



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Activities:**  
**Type of document:** Deliverable  
**Date:** 31/01/06

**IST Integrated Project No 507667**

**Partners:** Ascom / Dimat / Dresden University of Technology / DS2 / EDF / Endesa / EPFL / Iberdrola / Iberinco / Main.net / PPC / Robotiker / Schneider Electric / Spidcom / Telvent / Unika / Yitran

**Responsible:** EDF, DS2

**Public** EC

**Circulation:**  **Confidential**

**Restricted**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 1 / 145

## OPERA SYSTEM SPECIFICATION – PART 2

Copyright

© Copyright 2006 The OPERA Consortium



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 2 / 145

## **COPYRIGHT**

**“Copyright and Reprint Permissions. You may freely reproduce all or part of this paper for non-commercial purposes, provided that the following conditions are fulfilled: (i) to cite the authors, as the copyright owners (ii) to cite the OPERA Project and mention that the European Commission co-finances it, by means of including this statement “OPERA. IST Integrated Project No 507667. Funded by EC” and (iii) not to alter the information.”**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM **3 / 145**

**TABLE OF CONTENTS**

<b>1</b>	<b>PURPOSE.....</b>	<b>7</b>
<b>2</b>	<b>INTRODUCTION .....</b>	<b>8</b>
2.1	SCOPE .....	8
2.2	OVERVIEW .....	8
2.3	DOCUMENT CONVENTIONS .....	8
2.4	ABBREVIATIONS AND ACRONYMS .....	9
<b>3</b>	<b>GENERAL DESCRIPTION .....</b>	<b>13</b>
3.1	GENERAL DESCRIPTION OF THE ARCHITECTURE .....	13
3.2	NODE DESCRIPTION .....	13
3.2.1	<i>HE</i> .....	14
3.2.2	<i>Time Division Repeaters</i> .....	14
3.2.3	<i>CPE</i> .....	14
3.3	REFERENCE MODEL.....	15
3.3.1	<i>Bridging block description</i> .....	16
<b>4</b>	<b>SYSTEM PARAMETERS .....</b>	<b>17</b>
4.1	GENERAL PARAMETERS .....	17
4.2	AGC (AUTOMATIC GAIN CONTROL) PARAMETERS .....	21
4.3	RADIUS PARAMETERS .....	22
4.4	CLASS OF SERVICE (COS) PARAMETERS .....	23
4.5	QUALITY OF SERVICE (QOS) PARAMETERS .....	25
4.5.1	<i>Slave Node Parameters (CPE)</i> .....	26
4.5.2	<i>Master Node Parameters (HE or REPEATER)</i> .....	26
4.6	PROFILES PARAMETERS .....	27
4.7	TRANSLATION TABLE PARAMETERS .....	32
4.8	MAC FILTER PARAMETERS .....	33
4.9	NTP PARAMETERS .....	35
4.10	SNMP PARAMETERS .....	36
4.11	STP PARAMETERS .....	36
4.12	VOIP PARAMETERS.....	39
4.12.1	<i>Dial Plan Configuration</i> .....	47
4.12.2	<i>Country Specific Parameters</i> .....	48
4.12.3	<i>Tone pattern configuration</i> .....	51
4.13	VLAN NETWORK .....	51
4.14	OVLAN PARAMETERS .....	55
4.15	CUSTOM VLAN/OVLAN PARAMETERS.....	56
4.15.1	<i>Custom VLAN Parameters</i> .....	56
4.15.2	<i>Custom OVLAN Parameters</i> .....	62
4.16	ACCESS PROTOCOL PARAMETERS.....	66
<b>5</b>	<b>CONFIGURATION.....</b>	<b>70</b>
5.1	MIB .....	70
5.1.1	<i>SNMP Management</i> .....	70



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM **4 / 145**

5.1.2	MIB-II for OPERA.....	70
5.1.3	OPERA Private MIB.....	71
5.1.3.1	The OPERA MIB Description.....	73
5.2	AUTO-CONFIGURATION AND PROVISIONING.....	84
5.2.1	Auto-configuration purpose.....	84
5.2.2	Auto-configuration process overview.....	85
5.2.3	Access Protocol.....	87
5.2.4	Auto-configuration at Modem Boot.....	88
5.2.4.1	Autoconfiguration PTPP Boot.....	88
5.2.4.2	Autoconfiguration no PTPP Boot.....	88
5.2.4.3	Boot from local settings.....	88
5.2.5	PTPP Protocol.....	89
5.2.5.1	General description.....	89
5.2.5.2	Protocol description.....	89
5.2.5.3	PTPP Packets Format.....	93
5.2.5.3.1	RRQ packet.....	94
5.2.5.3.2	DATA packet.....	94
5.2.5.3.3	DATA ACK packet.....	95
5.2.5.4	Translation Table DATA format.....	95
5.2.5.5	VLAN configuration while doing PTPP.....	96
5.2.5.6	PTPP packets forwarding.....	97
5.2.6	Translation Table.....	97
5.2.7	Auto-configuration & Networking.....	98
5.2.7.1	VLAN Network.....	98
5.2.7.2	noVLAN Network.....	99
5.2.7.3	OVLAN Configuration and Root Interface.....	99
5.2.7.4	User Profiles.....	100
5.2.7.5	User Profiles inside auto-configuration.....	100
5.2.7.6	Working with RADIUS Authentication.....	101
5.2.7.7	Working without RADIUS Authentication.....	101
5.2.8	DHCP Support.....	101
5.2.8.1	DHCP Client.....	101
5.2.8.2	DHCP Server.....	102
5.2.9	RADIUS Support.....	102
5.2.9.1	RADIUS Client.....	102
5.3	AUTO-CONFIGURATION PARAMETERS.....	103
5.3.1	Parameter Types.....	103
5.3.2	Parameter Format.....	103
5.3.3	Auto-configuration parameter list.....	104
5.3.3.1	General Parameters.....	104
5.3.3.2	AGC (Automatic Gain Control) Parameters.....	105
5.3.3.3	RADIUS Parameters.....	106
5.3.3.4	Class of Service (CoS) Parameters.....	106
5.3.3.5	Quality of Service (QoS) Parameters.....	107
5.3.3.5.1	Slave Node Parameters (CPE).....	107
5.3.3.5.2	Master Node Parameters (HE or REPEATER).....	107
5.3.3.6	Profiles Parameters.....	108
5.3.3.7	Translation Table Parameters.....	109
5.3.3.8	VLAN Parameters.....	110
5.3.3.9	OVLAN Parameters.....	111
5.3.3.10	Access Protocol Parameters.....	111
5.3.3.11	STP Parameters.....	112
5.3.3.12	VoIP Parameters.....	113
5.3.3.13	NTP Parameters.....	117
5.3.3.14	Custom VLAN/OVLAN Parameters.....	117



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 5 / 145

5.3.3.15	SNMP parameters .....	121
<b>6</b>	<b>ENVIRONMENTAL REQUIREMENTS (INFORMATIVE).....</b>	<b>122</b>
6.1	CPE .....	122
6.2	LV REPEATER.....	122
6.3	LV HEAD END AND MV UNITS.....	123
<b>ANNEX A (NORMATIVE): MIB DEFINITION IN ASN.1 FORMAT .....</b>		<b>125</b>

**LIST OF TABLES**

Table 1	Upload file parameters .....	74
Table 2	Download configuration file parameters.....	75
Table 3	Upgrade status code list .....	76
Table 4	Update system parameters.....	76
Table 5	Translation table parameters .....	96

**LIST OF FIGURES**

Figure 1	Typical Access Scenario.....	13
Figure 2	Reference model .....	15
Figure 3	OPERA MIB tree.....	72
Figure 4	Power mask encoding graphic.....	78
Figure 5	Autoconfiguration of a slave modem .....	86
Figure 6	Autoconfiguration of a HE.....	87
Figure 7	Usual PTTTP operation. ....	90
Figure 8	ACK timer expiration and data block retransmission. ....	92
Figure 9	DATA timer expiration and Maximum Number of Retransmissions exceeded. ....	93
Figure 10	PTTP RRQ packet format.....	94
Figure 11	PTTP DATA packet format .....	94
Figure 12	PTTP DATA ACK packet format.....	95
Figure 13	Translation Table parameter item.....	95
Figure 14	Full Translation Table Data block .....	96
Figure 15	Translation table example.....	97
Figure 16	VLAN use inside the PLC network.....	99
Figure 17	Radius profiles example .....	100



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 6 / 145

## References

- [1] Opera Standard Technology Specification (D59 Part 1)



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 7 / 145

## 1 PURPOSE

This document is the system specification of the OPERA technology.

This document specifies technical aspects, in order that OPERA PLC compatible devices can be transparently managed and configured by system providers.

The specification of the OPERA PLC technology (layer 1 and layer 2 of the communication system) is out of scope of this document. However it is assumed that the devices are compliant to the OPERA PLC technology specification as defined in [1].



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 8 / 145

## 2 INTRODUCTION

### 2.1 Scope

This document specifies:

- The MIB for opera PLC compatible devices.
- Auto-configuration of the PLC nodes.
- Nodes authentication & user profiles
- Security and privacy aspects in the plc system

### 2.2 Overview

One goal of the OPERA project is to guarantee the interoperability of the PLC devices. In fact there are different levels of interoperability. Within the OPERA project, the interoperability was defined as follows:

- The different nodes should be able to communicate with each other
- Nodes should be able to guarantee a minimum performance
- The change of a slave node, should have a no or minimal impact on the overall plc cell performance
- The provisioning and the configuration of different nodes should be transparent

The first three requirements are fulfilled by [1]. The last requirement is not related to the PLC technology. Nevertheless it's very important to service providers in order to reduce the operational costs. This document is the technical specifications to fulfil the last requirement.

### 2.3 Document Conventions

This document is divided into sections and appendices. The document body (all sections) is normative (except for italicised text); each appendix is identified as in its title as normative or informative.

*Text formatted in italics is not part of the specification. It is for clarification only.*





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 9 / 145

Binary numbers are indicated by the prefix 0b followed by the binary digits, for example, 0b0101. Hexadecimal numbers are indicated by the prefix 0x.

Formal requirements are indicated with 'shall' in the main body of this document.

Options are indicated with 'may' in the main body of this document. If an option is incorporated in an implementation, it shall be done as specified in this document.

## 2.4 Abbreviations and acronyms

ABLP	Adaptive Bit-Loading Protocol
ACK	ACKnowledge
AGC	Automatic Gain Control
ASIC	Application-Specific Integrated Circuit
BPC	Bits Per subCarrier
CFR	Channel Frequency Response
CPE	Customer Premise Equipment
CoS	Class of Service
CRC	Cyclic Redundancy Check
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DTMF	Dual Tone Multi-Frequency
EN	European Standard
ETSI	European Telecommunications Standards Institute
EU	End User
EXTA	Ethernet interface A
EXTB	Ethernet interface B
FDR	Frequency Division Repeater



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 10 / 145

FEC	Forward Error Correction
FTP	File Transfer Protocol
GMT	Greenwich Mean Time
HE	Head End
HTTPS	Secure HyperText Transfer Protocol
HURTO	High Ultra Reliable Transmission for Ofdm
HW	Hardware
IAB	Internet Architecture Board
IEEE	Institute of Electrical and Electronics Engineers
ICMP	Internet Control Message Protocol
IGMP	Internet Group Management Protocol
IP	Internet Protocol
ISP	Internet service provider
ITU	International Telecommunication Union
LDP	Label Distribution Protocol
LLC	Logical Link Control
LV	Low Voltage
MAC	Media Access Control
MIB	Management Information Base
MGCP	Media Gateway Control Protocol
MPLS	Multiprotocol Label Switching
MV	Medium Voltage
NAS	Network Access Server



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 11 / 145

NCS	Network-based Call Signalling
NTP	Network Time Protocol
OID	Object Identifiers
OPERA	Open PLC European Research Alliance
OPERACP	OPERA Communication Protocol
OSI	Open Systems Interconnection
OVLAN	Optimized VLAN
PHY	PHYSical layer
PLC	Powerline Communications
PLR	Packet Loss Rate
PTTP	Parametric Translation Table Protocol
QoS	Quality of Service
REP	Repeater
RFC	Request For Comments
RRQ	Read ReQuest
RSTP	Rapid STP
RTCP	RTP Control Protocol
RTP	Real-Time Transport Protocol
SCTP	Stream Control Transmission Protocol
SIP	Session Initiation Protocol
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
SSH	Secure Shell



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 12 / 145

STP	Spanning Tree Protocol
SW	Software
TCP	Transfer Control Protocol
TDR	Time Division Repeater
TFTP	Trivial File Transfer Protocol
TOS	Type of Service
TR	Technical Report
UDP	User Datagram Protocol
UII	User Input Indication
USB	Universal Serial Bus
UT	Universal Time
VLAN	Virtual Local Area Network
VoIP	Voice over IP
WIFI	Wireless Fidelity



## 3 GENERAL DESCRIPTION

### 3.1 General description of the architecture

An access PLC network consists of a number of user terminals (CPEs) that transmit/receive traffic in a shared medium to/from a centralized station (HE). If the signal is too attenuated to reach all CPEs from the same HE, repeaters (REP) can be inserted in the network in order to retransmit the signal and thus increase the coverage. Repeaters can be either TDR or FDR. From this description, the type of topologies to be found in PLC access networks are tree-like topologies, like the one depicted in Figure 1, where a central node, called a HE, concentrates all of the upstream and downstream traffic.

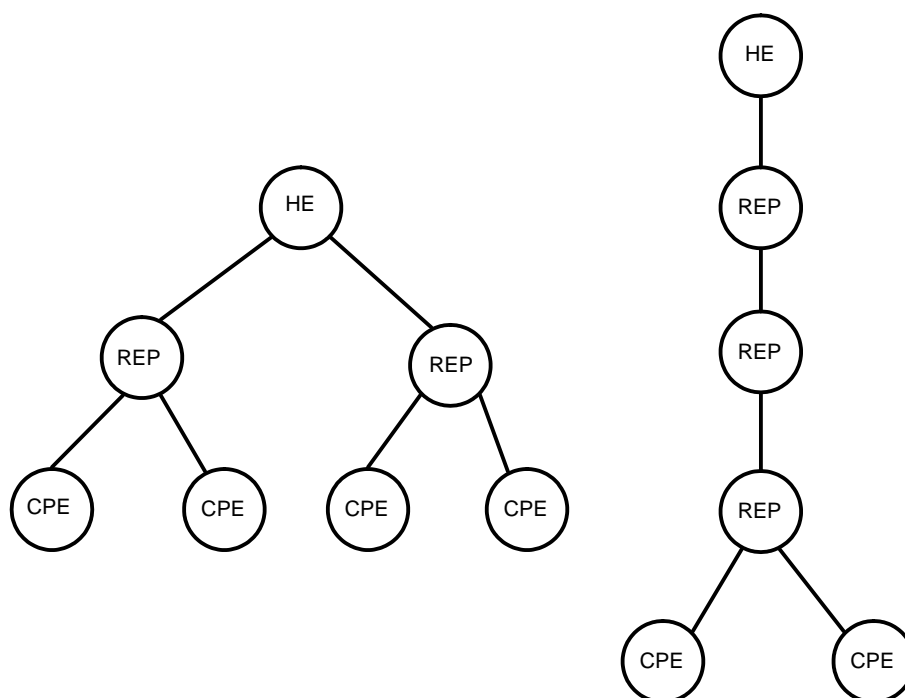


Figure 1 Typical Access Scenario

### 3.2 Node description

A PLC network can be made either of:

- one PLC cell,



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 14 / 145

- several PLC cells if they are interconnected via Frequency Division repeaters (FDR). FDR are made of a combination of one HE and one CPE or TDR operating in different modes.

In an access PLC network, there is usually one HE, placed in the MV/LV substation, that concentrates the upstream and downstream traffic from/to all the CPEs of all the connected PLC cells.

A PLC cell is composed by a HE and the set of units (CPEs or TDRs) under the direct or indirect control of that HE operating under the same symbol type and the same carrier frequency. It is composed of:

1. One HE
2. From zero to several TDRs
3. One (or several) CPE(s)

### 3.2.1 HE

The HE is the central node that controls the entire PLC cell. It assigns resources to all nodes of the PLC cell through the use of the token, according to the QoS requirements of the flows circulating on the PLC cell. The HE will always be the master of any node directly connected to it.

### 3.2.2 Time Division Repeaters

A TDR is used to increase the coverage in areas too far from the cell's HE. TDRs are connected to the HE or to other TDRs that act as their master node. TDRs share the channel allocated to them by their master node and distribute it among their slave nodes according to each one's QoS profile. The TDR will be the slave of the HE or of another TDR, and will be the master of its slaves.

### 3.2.3 CPE

CPEs are PLC units installed in the customer's household. A CPE must subscribe to the network before being able to access the channel. Subscribing to the network means selecting a master node that assigns channel access time. In order to subscribe to the network, a validation process is run that acknowledges that the CPE is valid. After being accepted into the network, the CPE automatically downloads a file (auto-configuration process) detailing the parameters to use, such as the user QoS profile and other configuration parameters. The CPE is always a slave.



### 3.3 Reference model

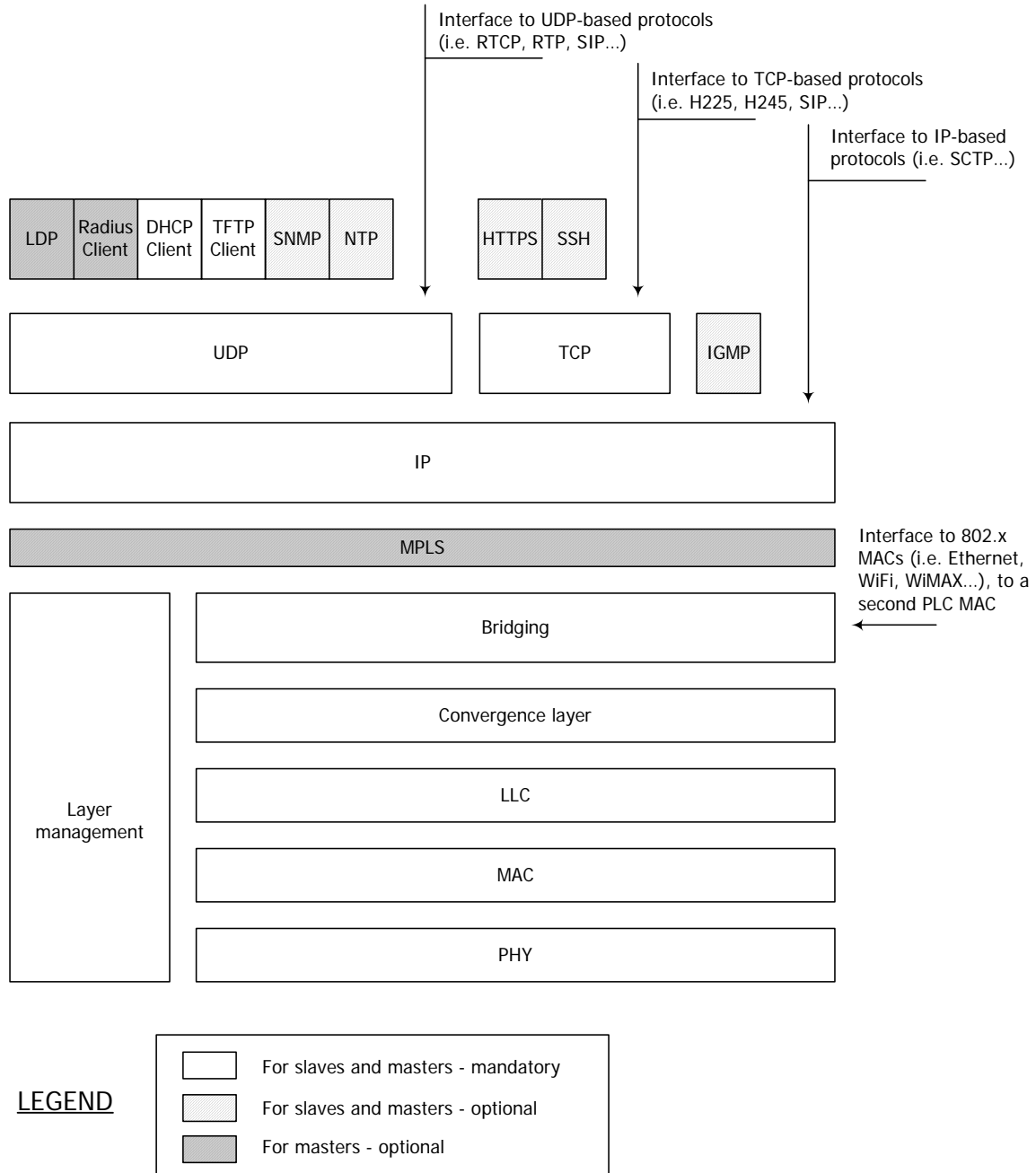


Figure 2 Reference model



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 16 / 145

### 3.3.1 Bridging block description

The bridging block interconnects bridge ports. There are three types of bridge ports: PLC ports, non-PLC ports and the management port. PLC ports are the bridge ports that are directly mapped onto the completed entries of the Port Solver Table. Non-PLC ports are any other external ports of the node (e.g. Ethernet, USB, WIFI,...). The management port is used for the exchange of management messages between the bridging block and the layer management.

The bridging block shall provide standard 802.1D-2004 bridging functions with optional 802.1Q-2003 support. Some specific functional requirements apply to this block (see section 7 in Part I). From a bridging standpoint, the convergence layer is seen as a set of bridge ports called "PLC ports" which are both transmission and reception unicast ports. The bridging block of a node handles as many PLC ports as there completed entries in the Port Solver Table of this node. The identifier of a PLC port corresponds to the value of the local port attached to a remote node. The bridging block only handles unicast PLC ports. The decision to carry transmissions over the broadcast local port (port 127) is performed at the convergence layer, considering the list of PLC ports submitted by the bridging block. The status (open/close) and the identifier of the PLC ports are mapped onto the status and identifiers of the local ports defined in the Port Solver Table.

*\*Note1: A CPE only communicates with one single node (its master): thus, it has a bridging block which is only required to handle one single PLC port. From a bridging standpoint, TDRs and HEs differ from CPEs in the fact that they can handle several PLC ports.*

*\*Note2: The port solver table includes complete entries and incomplete entries. Complete entries correspond to local port which are associated to solved remote port and MAC addresses. Incomplete entries correspond to local ports which associated remote port are still not solved via the Port Solver Protocol.*





**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 17 / 145

## 4 SYSTEM PARAMETERS

### 4.1 General Parameters

- **GENERAL\_USE\_AUTOCONF = [YES | NO]**

- **Parameter:** YES enables autoconf, NO disables it.
- **SNMP:** no
- **Mandatory:** yes

This should be the first parameter in the auto-configuration file. If this parameter is disabled, when downloading the file, all the parameters will be stored in non-volatile memory, and next boot-up will be in local settings boot mode. In case of enabled, except a few parameters that must be necessarily saved in non-volatile memory, the others will not be stored in the non-volatile memory, and next boot-up will be in Auto-configuration mode. By default, it is enabled.

- **GENERAL\_TYPE = [HE | CPE | TDREPEATER]**

- **Parameter:** Possible values are: HE (Head End), CPE (Customer Premises Equipment) and TDREPEATER (Time Division Repeater).
- **SNMP:** *plSysNodeType*
- **Mandatory:** yes

Configures the type of node. A node can be configured as a HE (Head End), a CPE (Customer Premises Equipment) or a TDREPEATER (Time Division Repeater). The default value is CPE.

- **GENERAL\_FW\_TYPE = [MV | LV | EU]**

- **Parameter:** Possible values are: MV (Medium Voltage), LV (Low Voltage) and EU (End User).
- **SNMP:** no
- **Mandatory:** yes

Configures the firmware type of the node. The following firmware types can be configured: MV (Medium Voltage), LV (Low Voltage) and EU (End User). This parameter affects the QoS and VLAN/OVLAN configuration. The default value is LV.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 18 / 145

- **GENERAL\_SIGNAL\_MODE = [1 ... m]**

- **Parameter:** Configures the physical mode used by the modem. This value can reach from 1 to m, depending on the range of frequency used.
- **SNMP:** *plBasicMode*
- **Mandatory:** yes

Configures the physical mode used by the modem. The valid modes depend on the range of frequency used.

- **GENERAL\_SIGNAL\_MODE\_LIST.i = [1 ... m]**

- **Parameter:** This value can reach from 1 to m, depending on the range of frequency used.
- **SNMP:** *plBasicSearchModes*
- **Mandatory:** yes

Configures i-mode of the mode list for the modem to search with the SearchLink protocol ( $i = 1 \dots 12$ ). The valid modes depend on the range of frequency used. The mode list is scanned to select the range of frequencies that will be taken into account by the modem.

- **GENERAL\_AUTHENTICATION = [RADIUS | AUTHLIST | NONE]**

- **Parameter:** There are three possible values: RADIUS, AUTHLIST and NONE. If *RADIUS* is selected, a RADIUS server will be in charge of accepting new users and assigning the profile. If *AUTHLIST* is selected, authentication will be done by checking a list provided in the auto-configuration file. If *NONE* is selected, all the users will be accepted
- **SNMP:** no
- **Mandatory:** yes

Selects one of the following authentication methods:

- RADIUS server. In this case, a RADIUS server will be in charge of accepting new users and assigning the profile.
- Authorization list. In this case, authentication will be done by checking a list provided in the auto-configuration file. This option avoids the installation of a RADIUS server.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 19 / 145

- No authentication. In this case, no authentication method is used at all. Therefore, all the users will be accepted.

By default, no authentication is used.

- **GENERAL\_STP = [YES | NO]**

- **Parameter:** Enables (YES) or disables (NO) the Spanning Tree Protocol in the node.
- **SNMP:** *plStpEnable*
- **Mandatory:** yes

Enables or disables the Spanning Tree Protocol in the node. Enabled by default.

- **GENERAL\_COMMON\_STP\_EXT\_A = [YES | NO]**

- **Parameter:** Enables (YES) or disables (NO) the Common STP feature in the Ethernet interface A (EXTA).
- **SNMP:** no
- **Mandatory:** no

Enables or disables the Common STP feature in the Ethernet interface A (EXTA). This parameter only makes sense to be used if VLANs are enabled. If it is enabled, STP packets will be released and accepted through EXTA without VLAN tag (even if VLANs are enabled). If it is disabled, STP packets will be released with the management VLAN tag (if VLANs are active).

WARNING: with this parameter enabled, all packets without VLAN will be accepted through EXTA.

- **GENERAL\_COMMON\_STP\_EXT\_B = [YES | NO]**

- **Parameter:** Enables (YES) or disables (NO) the Common STP feature in the Ethernet interface B (EXTB).
- **SNMP:** no
- **Mandatory:** no

Enables or disables the Common STP feature in the Ethernet interface B (EXTB). This parameter only makes sense to be used if VLANs are enabled. If it is enabled, STP packets will be released and accepted through EXTB without VLAN tag (even if



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 20 / 145

VLANs are enabled). If it is disabled, STP packets will be released with the management VLAN tag (if VLANs are active).

WARNING: with this parameter enabled, all packets without VLAN will be accepted through EXTB.

- **GENERAL\_IP\_ADDRESS = <ddd.ddd.ddd.ddd>**

- **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP:** *pISysStaticIPAddress*
- **Mandatory:** no

Configures the IP address to be used when booting up with DHCP disabled.

- **GENERAL\_IP\_NETMASK = <ddd.ddd.ddd.ddd>**

- **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP:** *pISysStaticNetMask*
- **Mandatory:** no

Configures the IP network mask to be used when booting up with DHCP disabled.

- **GENERAL\_IP\_GATEWAY = <ddd.ddd.ddd.ddd>**

- **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP:** *pISysStaticDefaultGW*
- **Mandatory:** no

Configures the default gateway IP address to be used when booting up with DHCP disabled.

- **GENERAL\_IP\_USE\_DHCP = [YES | NO]**

- **Parameter:** If Yes DHCP is used, if NO DHCP is not used.
- **SNMP:** *pISysUseDHCP*
- **Mandatory:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 21 / 145

Enables or disables the DHCP protocol in the modem. If DHCP is enabled, network configuration parameters (IP address, network mask and default gateway IP address) will be obtained from a DHCP server when booting up. If it is disabled, the network configuration parameters saved in the non-volatile memory will be used instead.

## 4.2 AGC (Automatic Gain Control) Parameters

The following parameters must be handled with special care. A bad configuration of them can produce loss of communication with the modem through PLC.

- **AGC\_TX\_GAIN = [0 | 1]**

- **Parameter:** Selecting 1, the default value, 12 dB are added to the reference gain. In case of 0 value, no extra gain is added (0 dB).
- **SNMP:** *plBasicTXAGCGain*
- **Mandatory:** no

It configures the transmission gain. Two gain values, 0 and 12 dB, can be added to the reference gain. By default, 12 dB are selected.

- **AGC\_RX\_ENABLE = [0 | 1]**

- **Parameter:** Enables (1) or disables (0) the hardware AGC.
- **SNMP:** *plBasicRXAGCEnable*
- **Mandatory:** no

Enables or disables the reception HW AGC. It is enabled by default.

- **AGC\_RX\_FIX\_GAIN = [0 ... 7]**

- **Parameter:** Eight values, from 0 to 7, are possible. Those values represent gains from 0 to 42 dB, respectively, added to the reference gain in steps of 6 dB.
- **SNMP:** *plBasicRXAGCGain*
- **Mandatory:** no

It sets a fixed value for the reception gain. This value is only taken into account if the HW AGC is disabled. Eight gain values, from 0 to 42 dB, can be added to the reference gain.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 22 / 145

- **AGC\_MAX\_RX\_GAIN = [0 ... 7]**

- **Parameter:** Eight values, from 0 to 7, are possible. Those values represent gains from 0 to 42 dB, respectively, added to the reference gain in steps of 6 dB. The default value is 7 (42 dB).
- **SNMP:** no
- **Mandatory:** no

Configures the maximum reception gain for the HW AGC. Eight gain values, from 0 to 42 dB, can be added to the reference gain. The default value is 42 dB.

- **AGC\_MIN\_RX\_GAIN = [0 ... 7]**

- **Parameter:** Eight values, from 0 to 7, are possible. Those values represent gains from 0 to 42 dB, respectively, added to the reference gain in steps of 6 dB. The default value is 7 (42 dB).
- **SNMP:** no
- **Mandatory:** no

Configures the minimum reception gain for the HW AGC. Eight gain values, from 0 to 42 dB, can be added to the reference gain. The default value is 0 dB.

