

User Manual

Basic Configuration Dragon PTN Legacy Services



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Hirschmann Automation and Control GmbH Stuttgarter Str. 45-51 72654 Neckartenzlingen Germany

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1. INTRODUCTION

1.1 General

This document is valid as of Dragon PTN Release 4.3DR. This manual describes the OAM for so-called "legacy services" that can be used to transport "legacy applications" over the Dragon PTN network. Legacy services are all the services that are not pure Ethernet services (see Ref. [2Eth] in Table 2). The following legacy service (types) are described further on:

- Local Mode
 - Optical Low Speed Serial / C37.94
- Serial Ethernet
- Circuit Emulation (SAToP/CESoPSN)
 - E1 / T1 / C37.94 / Serial / 2W/4W Voice (only CESoPSN) / CODIR / Optical Low Speed Serial
- Voice
- Smart SFP (uses service type 'Ethernet' over Dragon PTN but transports STM/OC frames from an SDH/Sonet network)

Prerequisites:

- The HiProvision PC must have been configured/installed as described in Ref. [2Mgt] in Table 2;
- The Dragon PTN core network has been configured as described in Ref. [2Net] in Table 2. At least one tunnel must have been created (except for the Local Mode services);
- Before creating the service, it is always interesting to verify the bandwidth already configured through the WAN links and tunnels of your network, see §12.4.

Table 1 Legacy Application	/ IFM / Service Type Ove	erview
-----------------------------------	--------------------------	--------

Legacy Application	Required IFM (Refs. in Table 2)	Service Type	Chapter
Serial (RS232, RS422,	7-SERIAL	Circuit Emulation: Serial	§5
RS485, X.21, V.35)		Serial Ethernet	§4
64 kbps (ITU G.703)	4-CODIR	Circuit Emulation: CODIR	§5
2-Wire Voice, 4-Wire Voice, E&M Signaling	4-2/4WEM	Circuit Emulation: 2W/4W Voice	§5
E1	4-E1-L / 16-E1-L	Circuit Emulation: E1	§5
Т1	4-T1-L / 16-T1-L	Circuit Emulation: T1	§5
Voice (FXO, SIP)	8-FXS, all Ethernet IFMs	Voice	§7
Optical Low Speed Serial	2-OLS	Local Mode: Optical Low Speed Serial	§2
		Circuit Emulation: Optical Low Speed Serial	§5
C37.94	2-C37.94	Local Mode: C37.94	§3
		Circuit Emulation: C37.94	§5
SHDSL	4-DSL-LW	Ethernet	§8
SDH/SONET (STM/OC)	Via smart SFPs on 4-GO-LW, 4-GC-LW/4-GCB-LW port 1	Ethernet	§9

1.2 Manual References

Table 2 is an overview of the manuals referred to in this manual. '&' refers to the language code, '*' refers to the manual issue. All these manuals can be found via the HiProvision Help Tile.

Ref.	Number	Number Title						
[1]	DRA-DRM801-&-*	Dragon PTN Installation and Operation						
[2Mgt]	DRA-DRM830-&-*	HiProvision Management Operation						
[2Eth]	DRA-DRM831-&-*	Dragon PTN Ethernet Services						
[2Net]	DRA-DRM833-&-*	Dragon PTN Network Operation						
[3]	DRE-DRM806-&-*	Dragon PTN Interface Module: PTN-4-DSL-LW						
[4]	DRE-DRM817-&-*	Dragon PTN Interface Module: PTN-4-GO-LW						
[5]	DRE-DRM805-&-*	Dragon PTN Interface Module: PTN-4-E1-L/ PTN-4-T1-L						
[6]	DRE-DRM809-&-*	Dragon PTN Interface Module: PTN-2-C37.94						
[8]	DRE-DRM813-&-*	Dragon PTN Interface Module: PTN-7-SERIAL						
[10]	DRE-DRM814-&-*	Dragon PTN Interface Module: PTN-4-2/4WEM						
[11]	DRE-DRM816-&-*	Dragon PTN Interface Module: PTN-4-CODIR						
[13]	DRE-DRM815-&-*	Dragon PTN Interface Module: PTN-2-OLS						
[14]	DRF-DRM811-&-*	Dragon PTN TRMs (Transmit Receive Modules: SFP, XFP, QSFP+)						
[22]	DRE-DRM818-&-*	Dragon PTN Interface Module: PTN-16-E1-L/ PTN-16-T1-L						
[24]	DRG-DRM826-&-*	HiProvision Add-on: Generic Reporting Engine						

Table 2 Manual References

2. LOCAL MODE: OPTICAL LOW SPEED SERIAL

2.1 General

Supported IFMs: 2-OLS: More information on this IFM in Ref. [13] in Table 2;

Local Mode at the source side means the conversion of incoming Serial signals into E1 signals, both at the front panel of the IFM. No IFM backplane or Dragon PTN network or Dragon PTN bandwidth is involved. The IFM just acts as a local Serial to E1 converter via an internal loopback. At the destination side, the conversion is just vice versa.

Prerequisite: make sure that you created links of type 'External E1 Link' (see figure below) between the two 2-OLS IFMs. These links can be created as via Dashboard \rightarrow Network Hardware \rightarrow Links $\rightarrow + \rightarrow$ (Link type) 'External E1 Link'. More info in Ref. [2Net] in Table 2.

	External E1 Link		~	Sourc Target	9						
	Device Name 🔺	Link Type		ά (2.55		ر کچ	×			
Þ	ExtDev100		^								
	ExtDev101										
	ExtDev102							Node3	_		
	Node1	\checkmark					5	_	Node	2	
	Node2					/					~
	Node3		~	<							>
											Close

Figure 1 Create External E1 Link



Service: Local Mode \rightarrow Optical Low Speed Serial

Figure 2 Local Mode: Optical Low Speed Serial via 2-OLS IFMs

2.2 Configure Service

2.2.1 Service Wizard

Click Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services $\rightarrow \pm$ to open the services wizard. See figure below.

