OPTICAL INTERNETWORKING FORUM

Call Detail Records for UNI 1.0 Billing

OIF-CDR-01.0

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Working Group: OAM&P

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1 Table of Contents

2 List of Figures

3 List of Tables

4 Document Revision History

Version 0: 10/29/2001, original draft text contributed to November 2001 OIF meeting.

Version 1: 1/18/2002, draft text revised to correct definition of connection identifier, contributed to January 2002 OIF meeting.

Version 2: 1/29/2002, draft text revised to incorporate comments in Verizon contribution oif2002.049.00 to January 2002 OIF meeting. 2/15/2002, draft text reformatted to use Implementation Agreement template.

Version 3: 4/10/2002, draft text revised to incorporate comments from straw ballot process.

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5 Project Summary

Note: This section is removed when the document is forwarded to the TC for vote. It is used to help maintain the progress of the document. It is expected that appropriate key content form this section is contained in the Introduction.

5.1 Working Group project(s)

Call Detail Records for UNI 1.0 Billing
This project as described below was approved at the November 2001 OIF meeting.

5.2 Working Group(s)

OAM&P Working Group

5.3 Date Approved

Project approved by TC on November 8. 2001.

5.4 Original Document

OIF2001.531.00.

5.5 Problem Statement

For carriers to bill for OIF UNI 1.0 calls, agreement is needed on call detail record (CDR) procedures and formats.

5.6 Scope

The scope of this project is to develop an implementation agreement on CDR procedures and formats for UNI 1.0 calls.

5.7 Expected Outcome

The expected outcome is an implementation agreement covering CDR procedures and formats for UNI 1.0 calls.

5.8 Schedule

- Present draft text (Contribution OIF2001.531) at November OIF meeting
- Liaise the draft text (Contribution OIF2001.531) to T1M1 (November meeting) and Ordering and Billing Forum (OBF) (John McDonough)
- Solicit contributions for January OIF meeting with proposed revisions to draft text; if agreement reached, move to straw ballot in February 2002
- If straw ballot passes without significant changes, move to principal ballot in March 2002
- Schedule to be revised as needed based on extent of revisions proposed in contributions

5.9 Merits to OIF

Both carrier and supplier members of OIF will benefit from an agreement on CDR procedures and formats for OIF UNI 1.0 calls.

5.10 Relationship to other Working Groups

Draft text has been written to be consistent with UNI 1.0.

5.11 Relationship to other Standards Bodies

Liaise to T1M1 and OBF for comments.
Conference calls held with OBF leadership on March 15, 2002, and April 2, 2002.

6 Introduction

Transport services such as T1 and T3 are typically provisioned by operations systems and billed at a fixed monthly rate based on such factors as the location of the endpoints. Conversely, services such as long-distance telephone calls are established dynamically using signaling messages. The telephone switches capture usage records for each call and transmit these records to billing systems, which generate bills based on the duration of the calls as well as the location of the endpoints.

The OIF User-Network Interface (UNI) will enable optical transport connections to be established dynamically using signaling messages. Carriers may bill for these services based on several components, for example:

- Fixed monthly charge based on the bit rate of the UNI

- Charge per call based on such call parameters as the location of the endpoints and the bandwidth, quality-of-service, and duration of the call.

To support the carriers' billing processes, the optical switches that handle the signaling messages will need to capture certain usage information for each call. That usage information will then be made available to the carrier's billing system. Ultimately, carriers' billing systems may be able to dynamically request usage information from the optical switches (via the network management system) so the carriers can provide up-to-the-minute billing information to their customers. Most legacy billing systems do not work this way, however, but instead typically rely on the management system to format the usage information into records that are stored in files on the management system and then pulled periodically to the carrier's billing system using FTP. The carrier's billing system then batch processes these formatted usage records to generate customer bills.

This document specifies the usage measurement functions that an Optical Switching System will need to perform in order to enable carriers to bill for OIF UNI 1.0 optical connections using their legacy billing systems. It also specifies three formats for storing these usage records in files for processing by the carrier's billing systems.

7 Usage Measurement Functions

Usage-based billing is new to transport services, but not to telephone services. Much work has been done over many years to develop requirements, systems, and processes for billing customers for usage-based telephone services. The intention here is not to reinvent billing requirements and processes, but to enable usage-based transport service billing to be implemented with minimal impact on the carriers' existing billing systems, as well as minimal development effort for the optical switching systems and management systems.

The industry term Automatic Message Accounting (AMA) refers to the three processes of Data Generation, Data Formatting, and Data Transmitting. The usage measurements created as a result of data generation and formatting are known internationally as Call Detail Records (CDRs).

Data Generation is the process of determining what usage information must be collected and producing the necessary information. In AMA terminology, the generation functionality assembles the data elements into an unformatted usage record.

Data Formatting is the process of formatting the unformatted usage records into CDRs. Telcordia's Billing AMA Format (BAF) is commonly used by Incumbent Local Exchange Carrier (ILEC) billing systems, while some other carriers use an ASCII CDR format (ACDR). Recent industry activities have focused on defining XML CDR formats (XCDR) for billing systems. XML formats have been defined through separate efforts of the European Telecommunications Standards Institute (ETSI), Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON), Open Settlement Protocol (OSP), and IPDR.org specification of Network Data Management - Usage (NDM-U) for IP-based Services.

Data Transmitting is the process of outputting formatted CDRs to the data systems that will transport the records to the billing system. Typically FTP is used to transport usage record files from management systems to billing systems.

8 Physical Architectures

This section describes potential architectures for the placement of the usage measurement functions needed to support billing for OIF UNI connections.