### 4.3 RADIUS Parameters

- **RADIUS\_SERVER\_IP = <ddd.ddd.ddd.ddd>**

- **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP:** no
- **Mandatory:** yes

This autoconfiguration parameter specifies the RADIUS server IP address. The access-request of the RADIUS procedure is submitted to the RADIUS server via the network using this IP address.

- **RADIUS\_SERVER\_PORT = ddddd**

- **Parameter:** Port number
- **SNMP:** no



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 23 / 145

- **Mandatory:** yes

It specifies the RADIUS client UDP port. The access-request of the RADIUS procedure is submitted to the RADIUS server via the network as a UDP communication to the IP address set before and sent to the UDP port of this parameter.

- **RADIUS\_SHARED\_SECRET = <string>**

- **Parameter:** 'shared\_secret' (string, limited to 16 characters, of the shared secret)
- **SNMP:** no
- **Mandatory:** yes

It sets the RADIUS shared secret, which is limited to 16 characters. The forwarding server decrypts the User-Password, if present, using the shared secret. Once the RADIUS server receives the request, it validates the sending client. A request from a client for which the RADIUS server does not have a shared secret MUST be silently discarded

All three parameters must be set up in order for the RADIUS client to work properly.

## 4.4 Class of Service (CoS) Parameters

Using the auto-configuration file, 2 classes of service criteria can be defined, assigning priorities from 0 to 7.

- **COS\_CUSTOM\_CRITERION\_OFFSET.i = [1 ... 531]**

- **Parameter:** Values from 1 to 531 are possible.
- **SNMP:** no
- **Mandatory:** no

Custom i-criterion frame offset, in bytes (i = 1, 2).

- **COS\_CUSTOM\_CRITERION\_PATTERN.i = 0XXXXXXXXXXXXXXXXXX**

- **Parameter:** The value must be specified with 16 hexadecimal digits.
- **SNMP:** no
- **Mandatory:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 24 / 145

Custom i-criterion 8-byte pattern (i = 1, 2).

- **COS\_CUSTOM\_CRITERION\_BITMASK.i = 0XXXXXXXXXXXXXXXXXX**

- **Parameter:** The value must be specified with 16 hexadecimal digits.
- **SNMP:** no
- **Mandatory:** no

Custom i-criterion 8-byte bitmask (i = 1, 2).

- **COS\_CUSTOM\_CRITERION\_CLASSES\_OFFSET.i = [1 ... 531]**

- **Parameter:** Values from 1 to 531 are possible.
- **SNMP:** no
- **Mandatory:** no

Custom i-criterion classes frame offset, in bytes (i = 1, 2).

- **COS\_CUSTOM\_CRITERION\_CLASSES\_BITMASK.i i = 0XXXXXXXXXXXXXXXXXX**

- **Parameter:** The value must be specified with 16 hexadecimal digits.
- **SNMP:** no
- **Mandatory:** no

Custom i-criterion classes 8-byte bitmask (i = 1, 2).

- **COS\_CUSTOM\_CRITERION\_CLASSES\_PATTERN.i.j i=0XXXXXXXXXXXXXXXXXX**

- **Parameter:** The value must be specified with 16 hexadecimal digits
- **SNMP:** no
- **Mandatory:** no

Custom i-criterion j-class 8-byte pattern (i = 1, 2; j = 1 ... 8).

- **COS\_CUSTOM\_CRITERION\_CLASSES\_PRIO.i.j = [0 ... 7]**

- **Parameter:** Values from 0 to 7 are allowed.
- **SNMP:** no





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 25 / 145

- **Mandatory:** no

Priority assigned the packets that match the custom i-criterion j-class priority ( $i = 1, 2; j = 1 \dots 8$ ).

- **COS\_CRITERION.k = [8021P | TOS | CUSTOM1 | CUSTOM2]**

- **Parameter:** There are two predefined criteria (*8021P*, based on IEEE 802.1p VLAN tag priority field, and *TOS*, based on IP type of service), and two custom criteria (*CUSTOM1* and *CUSTOM2*), defined with the parameters above (*COS\_CUSTOM\_CRITERION\_xxx*).
- **SNMP:** no
- **Mandatory:** yes

k-criterion definition ( $k = 1, 2$ ). Assigns up to 2 criteria to classify traffic. There are two predefined criteria (one based on IEEE 802.1p VLAN tag priority field, and another based on IP type of service), and two custom criteria, defined with the parameters above (*COS\_CUSTOM\_CRITERION\_xxx*).

- **COS\_DEFAULT\_PRIO = [0 ... 7]**

- **Parameter:** Values from 0 to 7 are allowed.
- **SNMP:** no
- **Mandatory:** yes

Configures the CoS default priority, i.e. the priority assigned to packets that do not match any criterion.

## 4.5 Quality of Service (QoS) Parameters

- **QOS\_ENABLE = [YES | NO]**

- **Parameter:** Enables (*YES*) or disables (*NO*) the quality of service in the node.
- **SNMP:** no
- **Mandatory:** yes

Enables or disables the quality of service in the node. If this parameter is disabled, all other parameters related to QoS will not be configured.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 26 / 145

- **QOS\_PRIOACK.prio+1 = [0 | 1]**
  - **Parameter:** This list enables (1) or disables (0) the Layer 2 ACK protocol depending on the priority level transmitted by the modem (priority levels: prio = 0 ... 7).
  - **SNMP:** no
  - **Mandatory:** yes

This list enables or disables the Layer 2 ACK protocol depending on the priority level transmitted by the modem (can be useful for those applications with hard settings in latency but not in PLR) (priority levels: prio = 0 ... 7). The ACK policy is carried out as follows:

- The highest priority of all the outgoing frames present in the output buffers of the modem is obtained.
- If the Layer 2 ACK protocol is enabled for such a priority, the ACKs will be enabled for all priorities.
- If the Layer 2 ACK protocol is disabled for such a priority, the ACKs will be disabled for all priorities.

The Layer 2 ACK protocol is enabled for all the priorities by default.

#### 4.5.1 Slave Node Parameters (CPE)

- **QOS\_UPBWLIMIT = [YES | NO]**
  - **Parameter:** Enables (YES) or disables (NO) the transmission bandwidth limitation in a slave.
  - **SNMP:** no
  - **Mandatory:** yes

Enables or disables the transmission bandwidth limitation in a slave. Enabled by default. If disabled, the user will transmit data constantly without restrictions. Every time it receives a resource allocation message to use the channel, there will be no limit imposed by the slave when transmitting data back to its master.

#### 4.5.2 Master Node Parameters (HE or REPEATER)

- **QOS\_LATENCY\_STEP = [20 ... 400]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 27 / 145

- **Parameter:** Values in ms, from 20 to 400.
- **SNMP:** no
- **Mandatory:** yes

It configures the minimum latency step for the different slaves when using QoS.

- **QOS\_BW\_POLICY = [0 | 1]**

- **Parameter:** A value of 0 corresponds to Fair mode, and 1 to Priority-based mode.
- **SNMP:** no
- **Mandatory:** yes

Selects the policy in which the QoS manages the excess of bandwidth: Fair or Priority-based mode.

- **QOS\_LATENCY.prio+1 = [1 | 2 | 4 | 8]**

- **Parameter:** Priority levels: prio = 0 ... 7. Possible values are: 1, 2, 4 and 8.
- **SNMP:** no
- **Mandatory:** yes

This list configures the latency for each priority level in QOS\_LATENCY\_STEP units (priority levels: prio = 0 ... 7).

## 4.6 Profiles Parameters

A profile is set of configurable parameters that are saved as a whole. A number is assigned to each profile, and when a modem is assigned one profile, it will use all the parameters that are saved in this profile.

To define a profile **all parameters must be set up**, even if not working with VLANs. In this case, the values are not used and can be 1 for instance.

- **PROFILE\_MAX\_TXPUT\_TX.i = N (in kbps)**

- **Parameter:** Number (32 bits size) of kbps
- **SNMP:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 28 / 145

- **Mandatory:** yes

Maximum transmission throughput (from the slave point of view: upstream) for users with profile i. A modem that uses the profile 'i' will have a transmission throughput limited to this value.

- **PROFILE\_MAX\_TXPUT\_RX.i N (in kbps)**

- **Parameter:** Number (32 bits size) of kbps
- **SNMP:** no
- **Mandatory:** yes

Maximum reception throughput (from the EU point of view: downstream) for users with profile i. A modem that uses the profile 'i' will have the reception throughput limited to this value.

- **PROFILE\_UPBWLIMIT.i = [YES|NO]**

- **Parameter:** 'yes' (to limit the upstream) or 'no' (to not limit the upstream)
- **SNMP:** no
- **Mandatory:** yes

In a Master or a TD Repeater, this parameter is used to limit the upstream (slave's transmission) for users with profile i. This parameter is set to 'yes' by default.

If set to 'no', the user will receive resource allocation messages constantly. Every time the master node has transmitted all required resource allocation messages to all the slaves with limit up bandwidth enabled, then it will transmit resource allocation messages to the slaves without up bandwidth limit until the rest of the slaves can receive resource allocation messages again.

- **PROFILE\_DWBWLIMIT.i = [YES|NO]**

- **Parameter:** 'yes' (to limit the downstream) or 'no' (to not limit the downstream)
- **SNMP:** no
- **Mandatory:** yes

In a Master or a TD Repeater, this parameter is used to limit the downstream (slave's reception) for users with profile i. This parameter is set to 'yes' by default.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 29 / 145

If disabled, the master node will never stop transmitting data to that user. Every time the master node has transmitted all required data to all slaves with down bandwidth limit, then it will transmit data to the slaves without down bandwidth limit until the rest of slaves can receive again.

- **PROFILE\_PRIORITIES.i = [0x00-0xFF]**

- **Parameter:** '0xXX' (hexadecimal number from 00 to FF) each bit represents a priority, that can be set (1) or not (0).i.e. 0x85 priorities 7, 2 and 0 are allowed.
- **SNMP:** no
- **Mandatory:** yes

This parameter indicates the priorities allowed for a user of profile i. This is useful to prioritise some transmission above others and to give some quality of service to the different modems.

At this parameter each bit represents a priority, that can be set or not. The default value is 0x85, so priorities 7, 2 and 0 are allowed. To include another priority, it is necessary to set the appropriate bit in the profile priorities flag. In any case, the maximum and minimum priorities are always set even if they are not configured (0x81).

- **PROFILE\_MNMT\_VLAN.i = [2-4093] | %<PARAMETRIC VALUE>**

- **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **SNMP:** no
- **Mandatory:** yes

If VLANs are used, this value indicates the management VLAN for that user.

- **PROFILE\_DATA\_VLAN.i = [2-4093] | %<PARAMETRIC VALUE>**

- **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **SNMP:** no
- **Mandatory:** yes

If VLANs are used, this value indicates the Data VLAN for that user.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 30 / 145

- **PROFILE\_VOIP\_VLAN.i = [2-4093] | %<PARAMETRIC VALUE>**

- **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **SNMP:** no
- **Mandatory:** no

If VLANs are used, this valued indicates the VoIP VLAN for that user.

- **PROFILE\_VLAN\_ADD\_TAG.i.j = [2-4093] or parametric**

- **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **SNMP:** no
- **Mandatory:** yes

With this parameter a filter list is created. The list can be 'allowed' or 'forbidden'. A user that uses the profile 'i' will add the filter list as allowed or forbidden.

This parameter is of table type, with up to 16 VLAN in the filter list. When the list is 'allowed', these tags are added to the base configuration. Otherwise, if the list is changed to forbidden, the base tags are removed and only the tags defined here are included, for security reasons.

- **PROFILE\_VLAN\_IS\_ALLOWED\_IFACE\_USER.i = [yes/no]**

- **Parameter:** 'yes' (to set the list as allowed) or 'no' (to set the list as forbidden)
- **SNMP:** no
- **Mandatory:** no

This parameter is the complementary of the previous one and indicates if the tags on the list are allowed or forbidden for the user with the profile i. When the list is 'allowed' (setting 'yes' as value of the parameter) the tags are additive to the base configuration, when the list is 'forbidden' (setting 'no' as value of the parameter), the list is reseted and only tags defined with PROFILE\_VLAN\_ADD\_TAG will be in the list.

- **PROFILE\_VLAN\_TAGGED\_ONLY\_IFACE\_USER.i = [yes/no]**

- **Parameter:** 'yes' (to drop input packets without VLAN tag) or 'no' (to not drop input packets without VLAN tag)



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 31 / 145

- **SNMP:** no
- **Mandatory:** no

This parameter indicates whether or not to drop input packets without a VLAN tag from the user with profile i (PL interface).

• **PROFILE\_VLAN\_OUTFORMAT\_TAG\_IFACE\_USER.i = [yes/no]**

- **Parameter:** 'yes' (to send packets with VLAN tag) or 'no' (to not send packets with VLAN tag)
- **SNMP:** no
- **Mandatory:** no

This parameter indicates whether or not to send packets with a VLAN tag to the user interface with this profile.

• **PROFILE\_OVLAN\_ADD\_TAG.i.j = [2-4094] or parametric**

- **Parameter:** Number from 2 to 4094 or '%Parameter\_name' (parametric value preceded by a %)
- **SNMP:** no
- **Mandatory:** yes

With this parameter a filter list is created. The list can be 'allowed' or 'forbidden'. A user that uses the profile 'i' will add the filter list as allowed or forbidden.

This parameter is of table type, with up to 16 OVLAN in the filter list. When the list is 'allowed', these tags are added to the base configuration. Otherwise, if the list is changed to forbidden, the base tags are removed and only the tags defined here are included, for security reasons.

• **PROFILE\_OVLAN\_IS\_ALLOWED\_IFACE\_USER.i = [yes/no]**

- **Parameter:** 'yes' (to mark the list as allowed) or 'no' (to mark the list as forbidden)
- **SNMP:** no
- **Mandatory:** no

This parameter is the complementary of the previous one and indicates if the tags on the list are allowed or forbidden for the user with the profile i. When the list is



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 32 / 145

'allowed' (setting 'yes' as value of the parameter) the tags are additive to the base configuration, when the list is 'forbidden' (setting 'no' as value of the parameter), the list is reset and only tags defined with PROFILE\_OVLAN\_ADD\_TAG will be in the list.

- **PROFILE\_OVLAN\_TAGGED\_ONLY\_IFACE\_USER.i = [yes/no]**

- **Parameter:** 'yes' (to drop input packets without OVLAN tag) or 'no' (to not drop input packets without OVLAN tag)
- **SNMP:** no
- **Mandatory:** no

This parameter indicates whether or not to drop input packets without a OVLAN tag from the user with profile i (PL interface).

- **PROFILE\_OVLAN\_OUTFORMAT\_TAG\_IFACE\_USER.i = [yes/no]**

- **Parameter:** 'yes' (to send packets with OVLAN tag) or 'no' (to not send packets with OVLAN tag)
- **SNMP:** no
- **Mandatory:** no

This parameter indicates whether or not to send packets with a VLAN tag to the user interface with this profile.

## 4.7 Translation Table Parameters

The translation table contains information about the VLAN/OVLANS used for all nodes hanging from HV/MV equipment. This table is necessary because the autoconfiguration file of equipment is a parametric file, that is, there are several symbolic values that should be translated into concrete values.

- **TRANSLATION\_MNMT\_VLAN = [2-4093]**

- **Parameter:** Number from 2 to 4093
- **SNMP:** none
- **Mandatory:** yes

Tag number of the Management VLAN. This parameter is mandatory when using VLANs in the network.





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 33 / 145

- **TRANSLATION\_DATA\_VLAN.i = [2-4093]**

- **Parameter:** Number from 2 to 4093
- **SNMP:** none
- **Mandatory:** yes

Tag number of the Data i-operator VLAN (i=1, 2, 3...). Up to 16 different tags can be set.

- **TRANSLATION\_VOIP\_VLAN.i = [2-4093]**

- **Parameter:** Number from 2 to 4093
- **SNMP:** none
- **Mandatory:** no

Tag number of the VOIP i-operator VLAN (i=1,2,3,...) Up to 16 different tags can be set.

- **TRANSLATION\_ROOTPATH\_OVLAN = [2-4094]**

- **Parameter:** Number from 2 to 4094
- **SNMP:** none
- **Mandatory:** yes

Tag number of the default OVLAN. This parameter is mandatory when using OVLANS in the network.

## 4.8 MAC Filter Parameters

- **MAC\_INGRESS\_FILTERING\_ENABLE = [YES | NO]**

- **Parameter:** Enables (YES) or disables (NO) MAC ingress filtering in Ethernet interfaces.
- **SNMP:** no
- **Mandatory:** no

Enables or disables MAC ingress filtering in Ethernet interfaces (EXTA and EXTB). If enabled, only the incoming frames whose source MAC address is contained in the



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 34 / 145

allowed MAC list will be processed by the bridge. If disabled, any MAC incoming frame will be processed, regardless its source address.

- **MAC\_INGRESS\_FILTERING\_MAX\_ALLOWED = [1 ... 4]**

- **Parameter:** Values from 1 to 4 are possible.
- **SNMP:** no
- **Mandatory:** no

Configures the maximum number of MAC addresses contained in the allowed MAC list for MAC ingress filtering.

- **MAC\_INGRESS\_FILTERING\_MODE = [FIXED | AUTO]**

- **Parameter:** Two possible values: FIXED or AUTO. If *FIXED* is selected, the allowed MAC list must be filled entering each MAC address manually. If *AUTO* is selected, the allowed MAC list is automatically filled with any new source MAC address learnt by the bridge.
- **SNMP:** no
- **Mandatory:** no

Selects one of the following MAC ingress-filtering modes:

- Fixed. In this case, the allowed MAC list must be filled entering each MAC address manually.
- Automatic. In this case, the allowed MAC list is automatically filled with any new source MAC address learnt by the bridge. Until the list is not full, the filtering is not actually performed. Once the list is full, the filtering is enabled and any frame with source MAC address not contained in the list will be discarded.

In both modes, the own MAC address is never filtered, i.e. it is implicitly contained in the allowed MAC list, although not taken into account when computing the number of allowed addresses.

- **MAC\_INGRESS\_FILTERING\_FIXED\_MAC.i 0XXXXXXXXXXXXX**

- **Parameter:** The value must be specified with 12 hexadecimal digits.
- **SNMP:** no
- **Mandatory:** no



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 35 / 145

Configures i-MAC address of the allowed MAC list for MAC ingress filtering when fixed MAC ingress-filtering mode is selected (i = 1 ... 4).

## 4.9 NTP Parameters

For complete information about NTP (Network Time Protocol) please refer to RFC 958.

- **NTP\_ENABLE = [ENABLED | DISABLED]**

- **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) the NTP feature.
- **SNMP:** no
- **Mandatory:** no

Enables or disables the NTP feature.

- **NTP\_SERVER\_IP = <ddd.ddd.ddd.ddd>**

- **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP:** no
- **Mandatory:** no

Configures the NTP server IP address.

- **NTP\_TIMEZONE = [-12 ... 12] \* 60**

- **Parameter:** This value must be specified in minutes (in 60-minute steps) relative to Universal Time (UT). A value of 0 corresponds to UT.
- **SNMP:** no
- **Mandatory:** no

Configures the timezone for the NTP clock server. This value is relative to Universal Time (UT), also known as Greenwich Mean Time (GMT).

- **NTP\_DST = [YES | NO]**

- **Parameter:** If the value is *YES*, the time correction for daylight savings time is applied. Not applied if *NO*.
- **SNMP:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 36 / 145

- **Mandatory:** no

If this parameter is enabled, the time correction for daylight savings time is applied. Not applied if disabled.

## 4.10 SNMP parameters

For complete information about SNMP (Simple Network Management Protocol) please refer to RFC 1157.

- **SNMP\_TRAP\_IP\_ADDRESS = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
  - **SNMP:** no
  - **Mandatory:** yes

Configures the IP address to which traps are sent when produced.

- **SNMP\_TRAP\_COMMUNITY\_NAME = community**
  - **Parameter:** This parameter is a string (up to 25 characters) (e.g. "SNMP\_TRAP\_COMMUNITY\_NAME = public").
  - **SNMP:** no
  - **Mandatory:** yes

It configures the trap community access.

## 4.11 STP Parameters

For complete information about STP (Spanning Tree Protocol) and RSTP (Rapid STP) please refer to IEEE 802.1d and IEEE 802.1w standards, respectively.

- **STP\_PRIO = [0 ... 65535]**
  - **Parameter:** Valid values range from 0 to 65535.
  - **SNMP:** no
  - **Mandatory:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 37 / 145

Configures the 2-byte field which, added to the MAC address, is used by the STP standard to decide the root path (Bridge Identifier Priority, part of *BridgeIdentifier*, in IEEE 802.1d). The default values, depending on the node features, are the following (in hexadecimal):

- 0x9010: MV MASTER
- 0x9010: MV MASTER
- 0x9020: MV TDREPEATER
- 0x9030: LV MASTER
- 0x9040: LV TDREPEATER
- 0x9050: LV CPE
- **STP\_PORT.i = [EXTA | EXTB | PLC]**
  - **Parameter:** Three possible values: EXTA, EXTB and PLC (i = 1,2 or 3).
  - **SNMP:** no
  - **Mandatory:** no

This list configures the type of port to be used in association with STP\_PORT\_PRIO.i and STP\_PORT\_COST.i parameters. (i = 1 ... 3). All these parameters are lists, whose elements are associated by the same i-index. Ethernet interfaces A and B, and the PLC ports can be selected. In case of PLC, all ports will be handled as an aggregate, i.e. the priority and cost will be the same for all PLC ports.

- **STP\_PORT\_PRIO.i = [0 ... 255]**
  - **Parameter:** Valid values range from 0 to 255 (i = 1,2 or 3).
  - **SNMP:** no
  - **Mandatory:** no

This list configures the priority assigned to each port, needed if their costs are equal (i = 1 ... 3). The default value for all ports is 80.

- **STP\_PORT\_COST.i = [0 ... 4294967295]**
  - **Parameter:** Valid values range from 0 to 4294967295 (i = 1,2 or 3).
  - **SNMP:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 38 / 145

- **Mandatory:** no

This list configures the cost associated with each port (*PortPathCost* in IEEE 802.1d) ( $i = 1 \dots 3$ ). The default values, depending on the port type, are the following:

- 2000000: Ethernet interface A (EXTA)
- 2000000: Ethernet interface B (EXTB)
- 4000000: PLC ports
- **STP\_HELLO\_TIME = [10 ... 40]**
  - **Parameter:** Valid values range from 10 to 40.
  - **SNMP:** no
  - **Mandatory:** no

Hello time expressed in deciseconds (*HelloTime* in IEEE 802.1d). The default value is 20 deciseconds.

- **STP\_MAX\_AGE = [10 ... 40]**
  - **Parameter:** Valid values range from 10 to 40.
  - **SNMP:** no
  - **Mandatory:** no

Maximum age time expressed in deciseconds (*MaxAge* in IEEE 802.1d). The default value is 200 deciseconds.

- **STP\_FORWARD\_DELAY = [40 ... 300]**
  - **Parameter:** Valid values range from 40 to 300.
  - **SNMP:** no
  - **Mandatory:** no

Forward delay time expressed in deciseconds (*forwardDelay* in IEEE 802.1d). The default value is 150 deciseconds.

- **STP\_FRONTIER = [EXTA | EXTB | NONE]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 39 / 145

- **Parameter:** Valid values are: EXT A (Ethernet interface A), EXT B (Ethernet interface B) and NONE (Spanning Tree Frontier disabled).
- **SNMP:** *plStpFrontier*
- **Mandatory:** no

Selects the interface where Spanning Tree Frontier is enabled or disables it. This feature drops all the STP messages on an external (Ethernet) interface.

- **STP\_MODE = [STP | RSTP]**

- **Parameter:** Possible values: STP selects STP or RSTP selects RSTP.
- **SNMP:** *plStpProtocolVersion*
- **Mandatory:** yes

Selects STP protocol version, either STP (version < 2, IEEE 802.1d) or RSTP (version ≥ 2, IEEE 802.1w) (*rstpVersion* and *stpVersion* in IEEE 802.1d). The RSTP version is compatible with STP on a per-port basis.

## 4.12 VoIP Parameters

For complete information about VoIP protocols please refer to ITU H.323, RFC 3261 (SIP) and RFC 2705 (MGCP) standards.

- **VOIP\_ENABLE = [ENABLED | DISABLED]**

- **Parameter:** This parameter enables (*ENABLED*) or disables (*DISABLED*) the VoIP service.
- **SNMP:** no
- **Mandatory:** no

This parameter enables or disables the VoIP service.

- **VOIP\_GATEKEEPERIP = <ddd.ddd.ddd.ddd>**

- **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP:** no
- **Mandatory:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 40 / 145

IP address of the H.323 gatekeeper.

- **VOIP\_LINE1NUMBER = number**

- **Parameter:** This parameter is a string (maximum string length is 20 characters) (e.g. "VOIP\_LINE1NUMBER = 612345678").
- **SNMP:** no
- **Mandatory:** no

Configures the telephone number for H.323.

- **VOIP\_DIALPLAN = ([0 ... 9, 'T', 'X', '.', '|'])**

- **Parameter:** This parameter is a string with maximum length is 200 characters (e.g. "VOIP\_DIALPLAN = (9XXXXXXXXX|6XXXXXXXXX|00X.T)").
- **SNMP:** no
- **Mandatory:** no

Configures the dial plan matching string for H.323. Please see section 4.12.1 for details.

- **VOIP\_INBANDDTMF = [ENABLED | DISABLED]**

- **Parameter:** This parameter enables (*ENABLED*) or disables (*DISABLED*) in-band DTMF feature.
- **SNMP:** no
- **Mandatory:** no

This parameter enables or disables in-band DTMF feature.

- **VOIP\_OUTOFBANDDTMF = [ENABLED | DISABLED]**

- **Parameter:** This parameter enables (*ENABLED*) or disables (*DISABLED*) out-of-band DTMF feature.
- **SNMP:** no
- **Mandatory:** no

This parameter enables or disables out-of-band DTMF feature.





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 41 / 145

- **VOIP\_KEYPADTYPE = [KEYPADTYPE\_NONE | KEYPADTYPE\_H225 | KEYPADTYPE\_H245ALPHANUMERIC | KEYPADTYPE\_H245SIGNAL | KEYPADTYPE\_RFC2833]**

- **Parameter:** This parameter is a string (up to 30 characters). Valid values are the following:
  - *KEYPADTYPE\_H225*: H.225/Q.931 User Info field (Keypad facility information element)
  - *KEYPADTYPE\_H245ALPHANUMERIC*: H.245 User Input Indication (UII) Alphanumeric message
  - *KEYPADTYPE\_H245SIGNAL*: H.245 User Input Indication (UII) Signal Type message
  - *KEYPADTYPE\_RFC2833*: RTP stream as defined in RFC 2833
  - *KEYPADTYPE\_NONE*: no out-of-band signalling
- **SNMP:** no
- **Mandatory:** no

Configures the different 'keypad types' defined by H.323 in order to codify the out-of-band DTMF signaling.

- **VOIP\_CALLSIGPORT1 = [1025 ... 65530]**

- **Parameter:** Valid values range from 1025 to 65530.
- **SNMP:** no
- **Mandatory:** no

Configures the modem signaling port for H.323.

- **VOIP\_G711USS = [YES | NO]**

- **Parameter:** Selects whether silence suppression for G.711  $\mu$ -law is enabled (*YES*) or not (*NO*).
- **SNMP:** no
- **Mandatory:** no

It selects whether silence suppression for G.711  $\mu$ -law is enabled or not.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 42 / 145

- **VOIP\_G711UPACK = [2 ... 4]**

- **Parameter:** Valid values range from 2 (20 ms) to 4 (40 ms).
- **SNMP:** no
- **Mandatory:** no

Configures the specific packet size in 10-ms units for G.711  $\mu$ -law.

- **VOIP\_G711ASS = [YES | NO]**

- **Parameter:** Selects whether silence suppression for G.711 A-law is enabled (*YES*) or not (*NO*).
- **SNMP:** no
- **Mandatory:** no

Selects whether silence suppression for G.711 A-law is enabled or not.

- **VOIP\_G711APACK = [2 ... 4]**

- **Parameter:** Valid values range from 2 (20 ms) to 4 (40 ms).
- **SNMP:** no
- **Mandatory:** no

Configures the specific packet size in 10-ms units for G.711 A-law.

- **VOIP\_JB\_TYPE = [FIXED | ADAPTIVE]**

- **Parameter:** Selects either adaptive (*ADAPTIVE*) or fixed (*FIXED*) jitter buffer.
- **SNMP:** no
- **Mandatory:** no

Selects either adaptive or fixed jitter buffer.

- **VOIP\_FJB\_DELAY = [1 ... 10] \* 10**

- **Parameter:** Valid values range from 10 to 100 ms.
- **SNMP:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 43 / 145

- **Mandatory:** no

Configures the fixed jitter buffer delay in ms.

- **VOIP\_AJB\_MAXDELAY = [1 ... 19] \* 10**

- **Parameter:** Valid values range from 10 to 190 ms.
- **SNMP:** no
- **Mandatory:** no

Configures the adaptive jitter buffer maximum delay in ms.

- **VOIP\_G729ON = [YES | NO]**

- **Parameter:** Selects whether G.729 codec is enabled (*YES*) or not (*NO*).
- **SNMP:** no
- **Mandatory:** no

Selects whether G.729 codec is enabled or not.

- **VOIP\_G729SS = [YES | NO]**

- **Parameter:** Selects whether G.729 silence enabled is supported (*YES*) or not (*NO*).
- **SNMP:** no
- **Mandatory:** no

Selects whether silence suppression for G.729 is enabled or not.

- **VOIP\_G729PACK = [2 ... 4]**

- **Parameter:** Valid values range from 2 (20 ms) to 4 (40 ms).
- **SNMP:** no
- **Mandatory:** no

Configures the specific packet size in 10-ms units for G.729.

- **VOIP\_ALTERNATEGK = [ENABLED | DISABLED]**



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 44 / 145

- **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) alternate gatekeeper feature for H.323.
- **SNMP:** no
- **Mandatory:** no

Enables or disables alternate gatekeeper feature for H.323.