	5	C DASHBOARD	ATABASE) CON	INECTIONS						
	LIN	IKS					ţ۵	० 🔛	표 🎽	م گ	<u> E</u>
		Link Name	•	Link T	Гуре					C	
	PORT://Node2/IFM-5/P1/ - PORT://			Ethernet 10G						l	Node3
	PORT://Node2/IFM-1/P2/ - PORT://		2/ - PORT://	Ether	Ethernet 1G						•
	TU	NNELS 🛨 🛃 🗶		E-I	110				Node4	<u>ן</u>	
		Tunnel Name 🔷	Tunnel Type		SubRing Color						
Services		SuperRing	Logical Ring								
	SEI	RVICES 🛨 🔎 💌 Service Name Crea	te Service	M	Service Type			Node5			
Services	SEF	VORIS//VOGE2/IEM-1/P2 PORT (A) 1 4/EM (A) NNELS + @ (X) Tunnel Name SuperRing RVICES + @ (X) Service Name Creation	Tunnel Type Logical Ring	MT S	SubRing Color		C	Node5	Node4		

Figure 3 Create Services

The services wizard opens. The list below summarizes every page in the wizard:

- Page: Information: Click Next>>;
- Page: Service Name and Type Selection:
 - Service Name: enter a name for your service.
 - Service Type: Local Mode;

Steps	Service Wizard - Se	rvice Name and Type	Selectior	ı		
Information	Service Name	Local1		^		
Service Endpoint Selection	Service Type	Local Mode	~			
Port Settings	Protocol	Optical Low Speed Serial	~			
Load	Optical Low Speed Serial			Optical Low Speed Serial		
	Synchronisation	Asynchronous		Synchronisation	Synchronous	~
	Bitrate	297,600	⊻ bps	Bitrate FM0 Coding	8 x 64k (512k) Disabled	v bps
		e e Danie	Nextss			

Figure 4 Service Type: Local Mode: Optical Low Speed Serial

- Protocol: Optical Low Speed Serial:
- Synchronisation:
 - Asynchronous (=default): When a bitrate is selected, an incoming serial signal with a lower bitrate will operate as well, because 2-OLS samples at 6.6 times the selected bitrate;
 - Synchronous: offers additional option to use FM0 Coding;
 - Bitrate: depends on the selected Synchronisation method, see overview in §8.
 - FM0 Coding (in Synchronous mode)
 - Disabled (=default): Normal data (without encoding) is expected at the optical serial RX ports. Normal data (without encoding) is generated at the optical serial TX ports;
 - Enabled: FMO encoded data is expected at the optical serial RX ports. FMO encoded data is generated at the optical serial TX ports. With FMO Coding enabled, a 0-bit (='space') will always have an extra transition halfway its bit time (=2 phases = biphase) whereas a 1-bit will have no transition within its bit time.



Figure 5 FM0 Coding

- Page: Service Endpoint Selection: It is point-to-point, so only select two end-points. The end-points are the optical serial ports of the 2-OLS IFMs connected to that External E1 link. Note: Within one 2-OLS IFM, [port 1 <-> port3] and [port 2 <-> port4] are always linked via a fixed local loopback including the conversion. E.g. It means that if port3 is used in the External E1 Link, port1 must be selected (and not port2) as end-point. Selecting ports can be done in two ways:
 - Via the table. The tree view can be expanded/collapsed via clicking the expand/collapse buttons. Just click the Selected checkbox to select the desired port;
 - Via clicking the node icons in the network drawing, see general example in §13;

- **NOTE:** Per port, an extra Info field can be filled out later on via Network Hardware \rightarrow Devices \rightarrow Select Node/IFM/Port \rightarrow Generic \rightarrow Info.
- Page: (Tunnel Selection: No tunnel must be selected in this service setup. The Dragon PTN network will not be used. After this service setup, a special tunnel with tunnel type 'External' has been created automatically.)
- Page: Port Settings:
 - Short Haul Link: (refers to E1 ports on the 2-OLS IFM): Long E1 links (>200m, Long Haul) have more E1 signal attenuation than shorter E1 links (<200m, Short Haul). As a result, the E1 signal levels or sensitivity ('0' or '1') on the receiver side depend on the usage of Long Haul/Short Haul links. Check this parameter for Short Haul links and uncheck it (=default) for Long Haul links. This parameter can be set on port level in the IFM or at service creation.</p>

Steps		Service Wizard - Port Settings									
Information	Port Parameters										
Service Name and Type Selection Service Endpoint Selection		PORT://Node8/IFM-12/P3/	PORT://Node4/IFM-7/P3/								
✓ Port Settings	Short Haul Link (< 200m)										

Figure 6 Port Settings: Short Haul

- Page: Review: The selected service ports will be shown: if ok, click Finish, the configuration load manager will be invoked.
- Page: Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info;

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

After this step, your customer applications connected to the front ports of the IFMs should be able to communicate.

2.2.2 Network Hardware → IFM Settings

After configuring the service via the service wizard, all IFM settings will be set according to the service configuration. Some individual IFM settings might need extra tuning or must be overruled. Find IFM settings via Network Hardware \rightarrow Devices \rightarrow 2-OLS.

a. Forced Power Mode

The powering of the 2-OLS IFM can be configured by the 'Forced Power Mode'. The setting of this parameter determines whether a CSM is required in the node for powering the 2-OLS IFM. Go to Network Hardware \rightarrow Devices \rightarrow 2-OLS \rightarrow Specific \rightarrow Forced Power Mode.

				N	etwork	Hardv	ware					
	; ¹¹ ; DA	SHBOARD	E DATABAS	e 🏟 Server	S TT N	ETWORK H	ARDWARE	XTERNAL DEVICES				
ſ	DEVICES	+ 🖌	\times	- Q - 👄	(*)	*	i 🖻 🖬 - 💙	· × × •	2 🏍 🖪 🗄 🗄	\$ s ⊕	MODULE://Node9/IFM-11/	
I	Туре			Name	Device ID	Status	Programmed Type	Measured Type	Address		Temperature	~
I	A)	(T-2215-A		Node9	9				NODE://Node9/		CPU	۹C
l		CSM540-A		CSM-2					MODULE://Node9/CS		Generic	^
I		CSM540-	2-0151	FM -1					MODULE://Node9/CS		Specific	~
l		9-L3A-L	2 0 1 5 1	4					MODULE://Node9/IFM		Internal Connection Port 1-3 True	~ 0
I		7-SERIAL		IFM-10				For	red Dower Mor		Internal Connection Port 2-4 True	~ 0
I		+ 4-GC-LW		IFM-1				10			Forced Power Mode On	
I		+ 4-CODIR		IFM-12					MODULE://Node9/IFM		Test And Loopback	
I	. ا	4 2-OLS		IFM-11					MODULE://Node9/IFM		Loopback Network Data Esice	
I		2-OLS-	L Optical P	P2					PORT://Node9/IFM-11/		Loophack Line Data	
I		2-OLS-	L Optical P	P1					PORT://Node9/IFM-11/		False	
I		2-OLS-	L E1 Port	P4					PORT://Node9/IFM-11/		BERI Ix Port 1	~ 🗆

Figure 7 2-OLS IFM: Forced Power Mode

Forced Power Mode:

- On (=default): Once the 2-OLS IFM has been configured by the CSM, the CSM can be removed from the node if desired. After removing the CSM, the 2-OLS IFM remains powered and a configured Local Mode service on this IFM remains operational;
- Off: the 2-OLS IFM always needs an operational CSM in the node for powering and for normal operation. After removing the CSM from the node, the 2-OLS IFM will be powered off automatically and goes out of service.

