INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.450.7

(05/99)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Supplementary services for multimedia

Message waiting indication supplementary service for H.323

ITU-T Recommendation H.450.7

(Previously CCITT Recommendation)

ITU-T H-SERIES RECOMMENDATIONS

AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Characteristics of transmission channels used for other than telephone purposes	H.10–H.19
Use of telephone-type circuits for voice-frequency telegraphy	H.20–H.29
Telephone circuits or cables used for various types of telegraph transmission or simultaneous transmission	H.30–H.39
Telephone-type circuits used for facsimile telegraphy	H.40–H.49
Characteristics of data signals	H.50–H.99
CHARACTERISTICS OF VISUAL TELEPHONE SYSTEMS	H.100–H.199
INFRASTRUCTURE OF AUDIOVISUAL SERVICES	
General	H.200–H.219
Transmission multiplexing and synchronization	H.220–H.229
Systems aspects	H.230–H.239
Communication procedures	H.240–H.259
Coding of moving video	H.260–H.279
Related systems aspects	H.280–H.299
Systems and terminal equipment for audiovisual services	H.300–H.399
Supplementary services for multimedia	**H.450–H.499**

For further details, please refer to ITU-T List of Recommendations.

ITU-T RECOMMENDATION H.450.7

MESSAGE WAITING INDICATION SUPPLEMENTARY SERVICE FOR H.323

Summary

This Recommendation proposes the procedures and signalling protocol for the Message Waiting Indication supplementary service (SS-MWI) in H.323 (Packet Based Multimedia Communications Systems) networks.

SS-MWI is a supplementary service that enables a Served User A to be sent a Message Waiting Indication and also enables this Message Waiting Indication to be cancelled. The Served User may also be permitted to interrogate a Message Centre for any Message Waiting Indications.

The procedures and the signalling protocol of this Recommendation are derived from the Message Waiting Indication supplementary service as specified in ISO/IEC 15505 and ISO/IEC 15506.

This Recommendation makes use of the "Generic functional protocol for the support of supplementary services in H.323" as defined in Recommendation H.450.1.

Source

ITU-T Recommendation H.450.7 was prepared by ITU-T Study Group 16 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 27 May 1999.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation the term *recognized operating agency (ROA)* includes any individual, company, corporation or governmental organization that operates a public correspondence service. The terms *Administration*, *ROA* and *public correspondence* are defined in the *Constitution of the ITU (Geneva, 1992)*.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Page

Recommendation H.450.7

MESSAGE WAITING INDICATION SUPPLEMENTARY SERVICE FOR H.323

(Geneva, 1999)

1 Scope

This Recommendation describes the Message Waiting Indication supplementary service (SS-MWI), which is applicable to H.323 Multimedia Endpoints. SS-MWI is based on the equivalent supplementary service for Private Integrated Services Network (PISN) as specified in ISO/IEC 15505 and ISO/IEC 15506.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

– ITU-T Recommendation H.225.0 (1998), *Call signalling protocols and media stream packetization for packet-based multimedia communication systems.*

– ITU-T Recommendation H.235 (1998), *Security and Encryption for H-Series (H.323 and other H.245-based) multimedia terminals*.

– ITU-T Recommendation H.245 (1998), *Control protocol for multimedia communication*.

– ITU-T Recommendation H.323 (1998), *Packet-based multimedia communications systems*.

– ITU-T Recommendation H.450.1 (1998), *Generic functional protocol for the support of supplementary services in H.323*.

– ISO/IEC 15505:1997, *Information technology, Telecommunications and information exchange between systems – Private Integrated Services Network (PISN) – Specification, functional model and information flows – Message waiting indication supplementary service*.

– ISO/IEC 15506:1997, *Information technology, Telecommunications and information exchange between systems – Private Integrated Services Network (PISN) – Inter-exchange signalling protocol – Message waiting indication supplementary service.*

3 Terms and definitions

This Recommendation defines the following terms:

3.1 Message Centre: The entity that requests activation or deactivation of the Message Waiting Indication.

When a callback request is issued using the mechanism provided by MWI, the originating user acts as a Message Centre.

3.2 Message Centre endpoint: The endpoint that handles the H.323 signalling on behalf of the Message Centre. For example, this may be the Message Centre itself if it is directly attached to the H.323 network, it may be the originating user's endpoint, or it may be a Gateway.

3.3 Message Waiting Indication: An indication to the Served User when messages are waiting for the Served User.

3.4 Served User: The user to whom the Message Waiting Indication is sent when initiated by the Message Centre.

NOTE – The indication may be a lamp, special tone, display etc. This is outside the scope of this Recommendation.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

APDU Application Protocol Data Unit

ASN.1 Abstract Syntax Notation One

GK Gatekeeper

MWI Message Waiting Indication

NFE Network Facility Extension

SDL Specification and Description Language

UTC Coordinated Universal Time (also known as Greenwich Mean Time)

5 Introduction

The Message Waiting Indication supplementary service provides a general purpose mechanism by which a user can be advised that messages intended for that user are available. A variety of message types are supported, such as voice mail, fax and teletex.

In one of its simplest forms, when a message is left for a user, a Message Centre sends a notification to the Served User, where a Message Waiting lamp is lit.

Additional information provided by the notification mechanism allows the Served User to know the number of messages that are waiting, the types of messages, the subjects of the messages, and the priority of the highest priority message.

In an H.323 environment, where endpoints may commonly be directly associated with general purpose computers, applications such as automated message retrieval may be envisioned.

SS-MWI also provides a mechanism whereby it is possible for an endpoint to issue a callback request to the Served User.

The interrogation mechanism provided by SS-MWI allows a Served User to query Message Centres known to it, or a known Gatekeeper/proxy for the MWI activations currently applied to it. A typical usage of this mechanism is by a Served User to recreate its MWI status when the endpoint is returned to service, as the status may have changed while it was out of service.

6 SS-MWI service description

6.1 Description

SS-MWI enables a Served User to be sent a Message Waiting Indication and also enables this Message Waiting Indication to be cancelled. A Message Waiting Indication activation may also be used to send a callback request to the Served User.

This service also includes an option to interrogate the Message Waiting Indication stored against the Served User.

A Served User can receive separate MWIs for each of the basic services for which there is a message waiting.

NOTE – A basic service for which there is a message waiting would usually be the basic service used to retrieve that message.

6.2 Normal procedures

6.2.1 Activation, deactivation and interrogation

To activate SS-MWI, the Message Centre shall supply the endpoint address and the basic service for which there is a message waiting and may, as an implementation option, add any combination of the following pieces of information: the identity of the Message Centre; the number of messages waiting for the Served User for that basic service; the address of the user that left a message; the time when a message was left; and the priority of the highest priority message waiting for that basic service. After activation, SS-MWI may be activated again whenever the number of waiting messages for a specific basic service changes.

It is also possible to use SS-MWI activation to request that the Served User initiate a call (callback) to a specified endpoint.

To deactivate SS-MWI, the Message Centre shall supply the endpoint address and the basic service for which there is no longer any messages waiting.

As a result of activation, a MWI shall be sent to the Served User. The MWI may include information on the messages waiting, if provided by the Message Centre. As a result of deactivation, the MWI at the Served User, for the basic service concerned, shall be cancelled.

When the Message Centre activates or deactivates SS-MWI at the Served User, it shall be provided with an indication of acceptance.