- **VOIP\_ALTGKIP = <ddd.ddd.ddd.ddd>**

- **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP:** no
- **Mandatory:** no

IP address of the H.323 alternative gatekeeper.

- **VOIP\_GKDISCOVERY = [ENABLED | DISABLED]**

- **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) gatekeeper discovery feature for H.323.
- **SNMP:** no
- **Mandatory:** no

Enables or disables gatekeeper discovery feature for H.323.

- **VOIP\_FULLRRQ1 = [ENABLED | DISABLED]**

- **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) full gatekeeper registration request for H.323.
- **SNMP:** no
- **Mandatory:** no

Enables or disables full gatekeeper registration request for H.323.

- **VOIP\_TIMETOLIVE = [≥ 60]**

- **Parameter:** The minimum valid value is 60 seconds.
- **SNMP:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 45 / 145

- **Mandatory:** no

Value in seconds for the H.323 time-to-live parameter (time after which the registration with the gatekeeper shall expire). This parameter is related to the time between two consecutive registration requests to the gatekeeper. Using a value greater than 1200 is recommended in order not to interfere with the polling feature.

- **VOIP\_FASTCONNECT = [ENABLED | DISABLED]**

- **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) fast connect signalling feature for H.323.
- **SNMP:** no
- **Mandatory:** no

Enables or disables fast connect signalling feature for H.323.

- **VOIP\_H245TUNNEL = [ENABLED | DISABLED]**

- **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) H.245 tunnelling signalling feature for H.323.
- **SNMP:** no
- **Mandatory:** no

Enables or disables H.245 tunnelling signalling feature for H.323.

- **VOIP\_COUNTRY = [XX | ES | PT | GB | JP | FR | SG | RU | AU]**

- **Parameter:** This parameter is a string (up to 20 characters). Valid values are: The USA (*XX*), Spain (*ES*), Portugal (*PT*), The United Kingdom (*GB*), Japan (*JP*), France (*FR*), Singapore (*SG*), Russia (*RU*) and Australia (*AU*). The default country is Spain (*ES*).
- **SNMP:** no
- **Mandatory:** no

Configures telephony tones (dial, network busy, busy and ring-back tones) and phone line (physical) parameters (line impedance, ring waveform and line feed voltage) for the specified country. The default country is Spain.

Please see section 4.12.2 for details.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 46 / 145

The following four parameters are provided to be able to configure tones for countries that are not available through the VOIP\_COUNTRY parameter. If the country is available, there is no need to use these parameters. In any case, these parameters overwrite the VOIP\_COUNTRY settings.

- **VOIP\_TONE\_DIALTONE =**  
**freq1@pot1+freq2@pot2#ON(time),OFF(time),IDLE(time),R**
  - **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_DIALTONE = 425@-10#ON").
  - **SNMP:** no
  - **Mandatory:** no

Dial tone configuration pattern. Please see section 4.12.3 for details.

- **VOIP\_TONE\_NETWORKBUSY =**  
**freq1@pot1+freq2@pot2#ON(time),OFF(time),IDLE(time),R**
  - **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_BUSY = 425@-10#ON(200),OFF(200),R").
  - **SNMP:** no
  - **Mandatory:** no

Network busy tone configuration pattern. Please see section 4.12.3 for details.

- **VOIP\_TONE\_BUSY =**  
**freq1@pot1+freq2@pot2#ON(time),OFF(time),IDLE(time),R**
  - **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_BUSY = 425@-10#ON(200),OFF(200),R").
  - **SNMP:** no
  - **Mandatory:** no

Busy tone configuration pattern. Please see section 4.12.3 for details.

- **VOIP\_TONE\_RINGBACK =**  
**freq1@pot1+freq2@pot2#ON(time),OFF(time),IDLE(time),R**
  - **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_RINGBACK = 425@-10#ON(1500),OFF(3000),R").



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 47 / 145

- **SNMP:** no
- **Mandatory:** no

Ring-back tone configuration pattern. Please see section 4.12.3 for details.

• **VOIP\_RTP\_TOS = 0xXX**

- **Parameter:** value must be specified with 2 hexadecimal digits.
- **SNMP:** no
- **Mandatory:** no

Configures the 8-bit bitmap of the type of service field in the IP header of the RTP packets.

• **VOIP\_CALLSIG\_TOS 0xXX**

- **Parameter:** value must be specified with 2 hexadecimal digits.
- **SNMP:** no
- **Mandatory:** no

Configures the 8-bit bitmap of the type of service field in the IP header of the VoIP signalling packets for H.323.

**4.12.1 Dial Plan Configuration**

A dial plan gives the unit a map to determine when a complete number has been entered and should be passed to the gatekeeper for resolution into an IP address. Dial plans are expressed using the same syntax used by MGCP NCS specification.

The dialled numbers that do not match the specified dial plan do not initiate an outgoing call from the VoIP modem.

The formal syntax of the dial plan is described using the following notation:

- Digit ::= "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9"
- Timer ::= "T" | "t"
- Letter ::= Digit | Timer | "#" | "\*" | "A" | "a" | "B" | "b" | "C" | "c" | "D" | "d"
- Range ::= "X" | "x" -- matches any digit  
| "[" Letters "]" -- matches any of the specified letters



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 48 / 145

Letters ::= Subrange | Subrange Letters

Subrange ::= Letter -- matches the specified letter

| Digit "-" Digit -- matches any digit between first and last

Position ::= Letter | Range

StringElement ::= Position -- matches any occurrence of the position

| Position "." -- matches an arbitrary number of occurrences including 0

String ::= StringElement | StringElement String

StringList ::= String | String "|" StringList

DialPlan ::= "(" StringList ")"

A dial plan, according to this syntax, is defined either by a string (not case-sensitive) or by a list of strings. Regardless of the above syntax a timer is only allowed if it appears in the last position in a string (12T3 is not valid). Each string is an alternate numbering scheme. The unit will process the dial plan by comparing the current dial string against the dial plan. If the result is under-qualified (partially matches at least one entry) then it will do nothing further; if the result matches or is overqualified (no further digits could possibly produce a match) then it sends the string to the gatekeeper and clears the dial string.

The timer T is activated when it is all that is required to produce a match. The period of timer T is 4 seconds. For example, a dial plan of (xxxT|xxxxx) will match immediately if 5 digits are entered and it will also match after a 4 second pause when 3 digits are entered.

#### 4.12.2 Country Specific Parameters

These are the country-specific parameters configured from "VOIP\_COUNTRY". Some of them (tone-related parameters) can be latter overwritten (thanks to VOIP\_TONE\_DIALTONE, VOIP\_TONE\_RINGBACK, VOIP\_TONE\_BUSY and VOIP\_TONE\_NETWORKBUSY). The others (line feed voltage, ring signal waveform and line impedance) can't be changed.

Default parameters:

These are the ones being used for any country not specified in the list below (they are USA parameters):

DIALTONE = 350@-13+440@-13#ON(300),OFF(0),R

RINGBACK = 440@-13+480@-19#2000(ON),4000(OFF),R





**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 49 / 145

BUSY = 480@-24+620@-24#500(ON),500(OFF),R

NETWORKBUSY = 480@-24+620@-24#250(ON),250(OFF),R

LINE FEED VOLTAGE = 48 V DC

RING SIGNAL = 48 V DC + 35 Vrms AC # 2000(ON),4000(OFF),R

LINE IMPEDANCE = 600 ohm

Countries:

NOTE: If some country does not specify all of the possible parameters that is because these parameters get the "default" value shown above.

SPAIN:

DIALTONE = 425@-10#ON(3000),OFF(0),R

NETWORKBUSY = 425@-10#ON(200),OFF(200),R

BUSY = 425@-10#ON(200),OFF(200),R

RINGBACK = 425@-10#ON(1500),OFF(3000),R

PORTUGAL:

DIALTONE = 425@-10#ON(3000),OFF(0),R

NETWORKBUSY = 425@-10#ON(200),OFF(200),R

BUSY = 425@-10#ON(200),OFF(200),R

RINGBACK = 425@-10#ON(1000),OFF(5000),R

RING SIGNAL = 48 V DC + 35 Vrms AC # 1000(ON),5000(OFF),R

UK:

DIALTONE = 350@-18+440@-18#ON(3000),OFF(0),R

NETWORKBUSY = 400@-14#ON(400),OFF(400),R

BUSY = 400@-14#ON(400),OFF(400),R

RINGBACK = 400@-15+450@-15#ON(400),OFF(200),ON(400),OFF(2000),R

JAPAN:



**opera**

Open PLC European Research Alliance

**Work Package:**

SSWG

**Type of document:**

Deliverable

**Date:**

31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc

**Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM

50 / 145

DIALTONE = 400@-15#ON(3000),OFF(0),R

NETWORKBUSY = 400@-5#ON(500),OFF(500),R

BUSY = 400@-5#ON(500),OFF(500),R

RINGBACK = 400@-10#ON(1000),OFF(2000),R

**FRANCE:**

DIALTONE = 440@-13#ON(3000),OFF(0),R

NETWORKBUSY = 440@-13#ON(500),OFF(500),R

BUSY = 440@-13#ON(500),OFF(500),R

RINGBACK = 440@-13#ON(1500),OFF(3500),R

**SINGAPORE:**

DIALTONE = 425@-15#ON(3000),OFF(0),R

NETWORKBUSY = 425@-10#ON(750),OFF(750),R

BUSY = 425@-10#ON(750),OFF(750),R

RINGBACK = 425@-10#ON(400),OFF(200),R

**RUSSIA:**

DIALTONE = 425@-10#ON(400),OFF(400),R

RINGBACK = 425@-10#ON(800),OFF(3200),R

**AUSTRALIA:**

DIALTONE = 425@-10#ON(3000),OFF(0),R

NETWORKBUSY = 425@-10#ON(200),OFF(200),R

BUSY = 425@-10#ON(400),OFF(400),R

RINGBACK = 425@-10#ON(400),OFF(200),ON(400),OFF(2000),R

LINE IMPEDANCE = 220 ohm + 820 ohm || 120 nF



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 51 / 145

### 4.12.3 Tone pattern configuration

The different available tones can be configured using the following ring cadence pattern: `freq1@pot1+freq2@pot2#ON(time),OFF(time),IDLE(time),R`. Only the following frequencies (in Hz) are possible: 350, 400, 425, 440, 480, 572, 620, 682, 697, 770, 852, 941, 1209, 1336, 1400, 1477, 1633, 2060, 2130, 2450, 2750 and 2600. An example will help to explain this string:

`950@-25+420@-10#ON(330),OFF(30),IDLE(1000),R:`

This will create the following tone:

- The tone will be the addition of two frequencies: 950Hz with a power of  $-25\text{dBm}$  plus 420Hz with a power of  $-10\text{dBm}$
- It will be ON during 330 msec.
- Then it will be OFF during 30 msec.
- And then it will be IDLE for 1000 msec. This IDLE number it is not mandatory in the string.
- R means that the sequence ON, OFF, IDLE will be repeated continuously.

To configure a continuous tone of 1400Hz and  $-10\text{dBm}$ , the following string should be used:

- `1400@-10#ON(3000),OFF(0),R`

Therefore, the mandatory symbols are:

- @ to separate frequency and power.
- # to separate the tone frequency and power from the sound cadence.
- , to separate the ON(xx), OFF(xx) and IDLE(xx) parameters.

Besides, the tone may be an addition of two different frequencies and powers using the + symbol.

### 4.13 VLAN Network

- **VLAN\_ENABLE = [yes|no]**
  - **Parameter:** 'yes' (to enable VLAN use) or 'no' (to disable VLAN use)
  - **SNMP:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 52 / 145

- **Mandatory:** yes

This autoconfiguration parameter enables or disables the use of VLAN. Normally this parameter is not needed because the modem itself discovers the use of VLAN, but it is necessary in case of booting from local settings.

- **VLAN\_MNMT\_TAG = [2-4093] | %<PARAMETRIC VALUE>**

- **Parameter:** Number from 2 to 4093) or '%Parameter\_name' (parametric value preceded by a %)
- **SNMP:** no
- **Mandatory:** yes

This parameter indicates the management VLAN tag of high-level management protocols (Telnet, Ping, ...). Often a parametric value is used, and so the appropriate parameter will be taken from the translation table (for example, writing '\$VLAN\_DATA\_2').

- **VLAN\_MNMT\_PRIO = [0-7]**

- **Parameter:** Number from 0 to 7.
- **SNMP:** no
- **Mandatory:** yes

This autoconfiguration parameter sets the VLAN priority for the high-level management (Telnet, Ping, ...) packets.

- **VLAN\_DATA\_TAG = [2-4093] | %<PARAMETRIC VALUE>**

- **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %).
- **SNMP:** no
- **Mandatory:** yes

This parameter is used at the EU nodes. It configures the VLAN tag for the data packets (packets coming from the external interfaces). The value set can be a value (from 2 to 4093) or a parametric value. In this last case, the adequate value will be taken from the translation table.

- **VLAN\_DATA\_PRIO = [0-6]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 53 / 145

- **Parameter:** Number from 0 to 6.
- **SNMP:** no
- **Mandatory:** yes

This parameter is used at the EU nodes. It configures the VLAN priority for the data packets (packets coming from the external interfaces).

• **VLAN\_VOIP\_TAG = [2-4093] | %<PARAMETRIC VALUE>**

- **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **SNMP:** no
- **Mandatory:** no

This parameter configures the VLAN tag for the VoIP packets (packets coming from the external interfaces). The value set can be a value (from 2 to 4093) or a parametric value. In this last case, the adequate value will be taken from the translation table.

• **VLAN\_VOIP\_PRIO = [0-7]**

- **Parameter:** Number from 0 to 7
- **SNMP:** no
- **Mandatory:** no

This autoconfiguration parameter sets the VLAN priority for the VoIP packets.

• **VLAN\_VSIG\_PRIO = [0-7]**

- **Parameter:** Number from 0 to 7
- **SNMP:** no
- **Mandatory:** no

It configures the VLAN priority for the VoIP signalling packets.

• **VLAN\_TRUNK.i = [2-4093]**

- **Parameter:** Number from 2 to 4093)
- **SNMP:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 54 / 145

- **Mandatory:** yes

This parameter is usable at LV and MV nodes. It configures a list of VLAN trunks different from the ones inside the translation table that must be allowed in the node interfaces. It is necessary to configure these trunks for private VLANs between EUs in all intermediary equipment.

- **VLAN\_RETAG\_EXT\_A\_SRC = [0 | 2-4095]**

- **Parameter:** '0' (in order to disable retagging in interface) number from 2 to 4095.
- **SNMP:** no
- **Mandatory:** yes

Autoconfiguration parameter used for VLAN retagging: External (Ethernet) interface A (EXTA) source tag. With 0, the retagging is disabled in EXTA interface.

- **VLAN\_RETAG\_EXT\_A\_DST = [0 | 2-4095]**

- **Parameter:** '0' (in order to disable retagging in interface) or number from 2 to 4095
- **SNMP:** no
- **Mandatory:** yes

Autoconfiguration parameter used for the VLAN retagging: External (Ethernet) interface A (EXTA) destination tag. With 0, the retagging is disabled in EXTA interface.

- **VLAN\_RETAG\_EXT\_B\_SRC = [0 | 2-4095]**

- **Parameter:** '0' (in order to disable retagging in interface) or number from 2 to 4095
- **SNMP:** no
- **Mandatory:** yes

Autoconfiguration parameter used for the VLAN retagging: External (Ethernet) interface B (EXTB) source tag. With 0, the retagging is disabled in EXTB interface.

- **VLAN\_RETAG\_EXT\_B\_DST = [0 | 2-4095]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 55 / 145

- **Parameter:** '0' (in order to disable retagging in interface) or number from 2 to 4095
- **SNMP:** no
- **Mandatory:** yes

Autoconfiguration parameter used for the VLAN retagging: External (Ethernet) interface B (EXTB) destination tag. With 0, the retagging is disabled in EXTB interface.

## 4.14 OVLAN Parameters

The OVLAN parameters are used to configure the basic OVLAN configuration, which avoids the visibility between different customers in the access network. They are similar to the VLAN parameters specified above.

- **OVLAN\_ENABLE = [yes|no]**
  - **Parameter:** 'yes' (to enable OVLAN use) or 'no' (to disable OVLAN use)
  - **SNMP:** none
  - **Mandatory:** yes

This autoconfiguration parameter enables or disables the use of OVLAN filtering.

- **OVLAN\_DATA\_TAG = [2-4094] | %ROOTPATH\_OVLAN**
  - **Parameter:** Number from 2 to 4093 or '%ROOTPATH\_OVLAN' (use the OVLAN Rootpath value)
  - **SNMP:** none
  - **Mandatory:** yes

This parameters specifies of the OVLAN tag assigned to the packets coming from the external interfaces. It should be the same as in the translation table to perform the basic OVLAN operation in all equipment except the one connected to the backbone, which will have the ALL\_VLAN tag (4095).

- **OVLAN\_TRUNK.i = [2-4094]**
  - **Parameter:** Number from 2 to 4094
  - **SNMP:** none



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 56 / 145

- **Mandatory:** yes

This parameter is used in LV and MV nodes, and it configures a list of OVLAN trunks different from the one inside the translation table that must be allowed in the node interfaces. It is necessary to configure these trunks for private OVLANS between EUs in all intermediary equipment.

## 4.15 Custom VLAN/OVLAN Parameters

- **USE\_CUSTOM\_VLAN\_OVLAN = [yes/no]**
  - **Parameter:** 'yes' (to enable the custom VLAN/OVLAN use) or 'no' (to disable the custom VLAN/OVLAN use)
  - **SNMP:** none
  - **Mandatory:** no

This parameter enables other VLAN/OVLAN parameters. If set to 'yes', it will configure the parameters that are set in the auto-configuration file. The connection will be lost if the new parameters are not properly configured in the auto-configuration file. It is necessary to specify several parameters with care or no connection will be possible between the modems.

As a general rule, this configuration overrides the basic VLAN/OVLAN configuration. In order to decrease the risk of losing connection, the VLAN/OVLAN filtering follows these rules:

- When the list is allowed, the tags specified here are added to the existing ones. This solution simplifies the configuration and decreases the risk of miss-configuration.
- When the list is forbidden, the lists are reset before inserting the tags specified here, due to the same reasons.

The VLAN/OVLAN custom configuration must be complemented with the profile parameters referred to the VLAN/OVLAN, to configure interfaces different from EXTA, EXTB, ROOT and OTHERS.

### 4.15.1 Custom VLAN Parameters

- **VLAN\_TAGGED\_ONLY\_IFACE\_ROOT = [yes/no]**
  - **Parameter:** 'yes' (to enable tag only in interface root) or 'no' (to disable tag only in interface root)





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 57 / 145

- **SNMP:** none
- **Mandatory:** no

If this parameter is set to 'yes', the modem will drop packets without a VLAN tag entering the root interface (IFACE\_ROOT).

• **VLAN\_TAGGED\_ONLY\_IFACE\_EXT\_A = [yes/no]**

- **Parameter:** 'yes' (to enable tag only in Ethernet A) or 'no' (to disable tag only in Ethernet A)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set, the modem will drop packets without a VLAN tag entering external (Ethernet) interface A.

• **VLAN\_TAGGED\_ONLY\_IFACE\_EXT\_B = [yes/no]**

- **Parameter:** 'yes' (to enable tag only in Ethernet B) or 'no' (to disable tag only in Ethernet B)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set, the modem will drop packets without a VLAN tag entering external (Ethernet) interface B.

• **VLAN\_TAGGED\_ONLY\_IFACE\_OTHER = [yes/no]**

- **Parameter:** 'yes' (to enable tag only in other interfaces) or 'no' (to disable tag only in other interfaces)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set, the modem will drop packets without a VLAN tag entering other interfaces (IFACE\_OTHER).

• **VLAN\_OUTFORMAT\_TAG\_IFACE\_ROOT = [yes/no]**

- **Parameter:** 'yes' (to tag output in root interface) or 'no' (to disable tag output in root interface)



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 58 / 145

- **SNMP:** none
- **Mandatory:** no

It this parameter is set, the modem will introduce a VLAN tag when sending packets to the root interface (IFACE\_ROOT).

- **VLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_A = [yes/no]**

- **Parameter:** 'yes' (to tag output in Ethernet A) or 'no' (to disable tag output in Ethernet A)
- **SNMP:** none
- **Mandatory:** no

It this parameter is set, the modem will introduce a VLAN tag when sending packets to the external (Ethernet) interface A.

- **VLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_B = [yes/no]**

- **Parameter:** 'yes' (to tag output in Ethernet B) or 'no' (to disable tag output in Ethernet B)
- **SNMP:** none
- **Mandatory:** no

It this parameter is set, the modem will introduce a VLAN tag when sending packets to external (Ethernet) interface B.

- **VLAN\_OUTFORMAT\_TAG\_IFACE\_OTHER = [yes/no]**

- **Parameter:** 'yes' (to tag output in other interfaces) or 'no' (to disable tag output in other interfaces)
- **SNMP:** none
- **Mandatory:** no

It this parameter is set, the modem will introduce a VLAN tag when sending packets to other interfaces (IFACE\_OTHER).

- **VLAN\_PVID\_PL = [2-4095]**

- **Parameter:** Number from 2 to 4095



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 59 / 145

- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the 802.1Q VLAN tag for tagging untagged packets from the powerline interface (PL).

- **VLAN\_PVID\_EXT\_A = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the 802.1Q VLAN tag for tagging untagged packets from the external interface A (EXTA).

- **VLAN\_PVID\_EXT\_B = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the 802.1Q VLAN tag for tagging untagged packets from the external interface B (EXTB).

- **VLAN\_PVID\_FW = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the 802.1Q VLAN tag for tagging untagged packets from the firmware interface (FW).

- **VLAN\_DEFAULT\_PRIO\_PL = [0-7]**

- **Parameter:** Number from 0 to 7
- **SNMP:** none
- **Mandatory:** no



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 60 / 145

This parameter configures the 802.1p priority for tagging untagged packets from the powerline interface (PL).

- **VLAN\_DEFAULT\_PRIO\_EXT\_A = [0-7]**

- **Parameter:** Number from 0 to 7
- **SNMP:** none

This parameter configures the 802.1p priority for tagging untagged packets from external (Ethernet) interface A (EXTA).

- **VLAN\_DEFAULT\_PRIO\_EXT\_B = [0-7]**

- **Parameter:** Number from 0 to 7
- **SNMP:** none
- **Mandatory:** no

This parameter configures the 802.1p priority for tagging untagged packets from external (Ethernet) interface B (EXTB).

- **VLAN\_DEFAULT\_PRIO\_FW = [0-7]**

- **Parameter:** Number from 0 to 7
- **SNMP:** none
- **Mandatory:** no

This parameter configures the 802.1p priority for tagging untagged packets from firmware interface (FW).

- **VLAN\_IS\_ALLOWED\_IFACE\_ROOT = [yes/no]**

- **Parameter:** 'yes' (to set list as allowed) or 'no' (to set list as forbidden)
- **SNMP:** none
- **Mandatory:** no

This parameter characterizes the VLAN list for the root interface. Root interface (IFACE\_ROOT) list is allowed tag if configured as 'yes' or forbidden if configured as 'no'.

- **VLAN\_LIST\_IFACE\_ROOT.i = [2-4095]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 61 / 145

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This parameter is a list of root interface (IFACE\_ROOT) VLAN tags. Up to 16 values can be configured.

• **VLAN\_IS\_ALLOWED\_IFACE\_EXT\_A = [yes/no]**

- **Parameter:** 'yes' (to set list as allowed) or 'no' (to set list as forbidden)
- **SNMP:** none
- **Mandatory:** no

This parameter characterizes the VLAN list for the external (Ethernet) interface A. The external (Ethernet) interface A list contains allowed tags if configured as 'yes' or forbidden if configured as 'no'.

• **VLAN\_LIST\_IFACE\_EXT\_A.i = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This parameter is a list of VLAN tags for external (Ethernet) interface A. Up to 16 values can be configured.

• **VLAN\_IS\_ALLOWED\_IFACE\_EXT\_B = [yes/no]**

- **Parameter:** 'yes' (to set list as allowed) or 'no' (to set list as forbidden)
- **SNMP:** none
- **Mandatory:** no

This parameter characterizes the VLAN list for the external (Ethernet) interface B. The external (Ethernet) interface B list contains allowed tags if configured as 'yes' or forbidden if configured as 'no'.

• **VLAN\_LIST\_IFACE\_EXT\_B.i = [2-4095]**

- **Parameter:** Number from 2 to 4095



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 62 / 145

- **SNMP:** none
- **Mandatory:** no

This parameter is a list of VLAN tags for external (Ethernet) interface B. Up to 16 values can be configured.

#### 4.15.2 Custom OVLAN Parameters

- **OVLAN\_TAGGED\_ONLY\_IFACE\_ROOT = [yes/no]**

- **Parameter:** 'yes' (to accept only tagged packets at root interface) or 'no' (to accept any packet at root interface)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set to 'yes', the modem will drop packets without a OVLAN tag entering the root interface (IFACE\_ROOT).

- **OVLAN\_TAGGED\_ONLY\_IFACE\_EXT\_A = [yes/no]**

- **Parameter:** 'yes' (to accept only tagged packets at Ethernet A interface) or 'no' (to accept any packet at Ethernet A interface)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set to 'yes', the modem will drop packets without a OVLAN tag entering external (Ethernet) interface A.

- **OVLAN\_TAGGED\_ONLY\_IFACE\_EXT\_B = [yes/no]**

- **Parameter:** 'yes' (to accept only tagged packets at Ethernet B interface) or 'no' (to accept any packet at Ethernet B interface)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set to 'yes', the modem will drop packets without a OVLAN tag entering external (Ethernet) interface B.

- **OVLAN\_TAGGED\_ONLY\_IFACE\_OTHER = [yes/no]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 63 / 145

- **Parameter:** 'yes' (to accept only tagged packets at other interfaces) or 'no' (to accept any packet at other interfaces)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set to 'yes', the modem will drop packets without a VLAN tag entering other interfaces (IFACE\_OTHER).

• **OVLAN\_OUTFORMAT\_TAG\_IFACE\_ROOT = [yes/no]**

- **Parameter:** 'yes' (to introduce a tag in output packets at root interface) or 'no' (to not introduce a tag in output packets at root interface)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set, the modem will introduce a VLAN tag when sending packets to the root interface (IFACE\_ROOT).

• **OVLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_A = [yes/no]**

- **Parameter:** 'yes' (to introduce a tag in output packets at Ethernet A interface) or 'no' (to not introduce a tag in output packets at Ethernet A interface)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set, the modem will introduce a VLAN tag when sending packets to the external (Ethernet) interface A.

• **OVLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_B = [yes/no]**

- **Parameter:** 'yes' (to introduce a tag in output packets at Ethernet B interface) or 'no' (to not introduce a tag in output packets at Ethernet B interface)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set, the modem will introduce a VLAN tag when sending packets to the external (Ethernet) interface B.

• **OVLAN\_OUTFORMAT\_TAG\_IFACE\_OTHER = [yes/no]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 64 / 145

- **Parameter:** 'yes' (to introduce a tag in output packets at other interfaces) or 'no' (to not introduce a tag in output packets at other interfaces)
- **SNMP:** none
- **Mandatory:** no

If this parameter is set, the modem will introduce a VLAN tag when sending packets to other interfaces (IFACE\_OTHER).

- **OVLAN\_PVID\_PL = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the VLAN tag for tagging untagged packets from the powerline interface (PL).

- **OVLAN\_PVID\_EXT\_A = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the VLAN tag for tagging untagged packets from the external interface A (EXT\_A).

- **OVLAN\_PVID\_EXT\_B = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the VLAN tag for tagging untagged packets from the external interface B (EXT\_B).

- **OVLAN\_PVID\_FW = [2-4095]**

- **Parameter:** Number from 2 to 4095





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 65 / 145

- **SNMP:** none
- **Mandatory:** no

This autoconfiguration parameter specifies the OVLAN tag for tagging untagged packets from the firmware interface (FW).

- **OVLAN\_IS\_ALLOWED\_IFACE\_ROOT = [yes/no]**

- **Parameter:** 'yes' (to set the root interface list as allowed) or 'no' (to set the root interface list as forbidden)
- **SNMP:** none
- **Mandatory:** no

This parameter characterizes the OVLAN list for the root interface. Root interface (IFACE\_ROOT) list is allowed tag if configured as 'yes' or forbidden if configured as 'no'.

- **OVLAN\_LIST\_IFACE\_ROOT.i = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This parameter is a list of root interface (IFACE\_ROOT) OVLAN tags. Up to 16 values can be configured.

- **OVLAN\_IS\_ALLOWED\_IFACE\_EXT\_A = [yes/no]**

- **Parameter:** 'yes' (to set the Ethernet A interface list as allowed) or 'no' (to set the Ethernet A interface list as forbidden)
- **SNMP:** none
- **Mandatory:** no

This parameter characterizes the OVLAN list for the external (Ethernet) interface A. The external (Ethernet) interface A list contains allowed tags if configured as 'yes' or forbidden if configured as 'no'.

- **OVLAN\_LIST\_IFACE\_EXT\_A.i = [2-4095]**

- **Parameter:** Number from 2 to 4095



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 66 / 145

- **SNMP:** none
- **Mandatory:** no

This parameter is a list of OVLAN tags for external (Ethernet) interface A. Up to 16 values can be configured.

- **OVLAN\_IS\_ALLOWED\_IFACE\_EXTB = [yes/no]**

- **Parameter:** 'yes' (to set the Ethernet B interface list as allowed) or 'no' (to set the Ethernet B interface list as forbidden)
- **SNMP:** none
- **Mandatory:** no

This parameter characterizes the OVLAN list for the external (Ethernet) interface B,. The external (Ethernet) interface B list contains allowed tags if configured as 'yes' or forbidden if configured as 'no'.

- **OVLAN\_LIST\_IFACE\_EXTB.i = [2-4095]**

- **Parameter:** Number from 2 to 4095
- **SNMP:** none
- **Mandatory:** no

This parameter is a list of OVLAN tags for external (Ethernet) interface B. Up to 16 values can be configured.

## 4.16 Access Protocol Parameters

Parameters for the slave:

- **AP\_MIN\_NUMBER\_HOPS = [0|1|...]**

- **Parameter:** Number from 0
- **SNMP:** no
- **Mandatory:** no

This parameter configures the main criterion for connecting to a master, the minimum number of hops that the master has to be separated to the backbone. '0' means that



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 67 / 145

it can connect to the master connected to the backbone (no hop), '1' means that it can connect to masters with one hop to the backbone (TDrepeaters), and so on.