8.1 High-Level Physical Architectures

Figure 1 shows the high-level physical architecture typically used to support billing for usage-based services, the relationship between the usage measurement functions and the downstream billing-related systems, and the mapping of billing-related functions to the Telecommunications Management Network (TMN) model.

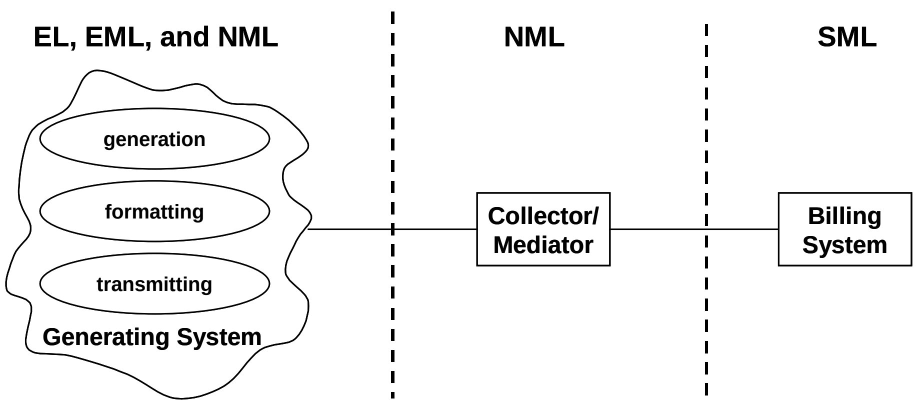

Figure 1. High-level physical architecture for supporting billing.

8.2 Low-Level Physical Architecture

Figure 2 illustrates two potential physical architectures for supporting usage measurement. The top architecture shows the case where the generation and formatting are done in the optical switch and the transmitting is done in the Management System (MS). Interface 1 might use Trivial File Transfer Protocol (TFTP), for example. The bottom architecture illustrates the case where the optical switch supports only the generation, and the MS handles both formatting and transmitting. Interface 2 could be realized using a management protocol such as Common Object Request Broker Architecture (CORBA), for example.

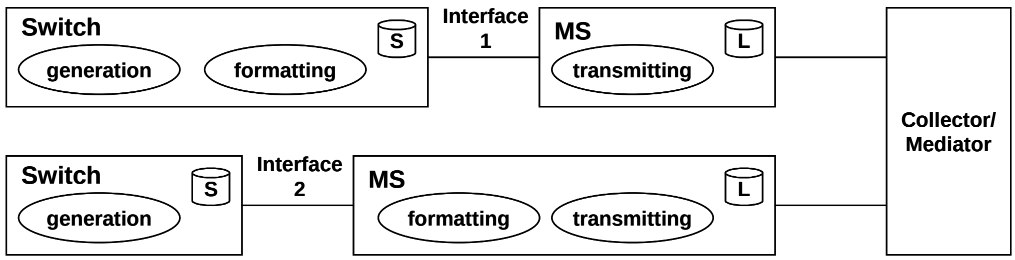

Figure 2. Low-level physical architectures for supporting billing.

Because of the critical nature of usage information, components that handle usage information must have enough stable storage to prevent information loss and thereby achieve the required high level of reliability. Information loss occurs when a component must discard newly produced or received information or overwrite older information that has yet to be transferred because of an insufficient amount of storage. In Figure 2, the amount of storage has been divided into long-term storage (denoted by "L") and short-term storage (denoted by "S"). Long-term storage is in the range of 3 to 5 days, and short-term storage is on the order of 1 day.

9 Data Generation for UNI Calls

A carrier may choose to bill for an OIF UNI call based on various aspects of the connection (e.g., bandwidth, duration of call, directionality, location of endpoints, quality of service, etc.). Certain information needs to be collected for the carrier to be able to calculate billing for the call. To be consistent with approaches already deployed and tested in the industry, this section is based on GR-1110-CORE, Issue 4, December 2000, “Broadband Switching System (BSS) Generic Requirements” with appropriate extensions to support OIF UNI connections.

9.1 Usage Recording

The ports associated with each Transport Network Address (TNA) should be settable via the management system such that usage recording is turned on or off.

9.2 Timing

To be consistent with current industry practices, the timing of an OIF UNI connection should follow the conventions for a circuit-switched call as described of GR-508-CORE, LSSGR: Automatic Message Accounting (AMA) Section 8.

For each successful UNI call, the generation function captures certain connection data as well as the connect time and the elapsed time of the call. The connect time is recognized as the time that the recording switch (typically the ingress switch) sends the connect message to the output buffer for delivery to the calling party, and the disconnect time is the time that the switch receives a connection release message.

The timing requirements in GR-508-CORE include specialized procedures related to long-duration circuit-switched calls. A long-duration OIF UNI call is defined as a UNI call for which, at a scheduled record generation time, both calling and called parties remain “off-hook” and the elapsed time of the UNI connection already exceeds 24 hours. The scheduled record generation time CDR is either designated by the carrier or is the default time of midnight. Once an initial long duration record is generated, a continuation record is generated at each "midnight" that the call continues to exist. This allows the telecommunications carrier to include long duration calls that are still in progress at the end of each billing cycle. The long duration records may also be used to measure QoS and usage volumes for the connection on a daily basis.