When the Served User interrogates SS-MWI for a particular basic service, the Message Centre shall provide the Served User with an indication of whether SS-MWI is activated for that basic service and may add, as an implementation option, any of the following information:

– the identity of the Message Centre;
– the number of messages waiting;
– the address of the user that left a message;
– the time when a message was left;
– the priority of the highest priority message waiting.

When the Served User interrogates SS-MWI for all basic services, the Message Centre shall provide the Served User with a list of basic services for which SS-MWI is active and, as an implementation option, for each basic service, any of the additional information listed above.

6.2.2 Invocation and operation

Not applicable.

6.3 Exceptional procedures

6.3.1 Activation, deactivation and interrogation

If the Served User cannot accept SS-MWI activation or deactivation, then the Message Centre shall be informed and may also be given the reason. If the Message Centre cannot accept interrogation, then the Served User shall be informed and may also be given a reason.

6.3.2 Invocation and operation

None.

7 Signalling protocol for the support of SS-MWI

7.1 SS-MWI coding requirements

7.1.1 H.450.1 Supplementary Service APDU

The APDUs of Message Waiting Indication operations are transported within User-to-User information elements in call control and FACILITY messages as defined in Recommendation H.450.1. The Message Waiting Indication operations are described in 7.1.2, Operations.

When conveying the Invoke APDU of the operations defined in 7.1.2, Operations, the destinationEntity data element of the NFE shall contain the value "endpoint".

When conveying the Invoke APDU of operations mwiActivate, mwiDeactivate, and mwiInterrogate, the interpretation APDU shall be omitted. This is implicitly equivalent to specifying an interpretation APDU of rejectAnyUnrecognizedInvokePDU.

7.1.2 Operations

The following operations defined in Abstract Syntax Notation One shall apply:

```
Message-Waiting-Indication-Operations
{itu-t recommendation h 450 7 version1(0) message-waiting-operations(0)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS         OPERATION, ERROR FROM Remote-Operations-Information-Objects
                    {joint-iso-itu-t remote-operations(4) informationObjects(5) version1(0)}
                EXTENSION, Extension{} FROM Manufacturer-specific-service-extension-definition
                    {itu-t recommendation h 450 1 version1(0) msi-definition(18)}

                userNotSubscribed, invalidServedUserNumber, basicServiceNotProvided
                    FROM H4501-General-Error-List
                    {itu-t recommendation h 450 1 version1(0) general-error-list(1)}

                EndpointAddress FROM Addressing-Data-Elements
                    {itu-t recommendation h 450 1 version1(0) addressing-data-elements(9)}

                MixedExtension FROM Call-Hold-Operations
                    {itu-t recommendation h 450 4 version1(0) call-hold-operations(0)};

H323-MWI-Operations   OPERATION     ::=   {mwiActivate | mwiDeactivate | mwiInterrogate }

mwiActivate           OPERATION     ::=
                        {
                        ARGUMENT      MWIActivateArg
                        RESULT        DummyRes
                        ERRORS        {     userNotSubscribed | invalidServedUserNumber |
                                            basicServiceNotProvided | undefined }
                        CODE          local: 80
                        }
```

```
mwiDeactivate       OPERATION       ::=
                        {
                        ARGUMENT        MWIDeactivateArg
                        RESULT          DummyRes
                        ERRORS          {       userNotSubscribed | invalidServedUserNumber |
                                                basicServiceNotProvided | undefined }
                        CODE            local: 81
                        }

mwiInterrogate      OPERATION       ::=
                        {
                        ARGUMENT        MWIInterrogateArg
                        RESULT          MWIInterrogateRes
                        ERRORS          {       userNotSubscribed | invalidServedUserNumber |
                                                notActivated | invalidMsgCentreId | undefined}
                        CODE            local: 82
                        }

MWIActivateArg      ::=     SEQUENCE
                        {
                        servedUserNr        EndpointAddress,
                        basicService        BasicService,
                        msgCentreId         MsgCentreId OPTIONAL,
                        nbOfMessages        NbOfMessages OPTIONAL,
                        originatingNr       EndpointAddress OPTIONAL,
                        timestamp           TimeStamp OPTIONAL,
                        priority            INTEGER (0..9) OPTIONAL,
                        -- the value 0 means the highest priority and 9 the lowest
                        extensionArgSEQUENCE SIZE(0..255) OF MixedExtension OPTIONAL,
                        ...
                        }

DummyRes            ::=     SEQUENCE SIZE(0..255) OF MixedExtension

MWIDeactivateArg    ::=     SEQUENCE
                        {
                        servedUserNr        EndpointAddress,
                        basicService        BasicService,
                        msgCentreId         MsgCentreId OPTIONAL,
                        callbackReq         BOOLEAN OPTIONAL,
                        extensionArgSEQUENCE SIZE(0..255) OF MixedExtension OPTIONAL,
                        ...
                        }

MWIInterrogateArg   ::=     SEQUENCE
                        {
                        servedUserNr        EndpointAddress,
                        basicService        BasicService,
                        msgCentreId         MsgCentreId OPTIONAL,
                        callbackReq         BOOLEAN OPTIONAL,
                        extensionArgSEQUENCE SIZE(0..255) OF MixedExtension OPTIONAL,
                        ...
                        }

MWIInterrogateRes   ::=     SEQUENCE SIZE(1..64) OF MWIInterrogateResElt

MWIInterrogateResElt ::=    SEQUENCE
                        {
                        basicService        BasicService,
                        msgCentreId         MsgCentreId OPTIONAL,
                        nbOfMessages        NbOfMessages OPTIONAL,
                        originatingNr       EndpointAddress OPTIONAL,
```

```
                    timestamp           TimeStamp OPTIONAL,
                    priority            INTEGER (0..9) OPTIONAL,
                    -- the value 0 means the highest priority and 9 the lowest
                    extensionArgSEQUENCE SIZE(0..255) OF MixedExtension OPTIONAL,
                    ...
                    }

MsgCentreId         ::=     CHOICE
                    {
                    -- only partyNumber provides a callable identification
                    integer             INTEGER (0..65535),
                    partyNumber         EndpointAddress,
                    numericString       NumericString (SIZE (1..10))
                    }

NbOfMessages        ::=     INTEGER (0..65535)

TimeStamp           ::=     GeneralizedTime (SIZE (12..19))
                    -- a VisibleString representation of date and time following ISO 8601
                    -- containing:
                    --      – the (local) date in 8 digits (YYYYMMDD),
                    --      – followed by (local) time of day in 4 or 6 digits [HHMM(SS)],
                    --      – optionally followed by the letter "Z" or by a local time differential
                    --        from UTC time in 5 digits ("+"HHMM or "-"HHMM);
                    -- Examples:
                    --      1) 19970621194530, meaning 21 June 1997, 19:45:30;
                    --      2) 19970621194530Z, meaning the same as 1);
                    --      3) 19970621194530-0500, meaning the same as 1),
                    --              5 hours retarded in relation to UTC time

undefined           ERROR   ::=
                    {
                    PARAMETER           SEQUENCE SIZE(0..255) OF MixedExtension
                                        OPTIONAL TRUE
                    CODE                local: 2002
                    }

invalidMsgCentreId  ERROR   ::=
                    {       -- returned by a Message Centre endpoint when an unknown Message
                            -- Centre Identifier is specified in a mwiInterrogate invoke
                    CODE                local: 1018
                    }

BasicService        ::=     ENUMERATED
                    {
                    -- MWI Services:
                    --      for compatibility among vendors, speech is recommended for voice mail
                    --      indications
                    allServices                         (0),
                    speech                              (1),
                    unrestrictedDigitalInformation      (2),
                    audio3100Hz                         (3),
                    telephony                           (32),
                    teletex                             (33),
                    telefaxGroup4Class1                 (34),
                    videotexSyntaxBased                 (35),
                    videotelephony                      (36),
                    telefaxGroup2-3                     (37),
                    reservedNotUsed1                    (38),
                    reservedNotUsed2                    (39),
                    reservedNotUsed3                    (40),
                    reservedNotUsed4                    (41),
                    reservedNotUsed5                    (42),
```

```
                    --
                    -- MWI Service Classes:
                    email                       (51),
                    video                       (52),
                    fileTransfer                (53),
                    shortMessageService         (54),
                    speechAndVideo              (55),
                    speechAndFax                (56),
                    speechAndEmail              (57),
                    videoAndFax                 (58),
                    videoAndEmail               (59),
                    faxAndEmail                 (60),
                    speechVideoAndFax           (61),
                    speechVideoAndEmail         (62),
                    speechFaxAndEmail           (63),
                    videoFaxAndEmail            (64),
                    speechVideoFaxAndEmail      (65),
                    multimediaUnknown           (66),
                    serviceUnknown              (67),
                    --
                    -- Reserved for future additions:
                    futureReserve1              (68),
                    futureReserve2              (69),
                    futureReserve3              (70),
                    futureReserve4              (71),
                    futureReserve5              (72),
                    futureReserve6              (73),
                    futureReserve7              (74),
                    futureReserve8              (75)
                    }

notActivated        ERROR       ::=
                    {
                    CODE                local: 31
                    }

END -- of Message-Waiting-Indication-Operations
```

