broadband forum

TECHNICAL REPORT

TR-232
Bulk Data Collection

Issue: 1
Issue Date: May 2012

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Issue History

Issue Number	Approval Date	Publication Date	Issue Editor	Changes
1	14 May 2012	29 June 2012	John Blackford, Pace Plc	Original

Comments or questions about this Broadband Forum Technical Report should be directed to info@broadband-forum.org.

Editor	John Blackford	Pace Plc
BroadbandHome™ WG Chairs	Greg Bathrick Jason Walls	PMC Sierra QA Cafe
Chief Editor	Michael Hanrahan	Huawei

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Executive Summary

TR-232 presents an IPDR-based mechanism that allows Service Providers to efficiently collect a potentially large amount of data from their entire CPE population on a regular basis. This bulk data collection mechanism is built upon the IPDR standard as defined in TM Forum, instead of the CWMP standard as defined in TR-069, as CWMP is designed to be a device management protocol rather than a data collection protocol. So, by utilizing IPDR instead of CWMP the management plane is not polluted and the transfer of the data is more efficient. Devices supporting the IPDR-based bulk data collection mechanism will have the mechanism configured via CWMP.

1   Purpose and Scope

1.1   Purpose

Service Providers have the desire to use data available on their CPE population to analyze their deployed services, collect trending information about specific CPE, and proactively identify network problems before they cause subscriber churn. The following three statements summarize the problem being addressed by this Technical Report.

1) Service Providers have a desire to reliably collect data from their CPE population on a regular basis.
2) The data being collected is sizeable in nature and consists of statistics, performance data, and other related parameters.
3) CWMP is an undesirable protocol for the collection of this data as it is not efficient or flexible enough to meet the Service Provider's needs.

The purpose of this Technical Report is to define a solution that allows for the collection of data that resides on the Service Provider's CPE population in an efficient and standard manner and to reference IPDR as defined by TM Forum.

1.2   Scope

This Technical Report is intended to specify a complete solution that permits the collection of bulk data from a Service Provider's CPE population. In order to specify this solution, this Technical Report will reference the existing IPDR protocol and data encodings. Furthermore, this Technical Report will define an IPDR-relevant data format for use in the solution. Finally, the content of this Technical Report will be formatted like an IPDR Service Specification, the preferred documentation format of TM Forum.

2   References and Terminology

2.1   Conventions

In this Technical Report, several words are used to signify the requirements of the specification. These words are always capitalized. More information can be found be in RFC 2119 [8].

MUST	This word, or the term "REQUIRED", means that the definition is an absolute requirement of the specification.
MUST NOT	This phrase means that the definition is an absolute prohibition of the specification.
SHOULD	This word, or the term "RECOMMENDED", means that there could exist valid reasons in particular circumstances to ignore this item, but the full implications need to be understood and carefully weighed before choosing a different course.
SHOULD NOT	This phrase, or the phrase "NOT RECOMMENDED" means that there could exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications need to be understood and the case carefully weighed before implementing any behavior described with this label.
MAY	This word, or the term "OPTIONAL", means that this item is one of an allowed set of alternatives. An implementation that does not include this option MUST be prepared to inter-operate with another implementation that does include the option.

2.2   References

The following references are of relevance to this Technical Report. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Technical Report are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.
A list of currently valid Broadband Forum Technical Reports is published at www.broadband-forum.org.

Document		Title	Source	Year
[1]	TR-069 Amendment 4	*CPE WAN Management Protocol*	Broadband Forum	2011
[2]	tr-157-1-6.xml	*Component Objects for CWMP, Amendment 6*	Broadband Forum	2012
[3]	TMF8002-IPDR-IIS-DG	*IPDR Service Specification Design Guide, Version 3.8, Release 1.0*	TM Forum	2009
[4]	TMF8001-IPDR-IIS-PS	*IPDR/XDR Encoding Format, V3.8 – Release 1.0*	TM Forum	2009
[5]	TMF877-IPDR-IIS-PS	*IPDR/XML File Encoding Format, V3.7 – Release 1.0*	TM Forum	2009
[6]	TMF8000-IPDR-IIS-PS	*IPDR Streaming Protocol (IPDR/SP), V2.7*	TM Forum	2011
[7]	TMF878-IPDR-IIS-PS	*IPDR/File Transfer Protocol, V3.9 – Release 1.0*	TM Forum	2009
[8]	RFC 2119	*Key words for use in RFCs to Indicate Requirement Levels*	IETF	1997

2.3   Definitions

The following terminology is used throughout this Technical Report.