Depending on implementation, the timestamps related to UNI calls may be captured either using the local time of the Optical Switching System generating the CDR data, or using Universal Coordinated Time (UTC). The generating function needs to account for any changes in clock time (e.g., due to daylight savings time or adjustments for clock drift) that occur during a UNI connection. For non-long duration UNI calls, if a clock adjustment is made while a UNI call is in progress, the values in effect at connect time should be used until the call is disconnected. For long-duration UNI calls, if the local time changes while a UNI call is in progress, the new values should take effect at the beginning of the next long duration period. For example, if the change occurs on Day 3 of a long duration UNI call that lasts 6 days, the previous values would be reflected in the usage records generated for Days 1, 2, and 3, and the new values would be reflected in the usage records generated for Days 4, 5, and 6.

9.3 Usage Generation and Recording Office Identification

As indicated in Figure 2, there may be multiple systems involved in the data generation and formatting of usage data into a CDR. It is desirable to identify each system involved in the CDR generation, and the role the system performs.

Using BAF terminology, the sensor identification identifies the sensor (i.e., optical switch) that generates the raw usage data CDR. The recording office identification indicates the recording office that first created an archivable image of the CDR.

9.4 UNI Call Information

The usage data generation capabilities described above are generic to many different call types. Information specific to OIF UNI 1.0 connections is also required in the Call Detail Records, specifically certain parameters contained in the signaling messages as defined in the OIF User Network Interface (UNI) 1.0 Signaling Specification.

10 CDR Content for UNI Calls

This section builds on the information in Section 9 to create a generic view of the information content that is captured in CDRs for OIF UNI calls. To the extent possible, one CDR should be defined for all types of UNI-based services, such as SONET TDM, lambda, packet, and fiber. Although OIF UNI 1.0 specifically refers to SONET TDM based services, it is desirable for the UNI CDR to be designed flexibly in order to anticipate future UNI enhancements and be able to handle them without significant change to the CDR format. The elements for UNI 1.0 are listed in Table 1.

11 Data Formatting for UNI Calls

Data formatting is the process of converting the unformatted usage records into CDRs. Telcordia's Billing AMA Format (BAF) is commonly used by ILEC billing systems, while some other carriers use an ASCII AMA Format (ACDR) or an XML AMA Format (XCDR) for their billing systems.

The information content in Section 10 (Table 1) applies generically to the information generated, whether formatted in BAF, ACDR, XCDR, or some other format. Attachment 1 documents extensions to BAF for supporting OIF UNI 1.0 calls, Attachment 2 documents an ACDR record format for OIF UNI 1.0 calls, and Attachment 3 documents an XCDR record format for OIF UNI 1.0 calls. Each carrier will likely use only one of the formats, but the format used will likely vary from carrier to carrier depending on the billing system deployed. Therefore, optical switch products may not need to support all three formats, but only the format(s) used by their carrier customers.

12 Data Transmitting for UNI Connections

Data transmitting is the process of outputting formatted CDRs to the data systems that will transport the records to the billing system. FTP is commonly used for transmitting usage records between the management system and the billing system.

Field_ID	Information	Description
1	Call Type (Mandatory)	This field identifies the CDR contents as referring to an OIF UNI 1.0 call.
2	Generating System (Mandatory)	This field identifies the system that generated the usage measurements provided in the CDR. This information is provided in BAF as the combination of Sensor Type and Sensor Identification. For other CDR formats, this information may be represented as up to 32 ASCII characters.
3	Recording Office (Mandatory)	This field identifies the recording office (e.g., management system) that first created an archivable image of the CDR. This information is provided in BAF as the combination of Recording Office Type and Recording Office Identification. For other CDR formats, this information may be represented as up to 32 ASCII characters.
4	Connect Date (Mandatory)	This field identifies the year, month, and day that the call was established. BAF format: ymmdd, where y is the least significant digit of the year (0-9), mm is the number of the month (1-12) and dd is the number of the day of the month (1-31). ACDR and XCDR formats use the format: mm.dd.yyyy.
5	Timing Indicator (Mandatory)	This field flags long-duration calls. General format: 0 = Default value (non-long-duration call), 1 = Start of long duration call, 2 = Continuation of long duration call.
6	Connect Time (Mandatory)	This field identifies the time of day that the connection was established. Format: hh.mm.ss.t, where hh is the hour (00-23), mm is the minute (00-59), ss is the second (00-59), and t is the tenths of seconds (0-9).
7	Elapsed Time (Mandatory)	This field identifies the time interval in minutes, seconds, and tenths of seconds since the call was established or since the previous record (for a continuation record of a long-duration call). Format: mmmmm.ss.t, where mmmmm is the number of minutes (00000-99999), ss is the number of seconds (00-59), and t is the number of tenths of seconds (0-9) of elapsed time.
8	GMT Time Zone (Mandatory)	This field identifies the time zone for the timestamps in this CDR. Format: s.o.hh.mm, where s = time zone source (1 = switch, 2 = subscriber, 3 = call agent), o = offset (1 = plus, 2 = minus), hh = hours off of GMT (00-23) and mm = fractional hours in minutes off of GMT (00-59).
9	Release Cause Indicator (Optional)	This field indicates the reason for the termination of the call. Format: ccc, where ccc is a 3-digit release cause code. Reference GR-1100-CORE, Billing Automatic Message Accounting Format (BAF) Generic Requirements.
10	Source TNA Address (Mandatory)	This field identifies the source TNA address assigned by the service provider to one or more source data links (OIF UNI 1.0 Section 10.9.1.1). Format: d.d.d.d, where d is a decimal number (0-255) (for IPv4 format TNAs). Format x.x.x.x.x.x.x.x, where each x is the hex representation of a 16-bit number (for IPv6 format TNAs). The format for NSAP addresses is to be determined.
11	Source Logical Port Identifier (Optional)	This field identifies the source logical port (OIF UNI 1.0 Section 10.9.1.2). This attribute is only necessary when the TNA address spans multiple data links. If there is no Port Identifier, the value of this field is zero. Format: x, where x is the hex representation of the 32-bit Source Logical Port Identifier.

