

# ETSI GS F5G 016 V1.1.1 (2023-06)



## **Fifth Generation Fixed Network (F5G); Data Models of Telemetry for Access Network**

(standards.iteh.ai)

[ETSI GS F5G 016 V1.1.1 \(2023-06\)](https://standards.iteh.ai/catalog/standards/sist/788f86e4-4b8b-4abc-8e85-db925636a24c/etsi-gs-f5g-016-v1-1-1-2023-06)

<https://standards.iteh.ai/catalog/standards/sist/788f86e4-4b8b-4abc-8e85-db925636a24c/etsi-gs-f5g-016-v1-1-1-2023-06>

### ***Disclaimer***

---

The present document has been produced and approved by the Fifth Generation Fixed Network (F5G) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG. It does not necessarily represent the views of the entire ETSI membership.

---

**Reference**

---

DGS/F5G-0016 Telemetry Models

---

**Keywords**

---

F5G, telemetry, YANG**ETSI**

---

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**Important notice**

The present document can be downloaded from:

<https://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://standards.etsi.org/People/CommitteeSupportStaff.aspx> 4abc-8e85-

If you find a security vulnerability in the present document, please report it through our

Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

---

**Notice of disclaimer & limitation of liability**

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2023.  
All rights reserved.

# Contents

Intellectual Property Rights .....	5
Foreword.....	5
Modal verbs terminology.....	5
1 Scope .....	6
2 References .....	6
2.1 Normative references .....	6
2.2 Informative references.....	6
3 Definition of terms, symbols and abbreviations.....	6
3.1 Terms.....	6
3.2 Symbols.....	7
3.3 Abbreviations .....	7
4 Introduction to F5G Telemetry Models.....	8
4.1 Overview .....	8
4.2 Objectives of the Telemetry Models .....	8
5 F5G Telemetry Models .....	10
5.1 Fundamentals of Telemetry Configuration Models.....	10
5.1.1 Overviews .....	10
5.1.2 Module an-telemetry.....	10
5.1.3 Module an-inet-types .....	10
5.1.4 Module an-telemetry-types .....	10
5.1.5 Module an-telemetry-ext.....	11
5.2 Fundamentals of Telemetry gRPC® Protocol Models .....	12
5.2.1 Overviews .....	12
5.2.2 Module grpc-dialin .....	12
5.2.3 Module grpc-dialout .....	13
5.3 Fundamentals of Telemetry Data Header Models .....	13
5.3.1 Overviews .....	13
5.3.2 Module telemetry .....	13
5.4 Fundamentals of Telemetry Collection Models .....	14
5.4.1 Overviews .....	14
5.4.2 Traffic Collection.....	14
5.4.2.1 Module an-gpon-pm-olt-traffic .....	14
5.4.2.2 Module an-epon-pm-olt-traffic .....	15
5.4.2.3 Module an-ethernet-kpi .....	16
5.4.2.4 Module an-bb-queue-kpi .....	17
5.4.2.5 Module an-bb-service-flow-kpi.....	17
5.4.2.6 Module an-gpon-pm-onu-traffic .....	17
5.4.2.7 Module an-epon-pm-onu-traffic.....	18
5.4.3 Optical Link Information Collection .....	18
5.4.3.1 Module an-gpon-pm-olt-transceivers .....	18
5.4.3.2 Module an-epon-pm-olt-transceivers .....	18
5.4.4 ONU Information Collection .....	19
5.4.4.1 ONU local information .....	19
5.4.4.1.1 Module an-gpon-pm-onu-local-info .....	19
5.4.4.1.2 Module an-epon-pm-onu-local-info .....	19
5.4.4.1.3 Module an-gpon-pm-onu-line-quality .....	19
5.4.4.2 ONU remote information .....	20
5.4.4.2.1 Module an-gpon-pm-onu-remote-info .....	20
5.4.4.2.2 Module an-epon-pm-onu-remote-info .....	20
5.4.4.2.3 Module an-gpon-ONU-transceivers .....	20
5.4.4.2.4 Module an-epon-ONU-transceivers .....	21
<b>Annex A (informative): Examples Usage of the Telemetry Models.....</b>	<b>22</b>

A.1	Telemetry Configuration Uses Case.....	22
A.1.1	Description .....	22
A.1.2	Pre-conditions.....	22
A.1.3	Operations .....	22
A.2	Collection Data Decoding Example .....	23
	History .....	24

i T h S T A N D A R D P R E  
( s t a n d a r d s . i t e )

E T S I G S F 5 G 0 1 6  
h t t p s : / / s t a n d a r d s . i t e h . a  
d b 9 2 5 6 3 6 a 2 4 c / e t s i - g

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

# Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Fifth Generation Fixed Network (F5G). <https://standards.iteh.ai/catalog/standards/sist/788f86e4-4b8b-4abc-8e85-db925636a24c/etsi-gs-f5g-016-v1-1-1-2023-06>

---

# Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

---

# 1 Scope

The present document specifies the data models for Telemetry in the Access Network including both configuration and collection, referring to ETSI GS F5G 011 [1] and providing typical examples.

