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## Foreword

This ETSI Technical Report (ETR) has been prepared by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or I-ETS.

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## 1 Scope

For some management applications, the relationships for the scheduling function between managed objects (i.e. scheduler and scheduled objects), are time/type of day dependant. To manage these time/type of day dependencies, a generic solution, useful for a number of different management applications, needs to be applied.

The scope of this ETR is to model the support functions, at the Network Element/Operations System (NE/OS) interface, related to the time/type of day dependant scheduling function. As an example, the application of the model to the case of the Telecommunications Management Network (TMN) management service: "Routeing and Digit Analysis Administration" (ETR 047 [3], I-ETS 300 292 [4]) is shown in Annex A.

The requirements for temporary override and automatic/manual fall-back to previous management schema, are outside the scope of this ETR.

## 2 References

For the purposes of this ETR, the following references apply.

- [1] ETR 046: "Network Aspects (NA); Telecommunications Management Network (TMN) modelling guidelines".
- [2] CCITT Recommendation X.721: "Information Technology - Open Systems Interconnection - Structure of management information: definition of management information".
- [3] ETR 047: "Network Aspects (NA); Telecommunications Management Network (TMN) Management services".
- [4] pri-ETS 300 292: "Network Aspects (NA); Functional specification of call routeing information management on the Operations Systems/Network Element (OS/NE) interface".
- [5] Draft CCITT Recommendation X.746 (1992): "Scheduling function (SC21 N 6021)".
- [6] CCITT Recommendation M.3100 (1992): "Generic network information model".

## 3 Abbreviations

For the purposes of this ETR, the following abbreviations apply.

ASN.1	Abstract Syntax Notation number 1
NE	Network Element
OS	Operations System

## **4 Time/type of day dependant scheduling function**

### **4.1 Functional requirements**

Some management applications (e.g. charging or routeing) need time/type of day dependant scheduling function. To manage these dependencies, the functional requirements are the following:

- differentiation on type of day;
- differentiation on time of day;
- a scheduled object should be selected from a list of scheduled objects;
- a NE can contain a number of scheduled objects. The scheduling time could be common for a number of them. It should be possible to specify which scheduled object should be selected for each selection time;
- it should be possible to temporarily override the current scheduled selection;
- it should be possible to replace the current scheduled selection.

### **4.2 References analysis**

The scheduling function described in CCITT Recommendation X.746 [5] provides a function that can schedule a number of activities within multiple managed objects by a single scheduler and is able to specify the time duration that the schedule is active.

The defined scheduler covers only a part of the functional requirements given in the subclause 4.1 and it is designed for starting and stopping of activities.

It could be possible to use it by straining the modelling to the maximum extent. It is not used in this ETR for the following reasons:

- it is not possible to define, for every point of time, different activities for each scheduled managed object;
- the scheduler schedules activities but the requirement given in the subclause 4.1 is related to scheduled selection;
- the type of day dependency is not covered.



## 5 Informative model

### 5.1 Functional model

The function of this model is to select one out of n objects on type of day and 24 hour time bases. A number of support objects are needed for the function. The related E-R diagram is shown in figure 1 and the following text is a short functional description of the model.

The activation of a specific timeControlledSelector is controlled by a typeOfDayController object that indicates the value of the current type of day to the timeControlledSelector. The timeControlledSelector drives the one out of n choice in a scheduled object (selectorScheduledObject). This is possible by using an index mechanism based on the assignment of an index to a "point of time" (indicating a change at a certain time, controlled by the clockCalendar object, to a new index). The scheduled object uses the indexes to select one out of n "possibilities" (e.g. pointers). An index is unambiguously assigned to a possibility. At change of a timeControlledSelector at midnight, due to a different type of day, the previous index is valid, for a certain selectorScheduledObject object instance, until the first point of time of the new timeControlledSelector is reached. By the indexing mechanism, a non sequential selection of "possibilities" in a selectorScheduledObject can be made. The timeControlledSelector can control any number of the selectorScheduledObject object instances.