ACS	A software component in the broadband network responsible for auto-configuration of the CPE for advanced services. This software component utilizes CWMP, as defined in TR-069 [1], to communicate to the CPE in the broadband network.
Data Encoding	Specifies a set of rules that defines how information is turned into a format such that it can be transported across the network via the protocol.
Data Format	Specifies a set of rules that defines how the information is organized.
IPDR Collector	A software component in the broadband network responsible for collecting IPDR Documents from the IPDR Exporter.

IPDR Document	A series of records that were generated for transmission across an IPDR Session or during a specific collection interval.
IPDR Exporter	A software component in the broadband network responsible for exporting IPDR Documents to the IPDR Collector. For the purpose of this document the IPDR Exporter is the CPE.
IPDR Group	An IPDR File Transfer Protocol concept that associates multiple IPDR Documents. For the purposes of this document an IPDR Group directly corresponds to an instance of the BulkData.Profile table (see A.5 for more details).
IPDR Session	An IPDR Streaming Protocol concept that defines a set of different data templates for different applications and enables the collection of IPDR Documents. For the purposes of this document an IPDR Session directly corresponds to an instance of the BulkData.Profile table (see A.5 for more details).
Protocol	Specifies a set of rules that controls how information is transported across the network.

2.4   Abbreviations

This Technical Report uses the following abbreviations:

BSS	Business Support System
CPE	Customer Premise Equipment
CWMP	CPE WAN Management Protocol
IP	Internet Protocol
IPDR	IP Detail Record
IPDRDoc	IPDR Document
IR	IPDR Recorder
IS	IPDR Store
IT	IPDR Transmitter
OUI	Organizationally Unique Identifier
SE	Service Element
TR	Technical Report
WAN	Wide Area Network
WG	Working Group

3   Technical Report Impact

3.1   Energy Efficiency

TR-232 has no impact on Energy Efficiency.

3.2   IPv6

TR-232 has no impact on IPv6.

3.3   Security

TR-232 has no direct impact on Security. Any Security concerns over using or implementing this solution are part of the underlying IPDR protocol and are fully explained in the TM Forum documentation regarding IPDR.

3.4   Privacy

TR-232 has no direct impact on user data Privacy. Any Privacy concerns over using or implementing this solution are part of the underlying data models that are implemented on the devices, meaning that this mechanism does not override any data model constraints on sensitive user data.

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4   Bulk Data Collection Service Specification

This is the format to be used when publishing this Technical Report as an IPDR Service Specification (see the IPDR Service Specification Design Guide [3] for more details about the structure).

4.1   Title Page

When the IPDR Service Specification is created, the "Title Page" will be the same style as the IPDR Service Specification Design Guide, but it will contain the information that is located on the Title Page of this Technical Report.

4.2   Preface

4.2.1   Contacts

When the IPDR Service Specification is created, this section will contain the contents of the table that documents the Editors of this Technical Report and the Broadband Home WG Chairs, which in this Technical Report is located between the Revision History table and the Table of Contents.

4.2.2   Acknowledgements

When the IPDR Service Specification is created, this section will contain a list of companies that contributed to the creation of this Technical Report, which can be created by searching through the Broadband Forum contribution site.

4.2.3   Abstract

When the IPDR Service Specification is created, this section will contain the Executive Summary from this Technical Report.

4.2.4   Change History

When the IPDR Service Specification is created, this section will contain the Revision History table from this Technical Report.