---

## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] [ETSI GS F5G 011](#): "Fifth Generation Fixed Network (F5G); Telemetry Framework and Requirements for Access Networks".

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] IEEE 802.3-2008<sup>TM</sup>: "IEEE Standard for information technology".
- 

## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

For the purposes of the present document, the terms given in ETSI GS F5G 004 [1] and the following apply:

**Access Network Telemetry (ANT):** monitoring technology that remotely collects data in push mode from the OLT

**alignment error packet:** packet with bad FCS and with a non-integral number of octets

NOTE: The definition of this term comes from IEEE 802.3 [i.1].

**error packet:** error frames include the following data frames:

- Correct and incorrect data frames with a frame length less than 64 bytes.
- Correct and incorrect data frames whose frame size is greater than the maximum MTU.
- Data frames with FCS errors whose frame length ranges from 64 to the maximum MTU.

- Data frames with alignment errors whose frame length ranges from 64 to the maximum MTU.

NOTE: The definition of this term comes from IEEE 802.3 [i.1].

**fragment packet:** packets with less than 64 octets in length, excluding framing octets but including FCS octets

NOTE 1: These packets have, and had either a bad FCS with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error).

NOTE 2: The definition of this term comes from IEEE 802.3 [i.1].

**jabber packet:** packet that is greater than 1 518 octets in length, excluding framing octets but including FCS octets

NOTE 1: These packets have, and had either a bad FCS with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error).

NOTE 2: The definition of this term comes from IEEE 802.3 [i.1].

**oversized packet:** packet with length greater than 1 518 octets

NOTE: The definition of this term comes from IEEE 802.3 [i.1].

**sensor group:** group of multiple sensor paths

**sensor path:** data model path of the sensor, which describes the specific ANT objects for collection

**service flow:** a service flow is a consequence of traffic classification based on the identifiers in the Ethernet packets on a physical port or logical port

EXAMPLE: An identifier can be a VLAN ID, which means Ethernet packets are classified based on VLANs.

NOTE: A service flow can also be a Layer 2 logical channel that carries services between an access node (OLT) and a subscriber (ONU).

**undersized packet:** packet with length less than 64 octets

NOTE: The definition of this term comes from IEEE 802.3 [i.1].

## 3.2 Symbols

Void.

## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ANT	Access Network Telemetry
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DOW	Drift Of Window
EPON	Ethernet Passive Optical Network
FCS	Frame Check Sequence
FEC	Forward Error Correction
gNMI	gRPC <sup>®</sup> Network Management Interface
GPB <sup>®</sup>	Google Protocol Buffer
GPON	Gigabit-capable Passive Optical Networks
gRPC <sup>®</sup>	Google Remote Procedure Call
IP	Internet Protocol
JSON	JavaScript Object Notation
KPI	Key Performance Indicator
LOF	Loss Of Frame
MTU	Maximum Transmission Unit
NETCONF	Network Configuration protocol

OAM	Operation Administration and Maintenance
ODN	Optical Distribution Network
OLT	Optical Line Terminal
OMCI	ONU Management and Control Interface
ONU	Optical Network Unit
PM	Performance Monitoring
PON	Passive Optical Network
RPC	Remote Procedure Call
UDP	User Datagram Protocol
UINT	Unsigned Integer
VLAN	Virtual Local Area Network
YANG	Yet Another Next Generation data modelling language

## 4 Introduction to F5G Telemetry Models

### 4.1 Overview

Telemetry provides a mechanism to stream collection data from OLT to the telemetry system as shown in ETSI GS F5G 011 [1]. The telemetry system is an automated controller for Access Network telemetry. It shall implement telemetry collection and may have the capability to dynamically configure and generate the telemetry subscriptions. When receiving the collected telemetry data, the telemetry system decodes it with identified encoding format and get subscribed information. For most OAM engineers, telemetry technology streams the collection data for helping access network monitoring and troubleshooting.