7.2 SS-MWI state definitions

7.2.1 States at the Message Centre endpoint

The procedures for the Message Centre endpoint are written in terms of the following conceptual states existing within the SS-MWI Supplementary Service Control entity in that endpoint in association with an activation or deactivation request from the Message Centre entity.

7.2.1.1 State MWI-MC-Idle

Activation/deactivation is not in progress. The Message Centre endpoint is ready for receipt of a **mwiInterrogate** Invoke APDU.

7.2.1.2 State MWI-MC-Wait

A **mwiActivate** or **mwiDeactivate** Invoke APDU has been sent. The Message Centre endpoint is waiting for a response.

7.2.2 States at the Served User

The procedures for the Served User are written in terms of the following conceptual states existing within the SS-MWI Supplementary Service Control entity in that endpoint in association with a particular call-independent signalling connection for the Served User.

7.2.2.1 State MWI-Ser-Idle

The Served User is ready for receipt of a **mwiActivate** or **mwiDeactivate** Invoke APDU.

7.2.2.2 State MWI-Ser-Wait

A **mwiInterrogate** Invoke APDU has been sent. The Served User is waiting for a response.

7.3 Timers

7.3.1 Timer T1

Timer T1 shall operate at the Message Centre endpoint during state MWI-MC-Wait. Its purpose is to protect against an absence of a response to the **mwiActivate** or **mwiDeactivate** Invoke APDU.

Timer T1 shall have a value not less than 15 seconds.

7.3.2 Timer T2

Timer T2 shall operate at the Served User during state MWI-Ser-Wait. Its purpose is to protect against an absence of a response to the **mwiInterrogate** Invoke APDU.

Timer T2 shall have a value not less than 15 seconds.

7.4 SS-MWI Signalling procedures

The SDL representation of procedures at the Message Centre endpoint is shown in 9.1.

The SDL representation of procedures at the Served User is shown in 9.2.

7.4.1 Activation/deactivation

7.4.1.1 Actions at the Message Centre Endpoint

7.4.1.1.1 Normal procedures

On receipt of an activation/deactivation request from the Message Centre entity, the Message Centre endpoint shall send a **mwiActivate**/**mwiDeactivate** Invoke APDU to the Served User in a SETUP message of a new call-independent signalling connection or in a FACILITY message of an already established call independent signalling connection. If a new call-independent signalling connection is initiated, it shall be the established in accordance with the procedures specified in 6.2/H.450.1. Upon sending of the **mwiActivate**/**mwiDeactivate** Invoke APDU, the Message Centre endpoint shall start timer T1 and enter the MWI-MC-Wait state. The **mwiActivate**/**mwiDeactivate** Invoke APDU shall contain the endpoint address of the Served User and the basic service for which the activation/deactivation applies.

A Message Centre may combine several **mwiActivate** Invoke APDUs and/or **mwiDeactivate** Invoke APDUs in a single H.450.1 Supplementary Service APDU.

The Message Centre endpoint may optionally include in the **mwiActivate** Invoke APDU any of the following information:

– an identifier of the Message Centre, in the element msgCentreId;
– the number of messages for the Served User in the element nbOfMessages;
– the endpoint address of the user that has left a message in the element originatingNr;
– the time when a message was left in the element timestamp;
– the priority of the highest priority message for the Served User in the element priority.

If a **mwiActivate** Invoke APDU is being used to signal a callback request to the Served User, then the nbOfMessages element shall be set to zero and the msgCentreId element shall be set to the Endpoint Address destination for the callback.

In state MWI-MC-Wait, on receipt of a **mwiActivate** or **mwiDeactivate** Return Result APDU, the Message Centre endpoint shall stop timer T1 and enter state MWI-MC-Idle.

NOTE – The Message Centre endpoint should indicate acceptance to the Message Centre entity.

The Message Centre endpoint is responsible for clearing the call-independent signalling connection towards the Served User. This may occur on receipt of a **mwiActivate** or **mwiDeactivate** Return Result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

7.4.1.1.2 Exceptional procedures

In the state MWI-MC-Wait, on receipt of a **mwiActivate**/**mwiDeactivate** Return Error APDU from the Served User, the Message Centre endpoint shall stop timer T1 and enter state MWI-MC-Idle.

If timer T1 expires, the Message Centre endpoint shall enter state MWI-MC-Idle.

NOTE – The Message Centre endpoint should indicate rejection to the Message Centre entity.

7.4.1.2 Actions at the Served User

7.4.1.2.1 Normal procedures

On receipt of a **mwiActivate**/**mwiDeactivate** Invoke APDU using the transfer mode of a call-independent signalling connection (as specified in 7.2/H.450.1) and if activation/deactivation is possible, the Served User shall activate/deactivate SS-MWI and send back a **mwiActivate**/**mwiDeactivate** Return Result APDU to the Message Centre endpoint and remain in MWI-Ser-Idle state.

NOTE – The Served User shall consider an **mwiActivate** Invoke APDU with the nbOfMessages element equal to zero as a request to callback the endpoint specified by the msgCentreId element.

When used for callback, the basic service specified in the activation would usually be the basic service used for the resultant call. For H.323, this would normally be allServices(0) which allows media stream properties to be determined using H.245.

If the optional callbackReq element is not present in the **mwiDeactivate** Invoke APDU, the Served User shall deactivate all matching SS-MWI activations. If the callbackReq element is present, only matching SS-MWI activations for callbacks shall be deactivated if the callbackReq value is TRUE, and only matching SS-MWI activations which are not for callbacks shall be deactivated if the callbackReq value is FALSE.

