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MTP3

The mtp module implements ITU-T Recommendation Q.704 (Signalling System No.7 - Signalling network functions and messages) [1]. This Message Transfer Part level 3 (MTP3) is responsible for the routing of signal units between all signalling points.

1 Introduction

This documentation describes architecture and implementation solutions of MTP3 using the services of ITU-T Recommendation Q.2140 [2]. This interaction is specified in ITU-T Recommendation Q.2210 [3]. MTP3 describes functions and procedures for and relating to the transfer of messages between signalling points, which are the nodes of the signalling network. Recommendation Q.2140 specifies a function that is part of the ATM Adaptation Layer to support signalling (SAAL) at the Network Node Interface (NNI) of the B-ISDN (Broadband Integrated Services Digital Network).

MTP3 provides reliable messages transferring between signalling points and signalling transfer points. It takes care of message routing, delivers messages to corresponding user parts in a level four, informs link failures and reorganizes message routes when link failures occur.

2 Architecture

In traditional SS7 (Signalling System No. 7) network, MTP3 stays on top of message transfer part level two (MTP2), specified in Recommendation Q.703. But in ATM architecture there is AAL connections in the lower side of the MTP3 according to Recommendation Q.2140. Right AAL connection is selected according to a routing table in MTP3. Different user parts like BISUP (B-ISDN User Part) and SCCP (Signalling Connection Control Part) can be connected to an upper side of MTP3. The user part is selected according to a service indicator field in the MTP3 user part message.

MTP3 consist of many functional blocks (figure 1). A message handling part is composed of three simple blocks (message discrimination, distribution and routing), but signalling network management is composed of three very complex functional blocks (signalling traffic, route and link management blocks). In this version of MTP3, only the message handling part is implemented (the grayish area of the figure 1).

The figure 1 shows signalling network functions and a structure of MTP3 specified in ITU-T Recommendation Q.704.

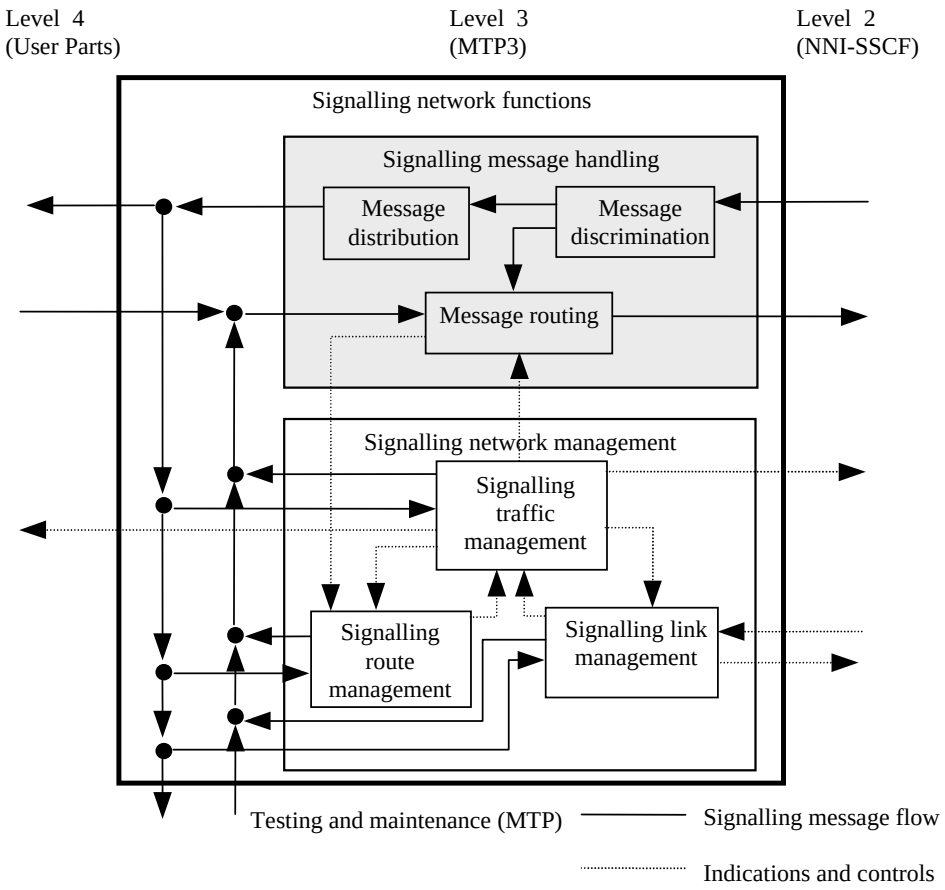

Figure 1. Signalling Network Functions.