Access Network Telemetry contains the information about the applied configuration and uses configuration models to identify the subscription which consists of sensor-path and destinations.

The data layer of telemetry refers to the clause 5 of ETSI GS F5G 011 [1] as shown in Table 1. There are three layers and corresponding models.

**Table 1: Data Layer of the Access Network Telemetry**

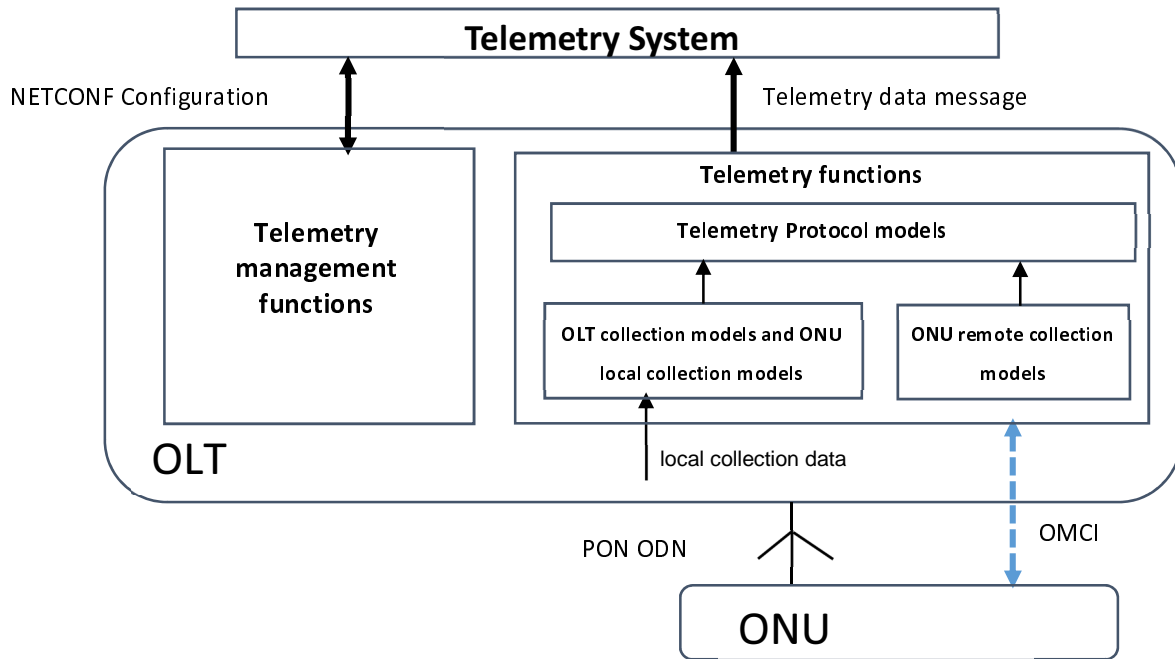
Telemetry Stack		Corresponding Models	Requirements
Data layer	Collection data layer	Telemetry Collection Models	Carry encoded telemetry collection data.
	Telemetry layer	Telemetry Data Header Models	Defines the data header when telemetry data is sent, including sampling path, sampling timestamp, etc.
	RPC layer (only in gRPC <sup>®</sup> protocol)	gRPC <sup>®</sup> Protocol Models	Defines the RPC interfaces when the OLT equipment reporting telemetry data as a server.

Combining the two pieces of information (configuration and collection) is the basis for automation and for intent-based networking of access network. The telemetry models define configuration models and data layer models for access network in telemetry collection. Having the same data language of models as the source of telemetry facilitates the OLT streaming data, aggregation and data analytics.

### 4.2 Objectives of the Telemetry Models

Figure 1 illustrates the telemetry system and telemetry data streaming architecture. The Telemetry models combines configuration models and Telemetry data layer models.





**Figure 1: Telemetry Architecture with Combined Mode**

The telemetry configuration models are the YANG models to the Northbound OAM Interfaces for telemetry management functions of the OLT. The interfaces of the YANG models exploit good programmability level of the Telemetry management platform. The Telemetry configuration models shall fulfil the following objectives:

- The telemetry configuration models are used in the telemetry management functions of the OLT. The OLT shall have a NETCONF server for its telemetry management function. The Telemetry configuration models and their NETCONF management interfaces are hosted by the OLT.
- The models shall support functions based on ETSI GS F5G 011 [1], clause 7.3.1 which are the essential blocks of the OLT enabling telemetry in Access Network.