12	Destination TNA Address (Mandatory)	This field identifies the destination TNA address assigned by the service provider to one or more destination data links (OIF UNI 1.0 Section 10.9.1.1). Format: d.d.d.d, where d is a decimal number (0-255) (for IPv4 format TNAs). Format: x.x.x.x.x.x.x.x, where x is the hex representation of a 16-bit number (for IPv6 format TNAs). The format for NSAP addresses is to be determined.
13	Destination Logical Port Identifier (Optional)	This field identifies the destination logical port (OIF UNI 1.0 Section 10.9.1.2). This attribute is only necessary when the TNA address spans multiple data links. If there is no Port Identifier, the value of this field is zero. Format: x, where x is the hex representation of the 32-bit Destination Logical Port Identifier.
14	Local Connection Identifier (Mandatory)	This field uniquely identifies a connection locally at a UNI (OIF UNI 1.0 Section 10.9.1.4). Format: x, where x is the hex representation of the 32-bit Local Connection Identifier.
15	Encoding Type (Mandatory)	This field specifies the encoding format of the signal to be transported across the UNI (OIF UNI 1.0 Section 10.9.2.1) Format: d, where d is the 3-digit decimal representation of the 8-bit Encoding Type (0-255).
16	SONET/SDH Traffic Parameters (Mandatory)	This field identifies the SONET/SDH traffic parameters. Format: sss.c.nnnnn.vvvvv.mmmmm.tttttttt, where ss is the 3-digit decimal representation of the 8-bit Signal Type (OIF UNI 1.0 Section 10.9.2.2.1), c is the 1-digit decimal representation of the 8-bit Contiguous Concatenation Type (CCT) (OIF UNI 1.0 Section 10.9.2.2.2), nnnnn is the 5-digit decimal representation of the 16-bit Number of Contiguous Components (NCC) (OIF UNI 1.0 Section 10.9.2.2.3), vvvvv is the 5-digit decimal representation of the 16-bit Number of Virtual Components (NVC) (OIF UNI 1.0 Section 10.9.2.2.4), mmmmm is the 5-digit decimal representation of the 16-bit Multiplier (OIF UNI 1.0 Section 10.9.2.2.5), and ttttttt is the hex representation of the 32-bit Transparency (OIF UNI 1.0 Section 10.9.2.2.6).
17	Directionality (Mandatory)	This field indicates whether the connection is uni-directional or bi-directional (OIF UNI 1.0 Section 10.9.2.3). Format: 1 = uni-directional, 2 = bi-directional.
18	Generalized Payload Identifier (Mandatory)	This field indicates the payload carried within the established connection (i.e., the client layer of the call) (OIF UNI 1.0 Section 10.9.2.4). Format: d, where d is the 5-digit decimal representation of the 16-bit Generalized Payload Identifier (0-65535).
19	Service Level (Mandatory)	This field indicates the class of service (OIF UNI 1.0 Section 10.9.2.5). Format: d, where d is the 3-digit decimal representation of the 8-bit Service Level (0 – 255).
20	Diversity (Mandatory)	This field indicates the whether diversity has been requested (OIF UNI 1.0 Section 10.9.3.1). Format n.l.s.p, where n indicates whether Node Diversity has been requested (0 = no, 1 = yes), l indicates whether Link Diversity has been requested (0 = no, 1 = yes), s indicates whether SRLG Diversity has been requested (0 = no, 1 = yes), and p indicates whether Shared Path has been requested (0 = no, 1 = yes).
21	Contract ID (Optional)	This field is assigned by the service provider and configured in clients. This is not interpreted by the clients. Format: For BAF, this field has a decimal value with up to 32 decimal digits. For other CDR formats, this information may be represented as up to 32 ASCII characters.

Table 1: OIF UNI 1.0 CDR Information Content

Attachment 1 – Billing AMA Format (BAF) for OIF UNI Usage Records

Automatic Message Accounting (AMA) is the process used by circuit-switching systems, packet-switching systems, and other network elements to generate data from which customers are billed for their use of network services. Carriers process a tremendous volume of AMA data each day, so Telcordia developed a universal AMA format for use by all network elements and for all services. This format is detailed in GR-1100-CORE, Billing Automatic Message Accounting Format (BAF) Requirements.

The basic building block of a BAF record is a data field, also known as a table. The table number defines the format of a data field. Each BAF record is a simple predefined structure of data fields that may be appended with additional modules of data fields. A BAF structure is a set of eight common data fields, shown in Table A1-1, followed by a group of fields required by the type of service/technology for which the data is recorded. Each structure is a unique, ordered set of fields identified by a structure code, the third data field in the record. The call type, one of the required data fields, identifies the type of telecommunications service (e.g., OIF UNI 1.0) measured by the record.

Field Title	Table Number (GR-1100-CORE)	Description
Record Descriptor Word	000	States total octets in record, in binary.
Hexadecimal Identifier	00	Identifies start of record.
Structure Code	0	Identifies the structure.
Call Type	1	Identifies type of call or service/technology
Sensor Type	2	Identifies the type of sensor that generated and/or formatted the data in the record.
Sensor Identification	3	Identifies the sensor. Indicates whether the record possibly has been output previously.
Recording Office Type	4	Identifies the type of recording office that captured the record for transport.
Recording Office Identification	5	Identifies the recording office.

Table A1-1. Common data fields of all BAF structures.

