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Prizemni snopovni radio (TETRA) - Digitalne naprednejše brezžične storitve (DAWS) - Opis logične krmiljenja povezav (LLC)

Terrestrial Trunked Radio (TETRA); Digital Advanced Wireless Service (DAWS); Logical Link Control (LLC) service description

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Contents

Intellectual Property Rights 5
Foreword 5
1 Scope 6
2 References 6
3 Definitions and abbreviations 6
3.1 Definitions 6
3.2 Abbreviations 7
4 Introduction 7
5 Registration Services 8
5.1 Base station registration 8
5.2 Mobile station registration 9
5.2.1 Cell selection 9
5.2.2 Registration 9
5.2.3 Service interruption 9
5.2.4 Intra-network hand-over 10
5.2.5 Inter-network hand-over 10
5.3 De-registration 10
6 Transport Services 11
6.1 Link layer address resolution 11
6.2 Packet classification 11
6.3 Traffic measurement, policing, and shaping 11
7 Admission Control Services 12
7.1 Reservation creation procedure 12
7.2 Reservation deletion procedure 13
7.3 Reservation modification procedure, resource increase 13
7.4 Reservation modification procedure, resource decrease 13
8 Service Primitives 14
8.1 Primitive Definitions 14
8.1.1 LLC_transfer_request 14
8.1.2 LLC_transfer_confirm 14
8.1.3 LLC_transfer_indication 14
8.1.4 LLC_create_protocol_request 15
8.1.5 LLC_create_protocol_confirm 15
8.1.6 LLC_create_protocol_indication 15
8.1.7 LLC_delete_protocol_request 16
8.1.8 LLC_delete_protocol_confirm 16
8.1.9 LLC_delete_protocol_indication 16
8.1.10 LLC_service_indication 16
8.2 Parameter Definitions 17
8.2.1 create_protocol_result 17
8.2.2 delete_protocol_result 17
8.2.3 new_service_state 17
8.2.4 *NPDU* 17
8.2.5 packet_classification_params 17
8.2.6 protocol_instance_ID 17
8.2.7 protocol_parameters 18
8.2.8 protocol_type 18
8.2.9 service_parameters 18
8.2.10 transfer_receipt_ack 18

Annex A (informative): The IPv4 to IPv6 Transition 19
Bibliography 22
History 23

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Foreword

This Technical Specification (TS) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA).

An overview of the requirements for DAWS can be found in TR 101 156.

1 Scope

The present document specifies the service requirements for the Digital Advanced Wireless Service (DAWS) Logical Link Control (LLC) layer. The present document provides a conceptual architecture useful for specifying requirements but is not intended to imply a particular implementation. The present document contains preliminary LLC protocol requirements which will be moved into the formal LLC protocol specification document (Part 6) when it is drafted.

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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, subsequent revisions do apply.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] TR 101 156: "Terrestrial Trunked Radio (TETRA); Technical requirements specification for Digital Advanced Wireless Service (DAWS)".

[2] TS 101 659: "Terrestrial Trunked Radio (TETRA); Digital Advanced Wireless Service (DAWS); Medium Access Control (MAC); Requirements Specification".

[3] Void.

[4] Void.

[5] IETF RFC 2211: "Specification of the Controlled-Load Network Element Service".

[6] IETF RFC 2205: "Resource Reservation Protocol (RSVP) – Version 1 Functional Specification".

[7] IETF RFC 2215: "General Characterization Parameters for Integrated Service Network Elements".

3 Definitions and abbreviations

3.1 Definitions

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

base station: piece of equipment providing simultaneous, bi-directional network access to mobile stations.

downlink: general term meaning "from the base station to the mobile station".

flow: sequence of data packets originating from a single source and addressed to the same destination for which special handling by intervening routers is desired.

mobile station: piece of equipment able to create and consume data but only having network access via a base station.

protocol data unit: set of parameters and/or data passed from peer to peer by a protocol primitive.

protocol instance: two protocol processes which exchange messages in order to transfer data from one protocol process to the other.

protocol primitive: request, response, or informative message sent from peer to peer.

protocol process: entity created to manage one end of a peer-to-peer protocol. For unidirectional data flows, a protocol process can be further described as either a sender process or a receiver process.

service data unit: set of parameters and/or data passed between adjacent layers by a service primitive.

service primitive: request, response, or informative message sent between adjacent layers.

uplink: general term meaning "from the mobile station to the base station".

