Remote logs for ONT in GPON networks

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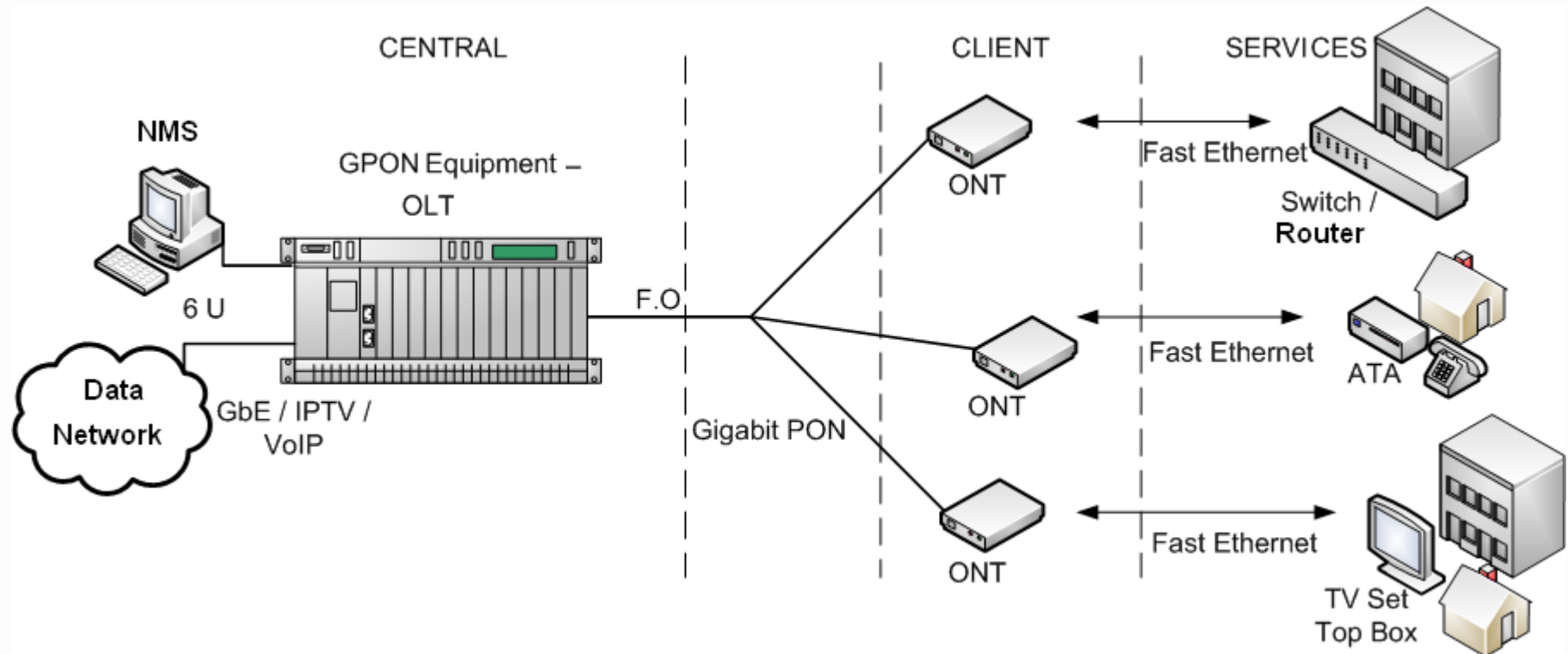
Introduction

- GPON (Gigabit capable Passive Optical Networks) - ITU-T G.984:

    - Point-to-multipoint FTTP network architecture, consisting of an OLT and a number of ONUs near end users

- OLT (Optical Line Terminal):

    - The central office node, providing the interface between the GPON network and the service providers network services

- ONT (Optical Network Terminal):

    - Device that terminates the GPON and presents customer service interfaces to the user

- OMCI (ONT Management and Control Interface) - ITU-T G.984.4:

    - Management information base (MIB) and a set of tools used to keep ONT and OLT MIBs synchronized.