The typeOfDayController object class uses a weekday translation list to translate weekdays to types of days (e.g. work day, weekend, special day, etc.). Furthermore, it contains one or more specialDay object instances. These object instances, identified by the date, are used to determine the special days for the overriding of the weekday translation. The typeOfDayController selects the correct special day of the year by matching of the current date (e.g. December 25, 1993) with the identifiers of the contained specialDay object instances. At match of date, the week day translation is overridden by the specialDay and the related special day is also indicated (e.g. Christmas). The typeOfDayController can control (on/off) any number of timeControlledSelector object instances. A number of typeOfDayController object instances can be necessary in a system to be used for different management applications (e.g. routing, charging, etc.).

The actualisation of time and date is supported by the clockCalendar object class. Translations of date in the form yy/mm/dd to day of week in the form Sunday, Monday, Tuesday, etc., is performed by the weekDayCalendar object class, using the attribute weekDay. The weekDayCalendar object class has an implicit relationship with one or more controlled typeOfDayController object instances. The clockCalendar object class has an implicit relationship with one or more controlled timeControlledSelector object instances.

The selectorScheduledObject object class (see figure 1) is a place holder for real objects (e.g. the routingPrimitives object class defined in I-ETS 300 292 [4]).

Malfunctions of any of the objects in the model will not be explicitly propagated down to the supported objects.