Best Practice:

If a Local Mode service has been configured on the 2-OLS IFM and you want to remove the CSM from the node later on, set Forced Power Mode = 'On'. In any other case, set it to 'Off'.

2.2.3 Network Hardware → IFM-Port Settings

After configuring the service via the service wizard, all port settings of the endpoints in this service will be set according to the service configuration. Some individual port settings might need extra tuning or must be overruled. Go to Network Hardware \rightarrow Devices \rightarrow 2-OLS \rightarrow (optical/E1) port.

a. Clock Source Settings

The ports of the 2-OLS IFM have by default the settings below which are OK if the IFM can slave to the external E1 network.

Within one 2-OLS IFM, the E1 ports will slave to the external network e.g. SDH (=Rx Clock). The optical serial ports uses the same clock as the clock on their associated E1 ports (=Through Timing). Port 1 is linked to Port3 and Port2 is linked to Port4;

Clock Source:

- Optical Serial Port1: Through Timing;
- E1 Port3: Rx Clock;
- Optical Serial Port2: Through Timing;
- E1 Port4: Rx Clock;
- Apply your changes and load these changes into the Dragon PTN network.

2.3 Modify Service

After service creation, this service can be modified if needed via:

- ▶ Wizard: Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services \rightarrow select service \rightarrow \bowtie ;
- Port settings, see §2.2.3;

2.4 Delete Service

After service creation, this service can be deleted if needed via:

▶ Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services \rightarrow select service \rightarrow ×;

2.5 Troubleshooting: Test and Loopback

This service can be tested via loopback settings on IFM level and port level in the Network Hardware tab. See §14 for setting up loopbacks.

You also could use OLS testers, two 2-OLS IFMs and a direct E1 link between the 2 E1 ports (= exclude the external SDH network) to test your Local Mode. Configure the 'Clock Source' port settings as indicated in the figure. You could also play with the 'Link Enabled' port setting to enable/disable a link.



Figure 8 Local Mode: Troubleshooting and Testing

2.6 Monitoring

2.6.1 (Configuration) Network Hardware Tile

It can be verified if a local loopback or local mode is active on the IFM. Go to Dashboard \rightarrow (Configuration) Network Hardware \rightarrow Devices \rightarrow IFM \rightarrow Specific \rightarrow Internal Connection. If this parameter is 'True', a local loopback is active on your IFM.

	ç [™] t DA	SHBOARD 📑 DATABASI	e 🏠 server	5 N	etwork ha	ARDWARE	s	
	DEVICE	• + & 🗵 Đ	- Ω - 👄	⇔ ↔	*	🕅 🔟 · ♥ - 🔨 😒	🙅 🗞 👫 📜 🗄 🐛 🔴	MODULE://Node9/IFM-11/
T	Туре	-	Name	Device ID	Status	Programmed Type Measured Type	Address	Temperature
I	4	KT-2215-A	Node9	9			NODE://Node9/	
I		CSM540-A	CSM-2				MODULE://Node9/CS	Generic
		CSM540-A	CSM-1				MODULE://Node9/CS	Specific
		9-L3A-L	IFM-4				MODULE://Node9/IFM	Internal Connection Port 1-3 True 🗸 🗆
		7-SERIAL	IFM-10				MODULE://Node9/IFM	Internal Connection Port 2-4 True 🗸 🗆
		+ 4-GC-LW	IFM-1				MODULE://Node9/IFM	Forced Power Mode On
		4-CODIR	IFM-12				MODULE://Node9/IFM	Test And Loopback
П	•	4 2-0LS	IFM-11				MODULE://Node9/IFM	Loopback Network Data Ealco
Г		2-OLS-L Optical P	P2				PORT://Node9/IFM-11/	Loophack Line Data
П		2-OLS-L Optical P	P1				PORT://Node9/IFM-11/	False
		2-OLS-L E1 Port	P4				PORT://Node9/IFM-11/	BERI IX Port 1

Figure 9 Local Mode Indication: Internal Connection

2.6.2 (Configuration) Connections Tile

What has been configured via the service wizard can also be viewed via Dashboard \rightarrow Connections \rightarrow Services \rightarrow select service in the list. Some extra tabs (Service, Local Mode) with service configuration data will be shown.

CAUTION: The configuration that you see here is the service configuration done via the service wizard. Port settings could be tuned manually via §2.2.3 and as a result could be different from these service settings. Always verify these port settings, to know the exact port setting in the live network.



Figure 10 (Configuration) Connections Tile: Local Mode Service

2.6.3 (Monitoring) Network Tile

None.

2.6.4 Performance Counters

None. There are only counters available via Test and Loopback.

2.6.5 HiProvision Add-on: Generic Reporting Engine

Service and port reporting information is available via the Reporting Engine Add-on, see Ref.[24] in Table 2.

3. LOCAL MODE: C37.94

3.1 General

Supported IFMs: 2-C37.94: More information on this IFM in Ref. [6] in Table 2;

Local Mode at the source side means the conversion of incoming C37.94 signals into E1 signals, both at the front panel of the IFM. No IFM backplane or Dragon PTN network or Dragon PTN bandwidth is involved. The IFM just acts as a local C37.94 to E1 converter via an internal loopback. At the destination side, the conversion is just vice versa.

Prerequisite: make sure that you created links of type 'External E1 Link' (see figure below) between the two 2-C37.94 IFMs. These links can be created as via Dashboard \rightarrow Network Hardware \rightarrow Links $\rightarrow = \rightarrow$ (Link type) 'External E1 Link'. More info in Ref. [2Net] in Table 2.



Figure 11 Create External E1 Link



Service: Local Mode → C37.94

Figure 12 Local Mode: C37.94 via 2-C37.94 IFMs

3.2 Configure Service

3.2.1 Service Wizard

Click Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services $\rightarrow \pm$ to open the services wizard. See figure below.