Introduction

Paper proposal

- A new scheme to remotely recover execution information from ONT in GPON, using two new managed entities to complement OMCI MIB with remote log features:

  - ONT Logger entity
  - Date and Time entity

Motivation

- Allow the simultaneous analysis of the behavior of OLT and ONT

- Advantages:

  - It is not necessary to send to the field operator in case of problems

  - Fix bugs faster

- In the OMCI MIB, there are many entities for operation, administration and maintenance (OAM), but no entity provides logging feature.

ONT Logger entity

- *Relationships*
  - This managed entity is related directly to the ONT-G entity.

- *Attributes*
  - Managed entity id
  - Is Logger active
  - Ticket Mask
  - Log Buffer

- *Actions*
  - Get, Set, Get Next

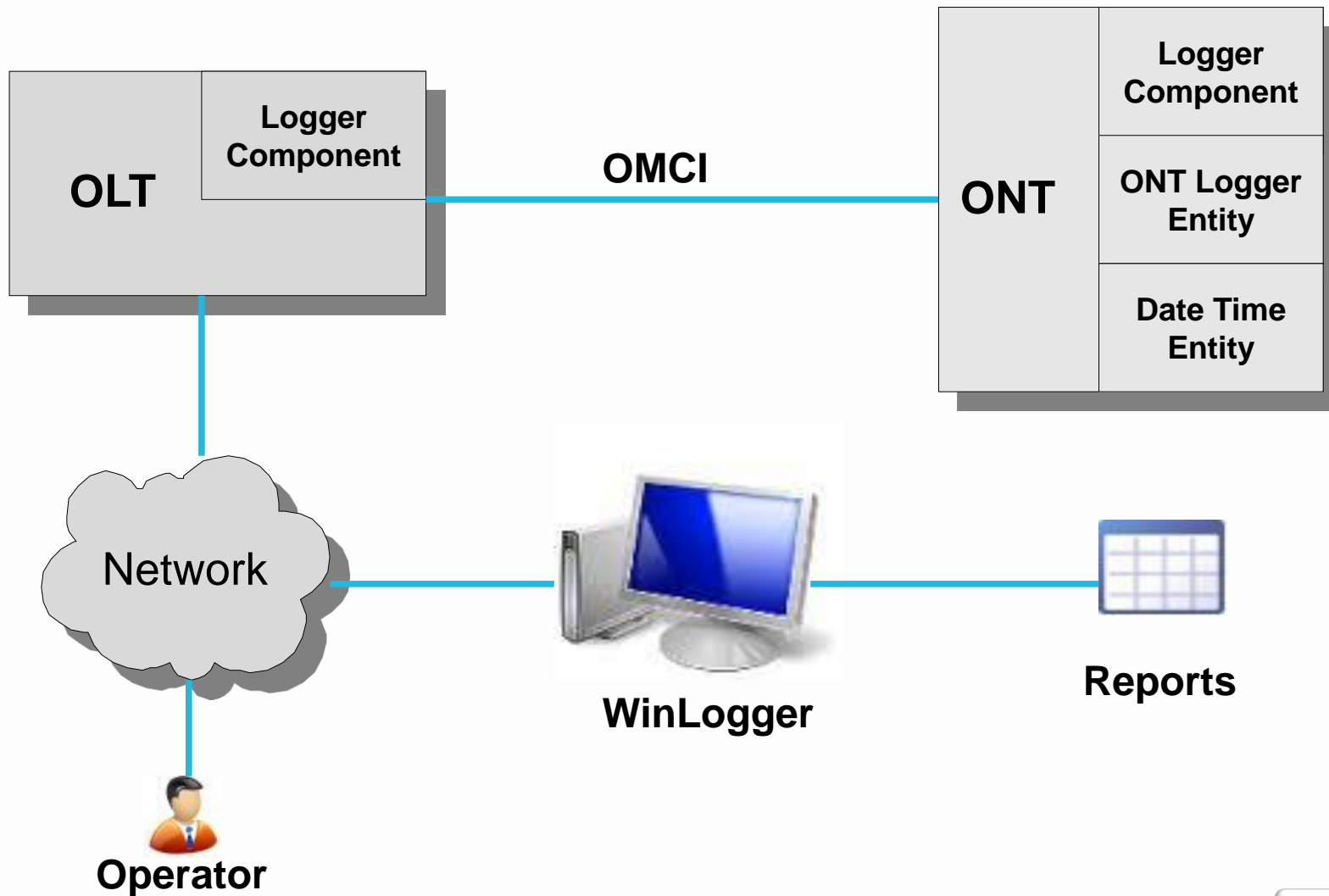- *Notifications*
  - Attribute Value Change

Date and Time entity

- *Relationships*
  - This managed entity is related directly to the ONT-G entity.

