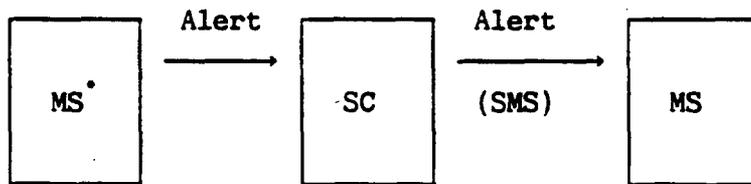


Figure 6: The Auto-alert via SMS.

The address needed by the MS to reach the MS over the SMS is the E.164 ISDN number. The ASN.1 data-type of this address (MS-address) and the Object Identifier (id-AutAl) for the auto-alert over the SMS are given in the formal ASN.1 description below.

```
SMS-Auto-Alert-UsefulDefinitions {iso identified-organization cept(12)
    gsm(0) sms(5) id-mod(1)
    auto-Alert-usefulDefinitions(3)}
```

```
DEFINITIONS ::=
```

```
    IMPLICIT TAGS
```

```
BEGIN
```

```
EXPORTS MSAddress, id-AutAl;
```

```
IMPORTS gsm FROM GSM-usful-definitions
    {iso identified-organization cept(12) gsm(0)
    management(0) notation(6) gsm-useful-definitons(0)}
```

```
ID ::= OBJECT IDENTIFIER
```

```
    - - root for all sms allocations
```

```
    sms ID ::= {gsm sms(5)}
```

```
    - - new category
```

```
    id-AutAl ID ::= {sms 7}
```

```
    - - upper bound setting
```

```
    ub-E164-length INTEGER ::= 15
```

```
    - - address definition
```

```
    MSAddress ::= E164Address
```

```
    E164Address ::= NumericString (SIZE(0..ub-E164-length))
```

```
END
```


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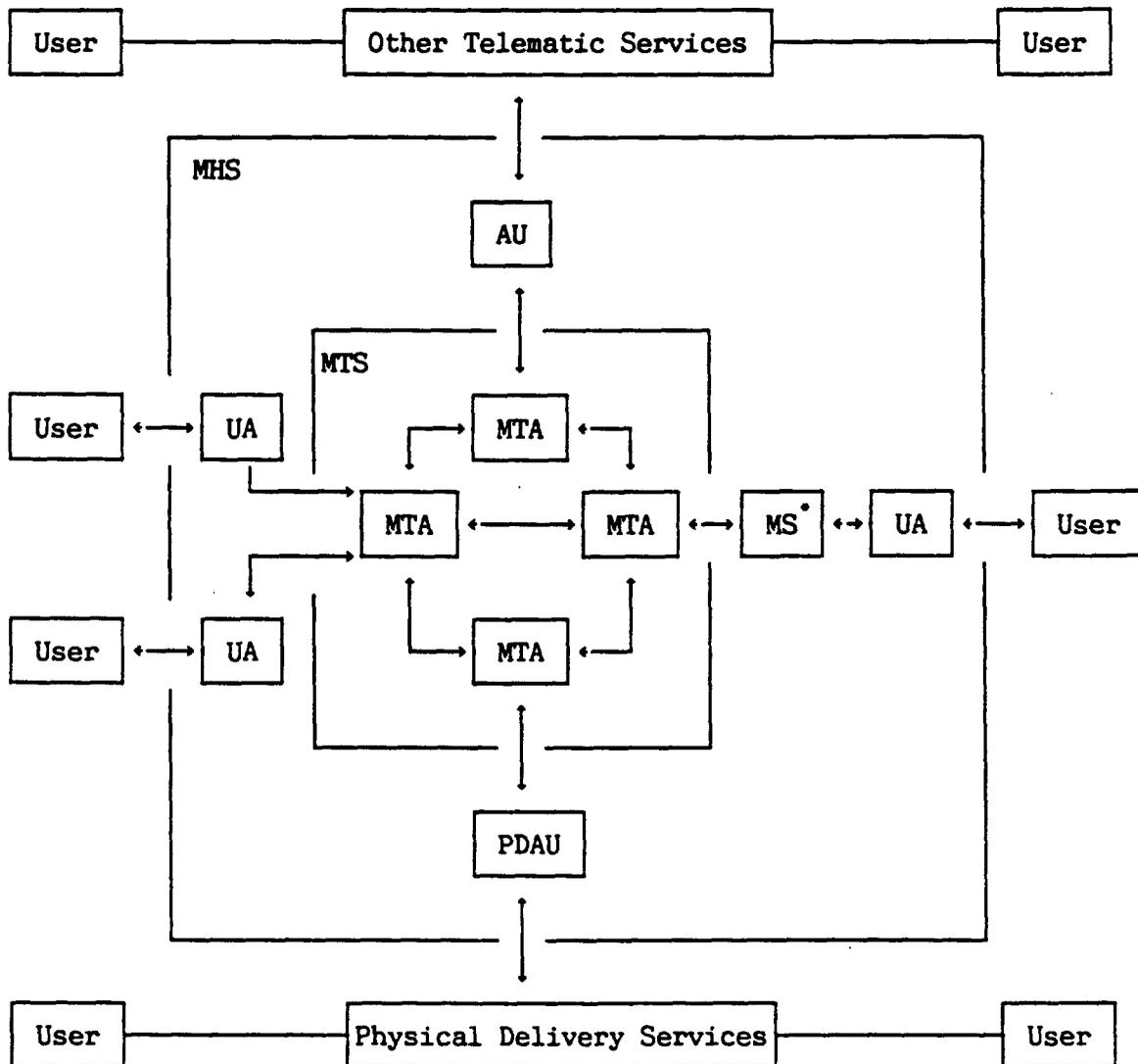