4.2.5   Table of Contents

When the IPDR Service Specification is created, this section will contain the Table of Contents for the IPDR Service Specification, which is auto-generated by Word.

4.3   Introduction

4.3.1   Purpose

The purpose of TR-232 is to define an IPDR Service Specification in line with the Service Specification Design Guide [3].

An IPDR Service Specification defines a service's usage of IPDR including all pertinent use cases, all definitions for data to traverse between the two entities, and a detailed XML Schema that governs the data sent via the service.

4.3.2   Compatibility

Future revisions are expected to make every attempt to preserve investments made by service providers and solution vendors by considering backward and forward compatibility whenever it is practical.

4.3.3   References

The following references constitute provisions of this Technical Report. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this document are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.

> *When the IPDR Service Specification is created, this part of the section will contain a list of reference for all external documents mentioned within the IPDR Service Specification, which will be a subset of Section 2.2 from this Technical Report.*

TMF8001-IPDR-IIS-PS	IPDR/XDR Encoding Format, V3.8 – Release 1.0	TM Forum	2009
TMF877-IPDR-IIS-PS	IPDR/XML File Encoding Format, V3.7 – Release 1.0	TM Forum	2009
TMF8000-IPDR-IIS-PS	IPDR Streaming Protocol (IPDR/SP), V2.7	TM Forum	2011
TMF878-IPDR-IIS-PS	IPDR/File Transfer Protocol, V3.9 – Release 1.0	TM Forum	2009

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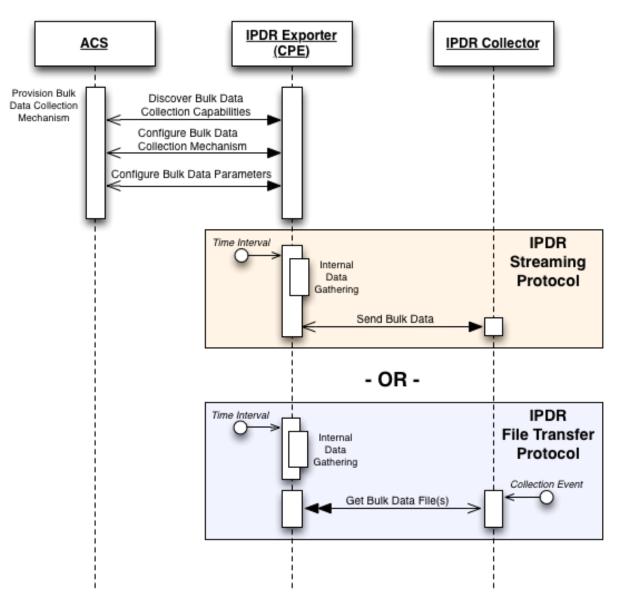
4.3.4   Overview

TR-232 defines a complete IPDR Service Specification [3] detailing the collection of bulk data for CPE. This document also defines a data model for use in CWMP (as defined in TR-069 [1]) managed devices to configure the IPDR mechanism being used to collect and deliver the bulk data.

TR-232 is separated into 3 sections:
- Bulk Data Collection Use Case – including the CWMP mechanism for configuring the collection of bulk data.
- Data Definitions – describing the attributes essential for the reporting of bulk data.
- Service Definitions – detailing the XML Schema and sample instance documents.

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4.4   Use Case

Service Providers are increasingly interested in retrieving large quantities of data from their installed CPE base at regular intervals. The amount of data being requested represents a significant portion of the CPE's data model and is thus a large amount of data. This IPDR-based service specification defines a mechanism for collecting and transmitting this data out-of-band from a CWMP management session thereby saving network resources and ACS resources.