7.4.1.2.2 Exceptional procedures

On receipt of a **mwiActivate**/**mwiDeactivate** Invoke APDU and if the activation/deactivation request cannot be accepted, the Served User shall send a **mwiActivate**/**mwiDeactivate** Return Error APDU with an appropriate error value or a Reject APDU and remain in state MWI-Ser-Idle.

7.4.2 Interrogation

7.4.2.1 Actions at the Message Centre Endpoint

7.4.2.1.1 Normal procedures

In state MWI-MC-Idle, on receipt of a **mwiInterrogate** Invoke APDU using the transfer mode of a call-independent signalling connection (as specified in 7.2/H.450.1) and if the interrogation is possible and the Message Centre identifier, if received, is correct, the Message Centre endpoint shall get the status of SS-MWI, send back a **mwiInterrogate** Return Result APDU to the Served User and

stay in state MWI-MC-Idle. The information that may be included in the Return Result APDU is analogous to the information sent in the **mwiActivate** Invoke APDU as described in 7.4.2.2.1, Normal Procedures.

If the basicService value specified in the **mwiInterrogate** Invoke APDU is allServices, the Message Centre shall provide the Served User with a list of basic services for which SS-MWI is active and, as an implementation option, for each basic service, any of the optional information which is analogous to the information sent in the **mwiActivate** Invoke APDU.

If the optional callbackReq element is not present in the **mwiInterrogate** Invoke APDU, the Message Centre shall provide information for all matching SS-MWI activations. If the callbackReq element is present, only information for matching SS-MWI activations which are for callbacks shall be provided if the callbackReq value is TRUE, and only information for matching SS-MWI activations which are not for callbacks shall be provided if the callbackReq value is FALSE.

7.4.2.1.2 Exceptional procedures

On receipt of a **mwiInterrogate** Invoke APDU using the transfer mode of a call-independent signalling connection (as specified in 7.2/H.450.1) and if interrogation is not possible, or an incorrect Message Centre identifier is included, the Message Centre endpoint shall send back a **mwiInterrogate** Return Error APDU to the Served User and stay in state MWI-MC-Idle.

7.4.2.2 Actions at the Served User

7.4.2.2.1 Normal procedures

On receipt of an interrogation request from the user, the Served User shall send a **mwiInterrogate** Invoke APDU to the Message Centre endpoint using the transfer mode of a call-independent signalling connection (as specified in 7.2/H.450.1). The Served User shall start timer T2 and enter MWI-Ser-Wait state. The **mwiInterrogate** Invoke APDU shall contain the endpoint address of the Served User, the basic service for which the interrogation applies, and optionally the Message Centre identifier.

In state MWI-Ser-Wait, on receipt of a **mwiInterrogate** Return Result APDU, the Served User shall stop timer T2, and enter state MWI-Ser-Idle.

NOTE 1 – The Served User should indicate the result to the user.

NOTE 2 – The Served User shall consider an MWIInterrogateResElt in an **mwiInterrogate** Return Result APDU with nbOfMessages equal to zero as a request to callback the endpoint specified by the msgCentreId.

The Served User is responsible for clearing the call-independent signalling connection towards the Message Centre endpoint. This may occur on receipt of a **mwiInterrogate** Return Result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

7.4.2.2.2 Exceptional procedures

In state MWI-Ser-Wait, on receipt of a **mwiInterrogate** Return Error APDU from the Message Centre endpoint, the Served User shall stop timer T2, and enter state MWI-Ser-Idle.

If timer T2 expires, the Served User shall enter state MWI-Ser-Idle.

NOTE – The Served User should indicate rejection to the user.

The Served User is responsible for clearing the call-independent signalling towards the Message Centre endpoint. This may occur on receipt of a **mwiInterrogate** Return Error APDU, receipt of a Reject APDU, or on expiry of timer T2. Alternatively, the signalling connection may be retained for other applications, if appropriate.

7.4.3 Primitives

7.4.3.1 Message Centre Primitives

See Table 1.

Table 1/H.450.7 – Message Centre Primitives

Generic Name	Type			
	request	**indication**	**response**	**confirm**
MWIActivate	PARAMETERS	Not defined	Not defined	–
MWIDeactivate	PARAMETERS	Not defined	Not defined	–
MWIInterrogate	Not defined	PARAMETERS	PARAMETERS	Not defined
NOTE – "–" means no parameters (manufacturer specific parameters may apply).				

7.4.3.2 Primitive definitions

The definition of these primitives is as follows:

a) The MWIActivate.request primitive is used to activate SS-MWI at a Served User.

b) The MWIActivate.confirm primitive reports successful or unsuccessful SS-MWI activation at the Served User.

c) The MWIDeactivate.request primitive is used to deactivate SS-MWI at a Served User.

d) The MWIDeactivate.confirm primitive reports successful or unsuccessful SS-MWI deactivation at the Served User.

e) The MWIInterrogate.indication primitive indicates that a Served User is querying its SS-MWI status.

f) The MWIInterrogate.response primitive is used to convey SS-MWI status in an MWIInterrogate Return Result APDU, or an MWIInterrogate Return Error APDU, to the Served User.

7.4.3.3 Parameter definitions

MWIActivate.request parameters

- servedUserNr: endpoint address of the Served User.
- basicService: service for which the activation applies.
- msgCentreId: identity of the Message Centre (optional).
- nbOfMessages: the number of message for the Served User (optional).
- originatingNr: endpoint address of user that left a message (optional).
- timestamp: time when a message was left (optional).
- priority: priority of the highest priority message for the Served User (optional).

MWIActivate.confirm (ack and rej)

- (rej) userNotSubscribed.
- (rej) invalidServedUserNumber.
- (rej) basicServiceNotProvided.
- (rej) undefined.

MWIDeactivate.request parameters

- servedUserNr: endpoint address of the Served User.
- basicService: service for which the deactivation applies.
- msgCentreId: identity of the Message Centre (optional).
- callbackReq: limit deactivations to callback requests (optional).

MWIDeactivate.confirm (ack and rej)

- (rej) userNotSubscribed.
- (rej) invalidServedUserNumber.
- (rej) basicServiceNotProvided.
- (rej) undefined.

MWIInterrogate.indication parameters

- servedUserNr: endpoint address of the Served User.
- basicService: service for which the Served User is querying the MWI status.
- msgCentreId: identity of the Message Centre (optional).
- callbackReq: limit results to callback requests (optional).

MWIInterrogate.response (ack and rej) parameters

- (ack) MWIInterrogateRes: the Served User's Message Waiting status; if basicService in the MWIInterrogate.ind was "allServices", the Message Centre shall provide a list of all basic services for which SS-MWI is active for the Served User.
- (rej) userNotSubscribed.
- (rej) invalidServedUserNumber.
- (rej) notActivated.
- (rej) invalidMsgCentreId.
- (rej) undefined.

7.4.3.4 Served User Primitives

See Table 2.

Table 2/H.450.7 – Served User Primitives

Generic Name	Type			
	request	indication	response	confirm
MWIActivate	Not defined	PARAMETERS	–	Not defined
MWIDeactivate	Not defined	PARAMETERS	–	Not defined
MWIInterrogate	PARAMETERS	Not defined	Not defined	PARAMETERS
NOTE – "–" means no parameters (manufacturer specific parameters may apply).				