- *Attributes*
  - Managed entity id
  - Year, Month, Day
  - Hour, Minute, Second
  - Uptime

- *Actions*
  - Get, Set

- *Notifications*
  - None

Implementation and operation

- These MEs are synchronized using OMCI process. They are connected, in a one by one relationship, with ONT-G entity

- An instance of each one of these MEs is automatically created by the ONT after its initialization

- After ONT activation, OLT updates Date and Time entity attributes with its real time clock information

- Initially, ONT Logger entity has its attributes updated according to the data within the ONT Logger buffer capacities

- There are two buffers: one to store new tickets and one to transmit stored tickets to OLT

- An AVC (attribute value change) is generated by ONT: a) when the buffer that is storing the tickets becomes full; b) periodically, by means of an ONT timer, if there is any ticket in the buffer

- After receiving AVC, OLT decides when to read the buffers using Get and Get Next actions

Tests

Tests

1. Activate Link 1
2. Register ONT 1 in Link 1
3. Activate ONT 1
4. Set *Date and Time* in ONT 1
5. Activate *ONT Logger* in ONT 1
6. Create 10 Ethernet flows in ONT 1
7. Activate all Ethernet flows in ONT 1
8. Deactivate ONT 1
9. Deactivate Link 1.

· The methods used to extract performance data and to generate the results below are the same used in "Time survey on embedded software using remote IP log system: a GPON study case".
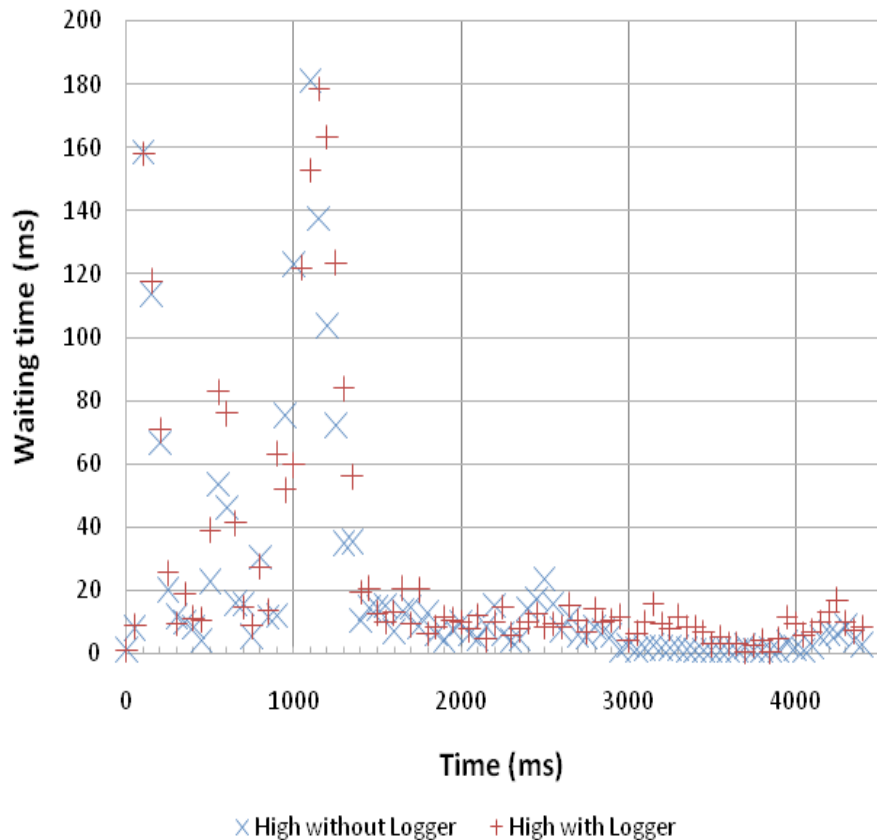
Tests results