	💘 DASHBOARD 📄 DA) CONI	NECTIONS						
LI	NKS	_				°a,	۹ 👪		∝°	計, -
	Link Name PORT://Node2/IFM-5/P1/	- PORT://	Link Ty Ethern	vpe net 10G	^				(Node
-	PORT://Node2/IFM-1/P2/	- PORT://	Ethern	iet 1G	~		ſ	Noted	5	•
т	JNNELS 🕂 🌽 🗙 Tunnel Name	Tunnel Type		SubRing Color				/	1	
Services	SuperRing	Logical Ring					/			
SE	RVICES + & ×	M° M ∣	MŦ	Service Type			Node5			
	Creat	e Services	5							

Figure 13 Create Services

The services wizard opens. The list below summarizes every page in the wizard:

- Page: Information: Click Next>>;
- Page: Service Name and Type Selection:
 - Service Name: enter a name for your service.
 - Service Type: Local Mode;

Steps	Service Wizard - Serv	vice Name and Type Selection	on						
Information ✓ Service Name and Type Selection									
Service Endpoint Selection	Service Name	LocalMode1							
Port Settings									
Review	Protocol	C37.94	1						
	Number Of Timeslots	12 🗘]						
		<< Prev Next >>	Cancel						

Figure 14 Service Type: Local Mode: C37.94

- Protocol: C37.94:
- Number of Timeslots: (=default, read-only). Not relevant.
- Page: Service Endpoint Selection: It is point-to-point, so only select two end-points. The end-points are the C37.94 ports of the 2-C37.94 IFMs connected to that External E1 link. Note: Within one 2-C37.94 IFM, [port 1 <-> port3] and [port 2 <-> port4] are always linked via a fixed local loopback including the conversion. E.g. It means that if port3 is used in the External E1 Link, port1 must be selected (and not port2) as end-point. Selecting ports can be done in two ways:
 - Via the table. The tree view can be expanded/collapsed via clicking the expand/collapse buttons. Just click the Selected checkbox to select the desired port;
 - Via clicking the node icons in the network drawing, see general example in §13;

- **NOTE:** Per port, an extra Info field can be filled out later on via Network Hardware \rightarrow Devices \rightarrow Select Node/IFM/Port \rightarrow Generic \rightarrow Info.
- Page: (Tunnel Selection: No tunnel must be selected in this service setup. The Dragon PTN network will not be used. After this service setup, a special tunnel with tunnel type 'External' has been created automatically.)
- Page: Port Settings:
 - Short Haul Link: (refers to E1 ports on the 2-C37.94 IFM): Long E1 links (>200m, Long Haul) have more E1 signal attenuation than shorter E1 links (<200m, Short Haul). As a result, the E1 signal levels or sensitivity ('0' or '1') on the receiver side depend on the usage of Long Haul/Short Haul links. Check this parameter for Short Haul links and uncheck it (=default) for Long Haul links. This parameter can be set on port level in the IFM or at service creation.</p>

Steps		Service Wizard - Port Settings									
Information	Port Parameters										
Service Name and Type Selection Service Endpoint Selection		PORT://Node8/IFM-12/P3/	PORT://Node4/IFM-7/P3/								
✓ Port Settings	Short Haul Link (< 200m)										

Figure 15 Port Settings: Short Haul

- Page: Review: The selected service ports will be shown: if ok, click Finish, the configuration load manager will be invoked.
- Page: Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info.

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

After this step, your customer applications connected to the front ports of the IFMs should be able to communicate.

3.2.2 Network Hardware → IFM Settings

None.

3.2.3 Network Hardware → IFM-Port Settings

After configuring the service via the service wizard, all port settings of the endpoints in this service will be set according to the service configuration. Some individual port settings might need extra tuning or must be overruled. Go to Network Hardware \rightarrow Devices \rightarrow 2-C37.94 \rightarrow (C37.94/E1) port.

a. Clock Source Settings

The ports of the C37.94 IFM in Local Mode have by default the settings below which are OK if the IFM can slave to the external E1 network.

Within one 2- C37.94 IFM, the E1 ports will slave to the external network e.g. SDH (=Rx Clock). The C37.94 ports uses the same clock as their associated E1 ports (=Through Timing). Port 1 is linked to Port3 and Port2 is linked to Port4;

- Clock Source:
 - C37.94 Port1: Through Timing;
 - E1 Port3: Rx Clock;
 - C37.94 Port2: Through Timing;
 - E1 Port4: Rx Clock;
- Apply your changes and load these changes into the Dragon PTN network.

3.3 Modify Service

After service creation, this service can be modified if needed via:

- ▶ Wizard: Dashboard → Configuration → Connections → Services → select service → \square ;
- Port settings, see §3.2.3;

3.4 Delete Service

After service creation, this service can be deleted if needed via:

▶ Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services \rightarrow select service \rightarrow ×;

3.5 Troubleshooting: Test and Loopback

This service can be tested via loopback settings on IFM level and port level in the Network Hardware tab. See §14 for setting up loopbacks. You could also use C37.94 testers, two 2-C37.94 IFMs and a direct E1 link between the 2 E1 ports (= exclude the external SDH network) to test your Local Mode. Configure the 'Clock Source' port settings as indicated in the figure. You could also play with the 'Link Enabled' port setting to enable/disable a link.



Figure 16 Local Mode: Troubleshooting and Testing

3.6 Monitoring

3.6.1 (Configuration) Network Hardware Tile

It can be verified if a local loopback or local mode is active on the IFM. Go to Dashboard \rightarrow (Configuration) Network Hardware \rightarrow Devices \rightarrow IFM \rightarrow Specific \rightarrow Internal Connection. If this parameter is 'True', a local loopback is active on your IFM.

	"; DA		BASE 🏠 SER	VERS	NETWORK	K HARDWARE	EXTERNAL DEVIC	ES	
	EVICES	+ 🖉 🖂 :	0 - Q -	⇒ ⇔ <	1) (°÷ 🖬 🔟 · 🤇	♥- * ×	🙅 🖆 👫 📜 🗄 🖡 🌘	MODULE://Node9/IFM-15/
	Туре		 Name 	Device ID	Status	Programmed Type	Measured Type	Address	Temperature LOCAT MOUE !
Г	- A -)	(T-2215-A	Node9	9				NODE://Node9/	Generic
Г		CSM540-A	CSM-2					MODULE://Node9/CS	Specific
]	CSM540-A	CSM-1	1				MODULE://Node9/CS	Internal Connection Port 1-3 False 🗸 🗆
		9-L3A-L	IFM-4					MODULE://Node9/IFM	Internal Connection Port 2-4 False 🗸 🗆
		7-SERIAL	IFM-10					MODULE://Node9/IFM	Test And Loopback
L	. I	4-GC-LW	IFM-1					MODULE://Node9/IFM	Loopback Network Data Off
		4-CODIR	IFM-12					MODULE://Node9/IFM	Loopback Line Data
		2-OLS	IFM-11					MODULE://Node9/IFM	
Þ		2-C37.94-E1-L	IFM-15					MODULE://Node9/IFM	Port 1 Line
]	16-E1-L	IFM-14					MODULE://Node9/IFM	BERT Rx Direction Port 1 Line
		1-40G-LW	IFM-9					MODULE://Node9/IFM	BERT Tx/Rx Enable False
	•)	(T-2215-A	Node7	7				NODE://Node7/	Hardware And Operational Errors

Figure 17 Local Mode Indication: Internal Connection

3.6.2 (Configuration) Connections Tile

What has been configured via the service wizard can also be viewed via Dashboard \rightarrow Connections \rightarrow Services \rightarrow select service in the list. Some extra tabs (Service, Local Mode) with service configuration data will be shown.

