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Digitalni celiļ ni telekomunikacijski sistem (faza 2) âï Upravljanje konfiguracije omreģja GSM (GSM 12.06)

Digital cellular telecommunications system (Phase 2) (GSM); GSM network configuration management (GSM 12.06)

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Digital cellular telecommunications system (Phase 2); GSM Network configuration management (GSM 12.06)

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SIST ETS 300 617 E1:2003

Contents

Foreword 5

Introduction 5

1 Scope 7

2 Normative references 7

3 Definitions, symbols and abbreviations 8
3.1 Definitions 8
3.2 Symbols 9
3.3 Abbreviations 9

4 Network configuration management 10
4.1 General 10
4.1.1 Installing a PLMN 10
4.1.2 Operating a PLMN 10
4.1.3 Growing/pruning a PLMN 10
4.1.3.1 System up-date 10
4.1.3.2 System up-grade 11
4.2 Operational context for configuration management 11
4.2.1 Administrative aspects of configuration management 11
4.2.1.1 Security aspects 12
4.2.1.2 Data validity 12
4.2.1.3 Data consistency 12
4.2.1.4 Resource administration 14
4.2.2 Configuration management triggers 14

5 Configuration management service components 15
5.1 System modification service component 15
5.2 System monitoring service component 16

6 Configuration management functions 17
6.1 System modification functions 17
6.1.1 Creation of network elements and network resources 17
6.1.2 Deletion of network elements and network resources 18
6.1.3 Conditioning of network elements and network resources 18
6.1.3.1 Considerations on conditioning mechanisms 18
6.1.3.2 Network traffic considerations 19
6.2 System monitoring functions 20
6.2.1 Information request function 20
6.2.2 Information report function 20
6.2.3 Response/report control function 20

7 BSS configuration management 21
7.1 Equipment management 21
7.1.1 Definition of equipment 21
7.1.2 Equipment management functions 21
7.1.2.1 Equipment availability management 22
7.1.2.2 Equipment utilisation management 22
7.1.2.3 Equipment identification 22
7.1.2.4 Equipment redundancy 22
7.1.2.5 Overload protection 22
7.1.2.6 Replaceability 23
7.1.2.7 Compatibility 23
7.2 Software management 23

iTeh STANDARD PREVIEW
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SIST ETS 300 617 E1:2003
https://standards.iteh.ai/catalog/standards/sist/4ca1d86e-cca6-48ac-91bd-3badea657dd8/sist-ets-300-617-e1-2003

SIST ETS 300 617 E1:2003

7.2.1 Definition of software ... 23
7.2.2 Software management functions ... 24
7.2.2.1 Receive the software delivery ... 24
7.2.2.2 Transfer the software to the network element ... 24
7.2.2.3 Identification of the software package ... 25
7.2.2.4 Construct a loadable form of the software ... 25
7.2.2.5 Load the software and execute ... 25
7.2.2.6 Manage the local storage of software ... 26
7.3 Logical configuration management ... 26
7.3.1 Definition of logical configuration ... 26
7.3.2 Logical parameter management requirements ... 26
7.3.2.1 Create initial data elements and values ... 26
7.3.2.2 Modify data values ... 27
7.3.2.3 Delete data elements ... 27
7.3.2.4 Read data values ... 27
7.3.3 Logical functionality management requirements ... 28
7.3.3.1 Enabling functionality ... 28
7.3.3.2 Disabling functionality ... 28
7.3.3.3 Cell configuration management function ... 29
7.3.3.4 Adjacent cell configuration management function ... 29
7.3.3.5 Power control management function ... 29
7.3.3.6 Handover control management function ... 30
7.3.3.7 Frequency control management function ... 30
7.3.3.8 Protocol/timer control management function ... 30
7.3.3.9 Functional building block management ... 31
7.4 Modelling notes ... 31