4.4.1   Basic Use Case

Figure 1 – Operational View of Bulk Data Collection

The use case depicted above is outlined here:

1. The ACS discovers the Bulk Data Collection capabilities of the CPE in question
   a. Retrieve the Minimum Reporting Interval
   b. Retrieve the Supported Protocols
   c. Retrieve the Supported Encoding Types
   d. Retrieve the Maximum Number of Profiles supported
   e. Retrieve the Maximum Number of Parameters that can be Referenced
2. The ACS creates and configures a collection profile
   a. Enable the general Bulk Data Collection mechanism
   b. Create a Profile instance
   c. Set the Alias for this collection profile (the Alias will also be either the name of the IPDR Session, if using the IPDR Streaming Protocol, or the name of the IPDR Group, if using the IPDR File Transfer Protocol)
   d. Set the Reporting Interval for this collection profile
   e. Set the Time Reference (time of day) for this collection profile
   f. Set the Protocol to be used for this collection profile
   g. Set the Encoding Type to be used for this collection profile
   h. Set either the IPDR Streaming Protocol specific parameters (StreamingHost, StreamingPort, StreamingSessionID) OR the IPDR File Transfer Protocol specific parameters (FileTransferURL, FileTransferUsername, FileTransferPassword, ControlFileFormat) for this collection profile
3. The ACS configures the individual parameters or parameter paths to be collected
4. Enable the collection profile that was created in Step 2 and fully configured across Steps 2 and 3
5. Depending on how the CPE was configured in Step 2 above, the CPE will either use the IPDR Streaming Protocol to deliver information to the IPDR Collector as the time interval dictates **OR** use the IPDR File Transfer Protocol and wait for the IPDR Collector to gather the IPDR Document(s) that have been created based on the configured time interval.

4.4.2   CWMP Data Model

In order to allow an ACS to remotely configure the IPDR mechanism, a data model component is defined in tr-157-1-6.xml [2]. The data model allows the ACS to configure protocol details, reporting intervals, collection URLs, credentials, and the set of data to be collected. The data model component was first included in the following root data models: Device:1.10, Device:2.5, and InternetGatewayDevice:1.11.

4.5   Data Definitions

4.5.1   BulkDataReport

There SHOULD be only one BulkDataReport record per each IPDRDoc.

4.5.1.1   OUI

The Organizationally Unique Identifier (OUI) of the device manufacturer. The OUI is represented as a six hexadecimal-digit value using all upper-case letters and including any leading zeros.

This value MUST be a valid OUI as defined in Organizationally Unique Identifiers (OUIs) http://standards.ieee.org/faqs/OUI.html.

4.5.1.2   ProductClass

This is the identifier of the class of product for which the serial number applies. That is, for a given manufacturer, this parameter is used to identify the product or class of product over which the SerialNumber is unique.

4.5.1.3   SerialNumber

This is the identifier of the particular device that is unique for the indicated class of product and OUI.

4.5.1.4   Suspect

This is a boolean identifying the data integrity status of the bulk data being collected by this device. A false value means that there is no problem with this report and that the data is complete. A true value means that there is a problem with this report and that the data contained in this report is not complete.

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4.5.1.5 BulkData

Each Bulk Data item will correspond to a single piece of information that was requested for collection.

4.5.1.5.1 Name

This is the fully qualified name of a CWMP parameter that is being collected as bulk data. The parameter name MUST adhere to the requirements specified in Section 3.6.1/TR-069a4 [1] regarding instance identifiers and the value of the InstanceMode parameter.

4.5.1.5.2 Value

This is the value, in string format, of the CWMP parameter that is being collected as bulk data. Only printable ASCII characters can be present in the transmitted data (i.e. characters whose hex ASCII representations are in the inclusive range of hex 20 to 7E) and any non-ASCII characters or non-printable ASCII characters that exist in the original data MUST be converted to the '.' (hex 2E) character before transmission.