CAUTION: The configuration that you see here is the service configuration done via the service wizard. Port settings could be tuned manually via §3.2.3 and as a result could be different from these service settings. Always verify these port settings, to know the exact port setting in the live network.

LINKS	
Link Name 👻 Link Type	
PORT://Node8/IFM-1/P1/ - PORT:// Ethernet 1G	
PORT://Node7/IFM-6/P1/ - PORT:// Ethernet 40G	
PORT://Node7/IFM-1/P2/ - PORT:// Ethernet 1G	Node2
PORT://Node6/IFM-2/P1/ - PORT://E Monitored Link	External E1 Link
PORT://Node6/IFM-1/P2/ - PORT:// Ethernet 1G	
PORT://Node5/IFM-1/P2/ - PORT:// Ethernet 1G	
PORT://Node4/IFM-8/P3/ - PORT:// Ethernet 1G	Node1
PORT://Node4/IFM-8/P2/ - PORT:// Ethernet 1G	
PORT://Node4/IFM-7/P4/ - PORT:// External E1 Link	
PORT://Node4/IFM-7/P3/ - PORT:// External E1 Link	
TUNNELS • I I I I I I I I I I I I I I I I I I	
ELAN://Norde1//EM-10/03/ - Norde3//EM-7/03// Evternal	
ELAN://Node4/IEM-7/P3/ - Node8/IEM-12/P3// External	
ELAN://Node4/IEM-7/P4/ - Node8/IEM-12/P4// External	
ptmp123 MultiPoint	
ptmp345 MultiPoint	Node
pto-n4n5 Point-to-Point	
ptp-n5n6 Point-to-Point	
SuperRing Logical Ring	
SERVICES 🕂 🌈 🛪 📌 M M	Service Local Mode
	C37.94 Port 1 C37.94 Port 2 E1 Port 1 E1 Port 2 Protocol Synchronisation E1 Port 1 Short Haul E1 Port 2 Short H
Service lype	PORT://Node3/IFM-7/P1/ PORT://Node1/IFM-10/P1/ PORT://Node3/IFM-7/P3/ PORT://Node1/IFM-10/P3/ C37.94 Asynchronous
SerialEthemet	Service Local Mode
Local Mode	Sanice Name Senice Tune
Local_L3/94 Local Mode	Jervice training between type

Figure 18 (Configuration) Connections Tile: Local Mode Service

3.6.3 (Monitoring) Network Tile

None.

3.6.4 Performance Counters

None. There are only counters available via Test and Loopback.

3.6.5 HiProvision Add-on: Generic Reporting Engine

Service and port reporting information is available via the Reporting Engine Add-on, see Ref.[24] in Table 2.

4. SERIAL ETHERNET

4.1 General

Supported IFMs: 7-SERIAL. More information on this IFM in Ref. [8] in Table 2.

7-SERIAL IFMs can use either 'Serial Ethernet' or 'Circuit Emulation \rightarrow Serial' services. Depending on your needs and application, you can choose either one or the other. The table below compares both types. This chapter describes the Serial Ethernet, for a description of the Circuit Emulation \rightarrow Serial service, see §5.

Parameter	Serial Ethernet	Circuit Emulation \rightarrow Serial
Interface Types	RS232, RS422, RS485	RS232, RS422, RS485, X.21, V.35
Front ports	All 7 ports supported	Port support depends on the used interface type, see Figure 20
Hitless Switching	No	Yes
Data bits, parity, speed,	Must be configured exactly	Easier configuration
Synchronization	Asynchronous only	Both Synchronous and Asynchronous
Clocking	No	Yes
Point-to-Point	Yes	Yes
Multidrop or Point-to- MultiPoint (master/slave)	Yes	No
Bandwidth Usage	Less	More
Control signals (RTS, CTS,)	Only transmitted if data is transmitted	Always transmitted
Best Practice: Try to use Circu	uit Emulation for Point-to-Point	and Serial Ethernet for Multi-drop services.

Table 3 7-SERIAL: Compare 'Serial Ethernet' $\leftarrow \rightarrow$ Circuit Emulation



Figure 19 Serial Ethernet Service

	RS232			RS422		RS4	85	X.2	21	V.35			
		Async (Serial Ethernet)	Async (CES)	Sync (CES)	Async (Serial Ethernet)	Async (CES)	Sync (CES)	Async (Serial Ethernet)	Async (CES)	Optimised (CES)	Full (CES)	Optimised (CES)	Full (CES)
P1		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	spare	\checkmark	\checkmark	\checkmark	spare	\checkmark	spare
P2		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Р3		\checkmark	spare	spare	\checkmark	spare	combi	\checkmark	spare	spare	combi	spare	combi
P4		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Р5		\checkmark	spare	spare	\checkmark	spare	combi	\checkmark	spare	spare	combi	spare	combi
P6		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	√	\checkmark	\checkmark	\checkmark	√	\checkmark	\checkmark
P7		\checkmark	spare	spare	\checkmark	spare	combi	\checkmark	spare	spare	combi	spare	combi

Figure 20 7-SERIAL Service Matrix

4.2 Configure Service

4.2.1 Service Wizard

a. Wizard Steps

Click Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services $\rightarrow \pm$ to open the services wizard. See figure below.

	CASHBOARD	ATABASE 💿 CO	NNECTIONS					
	LINKS			a a	53 A	🎽 🖧	∷ + •	
	Link Name	▼ Link	Туре				ſ	
	PORT://Node2/IFM-5/P1,	/ - PORT:// Ethe	rnet 10G				l	Node3
	PORT://Node2/IFM-1/P2,	/ - PORT:// Ethe	rnet 1G	~				
	TUNNELS 🛨 🛃 🗙					Node4		
	Tunnel Name 🔺	Tunnel Type	SubRing Color					
Services	SuperRing	Logical Ring						
4	SERVICES + P ×	MP M MT	Service Type		,	Node5		

Figure 21 Create Services

The services wizard opens. The list below summarizes every page in the wizard:

- Page: Information: Click Next>>;
- Page: Service Name and Type Selection:
 - Service Name: enter a name for your service.
 - Service Type: Serial Ethernet;

Service Wizard - Service Name and Type Selection							
Service Name	SerialEthernet1						
Service Type	Serial Ethernet						
Serial Ethernet							
Interface Type	RS232						
Bitrate	1,200 v bps						
Data Bits	8						
Parity	None						
Stop Bits	1						
Multidrop Consistency							
Advanced Mode	Fixed Block Size						
Transmit Timer	0 🗘 msec						
Line Termination Character (decimal)	0 ♦						
Block Size	8 💭 bytes						
	concel						
	Service Wizard - Service Name Service Type Serial Ethernet Interface Type Bitrate Data Bits Parity Stop Bits Multidrop Consistency Advanced Mode Transmit Timer Line Termination Character (decimal) Block Size						

Figure 22 Service Type: Serial Ethernet

- Interface Type: RS232 (=default) /RS422/RS485;
- Bitrate: see overview in §8;
- Data Bits: Amount of data bits: 6,7,8 (=default);
- Parity: None (=default), Odd, Even, Mark, Space;
- Stop Bits: Amount of stop bits: 1 (=default), 2;
- Multidrop Consistency: is a polling mechanism between the master(s) port(s) and the slave ports to check whether the slaves are still alive (more info in §b).
 - Unchecked: polling disabled;
 - Checked (=default): polling enabled.