2.1 Class hierarchy

MTP3 messages are transmitted through the Message Handling, and other blocks communicate with each other using control signals. OVOPS++ multiplexer is not very suitable for this kind of many-to-many communication.

A Mediator pattern (Design Patterns (273) [4]) is used to handle communication between functional blocks. Each block is a protocol conduit with own state machine. Blocks have a base class (mtp3Colleague). The mediator object (mtp3Protocol) has all blocks as attributes and each block has a pointer to the mediator, in this way blocks can communicate with each other through the mediator. This local communication is synchronous. The MTP3 protocol (mediator) conduit has also a state machine, which receives incoming primitives and directs them to the right block in the mediator hierarchy.

A MTP3 initialization, like point code or routing table configuration, is implemented in separate configuring object (ss7Configure). A proxy to the configuring object implementation is given as parameter, when MTP3 is created.

Following figure2 shows the mediator class hierarchy of needed blocks.

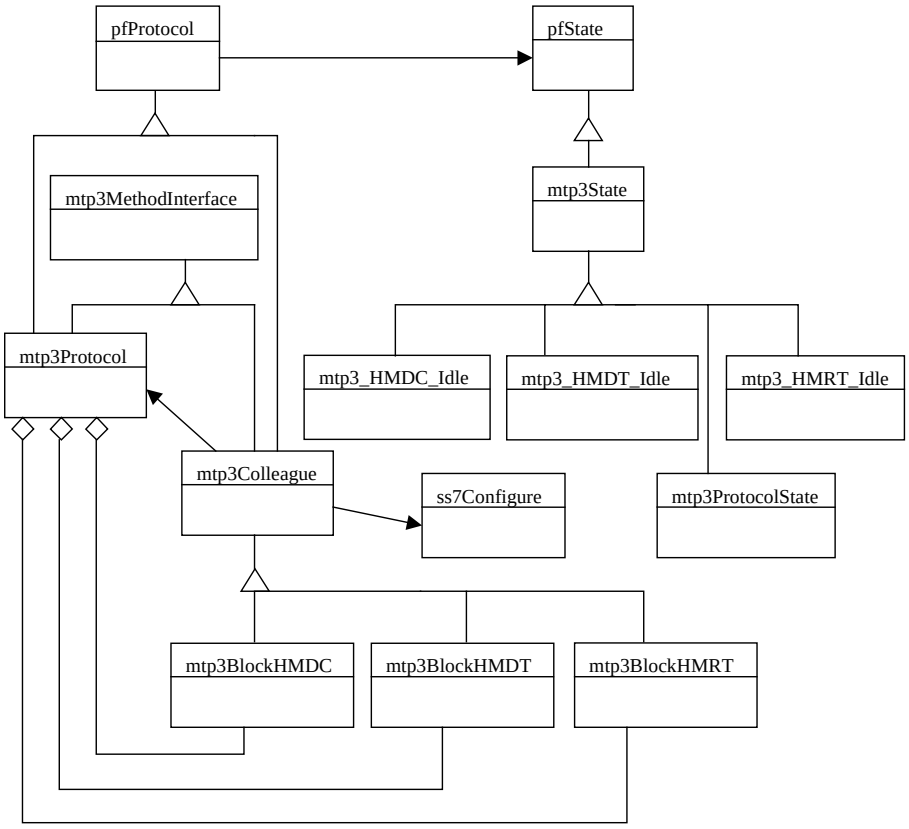

Figure 2. The Mediator class hierarchy.

Because MTP3 handles routing between signalling points and user parts, there are two multiplexers, one for AAL connections and one for different user parts. User parts and AAL connections can be connected to the corresponding multiplexer using a special configuring transporter (mtpConfigTransporter). A figure 3 shows how MTP3 is connected to other protocol conduits.

3 Implementation details

Outgoing messages from MTP3 to the AAL multiplexer have additional identifier field (in storage). This AAL identifier is set in the MTP3 to indicate to which AAL connection the message should be delivered.

Configuring values for MTP3 are defined in a common module (ss7defs.h). Non-standard value (00001011) is used for INAP as a sub system number.