Annex A (informative): Examples of management procedures ... 32
A.1 Network element and network resource management examples ... 33
A.1.1 Network resource creation scenario (TRX) ... 33
A.1.2 Network resource creation scenario (BTS) ... 36
A.1.3 Network resource deletion scenario (TRX) ... 37
A.1.4 Network resource deletion scenario (BTS) ... 38
A.2 Network element and network resource conditioning examples ... 39
A.2.1 Network element/network resource conditioning scenario without traffic impact ... 39
A.2.2 Network element/network resource conditioning scenario with capacity impact ... 40
A.2.3 Network element/network resource conditioning scenario with traffic impact on one network element/network resource ... 41
A.2.4 Network element/network resource conditioning scenario with traffic impact on multiple network elements/network resources ... 42

Annex B (informative): Bibliography ... 43

Annex C (informative): Register ... 44

History ... 45

iTeh STANDARD PREVIEW
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SIST ETS 300 617 E1:2003
https://standards.iteh.ai/catalog/standards/sist/4ca1d8be-cca6-48ac-91bd-3badea657dd8/sist-ets-300-617-e1-2003

SIST ETS 300 617 E1:2003

Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS describes the Configuration Management (CM) aspects of Network Elements (NEs) within the Digital cellular telecommunications system. This ETS corresponds to GSM technical specification, GSM 12.06, version 4.1.1.

NOTE: TC-SMG has produced documents which give technical specifications for the implementation of the Digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These specifications may subsequently become I-ETSs (Phase 1), or European Telecommunication Standards (ETSs)(Phase 2), whilst others may become ETSI Technical Reports (ETRs). These ETSI-GSM Technical Specifications are, for editorial reasons, still referred to in this ETS.

Transposition dates	
Date of adoption of this ETS:	06 June 1996
Date of latest announcement of this ETS (doa):	26 September 1996
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Introduction

Configuration Management (CM), in general, provides the operator with the ability to perform effective network management as the PLMN evolves. CM is initiated by the operator in various network elements of the PLMN to meet the operator objectives.

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CM actions may be requested as part of an implementation programme (e.g. additions and deletions), as part of an optimisation programme (e.g. modifications), and to maintain the overall Quality of Service. The CM actions are initiated either as a single action on a network element of the PLMN or as part of a complex procedure involving actions on many network elements.

Clause 4 provides a brief background of CM while Clause 5 explains CM services available to the operator. Clause 6 breaks these services down into individual CM functions which will support the defined services. Clause 7 describes the application of these services and functions to the BSS NE in a GSM PLMN. In Annex A there are informative examples to illustrate the application of CM functions to complete scenarios.

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SIST ETS 300 617 E1:2003

1 Scope

This European Telecommunication Standard (ETS) describes the Configuration Management (CM) aspects of Network Elements (NEs) which constitute a PLMN with initial emphasis on the Base Station System (BSS) management. This is described from a management perspective being decomposed into constituent functionalities, which in turn will allow the construction of a management object model using the object oriented paradigm to support open systems management (see GSM 12.20 (ETS 300 622) [14]). The ETS follows the methodology described in GSM 12.00 (ETS 300 612-1)[10].

This ETS defines a set of controls to be employed to effect set-up and changes to a PLMN, in such a way that operational capability, network integrity and inter working co-operation are ensured. In this way, this ETS describes the interface behaviour for the management of PLMN NEs in the context of the described management environment. The context is described for both the Operation System (OS) and NE functionality. The standardisation of specific controls is outside of the scope of this ETS.

2 Normative references

This ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references subsequent amendments to, or revisions of, any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

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[1] GSM 01.04 (ETR 100): "Digital cellular telecommunication system (Phase 2); Abbreviations and acronyms".

[2] GSM 04.06 (ETS 300 555): "Digital cellular telecommunication system (Phase 2); Mobile Station - Base Station System (MS - BSS) interface Data Link (DL) layer specification".

[3] GSM 04.08 (ETS 300 557): "Digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".

SIST ETS 300 617 E1:2003
https://standards.iteh.ai/catalog/standards/sist/4ca1d86e-cca6-48ac-91bd-3badea657dd8/sist-ets-300-617-e1-2003

[4] GSM 05.02 (ETS 300 574): "Digital cellular telecommunication system (Phase 2); Multiplexing and multiple access on the radio path".

[5] GSM 05.05 (ETS 300 577): "Digital cellular telecommunication system (Phase 2); Radio transmission and reception".

[6] GSM 05.08 (ETS 300 578): "Digital cellular telecommunication system (Phase 2); Radio subsystem link control".