7.4.3.5 Primitive definitions

The definition of these primitives is as follows:

a) The MWIActivate.indication primitive signals a request from a Message Centre to activate SS-MWI.

b) The MWIActivate.response (ack or rej) primitive acknowledges or rejects an SS-MWI activation by the Message Centre.

c) The MWIDeactivate.indication primitive signals a request from a Message Centre to deactivate SS-MWI.

d) The MWIDeactivate.response (ack or rej) primitive acknowledges or rejects an SS-MWI deactivation by the Message Centre.

e) The MWIInterrogate.request primitive is used to obtain SS-MWI status from a Message Centre.

f) The MWIInterrogate.confirm primitive is used to convey SS-MWI status information from the Message Centre.

7.4.3.6 Parameter definitions

MWIActivate.indication parameters

- servedUserNr: endpoint address of the Served User.
- basicService: service for which the activation applies.
- msgCentreId: identity of the Message Centre (optional).
- nbOfMessages: the number of message for the Served User (optional).
- originatingNr: endpoint address of user that left a message (optional).
- timestamp: time when a message was left (optional).
- priority: priority of the highest priority message for the Served User (optional).

MWIActivate.response (ack and rej)

- (rej) userNotSubscribed.
- (rej) invalidServedUserNumber.
- (rej) basicServiceNotProvided.
- (rej) undefined.

MWIDeactivate.indication parameters

- servedUserNr: endpoint address of the Served User.
- basicService: service for which the deactivation applies.
- msgCentreId: identity of the Message Centre (optional).
- callbackReq: limit deactivations to callback requests (optional).

MWIDeactivate.response (ack and rej)

- (rej) userNotSubscribed.
- (rej) invalidServedUserNumber.
- (rej) basicServiceNotProvided.
- (rej) undefined.

MWIInterrogate.request parameters

- servedUserNr: endpoint address of the Served User.
- basicService: service for which the Served User is querying the MWI status.
- msgCentreId: identity of the Message Centre (optional).
- callbackReq: limit results to callback requests (optional).

MWIInterrogate.confirm (ack and rej) parameters

- (ack) MWIInterrogateRes: the Served User's Message Waiting status (see 7.4.3, Primitive Definitions).
- (rej) userNotSubscribed.
- (rej) invalidServedUserNumber.
- (rej) notActivated.
- (rej) invalidMsgCentreId.
- (rej) undefined.

7.5 Gatekeeper interactions

A Gatekeeper should transparently transport **mwiActivate** and **mwiDeactivate** Invoke APDUs to the served endpoint. However, a Gatekeeper or proxy[1] may act as a Served User for **mwiActivate** and **mwiDeactivate** Invoke APDUs, for example storing callback requests while the served endpoint is out of service. In such cases, the served endpoint may update its MWI information in a variety of ways:

- The endpoint may send a **mwiInterrogate** Invoke APDU to the GK or its proxy. In this case, the msgCentreId in the **mwiInterrogate** Invoke APDU shall identify the Gatekeeper or proxy.
- The GK or its proxy may send **mwiActivate** and **mwiDeactivate** Invoke APDUs, as required, to the served endpoint (typically following endpoint registration with the GK).
- Using mechanisms outside the scope of this Recommendation:
  - A typical use of this capability allows a Gatekeeper or proxy to store MWI activations and deactivations from unknown Message Centres sent to an endpoint that is out of service. This will most notably be the case for callback requests. When such an endpoint returns to service, it can interrogate known Message Centres for MWI, but has no information about other sources of MWI information.

    NOTE – These mechanisms may be used in addition to, or in place of, querying Message Centres known to the Served User using the **mwiInterrogate** Invoke APDU.
  - Synchronization of the MWI information stored in a Gatekeeper or proxy with the information stored in the served endpoint is outside the scope of this Recommendation.

7.6 Interactions between SS-MWI and other supplementary services

This subclause specifies protocol interactions between SS-MWI and other supplementary services currently defined by H.450-series Recommendations.

For interactions with supplementary services published subsequent to this Recommendation, see those other Recommendations.

7.6.1 Interaction with Call Forwarding (SS-CFU, SS-CFNR, SS-CFB)

No interaction.

NOTE – A MWI should not be redirected to the diverted-to user. The indication may be given to the Served User.

7.6.2 Interaction with Call Transfer (SS-CT)

No interaction.

---

[1] The proxy is an addressable entity either located in a separate endpoint or colocated with a Gatekeeper.

7.6.3 Interaction with Call Hold (SS-HOLD)

No interaction.

7.6.4 Interaction with Call Park (SS-PARK) and Call Pickup (SS-PICKUP)

No interaction.

7.6.5 Interaction with Call Waiting (SS-CW)

No interaction.

7.7 SS-MWI security considerations

SS-MWI uses H.225.0 call-independent signalling connections for transport of its APDUs. Served Users should authenticate the Message Centre before processing a **mwiActivate** or **mwiDeactivate** Invoke APDU. Similarly, a Message Centre endpoint should authenticate a requesting Served User before accepting a **mwiInterrogate** Invoke APDU. Authentication procedures are described in Recommendation H.235.

Applications that accept callback requests using MWI procedures should provide a means of screening the destination address provided in the msgCentreId field of the callback request, prior to initiating the callback.

8 Signalling flows for SS-MWI

This clause shows example message sequences for SS-MWI services.

Interactions of endpoints with their Gatekeepers are omitted for clarity. These interactions include RAS messaging for admission, and message relay where Gatekeeper-routed call signalling is used. Gatekeepers are normally transparent for the purposes of SS-MWI.

8.1 Example Message Sequence for SS-MWI activation

This subclause shows examples of activation of SS-MWI.

The first example shows a scenario where the call-independent signalling connection is not cleared by the Message Centre endpoint after the first activation of MWI. This could happen, for example, when the number of messages waiting changes before the Message Centre endpoint receives the **mwiActivate** Return Result APDU.

The CALL PROCEEDING message is normally not used for APDU return results as they are not sent end-to-end.

See Figure 1.

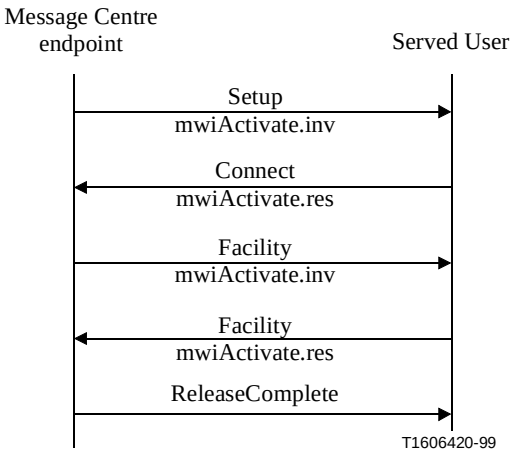

Figure 1/H.450.7 – Example of activation of SS-MWI

It is also possible to use the MWI activation mechanism to request a callback. In this instance, the optional originatingNr and nbOfMessages elements must be present. See Figure 2.

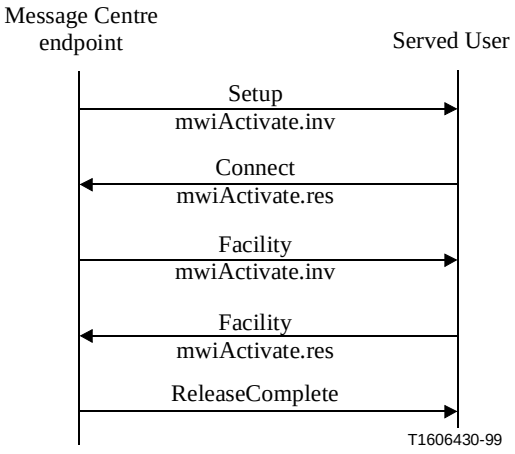

Figure 2/H.450.7 – Example of a callback request using SS-MWI

8.2 Example Message Sequence for SS-MWI deactivation

This subclause shows an example of deactivation of SS-MWI. See Figure 3.