4.5.2   Formal Definitions

Table 1 – IPDR Formal Data Definition

Category	Name	Type	Presence	Permitted Values	Remarks
BulkDataReport					
Who	OUI	String	Required	Six hexadecimal-digit value using all upper-case letters and including any leading zeros	See Section 4.5.1.1
Who	ProductClass	String	Required		See Section 4.5.1.2
Who	SerialNumber	String	Required		See Section 4.5.1.3
What	Suspect	Boolean	Required		See Section 4.5.1.4
What	BulkData.Name	String	Required		See Section 4.5.1.5.1
What	BulkData.Value	String	Required		See Section 4.5.1.5.2

4.6   Service Definition

4.6.1   XML Schema

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!--
    IPDR Service Specification for Bulk Data Collection

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     Summary:
     This document defines the IPDR Service Definition for the Bulk Data
     Service Specification.

     Version History:
     * May 2012: Initial Version
-->

<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
     xmlns:ipdr="http://www.ipdr.org/namespaces/ipdr"
     xmlns:bdc="urn:broadband-forum-org:ipdr:tr-232-1-0"
     targetNamespace="urn:broadband-forum-org:ipdr:tr-232-1-0"
     elementFormDefault="qualified" attributeFormDefault="unqualified">

     <xs:include schemaLocation="http://www.ipdr.org/public/IPDRTypes.xsd"/>
     <xs:import namespace="http://www.ipdr.org/namespaces/ipdr"
               schemaLocation="http://www.ipdr.org/public/IPDRDoc3.5.1.xsd"/>


     <xs:element name="OUI" type="xs:string">
         <xs:annotation>
             <xs:appinfo>
                 The value MUST be a valid OUI as defined in:
                 Organizationally Unique Identifiers (OUIs)
                 http://standards.ieee.org/faqs/OUI.html
             </xs:appinfo>
             <xs:documentation>
                 Organizationally unique identifier of the device manufacturer.
                 Represented as a six hexadecimal-digit value using all
                 upper-case letters and including any leading zeros.
             </xs:documentation>
         </xs:annotation>
     </xs:element>
     <xs:element name="ProductClass" type="xs:string">
         <xs:annotation>
             <xs:documentation>
                 Identifier of the class of product for which the serial number
                 applies.  That is, for a given manufacturer, this parameter is
                 used to identify the product or class of product over which
                 the SerialNumber parameter is unique.
             </xs:documentation>
         </xs:annotation>
     </xs:element>
     <xs:element name="SerialNumber" type="xs:string">
         <xs:annotation>
             <xs:documentation>
                 Identifier of the particular device that is unique for the
                 indicated class of product and manufacturer.
             </xs:documentation>
         </xs:annotation>
     </xs:element>

     <xs:element name="Suspect" type="xs:boolean">
         <xs:annotation>
```

```xml
                <xs:documentation>
                    The data integrity status of the bulk data being collected by
                    this device.  A false value means that there is no problem
                    with this report and that the data is complete. A true value
                    means that there is a problem with this report and that the
                    data contained in this report is not complete.
                </xs:documentation>
            </xs:annotation>
    </xs:element>

    <xs:element name="Name" type="xs:string">
        <xs:annotation>
            <xs:documentation>
                The fully qualified name of a CWMP parameter that is being
                collected as bulk data.  The parameter name MUST adhere to the
                requirements specified in Section 3.6.1/TR-069a4 regarding
                instance identifiers and the value of the InstanceMode
                parameter.
            </xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="Value" type="xs:string">
        <xs:annotation>
            <xs:documentation>
                The value, in string format, of the CWMP parameter defined
                that is being collected as bulk data.  Only printable ASCII
                characters can be present in the transmitted data (i.e.
                characters whose hex ASCII representation are in the
                inclusive range of hex 20 to 7E) and any non-ASCII
                characters or non-printable ASCII characters that exist in
                the original data MUST be converted to the '.' (hex 2E)
                character before transmission.
            </xs:documentation>
        </xs:annotation>
    </xs:element>
    <xs:element name="BulkData">
        <xs:complexType>
            <xs:sequence>
                <xs:element ref="bdc:Name"/>
                <xs:element ref="bdc:Value"/>
            </xs:sequence>
        </xs:complexType>
    </xs:element>