3.2 Abbreviations

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

ACK	Acknowledged
BEP	Best-Effort Plus
BS	Base Station
DAWS	Digital Advanced Wireless Service
DL	Downlink
GW	Gateway
IP	Internet Protocol
LLC	Logical Link Control
LLC_ADM	LLC Admission Control Service
LLC_REG	LLC Registration Service
LLC_TPT	LLC Transport Service
LPDU	LLC Protocol Data Unit
MAC	Medium Access Control
MS	Mobile Station
MSH	Mobile Station Handle
MSI	Mobile Station Identifier
NWK	Network
PDU	Protocol Data Unit
QOS	Quality Of Service
RSVP	Resource Reservation Protocol
SAP	Service Access Point
SDU	Service Data Unit
SW	Switch
UL	Uplink

4 Introduction

The DAWS protocol architecture is provided in TR 101 156 [1]. The Logical Link Control (LLC) provides services to the network layer (NWK) and requests services from the Medium Access Control (MAC) TS 101 659 [2]. The present document provides the requirements the LLC service has to satisfy to operate successfully within a Digital Advanced Wireless Service (DAWS) network. As described in TR 101 156 [1], LLC functionality may be distributed across several DAWS nodes. The following prefixes will be used to specify the scope of a requirement:

- LLC - the requirement applies to the LLC in general;
- GW_LLC - the requirement applies to Gateway functionality;
- SW_LLC - the requirement applies to Switch functionality;
- BS_LLC - the requirement applies to Base Station functionality;
- MS_LLC - the requirement applies to Mobile Station functionality.

Figure 1 shows the architecture of the LLC for the minimum complexity DAWS network described in TR 101 156 [1]. The network layer (NWK) accesses LLC services via service access points (SAPs) A and B. LLC_SAP_A is for data transfer service primitives and LLC_SAP_B is for local control and status service primitives, including RSVP IETF RFC 2205 [6] operations.

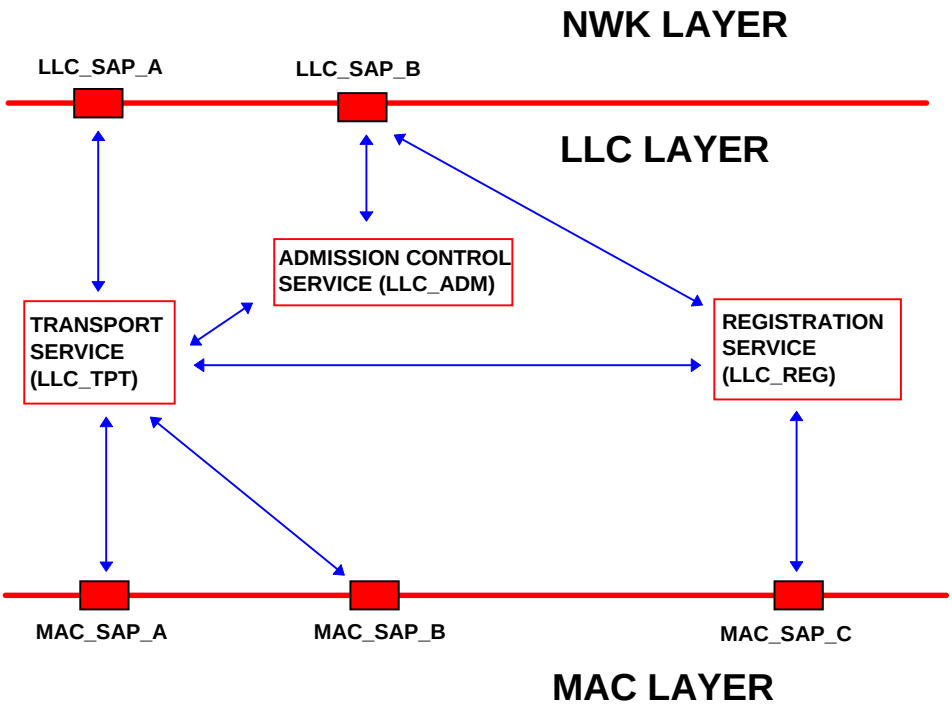

Figure 1: DAWS LLC Architecture

The LLC accesses MAC services via service access points A, B, and C. MAC_SAP_A is for service primitives relating to PDU transfers using an unacknowledged protocol; MAC_SAP_B is for service primitives relating to PDU transfers using an acknowledged protocol; and MAC_SAP_C is for local control and status service primitives.

