SLOVENSKI STANDARD
SIST ES 201 803-2-1 V1.1.1:2005

01-januar-2005

Dinamiļ ni sinhroni prenosni naļ in (DTM) ï 2. del: Karakteristike sistema ï 1. poddel: Vidiki podatkovne povezave

Dynamic synchronous Transfer Mode (DTM); Part 2: System characteristics; Sub-part 1: Data link aspects

Ta slovenski standard je istoveten z: ES 201 803-2-1 Version 1.1.1

ICS:

33.040.40	Podatkovna komunikacijska omrežja	Data communication networks

SIST ES 201 803-2-1 V1.1.1:2005 **en**

ETSI ES 201 803-2-1 V1.1.1 (2002-10)

ETSI Standard

Dynamic synchronous Transfer Mode (DTM); Part 2: System characteristics; Sub-part 1: Data link aspects

Reference
DES/SPAN-130005-1

Keywords
addressing, DTM

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, send your comment to:
editor@etsi.org

Copyright Notification

DECT™, **PLUGTESTS**™ and **UMTS**™ are Trade Marks of ETSI registered for the benefit of its Members.
TIPHON™ and the **TIPHON logo** are Trade Marks currently being registered by ETSI for the benefit of its Members.
3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Services and Protocols for Advanced Networks (SPAN).

The present document is part 2, sub-part 1 of a multi-part deliverable covering Dynamic synchronous Transfer Mode (DTM), as identified below:

Part 1: "System description";

Part 2: "System characteristics";

Sub-part 1: "Data link aspects";

Sub-part 2: "Network aspects";

Sub-part 3: "Transport network and channel adaptation aspects";

Part 3: "Physical protocol";

Part 4: "Mapping of DTM frames into SDH containers";

Part 5: "Mapping of PDH over DTM";

Part 6: "Mapping of SDH over DTM";

Part 7: "Ethernet over DTM Mapping";

Part 8: "Mapping of Frame relay over DTM";

Part 9: "Mapping of ATM over DTM";

Part 10: "Routeing and switching of IP flows over DTM";

Part 11: "Mapping of video streams over DTM";

Part 12: "Mapping of MPLS over DTM";

Part 13: "System description of sub-rate DTM";

Part 14: "Network management".

Introduction

The present document describes the architecture and protocols of signalling and maintenance on the data link layer of the DTM system.

1 Scope

The present document:

- establishes a system for bypass chain management;
- specifies the characteristics of bypass chain management;
- establishes a system for control signalling;
- specifies the characteristics of control signalling;
- establishes a system for bypass chain resource management;
- specifies the characteristics of bypass chain resource management.

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.

[1] ETSI TR 101 287: "Services and Protocols for Advanced Networks (SPAN); Terms and Definitions".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

access token: right to use a slot for transmitting data on a physical interface for a certain number of bypass hops

address, DTM address: 64 bit numerical value that uniquely identifies a node in a DTM network

NOTE: See further anycast address and multicast address.

allocation domain: same as a bypass chain where, if the topology is point-to-point or bus, the last node is not counted as member of the AD

Bypass Chain (BC): series of concatenated physical links, where data can be transported end-to-end using bypass switching

bypass switching: space switching of slots from a receiver to a transmitter on the same physical interface on a per slot basis

channel: set of slots allocated from one source Access node to one or more destination Access nodes in a network

NOTE: The source and destination Access nodes can be the same, i.e. the channel is internal to the node.

channel adaptation: channel path termination function that provides an adaptation between the DTM slot based service and some other traffic service (such as word stream, bit stream or asynchronous packets)

Channel Multiplexing Identifier (CMI): identifier by DCAP-1 used for multiplexing packets of different protocols on a single channel

control channel: channel used for DTM control signalling

data channel: channel used for transport data between interworking functions

DTM network address, DTM address: See definition of "address, DTM address".

DTM Service Type (DST): identifying the type of interworking function to be associated with the channel

DTM Service Type Instance (DSTI): identifying which interworking function of a specific type to be addressed by the channel

physical interface address: globally unique identifier of a physical interface that is represented as a 48-bit MAC address

master physical interface: physical interface in the allocation domain having the lowest physical interface address

multicast address: address used to represent all nodes belonging to a multicast group

network address: an address to be used in the network layer of the ISO OSI model

NOTE 1: A network address may take on different forms depending on which protocol is being used in the network layer.