Telcordia has formalized a process for defining additional structures for new service types. The structure in Table A1-2 has been proposed for OIF UNI 1.0 billing usage records. This attachment contains a summary of the BAF format for OIF UNI 1.0 connections; refer to GR-1100-CORE for detailed information about each of the data fields.

Attachment 1

Billing AMA Format (BAF) for OIF UNI Usage Records

Information	Table Number (GR-1100-CORE)	Number of Characters	Byte Offset
Record Descriptor Word	000	-	-
Hexadecimal Identifier	00	2	0
Structure Code	0	6	1
Call Type	1	4	4
Sensor Type	2	4	6
Sensor Identification	3	8	8
Recording Office Type	4	4	12
Recording Office Identification	5	8	14
Connect Date	6	6	18
Timing Indicator	7	6	21
Connect Time	18	8	24
Elapsed Time	19	10	28
GMT Time Zone	866	8	33
Release Cause Indicator	411	6	37
Source TNA Address (IPv4 format)	UNI1	8	40
Source Logical Port Identifier	UNI2	8	44
Destination TNA Address (IPv4 format)	UNI1	8	48
Destination Logical Port Identifier	UNI2	8	52
Local Connection Identifier	UNI3	8	56
Encoding Type	UNI5	4	60
SONET/SDH Traffic Parameters	UNI6	28	62
Directionality	UNI7	2	76
Generalized Payload Identifier	UNI8	6	77
Service Level	UNI9	4	80
Diversity	UNI10	6	82
Contract ID	UNI4	34	85
		Total Bytes	102

Table A1-2. BAF structure for OIF UNI billing usage records (Structure Code to be assigned by Telcordia).

Tables UNI1 to UNI10 indicate new BAF data fields that are part of this BAF structure. Telcordia has not yet assigned table numbers for these records, so UNI1 to UNI10 are used here as placeholders. The OIF recommends the format in Attachment 1 for BAF, but Telcordia may need to make some format changes before publishing BAF format in GR-1100-CORE.

Table UNI1 (Note 1)
IPv4-format TNA Address

Chars	Meaning
1-8	TNA Address (32-bit binary number representing an TNA address in IPv4-format)

This field represents an Internet Protocol (IP) address using the IPv4 format.

This field represents Transport Network Assigned (TNA) addresses used in Optical Internetworking Forum (OIF) User-Network Interface (UNI) 1.0 signaling messages. The TNA address in OIF UNI signaling messages can use either the 32-bit IPv4 format or the 128-bit IPv6 format. If the TNA address uses IPv4 format, it is populated as in Table UNI1. If the TNA address uses IPv6 or NSAP format, Table UNI1 should be populated with all zeros, and the TNA address should be presented in a Module (to be defined).

References

OIF UNI 1.0 Signaling Specification (Section 10.9.1.1)

Value

If the TNA address uses the 32-bit IPv4 format, the value of this field (in hexadecimal format) is xx xx xx xx, where xx xx xx xx is the hex representation of the 32-bit OIF UNI TNA Address. (8 characters, 4 bytes)

Note 1: Telcordia assigns Table numbers for BAF format. These numbers have not yet been assigned, so they are referred to here as UNIx. When the number are assigned, they will be included in GR-1100-CORE.

Table UNI2
OIF UNI Port Identifier

Chars	Meaning
1-8	OIF UNI Port Identifier (32-bit binary number representing the port)

The OIF UNI Port Identifier identifies a port between a client and a Transport Network Equipment (TNE). This attribute is only necessary when individual ports are not given unique Transport Network Addresses (TNA). If there is no Port Identifier, the value of this field is zero.

References
OIF UNI 1.0 Signaling Specification (Section 10.9.1.2)

Value
The value of this field (in hexadecimal format) is xx xx xx xx, where xx xx xx xx is the hex representation of the 32-bit OIF UNI Port Identifier. If there is no Port Identifier, the value of this field is hex 00 00 00 00. (8 characters, 4 bytes)

Table UNI3
OIF UNI Local Connection Identifier

Chars	Meaning
1-8	OIF UNI Local Connection Identifier

The OIF UNI Local Connection Identifier uniquely identifies a connection locally at a UNI. The local connection ID at the initiating end is assigned by the UNI-C that initiates a connection create request.

References
OIF UNI 1.0 Signaling Specification (Section 10.9.1.4)

Value
The value of this field (in hexadecimal format) is xx xx xx xx, where xx xx xx xx is the hex representation of the 32-bit OIF UNI Connection Identifier. (8 characters, 4 bytes)

Table UNI4
OIF UNI Contract ID

Chars	Meaning
1-32	OIF UNI Contract ID
	Reserved
	SIGN (hex-C)

The OIF UNI Contract ID is assigned by the service provider and configured in clients. It is not interpreted by the clients.

References
OIF UNI 1.0 Signaling Specification (Section 10.9.4.1)

Value
The value of this field (in hexadecimal format) is cc cc cc cc cc cc cc cc cc cc cc cc cc cc cc cc 0C where cc cc cc cc cc cc cc cc cc cc cc cc cc cc cc cc is the packed BCD representation of the 32-digit contract ID. (34 characters, 17 bytes)

Table UNI5
OIF UNI Encoding Type

Chars	Meaning
1-3	OIF UNI Encoding Type
4	SIGN (hex-C)

The OIF UNI Encoding Type specifies the encoding format of the signal to be transported across the UNI.