- **AP\_FORBID\_MASTER.i = 0XXXXXXXXXXXXX**

- **Parameter:** '0XXXXXXXXXXXXX' (MAC address of forbidden master)
- **SNMP:** no
- **Mandatory:** yes

This parameter is a list of the MAC addressees of the masters this equipment has to avoid. The equipment will not connect to a master on this list, even if there are no other masters available.

- **AP\_PREFER\_MASTER = 0XXXXXXXXXXXXX**

- **Parameter:** '0XXXXXXXXXXXXX' (MAC address of preferred master)
- **SNMP:** no
- **Mandatory:** yes

This parameter specifies a MAC address of a master that is preferred by the equipment. If the node can detect the master with this MAC address and it is not restricted (it is not forbidden and the number of hops is the adequate), it will try to connect to it regardless of any other parameter. If fails to connect to this prefer master, it will use the usual algorithm to decide to which master connect.

- **AP\_FIX\_MASTER = '0XXXXXXXXXXXXX'**

- **Parameter:** 0XXXXXXXXXXXXX (MAC address of fixed master)
- **SNMP:** no
- **Mandatory:** yes

This parameter specifies the only one master to which the node can connect. If this MAC address is not detected in the network, the node will not connect to any other one, so this parameter can be dangerous because if not properly configured can produce slaves unable to connect.

- **AP\_CHECK\_BEST\_MASTER\_ENABLE = [yes|no]**

- **Parameter:** 'yes' (to enable checking of best master periodically after connecting with one) or 'no' (to disable the checking of better masters after connecting to one).



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 68 / 145

- **SNMP:** no
- **Mandatory:** no

Once the node is connected to the network (after choosing and being accepted by a master) it is possible to repeat periodically the search of a better master. This parameter enables or disables the periodical check of the best master of the access protocol.

- **AP\_CHECK\_BEST\_MASTER\_PERIOD = <time>**

- **Parameter:** Number of minutes
- **SNMP:** no
- **Mandatory:** no

This parameter configures how much time has to pass to search for a better master. This process is periodic, and the time is in minutes.

- **AP\_CURRENT\_MASTER\_MIN\_BPS = <bps\_thr>**

- **Parameter:** Number of bits per symbol (0-14592)
- **SNMP:** no
- **Mandatory:** no

This parameter is also used in the period search for a better master. The node will only change to a better master if the number of bits per symbol with the current master is lower than the 'AP\_CURRENT\_MASTER\_MIN\_BPS' value.

- **AP\_NEW\_MASTER\_MIN\_BPS = <bps\_thr>**

- **Parameter:** Number of bits per symbol (0-14592)
- **SNMP:** no
- **Mandatory:** no

At the period search for a better master, no every master will be considered. Only the masters with a number of bits per symbol greater than 'AP\_NEW\_MASTER\_MIN\_BPS' will be eligible.



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 69 / 145

Parameters for the master: The master will receive petitions of the slaves that want to connect to it. There are different policies about what to do in this case:

- Accept any petition. The slave will be allowed to connect through this master.
- Deny any petition. No slave will be allowed to connect through this master.
- Use the Radius. The RADIUS will be the one that decides to accept or reject the connection of a slave.
- Use an authorization list. This is a list of the MACs of the slaves that will be allowed to connect through this master. The following parameters configure this list.

- **ACCESSP\_AUTHLIST\_MAC.i = 0XXXXXXXXXXXXX**

- **Parameter:** '0XXXXXXXXXXXXX' (MAC address authorized to connect)
- **SNMP:** no
- **Mandatory:** no

This parameter is a list of the MAC address of the modems that will be allowed to connect through this master. The length of the list is 128 (i=1...128).

- **ACCESSP\_AUTHLIST\_PROFILE.i = [1-16]**

- **Parameter:** Number of the profile related to a MAC authorized)
- **SNMP:** no
- **Mandatory:** no

If a slave is accepted via the authorization list it will use the parameters of one profile. This autoconfiguration parameter indicates which profile will be associated with each slave. The length of the list is 128 (i=1...128).

- **ACCESSP\_AUTHLIST\_FWTYPE.i = [MV|LV|EU]**

- **Parameter:** 'MV' (medium voltage) or 'LV' (low voltage) or 'EU' (End User)
- **SNMP:** no
- **Mandatory:** no

If a slave is accepted via the authorization list it will have a firmware type. This autoconfiguration parameter indicates which firmware type will be associated with each slave. The length of the list is 128 (i=1...128).



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 70 / 145

## 5 CONFIGURATION

### 5.1 MIB

#### 5.1.1 SNMP Management

SNMP (Simple Network Management Protocol) refers to a group of specifications for the management of communication networks: the protocol, the data base definition and the modules. For more information, consult the SNMP standards RFC 1155 (*Structure and Identification of Management Information for TCP/IP-based Internets*), RFC 1157 (*Simple Network Management Protocol*), RFC 1213, *Management Information Base*).

Each resource to be managed in a device is represented by an object. The MIB is a structured collection of these objects. For SNMP, the MIB is a database structure, or a database definition. Each system in a network to be managed must maintain a MIB that reflects the status of the managed resources in that system.

All managed objects in the SNMP environment are arranged in a hierarchical or tree structure. The leaf objects of the tree are the actual managed objects, each of which represents some resource, activity or related information that is to be managed.

SNMP and thus MIB support are optional in this specification (see 3.2)

#### 5.1.2 MIB-II for OPERA

The structure MIB-II is located under the node *mgmt*. This node contains the definition of the management information base approved by the IAB. MIB-II is an extension of the previously defined MIB-I. Under the node 'mib-2', OPERA nodes must support the following structures in RFC 1213:

- **system(1):** General information about the system:
  - Description of the entity – hardware, operating system, etc.
  - Level of OSI reference model to which the managed object pertains.
  - Time since the last initialization of the system.
- **interfaces(2):** Information about the network interfaces of the managed entity, including information and statistics about the events in each. There is an “interfaces” table in which each row corresponds to a network interface. The information for a given interface:



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 71 / 145

- Physical address
- Type of interface
- Speed
- Status
- Number of transmitted and received octets

The implementation of the following nodes is optional.

- **at(3):** Translation of addresses IP – MAC.
- **ip(4):** Information about the configuration of the IP protocol over the device. Among others, the nodes under the 'ip' node contain information about:
  - Number of packets discarded because of errors in the IP header, because of errors in the addresses, because of not finding a correct route, etc.
  - Number of accepted packets.
  - IP address of the interfaces and network mask of the network.
- **icmp(5):** Information about the Internet Control Message Protocol (ICMP).
- **tcp(6):** General information about the TCP protocol working in the managed node.
- **udp(7):** General information about the UDP protocol.
- **snmp(11):** Information about the execution of the SNMP protocol in the entity.

All fundamentals for the MIB-II can be found in RFC 1213, and no further information will be shown in this document.

### 5.1.3 OPERA Private MIB

This chapter walks through the OPERA Private MIB.

Under the '.iso.org.dod.internet.private.enterprises' node in the standard MIB, in position number 6798, the node assigned to DS2 (ds2 OBJECT IDENTIFIER ::= {enterprises 6798}) is allocated and in turn, under this node, the OPERA MIB branch has position 3 (**opera** OBJECT\_IDENTIFIER ::= {ds2 3}) and contains all objects that are not supported in the standard MIB-II but can be remotely managed in an OPERA node.

Internally the **opera** (3) branch is composed of 8 sub-branches.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 72 / 145

- **plSystem:** Generic information about the system.
- **plBasic:** Information about the general powerline configuration.
- **plPhy:** Information related to the physical layer indexed by node address.
- **plMAC:** Objects related to the Medium Access Control.
- **plQoS:** Objects related to Quality of Service.
- **plOVLAN:** Objects related to OVLAN.
- **plStatistics:** Statistics counters.
- **plTraps:** Trap information.
- **plStp:** STP information.
- **plSecurity:** Security configuration.

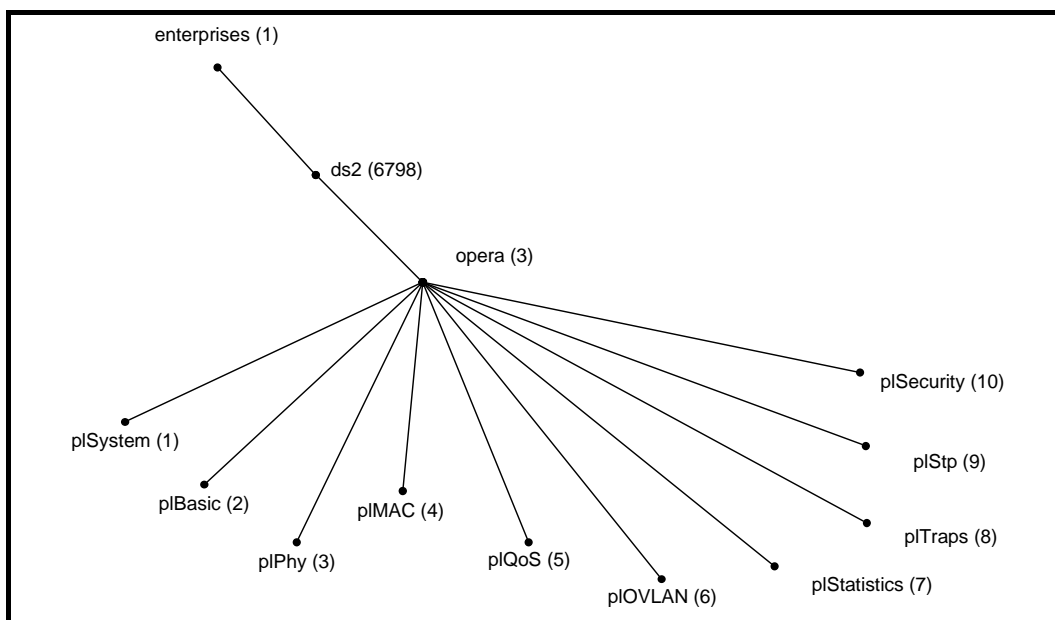


Figure 3 OPERA MIB tree





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 73 / 145

### 5.1.3.1 The OPERA MIB Description

This section shows the OPERA MIB and contains a brief description of every object inside each branch under the 'opera' node. The MIB definition in ASN.1 format can be found in ANNEX A (NORMATIVE): MIB definition in ASN.1 format.

Note that not every OID can be accessed for get/set operations; read-only OIDs only accept 'get' operations, read-write OIDs accept both 'get' and 'set' operations, and nonaccessible OIDs accept neither of them (indicated in the table above). In addition, every OID with an enable/disable meaning accepts an integer '1' for enabling and an integer '0' for disabling.

#### pISystem

- **pISystemTable**

Almost every table in the Opera MIB is indexed by the card number, so there will be a copy of this object in these tables; their explanation is equivalent to this one.

- **pISysCard:** Used as an index to get/set system characteristic data for a specific PLC card. This could be seen as useless because every PLC card has its own IP address, but it has been included to support future improvements in Opera technology where a single node will have a single IP address, independent of the number of cards it will hold. But at present, this index is always a fixed '1' value.
- **pISysNodeType:** Node type. An Opera PLC card can act as a master, slave or repeater, and therefore this OID can hold the values of 0:Master, 1:Slave and 2:Repeater.
- **pISysFWVersion:** Shows a string describing the firmware version running in the Opera modem.
- **pISysHWVersion:** Shows a string describing the hardware version built inside the modem.
- **pISysReset:** Performs a system reset when receiving a 'set' with a '1'.
- **pISysFactoryReset:** Performs a system reset when receiving a 'set' with a '1' and restores the factory configuration parameters.
- **pISysUseDHCP:** Enables (1) or disables (0) the DHCP protocol in the modem. If DHCP is enabled, network configuration parameters (IP address, netmask and gateway IP address) will be obtained from a DHCP server; if it is disabled, the network configuration parameters saved in the modem will be used.



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 74 / 145

- **plSysStaticIPAddress:** Holds the IP address to be used when DHCP is disabled.
- **plSysStaticNetMask:** Holds the network mask to be used when DHCP is disabled.
- **plSysStaticDefaultGW:** Holds the default gateway IP address to be used when DHCP is disabled.
- **plSysSaveAsPermanent:** When a '1' integer value is passed to this OID, all node parameters that could have changed and are liable to be saved are stored in non-volatile memory for using them as the current system configuration. As soon as these parameters are saved, the system is reconfigured to use the new parameters.
- **plSysConfUpload:** This OID accepts a string in this format:

"PROT IP CONFIG\_FILE USER PASSWD"

where:

PROT	Value of 0 for uploading the configuration by TFTP, or 1 to upload it by FTP.
IP	IP address of the TFTP or FTP server.
CONFIG_FILE	Name of the file where the uploaded configuration will be stored.
USER	User login for FTP, not necessary if TFTP is being used.
PASSWD	User password for FTP, not necessary if TFTP is being used.

Table 1 Upload file parameters

This way, the system performs an upload of the active configuration to a TFTP or FTP server. The configuration file name string size can be up to 60 characters long.

- **plSysConfDownload:** This OID accepts a string in this format:

"PROT IP CONFIG\_FILE USER PASSWD"

where:

PROT	Value of 0 for downloading the configuration file by TFTP, or 1 to download it by FTP.
IP	IP address of the TFTP or FTP server.
CONFIG_FILE	Name of the file to be downloaded.
USER	User login for FTP, not necessary if TFTP is being used.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 75 / 145

PASSWD	User password for FTP, not necessary if TFTP is being used.
--------	---

Table 2 Download configuration file parameters

This way, the system performs a download of a new configuration file from a FTP or TFTP server. The configuration file name string size can be up to 60 characters long.

- **pISysUpgradeStatus:** This OID is read-only and shows an integer number, which is a special code for showing the current status of the upgrade in progress. The codes for this OID are:

0	Last upgrade was performed correctly.
-1	No FLASH upgrade has been performed since the last boot.
-2	Last upgrade failed checking CRC.
-3	Last upgrade failed due to src was incorrect.
-4	Last upgrade failed due to destination (FLASH sector) was incorrect.
-5	Last upgrade failed due to file was for an incorrect HW product.
-6	Last upgrade failed due to file was for an incorrect HW Revision.
-7	Last upgrade failed due to file was for an incorrect ASIC.
-8	Last upgrade failed due to file was for an incorrect flash region.
-9	Last upgrade failed due to file was for an incorrect SW product.
-10	Last upgrade failed due to file size exceeds the flash section size.
-11	Last upgrade failed due to flash section is read-only.
-12	Last upgrade failed downloading/uploading file.
-13	Last upgrade failed due to another upgrade process is running.
-14	Last upgrade failed due to download buffer could not be allocated.
-15	Last upgrade failed due to the region used at upgrade process is invalid.
-16	Warning. The file used is not full compatible.
-17	Last upgrade failed due to the upgrade thread could not be created.
-18	Last upgrade failed due to file was for an incorrect SW version.
-19	Last upgrade failed due to Board Description Data is not set.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 76 / 145

-20	Last upgrade failed with other error (unknown).
-21	Last upgrade failed due to file not found.
1	A FLASH upgrade process is starting.
2	A FLASH upgrade process is downloading/uploading file.
3	A FLASH upgrade process is checking CRC.
4	A FLASH upgrade process is finishing.
99	A FLASH upgrade process is in unknown status.

Table 3 Upgrade status code list

- o **plSysUpdate:** This OID accepts a string in this format:

"PROT IP CONFIG\_FILE USER PASSWD"

where:

PROT	Value of 0 for downloading the firmware by TFTP, or 1 to download it by FTP.
IP	IP address of the TFTP or FTP server.
CONFIG_FILE	Name of the file to be downloaded.
TYPE	Type of file 1:FW imag, 2 Loader image, etc.
USER	User login for FTP, not necessary if TFTP is being used.
PASSWD	User password for FTP, not necessary if TFTP is being used.

Table 4 Update system parameters

This way, the system performs an update of the firmware, loader or whatever part of the code in a modem from a TFTP or FTP server. The configuration file name string size can be up to 60 characters long.

- o **plSysDNSAddress:** Holds the DNS IP address.
- o **plSnmprOCcommunityName:** Holds the community name string.
- o **plSnmprRWcommunityName:** Holds the community name string.
- o **plSnmprTrapDest:** Holds the IP address to send the traps to.



**EC/IST FP6 Project No 507667**

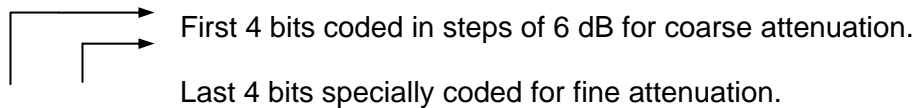
**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 77 / 145

**pIBasic**

- **pIBasicTable**

- **pIBasicCard:** Card index.
- **pIBasicMode:** Physical mode used by the modem. These values can reach from 1 to *M*, depending on the range of frequency used.
- **pIBasicCentralFrequency:** Mode central frequency value in KHz.
- **pIBasicBandwidth:** Mode bandwidth in MHz.
- **pIBasicTXAGCEnable:** Enables/disables transmission AGC. This AGC feature controls transmission gains automatically and dynamically.
- **pIBasicRXAGCEnable:** Enables/disables reception AGC.
- **pIBasicTXAGCGain:** Sets/gets the transmission gain, and it can accept two values, '0' and '1'. These values have a 'distance' of 12 dB and act over the AFE amplifiers.
- **pIBasicRXAGCGain:** Sets/gets the gain in reception, in a range of values from '0' to '7' in steps of 6 dB.
- **pIBasicTXPowerMaskLB:** Sets/gets the system powermask in the low half band of frequencies in the whole bandwidth used by the Opera node, from carrier numbers 1 to 768. The value is a 768-character long string, each character corresponding to a carrier, that is, the first character corresponds to carrier number 1 and so on. These characters have a special coding, and its meaning has to be split into two sub-codes, e.g.:



0100 0110

The coding for the last 4 bits can be deduced from this graph:

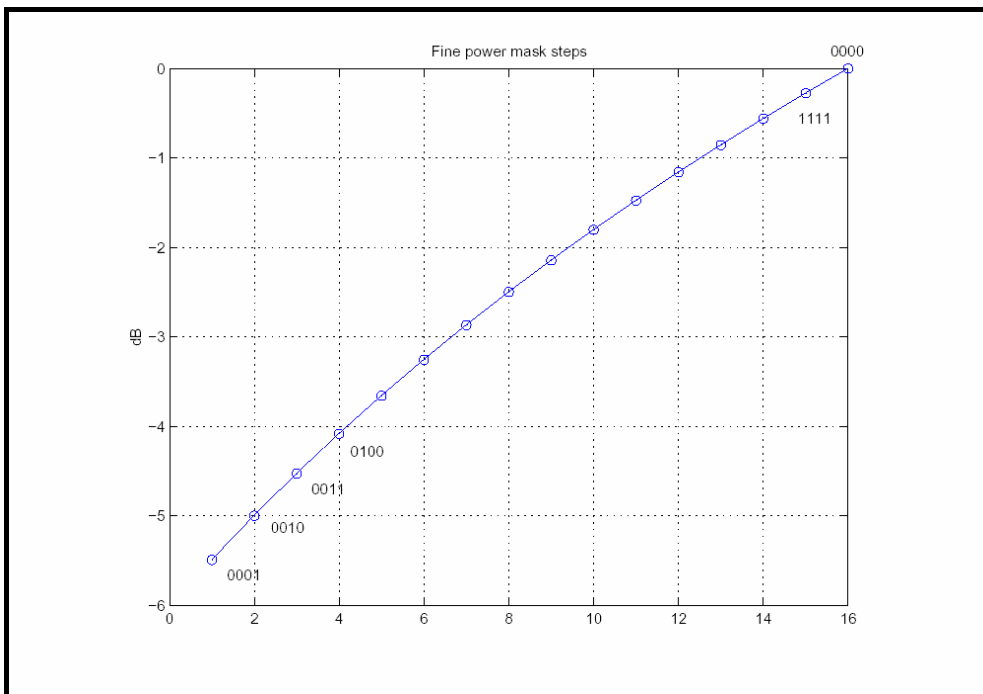


Figure 4 Power mask encoding graphic

- **pIBasicTXPowerMaskHB:** Sets/gets the system powermask in the high half band frequencies of the whole bandwidth used by the OPERA node, from carrier numbers 769 to 1536. The explanation of the value of this OID is equivalent to the previous one.
- **pIBasicMasterMAC:** Shows the MAC address of the current master of the node.

## pIPhy

- **pIPhyByMACTable**

- **pIPhyByMACCard:** Card index.
- **pIPhyByMACMAC:** Physical (MAC) address that also serves as an index. This means that all of the following OIDs will refer to a single MAC address. These MAC addresses are those that have been learned by the MAC protocol or configured manually. Other tables could be also indexed by MAC, and all of them would mean that the value shown affects that MAC.
- **pIPhyByMACTXBPC:** For all practical purposes, these are the bits per carrier (BPCs) associated to the indexed MAC in transmission. The value is a 768-character long string with numbers from 2 to 10, each number representing



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 79 / 145

the number of bits per symbol of each carrier. Each byte contains two carriers (4 bits each).

**NOTE:** All BPC OIDs are the result of applying the Adaptive Bitloading ProtoCol, for which BPC is the acronym.

- **pIPhyByMACTXBPCAggregated:** Holds the aggregated BPC value in transmission, which is a value from 288 to 14592. Although the maximum number of bits per carrier is 10 and the number of carriers is 1536, the physical throughput requires making a subtraction of 0.5 bits for each BPC value, which is used by the FEC algorithm. Therefore, 1536 times 9.5 results in 14592.
- **pIPhyByMACTXPhySpeed:** Physical speed in transmission in Mbits per second.
- **pIPhyByMACRXBPC:** These are the BPCs associated to the indexed MAC in reception. The value is a 768-character long string with numbers ranging from 2 to 10, each number representing the number of bits per symbol for each carrier. Each byte contains two carriers (4 bits each).
- **pIPhyByMACRXBPCAggregated:** Shows the aggregated BPC value in reception, which is a value from 288 to 14592. Although the maximum number of bits per carrier is 10 and the number of carriers is 1536, the physical throughput requires making a subtraction of 0.5 bits for each BPC value, which is used by the FEC algorithm. Therefore, 1536 times 9.5 results in 14592.
- **pIPhyByMACRXPhySpeed:** Physical speed in reception in Mbits per second.
- **pIPhyByMACSNR:** Shows the measured channel SNR. The value shown is a 768-character long string where each character is a number that shows the SNR value in units of 0.5 dB.
- **pIPhyByMACCFR:** Shows the measured channel CFR. The value shown is a 768-character long string where each character is a number that shows the CFR value in units of 1 dB.
- **pIPhyByMACACK:** Enables/disables the level 2 ACKs feature.
- **pIPhyByMACCipher:** Enables/disables the cipher feature.
- **pIPhyByMACTxHURTO:** Forces HURTO mode in transmission for a 'set' operation, or indicates if the modem is transmitting in HURTO mode to the indexed MAC for a 'get' operation.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 80 / 145

- **pIPhyByMACRxHURTO:** Forces HURTO mode in reception for a 'set' operation, or indicates if the modem is receiving in HURTO mode from the indexed MAC for a 'get' operation.
- **pIPhyByMACIsActive:** Used to check if a node, whose MAC is the index, is active (1) or not (0).
- **pIPhyByMACRXTimeLastActivity:** Indicates the number of seconds since the last time the indexed MAC showed PLC activity.
- **pIPhyRXSNRThresholdTable**
  - **pIPhyRXSNRThresholdCard:** Card index.
  - **pIPhyRXSNRThresholdIndex:** The Opera modems have 9 levels of SNR thresholds for changing the BPCs to be used when these levels are reached. This OID is an index with fixed values from 2 to 10 to refer to the BPCs to be used when a certain SNR value is reached. For instance, if data is requested (see the OID below) for the index 6, it will return the SNR value from which 6 BPCs will be used.
  - **pIPhyRXSNRThreshold:** SNR threshold value in units of 0.5 dB for a determinate threshold index in the above OID.

## pIMAC

- **pIMACTable**
  - **pIMACCard:** Card index.
  - **pIMACAccessProtocol:** Enables/disables the Access Protocol mode, which has been implemented to allow a node to automatically learn the MAC addresses of the nodes that are liable to connect with it.
  - **pIMACNumConnectedNodes:** Shows the number of nodes successfully connected, that is, with its link solved by the Port Solver Protocol.
  - **pIMACNumSlaves:** Shows the number of configured slaves if the node is a master.
- **pIMACConnectedNodesTable**
  - **pIMACConnectedNodesCard:** Card index.
  - **pIMACConnectedNodesIndex:** This index will refer to a connected node, a number ranging from 0 to the value shown by *pIMACNumConnectedNodes* (see above).





# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 81 / 145

- **pIMACConnectedNodesMAC:** MAC address of the indexed connected node.
- **pIMACSlavesTable**
  - **pIMACSlavesCard:** Card index.
  - **pIMACSlavesIndex:** This index will refer to a slave node, a number ranging from 0 to the value shown by *pIMACNumSlaves* (see above).
  - **pIMACSlavesMAC:** MAC address of the indexed slave node.

## plQoS

- **plQoSMasterGeneralMinOneWayLat**

If the modem is a master, this OID shows the minimum latency configured in the modem in milliseconds.
- **plQoSMasterGeneralBwMngrPolicy**

This OID shows the policy to be followed by a master in assigning a certain bandwidth to its attached slaves. If a 0 is returned, the master is configured to assign bandwidth in a fair policy, while if a 1 is returned, the bandwidth is assigned in a priority-based policy.
- **plQoSPriorityManagementTable**
  - **plQoSPriorityManagementCard:** Card index.
  - **plQoSPriorityManagementPrio:** Priority value, from 1 to 8.
  - **plQoSPriorityManagementLatency:** Latency coding value for the priority. Allowed coding values are 0, 1, 2, 4 and 8
- **plQoSPerUserTable**
  - **plQoSPerUserCard:** Card index.
  - **plQoSPerUserMAC:** Physical MAC address of the user hanging from the master. Used as index.
  - **plQoSPerUserTXMaxXput:** Shows the maximum throughput allowed in transmission for a user in kilobits per second.
  - **plQoSPerUserRXMaxXput:** Shows the maximum throughput allowed in reception for a user in kilobits per second.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 82 / 145

- **plQoSPerUserPriorityAllowedUp:** Shows the allowed priorities for transmission and reception in upstream for a user. The returned value is a number from 0 to 255, which is a number corresponding to the allowed priorities' 8-bit mask coding, i.e., a value of 16 (0010000b) would mean that priority 5 is the only one allowed.
- **plQoSPerUserPriorityAllowedDown:** Shows the allowed priorities for transmission and reception in downstream for a user. The returned value is a number from 0 to 255, which is a number corresponding to the allowed priorities' 8-bit mask coding, i.e., a value of 17 (0010001b) would mean that priorities 5 and 1 are the only ones allowed.

### plOVLAN

This node has the same structure and OID that the dot1qVlan MIB branch.

### plStatistics

- **plStatisticsTable**

- **plStatisticsCard:** Card index.
- **plStatisticsPLCInputWords:** Number of words received by the PLC physical interface.
- **plStatisticsPLCInputPackets:** Number of packets received by the PLC physical interface.
- **plStatisticsPLCInputIncorrigible:** Number of incorrigible packets received by the PLC physical interface.
- **plStatisticsPLCInputFECBlocksTotal:** Number of FEC blocks received by the PLC physical interface.
- **plStatisticsPLCInputFECBlocksCorrected:** Number of FEC blocks received and corrected by the PLC physical interface.
- **plStatisticsPLCInputPktsReceived:** Number of packets received by the PLC physical interface.
- **plStatisticsPLCInputPktsRcvComplete:** Number of packets received complete by the PLC physical interface.
- **plStatisticsPLCInputPktsRcvIncomplete:** Number of packets received incomplete by the PLC physical interface.
- **plStatisticsPLCOutputWords:** Number of words transmitted through the PLC physical interface.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 83 / 145

- **plStatisticsPLCOutputPkts:** Number of packets transmitted through the PLC physical interface.

## plTraps

- **plTrapsPhyTable**

- **plTrapsPhyCard:** Card index.
- **plTrapsPhyTrapToHURTOEnable:** Enables/disables trap generation when entering HURTO mode.
- **plTrapsPhyTrapFromHURTOEnable:** Enables/disables trap generation when leaving HURTO mode.

- **plTrapsMACTable**

- **plTrapsMACCard:** Card index.
- **plTrapsMACTrapPeerDetectedEnable:** Enables/disables trap generation when detecting a peer modem.
- **plTrapsMACTrapPeerDisappearedEnable:** Enables/disables trap generation when a peer modem disappears.

- **plTrapsBridgeTable**

- **plTrapsBridgeCard:** Card index.
- **plTrapsBridgeTrapNewRootEnable:** Enables/disables trap generation when a new root is assigned. The trap is sent from a node when this node becomes root.
- **plTrapsBridgeTopologyChangeEnable:** Enables/disables trap generation when network topology changes.

- **plTrapsConfFailTable**

- **plTrapsConfFailCard:** Card Index.
- **plTrapsConfDownloadFailEnable :** Enables/disables the trap generation when a configuration file download fails.
- **plTrapsConfUploadFailEnable :** Enables/disables the trap generation when a configuration file upload fails.

## plStp

- **plStpTable**



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 84 / 145

- **plStpCard:** Card index.
- **plStpEnable:** Enables/disables the Spanning Tree protocol.
- **plStpProtocolVersion:** Chooses either using STP (IEEE 802.1d) or RSTP (IEEE 802.1w). The RSTP version is compatible to STP on a per-port basis. Values: "STP", RSTP".
- **plStpPtpExtA:** Sets the point-to-point flag on EXTA. This port will be considered point-to-point, thus candidate for rapid transition to forwarding. Set by default when EXTA is connected to backplane.
- **plStpPtpExtB:** Sets the point-to-point flag on EXTB. This port will be considered point-to-point, thus candidate for rapid transition to forwarding. Set by default when EXTB is connected to backplane.
- **plStpFrontier:** Enables/disables the Spanning Tree Frontier . This feature drops all the STP messages on an EXT interface. Values: "NONE", "EXTA", "EXTB".