NOTE 2: See also DTM network address.

node: network element containing DTM functions

node control channel: dynamically established control channel from one node to one or more other nodes on the same bypass chain

node identity: identifier that uniquely identifies a node over a global scope

ownership: responsibility to supervise an access token of a slot

physical interface: interface between two equipments

NOTE: Adopted from TR 101 287 [1].

physical link: unidirectional connection between the transmitter of one physical interface and the receiver of another physical interface

quark: smallest resource unit that is one slot wide and one physical link long

NOTE: Used to model dynamic resource management on a bypass chain.

return physical interface: physical interface that receives reply messages from a neighbouring node

switch: node that is capable of switching slots from one physical interface to another

slot: time slot within a frame, capable of transporting 64 bits of data or a number of special codes

topology: specific physical, i.e. real, or logical, i.e. virtual, arrangement of the elements of a network

NOTE: Two networks have the same topology if the connection configuration is the same, although the networks may differ in physical interconnections, distances between nodes, transmission rates, and/or signal types.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AD	Allocation Domain
aTSF	Trail Signal Failure action
BC	Bypass Chain
BCC	Bypass Chain Change
CMI	Channel Multiplexing Identifier
DCAP	DTM Channel Adaptation Protocol
DCC	DTM Control Channel function
DCFF	DTM Control Filtering and Forwarding
DCP	DTM Channel Protocol
DLSP	DTM Link State Protocol
DO	Dynamic Ownership
DPP	Detection Point Processing
DRP	DTM Routing Protocol
DRMP	DTM Resource Management Protocol
DSI	DownStream physical Interface
DST	DTM Service Type
DSTI	DTM Service Type Instance
DSYP	DTM SYnchronization Protocol
DTM	Dynamic synchronous Transfer Mode
FIFO	First In First Out
ID	IDentity
II	physical interface address
PrRpy	Probe Reply
QRequest	Quark Request
QReturn	Quark Return
QT	Quark Transfer
SDL	Standard Description Language
TDM	Time Division Multiplex
USI	Upstream Physical interface

4 Data link management system overview

A DTM network is composed of connected DTM nodes. A DTM node has one instance of the DTM protocol stack, and one or several physical interfaces. The technology support TDM switching and add/drop/bypass switching resulting in that the physical links of the nodes can be connected forming for example rings. The nodes can then be further connected to form a meshed network consisting of for example rings, point-to-point links and buses. The present document describes the management of data links. Throughout the present document, a DTM node is drawn as in figure 1, when topologies are shown. The picture shows a DTM node named 'B', with two physical interfaces, named B:1 and B:2.

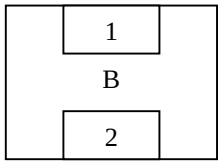


Figure 1: Node representation

4.1 Physical interfaces and physical links

A physical interface has a receive side and a transmit side. One property of the physical interfaces is that time slots can be bypass switched, in which data from a time slot on the receive side, is transparently copied to the same time slot on the transmit side of the physical interface. Bypass switching is default behaviour for time slots unless they are explicitly used for transmitting data on.

Slot 0, which is the first time slot in each DTM frame, is always used for transmitting data on and is thus never bypass switched.

A physical link, the smallest topological unit in a DTM network, is the direct connection from the transmit side of a physical interface to the receive side of a physical interface. In the real world, the physical link is typically synonymous to a fibre.

Since physical links are unidirectional, an arrow is used to depict the direction of data flow. Figure 2 shows DTM nodes A and B, connected with a physical link from A:1 to B:1.

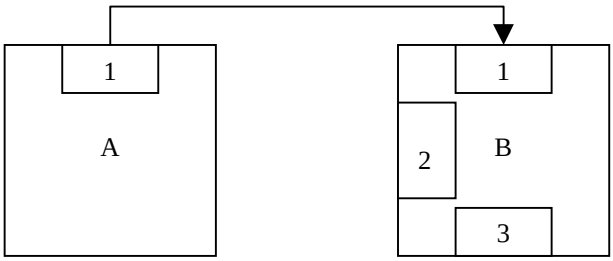
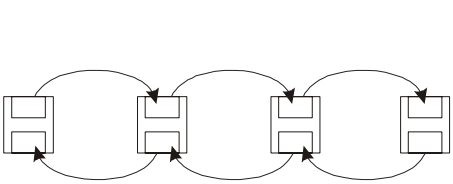


Figure 2: Physical links

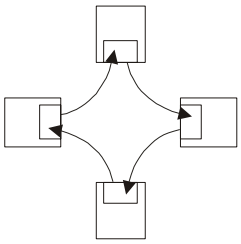
Some times physical interface B:1 is said to be downstream of physical interface A:1, and A:1 upstream of B:1.

