# SLOVENSKI STANDARD
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**Prenos in multipleksiranje (TM) ï Generiļ ne zahteve za sinhronizacijska omreģja ï 2-1. del: Arhitektura sinhronizacijskih omreģij, ki temelji na omreģjih SDH**

Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 2-1: Synchronization network architecture based on SDH networks

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*European Standard (Telecommunications series)*

## Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 2-1: Synchronization network architecture based on SDH networks

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# Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Transmission and Multiplexing (TM).

The present document has been produced to provide requirements for synchronization networks that are compatible with the performance requirements of digital networks. It is one of a family of documents covering various aspects of synchronization networks.

The present document is part 2-1 of a multi-part deliverable covering generic requirements for synchronization networks, as identified below:

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Part 1-1: "Definitions and terminology for synchronization networks";

**Part 2-1: "Synchronization network architecture based on SDH networks";**

Part 3-1: "The control of jitter and wander within synchronization networks";

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Part 4-1: "Timing characteristics of slave clocks suitable for synchronization supply to Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) equipment";

Part 4-2: "Timing characteristics of slave clocks suitable for synchronization supply to Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) equipment; Implementation Conformance Statement (ICS) proforma specification";

Part 5-1: "Timing characteristics of slave clocks suitable for operation in Synchronous Digital Hierarchy (SDH) equipment";

Part 6-1: "Timing characteristics of primary reference clocks";

Part 6-2: "Timing characteristics of primary reference clocks; Implementation Conformance Statement (ICS) proforma specification";

Part 7-1: "Timing characteristics of slave clocks suitable for synchronization supply to equipment in local node applications".

Part 2-1 has been revised in several sections with regard to the work done in EG 201 793 [7] and to reflect the present status of synchronization networks.

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# 1 Scope

The present document specifies the architectural principles that should be applied for the design of synchronization networks that are suitable for the synchronization of Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) networks. It supports the construction of synchronization networks that support both the short-term stability requirements of SDH networks and the long-term stability requirements of digital switching networks (e.g. PSTN) connected to the SDH network. It applies to the design of new synchronization networks. It does not characterize existing synchronization networks based on PDH networks.

The present document specifies the rules and architectural principles the implementation of synchronization networks shall follow. This information is supplemented by EG 201 793 [7]. It gives guidance and examples how these rules and architectural principles can be used to set up a synchronization scheme for various network configurations.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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[1] ETSI EN 300 462-1-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 1-1: Definitions and terminology for synchronization networks".

[2] ETSI EN 300 462-3-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 3-1: The control of jitter and wander within synchronization networks".

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[3] ETSI EN 300 147: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH); Multiplexing structure".

[4] ETSI EN 300 462-5-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 5-1: Timing characteristics of slave clocks suitable for operation in Synchronous Digital Hierarchy (SDH) equipment".

[5] ETSI EN 300 462-6-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 6-1: Timing characteristics of primary reference clocks".

[6] ETSI EN 300 462-4-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 4-1: Timing characteristics of slave clocks suitable for synchronization supply to Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) equipment".

[7] ETSI EG 201 793: "Transmission and Multiplexing (TM); Synchronization network engineering".

[8] ETSI EN 300 462-7-1: "Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 7-1: Timing characteristics of slave clocks suitable for synchronization supply to equipment in local node applications".

[9] ETSI EN 300 417-6-1: "Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 6-1: Synchronization layer functions".

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# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 300 462-1-1 [1] apply.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations defined in EN 300 462-1-1 [1] and the following apply:

| | |
|---|---|
| ADM | Add Drop Multiplexer |
| AIS | Alarm Indication Signal |
| NE | Network Element |
| OTN | Optical Transport Network |
| PDH | Plesiochronous Digital Hierarchy |
| ppm | parts per million |
| PRC | Primary Reference Clock |
| PSTN | Public Switched Telephone Network |
| SASE | Stand-Alone Synchronization Equipment |
| SDH | Synchronous Digital Hierarchy |
| SEC | SDH Equipment Clock |
| SETG | SDH Equipment Timing Generator |
| SETS | SDH Equipment Timing Source |
| SSU | Synchronization Supply Unit |
| SSM | Synchronization Status Message |
| STM-N | Synchronous Transport Module N |

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# 4 Synchronization methods

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Master-slave synchronization is appropriate for synchronizing SDH networks and the following material offers guidance on using this method.

Master-slave synchronization uses a hierarchy of clocks in which each level of the hierarchy is synchronized with reference to a higher level. There are four qualities of clock in the synchronization hierarchy shown below:

- Primary Reference Clock (PRC): see EN 300 462-6-1 [5];
- slave clock (transit node): see EN 300 462-4-1 [6];
- slave clock (local node): see EN 300 462-7-1 [8];
- SDH Equipment Clock (SEC): see EN 300 462-5-1 [4].

The PRC is the highest quality hierarchical clock and the SEC is the lowest quality clock. Higher quality clocks shall not be synchronized by lower quality clocks in holdover mode, but clocks in holdover mode can be used to synchronize clocks of the same quality. There are limits on the number of clocks, which can be connected in a synchronization distribution trail (see clause 8). Clock reference signals are distributed between levels of the hierarchy via a distribution network, which may use the facilities of the transport network. The transport network may contain SECs. The distribution of timing between hierarchical node clocks shall be performed using a method, which avoids intermediate pointer processing. Two possible methods are as follows:

a) recover timing from a received Synchronous Transport Module N (STM-N) signal (this avoids the unpredictable effect of a pointer adjustment on the downstream slave clock);

b) derive timing from a synchronization trail that is not supported by a SDH network.

The master-slave method uses a single-ended synchronization technique with the slave clock selecting the synchronization trail to be used as its reference and changing to an alternative if the original trail fails. This is a unilateral control scheme.