References

OIF UNI 1.0 Signaling Specification (Section 10.9.2.1)

Value

The value of this field (in hexadecimal format) is dd dC, where ddd is the packed BCD representation of the 8-bit Encoding Type. (4 characters, 2 bytes)

Table UNI6
OIF UNI SONET/SDH Traffic Parameters

Chars	Meaning
1-3	Signal Type (OIF UNI 1.0 Section 10.9.2.2.1)
4	Contiguous Concatenation Type (OIF UNI 1.0 Section 10.9.2.2.2)
5-9	Number of Contiguous Components (OIF UNI 1.0 Section 10.9.2.2.3)
10-14	Number of Virtual Components (OIF UNI 1.0 Section 10.9.2.2.4)
15-19	Multiplier (OIF UNI 1.0 Section 10.9.2.2.5)
20-27	Transparency (OIF UNI 1.0 Section 10.9.2.2.6) (32-bit binary value)
28	SIGN (hex-C)

This field describes the OIF UNI connection type in terms of various attributes of the connection. Each character represents a 4-bit hexadecimal field.

Characters 1-3 specify the Signal Type.

Character 4 specifies the Contiguous Concatenation Type.

Characters 5-9 specify the Number of Contiguous Components.

Characters 10-14 specify the Number of Virtual Components.

Characters 15-19 specify the Multiplier.

Characters 20-27 specify the Transparency.

References
OIF UNI 1.0 Signaling Specification (Section 10.9.2.2)

Value
The value of this field (in hexadecimal format) is ss sc nn nn nv vv vv mm mm mt tt tt tt tC, where
sss is the packed BCD representation of the 8-bit signal type,
c is the packed BCD representation of the contiguous concatenation type,
nnnnn is the packed BCD representation of the 16-bit number of contiguous components,
vvvvv is the packed BCD representation of the 16-bit number of virtual components,
mmmmm is the packed BCD representation of the 16-bit multiplier, and
tttttttt is the hex representation of the 32-bit transparency. (28 characters, 14 bytes)

Table UNI7
OIF UNI Directionality

Chars	Meaning
1	OIF UNI Directionality (OIF UNI 1.0 Section 10.9.2.3)
2	SIGN (hex-C)

The OIF UNI Directionality indicates whether the connection is uni-directional or bi-directional. Format: 1 = uni-directional, 2 = bi-directional.

Reference
OIF UNI 1.0 Signaling Specification (Section 10.9.2.3)

Value
The value of this field (in hexadecimal format) is dC, where d is the packed BCD representation of the directionality (1 for uni-directional and 2 for bi-directional). (2 characters, 1 bytes)

Table UNI8
OIF UNI Generalized Payload Identifier

Chars	Meaning
1-5	OIF UNI Generalized Payload Identifier
6	SIGN (hex-C)

The OIF UNI Generalized Payload Identifier indicates the payload carried within the established connection (i.e., identifies the client layer of the connection).

References

OIF UNI 1.0 Signaling Specification (Section 10.9.2.4)

Value

The value of this field (in hexadecimal format) is dd dd dC, where ddddd is the packed BCD representation of the 16-bit Generalized Payload Identifier. (6 characters, 3 bytes)

Table UNI9
OIF UNI Service Level

Chars	Meaning
1-3	OIF UNI Service Level
4	SIGN (hex-C)

The OIF UNI Service Level indicates the class of service.

References
OIF UNI 1.0 Signaling Specification (Section 10.9.2.5)

Value
The value of this field (in hexadecimal format) is dd dC, where ddd is the packed BCD representation of the 8-bit Service Level. (4 characters, 2 bytes)

Table UNI10
OIF UNI Diversity

Chars	Meaning
1	Node Diversity (0 = no, 1 = yes)
2	Link Diversity (0 = no, 1 = yes)
3	SRLG Diversity (0 = no, 1 = yes)
4	Shared Path (0 = no, 1 = yes)
5	Reserved
6	SIGN (hex-C)

The OIF UNI Diversity indicates whether certain diversity has been requested.

References

OIF UNI 1.0 Signaling Specification (Section 10.9.3.1)

Value

The value of this field (in hexadecimal format) is nl sp 0C, where n, l, s, and p indicate whether Node Diversity, Link Diversity, SRLG Diversity, and/or Shared Path have been requested. (6 characters, 3 bytes)

Attachment 2 – ASCII CDR Format (ACDR) for OIF UNI Usage Records

Many non-ILEC carriers do not use the BAF format, but instead use billing usage records formatted in various proprietary formats, often using ASCII characters. This attachment defines an ASCII format for OIF UNI billing records.

Format:

Record = Field1;[Field [;Field] [CRLF]] CRLF
Field1 = “OIF UNI 1.0”
Field = Field_ID:Field_Information

Formatting Rules:

- Space and tab characters in a record are ignored.
- Field1 must appear first, but other fields may be listed in any order, since fields are explicitly identified by the Field_ID.
- Fields in a record are delimited by semicolon (;).
- Field_information must not contain the colon (:) or semicolon (;) characters.
- If any field is not present, the value is assumed to be zero.
- Records are delimited by carriage return (CR) and linefeed (LF) (CRLF).
- Additional CRLFs may be inserted after fields if desired to keep the line width within a specified range (e.g., 80 characters).

Table A2-1. ACDR structure for OIF UNI billing usage records.

OIF UNI 1.0; 2:123456; 3:98765; 4:07.21.2001; 5:0; 6:22.11.35.3; 7:00000.20.3;
8:1.2.05.00; 9:16; 10:64.82.94.54; 11:3d; 12:168.144.169.55; 13:a6; 14:32a7bf0;
15:5; 16:7.1.1.0.1.0; 17:2; 18:33; 19:3; 20:0.0.0.0; 21:2001-A57

Table A2-2. Sample ACDR billing usage record.

Attachment 2
ASCII CDR Format (ACDR) for OIF UNI Usage Records

The fields included in the ACDR are listed in Table A2-3.