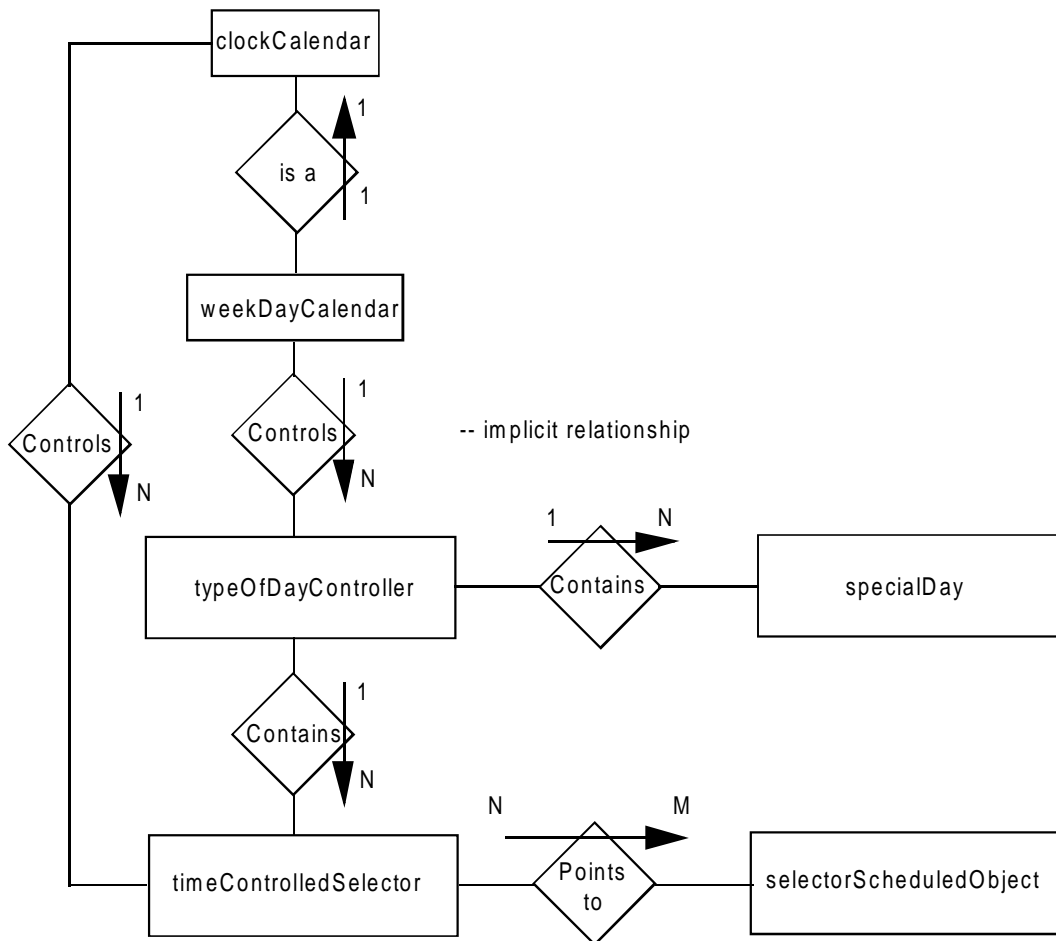
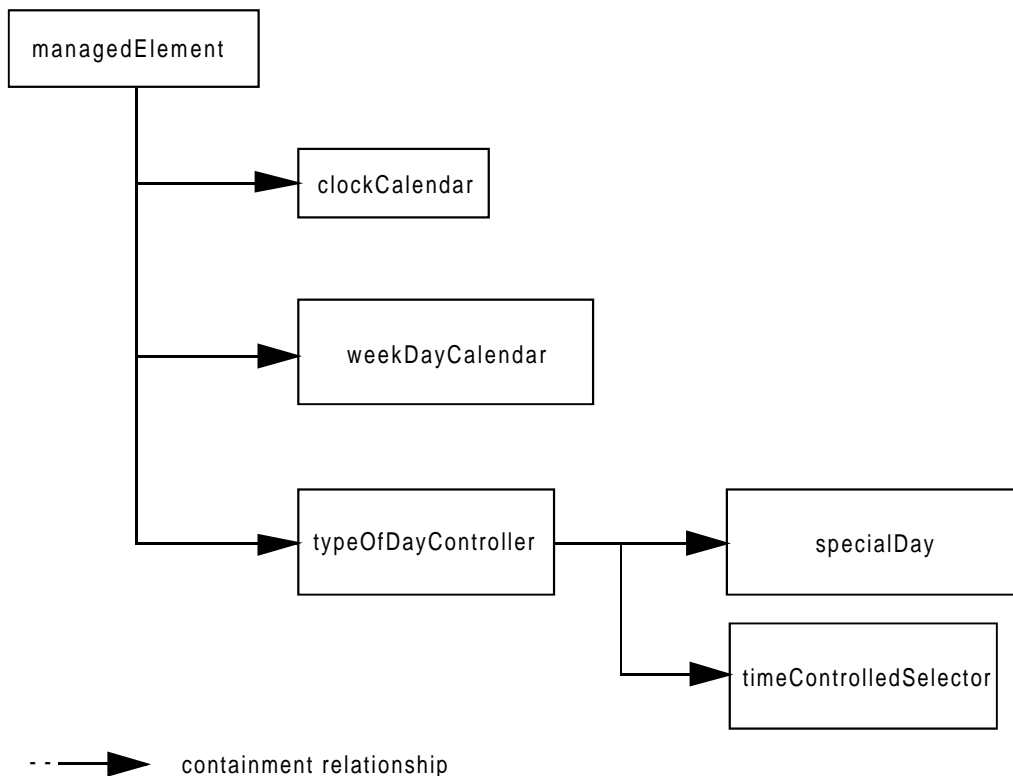


Figure 1: Scheduled selection E-R diagram



--> containment relationship

Figure 2: Containment tree

## 5.2 Object class definitions

This subclause contains the formal object classes definitions.