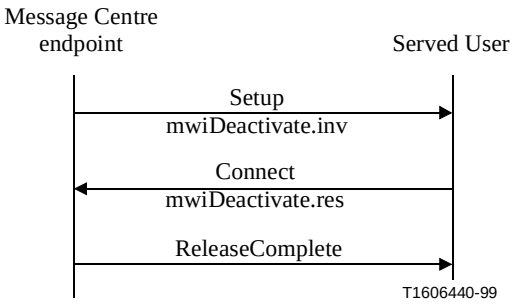

Figure 3/H.450.7 – Example of deactivation of SS-MWI

8.3 Example Message Sequence for SS-MWI interrogation

This subclause shows an example of interrogation of SS-MWI. See Figure 4.

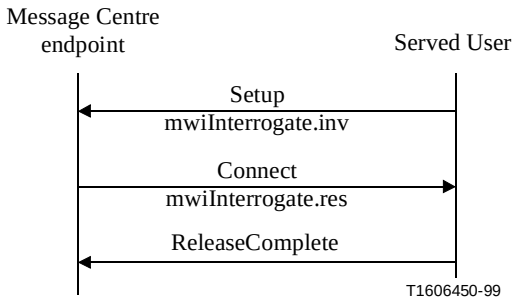

Figure 4/H.450.7 – Example of interrogation of SS-MWI

9 Specification and Description Language (SDL) diagrams

The procedures for Message Waiting Indication signalling entities are described in SDL form in Figures 6 through 10. For primitives and their meanings, refer to clause 7.4.3. In case of a conflict between the SDLs and the text within the previous clauses, the text shall take precedence.

The symbols used in the SDLs are defined in Figure 5.

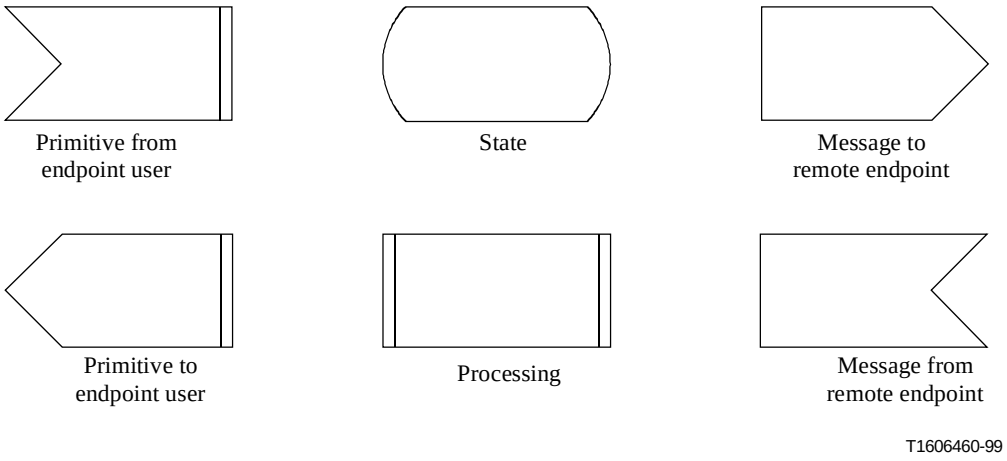

Figure 5/H.450.7 – SDL Symbols

APDUs H.450.1 sent via the network are indicated using bold letters with the following abbreviations:

(.inv) Invoke APDU

(.rr) Return Result APDU

(.re) Return Error APDU

(.rej) Reject APDU

9.1 SDL Representation of SS-MWI at the Message Centre endpoint

The figures in this subclause show the behaviour of an SS-MWI Supplementary Service Control Entity within the Message Centre endpoint. See Figures 6, 7 and 8.

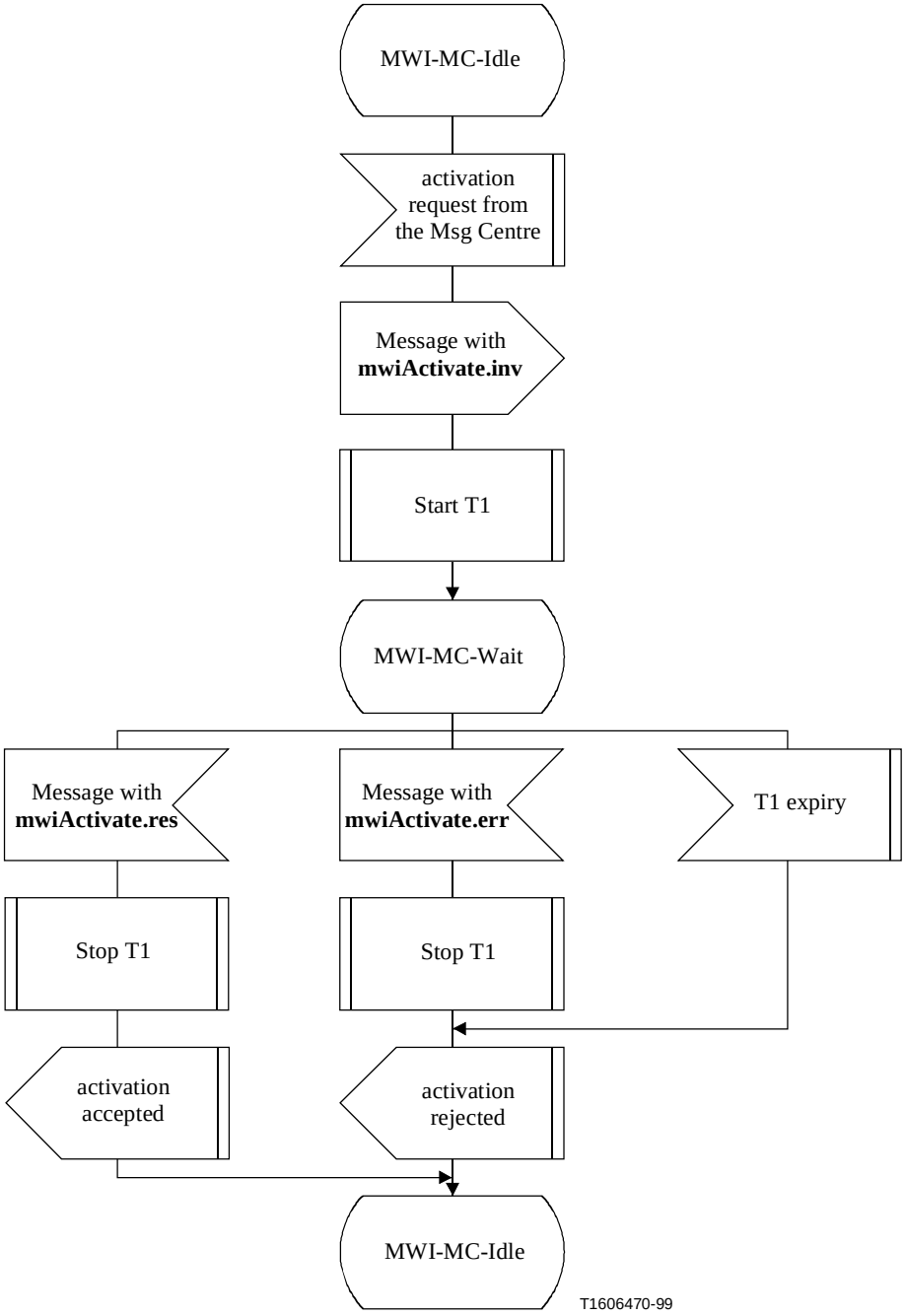

Figure 6/H.450.7 – SDL representation of SS-MWI activation at the Message Centre endpoint