### plSecurity

- **plSecurityConsoleSerial:** Enables or disables the serial console access to the modem.
- **plSecurityConsoleTelnet:** Enables or disables the telnet console access to the modem.
- **plSecurityConsoleAuthTable:** Table containing the IP addresses from which telnet clients may access this

## 5.2 Auto-Configuration and Provisioning

### 5.2.1 Auto-configuration purpose

The purpose of the auto-configuration process is the complete automation of the deployment of the PLC network:

- Medium Voltage equipment
- Low Voltage Repeaters and Home Gateways
- CPEs

With the auto-configuration mechanism no prior pre-configuration of any modem is required.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 85 / 145

### 5.2.2 Auto-configuration process overview

The objective of the auto-configuration process is the centralized management of a PLC network using configuration files stored in a centralized database that are transferred to each node when it boots. These files contain all of the information that a node needs to know to work as expected.

Below is a brief description of the process:

1. Every node starts with the same default factory configuration: Access CPE.
2. Using PTTTP (explained later in this document 5.2.5) the modem discovers if it is booting in a network with VLANs or not. If a network has been built using VLANs it is necessary to know the Management VLAN of that network segment for the DHCP request to reach the backbone. The information passed between modems during PTTTP is called the translation table.
3. Using DHCP protocol, each node gets their IP configuration (IP address, netmask and gateway), the phone number (in the case of VoIP CPEs), the name of their corresponding auto-configuration file and the IP address of the TFTP server where the auto-configuration file is.
4. Using TFTP protocol, the nodes download the auto-configuration file and configure the node accordingly.

The four points mentioned above are the main ones, but there is another point to consider:

In order to achieve a secure network, PLC authentication is introduced. When a new slave is trying to access the PLC network and connecting to a master or a repeater, the master or repeater may perform a RADIUS request to authenticate the user. See section 5.2.9 for more information.

Below there is an example of the actions involved in the auto-configuration of a slave modem:

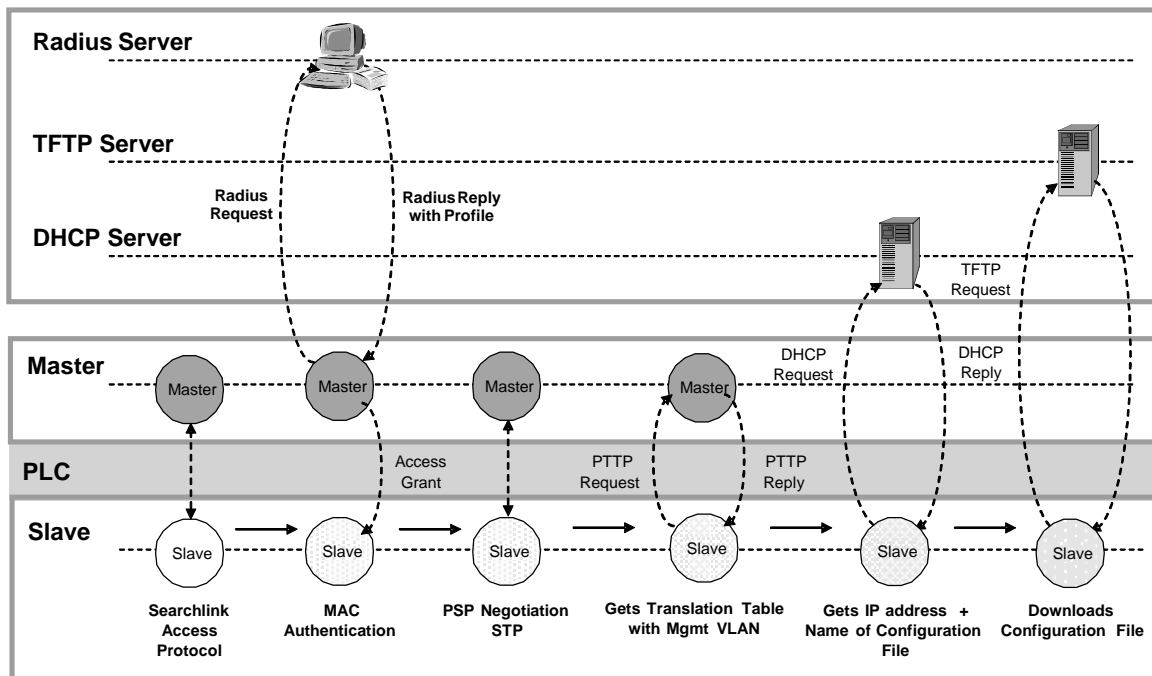


Figure 5 Autoconfiguration of a slave modem

If the node is the first modem in the network and connected directly through the Ethernet port to the backbone, the process is slightly different:

1. This node starts with the same default factory configuration: Access CPE.
2. Using DHCP protocol, the node gets their IP configuration (IP address, netmask and gateway, and the name of their corresponding auto-configuration file). Also there is another parameter called ptp-code that indicates if VLAN is used and the value of the management VLAN if needed. Once this parameter is obtained the PTP protocol finishes. Important: the DHCP server must ask this node in the VLAN #1 or without VLAN. In other words, the node performs DHCP requests without VLAN and with VLAN #1 alternately.
3. Using TFTP protocol, the nodes download the auto-configuration file and configure the node accordingly.

The figure below shows an example of this case:

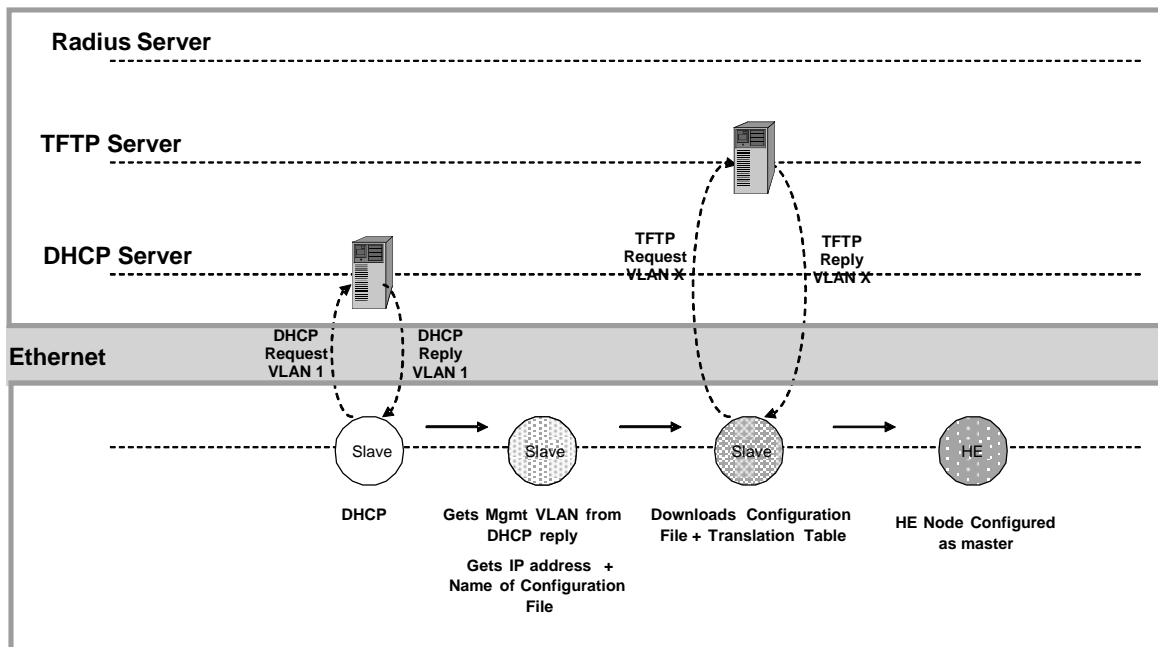


Figure 6 Autoconfiguration of a HE

### 5.2.3 Access Protocol

The access protocol mechanism controls the access of slaves to the PLC network. The master or repeater queries the Radius server (if Radius authentication is enabled) when a new slave is detected.

Only nodes that link to a Master or repeater need to be in the Radius database:

- CPEs
- TD Repeaters

The Radius server checks:

- The MAC address of the slave applying for authentication
- The MAC address of the master placing the request

The Radius server replies:

- Accept / Reject
- Profile number

The profile number relates to the QoS and VLAN settings for the given slave (Radius user).



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 88 / 145

If Access Protocol authentication is disabled, all slaves get access to the network with the default settings (profile 1).

A third type of authentication is possible: Authlist. In this mode, the autoconfiguration file of the master contains all the slaves that are allowed to connect and their associated profile.

#### **5.2.4 Auto-configuration at Modem Boot**

Nodes may have a non-volatile memory that can be used to obtain the values of autoconfiguration parameters on booting. When any node boots, there may be a parameter stored in the non-volatile memory called **GENERAL\_USE\_AUTOCONF**. When this value is YES, the node boots in auto-configuration mode. When this value is NO, the node boots from local settings.

Inside the autoconfiguration boot mode there are two possibilities depending on whether or not PTTP is performed.

##### **5.2.4.1 Autoconfiguration PTTP Boot**

In this autoconfiguration boot mode, the node always initiates as a slave (CPE) and starts to send PTTP requests. When this protocol ends, the modem has the minimum information to successfully connect to the backbone and execute DHCP and TFTP.

The node then performs a DHCP request to get an IP configuration, the phone number (if required) and the name of the auto-configuration file, as well as the TFTP server where the file is located. Then it downloads the file and configures the node accordingly.

##### **5.2.4.2 Autoconfiguration no PTTP Boot**

In this autoconfiguration boot modality, the modem has been already configured somehow (see chapter 5.2.5 for more information) to successfully execute DHCP and TFTP so it skips PTTP.

This mode requires pre-configuration and it is only recommended in the first node of the PLC network, the node that connects to the backbone, because this node cannot get the information for booting from any other node. However, there is defined a DHCP extension to solve this issue without pre-configuration. See section 5.2.8.

##### **5.2.4.3 Boot from local settings**

When a node starts in local settings boot mode, it collects all of the configured parameters from the non-volatile memory and configures the node accordingly. There are some basic parameters that are always configured in this mode:

- **GENERAL\_TYPE:** Node type – HE, CPE, or TDREPEATER.





**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 89 / 145

- **GENERAL\_IP\_USE\_DHCP:** Use DHCP – yes or no. If this parameter is set to no, the IP configuration parameters and the phone number are also configured from non-volatile memory.

All of the other parameters are only configured if they have been downloaded from a file first, and a **GENERAL\_USE\_AUTOCONF = no** line was in that auto-configuration file. This is equivalent to performing a *Save as Permanent*.

## 5.2.5 PTP Protocol

The PTP (Parametric Translation Table Protocol) is used to transfer the translation table (explained later in this document) between modems at booting. The PTP uses the OPERACP

### 5.2.5.1 General description

The Parametric translation table protocol takes place every time a node boots. The aim of this protocol is to obtain from the nearest active node a table with the values of certain auto-configuration parameters. When the node downloads the auto-configuration file it uses the obtained values to translate all the parametric values contained in the file.

The translation table contains information about the different VLAN and OVLAN tags used in the network, as well as information about the QoS settings. If the network is not using VLAN tags, this information is also contained in the translation table. Due to this, it is necessary to perform the protocol before the DHCP request.

Once the translation table is obtained, the node is able to perform the DHCP request successfully and download and interpret the auto-configuration file, translating the parametric values contained on it.

### 5.2.5.2 Protocol description

The Translation Table protocol is client-server. Each node belonging to the network at boot time represents the client side. Each configured node in the network excluding End Users nodes performs the server side of the protocol.

The usual sequence of packet exchanging is described:

1. The client starts sending a Read ReQuest (RRQ) packet through all active interfaces.
2. The closest server receives the RRQ packet and it sends the first block of the Translation Table to the client with a DATA packet with block number 1.
3. The client answers with an ACK packet of the block number 1.
4. The server sends the next block of DATA.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 90 / 145

5. The client replies with another ACK
6. Steps 4 and 5 are repeated until the translation table is sent completely.
7. The server sends an empty DATA packet to finish the protocol.
8. The client replies with an ACK to this empty packet and closes the connection.
9. The server receives the last ACK and closes the connection.

The following figure shows this sequence:

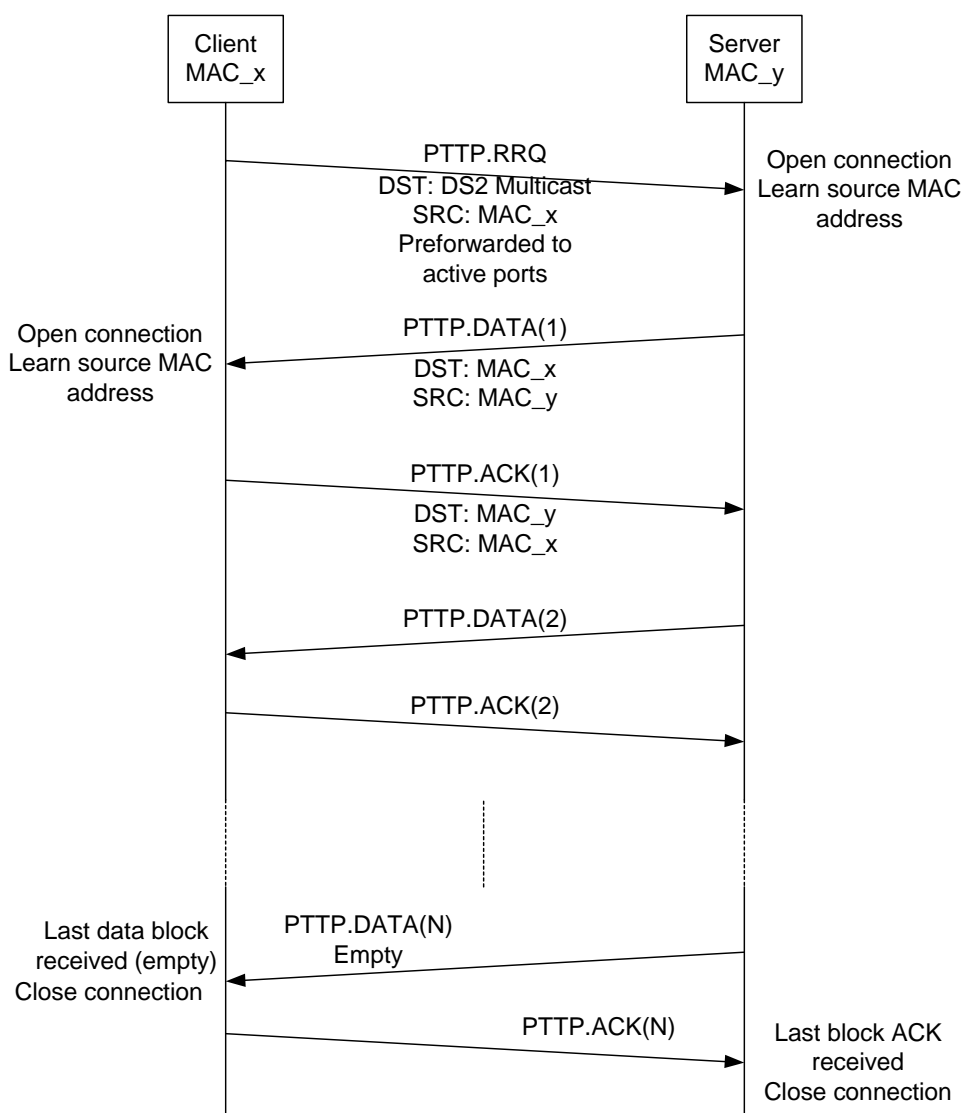


Figure 7 Usual PTPP operation.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 91 / 145

Since PTTTP protocol operates directly over PLC and Ethernet protocols, it must handle itself lost and duplicated packets. PTTTP implements the stop-and-wait protocol described before. For this purpose, two timers are needed per each connection: DATA and ACK timers. The DATA timer is in the client, whereas the ACK timer is located in the server.

If a duplicated DATA or ACK message arrives, it is simply discarded, because its Block Number field will not match the expected one. If a DATA or ACK message is lost, the ACK timer will expire in the server and this will retransmit the last DATA message.

There is defined a Maximum Number of Retransmissions, which in case of being exceeded, the connection will be closed on the server side. Moreover, the connection will be closed on the client side too, because its DATA timer will expire.

If the initial RRQ packet is lost, the DATA timer will expire too, and the connection will not be open.

In case of DATA timer expiration, the client would not get its translation table and will not be configured. For that reason, it must retry sending another RRQ message again to request the translation table.

DATA timer value should be several times the ACK timer. Concretely, this value must be slightly greater than the product of the Maximum Number of Retransmissions and the ACK timer:

$$\text{DATA\_Timer} > \text{Max\_Retransmissions} \cdot \text{ACK\_Timer}$$

The reason for using this value is to avoid useless retransmissions by the server, because the client might have closed its connection, due to DATA timer timeout, before the server did. Thus, in case of DATA timer expiration, the server should close the connection before the client.

The following figure shows the mechanism of ACK timer expiration and data block retransmission:

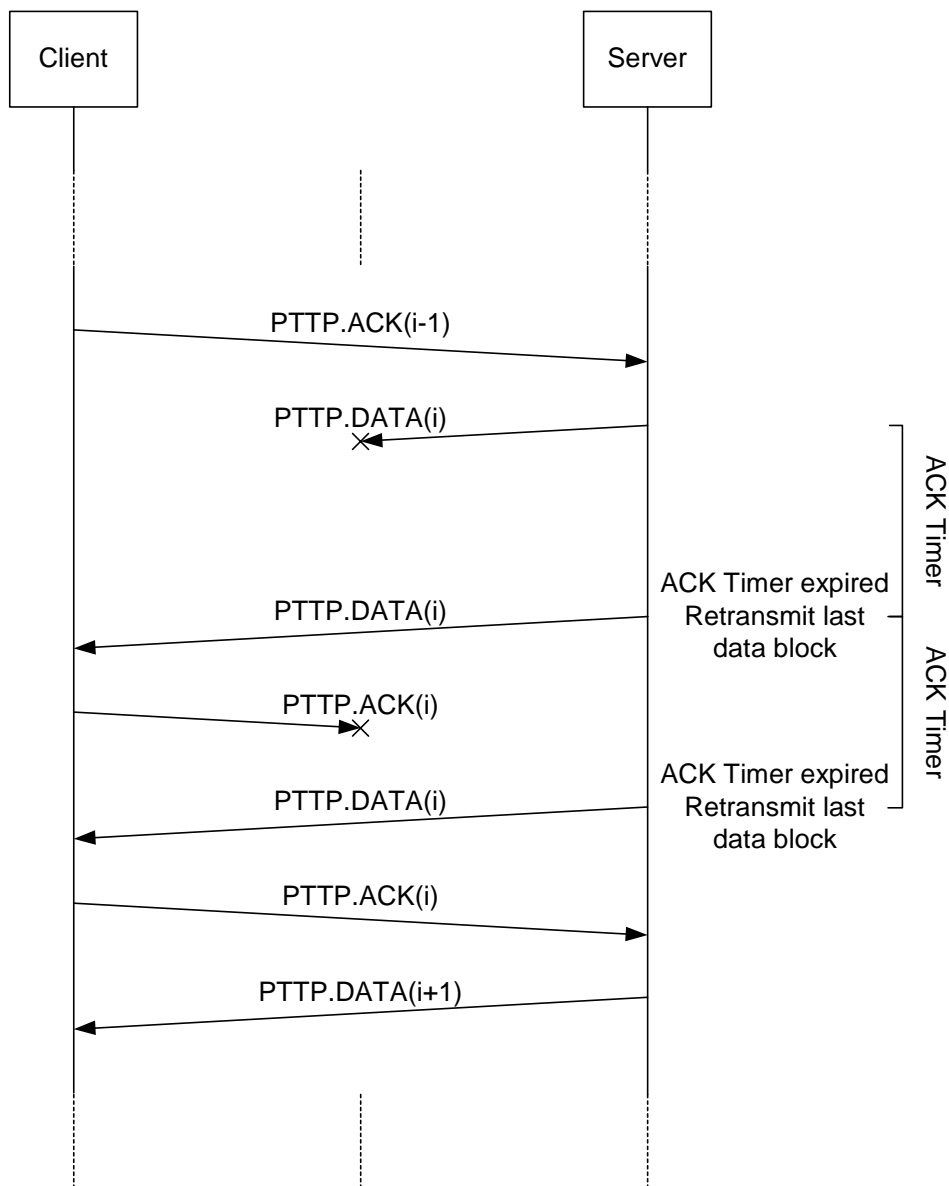


Figure 8 ACK timer expiration and data block retransmission.

The following figure shows the mechanism of DATA timer expiration and Maximum Number of Retransmissions exceeded, whose consequence is the connection closing:

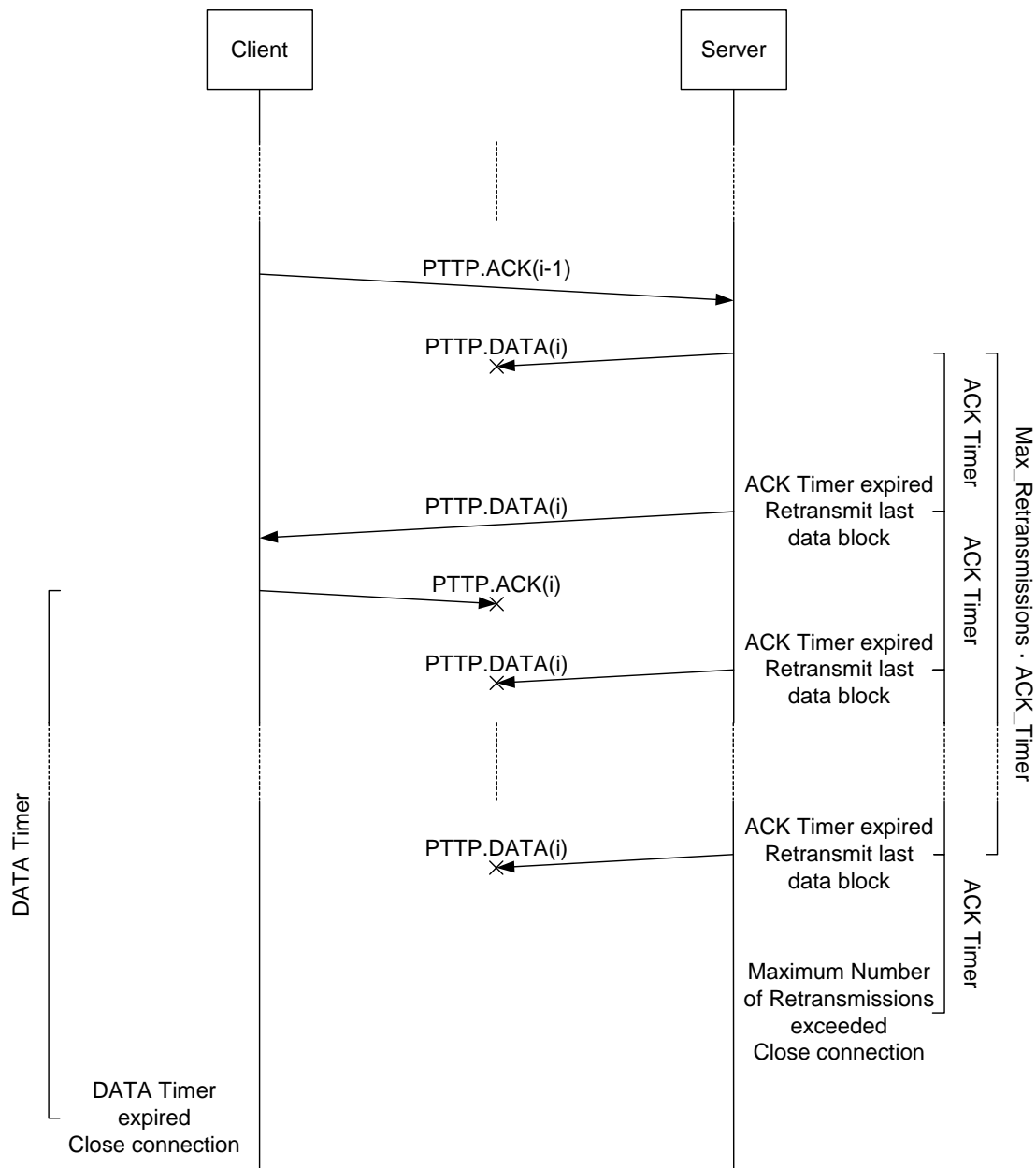


Figure 9 DATA timer expiration and Maximum Number of Retransmissions exceeded.

### 5.2.5.3 PTTTP Packets Format

All the packets used by the PTTTP protocol are encapsulated with the OPERACP format, with Type0 0x07. The Type1 field indicates the type of packet within the PTTTP protocol:

- 0x06 RRQ (Establish connection)



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 94 / 145

- 0x07 Data
- 0x08 Data Ack

The data field contains the block number and/or data to transmit.

**5.2.5.3.1 RRQ packet**

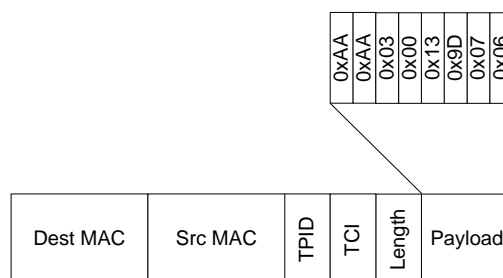


Figure 10 PTTP RRQ packet format

The destination address is the Multicast address 0x01139D000000 defined by the OPERACP protocol. When a node receives such a packet, it must not be forwarded.

**5.2.5.3.2 DATA packet**

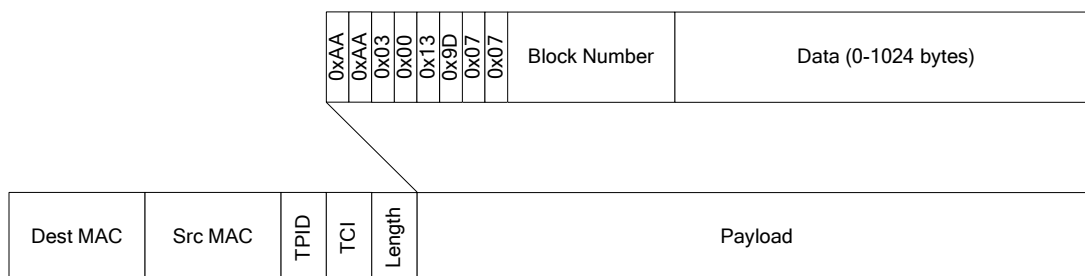


Figure 11 PTTP DATA packet format

The destination and source address are the client and server MAC addresses respectively.

The Type1 field indicates this is a data packet. Next to this field, it is the data block number, and finally the data block. The data field can be empty if the DATA packet is the last packet of the transfer.



### 5.2.5.3.3 DATA ACK packet

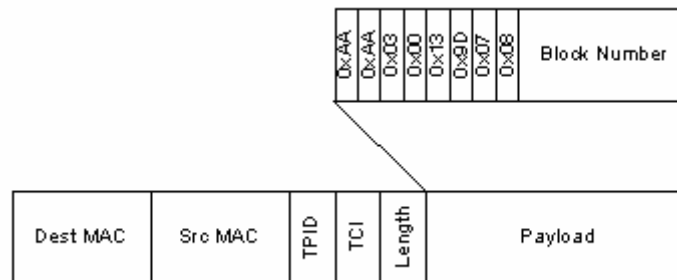


Figure 12 PTTP DATA ACK packet format

The destination and source address are the server and client MAC addresses respectively.

The Type1 field indicates this is a data ack packet. Next to this field, it is the acknowledged data block number.

### 5.2.5.4 Translation Table DATA format

The Translation Table data follows a specific format. It is a set of one or more parameter items. A parameter item is defined as follows:

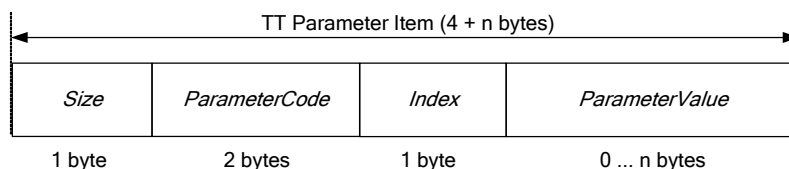


Figure 13 Translation Table parameter item

The field *Size* is the number of bytes of the rest of parameter item (*ParameterCode* + *Index* + *ParameterValue*). The minimum value is thus 4. If the value is 0, it means that no more parameters are sent. It is mandatory to finish the Data block with a 0-size byte.

The *ParameterCode* is a 2-byte field. The first byte is reserved for future extensions. It defaults to 0x00. The second byte is the parameter code. The whole field identifies one and only one parameter.

The *Index* byte contains the index for list parameters (from 1 to 127). It is 0 for scalar parameters.

The *ParameterValue* contains the value for that parameter. Its format depends on the *ParameterCode* and may be of any type such as int8, int16, int32, string...



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 96 / 145

The next parameters are available:

TRANSLATION TABLE PARAMETER	PARAMETER SIZE (IN BYTES)	PARAMETER CODE (IN HEXADECIMAL)	PARAMETER TYPE
TRANSLATION_USE_VLAN	1	0x00 01	Boolean
TRANSLATION_MNMT_VLAN	2	0x00 02	Int16
TRANSLATION_DATA_VLAN.i	2	0x00 03	Int16
TRANSLATION_VOIP_VLAN.i	2	0x00 04	Int16
TRANSLATION_ROOTPATH_OVLAN	2	0x00 05	Int16
TRANSLATION_MAX_TXTPUT_TX.i	4	0x00 06	Int32
TRANSLATION_MAX_TXTPUT_RX.i	4	0x00 07	Int32

Table 5 Translation table parameters

When the Data block exceeds the maximum length of 1024 bytes, it is fragmented and transferred in different DATA packets. No padding is needed for the last packet in case the Data field is smaller than 1024 bytes.

The big endian format is used in the entire Data block to preserve the net order.

The Figure 14 shows a complete data block.