### 5.2.1 clockCalendar

clockCalendar MANAGED OBJECT CLASS

DERIVED FROM "CCITT Recommendation X.721:1992":top;

CHARACTERIZED BY

clockCalendarPackage,

"CCITT Recommendation M.3100: 1992": systemTimingSourcePackage;

REGISTERED AS {managed ObjectClass 1};

### 5.2.2 special Day

specialDay MANAGED OBJECT CLASS

DERIVED FROM "CCITT Recommendation X.721:1992":top;

CHARACTERIZED BY specialDayPackage;

REGISTERED AS {managed ObjectClass 2};

### 5.2.3 timeControlledSelector

timeControlledSelector MANAGED OBJECT CLASS

DERIVED FROM "CCITT Recommendation X.721:1992":top;

CHARACTERIZED BY timeControlledSelectorPackage;

REGISTERED AS {managed ObjectClass 3};

### 5.2.4 typeOfDayController

typeOfDayController MANAGED OBJECT CLASS

DERIVED FROM "CCITT Recommendation X.721:1992":top;

CHARACTERIZED BY typeOfDayControllerPackage;

REGISTERED AS {managed ObjectClass 4};

### 5.2.5 weekDayCalendar

weekDayCalendar MANAGED OBJECT CLASS

DERIVED FROM clockCalendar;

CHARACTERIZED BY weekDayPackage;

REGISTERED AS {managed ObjectClass 5};

## 5.3 Packages

This subclause contains the formal packages definitions.

### 5.3.1 clockCalendarPackage

clockCalendarPackage PACKAGE

BEHAVIOUR clockCalendarBehaviour;

ATTRIBUTES

clockCalendarId GET,

"CCITT Recommendation M.3100: 1992": externalTime GET-REPLACE;

NOTIFICATIONS

"CCITT Recommendation X.721: 1992":objectCreation;

REGISTERED AS {Package 1};

clockCalendarBehaviour BEHAVIOUR

DEFINED AS "The external time also functions as a reference for scheduling activities.";;

### 5.3.2 specialDayPackage

specialDayPackage PACKAGE

BEHAVIOUR specialDayBehaviour;

ATTRIBUTES

date GET,

specialTypeOfDay GET-REPLACE;

NOTIFICATIONS

"CCITT Recommendation X.721: 1992":attributeValueChange,

"CCITT Recommendation X.721: 1992":objectCreation,

"CCITT Recommendation X.721: 1992":objectDeletion;

REGISTERED AS {Package 2};

specialDayBehaviour BEHAVIOUR

DEFINED AS "This package is used to define the special days for the overriding of the weekDayTranslationList definition in the typeOfDayController that contains the specialDay. The date attribute is used as the identifier.";;

### 5.3.3 systemTimingSourcePackage

The systemTimingSourcePackage is defined in CCITT Recommendation M.3100 [6].

### 5.3.4 timeControlledSelectorPackage

timeControlledSelectorPackage PACKAGE

BEHAVIOUR timeControlledSelectorBehaviour;

ATTRIBUTES

timeControlledSelectorId GET,

"CCITT Recommendation X.721: 1992":administrativeState GET-REPLACE,

typeOfDay GET-REPLACE,

pointsOfTime GET-REPLACE ADD-REMOVE,

listOfSelectorScheduledObjects GET-REPLACE ADD-REMOVE;

NOTIFICATIONS

"CCITT Recommendation X.721: 1992":objectCreation,

"CCITT Recommendation X.721: 1992":stateChange;

REGISTERED AS {Package 3};

timeControlledSelectorBehaviour BEHAVIOUR

DEFINED AS "This package is used to schedule objects on an index basis. The activation of a Time Controlled Selector is on a type of day basis. Indexes are assigned to points of time. Indexes are activated when the current time provided by the externalTime attribute of the clockCalendar object class matches the point of time.";

### 5.3.5 typeOfDayControllerPackage

typeOfDayControllerPackage PACKAGE

BEHAVIOUR typeOfDayControllerBehaviour;

ATTRIBUTES

typeOfDayControllerId GET,

"CCITT Recommendation X.721: 1992":administrativeState GET-REPLACE,

currentTypeOfDay GET,

weekDayTranslationList DEFAULT VALUE DefaultWeekDayTranslationList GET-REPLACE;

NOTIFICATIONS

"CCITT Recommendation X.721: 1992":objectCreation,

"CCITT Recommendation X.721: 1992":stateChange;

REGISTERED AS {Package 4};

typeOfDayControllerBehaviour BEHAVIOUR

DEFINED AS "This package is used to define type of day based on the current week day and on the current date provided by the externalTime attribute of the clockCalendar object class.