Field_ID	Information
1	Call Type
2	Generating System Identification
3	Recording Office Identification
4	Connect Date
5	Timing Indicator
6	Connect Time
7	Elapsed Time
8	GMT Time Zone
9	Release Cause Indicator (Optional)
10	Source TNA Address
11	Source Logical Port Identifier (Optional)
12	Destination TNA Address
13	Destination Logical Port Identifier (Optional)
14	Local Connection Identifier
15	Encoding Type
16	SONET/SDH Traffic Parameters
17	Directionality
18	Generalized Payload Identifier
19	Service Level
20	Diversity
21	Contract ID (Optional)

Table A2-3. Information content of ACDR.

Attachment 3 – XML CDR Format (XCDR) for OIF UNI Usage Records

Extensible Markup Language (XML) is a W3C-endorsed standard for document markup, and it has been proposed as an alternative for interfaces between operations systems. XML defines a generic syntax to mark up data with simple, human-readable tags. Data is included in XML documents as strings of text, and the data is surrounded by text markup that describes the data. A particular unit of data and markup is called an element. As a meta-markup language, XML doesn't have a fixed set of tags and elements, but instead allows developers to define the elements as they need them.

The markup permitted in a particular XML application can be specified in a document type definition (DTD). The DTD lists all legal markup and specifies where and how the markup may be included in a document.

This attachment defines an XML format for OIF UNI billing records.

```
<!ELEMENT OIFUsageRecord (GenSys, RecordingOffice, ConnectDate,TimingInd,
          ConnectTime, Elapsed, TimeZone, ReleaseCause, SrcTNA, SrcPort, DestTNA,
          DestPort, ConnID, Encoding, Traffic, Direction, GPID, SvcLevel, Diversity, ContractID)>
<!ELEMENT GenSys (#PCDATA)>
<!ELEMENT RecordingOffice (#PCDATA)>
<!ELEMENT ConnectDate (#PCDATA)>
<!ELEMENT TimingInd (#PCDATA)>
<!ELEMENT ConnectTime (#PCDATA)>
<!ELEMENT Elapsed (#PCDATA)>
<!ELEMENT TimeZone (#PCDATA)>
<!ELEMENT ReleaseCause (#PCDATA)>
<!ELEMENT SrcTNA (#PCDATA)>
<!ELEMENT SrcPort (#PCDATA)>
<!ELEMENT DestTNA (#PCDATA)>
<!ELEMENT DestPort (#PCDATA)>
<!ELEMENT ConnID (#PCDATA)>
<!ELEMENT Encoding (#PCDATA)>
<!ELEMENT Traffic (#PCDATA)>
<!ELEMENT Direction (#PCDATA)>
<!ELEMENT GPID (#PCDATA)>
<!ELEMENT SvcLevel (#PCDATA)>
<!ELEMENT Diversity (#PCDATA)>
<!ELEMENT ContractID (#PCDATA)>
```

Table A3-1. DTD for XML OIF billing usage record.

Attachment 3

XML CDR Format (XCDR) for OIF UNI Usage Records


```
<OIFUsageRecord>
<GenSys>123456</GenSys>
<RecordingOffice>98765</RecordingOffice>
<ConnectDate>07:21:2001</ConnectDate>
<TimingInd>0</TimingInd>
<ConnectTime>22.11.35.3</ConnectTime>
<Elapsed>00000.20.3</Elapsed>
<TimeZone>1.2.05.00</TimeZone>
<ReleaseCause>16</ReleaseCause>
<SrcTNA>64.82.94.54</SrcTNA>
<SrcPort>3d</SrcPort>
<DestTNA>168.144.169.55</DestTNA>
<DestPort>a6</DestPort>
<ConnID>32a7bf0</ConnID>
<Encoding>5</Encoding>
<Traffic>7.1.1.0.1.0</Traffic>
<Direction>2</Direction>
<GPID>33</GPID>
<SvcLevel>3</SvcLevel>
<Diversity>0.0.0.0</Diversity>
<Contract ID>2001-A57</Contract ID>
</OIFUsageRecord>
```


Table A3-2. Sample XML OIF billing usage record.

The information content of the XCDR is listed in Table A3-3.

XML Tag	Information
OIFUsageRecord	Call Type/DTD label
GenSys	Generating System Identification
RecordingOffice	Recording Office Identification
ConnectDate	Connect Date
TimingInd	Timing Indicator
ConnectTime	Connect Time
Elapsed	Elapsed Time
TimeZone	Time Zone
ReleaseCause	Release Cause Indicator
SrcTNA	Source TNA Address
SrcPort	Source Logical Port Identifier (Optional)
DestTNA	Destination TNA Address
DestPort	Destination Logical Port Identifier (Optional)
ConnID	Local Connection Identifier
Encoding	Encoding Type
Traffic	SONET/SDH Traffic Parameters
Direction	Directionality
GPID	Generalized Payload Identifier
SvcLevel	Service Level
Diversity	Diversity
ContractID	Contract ID (Optional)

Table A3-3. Information content of XCDR.