    <xs:complexType name="BulkDataReport">
        <xs:complexContent>
            <xs:extension base="ipdr:IPDRType">
                <xs:sequence>
                    <xs:element ref="bdc:OUI" minOccurs="1"/>
                    <xs:element ref="bdc:ProductClass" minOccurs="1"/>
                    <xs:element ref="bdc:SerialNumber" minOccurs="1"/>
                    <xs:element ref="bdc:Suspect" minOccurs="1"/>
                    <xs:element ref="bdc:BulkData" minOccurs="0"
                                maxOccurs="unbounded"/>
                </xs:sequence>
            </xs:extension>
        </xs:complexContent>
    </xs:complexType>

</xs:schema>
```

4.6.2   Sample Instance Document

```xml
<?xml version="1.0" encoding="UTF-8"?>
<ipdr:IPDRDoc xmlns:ipdr="http://www.ipdr.org/namespaces/ipdr"
              xmlns="urn:broadband-forum-org:ipdr:tr-232-1-0"
              xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
              xsi:schemaLocation="urn:broadband-forum-org:ipdr:tr-232-1-0
                                  tr-232-1-0-0-serviceSpec.xsd
                              http://www.ipdr.org/namespaces/ipdr
                                  http://www.ipdr.org/public/IPDRDoc3.5.1.xsd"
              docId="f81d4fae-7dec-11d0-a765-00a0c91e6bf6"
              creationTime="2008-08-27T10:04:03Z"
              IPDRRecorderInfo="ExampleProfile"
              version="3.5.1">
    <ipdr:IPDR xsi:type="BulkDataReport">
        <OUI>00D09E</OUI>
        <ProductClass></ProductClass>
        <SerialNumber>71234813214</SerialNumber>
        <Suspect>false</Suspect>
        <BulkData>
            <Name>InternetGatewayDevice.DeviceInfo.UpTime</Name>
            <Value>771234</Value>
        </BulkData>
        <BulkData>
            <Name>InternetGatewayDevice.Time.NTPServer1</Name>
            <Value>time.gov</Value>
        </BulkData>
        <BulkData>
            <Name>InternetGatewayDevice.Time.NTPServer2</Name>
            <Value>time.xyzcorp.com</Value>
        </BulkData>
        <BulkData>
            <Name>InternetGatewayDevice.Time.CurrentLocalTime</Name>
            <Value>2008-08-27T10:04:04Z</Value>
        </BulkData>
    </ipdr:IPDR>
    <ipdr:IPDRDoc.End count="1" endTime="2008-08-27T10:04:05Z"/>
</ipdr:IPDRDoc>
```

Annex A: IPDR Theory of Operation

A.1 Introduction

The IPDR reference architecture is presented in Figure 2, which depicts a Service Element communicating to an IPDR Recorder that sends messages to the IPDR Transmitter and optionally to an IPDR Store. The IPDR Transmitter is responsible for sending messages to the BSS (a.k.a. Business Management System in the reference diagram). For the purposes of this implementation, the "E" and "F" interfaces supporting multi-party settlement are ignored.
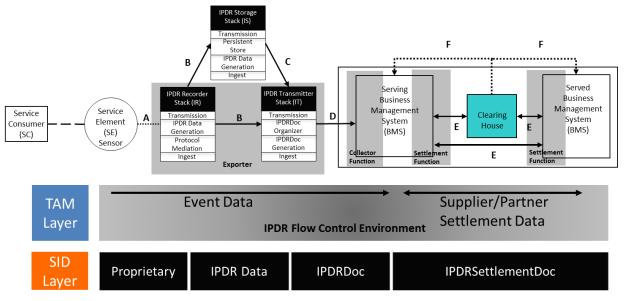

Figure 2 – IPDR Reference Architecture

From the perspective of the Broadband Forum and this Technical Report, the CPE is the Service Element and IPDR Exporter, and the IPDR Collector is the BSS. The IPDR documentation clarifies that the following scenario, where the Service Element directly communicates to the BSS, is valid and simply means that the IPDR Recorder and IPDR Transmitter (collectively the IPDR Exporter in this use case) are all incorporated into the Service Element. The Service Element is permitted to directly interface with the BSS if it supports the "D" interface specifications including backing stores and retransmission of IPDR documents.
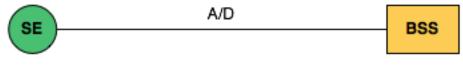

Figure 3 – Simplified IPDR Architecture

A.2 IPDR Nodes

Service Elements (SE) : The equipment and software that collects data and delivers it to an IPDR Recorder. For our purposes, this is the CPE.

IPDR Recorder (IR) : An entity that collects information from the SE and generates IPDR data from that information. For our purposes, this entity is contained within the CPE.