[7] GSM 08.08 (ETS 300 590): "Digital cellular telecommunication system (Phase 2); Mobile Switching Centre - Base Station System (MSC - BSS) interface Layer 3 specification".

[8] GSM 08.52 (ETS 300 593): "Digital cellular telecommunication system (Phase 2); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Interface principles".

[9] GSM 08.58 (ETS 300 596): "Digital cellular telecommunication system (Phase 2); Base Station Controller - Base Transceiver Station (BSC - BTS) interface Layer 3 specification".

[10] GSM 12.00 (ETS 300 612-1): "Digital cellular telecommunication system (Phase 2); Objectives and structure of Network Management (NM)".

[11] GSM 12.01 (ETS 300 612-2): "Digital cellular telecommunication system (Phase 2); Common aspects of GSM Network Management (NM)".

[12] GSM 12.03 (ETS 300 614): "Digital cellular telecommunication system (Phase 2); Security management".

SIST ETS 300 617 E1:2003

[13] GSM 12.04 (ETS 300 615): "Digital cellular telecommunication system (Phase 2); Performance data measurements".

[14] GSM 12.20 (ETS 300 622): "Digital cellular telecommunication system (Phase 2); Base Station System (BSS) Management Information".

[15] CCITT Recommendation X.721 (ISO/IEC 10165-2): "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[16] CCITT Recommendation X.731 (ISO/IEC 10164-2): "Information technology - Open Systems Interconnection - Systems Management: State management function".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the puposes of this ETS the following definitions apply.

Data: is any information or set of information required to give software or equipment or combinations thereof a specific state of functionality.

Equipment: is one or more hardware items which correspond to a manageable or supervisable unit or is described in an equipment model.

Firmware: is a term used in contrast to software to identify the hard-coded program which is not downloadable on the system.

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Hardware: is each and every tangible item.

Network Element: is a discrete telecommunications entity which can be managed over a specific interface e.g. the BSS.

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Network Resource: is a component of a Network Element which can be identified as a discrete separate unit e.g. BSC, BTS or TRX .

Operator: is either

- a human being controlling and managing the network; or,
- a company running a network (the PLMN operator).

Optimisation: of the network is each up-date or modification to improve the network handling and/or to enhance subscriber satisfaction. The aim is to maximise the performance of the system.

Re-configuration: is the re-arrangement of the parts, hardware and/or software that make up the PLMN. A re-configuration can be of the parts of a single NE or can be the re-arrangement of the NEs themselves, as the parts of the PLMN.

Reversion: is a procedure by which a configuration, which existed before changes were made, is restored.

Software: is a term used in contrast to firmware to refer to all programs which can be loaded to and used in a particular system.

Up-Dates: generally consist of software, firmware, equipment and hardware, designed only to consolidate one or more modifications to counter-act errors. As such, they do not offer new facilities or features and only apply to existing NEs.

Up-Grades: can be of the following types:

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- enhancement - the addition of new features or facilities to the PLMN;
- extension - the addition of replicas of existing entities.

3.2 Symbols

None

3.3 Abbreviations

For the puposes of this ETS the following abbreviations apply.
Further abbreviations used may be found in ETR 100 [1].

BSIC	Base Station Identification Code
BSS	Base Station System
CM	Configuration Management
FM	Fault Management
FW	Firmware
HW	Hardware
MIB	Management Information Base
MOC	Managed Object Class
NE	Network Element
NR	Network Resource
OS	Operation System
SW	Software
TRX	Transceiver

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SIST ETS 300 617 E1:2003

4 Network configuration management

4.1 General

In the development of a PLMN, three general phases can be described which represent different degrees of stability. Once the first stage is over, the system will cycle between the second and the third phases. This is known as the network life-cycle and includes:

1) the PLMN is installed and put into service;
2) the PLMN reaches certain stability and is only modified (dynamically) to satisfy short term requirements, e.g. by (dynamic) re-configuration of resources or parameter modification; this stable state of a PLMN cannot be regarded as the final one because each equipment or SW modification will let the PLMN progress to an unstable state and require optimisation actions again;
3) the PLMN is being adjusted to meet the long term requirements of the network operator and the customer, e.g. with regard to performance, capacity and customer satisfaction through the enhancement of the network or equipment up-grade.