4.2 Bypass chains

When the physical links are connected such that data can be bypass switched in a circle, the full circle of physical links is referred to as a looped bypass chain. When physical links are connected such that data can be transferred through bypass switching, but not in a circle, the full range from the unconnected receive side to the unconnected transmit side, is called an open-ended bypass chain. In figure 3, a few examples of bypass chains are shown.



Two open ended bypass-chains
forming a double-bus



Ring
(closed bypass-chain)

Figure 3: Bypass chains

DTM signalling is bi-directional, which means that single open-ended bypass chains are useless. Bypass chains cannot be discovered or used, unless they together allow bi-directional communication. All looped bypass chains allow bi-directional communication.

A number of ways of combining bypass chains that allow bi-directional communication are common enough to have been given names, see figure 4.

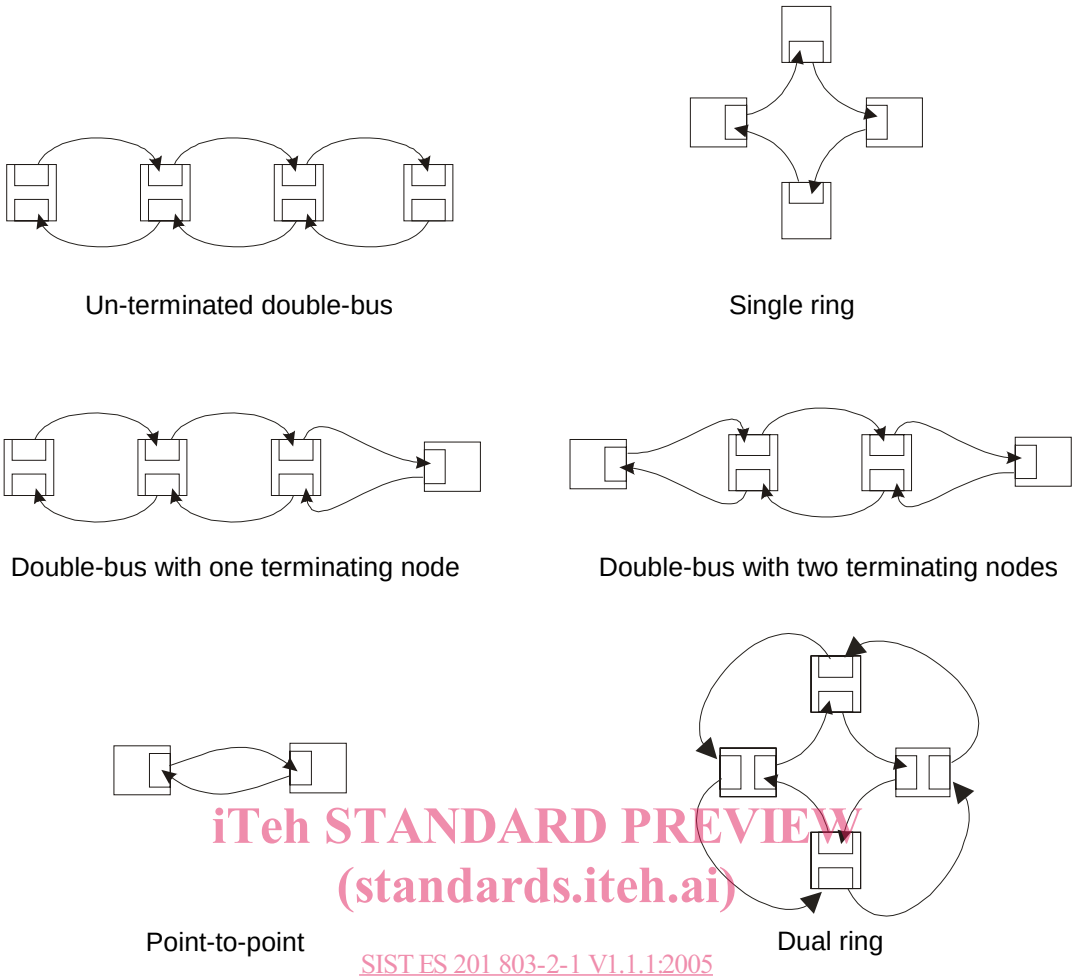


Figure 4: Combination of bypass chains

These are not the only valid combinations, however, and it is perfectly legal to add extra bypass chains to all the above, or to build completely different topologies, as long as the bypass chains follow two simple rules.