The translation of week days to types of day is controlled by the attribute week day translation list.

The translation of date to type of day is controlled by the contained instances of the special day object class. The special day object is named by date attribute.

The type of day controller selects the correct special day object instance by matching of the current date with the date attribute of the special day object instance.

On creation of the type of day controller object, the value of the current type of day attribute is taken from the week day translation list.

The value of the current type of day is actualised at midnight (00:00:00).

At the creation of the type of day controller, the administrative state must be locked.";;

### 5.3.6 weekDayPackage

weekDayPackage PACKAGE

BEHAVIOUR weekDayBehaviour;

ATTRIBUTES weekDay GET;

REGISTERED AS {Package 5};

weekDayBehaviour BEHAVIOUR

DEFINED AS "The weekDay attribute indicates the current week day in accordance to the date part of the external time.";;

## 5.4 Attributes

This subclause contains the formal attributes definitions.

### 5.4.1 administrativeState

The administrativeState attribute is defined in CCITT Recommendation X.721 [2]

### 5.4.2 clockCalendarId

clockCalendarId ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.NameType;

MATCHES FOR EQUALITY;

REGISTERED AS {Attribute 1};

#### 5.4.3 **currentTypeOfDay**

currentTypeOfDay ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.TypeOfDay;

MATCHES FOR EQUALITY;

REGISTERED AS {Attribute 2};

#### 5.4.4 **date**

date ATTRIBUTE

BEHAVIOUR dateBehaviour;

WITH ATTRIBUTE SYNTAX ASN1TypeModule.Date;

MATCHES FOR EQUALITY, SUBSTRING, DATE ORDERING;

REGISTERED AS {Attribute 3};

dateBehaviour BEHAVIOUR

DEFINED AS "This attribute represents the yy/mm/dd part of the generalised time";;

#### 5.4.5 **externalTime**

The externalTime attribute is defined in CCITT Recommendation M.3100 [6].

#### 5.4.6 **listOfSelectorScheduledObjects**

listOfSelectorScheduledObjects ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.ListOfSelectorScheduledObjects;

MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;

REGISTERED AS {Attribute 4};

#### 5.4.7 **pointsOfTime**

pointsOfTime ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.PointsOfTime;

MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;

REGISTERED AS {Attribute 5};

#### 5.4.8 specialTypeOfDay

specialTypeOfDay ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.SpecialTypeOfDay;

MATCHES FOR EQUALITY;

REGISTERED AS {Attribute 6};

#### 5.4.9 timeControlledSelectorId

timeControlledSelectorId ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.NameType;

MATCHES FOR EQUALITY;

BEHAVIOUR

timeControlledSelectorIdBehaviour BEHAVIOUR

DEFINED AS "The Time Controlled Selector Id is an attribute type whose distinguished value can be used as a RDN when naming an instance of the Time Controlled Selector object class.";;

REGISTERED AS {Attribute 7};

#### 5.4.10 typeOfDay

typeOfDay ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.TypeOfDay;

MATCHES FOR EQUALITY;

REGISTERED AS {Attribute 8};

#### 5.4.11 typeOfDayControllerId

typeOfDayControllerId ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.NameType;

MATCHES FOR EQUALITY;

REGISTERED AS {Attribute 9};

#### 5.4.12 weekDay

weekDay ATTRIBUTE

WITH ATTRIBUTE SYNTAX ASN1TypeModule.WeekDay;

MATCHES FOR EQUALITY;

REGISTERED AS {Attribute 10};



#### 5.4.13 **weekDayTranslationList**

weekDayTranslationList ATTRIBUTE

BEHAVIOUR weekDayTranslationListBehaviour;

WITH ATTRIBUTE SYNTAX ASN1TypeModule.WeekDayTranslationList;

MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;

REGISTERED AS {Attribute 11};

weekDayTranslationListBehaviour BEHAVIOUR

DEFINED AS "The normal type of day for each week day must be defined. Each week day must be present in the list, but only once.";;

#### 5.5 **Name bindings**

This subclause contains the formal name bindings definitions.