During these phases, the operators will require adequate management functions to perform the necessary tasks.

4.1.1 Installing a PLMN

When a PLMN is installed and initialised for the first time, all NEs need to be introduced to the OS, the data for initialisation and SW for proper functioning need to be provided. All these actions are carried out to create NEs and to initialise them.

4.1.2 Operating a PLMN

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Whilst in service, the operator needs to react to short term incidents such as traffic load requirements which are different from the current network capabilities, NEs/NRs need to be re-configured and parameters need to be adapted to follow these day-to-day requirements.

4.1.3 Growing/pruning a PLMN

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As the PLMN grows and matures new equipment is installed and understanding of system behaviour increases. Subscriber requirements/wishes may demand that operators modify their system. In addition manufacturers improve the infrastructure components and add features to their products hence the operator will start modifying the PLMN to profit from these changes and to improve subscriber satisfaction. Additionally, the PLMN configuration will be modified (i.e. it will be up-dated or up-graded) to cope with a need for increasing or decreasing network capacity. These actions are carried out for the long term strategy of the operators to optimise the network.

4.1.3.1 System up-date

Whenever the PLMN needs to be improved for reasons of reducing failures, the system will be up-dated. In this case SW or equipment will be replaced without adding new functionalities or resources to the network. The basic function required is:

the modification of existing SW/equipment; it may be necessary to introduce a different set of data to cope with the modified SW/equipment.

For system up-date the network shall not be disturbed in its function until the required modification is activated. This requires mechanisms to

– do SW/data downloading in parallel with on-going traffic;
– isolate the affected NEs/NRs from traffic before the actual modification is done.

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4.1.3.2 System up-grade

System up-grade may affect all areas of PLMN activities and can be described as enhancements, whereby either new features or new facilities are implemented. Also extensions, reductions or further replications of existing facilities are covered by this CM aspect. The CM functions employed are:

- Creation of NEs and/or NRs;
- Deletion of NEs and/or NRs; and,
- Modification of NEs and/or NRs.

The following requirements are to apply:

- to support expeditious handling of SW and data while minimising impact on ongoing traffic;
- to follow a required sequence of up-grades: e.g. the new SW depends upon the availability of the new equipment functionality;
- to provide the capability to create an additional logical NE/NR without having installed the physical resource supporting it: for example it should be possible to create a cell in a BSS without the physical equipment present or connected. However, additional mechanisms should be in place to prevent any service connection to any physically non-existent NE/NR or reporting failures from non-existing NE/NR;
- to provide the capability to prevent the erroneous taking into service of a NE/NR which is not fully installed and initialised: whenever a NE/NR is modified (extension or reduction) it shall be taken out of service until the logical part of the procedure is finished. An extended NE/NR cannot be placed into service until all needed parameters and equipment are initialised. Likewise, a reduced NE/NR cannot be placed back into service until the applicable re-configuration is performed.

When the network is up-graded by the addition of NEs or NRs or a change in the configuration, it is essential that the NE/NR can be restored to the configuration which existed before the changes were made. This procedure is called "reversion" and is useful in maintaining service if any difficulty should arise from a network up-grade.

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4.2 Operational context for configuration management

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The CM functions available to the operator need to address various aspects beyond that which might strictly be regarded as management of the network. These include:

- assisting the operator in making the most timely and accurate changes thus avoiding lengthy waiting periods or complex scenarios;
- ensuring that CM actions will not have any secondary effects on the network other than the specified ones;
- providing mechanisms to protect the telephony-related traffic from effects due to CM actions, it shall be possible to inhibit traffic if a traffic affecting CM action is expected and to gracefully release calls prior to the closure of the resource;
- providing mechanisms to overcome data inconsistency problems by logging the modifications for reversion reasons, or to recover through data update from a second source.

4.2.1 Administrative aspects of configuration management

When managing the network by creating, deleting or modifying NEs/NRs, the operator should ensure that there is no uncontrolled impact on the network. The network management system therefore needs to support the following set of management functionalities when addressing various administrative aspects:

- Security;
- Data Validity;
- Data Consistency; and,
- Resource Administration.