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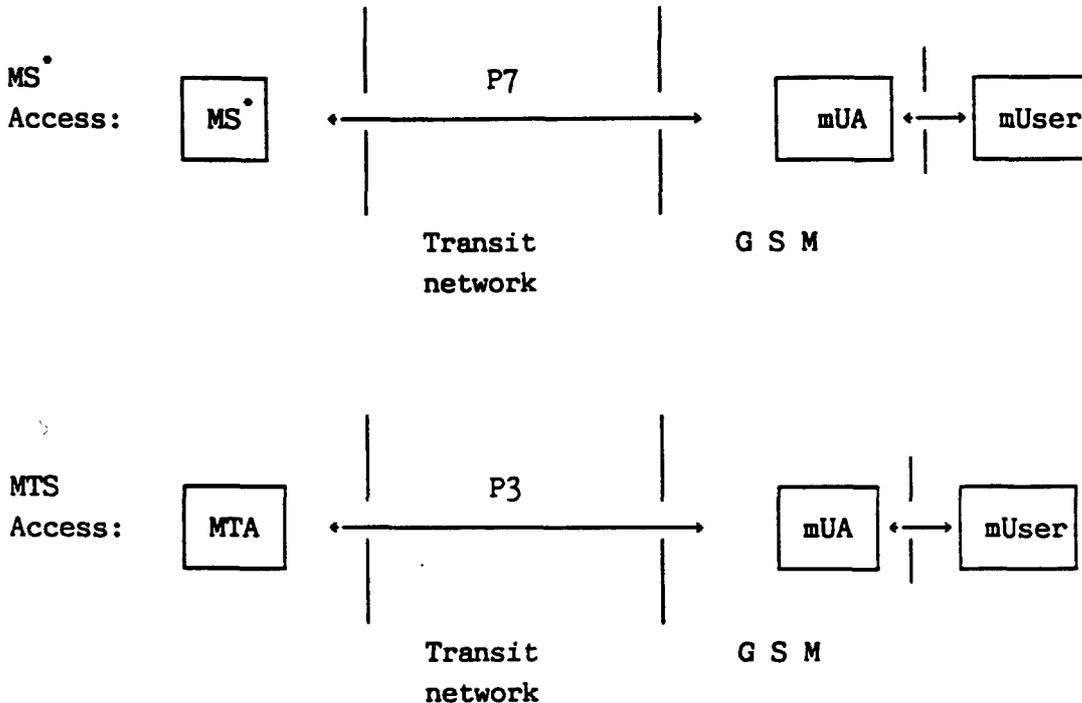