##### 5.5.1 **clockCalendar**

clockCalendar-system NAME BINDING

SUBORDINATE OBJECT CLASS clockCalendar;

NAMED BY

SUPERIOR OBJECT CLASS "CCITT Recommendation X.721:1992":system AND  
SUBCLASSES;

WITH ATTRIBUTE clockCalendarId;

CREATE WITH-AUTOMATIC-INSTANCE-NAMING;

REGISTERED AS {nameBinding 1}

clockCalendar-system-Behaviour BEHAVIOUR

DEFINED AS "Only one instance of the clockCalendar object class will be automatically created";;

##### 5.5.2 **specialDay**

specialDay-typeOfDayController NAME BINDING

SUBORDINATE OBJECT CLASS specialDay;

NAMED BY

SUPERIOR OBJECT CLASS typeOfDayController;

WITH ATTRIBUTE date;

CREATE ;

DELETE;

REGISTERED AS {nameBinding 2}



informationModel OBJECT IDENTIFIER ::= {ccitt (0) identified-organisation (4) etsi (0) time/typeOfDay-dependant-scheduling-information-management (**etsnumber**) informationModel (0)}

standardSpecificExtension OBJECT IDENTIFIER ::= {informationModel standardSpecificExtension (0)}

managedObjectClass OBJECT IDENTIFIER ::= informationModel managedObjectClass (3)}

package OBJECT IDENTIFIER ::= informationModel package (4)}

nameBinding OBJECT IDENTIFIER ::= informationModel nameBinding (6)}

attribute OBJECT IDENTIFIER ::= {informationModel attribute (7)}

action OBJECT IDENTIFIER ::= {informationModel action (9)}

notification OBJECT IDENTIFIER ::= {informationModel notification (10)}

Date ::= ImplicitVisibleString (SIZE(6))

DefaultWeekDayTranslationList WeekDayTranslationList ::= {{WeekDay{Monday},  
TypeOfDay{workday},  
WeekDay{Tuesday},  
TypeOfDay{workday},  
WeekDay{Wednesday},  
TypeOfDay{workday},  
WeekDay{Thursday},  
TypeOfDay{workday},  
WeekDay{Friday},  
TypeOfDay{workday},  
WeekDay{Saturday},  
TypeOfDay{weekend},  
WeekDay{Sunday},  
TypeOfDay{weekend}}}

ListOfSelectorScheduledObjects ::= SET OF ObjectInstance.

NameType ::= CHOICE {numericName INTEGER,  
pString GraphicString}



## Annex A: Application to the call routeing scheduling management

The following specialisation of the functional requirements given in subclause 4.1 must be considered in the case of the TMN management service "Routeing and digit analysis administration" (ETR 047 [3], I-ETS 300 292 [4]):

- a trunk group (an XTPSGComb managed object, I-ETS 300 292 [4]) must always be selected from a list of trunk groups;
- an exchange can contain a number of trunk group lists. The scheduling time can be common for a number of trunk group lists. In this case it must be possible to specify for each trunk group list which trunk group must be selected for each selection time.

With reference to the E-R diagram given in figure 1, one or more instances of the timeControlledSelector object class, drive the one out of n choice in the routeingPrimitives and/or digitElement object instances (the definition of these two managed object classes related to the call routeing administration is given in I-ETS 300 292 [4]). The index assigned to a point of time in a timeControlledSelector object instance is used by the call routeing managed object instances to select a trunk group from the pre-defined list of trunk groups. This functionality is covered by the definition for the implied call routeing managed objects of the schedulingAttribute attribute, I-ETS 300 292 [4]. This attribute is a set of index values of object of classes OrderedListXTPSGComb, DigitManip and RouteingTarget for scheduling reasons. The ASN.1 syntax of this attribute is a SET OF SEQUENCE of object instance and index (defined as INTEGER).

## History

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