- All circular bypass chains are legal.
- For all open-ended bypass chains, there must be at least one physical link in the opposite direction for every physical link that constitutes the open-ended bypass chain.

For invalid combinations, all circular bypass chains are still usable.

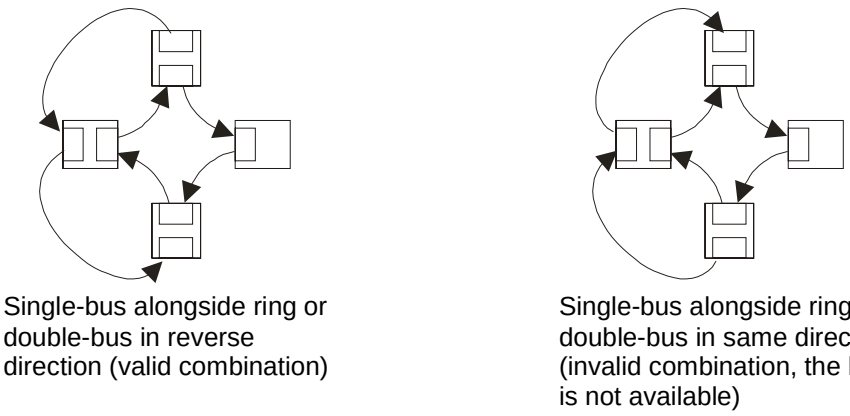


Figure 5: Example of valid and invalid combinations of bypass chains

The services and protocols described in the present document all operate on bypass chains and deal with physical interfaces rather than DTM nodes.

4.3 Control Services

DTM provides two types of control services that the protocol stack uses for communicating with peering nodes. The Slot-0 service for unidirectional communication over a physical link, and the DTM Control Channel service, DCC, which allows communication over bypass chains. The Slot-0 service is both used for start up communication for some functions and as the normal communication for system critical functions. The DCC service provides a more efficient service with more capacity and shorter delay for communicating over a bypass chain with several physical interfaces connected.

4.4 Topology Management

The DTM system automatically discovers of topologies of the bypass chains, and monitors changes in their topology. This function is handled by the DTM Link State Protocol (DLSP), which discovers and monitors all valid combinations of bypass chains. DLSP also discovers when new nodes are added to the network and when nodes fail. DLSP operates as a continuous monitoring process. One important aspect of topology management is to allow for topology changes with a minimum of disturbance of the network.

4.5 Resource Management

The DTM Resource Management Protocol (DRMP) handles control of transmission resources over bypass chains. Resource Management handles the right to use a time slot for transmission and the right to administer usage rights. The latter function is referred to as slot ownership.

A physical interface owns a set of time slots on the bypass chain. The owner of a time slot has the right to use it for transmission, but can also lend the right to another physical interface if it is in greater need. Ownership can either be statically configured on a bypass chain, or dynamic. In the latter case, the Dynamic Ownership part of DRMP, distributes ownership along the physical interfaces on the bypass chain according to a configured policy. Typically the physical interfaces are configured to own an equal share that exhausts the capacity of the bypass chain.

The right to transmit on a time slot can be limited spatially, so as to cover only as many physical links as is needed on a bypass chain for the intended transmission. On the next physical link downstream of the receiver, and the next physical link upstream of the transmitter, the same time slot can be used again for other data transmissions. This spatial reuse of time slots is referred to as slot scoping.

5 Slot-0 Service

5.1 Functionality

Slot-0 is a simple mechanism to send messages to the next directly connected downstream node.

5.1.1 The Slot-0 data transport

The Slot-0 service can receive and allow transmission of data on Slot-0 for all physical interfaces on a node. The first slot in a DTM frame, slot number zero, must never be bypassed by the physical interfaces. This is to ensure that a message from an upstream node only reaches the first downstream node on the physical link.

5.1.2 Control traffic over Slot-0

Slot-0 does not contain any addressing information. The messages must be formatted according to DCAP-1. There are no other restrictions on the payload of the control message being transported. When a message is received, the received message is forwarded to the Slot-0 client, if there is a client that corresponds to the Channel Multiplexing Identifier (CMI) number in the message header. If the CMI number is not known the message is discarded. The Slot-0 service shall under no circumstances retransmit received messages on any physical interface.