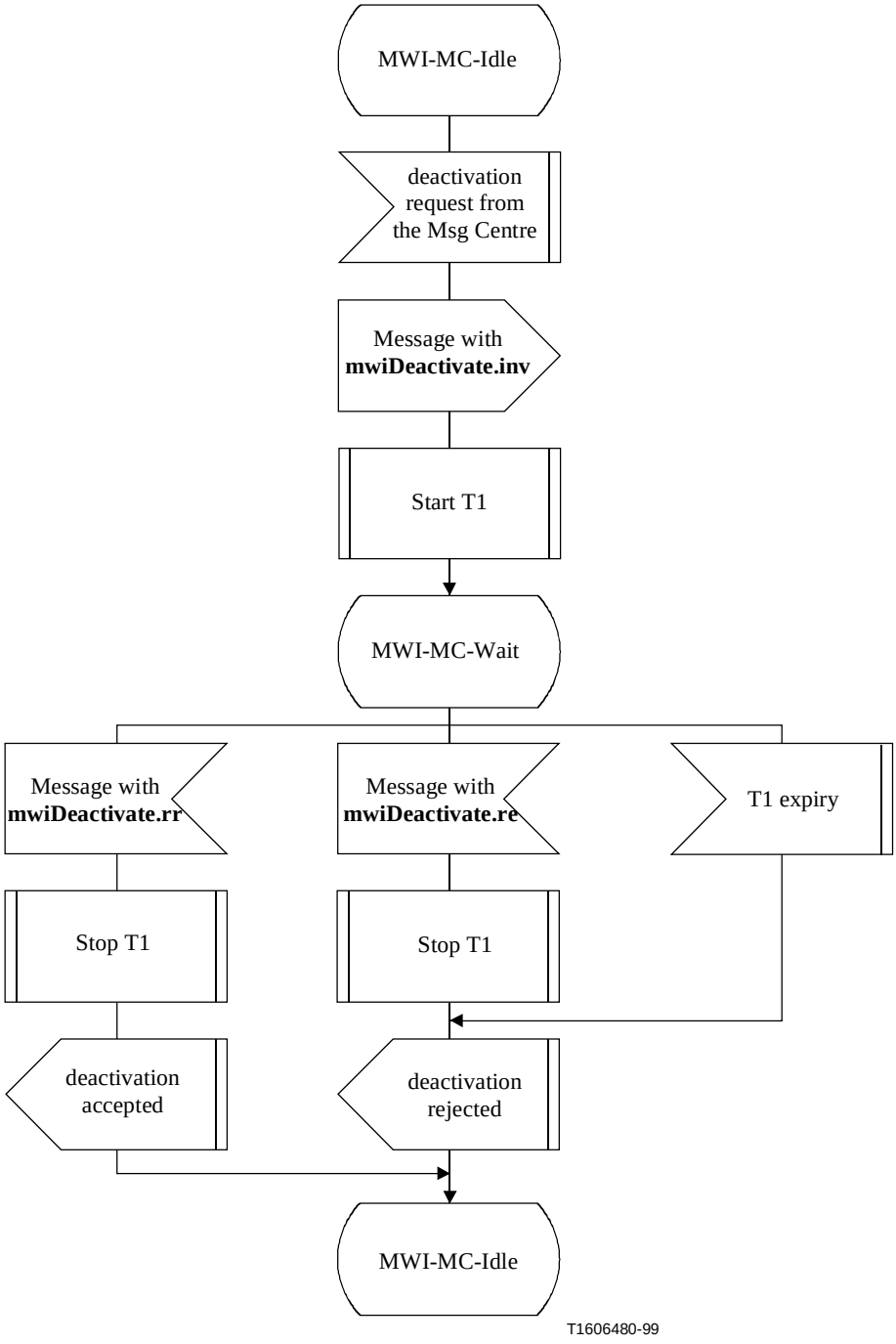

Figure 7/H.450.7 – SDL representation of SS-MWI deactivation at the Message Centre endpoint

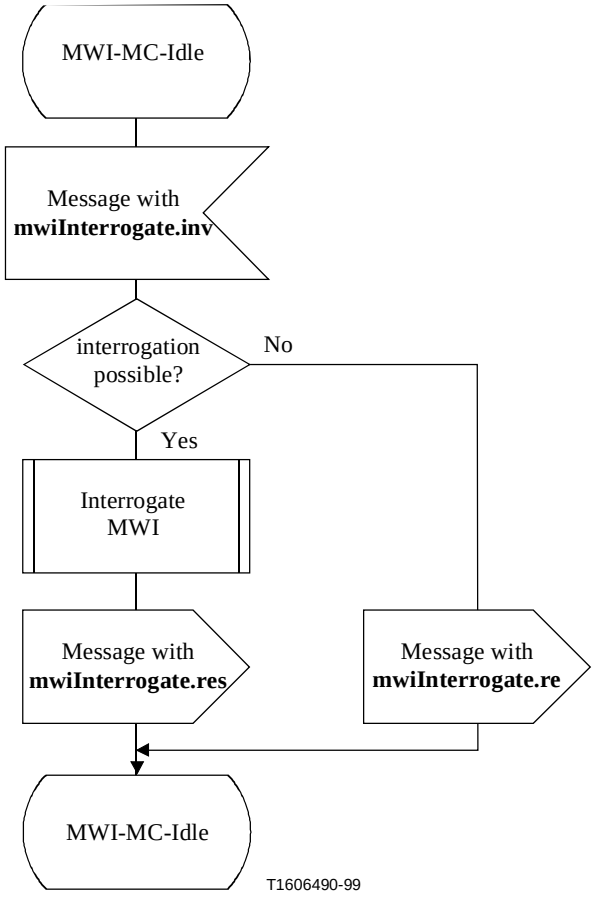

Figure 8/H.450.7 – SDL representation of SS-MWI interrogation at the Message Centre endpoint

9.2 SDL Representation of SS-MWI at the Served User

The figures in this subclause show the behaviour or an SS-MWI Supplementary Service Control Entity within the Served User. See Figures 9 and 10.