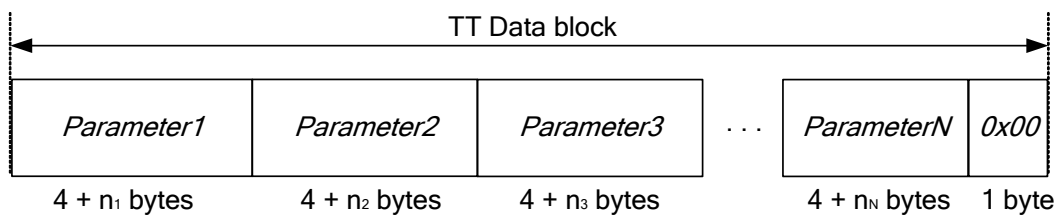


Figure 14 Full Translation Table Data block

**5.2.5.5 VLAN configuration while doing PTTT**

In order to discover the type of network where the node is booting, the PTTT petitions are made as described below:

- Step 1: A PTTT request is made without VLANs and waits for a response. If there is response, stay without VLAN.





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 97 / 145

- Step 2: Then it switches to VLAN mode and makes a PTTTP request using VLAN tag #1 (reserved in the OPERA network) and waits for response. If there is response, stay with VLAN.
- Step 3: Back to step 1.

To accomplish this, the VLAN #1 must be accepted in the node that acts as PTTTP master.

### 5.2.5.6 PTTTP packets forwarding

When a node receives a PTTTP RRQ packet, the packet is not treated as multicast to avoid packet storms.

In transmission, the request is forwarded to all active interfaces in order to reach any active PTTTP available server.

### 5.2.6 Translation Table

The translation table allows particularizing configuration files for a given network sector. Auto-configuration file is parametric, and the same for a given user category. Different sectors have different Translation Tables and each node combines its configuration file with the translation table to obtain its particular setting in VLAN/OVLAN and QoS terms.

The parameters contained in the translation table are shown in 5.2.5.4.

The next figure shows the use of the translation table.

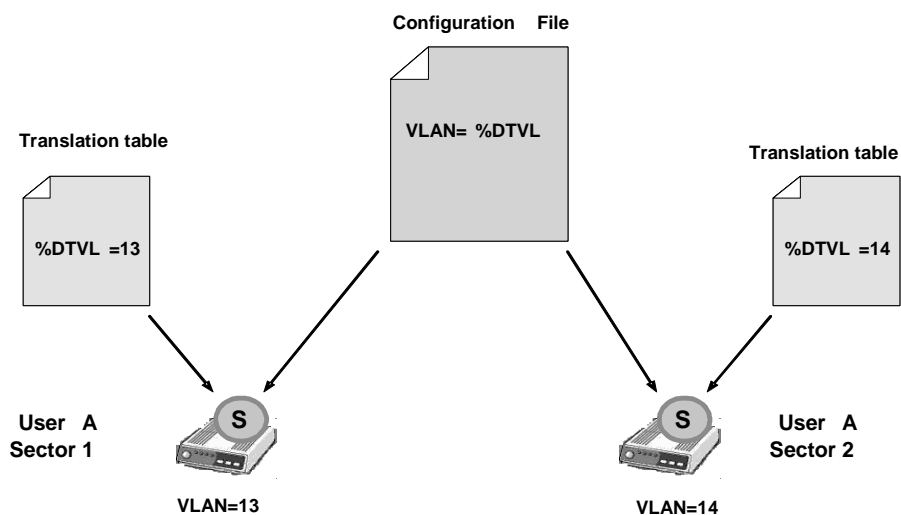


Figure 15 Translation table example



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 98 / 145

## 5.2.7 Auto-configuration & Networking

### 5.2.7.1 VLAN Network

The network model is described as follows:

- The PLC network is a switched network with different VLAN tags.
- PLC management protocols (PTTP, ABLP, etc.) use VLAN 1, while high-level management protocols (DHCP, TFTP, HTTP, NTP, SNMP, etc.) use the management VLAN configured by the auto-configuration procedure. The Management VLAN may be different in different LV cells.
- The end user node receives untagged traffic from the external interface and this traffic is tagged with the correct Data VLAN according to the ISP operator that the customer belongs to. So there can be more than one Data VLAN per LV cell.
- The end user node generates traffic from VoIP tagged with the correct VoIP VLAN according to the voice operator that the customer belongs to. So there can be more than one VoIP VLAN per LV cell.
- It is possible to add private VLANs between specific customers that do not belong to any ISP or voice operator. In this case, VLAN trunks must be defined in the intermediary equipment in order to allow all of that tagged traffic.
- All of the traffic is tagged inside the PLC network.

Each node must receive its VLAN configuration inside the auto-configuration file. In addition to this, and in order to reduce the number of auto-configuration files, there will be a translation table transferred between nodes which. The translation table contains information about the Management, Data and VoIP VLANs used in a LV cell.

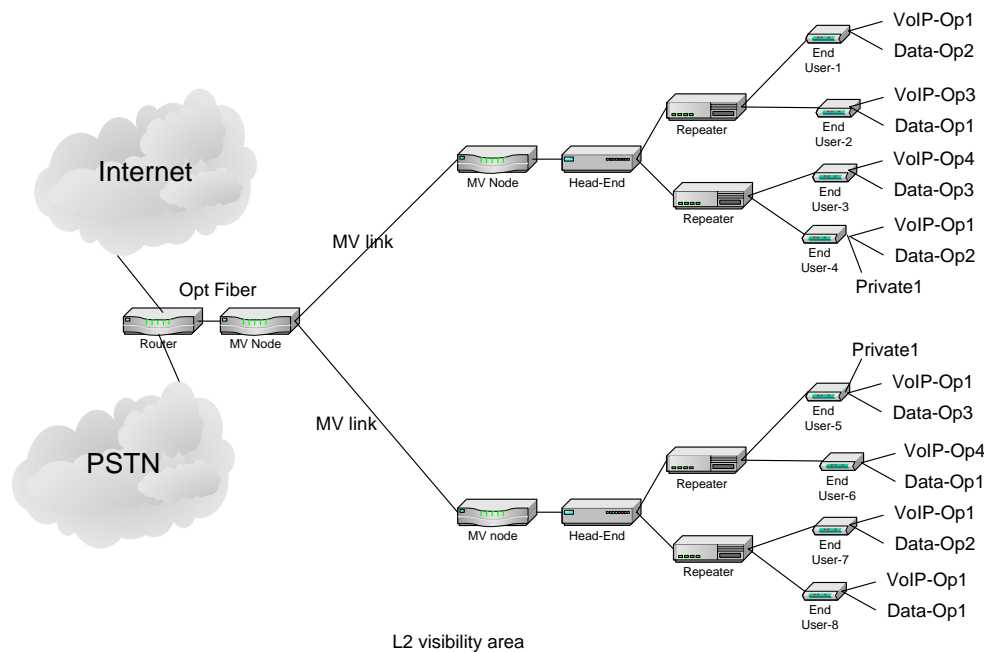


Figure 16 VLAN use inside the PLC network

The figure above shows the use of VLAN inside the PLC network.

### 5.2.7.2 noVLAN Network

The use of VLANs is not mandatory but is advisable for privacy reasons. Nevertheless this privacy can be implemented with different tools or if the operator simply wants to establish a LAN.

The node will perform its PTTTP requests, switching between VLAN #1 and not using VLAN, and finally a master will answer with the translation table that will at least contain the parameter "USE VLAN = no".

Once the modem has received the translation table and does not need to configure anything with regard to VLANs, it can complete the following steps: DHCP, TFTP and configuration.

### 5.2.7.3 OVLAN Configuration and Root Interface

The basic OVLAN configuration in OPERA avoids the visibility between customers connected to the end-user nodes in a simple way. All of the customer data packets in the same LV cell are tagged with the Rootpath OVLAN tag. This tag is the only allowed tag in



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 100 / 145

the entire path to the backbone. In the path from the backbone to the customers, the packets are tagged with the ALL\_VLAN tag (4095) in equipment that is connected to the backbone, and no tag is allowed in this path. However, packets with the ALL\_VLAN tag are not filtered, so only packets from the backbone can be transmitted over the downstream path.

#### 5.2.7.4 User Profiles

The use of profiles allows securely assigning resources to end-user modems based on MAC address. They also inform the master about the VLAN/OVLAN and QoS settings to be applied to the slave.

#### 5.2.7.5 User Profiles inside auto-configuration

Inside a master's auto-configuration file, there is a section with user profiles. These profiles contain the information a master needs to know to configure a port to a new slave that enters the network. The information is related to QoS and VLAN/OVLAN configuration.

The figure shows an example on the use of user profiles to configure different QoS settings:

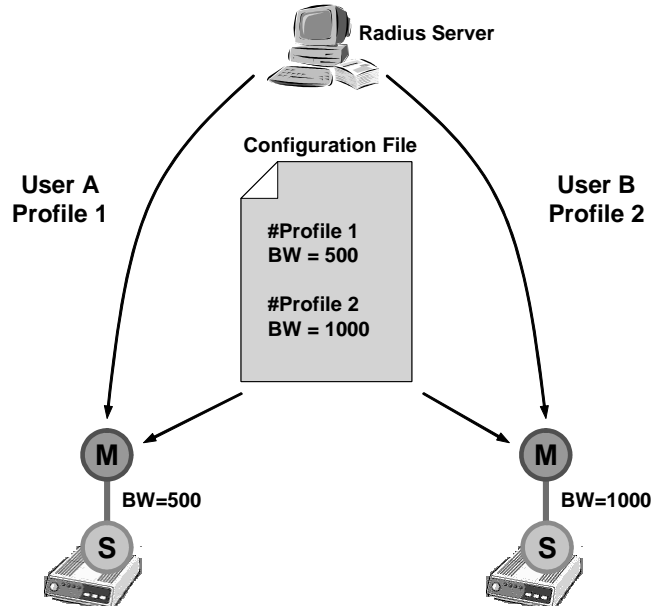


Figure 17 Radius profiles example

There will be always an invited profile, profile number 1, applied to the users with no specific profile or if the corresponding profile is not available. This invited profile, as well as the other profiles, can be redefined with auto-configuration.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 101 / 145

### 5.2.7.6 Working with RADIUS Authentication

When RADIUS authentication is active, the repeater or HE sends an Access-Request message to the RADIUS server, which checks if the MAC address corresponds to one that was accepted and, in that case, it responds with an Access-Accept message containing the profile number. Otherwise, the server replies with a RADIUS Access-Reject message and the authentication fails. If the authentication fails the slave will not join the PLC network.

Once authentication is achieved, the slave is authorized and a QoS and VLAN/OVLAN configuration takes place between the master and slave. The master uses the profile number to get these parameters. The slave uses the parameters inside the downloaded auto-configuration file. The slave node downloads the file during its auto-configuration process, after the RADIUS request on the master-side has been successful.

### 5.2.7.7 Working without RADIUS Authentication

If there is no RADIUS authentication, two ways of operation are possible.

The first one is 'NO AUTHENTICATION'. The master will configure a default QoS and VLAN/OVLAN configuration (the invited profile) for the slave.

The other one is the use of an 'AUTHORIZATION LIST'. With 'ACCESSP\_AUTHLIST\_x', up to 128 different users can be added with their related profiles. The user is searched for in that list, and if an entry matches with the new user, the QoS and VLAN/OVLAN configuration related to that entry is used for the new user. Otherwise, the user is rejected.

## 5.2.8 DHCP Support

### 5.2.8.1 DHCP Client

The OPERA nodes perform a DHCP request with extended custom options. So not only the basic IP configuration (IP address, netmask and gateway) is requested, but the client also requests three custom options in order to obtain the auto-configuration file:

- *fttp-server-name*: String with the IP address of the TFTP server.
- *extensions-path-name*: String with the path and file name of the auto-configuration file inside the TFTP server.
- *PTTP-code*: 32 bits integer that represents the PTTP behaviour:
  - 0: Boot without VLANs and skip PTTP.
  - 1: Keep on requesting PTTP (does nothing).
  - [2-4095]: Boot with Management VLAN = PTTP-code. Skip PTTP.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 102 / 145

On the other hand, if the phone number has to be downloaded using DHCP, another custom option should be requested:

- *phone-number*: Text with the phone number.

### 5.2.8.2 DHCP Server

A DHCP server that supports DHCP extensions is needed in order to provide the different OPERA nodes with the custom options requested.

**WARNING:** Although the two first custom options needed by the DHCP client are supposed to be standard, sometimes it is necessary to define the *extensions-path-name* option in the header of the *dhcpd.conf* file. The *PTTP-code* option is mandatory to define:

```
option extensions-path-name code 18 = string;  
option PTTP-code code 120 = unsigned integer 32;
```

It is also necessary to define the *phone-number* in the header of the *dhcpd.conf* file, if the phone number of some CPEs will be configured via DHCP:

```
option phone-number code 135 = text;
```

### 5.2.9 RADIUS Support

Every OPERA master or repeater node may implement a RADIUS client in order to authenticate users (slaves) connected through the powerline to that node. The modem acts as a NAS, which requests authentication, gives authorization, and allocates resources.

#### 5.2.9.1 RADIUS Client

The RADIUS client implemented in the OPERA nodes is configured through the auto-configuration file with three parameters:

- RADIUS server IP address
- RADIUS server UDP port
- Shared secret password between client and server

It also sends two RADIUS standard attributes within a RADIUS request:

- MAC address of the slave trying to join the network as User name.
- MAC address of the master as NAS-Identifier.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 103 / 145

## 5.3 Auto-configuration Parameters

### 5.3.1 Parameter Types

There are three types of parameters inside the auto-configuration file:

1. **Scalar:** PARAMETER = value
2. **List:** PARAMETER.index1 = value
3. **Table:** PARAMETER.index1.index2 = value

The first valid index for lists and tables is 1.

### 5.3.2 Parameter Format

The format of the parameters is:

- **PARAMETER\_LABEL[x][y] = value**  
for concrete parameter values
- **PARAMETER\_LABEL[x][y] = %parametric\_value**  
for parametric parameter values

For example, the following parameter could be inside an end-user auto-configuration file:

```
VLAN_DATA_TAG = 452
```

or

```
VLAN_DATA_TAG = %DATA3
```

In the second case, the parametric value must be translated to its correct value using the translation table.

The following is a list with the syntax of the autoconfiguration parameters.

It is important that the order in which these parameters appear in the auto-configuration file is preserved.



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 104 / 145

### 5.3.3 Auto-configuration parameter list

#### 5.3.3.1 General Parameters

- **GENERAL\_USE\_AUTOCONF = [YES | NO]**
  - **Parameter:** YES enables autoconf, NO disables it.
- **GENERAL\_TYPE = [HE | CPE | TDREPEATER]**
  - **Parameter:** Possible values are: *HE* (Head End), *CPE* (Customer Premises Equipment) and *TDREPEATER* (Time Division Repeater).
- **GENERAL\_FW\_TYPE = [MV | LV | EU]**
  - **Parameter:** Possible values are: *MV* (Medium Voltage), *LV* (Low Voltage) and *EU* (End User).
- **GENERAL\_SIGNAL\_MODE = [1 ... m]**
  - **Parameter:** Configures the physical mode used by the modem. This value can reach from 1 to m, depending on the range of frequency used.
- **GENERAL\_SIGNAL\_MODE\_LIST.i = [1 ... m]**
  - **Parameter:** This value can reach from 1 to m, depending on the range of frequency used.
- **GENERAL\_AUTHENTICATION = [RADIUS | AUTHLIST | NONE]**
  - **Parameter:** There are three possible values: *RADIUS*, *AUTHLIST* and *NONE*. If *RADIUS* is selected, a *RADIUS* server will be in charge of accepting new users and assigning the profile. If *AUTHLIST* is selected, authentication will be done by checking a list provided in the auto-configuration file. If *NONE* is selected, all the users will be accepted
- **GENERAL\_STP = [YES | NO]**
  - **Parameter:** Enables (*YES*) or disables (*NO*) the Spanning Tree Protocol in the node. Enabled by default.
- **GENERAL\_COMMON\_STP\_EXT\_A = [YES | NO]**
  - **Parameter:** Enables (*YES*) or disables (*NO*) the Common STP feature in the Ethernet interface A (*EXT\_A*).
- **GENERAL\_COMMON\_STP\_EXT\_B = [YES | NO]**





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 105 / 145

- **Parameter:** Enables (*YES*) or disables (*NO*) the Common STP feature in the Ethernet interface B (EXTB).
- **GENERAL\_IP\_ADDRESS = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **GENERAL\_IP\_NETMASK = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **GENERAL\_IP\_GATEWAY = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **GENERAL\_IP\_USE\_DHCP = [YES | NO]**
  - **Parameter:** If Yes DHCP is used, if NO DHCP is not used.

### 5.3.3.2 AGC (Automatic Gain Control) Parameters

- **AGC\_TX\_GAIN = [0 | 1]**
  - **Parameter:** Selecting 1, the default value, 12 dB are added to the reference gain. In case of 0 value, no extra gain is added (0 dB).
- **AGC\_RX\_ENABLE = [0 | 1]**
  - **Parameter:** Enables (1) or disables (0) the hardware AGC.
- **AGC\_RX\_FIX\_GAIN = [0 ... 7]**
  - **Parameter:** Eight values, from 0 to 7, are possible. Those values represent gains from 0 to 42 dB, respectively, added to the reference gain in steps of 6 dB.
- **AGC\_MAX\_RX\_GAIN = [0 ... 7]**
  - **Parameter:** Eight values, from 0 to 7, are possible. Those values represent gains from 0 to 42 dB, respectively, added to the reference gain in steps of 6 dB. The default value is 7 (42 dB).
- **AGC\_MIN\_RX\_GAIN = [0 ... 7]**



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 106 / 145

- **Parameter:** Eight values, from 0 to 7, are possible. Those values represent gains from 0 to 42 dB, respectively, added to the reference gain in steps of 6 dB. The default value is 7 (42 dB).

### 5.3.3.3 RADIUS Parameters

- **RADIUS\_SERVER\_IP = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **RADIUS\_SERVER\_PORT = ddddd**
  - **Parameter:** Port number
- **RADIUS\_SHARED\_SECRET = <string>**
  - **Parameter:** 'shared\_secret' (string, limited to 16 characters, of the shared secret)

### 5.3.3.4 Class of Service (CoS) Parameters

- **COS\_CUSTOM\_CRITERION\_OFFSET.i = [1 ... 531]**
  - **Parameter:** Values from 1 to 531 are possible.
- **COS\_CUSTOM\_CRITERION\_PATTERN.i = 0XXXXXXXXXXXXXXXXXX**
  - **Parameter:** The value must be specified with 16 hexadecimal digits.
- **COS\_CUSTOM\_CRITERION\_BITMASK.i = 0XXXXXXXXXXXXXXXXXX**
  - **Parameter:** The value must be specified with 16 hexadecimal digits.
- **COS\_CUSTOM\_CRITERION\_CLASSES\_OFFSET.i = [1 ... 531]**
  - **Parameter:** Values from 1 to 531 are possible.
- **COS\_CUSTOM\_CRITERION\_CLASSES\_BITMASK.i i = 0XXXXXXXXXXXXXXXXXX**
  - **Parameter:** The value must be specified with 16 hexadecimal digits.
- **COS\_CUSTOM\_CRITERION\_CLASSES\_PATTERN.i.j i=0XXXXXXXXXXXXXXXXXX**
  - **Parameter:** The value must be specified with 16 hexadecimal digits



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 107 / 145

- **COS\_CUSTOM\_CRITERION\_CLASSES\_PRIO.i.j = [0 ... 7]**
  - **Parameter:** Values from 0 to 7 are allowed.
- **COS\_CRITERION.k = [8021P | TOS | CUSTOM1 | CUSTOM2]**
  - **Parameter:** There are two predefined criteria (*8021P*, based on IEEE 802.1p VLAN tag priority field, and *TOS*, based on IP type of service), and two custom criteria (*CUSTOM1* and *CUSTOM2*), defined with the parameters above (*COS\_CUSTOM\_CRITERION\_xxx*).
- **COS\_DEFAULT\_PRIO = [0 ... 7]**
  - **Parameter:** Values from 0 to 7 are allowed.

#### 5.3.3.5 Quality of Service (QoS) Parameters

- **QOS\_ENABLE = [YES | NO]**
  - **Parameter:** Enables (*YES*) or disables (*NO*) the quality of service in the node.
- **QOS\_PRIOACK.prio+1 = [0 | 1]**
  - **Parameter:** This list enables (1) or disables (0) the Layer 2 ACK protocol depending on the priority level transmitted by the modem (priority levels: prio = 0 ... 7).
- **QOS\_PRIORSV.prio+1 = [CBR | VBR | BE]**
  - **Parameter:** Type of reservation for each priority

##### 5.3.3.5.1 Slave Node Parameters (CPE)

- **QOS\_UPBWLIMIT = [YES | NO]**
  - **Parameter:** Enables (*YES*) or disables (*NO*) the transmission bandwidth limitation in a slave.
- **QOS\_CLASSES.prio+1 = [VOIP | VIDEO | DATAH | DATAL]**
  - **Parameter:** Sets the type of application for each service class

##### 5.3.3.5.2 Master Node Parameters (HE or REPEATER)

- **QOS\_LATENCY\_STEP = [20 ... 400]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 108 / 145

- **Parameter:** Values in ms, from 20 to 400.
- **QOS\_BW\_POLICY = [0 | 1]**
  - **Parameter:** A value of 0 corresponds to Fair mode, and 1 to Priority-based mode.
- **QOS\_LATENCY.prio+1 = [1 | 2 | 4 | 8]**
  - **Parameter:** Priority levels: prio = 0 ... 7. Possible values are: 1, 2, 4 and 8.

### 5.3.3.6 Profiles Parameters

- **PROFILE\_MAX\_TXPUT\_TX.i = dddd (in kbps)**
  - **Parameter:** Number of kbps)
- **PROFILE\_MAX\_TXPUT\_RX.i = dddd (in kbps)**
  - **Parameter:** Number of kbps)
- **PROFILE\_PRIORITIES.i = [0x00-0xFF]**
  - **Parameter:** '0xXX' (hexadecimal number from 00 to FF)
- **PROFILE\_MNMT\_VLAN.i = [2-4093] | %<PARAMETRIC VALUE>**
  - **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **PROFILE\_DATA\_VLAN.i = [2-4093] | %<PARAMETRIC VALUE>**
  - **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **PROFILE\_VOIP\_VLAN.i = [2-4093] | %<PARAMETRIC VALUE>**
  - **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **PROFILE\_VLAN\_ADD\_TAG.i.j = [2-4093] or parametric**
  - **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **PROFILE\_VLAN\_IS\_ALLOWED\_IFACE\_USER.i = [yes/no]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 109 / 145

- **Parameter:** 'yes' (to set the list as allowed) or 'no' (to set the list as forbidden)
- **PROFILE\_VLAN\_TAGGED\_ONLY\_IFACE\_USER.i = [yes/no]**
  - **Parameter:** 'yes' (to drop input packets without VLAN tag) or 'no' (to not drop input packets without VLAN tag)
- **PROFILE\_VLAN\_OUTFORMAT\_TAG\_IFACE\_USER.i = [yes/no]**
  - **Parameter:** 'yes' (to send packets with VLAN tag) or 'no' (to not send packets with VLAN tag)
- **PROFILE\_OVLAN\_ADD\_TAG.i.j = [2-4094] or parametric**
  - **Parameter:** Number from 2 to 4094 or '%Parameter\_name' (parametric value preceded by a %)
- **PROFILE\_OVLAN\_IS\_ALLOWED\_IFACE\_USER.i = [yes/no]**
  - **Parameter:** 'yes' (to mark the list as allowed) or 'no' (to mark the list as forbidden)
- **PROFILE\_OVLAN\_TAGGED\_ONLY\_IFACE\_USER.i = [yes/no]**
  - **Parameter:** 'yes' (to drop input packets without OVLAN tag) or 'no' (to not drop input packets without OVLAN tag)
- **PROFILE\_OVLAN\_OUTFORMAT\_TAG\_IFACE\_USER.i = [yes/no]**
  - **Parameter:** 'yes' (to send packets with OVLAN tag) or 'no' (to not send packets with OVLAN tag)
- **PROFILE\_UPBWLIMIT.i = [YES|NO]**
  - **Parameter:** 'yes' (to limit the upstream) or 'no' (to not limit the upstream)
- **PROFILE\_DWBWLIMIT.i = [YES|NO]**
  - **Parameter:** 'yes' (to limit the downstream) or 'no' (to not limit the downstream)

### 5.3.3.7 Translation Table Parameters

- **TRANSLATION\_MNMT\_VLAN = [2-4093]**
  - **Parameter:** Number from 2 to 4093



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 110 / 145

- **TRANSLATION\_DATA\_VLAN.i = [2-4093]**
  - **Parameter:** Number from 2 to 4093
- **TRANSLATION\_VOIP\_VLAN.i = [2-4093]**
  - **Parameter:** Number from 2 to 4093
- **TRANSLATION\_ROOTPATH\_OVLAN = [2-4094]**
  - **Parameter:** Number from 2 to 4094

#### 5.3.3.8 VLAN Parameters

- **VLAN\_ENABLE = [yes|no]**
  - **Parameter:** 'yes' (to enable VLAN use) or 'no' (to disable VLAN use)
- **VLAN\_MNMT\_TAG = [2-4093] | %<PARAMETRIC VALUE>**
  - **Parameter:** Number from 2 to 4093 or '%Parameter name' (parametric value preceded by a %)
- **VLAN\_MNMT\_PRIO = [0-7]**
  - **Parameter:** Number from 0 to 7
- **VLAN\_DATA\_TAG = [2-4093] | %<PARAMETRIC VALUE>**
  - **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **VLAN\_DATA\_PRIO = [0-6]**
  - **Parameter:** Number from 0 to 6
- **VLAN\_VOIP\_TAG = [2-4093] | %<PARAMETRIC VALUE>**
  - **Parameter:** Number from 2 to 4093 or '%Parameter\_name' (parametric value preceded by a %)
- **VLAN\_VOIP\_PRIO = [0-7]**
  - **Parameter:** Number from 0 to 7
- **VLAN\_VSIG\_PRIO = [0-7]**



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 111 / 145

- **Parameter:** Number from 0 to 7
- **VLAN\_TRUNK.i = [2-4093]**
  - **Parameter:** Number from 2 to 4093
- **VLAN\_RETAG\_EXT\_A\_SRC = [0 | 2-4095]**
  - **Parameter:** '0' (in order to disable retagging in interface) or Number from 2 to 4095.
- **VLAN\_RETAG\_EXT\_A\_DST = [0 | 2-4095]**
  - **Parameter:** '0' (in order to disable retagging in interface) or Number from 2 to 4095
- **VLAN\_RETAG\_EXT\_B\_SRC = [0 | 2-4095]**
  - **Parameter:** '0' (in order to disable retagging in interface) or Number from 2 to 4095
- **VLAN\_RETAG\_EXT\_B\_DST = [0 | 2-4095]**
  - **Parameter:** '0' (in order to disable retagging in interface) or Number from 2 to 4095

#### **5.3.3.9 OVLAN Parameters**

- **OVLAN\_ENABLE = [yes|no]**
  - **Parameter:** 'yes' (to enable OVLAN use) or 'no' (to disable OVLAN use)
- **OVLAN\_DATA\_TAG = [2-4094] | %ROOTPATH\_OVLAN**
  - **Parameter:** Number from 2 to 4093 or '%ROOTPATH\_OVLAN' (use the OVLAN Rootpath value)
- **OVLAN\_TRUNK.i = [2-4094]**
  - **Parameter:** Number from 2 to 4094

#### **5.3.3.10 Access Protocol Parameters**

- **AP\_MIN\_NUMBER\_HOPS = [0|1|...]**
  - **Parameter:** Number from 0



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 112 / 145

- **AP\_FORBID\_MASTER.i = 0XXXXXXXXXXXXX**
  - **Parameter:** '0XXXXXXXXXXXXX' (MAC address of forbidden master)
- **AP\_PREFER\_MASTER = 0XXXXXXXXXXXXX**
  - **Parameter:** '0XXXXXXXXXXXXX' (MAC address of preferred master)
- **AP\_FIX\_MASTER = '0XXXXXXXXXXXXX'**
  - **Parameter:** 0XXXXXXXXXXXXX (MAC address of fixed master)
- **AP\_CHECK\_BEST\_MASTER\_ENABLE = [yes|no]**
  - **Parameter:** 'yes' (to enable checking of best master periodically after connecting with one) or 'no' (to disable the checking of better masters after connecting to one).
- **AP\_CHECK\_BEST\_MASTER\_PERIOD = <time>**
  - **Parameter:** Number of minutes
- **AP\_CURRENT\_MASTER\_MIN\_BPS = <bps\_thr>**
  - **Parameter:** Number of bits per symbol
- **AP\_NEW\_MASTER\_MIN\_BPS = <bps\_thr>**
  - **Parameter:** Number of bits per symbol
- **ACCESSP\_AUTHLIST\_MAC.i = 0XXXXXXXXXXXXX**
  - **Parameter:** '0XXXXXXXXXXXXX' (MAC address authorized to connect)
- **ACCESSP\_AUTHLIST\_PROFILE.i = [1-16]**
  - **Parameter:** Number of the profile related to a MAC authorized
- **ACCESSP\_AUTHLIST\_FWTYPE.i = [MV|LV|EU]**
  - **Parameter:** 'MV' (medium voltage) or 'LV' (low voltage) or 'EU' (End User)

### 5.3.3.11 STP Parameters

- **STP\_PRIO = [0 ... 65535]**
  - **Parameter:** Valid values range from 0 to 65535.





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 113 / 145

- **STP\_PORT.i = [EXTA | EXTB | PLC]**
  - **Parameter:** Three possible values: EXTA, EXTB and PLC (i = 1,2 or 3).
- **STP\_PORT\_PRIO.i = [0 ... 255]**
  - **Parameter:** Valid values range from 0 to 255 (i = 1,2 or 3).
- **STP\_PORT\_COST.i = [0 ... 4294967295]**
  - **Parameter:** Valid values range from 0 to 4294967295 (i = 1,2 or 3).
- **STP\_HELLO\_TIME = [10 ... 40]**
  - **Parameter:** Valid values range from 10 to 40.
- **STP\_MAX\_AGE = [10 ... 40]**
  - **Parameter:** Valid values range from 10 to 40.
- **STP\_FORWARD\_DELAY = [40 ... 300]**
  - **Parameter:** Valid values range from 40 to 300.
- **STP\_FRONTIER = [EXTA | EXTB | NONE]**
  - **Parameter:** Valid values are: EXTA (Ethernet interface A), EXTB (Ethernet interface B) and NONE (Spanning Tree Frontier disabled).
- **STP\_MODE = [STP | RSTP]**
  - **Parameter:** Possible values: STP selects STP or RSTP selects RSTP.