The telemetry data layer models contain the Telemetry collection models, the telemetry data header models and the gRPC<sup>®</sup> protocol models. The Telemetry data header models and the gRPC<sup>®</sup> protocol models can collectively be called the Telemetry protocol models as shown in Figure 1 and Figure 2. The Telemetry data layer models shall fulfil the following objectives:

- The telemetry data layer models are the protobuf models which are used in the telemetry functions of the OLT and decoding functions in the telemetry system. The encoding format of the telemetry data is based on the telemetry data layer models and their GPB<sup>®</sup> format. The Telemetry data layer models shall meet the interface requirements in ETSI GS F5G 011 [1], clause 6.
- The gRPC<sup>®</sup> protocol models are the protobuf models to define the gRPC<sup>®</sup> interfaces for the gRPC<sup>®</sup> Static Telemetry mode and gRPC<sup>®</sup> Dynamic Telemetry mode based on ETSI GS F5G 011 [1], clause 6.2.
- The telemetry collection models contain OLT collection models, local ONU collection models and remote ONU collection models. They shall support the collection parameters for telemetry in the Access Network based on ETSI GS F5G 011 [1], clause 8. The Telemetry collection models can be used in either of the two following modes as shown in Figure 1 and Figure 2:
  - **Telemetry Architecture with Combined Mode:** managing the OLT local collection and ONU remote collection as a combined telemetry functions in the OLT are shown in Figure 1. The telemetry collection models are all hosted in the OLT. The local collection data is sampled by the OLT. The remote ONU collection information can be retrieved through the management interface between the OLT and the ONU which can be OMCI or other protocols and generated according to the ONU remote collection models by the OLT.

- **Telemetry Architecture with Separate Mode:** managing the OLT local collection and ONU remote collection in separate entities is shown in Figure 2. The OLT only hosts the OLT collection models and local ONU collection models. The remote ONU collection models are hosted in the subtending ONU. The local collection data is sampled by the OLT. And when the ONU receives the subscription request from OLT, it collects remote ONU collection information and generates the corresponding telemetry data which encoding format is the same as identified by the telemetry system according to the ONU remote collection models and streams the message to the OLT periodically.

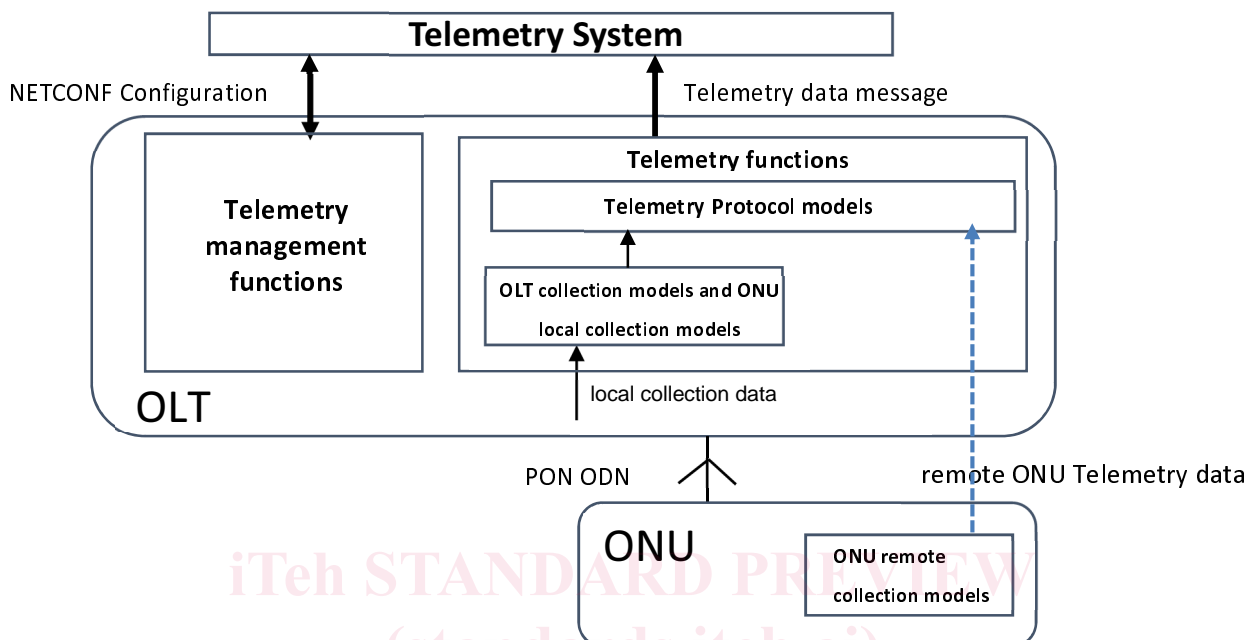


Figure 2: Telemetry Architecture with Separate Mode

ETSI GS F5G 016 V1.1.1 (2023-06)