Fig. 1 - Average waiting time for tasks assigned to high priority queue
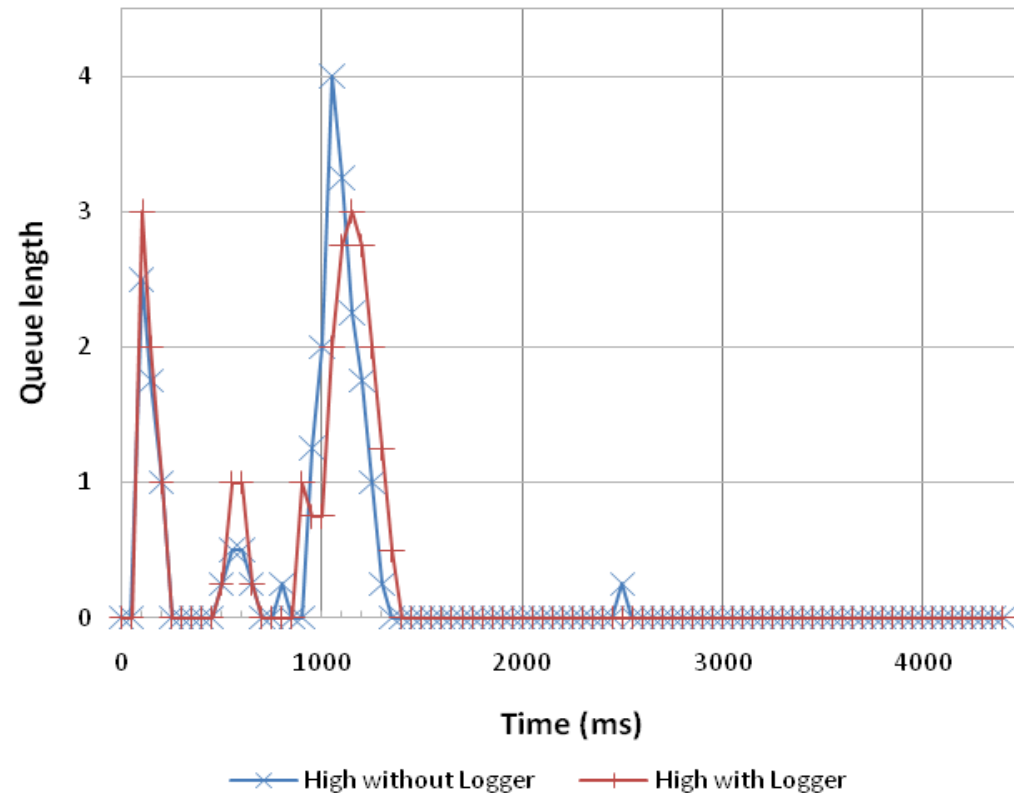

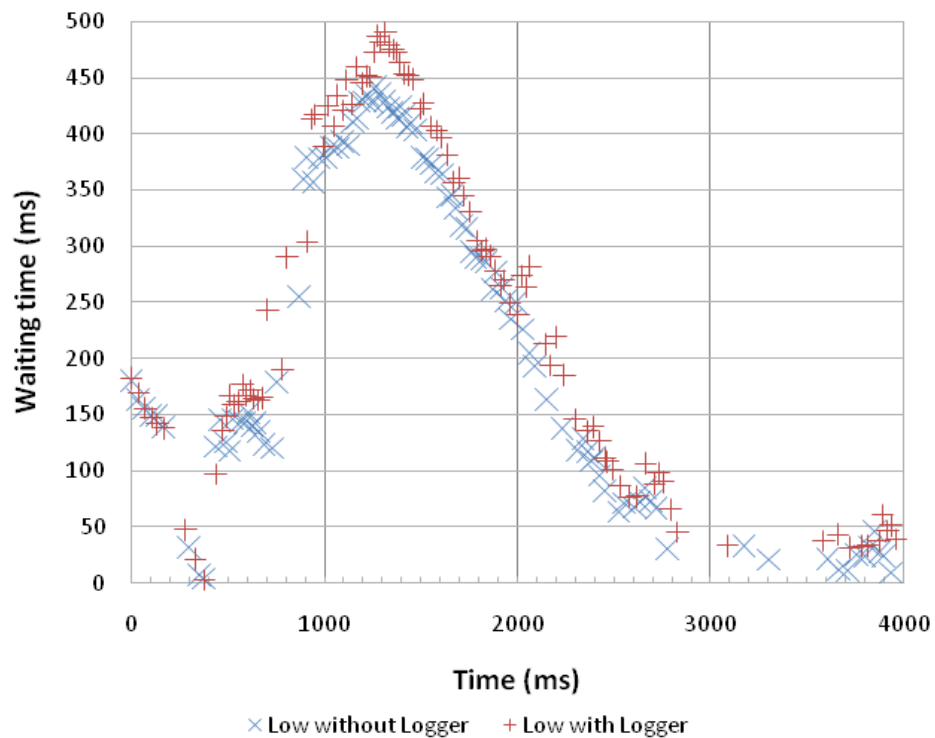Fig. 2 - Average high priority queue length

