PTC 331

Telecom Network Interconnection using ITU-T No.7 Signalling

Part A: Introduction

Access Standards
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Wellington
NEW ZEALAND

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Reference Documents

PTC 331: 2001 – Part B Network Interconnection using ITU-T No.7 Signalling Message Transfer Part (MTP)

PTC 331: 2012 – Part C Network Interconnection using ITU-T No.7 Signalling ISDN User Part (ISUP)

TDTA0568: 2012 - baseline test scripts used to develop PTC331 Stage 2 compliance tests.

PTC331 associated Forms A, B & C: Questionnaires completed by parties seeking to obtain PTC331 network compliance.

FOREWORD

PTC331 is the technical specification of the No.7 Signalling interface on Telecom's PSTN/ISDN Point of Interconnect exchanges used for interconnection with other New Zealand networks.

PTC 331: 2001 – Part A Introduction has been revised in conjunction with the 2012 re-issue of Part C of this specification, which has been revised to cover:

- Additional functionality that will be added to the interconnect interface on Telecom POI exchanges in a forthcoming software release in mid 2012.
- Additional functionality that has already been added to the interconnect interface on Telecom exchanges since the last release of PTC331 in 2001.
- Clarifications to the wording of some text, editorial corrections and alignment with latest ITU-T publications as the baseline (no technical changes).

Refer to the separate supplement: **PTC331 2012 Explanatory** *for further details of these changes.*

The text of Part A has also been rationalised to remove areas of duplication that were present in the 2001 issue.

Note that Part B has not been revised and the 2001 version remains current.

TELECOM DISCLAIMER

1 SCOPE

1.1 Application

(1) This Specification (PTC331 Parts A, B and C) covers the Telecom implementation of ITU-T No.7 common channel signalling as it is used for network interconnection. This Specification applies to all such interconnections at the inter-exchange level, whether the other network provides bridging (by-pass) facilities for calls originating and terminating within the Telecom network, international by-pass, originating and terminating network services, value-added services, or combinations of any or all of these or other services. While interconnection with Telecom's PSTN was the original sole aim of PTC 331:1992, it has since been applied to interconnection between networks other than fixed line telephone networks e.g. between cellular mobile networks.

(2) Since network compliance with PTC 331 had to be set-up for interconnection with the Telecom network, the technical conditions of this specification have been fairly widely adopted in New Zealand by other network and service operators, even when connecting between their own networks. Telecom recognises that this is a practical approach, as it avoids the need to provide a range of different network interfaces.

(3) Telecom has no objection to the use of this specification by parties other than Telecom for their own interconnection purposes. However, Telecom does not undertake to amend this specification to cover any special features that may be required by other parties. Any such features are to be negotiated between those parties independent of Telecom. In view of this, it is recommended that all such changes be covered by supplementary specifications prepared by the operators concerned, but based around this document as a common reference.

1.2 Format

(1) This 2012 edition follows the same format as the 2001 edition. However, some technical aspects previously in Part A have been moved to Part C, and several sections on Part A have been consolidated.

(2) Text which forms part of this Specification is printed in plain type, with each paragraph formally numbered. Comments and explanations, which are added only as explanations of requirements, or indications of the means of compliance with this Specification, are shown in Italics. Smaller type is used, each paragraph being preceded with a "ℯ" symbol, but without numbering. Paragraphs indicated with this symbol do not form part of this Specification.

- *Notes, such as this, are widely used to provide background information and matters that may be covered formally in an Interconnection Agreement. Because these notes do not form part of this Specification, there are automatically excluded from all Interconnection Agreements which make reference to PTC 331.*

1.3 Structure of this Specification

(1) This Specification has been set out in three distinct parts. **Part A** is a brief introductory section.