- Advanced Mode (see §c): Fixed Block Size; Fixed Transmit Timer; Delimiter Line Termination Character; Delimiter Timeout;
- Page: Service Endpoint Selection: Select the front ports on the involved IFMs that must be part of this service. Make sure to select the ports in nodes that are linked to a same tunnel. Selecting ports can be done in two ways:
 - Via the table. The tree view can be expanded/collapsed via clicking the expand/collapse buttons. Just click the Selected checkbox to select the desired port;
 - Via clicking the node icons in the network drawing, see general example in §13;
 - **NOTE:** Per port, an extra Info field can be filled out later on via Network Hardware \rightarrow Devices \rightarrow Select Node/IFM/Port \rightarrow Generic \rightarrow Info.
 - A node can have a maximum of 32767 MAC addresses. By default, per new Serial Ethernet service, 256 MAC addresses will be added to each LER node of the tunnel in which the service resides (not for point-to-point tunnels). If the maximum number of MAC addresses on a node has been reached, an error warning will pop up. After this warning, you will have to decrease the number of MAC addresses in this node from the other services first via clicking the MAC limit button if (see Ref. [2Eth] in Table 2 for more info). See the figure below:



Figure 23 Serial Ethernet: MAC Limit, Master/Slave

Master/Slave:

- In this service, at least one master (maximum two masters) and one or more slaves (maximum 156 slaves) must be selected. By default, the end-point is set as Slave but can be changed to Master by clicking the Master/Slave cell of the desired endpoint and selecting Master, see figure above. In some network drawings the Master will be indicated by the icon.
- When two masters are selected, one of them will be the active one and the other one will be the backup master. Which one is the active/backup master will be decided by the serial protocol itself.
- The (active) master will initiate commands or requests to their slaves. The backup master and all the slaves will see this request. Only the addressed slave will process the request and send a response back to the (active) master. The backup master and all the other slaves will see the slave response.

- Only the (active) master will process the slave response. The backup master (if any) will be synchronized with the active master and will take over when the active master gets out of service.
- Page: Tunnel Selection: Allowed tunnels for this service type: point-to-multipoint, logical ring. See §11 to select the desired tunnel;
- Page: Quality of Service Parameters: QoS (=Quality of Service) is a service traffic handling process in order to provide sufficient service delivery and bandwidth for critical applications. HiProvision provides a few QoS mechanisms, based on the parameters below.
 - Priority (range [0..5], default = 4): priority that will be assigned internally in the Dragon PTN node. 0 indicates the lowest priority (=least important). In the Dragon PTN network, higher priority traffic will be processed before lower priority traffic so that high priority traffic will not be compromised.
 - Frame Size: The 7-SERIAL IFMs convert their incoming signals from the LAN side into Ethernet packets towards the CSM. The Frame Size is the size of these Ethernet packets. The better you know the traffic (and its frame sizes) in your network, the better you can tune the consumed bandwidth on the WAN side. The Frame Size indicates the Ethernet frame size = payload + Ethernet overhead.
 - Frame Size is read-only;
 - Frame Sized depends on settings in Page: Service Name and Type Selection;

Steps		Service Wizard - Qual	ity of Servic	e Param	eters		
Information							
Service Name and Type Selection							
Service Endpoint Selection							
Tunnel Selection	Priority				4	\$?
✓ Quality of Service Parameters	Frame Size					68	bytes
Quality of Service Parameters Detail							
Pseudo Wire Label Selection							
Review							
Load							
				<< Prev	Next >>	1	Cancel

Figure 24 Wizard: Serial Ethernet: Quality of Service Parameters

- Page: Quality of Service Parameters Detail: see §12. Leave this page as it is, defaults are OK;
- Page: Pseudo Wire Label Selection: leave this page as it is, defaults are OK;
- Page: Review: The selected service ports will be shown: if ok, click Finish, the configuration load manager will be invoked.
- Page: Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info.

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

After this step, your customer applications connected to the front ports of the IFMs should be able to communicate over the Dragon PTN network.

b. Multidrop Consistency

Multidrop Consistency is a polling mechanism, within a Serial Ethernet service, between the master(s) port(s) and the slave ports to check whether the slaves are still alive. The master IFM is the IFM connected to the master application, the slave IFM is the IFM connected to the slave will see the poll requests to other slaves as well, but only answers the poll request addressed to itself.

- Checked (=default): the polling occurs every 500 ms. If a polling error occurs, the necessary alarms will be raised. If there are two masters, both masters poll independently of each other;
- Unchecked: no polling occurs at all. No alarm will be raised or nothing will be reported in HiProvision when a slave is missing.

Polling results can be monitored, see §4.6.5.

c. Advanced Mode – Bandwidth/Delay Optimization

At service creation, fine-tuning the bandwidth and delay through the network is done via the Advanced Mode parameter. It allows to group payload data into bigger packets, allowing more bandwidth efficiency (= resulting in less bandwidth). But grouping the payload into bigger packets costs more time, resulting in more delay.

Serial data is collected at the front ports and the payload data bits are buffered until one of the Advanced Mode events below is triggered. After the trigger, the payload data is packetized and sent over the Dragon PTN network.

- Advanced Mode:
 - Number of payload data bytes (=block) received at the front (Fixed Block size);
 - Periodic transmit timer expires (Fixed Transmit Timer);
 - Detection of a line termination character (Delimiter Line Termination Character);
 - Timeout occurs after the last received byte (Delimiter Timeout).

Each mode is explained more in detail below:

- Fixed Block Size (=default): Whenever 'N' payload data bytes are received at the front port, a packet including 'N' bytes will be sent through the Dragon PTN network. Configure 'N' in the Block Size field (default=8 bytes, range[1..1000] bytes). If 'N' is never received, the packet will be sent anyway after a specific timeout based on 'N' and the bitrate. A small 'N' results in an inefficient bandwidth but a low delay and vice versa.
- Fixed Transmit Timer: Configure the Transmit Timer (default = 10 ms, range [0-10000] ms). This timer is started whenever a serial data message enters a front port of the

7-SERIAL IFM. When the timer expires, a packet is transmitted through the Dragon PTN network and the timer is started again. This periodical process is repeated until the entire serial data message has been transmitted. The timer will only be started again when a new serial data message enters the 7-SERIAL IFM.