IPDR Store (IS) : An optional entity that persists IPDR data sent from an IR and delivers it as needed to an IT. For our purposes, this optional entity is not required.

IPDR Transmitter (IT) : An entity that builds, organizes, and then delivers IPDR documents to a BSS. For our purposes, this entity is contained within the CPE.

Business Support System (BSS) : An entity that collects IPDR documents and utilizes them in some fashion. For our purposes, this entity is the IPDR Collector that either retrieves the IPDR documents or has the IPDR documents pushed to it.

A.3 IPDR Interfaces

The IPDR Reference Model identifies 6 interfaces and includes definitions for 4 of them:

Interface	Description
A	Vendor proprietary. High-volume with high granularity void of context. **This interface is not part of the IPDR Protocol.**
B	IPDR Data Interface. From IPDR Recorders to IPDR Stores or IPDR Transmitters.
C	IPDR Store Export Interface.
D	BSS Interface. XML or XDR data from IPDR Exporter to IPDR Collector
E	Settlement Interface. Connects Service Delivery Business Management Systems.
F	Financial System Interface. **This interface is not part of the IPDR Protocol.**

Table 2 – IPDR Interfaces

From the perspective of the Broadband Forum and this Technical Report, the D interface is the only one we are interested in as the SE contains the IR and IT (meaning that the A and B interfaces are all internal to the CPE). The D interface is described in the IPDR File Transfer Protocol document [7] and the IPDR Streaming Protocol document [6] (i.e. the two protocols that we talk about in the TR-157 BulkData component). The IPDR File Transfer Protocol [7] uses FTP or HTTP to transfer files that contain IPDR records from the SE to the BSS. The IPDR Streaming Protocol [6] uses SCTP or TCP to transfer IPDR records from the SE to the BSS

using highly efficient XDR encoding as described in the IPDR/XDR Encoding Format document [4] or an XML encoding as described in the IPDR/XML File Encoding Format document [5].

A.4 Recommended Data Collection Techniques

The recommended IPDR data collection techniques for the D interface (i.e. between the IT and the BSS, or in our case between the CPE and the IPDR Collector) are as follows:

1. IPDR Transmitter Push (IT Push) : The IPDR Transmitter (or CPE in our case) delivers the IPDR records to a known BSS. This is done via the IPDR Streaming Protocol [6]. This method includes options for different session types, which permit time-based exports, event-based exports, event-based exports with time constraints, or exports in response to a request from the collector (ad-hoc exports). These types can be mixed and matched to accommodate different export requirements based upon the type of data being exported, but only the time-based exports (Time Interval Session Type) are currently supported.
2. Business Support System Pull (BSS Pull) : The BSS logically subscribes to specific IPDRDocs from the IPDR Transmitter (or CPE in our case). This is done via the IPDR File Transfer Protocol [7].

A.5 Implementation Guidelines

A.5.1 IPDR Recorder Information

The IPDR Document has a field in the IPDR element named "IPDRRecorderInfo", which is intended to contain identification information for the producer of the document. Since the Bulk Data Report already contains the typical CPE identification information (OUI, Product Class, and Serial Number), this field will be populated with the value of the Alias parameter within the Profile object (BulkData.Profile.{i}.Alias). The Alias parameter is a non-functional unique key for the Profile table and will typically be ACS driven, so this provides a means for the IPDR Collector to correlate the IPDR Document to a specific Bulk Data Profile.

A.5.2 IPDR Streaming Protocol Considerations