### 5.3.3.12 VoIP Parameters

- **VOIP\_ENABLE = [ENABLED | DISABLED]**
  - **Parameter:** This parameter enables (*ENABLED*) or disables (*DISABLED*) the VoIP service.
- **VOIP\_GATEKEEPERIP = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **VOIP\_LINE1NUMBER = number**



# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 114 / 145

- **Parameter:** This parameter is a string (maximum string length is 20 characters) (e.g. "VOIP\_LINE1NUMBER = 612345678").
- **VOIP\_DIALPLAN = ([0 ... 9, 'T', 'X', '.', '|'])**
  - **Parameter:** This parameter is a string with maximum length is 200 characters (e.g. "VOIP\_DIALPLAN = (9XXXXXXXX|6XXXXXXXX|00X.T)").
- **VOIP\_INBANDDTMF = [ENABLED | DISABLED]**
  - **Parameter:** This parameter enables (*ENABLED*) or disables (*DISABLED*) in-band DTMF feature.
- **VOIP\_OUTOFBANDDTMF = [ENABLED | DISABLED]**
  - **Parameter:** This parameter enables (*ENABLED*) or disables (*DISABLED*) out-of-band DTMF feature.
- **VOIP\_KEYPADTYPE = [KEYPADTYPE\_NONE | KEYPADTYPE\_H225 | KEYPADTYPE\_H245ALPHANUMERIC | KEYPADTYPE\_H245SIGNAL | KEYPADTYPE\_RFC2833]**
  - **Parameter:** This parameter is a string (up to 30 characters). Valid values are the following:
    - *KEYPADTYPE\_H225*: H.225/Q.931 User Info field (Keypad facility information element)
    - *KEYPADTYPE\_H245ALPHANUMERIC*: H.245 User Input Indication (UII) Alphanumeric message
    - *KEYPADTYPE\_H245SIGNAL*: H.245 User Input Indication (UII) Signal Type message
    - *KEYPADTYPE\_RFC2833*: RTP stream as defined in RFC 2833
    - *KEYPADTYPE\_NONE*: no out-of-band signalling
- **VOIP\_CALLSIGPORT1 = [1025 ... 65530]**
  - **Parameter:** Valid values range from 1025 to 65530.
- **VOIP\_G711USS = [YES | NO]**
  - **Parameter:** Selects whether silence suppression for G.711  $\mu$ -law is enabled (*YES*) or not (*NO*).



# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 115 / 145

- **VOIP\_G711UPACK = [2 ... 4]**
  - **Parameter:** Valid values range from 2 (20 ms) to 4 (40 ms).
- **VOIP\_G711ASS = [YES | NO]**
  - **Parameter:** Selects whether silence suppression for G.711 A-law is enabled (*YES*) or not (*NO*).
- **VOIP\_G711APACK = [2 ... 4]**
  - **Parameter:** Valid values range from 2 (20 ms) to 4 (40 ms).
- **VOIP\_JB\_TYPE = [FIXED | ADAPTIVE]**
  - **Parameter:** Selects either adaptive (*ADAPTIVE*) or fixed (*FIXED*) jitter buffer.
- **VOIP\_FJB\_DELAY = [1 ... 10] \* 10**
  - **Parameter:** Valid values range from 10 to 100 ms.
- **VOIP\_AJB\_MAXDELAY = [1 ... 19] \* 10**
  - **Parameter:** Valid values range from 10 to 190 ms.
- **VOIP\_G729ON = [YES | NO]**
  - **Parameter:** Selects whether G.729 codec is enabled (*YES*) or not (*NO*).
- **VOIP\_G729SS = [YES | NO]**
  - **Parameter:** Selects whether G.729 silence enabled is supported (*YES*) or not (*NO*).
- **VOIP\_G729PACK = [2 ... 4]**
  - **Parameter:** Valid values range from 2 (20 ms) to 4 (40 ms).
- **VOIP\_ALTERNATEGK = [ENABLED | DISABLED]**
  - **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) alternate gatekeeper feature for H.323.
- **VOIP\_ALTGKIP = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 116 / 145

- **VOIP\_GKDISCOVERY = [ENABLED | DISABLED]**
  - **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) gatekeeper discovery feature for H.323.
- **VOIP\_FULLRRQ1 = [ENABLED | DISABLED]**
  - **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) full gatekeeper registration request for H.323.
- **VOIP\_TIMETOLIVE = [ $\geq$  60]**
  - **Parameter:** The minimum valid value is 60 seconds.
- **VOIP\_FASTCONNECT = [ENABLED | DISABLED]**
  - **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) fast connect signalling feature for H.323.
- **VOIP\_H245TUNNEL = [ENABLED | DISABLED]**
  - **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) H.245 tunnelling signalling feature for H.323.
- **VOIP\_COUNTRY = [XX | ES | PT | GB | JP | FR | SG | RU | AU]**
  - **Parameter:** This parameter is a string (up to 20 characters). Valid values are: The USA (*XX*), Spain (*ES*), Portugal (*PT*), The United Kingdom (*GB*), Japan (*JP*), France (*FR*), Singapore (*SG*), Russia (*RU*) and Australia (*AU*). The default country is Spain (*ES*).
- **VOIP\_TONE\_DIALTONE =  
freq1 @pot1+freq2 @pot2#ON(time),OFF(time),IDLE(time),R**
  - **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_DIALTONE = 425@-10#ON").
- **VOIP\_TONE\_NETWORKBUSY =  
freq1 @pot1+freq2 @pot2#ON(time),OFF(time),IDLE(time),R**
  - **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_BUSY = 425@-10#ON(200),OFF(200),R").
- **VOIP\_TONE\_BUSY =  
freq1 @pot1+freq2 @pot2#ON(time),OFF(time),IDLE(time),R**



**opera**

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 117 / 145

- **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_BUSY = 425@-10#ON(200),OFF(200),R").
- **VOIP\_TONE\_RINGBACK = freq1@pot1+freq2@pot2#ON(time),OFF(time),IDLE(time),R**
  - **Parameter:** This parameter is a string (up to 70 characters) (e.g. "VOIP\_TONE\_RINGBACK = 425@-10#ON(1500),OFF(3000),R").
- **VOIP\_RTP\_TOS = 0xXX**
  - **Parameter:** value must be specified with 2 hexadecimal digits.
- **VOIP\_CALLSIG\_TOS 0xXX**
  - **Parameter:** value must be specified with 2 hexadecimal digits.

#### 5.3.3.13 NTP Parameters

- **NTP\_ENABLE = [ENABLED | DISABLED]**
  - **Parameter:** Enables (*ENABLED*) or disables (*DISABLED*) the NTP feature.
- **NTP\_SERVER\_IP = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **NTP\_TIMEZONE = [-12 ... 12] \* 60**
  - **Parameter:** This value must be specified in minutes (in 60-minute steps) relative to Universal Time (UT). A value of 0 corresponds to UT.
- **NTP\_DST = [YES | NO]**
  - **Parameter:** If the value is *YES*, the time correction for daylight savings time is applied. Not applied if *NO*.

#### 5.3.3.14 Custom VLAN/OVLAN Parameters

- **USE\_CUSTOM\_VLAN\_OVLAN = [yes/no]**
  - **Parameter:** 'yes' (to enable the custom VLAN/OVLAN use) or 'no' (to disable the custom VLAN/OVLAN use)



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 118 / 145

- **VLAN\_TAGGED\_ONLY\_IFACE\_ROOT = [yes/no]**
  - **Parameter:** 'yes' (to enable tag only in interface root) or 'no' (to disable tag only in interface root)
- **VLAN\_TAGGED\_ONLY\_IFACE\_EXT\_A = [yes/no]**
  - **Parameter:** 'yes' (to enable tag only in Ethernet A) or 'no' (to disable tag only in Ethernet A)
- **VLAN\_TAGGED\_ONLY\_IFACE\_EXT\_B = [yes/no]**
  - **Parameter:** 'yes' (to enable tag only in Ethernet B) or 'no' (to disable tag only in Ethernet B)
- **VLAN\_TAGGED\_ONLY\_IFACE\_OTHER = [yes/no]**
  - **Parameter:** 'yes' (to enable tag only in other interfaces) or 'no' (to disable tag only in other interfaces)
- **VLAN\_OUTFORMAT\_TAG\_IFACE\_ROOT = [yes/no]**
  - **Parameter:** 'yes' (to tag output in root interface) or 'no' (to disable tag output in root interface)
- **VLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_A = [yes/no]**
  - **Parameter:** 'yes' (to tag output in Ethernet A) or 'no' (to disable tag output in Ethernet A)
- **VLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_B = [yes/no]**
  - **Parameter:** 'yes' (to tag output in Ethernet B) or 'no' (to disable tag output in Ethernet B)
- **VLAN\_OUTFORMAT\_TAG\_IFACE\_OTHER = [yes/no]**
  - **Parameter:** 'yes' (to tag output in other interfaces) or 'no' (to disable tag output in other interfaces)
- **VLAN\_PVID\_PL = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **VLAN\_PVID\_EXT\_A = [2-4095]**
  - **Parameter:** Number from 2 to 4095



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc

**Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM

119 / 145

- **VLAN\_PVID\_EXTB = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **VLAN\_PVID\_FW = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **VLAN\_DEFAULT\_PRIO\_PL = [0-7]**
  - **Parameter:** Number from 0 to 7
- **VLAN\_DEFAULT\_PRIO\_EXT\_A = [0-7]**
  - **Parameter:** Number from 0 to 7
- **VLAN\_DEFAULT\_PRIO\_EXT\_B = [0-7]**
  - **Parameter:** Number from 0 to 7
- **VLAN\_DEFAULT\_PRIO\_FW = [0-7]**
  - **Parameter:** Number from 0 to 7
- **VLAN\_IS\_ALLOWED\_IFACE\_ROOT = [yes/no]**
  - **Parameter:** 'yes' (to set list as allowed) or 'no' (to set list as forbidden)
- **VLAN\_LIST\_IFACE\_ROOT.i = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **VLAN\_IS\_ALLOWED\_IFACE\_EXT\_A = [yes/no]**
  - **Parameter:** 'yes' (to set list as allowed) or 'no' (to set list as forbidden)
- **VLAN\_LIST\_IFACE\_EXT\_A.i = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **VLAN\_IS\_ALLOWED\_IFACE\_EXT\_B = [yes/no]**
  - **Parameter:** 'yes' (to set list as allowed) or 'no' (to set list as forbidden)
- **VLAN\_LIST\_IFACE\_EXT\_B.i = [2-4095]**
  - **Parameter:** Number from 2 to 4095



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 120 / 145

- **OVLAN\_TAGGED\_ONLY\_IFACE\_ROOT = [yes/no]**
  - **Parameter:** 'yes' (to accept only tagged packets at root interface) or 'no' (to accept any packet at root interface)
- **OVLAN\_TAGGED\_ONLY\_IFACE\_EXT\_A = [yes/no]**
  - **Parameter:** 'yes' (to accept only tagged packets at Ethernet A interface) or 'no' (to accept any packet at Ethernet A interface)
- **OVLAN\_TAGGED\_ONLY\_IFACE\_EXT\_B = [yes/no]**
  - **Parameter:** 'yes' (to accept only tagged packets at Ethernet B interface) or 'no' (to accept any packet at Ethernet B interface)
- **OVLAN\_TAGGED\_ONLY\_IFACE\_OTHER = [yes/no]**
  - **Parameter:** 'yes' (to accept only tagged packets at other interfaces) or 'no' (to accept any packet at other interfaces)
- **OVLAN\_OUTFORMAT\_TAG\_IFACE\_ROOT = [yes/no]**
  - **Parameter:** 'yes' (to introduce a tag in output packets at root interface) or 'no' (to not introduce a tag in output packets at root interface)
- **OVLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_A = [yes/no]**
  - **Parameter:** 'yes' (to introduce a tag in output packets at Ethernet A interface) or 'no' (to not introduce a tag in output packets at Ethernet A interface)
- **OVLAN\_OUTFORMAT\_TAG\_IFACE\_EXT\_B = [yes/no]**
  - **Parameter:** 'yes' (to introduce a tag in output packets at Ethernet B interface) or 'no' (to not introduce a tag in output packets at Ethernet B interface)
- **OVLAN\_OUTFORMAT\_TAG\_IFACE\_OTHER = [yes/no]**
  - **Parameter:** 'yes' (to introduce a tag in output packets at other interfaces) or 'no' (to not introduce a tag in output packets at other interfaces)
- **OVLAN\_PVID\_PL = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **OVLAN\_PVID\_EXT\_A = [2-4095]**
  - **Parameter:** Number from 2 to 4095





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 121 / 145

- **OVLAN\_PVID\_EXTB = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **OVLAN\_PVID\_FW = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **OVLAN\_IS\_ALLOWED\_IFACE\_ROOT = [yes/no]**
  - **Parameter:** 'yes' (to set the root interface list as allowed) or 'no' (to set the root interface list as forbidden)
- **OVLAN\_LIST\_IFACE\_ROOT.i = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **OVLAN\_IS\_ALLOWED\_IFACE\_EXT\_A = [yes/no]**
  - **Parameter:** 'yes' (to set the Ethernet A interface list as allowed) or 'no' (to set the Ethernet A interface list as forbidden)
- **OVLAN\_LIST\_IFACE\_EXT\_A.i = [2-4095]**
  - **Parameter:** Number from 2 to 4095
- **OVLAN\_IS\_ALLOWED\_IFACE\_EXT\_B = [yes/no]**
  - **Parameter:** 'yes' (to set the Ethernet B interface list as allowed) or 'no' (to set the Ethernet B interface list as forbidden)
- **OVLAN\_LIST\_IFACE\_EXT\_B.i = [2-4095]**
  - **Parameter:** Number from 2 to 4095

### 5.3.3.15 SNMP parameters

- **SNMP\_TRAP\_IP\_ADDRESS = <ddd.ddd.ddd.ddd>**
  - **Parameter:** The valid format is the dotted decimal notation (four decimal numbers separated by dots).
- **SNMP\_TRAP\_COMMUNITY\_NAME = community**
  - **Parameter:** This parameter is a string (up to 25 characters) (e.g. "SNMP\_TRAP\_COMMUNITY\_NAME = public").



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 122 / 145

## 6 ENVIRONMENTAL REQUIREMENTS (INFORMATIVE)

According to the terminology used in ETSI TR 100 035 “*Environmental Engineering; Guidance and terminology*” and ETSI EN 300 019 “*Environmental conditions and environmental tests for telecommunications equipment*”, basic requirements will be given for stationary use of PLC units (i.e., storage, transportation and mobile/portable usage are not considered). The numbers given are the “characteristic severities” which are supposed to cover 99% of the environmental situations.

It is assumed that PLC units are always installed in at least partly weather protected locations. Requirements for non-weather protected environments (e.g. outdoor installations in aerial lines) are not given here because it is considered that, in those situations, a cabinet or case will be protecting the PLC unit itself. Such cabinets and cases will nevertheless follow IEC 61969.

The presence of chemically active substances will also be neglected here, but in certain situations it could be worth to consider it for testing of equipment.

No provisions for seismic environment are given in this Specification.

### 6.1 CPE

These units will be designed to work in normal residential or office environments, with the following assumptions:

- Air Temperature ranging from +5°C to 40°C
- Rate of change of temperature of 0,5 °C/min
- Relative Air Humidity ranging from 5% to 85%
- Absolute Air Humidity ranging from 1 g/m<sup>3</sup> to 25 g/m<sup>3</sup>
- Air Pressure ranging from 70 kPa to 106 kPa
- Solar Radiation up to 700 W/m<sup>2</sup>
- Heat Radiation up to 600 W/m<sup>2</sup>
- No condensation
- No conditions of wind, rain or icing
- No presence of mould, fungus, rodents and other animals harmful to products
- Presence of suspension dust up to 0,2 mg/m<sup>3</sup>
- Limit for acoustic noise emitted by CPE of 5,0 bels according to ETSI EN 300 753

### 6.2 LV Repeater

These units will have to be designed to work in very harsh environmental conditions, given the fact that they can be installed in meter rooms but also in street cabinets, shelters or even “heat trap” locations. The following assumptions should be taken into account:



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 123 / 145

- Air Temperature ranging from -25°C to 55°C
- Rate of change of temperature of 0,5 °C/min
- Relative Air Humidity ranging from 10% to 100%
- Absolute Air Humidity ranging from 0,5 g/m<sup>3</sup> to 29 g/m<sup>3</sup>
- Air Pressure ranging from 70 kPa to 106 kPa
- Solar Radiation up to 1120 W/m<sup>2</sup>
- Heat Radiation up to 600 W/m<sup>2</sup>
- Movement of the surrounding air up to 5 m/s
- Conditions of condensation exist.
- Temporarily, conditions of wind-driven rain, snow, hail, etc. could exist.
- Dripping or spraying of water from other sources than rain could exist.
- Conditions of icing exist.
- Presence of mould, fungus, rodents and other animals harmful to products but excluding termites
- Presence of suspension dust up to 0,4 mg/m<sup>3</sup>
- Presence of sedimentation dust up to 15 mg/(m<sup>2</sup>h)
- Limit for acoustic noise emitted by repeater of 6,3 bels according to ETSI EN 300 753. It is assumed that repeaters can be located at less than 4m from places in which people can live/work/sleep, but always separated by at least one wall.

### 6.3 LV Head End and MV Units

These units will have to be designed to work in harsh environmental conditions, given the fact that they can be installed in substations and underground locations. Some requirements are based on *environmental class 8.1* "underground locations" (see ETSI EN 300 019-1-8) to reflect that the equipment may be immersed in water during exceptional conditions. The following assumptions should be taken into account:

- Air Temperature ranging from -15°C to 55°C
- Rate of change of temperature of 0,5 °C/min
- Relative Air Humidity ranging from 5% to 100%
- Absolute Air Humidity ranging from 0,5 g/m<sup>3</sup> to 29 g/m<sup>3</sup>
- Air Pressure ranging from 70 kPa to 106 kPa
- Solar Radiation up to 700 W/m<sup>2</sup>
- Heat Radiation up to 600 W/m<sup>2</sup>
- Movement of the surrounding air up to 1 m/s
- Conditions of condensation exist.
- No conditions of wind-driven rain, snow, hail, etc. exist.
- Conditions of dripping water, condensed water or soil water could exist.
- Conditions of icing exist.
- Presence of mould, fungus, rodents and other animals harmful to products but excluding termites
- Presence of suspension dust up to 0,4 mg/m<sup>3</sup>
- Presence of sedimentation dust up to 15 mg/(m<sup>2</sup>h)



# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 124 / 145

- Limit for acoustic noise emitted by LV head ends or MV Nodes of 7,5 bels according to ETSI EN 300 753. It is assumed that these types of units are located at places in which they would not usually disturb people.



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 125 / 145

## ANNEX A (NORMATIVE): MIB DEFINITION IN ASN.1 FORMAT

```
PLC-DEVICE-MIB DEFINITIONS ::= BEGIN

    IMPORTS
        NetworkAddress, IpAddress, Counter, Gauge, TimeTicks,
        enterprises
            FROM RFC1155-SMI
        OBJECT-TYPE,
        FROM RFC-1212
    STATUS,
        FROM SNMPv2-SMI
    PhysAddress,
        FROM RFC1213-MIB;

iso          OBJECT IDENTIFIER ::= { 1 }
org          OBJECT IDENTIFIER ::= { iso 3 }
dod         OBJECT IDENTIFIER ::= { org 6 }
internet    OBJECT IDENTIFIER ::= { dod 1 }
private     OBJECT IDENTIFIER ::= { internet 4 }
enterprises OBJECT IDENTIFIER ::= { private 1 }
opera       OBJECT IDENTIFIER ::= { enterprises 20804 }
v1          OBJECT IDENTIFIER ::= { opera 1 }

--
-- Object definition
--
-- Groups in v1 tree

plSystem    OBJECT IDENTIFIER ::= { v1 1 }
plBasic     OBJECT IDENTIFIER ::= { v1 2 }
plPhy       OBJECT IDENTIFIER ::= { v1 3 }
plMAC       OBJECT IDENTIFIER ::= { v1 4 }
plQoS       OBJECT IDENTIFIER ::= { v1 5 }
plStatistics OBJECT IDENTIFIER ::= { v1 7 }
plTraps     OBJECT IDENTIFIER ::= { v1 8 }
plStp       OBJECT IDENTIFIER ::= { v1 10 }
plSecurity  OBJECT IDENTIFIER ::= { v1 11 }

--
-- Groups definition
--

--
-- The plSystem Group
--

plSystemTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF plSystemEntry
    ACCESS      not-accessible
    STATUS      current
    DESCRIPTION "Generic information about the Opera system."
    ::= { plSystem 1 }

plSystemEntry OBJECT-TYPE
    SYNTAX      plSystemEntry
```



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 126 / 145

```

ACCESS      not-accessible
STATUS      current
DESCRIPTION "System information gathered per card."
INDEX       { plSysCard }
 ::= { plSystemTable 1 }

plSystemEntry ::= SEQUENCE {
    plSysCard          INTEGER,
    plSysNodeType      INTEGER,
    plSysNodeMode      INTEGER,
    plSysFWVersion     IA5String (SIZE(0..128)),
    plSysHWVersion     IA5String (SIZE(0..128)),
    plSysReset         INTEGER,
    plSysFactoryReset  INTEGER,
    plSysUseDHCP       INTEGER,
    plSysStaticIPAddress  IpAddress,
    plSysStaticNetMask   IpAddress,
    plSysStaticDefaultGW IpAddress,

    plSysSaveAsPermanent  INTEGER,
    plSysConfUpload       IA5String (SIZE (0..256)),
    plSysConfDownload     IA5String (SIZE (0..256)),
    plSysUpdateStatus     INTEGER,
    plSysUpdate           IA5String (SIZE(0..256)),
    plSysDNSIPAddress     IpAddress,
    plSysSnmpPROCommunityName      DisplayString
(SIZE(0..31)),
    plSysSnmpRWCommunityName      DisplayString
(SIZE(0..31)),
    plSysSnmpTrapDest             IpAddress
}

plSysCard          OBJECT-TYPE
SYNTAX             INTEGER
ACCESS             read-only
STATUS             current
DESCRIPTION        "Node card number"
 ::= { plSystemEntry 1 }

plSysNodeType      OBJECT-TYPE
SYNTAX             INTEGER
ACCESS             read-write
STATUS             current
DESCRIPTION        "Node type: master -> 0
                    slave -> 1
                    repeater -> 2"
 ::= { plSystemEntry 2 }

plSysNodeMode      OBJECT-TYPE
SYNTAX             INTEGER
ACCESS             read-write
STATUS             current
DESCRIPTION        "Node mode: access -> 0
                    in-home -> 1
                    medium-voltage -> 2"
 ::= { plSystemEntry 3 }

plSysFWVersion     OBJECT-TYPE
SYNTAX             IA5String (SIZE(0..128))
ACCESS             read-only
STATUS             current
DESCRIPTION        "Firmware version"
 ::= { plSystemEntry 5 }

plSysHWVersion     OBJECT-TYPE
SYNTAX             IA5String (SIZE(0..128))

```



# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 127 / 145

```
ACCESS          read-only
STATUS          current
DESCRIPTION     "Hardware version"
::= { plSystemEntry 6 }

plSysReset     OBJECT-TYPE
SYNTAX        INTEGER
ACCESS       read-write
STATUS      current
DESCRIPTION  "System reset"
::= { plSystemEntry 7 }

plSysFactoryReset OBJECT-TYPE
SYNTAX        INTEGER
ACCESS       read-write
STATUS      current
DESCRIPTION  "Restore factory parameters"
::= { plSystemEntry 8 }

plSysUseDHCP   OBJECT-TYPE
SYNTAX        INTEGER
ACCESS       read-write
STATUS      current
DESCRIPTION  "Use DHCP (1) or a fixed IP, netmask and gateway (0) instead"
::= { plSystemEntry 9 }

plSysStaticIPAddress OBJECT-TYPE
SYNTAX        IPAddress
ACCESS       read-write
STATUS      current
DESCRIPTION  "Default IP address if DHCP is disabled"
::= { plSystemEntry 10 }

plSysStaticNetMask OBJECT-TYPE
SYNTAX        IPAddress
ACCESS       read-write
STATUS      current
DESCRIPTION  "Default netmask if DHCP is disabled"
::= { plSystemEntry 11 }

plSysStaticDefaultGW OBJECT-TYPE
SYNTAX        IPAddress
ACCESS       read-write
STATUS      current
DESCRIPTION  "Default gateway if DHCP is disabled"
::= { plSystemEntry 12 }

plSysSaveAsPermanent OBJECT-TYPE
SYNTAX        INTEGER
ACCESS       read-write
STATUS      current
DESCRIPTION  "Saves changed objects as permanent"
::= { plSystemEntry 14 }

plSysConfUpload OBJECT-TYPE
SYNTAX        IA5String (SIZE(0..256))
ACCESS       read-write
STATUS      current
DESCRIPTION  "Uploads node local configuration to a server"
::= { plSystemEntry 15 }

plSysConfDownload OBJECT-TYPE
SYNTAX        IA5String (SIZE(0..256))
ACCESS       read-write
STATUS      current
DESCRIPTION  "Forces a configuration file download"
```



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 128 / 145

```
 ::= { plSystemEntry 16 }
```

```
plSysUpgradeStatus      OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-only
STATUS                   current
DESCRIPTION               "Status of the current upgrade: finished KO      -> 0
                           finished OK      -> 1
                           busy (in progress) -> 2"
```

```
 ::= { plSystemEntry 19 }
```

```
plSysUpdate              OBJECT-TYPE
SYNTAX                   IA5String (SIZE(0..256))
ACCESS                   read-write
STATUS                   current
DESCRIPTION               "Updates the selected flash section of a modem"
 ::= { plSystemEntry 30 }
```

```
plSysDNSIPAddress       OBJECT-TYPE
SYNTAX                   IPAddress
ACCESS                   read-write
STATUS                   current
DESCRIPTION               "IP address of the DNS"
 ::= { plSystemEntry 31 }
```

```
plSysSnmpROCommunityName OBJECT-TYPE
SYNTAX                   DisplayString (SIZE(0..31))
ACCESS                   read-write
STATUS                   current
DESCRIPTION               "Community Name string"
 ::= { plSystemEntry 32 }
```

```
plSysSnmpRWCommunityName OBJECT-TYPE
SYNTAX                   DisplayString (SIZE(0..31))
ACCESS                   read-write
STATUS                   current
DESCRIPTION               "Community Name string"
 ::= { plSystemEntry 33 }
```

```
plSysSnmpTrapDest       OBJECT-TYPE
SYNTAX                   IPAddress
ACCESS                   read-only
STATUS                   current
DESCRIPTION               "Trap destination IP address"
 ::= { plSystemEntry 34 }
```

```
--
-- The plBasic Group
--
```

```
plBasicTable            OBJECT-TYPE
SYNTAX                   SEQUENCE OF plBasicEntry
ACCESS                   not-accessible
STATUS                   current
DESCRIPTION               ""
 ::= { plBasic 1 }
```

```
plBasicEntry            OBJECT-TYPE
SYNTAX                   plBasicEntry
ACCESS                   not-accessible
STATUS                   current
```





## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 129 / 145

```

DESCRIPTION ""
INDEX { plBasicCard }
 ::= { plBasicTable 1 }

plBasicEntry ::= SEQUENCE {
    plBasicCard                INTEGER,
    plBasicMode                INTEGER,
    plBasicCentralFrequency    INTEGER,
    plBasicBandwidth           INTEGER,
    plBasicSearchModes         IA5String,
    plBasicTXAGCEnable         INTEGER,
    plBasicRXAGCEnable         INTEGER,
    plBasicTXAGCGain           INTEGER,
    plBasicRXAGCGain           INTEGER,
    plBasicTXPowerMaskLB      OCTET STRING (SIZE(769)),
    plBasicTXPowerMaskHB      OCTET STRING (SIZE(769)),
    plBasicMasterMAC           PhysAddress
}

plBasicCard                OBJECT-TYPE
SYNTAX                     INTEGER
ACCESS                     read-only
STATUS                     current
DESCRIPTION                 "Node card number"
 ::= { plBasicEntry 1 }

plBasicMode                OBJECT-TYPE
SYNTAX                     INTEGER
ACCESS                     read-write
STATUS                     current
DESCRIPTION                 "Physical mode (1..M)"
 ::= { plBasicEntry 2 }

plBasicCentralFrequency    OBJECT-TYPE
SYNTAX                     INTEGER
ACCESS                     read-write
STATUS                     current
DESCRIPTION                 "Band Central Frequency in MHz"
 ::= { plBasicEntry 3 }

plBasicBandwidth           OBJECT-TYPE
SYNTAX                     INTEGER
ACCESS                     read-write
STATUS                     current
DESCRIPTION                 "Working Node Bandwidth in MHz"
 ::= { plBasicEntry 4 }

plBasicSearchModes         OBJECT-TYPE
SYNTAX                     IA5String
ACCESS                     read-write
STATUS                     current
DESCRIPTION                 "List of modes used for searching"
 ::= { plBasicEntry 5 }

plBasicTXAGCEnable         OBJECT-TYPE
SYNTAX                     INTEGER
ACCESS                     read-write
STATUS                     current
DESCRIPTION                 "TX AGC: Enabled -> 1
                               Disabled -> 0"
 ::= { plBasicEntry 6 }

plBasicRXAGCEnable         OBJECT-TYPE
SYNTAX                     INTEGER
ACCESS                     read-write
STATUS                     current
DESCRIPTION                 "RX AGC: Enabled -> 1