- Delimiter Line Termination (=LT) Character: Whenever an LT character is received at the front port, a packet will be sent through the Dragon PTN network. Configure the decimal ASCII value in the 'Line Termination Character (decimal)' field. The LT character will be sent as well. E.g. two common LT characters are Line Feed ('\n' = ASCII decimal 10) and Carriage Return ('\r' = ASCII decimal 13). Also fill out the Minimum Message Size (default=8 bytes, range[1..1000] bytes), needed to calculate the required bandwidth. Attention: filling out a higher (incorrect) minimal value than the real minimum could cause data loss.
- Delimiter Timeout: Whenever a Timeout occurs after the last received byte at the front port, a packet will be sent through the Dragon PTN network. Configure the Timeout (default = 100000 µs, range [0-100000] µs). Also fill out the Minimum Message Size (default= 8 bytes, range[1..1000] bytes), needed to calculate the required bandwidth. Attention: filling out a higher (incorrect) minimal value than the real minimum could cause data loss.

Fixed	Mode	De	limiter Mode
Advanced Mode	Fixed Block Size	Advanced Mode	Delimiter Line Termina
Transmit Timer	0 🗘 msec	Timeout	
Line Termination Character (decimal)	0 🖕	Line Termination Character (de	ecimal)
Block Size	8 🗸 bytes	Minimum Message Size	
Block Size	8 bytes	Minimum Message Size	Delimiter Timeout
Block Size Advanced Mode Transmit Timer	Fixed Transmit Timer	Advanced Mode	Delimiter Timeout
Block Size Advanced Mode Transmit Timer Line Termination Character (decimal)	Fixed Transmit Timer	Advanced Mode Advanced Mode Timeout Line Termination Character (de	Delimiter Timeout

Figure 25 Serial Ethernet: Advanced Mode - Bandwidth Optimization

4.2.2 Network Hardware → IFM Settings

No extra settings must be done.

4.2.3 Network Hardware → IFM-Port Settings

After configuring the service via the service wizard, all port settings of the endpoints in this service will be set according to the service configuration. Some individual port settings might need extra tuning or must be overruled (e.g. DCE or DTE behaviour, or other settings...) via:

- Network Hardware \rightarrow Devices \rightarrow 7-SERIAL \rightarrow 7-SERIAL Port:
 - Serial Ethernet Port Settings: values configured via the Serial Ethernet service wizard are visible, and can be overwritten manually if desired;
 - Generic Port Properties: Fill out these properties depending the use case you have. More information on these properties can be found in Ref. [8] in Table 2.
- Apply your changes and load these changes into the Dragon PTN network.

6 16	DASHBO	ARD 🕂 NETWOR		NS 🖧 PROTOCOL			(HARDWARE	DISCOVERY			
DEVIC	ES 🕂		- Q - ⇔ #	• • • • •	R ⊡ • ♥ •	< < 🌳 🕯	р 🚻 📜		PORT//Node4//EM-10/P1/	_	
Tv	pe	•	Name 🔺	Device ID	Status	Programmed Type	Measured Type	Address	Generic	_	~
•	XT-22	15-A	Node7	7			71-	NODE://Node7/	Туре	7-SERIAL Port	
H,	XT-22	15-A	Node8	8				NODE://Node8/	Name	P1	
H,	XT-22	10-A	Node1	1				NODE://Node1/	Info		
Η,	XT-22	10-A	Node2	2				NODE://Node2/			
Η,	XT-22	09-A	Node3	3				NODE://Node3/	Alarma Status	Halmanna	
14	XT-22	09-A	Node4	4				NODE://Node4/	CRC Errors	Unknown	
	N	SM-A	NSM		•			MODULE://Node4/	Generic Port Properties		
	C	M310-A	CSM-1		•			MODULE://Node4/	Bitrate		has
	A	P-A	PSU-1		•			MODULE://Node4/	Port Mode	RS232 Asyme	
	¥ 9-	L3EA-L	IFM-1		•			MODULE://Node4/	Port Role	DCC	
	¥ 9-	L3A-L	IFM-3		•			MODULE://Node4/	Tu Data	DCE	
	▶ 8-	FXS	IFM-5		•			MODULE://Node4/	IX Data Pu Data	L	
	4 7-	SERIAL	IFM-10		•			MODULE://Node4/	RTS Input	Disable	
۶.		7-SERIAL Port	P1					PORT://Node4/IFM	DTP least	Disable	
		7-SERIAL Port	P2		•			PORT://Node4/IFM	Dikinput	Disable	
		7-SERIAL Port	P3		•			PORT://Node4/IFM	DCD Input		× 🗆
		7-SERIAL Port	P4		•			PORT://Node4/IFM	CTS Mode	Fixed	▶ □
		7-SERIAL Port	P5		•			PORT://Node4/IFM	CTS Output	On	v 🗆
		7-SERIAL Port	P6		•			PORT://Node4/IFM	DSR Mode	Fixed	v 🗆
		7-SERIAL Port	P7		•			PORT://Node4/IFM	DSR Output	On	v 0
	→ 4-	GC-LW	IFM-8		•			MODULE://Node4/	DCD Mode	Fixed	v n
	▶ 4-	GCB-LW	IFM-9		•			MODULE://Node4/	DCD Output	Tixed	•
ш.	+ 2-	OLS	IFM-7		•			MODULE://Node4/	DED OULPUT	Un	× u
Ц.	▶ 16	-T1-L	IFM-6		•			MODULE://Node4/	CTC Status		
<u>ا ا</u>	XT-22	06-A	Node5	5				NODE://Node5/	DTR Status		_
_ ·	XT-11	04-A	Node6	6				NODE://Node6/	DSR Status		
L)	ExtDe	vType3	ExtDev100	100				NODE://ExtDev100/	DCD Status	[_
<u>ا ا</u>	ExtDe	vType3	ExtDev101	101				NODE://ExtDev101/	Serial Ethernet Port Settin	as	, v
<u>ا ا</u>	ExtDe	vТуре3	ExtDev102	102				NODE://ExtDev102/	Master	<u></u>	_
									Bitrate	1200	✓ bps□
									Data Bits	8	V
									Parity	None	v .
									Stop Bits	1	¥ 0

Figure 26 7-SERIAL Port Settings

4.3 Modify Service

After service creation, this service can be modified if needed via:

- ▶ Wizard: Dashboard → Configuration → Connections → Services → select service → \square ;
- Port settings, see §4.2.3;

4.4 Delete Service

After service creation, this service can be deleted if needed via Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services \rightarrow select service $\rightarrow \times$;

4.5 Troubleshooting: Test and Loopback

This service can be tested via loopback settings on IFM level and port level in the Network Hardware tab. See §14 for setting up loopbacks.