Appendix A: Glossary

Appendix B: Open Issues / current work items

Appendix C: List of companies belonging to OIF when document is approved

Accelerant Networks
Accelight Networks
Acorn Networks
Actel
Acterna
ADC Telecommunications
Aeluros
Aerie Networks
Agere Systems
Agilent Technologies
Agility Communications
Alcatel
Alidian Networks
All Optical Networks, Inc.
Alphion
Altamar Networks
Altera
Alvesta Corporation
AMCC
America Online
Ample Communications
ANDO Corporation
Anritsu
Appian Communications
Applied Innovation
Applied Optoelectronics
Aralight
AT&T
Atoga Systems
Atrica Inc.
Avici Systems
Axiowave Networks
Bandwidth9
Bay Microsystems
BellSouth Telecommunications
Big Bear Networks
Bit Blitz Communications
Bitmath
Blaze Network Products

Blue Sky Research
Bookham Technology
Booz Allen
BrightLink Networks
Broadcom
BT
C Speed Corp.
Cable & Wireless
Calient Networks
Calix Networks
Caspian Networks
Celion Networks
Cenix
Centellax
Centillium Communications
Ceyba
Chiaro Networks
Chunghwa Telecom Labs
Cielo Communications
Ciena Communications
CIR
Cisco Systems
CIVCOM
Coherent Telecom
Computer & Communications Research Labs
Conexant
Continuum Networks
CoreOptics
Coriolis Networks
Corning Incorporated
Corona Optical Systems
Corrigent Systems
Cortina Systems
Corvis Corporation
CPlane
Crescent Networks
CyOptics
Cypress Semiconductor
Data Connection
Department of Defense
DeriveIt
Dorsal Networks
E2O Communications
Efficient Channel Coding
Elisa Communications

Emcore
Emperative
Entridia
Equant Telecommunications SA
Ericsson
ETRI
Extreme Networks
EZChip Technologies
Fiberhome Telecommunications
Fiberspace
Finisar Corporation
FirstWave Intelligent Optical Networks
Flextronics Semiconductor
Force 10 Networks
Foundry Networks
France Telecom
Free Electron Technology
Fujikura
Fujitsu
Furukawa Electric Technologies
Galazar Networks
Gazillion Bits
GDA Technologies
Gemfire
General Dynamics
Genoa
Glimmerglass Networks
Greenfield Networks
Gtran
GWS Photonics
Harris Corporation
Harting Electro-Optics GmbH
Helic S.A.
Helix AG
Hi/fn
Hitachi
Honeywell
Huawei Technologies
Hyperchip
IBM Corporation
Ignis Optics
Infineon Technologies
Infinera
Innovance Networks
Inphi

Integrated Device Technology
Intel
Internet Machines
Internet Photonics
Interoute
Intune Technologies, Ltd.
Iolon
Japan Telecom
JDS Uniphase
Jedai Broadband Networks
Jennic
Juniper Networks
KDDI R&D Laboratories
KereniX
Kestrel Solutions
Kirana Networks
Kodeos Communications
KPNQwest
KT Corp.
Lambda Crossing
Laurel Networks
Lightbit Corporation
LSI Logic
Lucent
Lumentis
LuxN
LYNX - Photonic Networks
Mahi Networks
Maple Optical Systems
Marconi Communications
MathStar
Maxim Integrated Products
Memlink
Meriton
Metro-OptiX
MindTree Consulting Pvt. Ltd
Mintera
Mitsubishi Electric Corporation
Movaz Networks, Inc.
Multilink Technology Corporation
Multiplex
MultiWave Networks
Myrica Networks
Mysticom
National Semiconductor

Nayna Networks
NEC
Network Associates
Network Elements
Network Photonics
NIST
Nokia
Nortel Networks
NTT Corporation
NurLogic Design
Octillion Communications
OKI Electric Industry
ONI Systems
OpNext
Opthos
Optical Datacom
Optical Switch
Optillion
Optium
Optivera
Optix Networks
Optobahn
OptronX
PacketLight Networks
Paracer
Parama Networks
Paxonet Communications
Peregrine Semiconductor
Perihelion Associates
Peta Switch Solutions
Philips Semiconductors
Photonami, Inc.
PhotonEx
Photuris, Inc.
Phyworks
Picarro
PicoLight
Pine Photonics Communications
Pluris
PMC Sierra
Polaris Networks, Inc.
Power X Networks
Princeton Optronics
Procket Networks
QOptics

Quake Technologies
Qwest Communications
Radiant Photonics, Inc.
Raza Foundries
Redback Networks
RedClover Networks
RF Micro Devices
RHK
Riverstone Networks
Sandia National Laboratories
Santec Corporation
Santel Networks
Santur
Siemens
Sierra Monolithics
Silicon Access Networks
Silicon Bridge
Silicon Labs
Silicon Logic Engineering
SiPackets, Inc.
Solidum
Sorrento Networks
Sparkolor
Spirent Communications
StrataLight Communications
Stratos Lightwave
Sumitomo Electric Industries
Sun Microsystems
Sycamore Networks
Syntera Communications
Tality
TDK Semiconductor
Tektronix
Telcordia Technologies
Tellabs
Tellium
TelOptica
Tenor Networks
TeraBeam Networks
TeraBurst Networks
TeraConnect
Teradiant Networks, Inc.
Terago Communications
Texas Instruments
TILAB S.p.A.

T-Networks, Inc.
Toshiba Corporation
Transparent Networks
Transpectrum
Transwitch Corporation
Trellis Photonics
TriCN Associates, LLC
TriQuint Semiconductor
Tropic Networks Inc.
TSRI
T-Systems Nova
Turin Networks
TyCom
US Conec
Valiant Networks
Velio Communications
Velocium (TRW)
Verizon
VIPswitch
Vitesse Semiconductor
Vivace Networks
VSK Photonics
W.L. Gore & Associates
Wavium AB
West Bay Semiconductor
White Rock Networks
Williams Communications
WorldCom
Xanoptix
Xelerated
Xignal Technologies
Xilinx
Xindium
Xlight Photonics
Yotta Networks
Zagros Networks
Zarlink Semiconductor
ZettaCom