Tests results

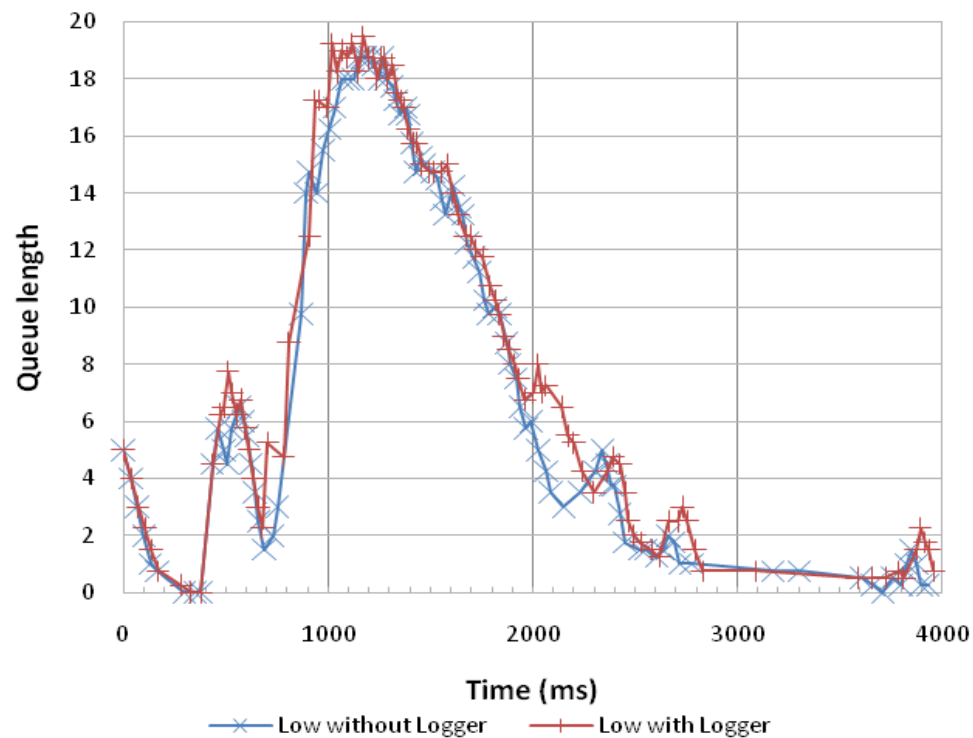Fig. 3 - Average waiting time for tasks assigned to low priority queue

Fig. 4 - Average low priority queue length

Tests results

Results	ONT Logger state		Relative increase
	Active	Inactive	
Average waiting time in high priority queue (ms)	22,6	22,3	19%
Average waiting time in low priority queue (ms)	241,9	220,3	10%
Average queue length in high priority queue	0,28	0,26	10%
Average queue length in low priority queue	8,3	7,9	6%
Average response time (ms)	5910	5894	0,28%
Standard deviation of response time (ms)	28,7	28,8	0,67%

Conclusion

· Good approach to recover log information from a remote ONT in a GPON system, avoiding the need of physical access to the equipment

· Positive cost-benefit ratio, proved by means of tests in a real GPON equipment

· The impact on the performance is not felt by the operator or by the subscribers.

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