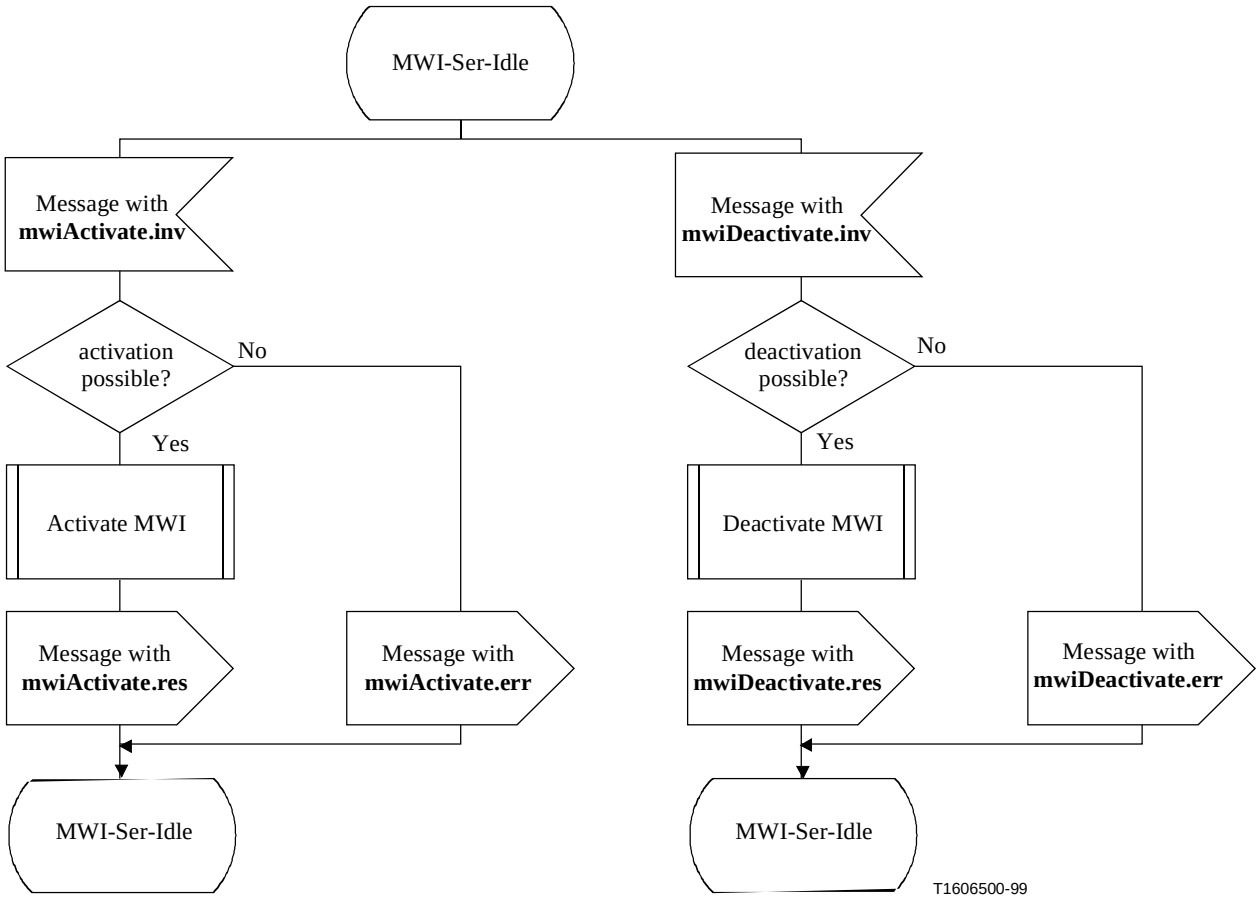

Figure 9/H.450.7 – SDL representation of SS-MWI activation/deactivation at the served endpoint

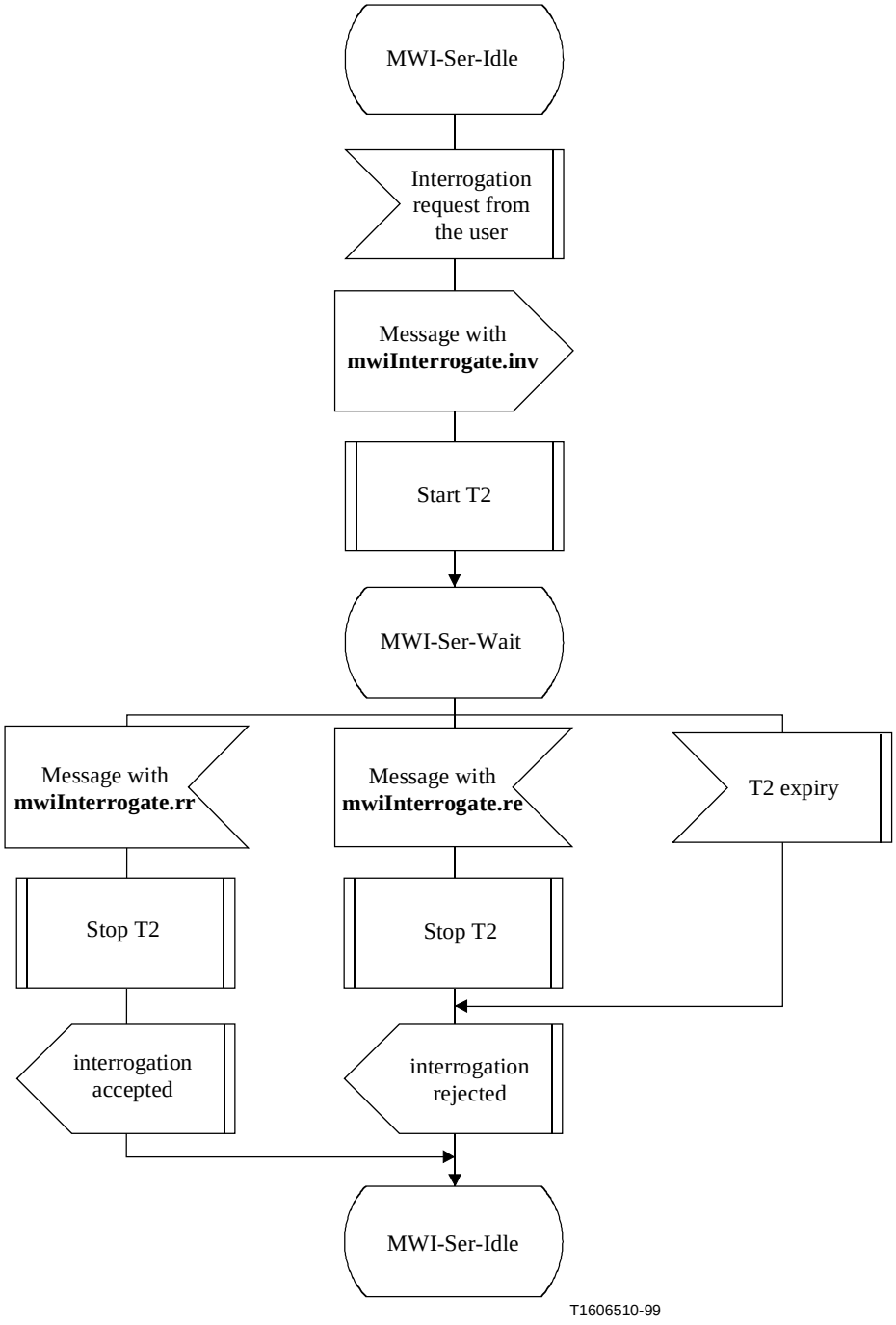

Figure 10/H.450.7 – SDL representation of SS-MWI interrogation at the served endpoint

ITU-T RECOMMENDATIONS SERIES

Series A	Organization of the work of the ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	**Audiovisual and multimedia systems**
Series I	Integrated services digital network
Series J	Transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure and Internet protocol aspects
Series Z	Languages and general software aspects for telecommunication systems