```



# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 130 / 145

```

                                Disabled -> 0"
 ::= { plBasicEntry 7 }

plBasicTXAGCGain      OBJECT-TYPE
SYNTAX                INTEGER
ACCESS                read-write
STATUS                current
DESCRIPTION            "TX AGC Gain"

 ::= { plBasicEntry 8 }

plBasicRXAGCGain      OBJECT-TYPE
SYNTAX                INTEGER
ACCESS                read-write
STATUS                current
DESCRIPTION            "RX AGC Gain"

 ::= { plBasicEntry 9 }

plBasicTXPowerMaskLB      OBJECT-TYPE
SYNTAX                OCTET STRING ( SIZE ( 769 ) )
ACCESS                read-write
STATUS                current
DESCRIPTION            "Low half Powermask"
 ::= { plBasicEntry 10 }

plBasicTXPowerMaskHB      OBJECT-TYPE
SYNTAX                OCTET STRING ( SIZE ( 769 ) )
ACCESS                read-write
STATUS                current
DESCRIPTION            "High half Powermask"
 ::= { plBasicEntry 11 }

plBasicMasterMAC      OBJECT-TYPE
SYNTAX                PhysAddress
ACCESS                read-only
STATUS                current
DESCRIPTION            "MAC address of the master of current node"
 ::= { plBasicEntry 12 }

--
-- The plPhy Group
--

-- plPhyByMAC Table

plPhyByMACTable OBJECT-TYPE
SYNTAX          SEQUENCE OF plPhyByMACEntry
ACCESS          not-accessible
STATUS          current
DESCRIPTION    "Physical parameters"
 ::= { plPhy 1 }

plPhyByMACEntry OBJECT-TYPE
SYNTAX          plPhyByMACEntry
ACCESS          not-accessible
STATUS          current
DESCRIPTION    ""
INDEX          { plPhyByMACCard, plPhyByMACMAC }
 ::= { plPhyByMACTable 1 }

plPhyByMACEntry ::= SEQUENCE {
                                plPhyByMACCard          INTEGER,
                                plPhyByMACMAC            PhysAddress,
                                plPhyByMACTXBPC          OCTET STRING (SIZE(769)),

```



**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 131 / 145

```

plPhyByMACTXBPCAggregated    INTEGER,
plPhyByMACRXBPC              OCTET STRING (SIZE(769)),
plPhyByMACRXBPCAggregated    INTEGER,
plPhyByMACRXSNR              OCTET STRING (SIZE(769)),
plPhyByMACRXCFR              OCTET STRING (SIZE(769)),
plPhyByMACTXPhySpeed         INTEGER,
plPhyByMACRXPhySpeed         INTEGER,
plPhyByMACACK                INTEGER,
plPhyByMACCIPHER             INTEGER,
plPhyByMACTXHURTO            INTEGER,
plPhyByMACRXHURTO            INTEGER,
plPhyByMACIsActive           INTEGER,
plPhyByMACRXTimeLastActivity  INTEGER
}

```

```

plPhyByMACCard OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION     "Node card number"
 ::= { plPhyByMACEntry 1 }

```

```

plPhyByMACMAC OBJECT-TYPE
SYNTAX          PhysAddress
ACCESS          read-only
STATUS          current
DESCRIPTION     "MAC Address"
 ::= { plPhyByMACEntry 2 }

```

```

plPhyByMACTXBPC OBJECT-TYPE
SYNTAX          OCTET STRING ( SIZE ( 769 ) )
ACCESS          read-only
STATUS          current
DESCRIPTION     "BPC in transmission for the low half band"
 ::= { plPhyByMACEntry 3 }

```

```

plPhyByMACTXBPCAggregated OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION     "BPC Aggregated in transmission"
 ::= { plPhyByMACEntry 5 }

```

```

plPhyByMACRXBPC OBJECT-TYPE
SYNTAX          OCTET STRING ( SIZE ( 769 ) )
ACCESS          read-only
STATUS          current
DESCRIPTION     "BPC in reception for the low half band"
 ::= { plPhyByMACEntry 6 }

```

```

plPhyByMACRXBPCAggregated OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION     "BPC Aggregated in reception"
 ::= { plPhyByMACEntry 8 }

```

```

plPhyByMACRXSNR OBJECT-TYPE
SYNTAX          OCTET STRING ( SIZE ( 769 ) )
ACCESS          read-only
STATUS          current
DESCRIPTION     "Measured SNR"
 ::= { plPhyByMACEntry 9 }

```



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 132 / 145

```

p1PhyByMACRXCFR          OBJECT-TYPE
SYNTAX                   OCTET STRING ( SIZE ( 769 ) )
ACCESS                   read-only
STATUS                   current
DESCRIPTION              "Measured CFR"
 ::= { p1PhyByMACEntry 10 }

p1PhyByMACTXPhySpeed     OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-only
STATUS                   current
DESCRIPTION              "Physical speed in transmission"
 ::= { p1PhyByMACEntry 11 }

p1PhyByMACRXPhySpeed     OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-only
STATUS                   current
DESCRIPTION              "Physical speed in reception"
 ::= { p1PhyByMACEntry 12 }

p1PhyByMACACK           OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-write
STATUS                   current
DESCRIPTION              "ACK enabled"
 ::= { p1PhyByMACEntry 13 }

p1PhyByMACCIPHER        OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-write
STATUS                   current
DESCRIPTION              "Cipher enabled"
 ::= { p1PhyByMACEntry 14 }

p1PhyByMACTXHURTO       OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-write
STATUS                   current
DESCRIPTION              "HURTO mode in transmission"
 ::= { p1PhyByMACEntry 15 }

p1PhyByMACRXHURTO       OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-write
STATUS                   current
DESCRIPTION              "HURTO mode in reception"
 ::= { p1PhyByMACEntry 16 }

p1PhyByMACIsActive     OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-only
STATUS                   current
DESCRIPTION              "Checks if the node is active or not"
 ::= { p1PhyByMACEntry 17 }

p1PhyByMACRXTimeLastActivity OBJECT-TYPE
SYNTAX                   INTEGER
ACCESS                   read-only
STATUS                   current
DESCRIPTION              "Time since last PLC activity"
 ::= { p1PhyByMACEntry 18 }

```

-- p1PhyRXSNRThreshold Table



## EC/IST FP6 Project No 507667

File name: OPERA\_Specification\_Part\_2\_System\_v1.0.doc

Version: 1.0

Title: OPERA SPECIFICATION - Part 2: SYSTEM

133 / 145

```

plPhyRXSNRThresholdTable OBJECT-TYPE
    SYNTAX SEQUENCE OF plPhyRXSNRThresholdEntry
    ACCESS not-accessible
    STATUS current
    DESCRIPTION ""
    ::= { plWiscPhy 2 }

plPhyRXSNRThresholdEntry OBJECT-TYPE
    SYNTAX plPhyRXSNRThresholdEntry
    ACCESS not-accessible
    STATUS current
    DESCRIPTION ""
    INDEX { plPhyRXSNRThresholdCard, plPhyRXSNRThresholdIndex }
}

plPhyRXSNRThresholdEntry ::= SEQUENCE {
    plPhyRXSNRThresholdCard INTEGER,
    plPhyRXSNRThresholdIndex INTEGER,
    plPhyRXSNRThreshold INTEGER
}

plPhyRXSNRThresholdCard OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS not-accessible
    STATUS current
    DESCRIPTION "Node card number"
    ::= { plPhyRXSNRThresholdEntry 1 }

plPhyRXSNRThresholdIndex OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS not-accessible
    STATUS current
    DESCRIPTION "SNR threshold value index (1..10)"
    ::= { plPhyRXSNRThresholdEntry 2 }

plPhyRXSNRThreshold OBJECT-TYPE
    SYNTAX INTEGER
    ACCESS read-write
    STATUS current
    DESCRIPTION "SNR threshold value"
    ::= { plPhyRXSNRThresholdEntry 3 }

--
-- The plMAC Group
--

-- plMAC Table

plMACTable OBJECT-TYPE
    SYNTAX SEQUENCE OF plMACEntry
    ACCESS not-accessible
    STATUS current
    DESCRIPTION ""
    ::= { plMAC 1 }

plMACEntry OBJECT-TYPE
    SYNTAX plMACEntry
    ACCESS not-accessible
    STATUS current
    DESCRIPTION ""
    INDEX { plMACCard }
    ::= { plMACTable 1 }

```



# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 134 / 145

```

plMACEntry ::= SEQUENCE {
    plMACCard                INTEGER,
    plMACAccessProtocol     INTEGER,
    plMACNumConnectedNodes  INTEGER,
    plMACNumSlaves          INTEGER
}

plMACCard OBJECT-TYPE
SYNTAX    INTEGER
ACCESS    read-only
STATUS    current
DESCRIPTION "Node card number"
 ::= { plMACEntry 1 }

plMACAccessProtocol OBJECT-TYPE
SYNTAX    INTEGER
ACCESS    read-write
STATUS    current
DESCRIPTION "Autodiscovery mode enabled"
 ::= { plMACEntry 2 }

plMACNumConnectedNodes OBJECT-TYPE
SYNTAX    INTEGER
ACCESS    read-only
STATUS    current
DESCRIPTION "Number of nodes with link solved (PSP)"
 ::= { plMACEntry 3 }

plMACNumSlaves OBJECT-TYPE
SYNTAX    INTEGER
ACCESS    read-only
STATUS    current
DESCRIPTION "Number of slaves configured in the master or repeater"
 ::= { plMACEntry 4 }

-- plMACConnectedNodes Table

plMACConnectedNodesTable OBJECT-TYPE
SYNTAX    SEQUENCE OF plMACConnectedNodesEntry
ACCESS    not-accessible
STATUS    current
DESCRIPTION ""
 ::= { plWiscMAC 2 }

plMACConnectedNodesEntry OBJECT-TYPE
SYNTAX    plMACConnectedNodesEntry
ACCESS    not-accessible
STATUS    current
DESCRIPTION ""
INDEX    { plMACConnectedNodesCard, plMACConnectedNodesIndex
}
 ::= { plMACConnectedNodesTable 1 }

plMACConnectedNodesEntry ::= SEQUENCE {
    plMACConnectedNodesCard  INTEGER,
    plMACConnectedNodesIndex INTEGER,
    plMACConnectedNodesMAC   PhysAddress
}

plMACConnectedNodesCard OBJECT-TYPE
SYNTAX    INTEGER
ACCESS    read-only
STATUS    current
DESCRIPTION "Node card number"
 ::= { plMACConnectedNodesEntry 1 }

```



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 135 / 145

```
plMACConnectedNodesIndex OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-only
STATUS current
DESCRIPTION "Node index"
 ::= { plMACConnectedNodesEntry 2 }

plMACConnectedNodesMAC OBJECT-TYPE
SYNTAX PhysAddress
ACCESS read-only
STATUS current
DESCRIPTION "MAC for the node index"
 ::= { plMACConnectedNodesEntry 3 }
```

-- plMACSlaves Table

```
plMACSlavesTable OBJECT-TYPE
SYNTAX SEQUENCE OF plMACSlavesEntry
ACCESS not-accessible
STATUS current
DESCRIPTION ""
 ::= { plWiscMAC 3 }

plMACSlavesEntry OBJECT-TYPE
SYNTAX plMACSlavesEntry
ACCESS not-accessible
STATUS current
DESCRIPTION ""
INDEX { plMACSlavesCard, plMACSlavesIndex }
 ::= { plMACSlavesTable 1 }

plMACSlavesEntry ::= SEQUENCE {
    plMACSlavesCard INTEGER,
    plMACSlavesIndex INTEGER,
    plMACSlavesMAC PhysAddress
}

plMACSlavesCard OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-only
STATUS current
DESCRIPTION "Node card number"
 ::= { plMACSlavesEntry 1 }

plMACSlavesIndex OBJECT-TYPE
SYNTAX INTEGER
ACCESS read-only
STATUS current
DESCRIPTION "Slaves index"
 ::= { plMACSlavesEntry 2 }

plMACSlavesMAC OBJECT-TYPE
SYNTAX PhysAddress
ACCESS read-only
STATUS current
DESCRIPTION "MAC for the slave index"
 ::= { plMACSlavesEntry 3 }
```

--  
-- The plQoS Group  
--



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 136 / 145

```
plQoSMasterGeneralMinOneWayLat OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION    "Latency in milliseconds"
 ::= { plQoS 1 }

plQoSMasterGeneralBwMngrPolicy OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION    "Bandwidth ..."
 ::= { plQoS 2 }

-- plQoSPriorityManagement Table

plQoSPriorityManagementTable OBJECT-TYPE
SYNTAX          SEQUENCE OF plQoSPriorityManagementEntry
ACCESS          not-accessible
STATUS          current
DESCRIPTION    ""
 ::= { plQoS 3 }

plQoSPriorityManagementEntry OBJECT-TYPE
SYNTAX          plQoSPriorityManagementEntry
ACCESS          not-accessible
STATUS          current
DESCRIPTION    "QoS Priorities Management per card."
INDEX          { plQoSPriorityManagementCard, plQoSPriorityManagementPrio }
 ::= { plQoSPriorityManagementTable 1 }

plQoSPriorityManagementEntry ::= SEQUENCE {
                                plQoSPriorityManagementCard    INTEGER,
                                plQoSPriorityManagementPrio    INTEGER,
                                plQoSPriorityManagementLatency  INTEGER,
                                plQoSPriorityManagementJitter   INTEGER,
                                plQoSPriorityManagementBandwidth INTEGER
                                }

plQoSPriorityManagementCard OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION    "Node card number"
 ::= { plQoSPriorityManagementEntry 1 }

plQoSPriorityManagementPrio OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-write
STATUS          current
DESCRIPTION    "Priority value (1..8)"
 ::= { plQoSPriorityManagementEntry 2 }

plQoSPriorityManagementLatency OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION    "Latency value for the priority (0,1,2,4,8)"
 ::= { plQoSPriorityManagementEntry 3 }

plQoSPriorityManagementJitter OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
```





**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 137 / 145

```
STATUS          current
DESCRIPTION     "Jitter value for the priority"
 ::= { plQoSPriorityManagementEntry 4 }
```

```
plQoSPriorityManagementBandwidth OBJECT-TYPE
SYNTAX          INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Bandwidth for the priority"
 ::= { plQoSPriorityManagementEntry 5 }
```

-- plQoSPerUser Table

```
plQoSPerUserTable OBJECT-TYPE
SYNTAX          SEQUENCE OF plQoSPerUserEntry
ACCESS         not-accessible
STATUS         current
DESCRIPTION     ""
 ::= { plWiscQoS 4 }
```

```
plQoSPerUserEntry OBJECT-TYPE
SYNTAX          plQoSPerUserEntry
ACCESS         not-accessible
STATUS         current
DESCRIPTION     "User QoS management values per card."
INDEX          { plQoSPerUserCard, plQoSPerUserMAC }
 ::= { plQoSPerUserTable 1 }
```

```
plQoSPerUserEntry ::= SEQUENCE {
    plQoSPerUserCard          INTEGER,
    plQoSPerUserMAC          PhysAddress,
    plQoSPerUserTXMaxXput    INTEGER,
    plQoSPerUserRXMaxXput    INTEGER,
    plQoSPerUserPriorityAllowedUp  INTEGER,
    plQoSPerUserPriorityAllowedDown  INTEGER
    -- plQoSPerUserPriorityActive    INTEGER
}
```

```
plQoSPerUserCard OBJECT-TYPE
SYNTAX          INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Node card number"
 ::= { plQoSPerUserEntry 1 }
```

```
plQoSPerUserMAC OBJECT-TYPE
SYNTAX          PhysAddress
ACCESS         read-only
STATUS         current
DESCRIPTION     "User MAC address"
 ::= { plQoSPerUserEntry 2 }
```

```
plQoSPerUserTXMaxXput OBJECT-TYPE
SYNTAX          INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Maximum allowed throughput in transmission for a user"
 ::= { plQoSPerUserEntry 3 }
```

```
plQoSPerUserRXMaxXput OBJECT-TYPE
SYNTAX          INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Maximum allowed throughput in reception for a user"
 ::= { plQoSPerUserEntry 4 }
```



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 138 / 145

```

plQoSPerUserPriorityAllowedUp    OBJECT-TYPE
SYNTAX      INTEGER
ACCESS      read-only
STATUS      current
DESCRIPTION "Allowed priorities for transmission and reception in upstream
for a user"
 ::= { plQoSPerUserEntry 5 }

plQoSPerUserPriorityAllowedDown  OBJECT-TYPE
SYNTAX      INTEGER
ACCESS      read-only
STATUS      current
DESCRIPTION "Allowed priorities for transmission and reception in
downstream for a user"
 ::= { plQoSPerUserEntry 6 }

-- plQoSPerUserPriorityActive    OBJECT-TYPE
-- SYNTAX      INTEGER
-- ACCESS      read-only
-- STATUS      current
-- DESCRIPTION "Active priorities for transmission and reception for a
user"
-- ::= { plQoSPerUserEntry 7 }

--
-- The plStatistics Group
--

-- plStatistics Table

plStatisticsTable    OBJECT-TYPE
SYNTAX      SEQUENCE OF plStatisticsEntry
ACCESS      not-accessible
STATUS      current
DESCRIPTION "Packets and Bytes Statistics by Interface"
 ::= { plStatistics 1 }

plStatisticsEntry    OBJECT-TYPE
SYNTAX      plStatisticsEntry
ACCESS      not-accessible
STATUS      current
DESCRIPTION ""
INDEX      { plStatisticsCard }
 ::= { plStatisticsTable 1 }

plStatisticsEntry    ::= SEQUENCE {
    plStatisticsCard                INTEGER,
    plStatisticsPLCInputWords       INTEGER,
    plStatisticsPLCInputPackets     INTEGER,
    plStatisticsPLCInputIncorrigible INTEGER,
    plStatisticsPLCInputFECBlocksTotal INTEGER,
    plStatisticsPLCInputFECBlocksCorrected INTEGER,
    plStatisticsPLCInputPktsReceived INTEGER,
    plStatisticsPLCInputPktsRcvComplete INTEGER,
    plStatisticsPLCInputPktsRcvIncomplete INTEGER,
    plStatisticsPLCOutputWords      INTEGER,
    plStatisticsPLCOutputPkts      INTEGER
}

plStatisticsCard    OBJECT-TYPE
SYNTAX      INTEGER

```



# opera

Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 139 / 145

```
ACCESS          read-only
STATUS          current
DESCRIPTION     "Node card number"
::= { plStatisticsEntry 1 }

plStatisticsPLCInputWords  OBJECT-TYPE
SYNTAX          INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Words received by PLC"
::= { plStatisticsEntry 19 }

plStatisticsPLCInputPackets  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Packets received by PLC"
::= { plStatisticsEntry 20 }

plStatisticsPLCInputIncorrigible  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Incorrigible packets received by PLC"
::= { plStatisticsEntry 21 }

plStatisticsPLCInputFECBlocksTotal  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Received FEC blocks by PLC"
::= { plStatisticsEntry 22 }

plStatisticsPLCInputFECBlocksCorrected  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "FEC blocks corrected by PLC"
::= { plStatisticsEntry 23 }

plStatisticsPLCInputPktsReceived  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Received packets by PLC"
::= { plStatisticsEntry 24 }

plStatisticsPLCInputPktsRcvComplete  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Complete received packets by PLC"
::= { plStatisticsEntry 25 }

plStatisticsPLCInputPktsRcvIncomplete  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION     "Incomplete received packets by PLC"
::= { plStatisticsEntry 26 }

plStatisticsPLCOutputWords  OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
```



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 140 / 145

```
STATUS          current
DESCRIPTION     "Transmitted words by PLC"
 ::= { plStatisticsEntry 27 }

plStatisticsPLCOutputPkts OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION     "Transmitted packets by PLC"
 ::= { plStatisticsEntry 28 }

-- End of plStatistics Table

--
-- The plTraps Group
--

-- plTrapsPhy Table
plTrapsPhyTable OBJECT-TYPE
SYNTAX          SEQUENCE OF plTrapsPhyEntry
ACCESS          not-accessible
STATUS          current
DESCRIPTION     ""
 ::= { plTraps 1 }

plTrapsPhyEntry OBJECT-TYPE
SYNTAX          plTrapsPhyEntry
ACCESS          not-accessible
STATUS          current
DESCRIPTION     ""
INDEX          { plTrapsPhyCard }
 ::= { plPhyTable 1 }

plTrapsPhyEntry ::= SEQUENCE {
    plTrapsPhyCard          INTEGER,
    plTrapsPhyTrapToHURTOEnable  INTEGER,
    plTrapsPhyTrapFromHURTOEnable  INTEGER
}

plTrapsPhyCard OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-only
STATUS          current
DESCRIPTION     "node card number"
 ::= { plTrapsPhyEntry 1 }

plTrapsPhyTrapToHURTOEnable OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-write
STATUS          current
DESCRIPTION     "Enable/disable trap generation when entering HURTO mode"
 ::= { plTrapsPhyEntry 2 }

plTrapsPhyTrapFromHURTOEnable OBJECT-TYPE
SYNTAX          INTEGER
ACCESS          read-write
STATUS          current
DESCRIPTION     "Enable/disable trap generation when exiting HURTO mode"
 ::= { plTrapsPhyEntry 3 }

-- plTrapsMAC Table
```



**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 141 / 145

```

plTrapsMACTable      OBJECT-TYPE
    SYNTAX             SEQUENCE OF plTrapsMACEntry
    ACCESS              not-accessible
    STATUS              current
    DESCRIPTION        ""
    ::= { plWiscTraps 2 }

plTrapsMACEntry      OBJECT-TYPE
    SYNTAX             plTrapsMACEntry
    ACCESS              not-accessible
    STATUS              current
    DESCRIPTION        ""
    INDEX              { plTrapsMACCard }
    ::= { plTrapsMACTable 1 }

plTrapsMACEntry ::= SEQUENCE {
    plTrapsMACCard                INTEGER,
    plTrapsMACPeerDetectedEnable  INTEGER,
    plTrapsMACPeerDisappearedEnable  INTEGER
}

plTrapsMACCard      OBJECT-TYPE
    SYNTAX             INTEGER
    ACCESS              read-only
    STATUS              current
    DESCRIPTION        "Node card number"
    ::= { plTrapsMACEntry 1 }

plTrapsMACPeerDetectedEnable  OBJECT-TYPE
    SYNTAX             INTEGER
    ACCESS              read-write
    STATUS              current
    DESCRIPTION        "Enable/disable trap generation when detecting a peer"
    ::= { plTrapsMACEntry 2 }

plTrapsMACPeerDisappearedEnable  OBJECT-TYPE
    SYNTAX             INTEGER
    ACCESS              read-write
    STATUS              current
    DESCRIPTION        "Enable/disable trap generation when dissapearing a peer"
    ::= { plTrapsMACEntry 3 }

---
-- plTrapsBridge Table
---

plTrapsBridgeTable      OBJECT-TYPE
    SYNTAX             SEQUENCE OF plTrapsBridgeEntry
    ACCESS              not-accessible
    STATUS              current
    DESCRIPTION        ""
    ::= { plWiscTraps 3 }

plTrapsBridgeEntry      OBJECT-TYPE
    SYNTAX             plTrapsBridgeEntry
    ACCESS              not-accessible
    STATUS              current
    DESCRIPTION        ""
    INDEX              { plTrapsBridgeCard }
    ::= { plTrapsBridgeTable 1 }

plTrapsBridgeEntry ::= SEQUENCE {
    plTrapsBridgeCard                INTEGER,
    plTrapsBridgeNewRootEnable       INTEGER,
    plTrapsBridgeTopologyChangeEnable  INTEGER
}

```



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 142 / 145

```

plTrapsBridgeCard    OBJECT-TYPE
SYNTAX               INTEGER
ACCESS               read-only
STATUS               current
DESCRIPTION          "Node card number"
 ::= { plTrapsBridgeEntry 1 }

plTrapsBridgeNewRootEnable    OBJECT-TYPE
SYNTAX               INTEGER
ACCESS               read-write
STATUS               current
DESCRIPTION          "Enable/disable trap generation when a new root is assigned"
 ::= { plTrapsBridgeEntry 2 }

plTrapsBridgeTopologyChangeEnable    OBJECT-TYPE
SYNTAX               INTEGER
ACCESS               read-write
STATUS               current
DESCRIPTION          "Enable/disable trap generation when topology changes"
 ::= { plTrapsBridgeEntry 3 }

---
-- plTrapsConfFail Table
---

plTrapsConfFailTable    OBJECT-TYPE
SYNTAX               SEQUENCE OF plTrapsConfFailEntry
ACCESS               not-accessible
STATUS               current
DESCRIPTION          ""
 ::= { plWiscTraps 4 }

plTrapsConfFailEntry    OBJECT-TYPE
SYNTAX               plTrapsConfFailEntry
ACCESS               not-accessible
STATUS               current
DESCRIPTION          ""
INDEX               { plTrapsConfFailCard }
 ::= { plTrapsConfFailTable 1 }

plTrapsConfFailEntry ::=SEQUENCE{
                                plTrapsConfFailCard                INTEGER,
                                plTrapsConfDownloadFailEnable     INTEGER,
                                plTrapsConfUploadFailEnable        INTEGER,
                                }

plTrapsConfFailCard    OBJECT-TYPE
SYNTAX               INTEGER
ACCESS               read-only
STATUS               current
DESCRIPTION          "Node card number"
 ::= { plTrapsConfFailEntry 1 }

plTrapsConfDownloadFailEnable    OBJECT-TYPE
SYNTAX               INTEGER
ACCESS               read-write
STATUS               current
DESCRIPTION          "Enable/disable trap generation when a configuration file
download fails"
 ::= { plTrapsConfFileEntry 2 }

plTrapsConfUploadFailEnable    OBJECT-TYPE
SYNTAX               INTEGER
ACCESS               read-write

```



## EC/IST FP6 Project No 507667

<b>File name:</b>	OPERA_Specification_Part_2_System_v1.0.doc	<b>Version:</b>	1.0
-------------------	--	-----------------	-----

<b>Title:</b>	OPERA SPECIFICATION - Part 2: SYSTEM	143 / 145
---------------	--------------------------------------	-----------

```

STATUS          current
DESCRIPTION     "Enable/disable trap generation when a configuration file
upload fails"
 ::= { plTrapsConfFileEntry 3 }

```

```

--
-- The plStp Group
--

```

```

plStpTable      OBJECT-TYPE
SYNTAX         SEQUENCE OF plStpEntry
ACCESS         not-accessible
STATUS         current
DESCRIPTION    "Information about Spanning Tree."
 ::= { plWiscStp 1 }

plStpEntry      OBJECT-TYPE
SYNTAX         plStpEntry
ACCESS         not-accessible
STATUS         current
DESCRIPTION    "System information gathered per card."
INDEX         { plStpCard }
 ::= { plStpTable 1 }

plStpEntry ::= SEQUENCE {
    plStpCard          INTEGER,
    plStpEnable        INTEGER,
    plStpProtocolVersion IA5String (SIZE(0..8)),
    plStpPtpExtA       INTEGER,
    plStpPtpExtB       INTEGER,
    plStpFrontier      IA5String (SIZE(0..8))
}

plStpCard       OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-only
STATUS         current
DESCRIPTION    "Node card number"
 ::= { plStpEntry 1 }

plStpEnable     OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-write
STATUS         current
DESCRIPTION    "0: STP Enabled, 1: STP Disabled"
 ::= { plStpEntry 2 }

plStpProtocolVersion OBJECT-TYPE
SYNTAX         IA5String (SIZE(0..8))
ACCESS         read-write
STATUS         current
DESCRIPTION    "STP Protocol Version [STP|RSTP]"
 ::= { plStpEntry 3 }

plStpPtpExtA    OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-write
STATUS         current
DESCRIPTION    "Set point-to-point flag for EXTA [0|1]"
 ::= { plStpEntry 4 }

plStpPtpExtB    OBJECT-TYPE
SYNTAX         INTEGER
ACCESS         read-write

```



## EC/IST FP6 Project No 507667

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 144 / 145

```

STATUS          current
DESCRIPTION     "Set point-to-point flag for EXTB [0|1]"
::= { plStpEntry 5 }

plStpFrontier  OBJECT-TYPE
SYNTAX         IA5String (SIZE(0..8))
ACCESS        read-write
STATUS        current
DESCRIPTION   "STP Frontier enabled in [EXTA|EXTB|NONE]"
::= { plStpEntry 6 }

```

```
--
-- The plSecurity Group
--
```

```

plSecurityConsoleSerial  OBJECT-TYPE
    SYNTAX                INTEGER { enabled ( 1 ),
                                disabled ( 0 ) }
    MAX-ACCESS            read-write
    STATUS                current
    DESCRIPTION           "Enable/disable access to the modems
                           serial port console."
    DEFVAL                { enabled }
    ::= { plSecurity 1 }

plSecurityConsoleTelnet  OBJECT-TYPE
    SYNTAX                INTEGER { enabled ( 1 ),
                                disabled ( 0 ) }
    MAX-ACCESS            read-write
    STATUS                current
    DESCRIPTION           "Enable/disable access to the modems
                           telnet console."
    DEFVAL                { disabled }
    ::= { plSecurity 2 }

plSecurityConsoleAuthTable  OBJECT-TYPE
    SYNTAX                SEQUENCE OF SecurityConsoleAuthEntry
    MAX-ACCESS            not-accessible
    STATUS                current
    DESCRIPTION           "Table of IP addresses form which
                           Telnet clients may access this modem."
    ::= { plSecurity 3 }

plSecurityConsoleAuthEntry  OBJECT-TYPE
    SYNTAX                SecurityConsoleAuthEntry
    MAX-ACCESS            not-accessible
    STATUS                current
    DESCRIPTION           "One entry of the table."
    INDEX                 { securityConsoleAuthNumber }
    ::= { plSecurityConsoleAuthTable 1 }

plSecurityConsoleAuthEntry ::= SEQUENCE {
    plSecurityConsoleAuthNumber    INTEGER,
    plSecurityConsoleAuthAddress   IpAddress,
    plSecurityConsoleAuthRowStatus RowStatus
}

plSecurityConsoleAuthNumber  OBJECT-TYPE
    SYNTAX                INTEGER (0..15)
    MAX-ACCESS            not-accessible

```





**opera**  
Open PLC European Research Alliance

**Work Package:** SSWG  
**Type of document:** Deliverable  
**Date:** 31/01/06

**EC/IST FP6 Project No 507667**

**File name:** OPERA\_Specification\_Part\_2\_System\_v1.0.doc **Version:** 1.0

**Title:** OPERA SPECIFICATION - Part 2: SYSTEM 145 / 145

```
STATUS current
DESCRIPTION "Number of this row."
::= { plSecurityConsoleAuthEntry 1 }
```

```
plSecurityConsoleAuthAddress OBJECT-TYPE
SYNTAX IpAddress
MAX-ACCESS read-create
STATUS current
DESCRIPTION "IP address of client."
::= { plSecurityConsoleAuthEntry 2 }
```

```
plSecurityConsoleAuthRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The status of this conceptual row."
::= { plSecurityConsoleAuthEntry 3 }
```

END