# Working Implementation Agreements for Open Systems Interconnection Protocols: Part 3 - Network Layer

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## Foreword

This part of the Working Implementation Agreements was prepared by the Lower Layers Special Interest Group (LLSIG) of the National Institute of Standards and Technology (NIST) Workshop for Implementors of Open Systems Interconnection (OSI). See Procedures Manual for Workshop charter.

Text in this part has been approved by the Plenary of the Workshop. This part replaces the previously existing chapter on this subject. There are some significant technical changes to this text as previously given.

Future changes and additions to this version of these Implementor Agreements will be published as a new part. Deleted and replaced text will be shown as strikeout. New and replacement text will be shown as shaded.

# Table of Contents

# Part 3 - Network Layer

**Editor's Note -** All references to Stable Agreements in this Section are to Version 4 .

## 0 Introduction

(Refer to Stable Implementation Agreements Document)

## 1 Scope

(Refer to Stable Implementation Agreements Document)

## 2 Normative References

## 3 Status

This material is current as of December 14, 1990.

## 4 Errata

Errata are reflected in pages of Version 4, Stable Document.

## 5 Connectionless-Mode Network Service (CLNS)

### 5.1 ISO 8473

Subsets of the protocol:

(Refer to the Stable Implementation Agreements Document).

Mandatory Functions of ISO 8473:

(Refer to the Stable Implementation Agreements Document).

Optional Functions of ISO 8473:

(Refer to the Stable Implementations Agreements document).

Intermediate systems implementing priority shall do so as described below. For End system network entities the implementation of priority is optional, but if implemented it shall also be done as described below:

a) NPDUs shall be scheduled based on the priority functions of ISO 8473. The scheduling algorithm for achieving this priority function is left as a local matter. It is required that the following constraints be met as described below:

1) An NPDU of lower priority shall not overtake an NPDU of higher priority in an intermediate system (i.e., exit an IS ahead of a higher priority NPDU arriving before it);

2) A minimum flow shall be provided for lower priority PDUs.[1];

b) According to ISO 8473, the priority level is a binary number with a range of 0000 0000 (lowest priority) to 0000 1110 (highest priority level). Within this range, the four abstract values corresponding to the four levels defined in section 3.11 shall be encoded as follows:

1) "high reserved" priority will be encoded with value 14 ( 0000 1110);

2) "high" priority will be encoded with value 10 ( 0000 1010);

3) "normal" priority will be encoded with value 5 ( 0000 0101);

4) "low" priority will be encoded with value "zero" ( 0000 0000);

5) For a receiving network entity, a value lower than 5 shall be considered as "low"; a value lower than 10 and higher than 5 shall be considered as "normal", and a value lower than 14 and higher than 10 shall be considered as "high";

c) Network entities supporting priority shall process PDUs in which the priority parameter is absent as either "low", "normal", or "high" according to a locally configurable parameter. This is to ensure that NPDUs not containing the priority parameter can be processed by intermediate systems in a defined manner with respect to those which do contain the priority parameter;

d) IEEE 802.4 and IEEE 802.5 local area networks as well as some X.25 networks implementations have the ability to support subnetwork priorities. When available, a subnetwork priority function should be utilized in support of the priority requested of the network layer. The mapping of network layer priority levels onto subnetwork priority levels is a local configuration matter.

## 5.2 Provision of CLNS over Local Area Networks

(Refer to the Stable Agreements Document)

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[1] The scheduling algorithm by which this is accomplished is for further study.

## 5.3 Provision of CLNS over X.25 Subnetworks

(Refer to the Stable Agreements Document)

## 5.4 Provision of CLNS over ISDN

(Refer to the Stable Implementation Agreements document).

## 5.5 Provision of CLNS over Point-to-Point Links

(To be based on ISO 8880)

# 6 Connection-Mode Network Service

## 6.1 Mandatory Method of Providing CONS

### 6.1.1 General

(Refer to the Stable Implementation Agreements document).

### 6.1.2 X.25 WAN

(Refer to the Stable Implementation Agreements document).

### 6.1.3 LANs

(Refer to the Stable Implementation Agreements document).

### 6.1.4 ISDN

(Refer to the Stable Implementation Agreements document).

### 6.1.5 Priority

Priority for CONS will be addressed with the implementation of X.25-1988 in a future version of these agreements.

## 6.2 Additional Option: Provision of CONS over X.25 1980 Subnetworks

(Refer to the Stable Implementation Agreements Document)

## 6.3 Agreements on Protocols

(Refer to the Stable Implementation Agreements Document)

### 6.3.1 ISO 8878

(Refer to the Stable Implementation Agreements Document.)

### 6.3.2 Subnetwork Dependent Convergence Protocol (ISO 8878/Annex A)

(Refer to the Stable Implementation Agreements Document)

## 6.4 Interworking

(Refer to the Stable Implementation Agreements Document.)