(2) **Part B** covers specific issues relating to the Message Transfer Part (MTP) of ITU-T No.7 signalling as it is used for network interconnection purposes by Telecom. It is structured as a "clause by clause" statement against the following ITU-T Q Series Recommendations:

(a) Q.701: Functional description of the MTP

(b) Q.702: Signalling Data Link

(c) Q.703: Signalling Link

(d) Q.704: Signalling Network Functions and Messages

(e) Q.705: Signalling Network Structure

(f) Q.706: MTP Signalling Performance

(g) Q.707: Testing and Maintenance

- *Access to the current ITU-T Recommendations is essential for a complete understanding of this Specification.*

(3) **Part C** covers the Integrated Services Digital Network User Part (ISUP) of ITU-T No.7 signalling as it is used for network interconnection purposes by Telecom. Part C comprises details of the application of ITU-T Recommendation Q.763 in a form consistent with the current published ITU-T document, and a comments/exceptions statement against the current published ITU-T Recommendations Q.764 and Q.73x.

2 COMPLIANCE

2.1 Compliance process

(1) Compliance with this specification is assessed by means of a three-stage Process as summarized in Figure 1 which shows the steps to be followed by a network operator ("Network X") who seeks to obtain PTC331 compliance.

- *This process is specific to a particular equipment type, to the software systems used, and to the particular network and its associated functions. As a result, whether or not a particular make and model of equipment and software version has been shown to comply with the requirements of this specification, it will still be necessary to reconfirm the equipment and software should it be used in another network configuration.*