## 5 F5G Telemetry Models

### 5.1 Fundamentals of Telemetry Configuration Models

#### 5.1.1 Overviews

The YANG modules provide functionality to manage telemetry configuration. These modules are published on the Forge platform at <https://forge.etsi.org/rep/f5g/f5g-access-telemetry/-/tree/v1.1.1/Configuration%20Models>.

#### 5.1.2 Module an-telemetry

This YANG module contains a collection of YANG definitions for supporting ETSI GS F5G 011 [1] requirements on telemetry functions in Access Network. As such, this module is specific to the OLT.

#### 5.1.3 Module an-inet-types

This YANG module contains a collection of YANG type definitions for a set of Internet address related types for use in telemetry for Access Network. As such, this module is specific to the OLT.

#### 5.1.4 Module an-telemetry-types

This YANG module contains a collection of YANG type and identities definitions used by the module an-telemetry for use in telemetry for Access Network. As such, this module is specific to the OLT.

## 5.1.5 Module an-telemetry-ext

This YANG module contains a collection of extension YANG definitions for the Telemetry configuration conditions for use in telemetry for access network. As such, this module is specific to the OLT. Specifically, this module augments the module an-telemetry to define these conditions.

## 5.1.6 Overall Structure

The fundamental parts of the data model are the "sensor-groups" with associated sensor paths, the "destination-groups" with all telemetry collector address and the "subscriptions" list of persistent-subscriptions and dynamic-subscriptions. These can be implemented by the OLT.

The data model has the following overall structure:

```

module an-telemetry
  +--rw telemetry-system
    +--rw sensor-groups
      +--rw sensor-group* [sensor-group-id]
        +--rw sensor-group-id leafref
        +--rw config
          | +--rw sensor-group-id? string
        +--ro state
          | +--ro sensor-group-id? string
        +--rw sensor-paths
          +--rw sensor-path* [path]
            +--rw path leafref
            +--rw config
              | +--rw path? string
              | +--rw exclude-filter? string
            +--ro state
              | +--ro path? string
              | +--ro exclude-filter? string
            +--rw an-telemetry-ext:filters
              +--rw an-telemetry-ext:filter* [name]
                +--rw an-telemetry-ext:name leafref
                +--rw an-telemetry-ext:config
                  | +--rw an-telemetry-ext:name? string
                  | +--rw an-telemetry-ext:condition-relation? enumeration
                +--ro an-telemetry-ext:state string
                +--ro an-telemetry-ext:name? string
                +--ro an-telemetry-ext:condition-relation? enumeration
              +--rw an-telemetry-ext:conditions
                +--rw an-telemetry-ext:condition* [op-field op-type op-value]
                  +--rw an-telemetry-ext:op-field leafref
                  +--rw an-telemetry-ext:op-type leafref
                  +--rw an-telemetry-ext:op-value leafref
                  +--rw an-telemetry-ext:config
                    | +--rw an-telemetry-ext:op-field? string
                    | +--rw an-telemetry-ext:op-type? enumeration
                    | +--rw an-telemetry-ext:op-value? string
                  +--ro an-telemetry-ext:state
                    +--ro an-telemetry-ext:op-field? string
                    +--ro an-telemetry-ext:op-type? enumeration
                    +--ro an-telemetry-ext:op-value? string
            +--rw destination-groups
              +--rw destination-group* [group-id]
                +--rw group-id leafref
                +--rw config
                  | +--rw group-id? string
                +--ro state
                  | +--ro group-id? string
                +--rw destinations
                  +--rw destination* [destination-address destination-port]
                    +--rw destination-address leafref
                    +--rw destination-port leafref
                    +--rw config
                      | +--rw destination-address? an-inet:ip-address
                      | +--rw destination-port? uint16
                    +--ro state
                      +--ro destination-address? an-inet:ip-address
                      +--ro destination-port? uint16
            +--rw subscriptions
              +--rw persistent-subscriptions
                | +--rw persistent-subscription* [name]

```