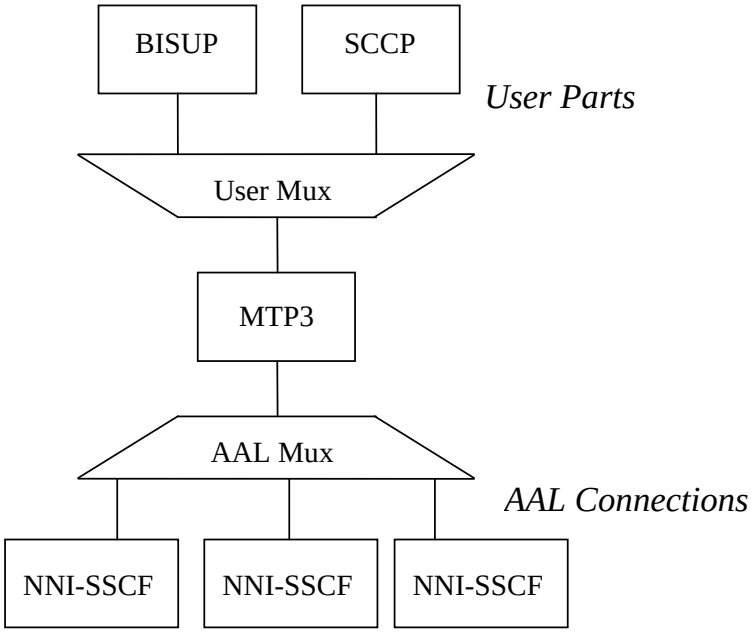

Figure 3. MTP3 in a counduit graph.

4 Features implemented

Only the message handling part is implemented in this version of MTP3. The message handling includes the message discrimination (HMDC), message distribution (HMDT) and message routing (HMRT) blocks. Only primitives to carry user part PDUs (see figure 4) and coding functions for MTP3 parameters are implemented. MTP3 PDUs and signals are used only in Signalling Network Management block, and therefore not needed in this version of MTP3. All actions in the message handling blocks that is related to signalling network management is not implemented (e.g. routing failure).

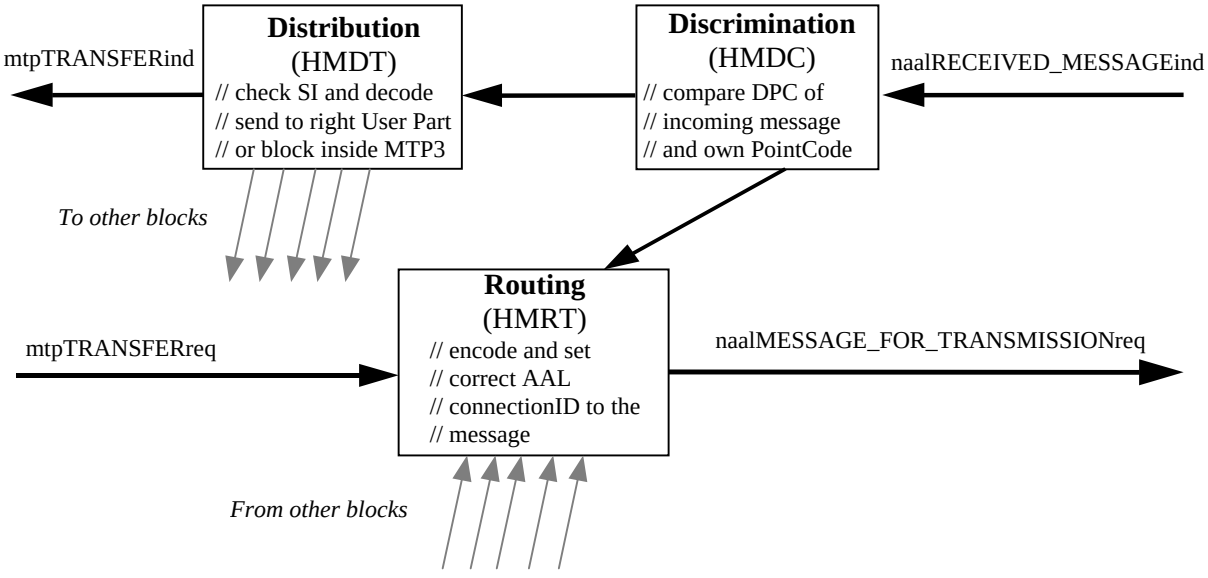

Figure 4. Signalling message handling.

When a message is received from level 2, the message discrimination function is activated, in order to determine whether it is destined to another signalling point. If the message is destined to the receiving signalling point, the message distribution delivers it to the appropriate user part (or local network management functions, not implemented). If the message is not destined to the receiving signalling point, which has a transfer capability, the message has to be transmitted on an outgoing link according to the routing function.

5 Known limitations

There are no other known limitations except that signalling network management is not implemented as described in previous chapter.

6 Future development

The signalling network management could be implemented.

7 References

[1] ITU-T Recommendation Q.704, Signalling System No.7 - Signalling network functions and messages, 03/93.

[2] ITU-T Recommendation Q.2140, B-ISDN ATM Adaptation Layer - Service Specific Coordination Function for Signalling at the Network Node Interface (SSCF at NNI), 02/95.

[3] ITU-T Recommendation Q.2210, Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140, 07/96.

[4] E. Gamma, R. Helm, R. Johnson, J. Vlissides. Design Patterns. Addison-Wesley, 1995.