# 7 Addressing

(Refer to the Stable Implementation Agreements Document)

Within routing domains intending to operate using the IS -IS Intradomain Routing Protocol defined in ISO/DIS 10589 and where an address is in the context of 10589, it is recommended that the DSP have a binary abstract syntax and that the last nine octets are structured as follows:

| AREA | ID | N-SELECTOR |
|---|---|---|
| 2 octets | 6 octets | 1 octet |

**Figure 1 - Partial Structure of DSP**

where the AREA field identifies a unique subdomain of the routing domain, the ID field identifies a unique system within an area, and an N-SELECTOR identifies a user of the Network Layer Service.

d) End Systems and Intermediate Systems operating in routing domains that employ the ISO/DIS 10589 Intra-domain Routing Protocol shall meet the NSAP/NET addressing requirements specified in ISO 10589 (clause 7.1) and clause 8.3 of these agrements".

# 8 Routing

## 8.1 ISO 9542 End System to Intermediate System Routing

(Refer to the Stable Implementation Agreements Document.)

To provide additional capabilities for using the redirection subset of ISO 9542 in X.25 subnetworks, the following changes to clause 8.1 of the Stable Implementation Agreements are to be made:

a) In the first sentence, delete the words "over LANs (refer to part 2, clause 5) and point-to point links";

b) Add to agreement b a new sentence, "For X.25 subnetworks, Route Redirection Information shall be supported";

c) Add to the end of agreement h:

- "On X.25 subnetworks, it is a DTE address, each digit being binary coded in a semi-octet, and, if there are an odd number of digits, an additional semi-octet set to the value 1111 shall be added at the end".

## 8.2 ISO 10030 End System to Intermediate System Routing

(Refer to the Stable Implementation Agreements Document.)

## 8.3 Intra-Domain Intermediate Systems to Intermediate Systems Routing

The protocol used to provide Intermediate System to Intermediate System routing in support of the CLNS (refer to clause 3.5) among systems in a single routing domain shall be ISO DIS 10589.

The following agreements apply to the use of ISO DIS 10589:

a) A management mechanism capable of configuring the Identifier, Characteristic, and Status attributes of the managed objects of clause 11 shall be provided;

b) The implementation shall support a system identifier (ID) length of 6 octets and shall use this value as a default.

### 8.4 Inter-Domain Intermediate Systems to Intermediate Systems Routing

(Refer to Stable Implementation Agreements Document.)

# 9 Procedures for OSI Network Service/Protocol Identification

## 9.1 General

(Refer to the Stable Implementation Agreements document).

## 9.2 Processing of Protocol Identifiers

(Refer to the Stable Implementation Agreements document).

### 9.2.1 Originating NPDUs

(Refer to the Stable Implementation Agreements document).

### 9.2.2 Destination System Processing

(Refer to the Stable Implementation Agreements document).

### 9.2.3 Further Processing in Originating End System

(Refer to the Stable Implementation Agreements document).

## 9.3 Applicable Protocol Identifiers

(Refer to the Stable Implementation Agreements document.)

# 10 Migration Considerations

This section considers problems arising from evolving OSI standards and implementations based on earlier versions of OSI standards.

# 11 Use of Priority[2]

## 11.1 Introduction

Within the OSI environment, Quality of Service (QoS) parameters are intended to influence the qualitative behavior of the various OSI Layer entities. QoS is described in terms of parameters related to performance, accuracy, and reliability (e.g. delay, throughput, priority, error rate, security, failure probability, and etc.).

QoS covers a broad spectrum of issues. As a first step, these agreements address the efficient sharing of Layer 1, 2, & 3 transmission resources by making use of the priority parameter. To accomplish this, implementation agreements and encodings are provided for Network and Transport Layer protocols. The implication of these agreement for upper layer protocols is limited to the conveyance of priority information in both directions between an application entity and the service boundary for the Transport Layer.

The implementation of priority as defined herein is optional for intermediate systems and end systems, but if implemented shall be as defined in the layer specific agreements (for Network Layer see clause 5.1; for Transport Layer see part 4, clause 5.1.2.6, and for Upper Layers the clause will be included at a later date).

## 11.2 Overview

The purpose of the priority parameter, in the context of the lower layers, is to influence the scheduling of the transmission of data on subnetworks, in CONS as well as CLNS environments (end systems as well as intermediate systems). The priority parameter as defined is to be used by OSI Applications to control the "priority of data". Within the lower layers this translates into a contention for transmission resources, which has a direct impact on performance.

In order to implement practical mechanisms for scheduling the transmission of data units while maintaining the usefulness of priority, the specification of priority levels is limited to four; one corresponding to each of the four service classes:

a) low priority

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[2] This section provides initial proposals on the use of priority. The proposal requires further technical review before considering it as having support as an implementation agreement. Refer to the following documents for further technical information:

LLSIG 88–64 LLSIG 88–120 LLSIG 88–122

b) normal priority

c) high priority

d) high reserved priority

The high reserved priority level is intended primarily for OSI network management purposes. The three lower priority levels are intended for information exchange by users.

These four priority levels are used, from an applications point of view, in the various communications lower layers (Transport, Network and Data Link) to provide a consistent mapping of "abstract priority levels" in and n-service onto the n-1 service and when available, priority parameter values in the layer protocol. In the upper layers (ASCE, Presentation and Session) local mechanisms are expected to be provided to application layer ASEs with a means for conveying priority information in both directions through the communication upper layers.

For example, this implies that an application request for a high priority service will be conveyed through association/presentation/session and will result in a high priority data transport connection and either high priority data CLNP PDUs (CLNS case) or a high priority data network connection/X.25 virtual call (CONS case).

## 12 Conformance

(Agreements to be added at a later date)