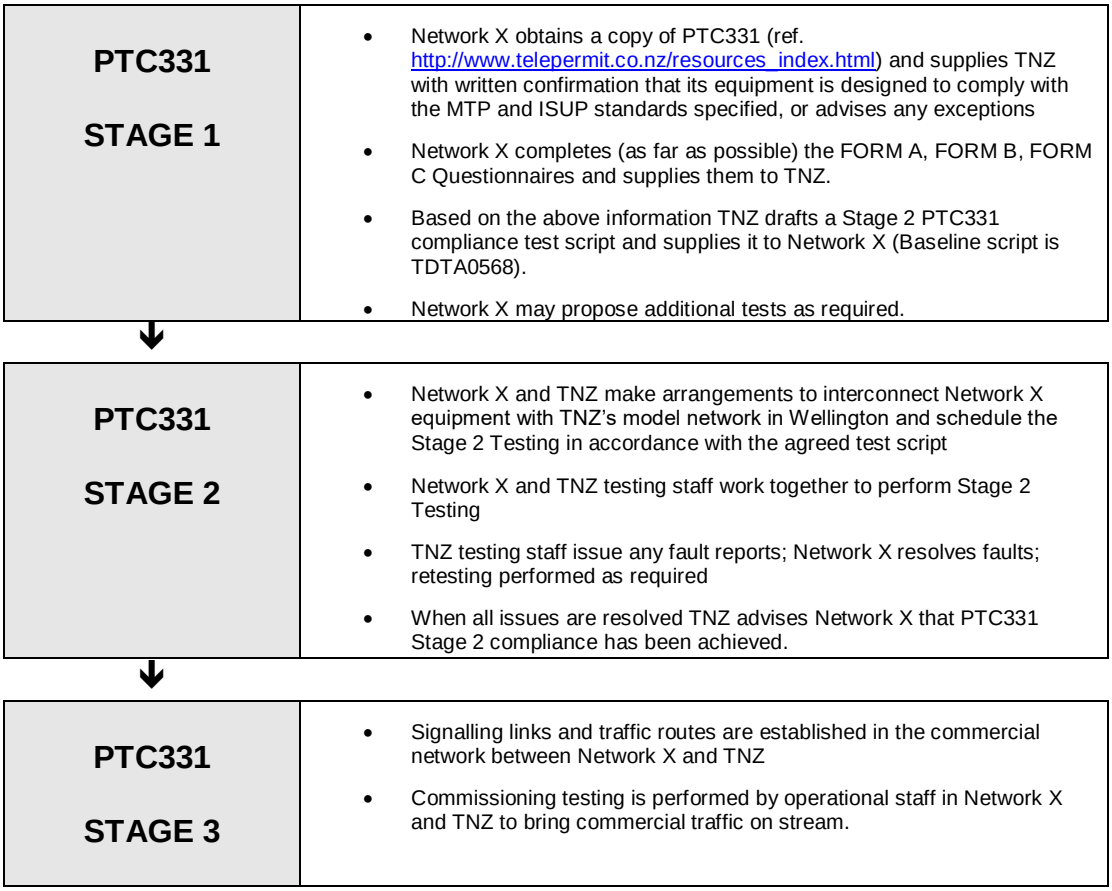

FIGURE 1: Outline of the 3 stage PTC331 compliance process

- *TNZ in this context will usually mean companies acting on TNZ's behalf to perform PTC331 testing and compliance assessment. These are typically NEC NZ Ltd (supplier of most of TNZ's PSTN/ISDN existing switching and signalling equipment) and Alcatel-Lucent NZ (performing Network Operations for TNZ).*

(2) Testing requirements vary according to the type of networks being interconnected, and the nature of the services to be carried across the network interface, as well as variations directly related to the type of equipment and software versions used. As a result, testing needs to be

carried out for each individual case, based on information provided by the interconnecting party.

(3) Prior to interconnecting any other network with the Telecom network it will be necessary for signalling aspects to be fully negotiated between the parties concerned. The technical details are covered by Parts B and C of this Specification. The details of any agreement reached will form part of the basis of the contract established between the parties, and may vary at different interconnect locations.

2.2 Commercial issues

(1) This Specification is intended to deal primarily with the technical aspects of interconnection. However, many issues have relevance to matters which are dealt with in the commercial terms of the Interconnection Agreement between Telecom and the other network operator. These commercial terms are negotiated on behalf of Telecom by the Service Delivery Section, Wholesale and International, Telecom NZ.

(2) All enquiries of a commercial nature should be addressed to the Head of Service, Wholesale and International, Telecom NZ.

2.3 Precedence of Interconnection Agreements

(1) Where there is any conflict between terms used or requirements defined in this Specification and the Interconnection Agreement between Telecom and another network operator, the Interconnection Agreement takes precedence.

(2) To minimise the risk of such conflicts, matters of a commercial or operational nature, and which are dealt with in an Interconnection Agreement, are generally incorporated as notes and are not a formal part of this Specification, as explained below.

(3) This specification is published on the internet, using the Access Standards website: http://www.telepermit.co.nz/resources_index.html

2.4 Standards Policy

Telecom policy is to comply as far as possible with ITU-T (International Telecommunications Union) Recommendations and Telecom's PTC and TNA Specifications are primarily based on these.

2.5 Compliance with Telecom standards within networks

(1) Other network operators are not required to comply with all of Telecom's own network design practices within their networks. However, to ensure the maintenance of end-to-end call quality standards and minimise any risk of interference between networks, it is necessary for all operators interconnecting with the Telecom network to meet the interface requirements of these PTC Specifications. This requirement will impact on internal design criteria and associated Customer Premises Equipment (CPE) to at least some extent.

- *The development of competing local networks has placed more emphasis on the desirability of transferring customers between networks without unnecessary constraints being caused by their existing CPE and premises wiring. This implies that all local network operators should be aware of the technical standards set by Telecom for CPE connected to its network. Information on these matters is published on the Access Standards website.*

(2) Other network operators are not constrained in the manner in which they will deal with the various options allowed by the ITU-T Recommendations within their own networks.

- *However, in the event of any problems, another network operator interconnecting with the Telecom network by means of ITU-T No.7 signalling is expected to provide details of the signalling implementation used within the network concerned. Receipt of this information will give Telecom an opportunity to discuss any likely potential sources of confusion or difficulty with the other network operator concerned.*

(3) Efficient signalling, switching and transmission performance throughout the country is a matter of commercial and strategic importance, as well as an obligation to the ITU-T for all calls connected to the international network.