When a device has bulk data collection enabled it will be configured to have one or more collection profiles (BulkData.Profile.{i}). If the collection profile is configured to use the IPDR Streaming Protocol [6], then the collection profile directly maps to the Session concept defined within the IPDR Streaming Protocol.

The IPDR Exporter (the CPE in our case) always initiates the connection as we are only dealing with time-based exports. This document also limits the transport protocol being used to only TCP, instead of SCTP or BEEP, which should limit the number of transport protocols that need to be supported by the CPE. An IPDR Collector can request all available sessions from the

IPDR Exporter where the response is a list of sessions including the session identifier (which is used to start collecting data), the session name (which is the value of the Alias parameter within the BulkData.Profile.{i} table), and the session type (which is always "Time Interval Session"). After the IPDR Collector determines the session it wants to receive information for, the IPDR Collector then informs the IPDR Exporter to start sending information by sending a "flow start" message including the appropriate session identifier (BulkData.Profile.{i}.StreamingSessionID). When the IPDR Exporter receives the "flow start" message it then begins a data template negotiation phase, which in our case will be the IPDR Exporter sending the template that matches data definition defined within Section 4.5 followed by the IPDR Collector acknowledging the template without any changes. At this point in time the IPDR Exporter sends a "session start" message and then begins to issue the IPDR Data message(s), which contain the BulkData IPDR Document. Each IPDR Data message will need an acknowledgement from the IPDR Collector when it has been successfully received. After the BulkData IPDR Document is transmitted and received then either the IPDR Exporter or the IPDR Collector is free to terminate the communications session. See the following figure for a graphical representation of this overview.
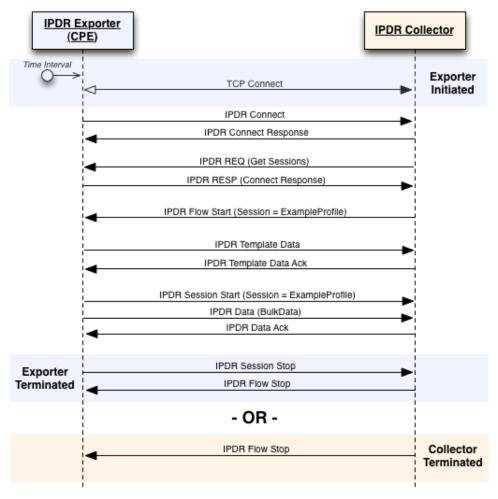

Figure 4 – IPDR Streaming Protocol Interaction Flow

Either the IPDR Exporter or the IPDR Collector can terminate the IPDR Session and thus the TCP connection that the IPDR Session is riding across. The IPDR Exporter terminates the session by issuing the IPDR Session Stop message, which tells the IPDR Collector that it has no further information to send. Whether or not the IPDR Exporter issues this message immediately after the BulkData record has been sent or not is currently implementation specific, but a guideline is to base this decision on the frequency of the collection profile's reporting interval. For example, if the reporting interval is 15 minutes, then perhaps it should hold the session open, but if the reporting interval is 24 hours then it should probably close the session after sending the BulkData record. The IPDR Collector terminates the session by issuing the IPDR Flow Stop message, which tells the IPDR Exporter that it does not want to receive any more information within this session. This is typically driven by a lack of resources within the IPDR Collector. Whether the session is terminated or not, the collection profile's reporting interval and time reference drives when the next BulkData IPDR Document is delivered from the IPDR Exporter.

A.5.3 IPDR File Transfer Protocol Considerations

When a device has bulk data collection enabled it will be configured to have one or more collection profiles (BulkData.Profile.{i}). If the collection profile is configured to use the IPDR File Transfer Protocol [7], then the collection profile directly maps to the Group concept defined within the IPDR File Transfer Protocol.

End of Broadband Forum Technical Report TR-232