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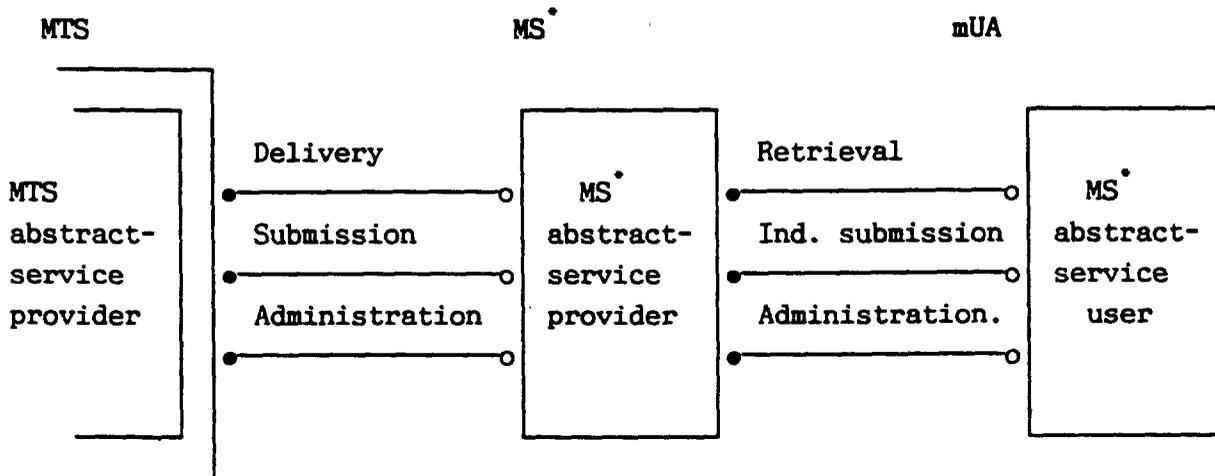


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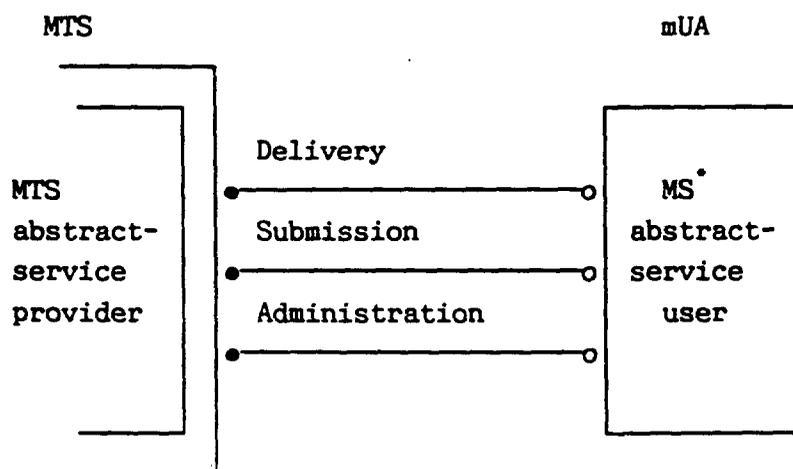


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Delivery-control: Enables the MTS-user to limit the abstract operations invoked and the messages delivered by the MTS.

MASE: Register: Makes long-term changes to various parameters of the MTS-user held by the MTS.

Change-credentials: Enables the MTS-user to change its credentials held by the MTS or the MTS to change its credentials held by the MTS-user.

The P3 protocol is based on the principle that the MTS and the UA are both continuously connected by the network service and that the UA is always operational (not the case for P7). To limit the consequences of a temporary fault either in the network service or in the UA (e.g. unnecessary retransmissions) it is recommended to implement the Hold for Delivery element of service in the UA and MTA. The element of service is described in X.400 1988. Its primary function is to give the UA the ability to request the MTS to keep incoming messages or reports for delivery until a later time.

The abstract-association is closed by the MTS or the mUA by invoking an abstract-unbind-operation.

5.3 MTS Access, X.400 1984

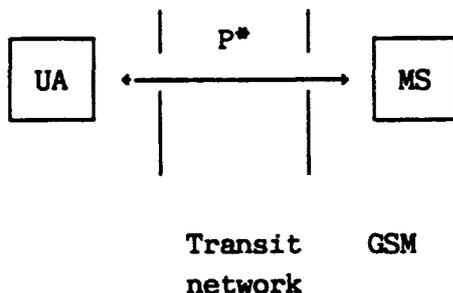
The service offered by the 1984 MTS Access is described in CCITT Rec. X.400 (1984) while the protocol (P3 - Submission and Delivery protocol) used between the UA and MTS is described in CCITT Rec. X.411 (1984). The service is provided by the following operations:

- Register: Allows the UA to make long-term changes to its registration parameters in the MTS.
- Control: Allows the MTS or the UA to temporarily restrict the operations that can be invoked by the other.
- Change Password: Allows the UA or the MTS to change its current password.
- Submit: Allows the UA to request the submission of a message.
- Probe: Enables the UA to submit a Probe.
- Cancel: Enables the UA to request that the MTS stop delivery of a previously submitted deferred delivery message
- Deliver: Enables the MTS to deliver a message to the UA.
- Notify: Provides an indication to the UA from the MTS of successful or unsuccessful delivery of a message.