2.6 Technical enquiries

(1) This Specification is published by Access Standards and initial technical enquiries may be addressed to this section of Telecom. However, signalling specialists in another part of Telecom and its partner companies provide the specialised knowledge of No.7 signalling and manage formal compliance testing.

3 DEFINITIONS

3.1 Approach used

(1) In general, definitions set by the International Telecommunications Union (ITU) apply throughout this Specification.

(2) Some of the terms used in this Specification are also used in Telecom's Interconnection Agreements, the details of which are published shortly after each is signed. Wherever practicable, the same usage and meaning of terms have been aligned between Telecom's PTC specifications and the various Interconnection Agreements.

(3) The various specialised terms and abbreviations used in the MTP and ISUP are listed in the Tables associated with Parts B and C of this Specification, respectively, and in section 4, below.

(4) The following are general interconnect related items of terminology used by Telecom in this specification and in individual Interconnection Agreements:

Point of Interconnection (POI): the term originally used to define an area around a Telecom-designated telephone exchange to which a link or network operated by another network operator is connected at inter-exchange level for the standard interconnection access charge.

- *Also termed "Handover Point".*
- *POI's are listed in Schedules associated with each Interconnection Agreement.*
- *POI Exchange refers to the Telecom exchange within the POI; also termed the Service Delivery Exchange (SDX)*

Point of Local Interconnection (POLI): a Telecom-designated telephone exchange to which a local network operated by another network operator is connected at inter-exchange level

- *POLI's are listed in Schedules associated with each Interconnection Agreement. POLI's are further sub-divided into "Major" and "Minor" POLI's, generally dependent on the size of the community concerned and its relationship to the hierarchy of telephone exchanges in the telephone area concerned.*

Service Delivery Exchange (SDX): the telephone exchange in the Telecom network to which another network is actually connected. Also termed the POI Exchange.

- *POI's are defined largely for tariffing reasons. For practical purposes, such as the provision of added security or improved traffic distribution, it may be more effective to connect another network to exchange(s) other than that designated as a POI in the area concerned. Such arrangements are made at Telecom's discretion following negotiation with the other network operator.*

Service Delivery Point (SDP): the defined electrical interface point provided at an agreed physical location to which Telecom will deliver or accept a service from another network operator or customer.

- *For network interconnection at inter-exchange level, the most usual form of SDP will be the sockets on the PCM terminal equipment provided at the network operator's end of an interconnect link.*

4. ITU-T No.7 SIGNALLING

4.1 General

(1) The standard digital line signalling system used throughout the Telecom network is the ITU-T No.7 common channel signalling system. All Telecom-designated interconnection locations are capable of supporting ITU-T No.7 signalling for interconnection.

(2) The ITU-T No.7 signalling system is an inter-exchange common channel signalling system interconnecting two or more switching nodes. It uses a system of labelled messages containing information pertaining to functions within the switching nodes.

(3) ITU-T has defined four levels in the functional structure of No.7 signalling:-

- Level 1 defines the physical, electrical and functional characteristics of the signalling link.
- Level 2 defines the functions and procedures for and relating to the transfer of signalling messages over one individual signalling data link.
- Level 3 defines those transport functions that are common to and independent of the operation of individual signalling links.
- Level 4 consists of the different User Parts.

- *Further detail is provided in ITU-T Rec. Q.700, para. 3.2.2.*

(4) The ITU-T No.7 signalling functions within levels 1 to 3, which are required to handle messages between two points, are termed the **Message Transfer Part (MTP)**.

