ATM Control Cells Illustrated − Idle Cells, Unassigned Cells, IMA Filler Cells and Invalid Cells

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Introduction

This document illustrates the format of several ATM control cells and indicates which application each type of control cell is used in. A cell header includes a three−bit payload type identifier (PTI) field. The first bit in the PTI field indicates whether the cell is a data cell (1) or a control cell (0).

Figure 1 − Format of ATM User−to−Network Interface (UNI) Cell Header

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document is not restricted to specific software and hardware versions.

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Idle and Unassigned Cells

The International Telecommunications Union (ITU−T) defines the format of unassigned and idle cells in its I.361 Recommendation. The purpose of these cells is to ensure proper cell decoupling or cell delineation, which enables a receiving ATM interface to recognize the start of each new cell. The ITU−T defines cell delineation mechanisms in its I.432 Recommendation.

With SONET/SDH interfaces, ATM Forum standards require that an ATM device send either idle cells or unassigned cells, and the selected cell format varies with the configured framing. For example, the PA−A3−OC3 sends unassigned cells when configured with Synchronous Optical Network (SONET) synchronous transport signal STS−3c framing. Use the **atm sonet stm−1** command to configure Synchronous Digital Hierarchy (SDH) synchronous transport module STM−1 framing and to configure the interface to send idle cells.

A receiving ATM device does not act on the contents of idle cells and does not pass them up to the ATM layer in the ATM protocol stack.

ATM interfaces providing circuit emulation services (CES) also send idle cells when there is no voice communication. The channel−associated signaling (CAS) with on−hook detection feature on ATM switches disables the transmission of idle cells during periods of no voice communication.

Table 1 − Format of Idle Cells

	Octet 1	Octet 2	Octet 3	Octet 4	Octet 5
Header Pattern	00000000	00000000	00000000	00000001	HEC = Valid code 01010010

The ITU−T specifies a payload pattern of 01101010 or 0x6A for idle cells in its I.361 Recommendation.

Table 2 − Format of Unassigned Cells

	Octet 1	Octet 2	Octet 3	Octet 4	Octet 5
Header Pattern	00000000	00000000	00000000	0000BBB0	HEC = Valid code

The cell loss priority (CLP) bit in the fourth octet must be set to zero. The PTI field (as indicated by the BBB values) is "don't care".

IMA Filler Cells

The inverse multiplexing over ATM protocol bundles the bandwidth of two or more physical T1 links into a virtual link or IMA group interface and round−robins cells from the ATM layer across the member T1s. IMA control protocol (ICP) cells control the operation of the inverse multiplexing function. With a default frame length value of 128, one of every 128 cells on each link is an ICP cell.

Like idle and unassigned cells, IMA filler cells perform cell rate decoupling at the IMA sublayer and are not passed to the ATM layer. They are used to ensure a steady stream of cells on the receiving end. IMA filler cells are identified by the value of the 5−byte header and by the operations, administration, and maintenance (OAM) label, cell ID, and cyclic redundancy check (CRC) fields.

The ATM Forum's IMA specification defines use of IMA filler cells as follows:

- The IMA transmitter shall distribute ATM cells arriving from the ATM layer (including any unassigned cells) over the N links in a cyclic round−robin fashion and on a cell−by−cell basis.

- The IMA transmitter shall distribute the ATM layer cells over the links using an ascending order based on the link ID assigned to each link within the IMA group.
- Each interface at the end of the IMA virtual link shall use the IMA control protocol cells format defined in the IMA specification to convey IMA configuration, synchronization, status, and defect information to the far−end.
- The IMA transmitter shall perform cell rate decoupling by inserting IMA filler cells in place of ATM cells when there is no cell available at the ATM layer.
- The IMA receiver shall:

    - ♦ Accept cells from the N links
    - ♦ Discard filler cells
    - ♦ Discard cells with bad header error checksum (HEC).
    - ♦ Process and discard ICP cells, and pass the aggregate ATM cell stream to the ATM layer (including unassigned cells)
    - ♦ Preserve the order of incoming cells.

Table 3 − Format of IMA Filler Cells

Octet	Label	Comments
1−5	ATM cell Header	Octet 1 = 00000000 Octet 2 = 00000000 Octet 3 = 00000000 Octet 4 = 00001011 (0x0B) Octet 5 = 01100100 (valid HEC)
6	OAM Label	00000001 (IMA version 1.0)
7	Cell ID Link ID	00000000
8−51	Unused	01101010 (0x6A) ITU−T Recommendation I.432
52−53	CRC Error Control	Bits 15 − 10 = 0000000 Bits 9 − 0 = CRC−10 ITU−T Recommendation I.610

Invalid Cells

The ITU−T defines the format of invalid cells in its I.361 Recommendation. A cell with a non−zero value in the virtual path identifier (VPI) field and a zero value for the virtual circuit identifier (VCI) field is an invalid cell, as defined in I.361.

Table 4 − Format of Invalid Cells

	Octet 1	Octet 2	Octet 3	Octet 4	Octet 5
Header Pattern	XXXXXXXX	XXXX0000	00000000	0000BBBB	HEC = Valid code

B = Don't care.

X = Any value other than zero.

Related Information

- **ATM Cell Structures**
- **T1/E1 Inverse Multiplexing over ATM**
- **Troubleshooting ATM Links on the 7x00 IMA Port Adapters**
- **Configuring Circuit Emulation Services**
- **ITU−T I.361**
- **Technical Support − Cisco Systems**

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