Abstract-associations between the UA and the MTS are established either by the MTS or by the UA. The operations listed above may only be invoked when an abstract-association has been established.

For the same reasons as indicated in section 5.2.3, the Hold for Delivery service element should be implemented. The service element is described in CCITT Rec. X.400 (1984).

NOTE: MHS can also be accessed via a non-standard, asynchronous character based protocol P*. In this case the UA is not located in the MS. The architecture is as shown below.



6 Advantages and disadvantages of the different ways of accessing MHS

The three ways of accessing MHS described above (MS^{*} Access, MTS Access X.400 1988 and MTS Access X.400 1984) offer the user different levels of feasibility.

The P7 protocol represents a powerful means for the mobile user to inspect, manage and retrieve fractions of his total mail record. Such a mail record may be stored in a device (the MS^{*}) operated and maintained by the MHS operator. He may even be alerted of an incoming message when his UA is not connected to the MS^{*} by an abstract-association (see section 8).

The P3 protocol offers the possibility for the user to attach to the MHS. Together with the Hold for Delivery element of service the MTA will store incoming messages in periods when not attached. However, waiting messages and incoming messages will be transferred to the mobile subscriber in a straight forward fashion, without the means for selective retrieval offered by P7. The storage capacity in the MTA may also be limited.

Without the Hold for Delivery element of service, the MTA will miss also the storing capabilities. When incoming messages arrive at an MTA to a UA which is currently unattached to the MTA, the message will be discarded and a notification will be returned to the originator indicating that the message was never delivered to the recipient.

7 Use of GSM bearer capabilities within the Advanced MHS Access

The only restriction from the X.400 recommendations put upon the network layer is in X.419 1988, where it is assumed an OSI network-service as defined in recommendation X.213.

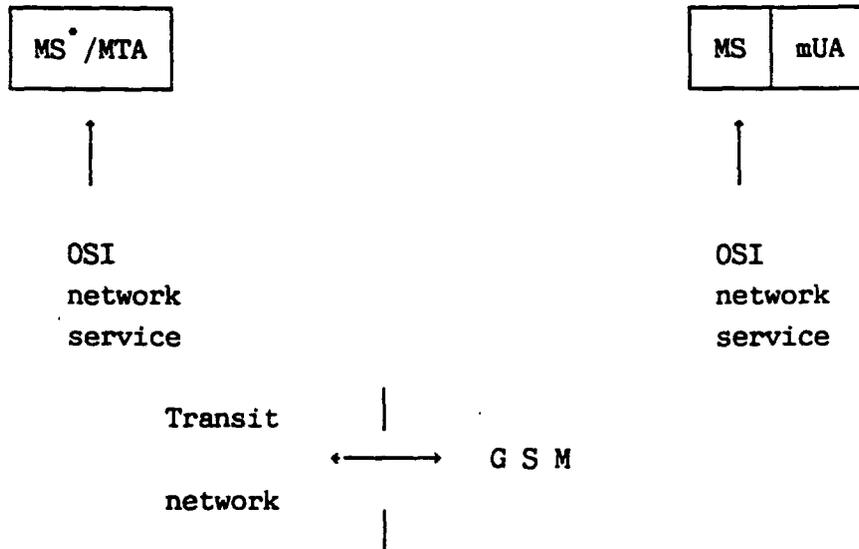


Figure 5: Use of the network service.

The interworking and bearer capabilities required within GSM for Advanced MHS access are described within Rec. GSM 09.01, 09.03, 09.06, 09.07 and 09.09. As stated in Rec. GSM 03.10, the Packet Service, transparent or non-transparent, 2,4 kbit/s, 4,8 kbit/s or 9,6 kbit/s are recommended for the Advanced MHS access. Another possible solution to offer an OSI network-service is to use the 'Circuit mode unstructured with unrestricted digital capability transparent synchronous' bearer service and an OSI link-layer and network-layer on top of it (X.25, ISO 7776/8208 or other).