- *The Message Transfer Part (MTP) is based on ITU-T Recommendations Q.701-707.*

(5) The Level 4 part of the ITU-T No.7 signalling system used by Telecom to provide the signalling functions required to support basic bearer service and supplementary services for voice and non-voice applications in the ISDN and PSTN is the **Integrated Services Digital Network User Part (ISUP).**

- *ISUP is based on ITU-T Recommendations Q.761-764.*
- *ISUP uses the services of No.7 Signalling Levels 1 - 3 (Message Transfer Part).*
- *The Telephone User Part (TUP) is not implemented by Telecom.*

4.2 Principles of Telecom inter-network No.7 signalling

(1) The basic principle behind the design of Telecom's inter-network No.7 signalling is that the system should provide basic call control for speech and 64 kbit/s data calls using a subset of the messages, parameters and procedures specifically defined by ITU-T. In general, Telecom-proprietary

items of signalling are not sent to other networks and signalling items specific to other networks are not expected to be received by Telecom.

(2) Telecom, in common with any other network operator, is concerned that there be no risk to network integrity or disruption of normal services due to either accidental or fraudulent inter-network signals. ITU-T No.7 signalling is capable of providing network control and message transfer capability and this can potentially have an adverse impact on network operation. To avoid such risk and ensure network protection to both Telecom and any other network operator, Telecom originally made no provision for other network operators to access Telecom's Signalling Transfer Points (STPs). However, limited connectivity to Telecom's STPs is now permitted, subject to the conditions specified in Part B.

- *Experience in several countries had demonstrated the possibility of serious network failures due to software incompatibilities where signalling messages from one network affected the correct operation of another network.*

4.3 Signalling Point (SP): a node in a signalling network which originates and receives signalling messages, but does not transfer such messages from one signalling link to another.

- *This definition varies from that given by ITU-T in the Glossary of Terms published in Blue Book fascicles VI.7, VI.8 and VI.9. However, the Telecom definition is in accord with the usage of the term in ITU-T Rec. Q.704.*

4.4 Signalling Point Code: A 14-bit binary code uniquely identifying a signalling point in a signalling network. This code is used, according to its position in the label, either as Destination Point Code (DPC) or Originating Point Code (OPC).

4.5 Signalling Transfer Point (STP): a node in a signalling network with the function of transferring signalling messages from one signalling link to another.

- *This definition varies from that given by ITU-T in the Glossary of Terms published in Blue Book fascicles VI.7, VI.8 and VI.9. However, the Telecom definition is in accord with the usage of the term in ITU-T Rec. Q.704.*

- *A node may provide both SP and STP functions and such nodes can be referred to as an SP/STP where necessary.*

4.6 Signalling link: Any designated 64 kbit/s channel within a 2 Mbit/s interconnect link which is used to carry ITU-T No.7 signalling messages.

(1) Any available channel time-slot can be used as the No.7 signalling link.

(2) Telecom bases its individual signalling link dimensioning on an assessed 10% occupancy under normal network operating conditions.

- *For a typical mix of ISUP messages, each signalling link is capable of handling about 12 calls per second across the interface for a 10% occupancy rate.*

(3) It is recommended practice to either provide at least two links in a link set, using one of the duplicated links as a back-up to cover possible failure of a working link, or to also use quasi-associated signalling via an STP as the backup.

- *Thus, in the event of failure of a working link, the loading of a duplicated link would not exceed 20%.*

(4) It is the responsibility of the network operator to determine the number of signalling links and their allocations from within the interconnect links provided by Telecom. Whether or not STP operation is to be used, is a matter for agreement between Telecom and the network operator concerned.

- *The dimensioning and allocation of signalling links for each POI will be determined during the initial interconnect agreement negotiation and as part of any subsequent operational rearrangements.*

- *Physical diversity may possibly be provided for the two or more signalling links. Where such facilities are required by a network operator, a formal request should be made during the interconnect negotiations.*

(5) Where STP functionality is not chosen, it will be necessary to provide signalling links between the network operator's network and each Telecom POI to which traffic circuits are connected.

END OF TEXT OF SPECIFICATION PTC 331: 2012 - PART A