Requirements for the registration, admission control, and transport services are provided in clauses 5, 6, and 7. Service primitives and associated service data units are provided in clause 8. Annex A discusses the IPv4 to IPv6 transition.

5 Registration Services

The LLC registration service (LLC_REG) supports BS registration, MS registration, and de-registration operations.

5.1 Base station registration

Every DAWS GW is assigned a globally unique identifier called the GWI. The GWI shall be assigned when the GW is manufactured and shall not be dynamically alterable. The GW address space shall be administered by an industry body to prevent GWI address duplication among manufacturers.

Every DAWS BS is assigned a globally unique identifier called the BSI. The BSI shall be assigned when the BS is manufactured and shall not be dynamically alterable. The BSI address space shall be administered by an industry body to prevent BSI address duplication among manufacturers.

Before a DAWS BS can provide wireless access service to a MS, the BS must register with a DAWS GW. BS registration usually occurs immediately after BS power-on, and is composed of the following steps:

1) BS_LLC sends a BS registration request message toward the GW via the next upstream switch;

2) SW_LLC adds the binding (BSI, output_interface) to its routing table, and forwards the BS registration request toward the GW. For simplicity, this example will assume only one upstream switch, so the next node will be the GW;

3) GW_LLC adds the binding (BSI, output_interface) to its routing table, and sends a BS registration response toward the BS. The BS registration response contains the GWI of the GW;

4) SW_LLC forwards the BS registration response towards the BS;

5) BS_LLC begins providing wireless access to MS within its cell. The BS regularly broadcasts the GWI of its serving GW and its own BSI in a system information message to all MS within the serving cell. Mobile Stations use GWI information during the hand-over procedure to differentiate between intra-network and inter-network hand-overs.

The size of the routing table within a DAWS switch is independent of the number of MS served by the DAWS network. The routing table size is proportional to the number of BS in the network.

A DAWS network shall automatically correct its routing table entries if the network topology changes. Manual intervention by the system administrator shall not be required.

5.2 Mobile station registration

5.2.1 Cell selection

When an MS is powered on, MS_LLC_REG shall issue a request to MS_MAC_REG to do a scan of available cells and report the results. MS_LLC_REG shall select the best cell and instruct MS_MAC_REG to camp on the cell. MS_LLC_TPT is then able to exchange PDUs with BS_LLC_TPT using the unacknowledged protocols.

5.2.2 Registration

After cell selection, MS_LLC automatically registers with BS_LLC. MS_LLC registration with a BS involves the following steps:

1) MS_LLC obtains the BSI of the BS and GWI of the GW serving the BS from a system information message;

2) MS_LLC sends a registration request to BS_LLC, providing its MSI;

3) BS_LLC generates a MSH for the MS and adds the binding (MSI, MSH) to its registration table;

4) BS_LLC generates two protocol instance identifiers for the ACK_BE_UL and a ACK_BE_DL protocol instances;

5) BS_LLC creates ACK_BE_UL and ACK_BE_DL protocol processes in BS_MAC;

6) BS_LLC sends a registration response message containing the MSH and protocol instance identifiers to MS_LLC;

7) MS_LLC stores its assigned MSH for future uplink and downlink signalling with the BS;

8) MS_LLC creates ACK_BE_UL and ACK_BE_DL protocol processes in MS_MAC;

9) MS_LLC sends a service indication message to MS_NWK indicating that LLC registration is complete, providing the registration triplet (GWI, BSI, MSI).

The MS is now able to exchange PDUs with the BS using the two best-effort acknowledged protocols ACK_BE_UL and ACK_BE_DL. MS_NWK can create additional protocol instances by the procedures described in clause 7.

5.2.3 Service interruption

When MS_LLC receives a service interruption indication from MS_MAC, MS_LLC sends a service indication interruption to MS_NWK. MS_NWK will report the service interruption to higher layers in the protocol stack and will discard uplink traffic until service is restored.

When MS_MAC indicates that service is restored, MS_LLC will re-register with BS_LLC and send a service indication message to MS_NWK indicating that LLC service is available. The triplet (GWI, BSI, MSI) reported during the prior registration will be reported again to MS_NWK, indicating that the serving BS and GW have not changed. If the duration of the LLC service interruption is sufficiently short, MS_NWK will not need to re-register with GW_NWK.