8 Auto-alert auto-action in MS* using the Short Message Service of GSM

The Auto-alert auto-action is a feature of the MS*, consequently this section only concerns systems based on the 1988 CCITT X.400 recommendations. The Auto-alert feature is independent of whether the MS* is accessed by the UA via GSM or by other means.

8.1 Stored-messages information-base

All delivered messages and reports to the MS^{*} are stored in this information-base as entries. Each entry consists of a set of attributes. Each attribute provides a piece of information about, or derived from, the data to which the entry corresponds. An attribute consists of an attribute-type, which identifies the class of information given by an attribute, and the corresponding attribute value(s), which are particular instances of that class appearing in the entry. Examples of attributes for a delivered message are: Content-type, creation-time, originator-name. The complete list of attributes is given in CCITT Rec. X.413.

8.2 Auto-alert auto-action

The auto-alert auto-action is fully described in the CCITT Rec. X.413. It enables the MS^{*} to automatically alert the user of the arrival of a message at the MS^{*} being destined for this user.

One or more sets of auto-alert parameters are registered in the MS^{*} by the MS^{*}-user by invoking the Register-MS^{*} abstract operation. Each parameter has an auto-alert-registration-identifier. The parameter consists of a criteria (filter) to determine whether it applies to a particular delivered message, zero or more alert-addresses and an indication of which attributes from the selected entries is to be included with the auto-alert. The auto-alert parameter set by the Register-MS^{*} abstract operation is the means for the MS^{*}-user to control the auto-alert auto-action in the MS^{*}.

An alert-address identifies the type of alert (e.g. a short message within the GSM Short Message Service) to be invoked, together with any information required to access the particular instances of those alert services (i.e. addresses), and any further information that needs to be conveyed during those alerts.

Each type of alert must be assigned an object-identifier to ensure that it is distinct from other alert types. The ASN.1 data-type of the auxiliary addressing information must also be defined.

When a new entry is created in the MS^{*} (e.g. when an incoming message arrives), this is matched against the filter of each auto-alert parameter specified. If there is a match, an attempt is made to alert the MS^{*}-user directly over the abstract-association between the MS^{*} and the MS^{*}-user i.e. invoking the Alert abstract operation. If there exists no abstract-association, the alert-addresses of the auto-alert parameter are invoked.

8.3 Auto-alert via the Short Message Service (SMS) defined in GSM

If an alert over the Short Message Service is invoked, the alert message is transferred to the SC. In the alert message is contained the information needed by the SC to reach the MS (MS-address) and also the requested attributes from the MS^{*}. The MS is then alerted from the SC via a message on the SMS.

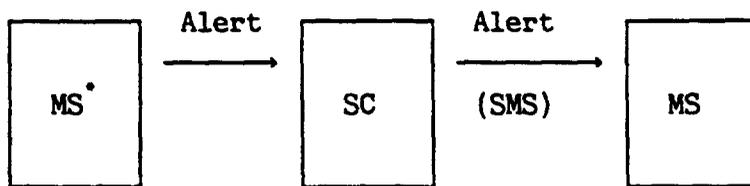


Figure 6: The Auto-alert via SMS.

The address needed by the MS^{*} to reach the MS over the SMS is the E.164 ISDN number. The ASN.1 data-type of this address (MS-address) and the Object Identifier (id-AutAl) for the auto-alert over the SMS are given in the formal ASN.1 description below.

```
SMS-Auto-Alert-UsefulDefinitions {iso identified-organization cept(12)
                                gsm(0) sms(5) id-mod(1)
                                auto-Alert-usefulDefinitions(3)}
```

```
DEFINITIONS ::=
```

```
    IMPLICIT TAGS
```

```
BEGIN
```

```
    EXPORTS MSAddress, id-AutAl;
```

```
    IMPORTS gsm FROM GSM-usful-definitions
            {iso identified-organization cept(12) gsm(0)
            management(0) notation(6) gsm-useful-definitons(0)}
```

```
    ID ::= OBJECT IDENTIFIER
```

```
    - - root for all sms allocations
```

```
    sms ID ::= {gsm sms(5)}
```

```
    - - new category
```

```
    id-AutAl ID ::= {sms 7}
```

```
    - - upper bound setting
```

```
    ub-E164-length INTEGER ::= 15
```

```
    - - address definition
```

```
    MSAddress ::= E164Address
```

```
    E164Address ::= NumericString (SIZE(0..ub-E164-length))
```

```
END
```