4.6 Monitoring

4.6.1 (Configuration) Network Hardware Tile

None.

4.6.2 (Configuration) Connections Tile

What has been configured via the service wizard can also be viewed via Dashboard \rightarrow Connections \rightarrow Services \rightarrow select service in the list. Some extra tabs (Service, Serial Ethernet) with service configuration data will be shown.

CAUTION: The configuration that you see here is the service configuration done via the service wizard. Port settings could be tuned manually via §4.2.3 and as a result could be different from these service settings. Always verify the port settings in §4.2.3 as well, to know the exact port setting in the live network.



Figure 27 (Configuration) Connections Tile: Serial Ethernet

4.6.3 (Monitoring) Network Tile

Live service data can be monitored via the Dashboard \rightarrow Network \rightarrow Services \rightarrow select service in the list. The service will be shown in the network drawing. Click log to show extra monitoring properties for this service. Click log to show the used nodes/links/tunnels.



Figure 28 (Monitoring) Network Tile: Serial Ethernet

4.6.4 Performance Counters

Go to Dashboard \rightarrow (Monitoring) Performance \rightarrow Counter Control \rightarrow Service Performance \rightarrow Serial Ethernet Monitoring. See figure below.

A detailed and similar monitoring set-up description (adding counters to graphs etc...) can be found in 'Port Performance' \rightarrow 'CSM Ethernet Port Monitoring' in Ref. [2Net] in Table 2.

Refresh						
;**; DASHBOARD DATABASE 🐼 SERVERS		IEN PERFORMANCE	ADVANCED		🖞 EVENTS 🛛 🚯 SOFTWARE 🗼 PROTO	COLS
COUNTER CONTROL 🕹 🙋						
Display Name			M	odule Information		
PORT PERFORMANCE TEST AND LOOPBACK PERFORMANCE						
SERVICE PERFORMANCE	Module	Data Rx Packet	Data Tx Packet	Data Rx Packet Error		
Circuit Emulation Monitoring Serial Ethernet Monitoring	MODULE://1/IFM-9/	C: 650354758 P: 650354757	C: 773812582 P: 773812582	C: 0 P: 0		
SYNCE PERFORMANCE OOS PERFORMANCE	MODULE://2/IFM-9/	C: 109157842 P: 109157841	C: 124016449 P: 124016449	C: 0 P: 0		
IEEE1588 PERFORMANCE V						
SERVICE COUNTERS				Port Information		
Service Na A Selected						
	Port	Seconds With Parity Errors	Seconds With Framing Errors	Seconds With Overrun Errors	Rx Good Characters	Tx Good Characters
Sanvisas	PORT://1/IFM-9/P1/	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0
Services	PORT://2/IFM-9/P2/	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0
	PORT://2/IFM-9/P3/	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0	C: 0 P: 0

Figure 29 Performance Counters: Serial Ethernet Monitoring

Field	Values	Description			
Module	value	Monitored module			
Data Rx Packet (ingress)	packets	The number of received data packets.			
Data Tx Packet (egress)	packets	The number of transmitted data packets.			
Data Rx Packet Error (ingress)	packets	The number of received erroneous data packets. The packets had for example a CRC error.			
Note: Click the Refresh button for the latest results; 'C' value in cell = current value; 'P' value in cell = previous value;					

Table 4 Services: Serial Ethernet Monitoring 'Module' Fields

Table 5 Services: Serial Ethernet Monitoring 'Port' Fields

Field	Values	Description
Port	value	Monitored port
Seconds With Parity Errors (ingress)	seconds	increasing = NOT OK: The total amount in seconds that frames with parity errors were received
Seconds With Framing Errors (ingress)	seconds	increasing = NOT OK: The total amount in seconds that frames with framing errors were received
Seconds With Overrun Errors (ingress)	seconds	increasing = NOT OK: The total amount in seconds that buffer overrun errors occurred
Rx Good Characters (ingress)	characters	The number of valid or good received characters. A good character contains 8 bits and has no errors in it. Character validation is based on start/stop/parity bits.
Tx Good Characters (egress)	characters	The number of valid or good transmitted characters. A good character contains 8 bits and has no errors in it. Character validation is based on start/stop/parity bits.

Note: Click the Refresh button for the latest results;

Note: Clear the counter values by disabling and enabling the BERT via the IFM/port settings in the network hardware tile; **Note**: 'C' value in cell = current value; 'P' value in cell = previous value;

4.6.5 Multidrop Consistency

The following poll results are reported per master and per slave in HiProvision and visible via the Dashboard \rightarrow Network \rightarrow Services \rightarrow Click Service in the list \rightarrow Click Serial Ethernet tab. The polling results can be updated via the refresh button \bigotimes .

- Poll Error Seen by Master:
 - False: Everything OK, slave IFM has answered the poll request of the master IFM;
 - True: Failure, slave IFM has not answered the poll request of the master IFM;
- Poll Error Seen by Slave:
 - False: Everything OK, the slave IFM receives all the poll requests to other slaves as well;
 - True: Failure, the slave IFM does not receive at least one of the poll requests addressed to other slaves;
- Specific Poll Error Seen by Slave:
 - False: Everything OK, slave IFM has received a poll request of the master IFM;
 - True: Failure, slave IFM has not received the poll request of the master IFM;



Figure 30 Monitoring: Multidrop Consistency: Polling Results

	DASHE	IOARD SERV	VERS 📄 DATA	ABASE	NETWORK HARDWA			ede P	ERFORMA	NCE SOFTWARE
2	T	2 7 6	1 같 🕯							
		Status	Severity	Created 💌	Last Occurrence	Address ID	Address Name	Code	Count	Message
Þ	î	Created	Major	26/09/2017 15:36:34	26/09/2017 15:36:34	PORT://1/IFM-5/P1/	PORT://1/IFM-5/P1/	5.18	1	1-10G-LW: Loss of Signal.
	1	Created	Major	26/09/2017 15:36:28	26/09/2017 15:36:28	PORT://2/IFM-5/P1/	PORT://2/IFM-5/P1/	4.1	1	Cabling fault detected on port.
	(Created	Major	26/09/2017 15:36:28	26/09/2017 15:36:28	PORT://1/IFM-5/P1/	PORT://1/IFM-5/P1/	4.1	1	Cabling fault detected on port.
	î	Created	Minor	26/09/2017 15:36:25	26/09/2017 15:36:25	SERVICE://SerialEthernet/	SERVICE://SerialEthernet/Serial Ethe	11.9	1	Serial Ethernet : Multidrop Consistency alarm.
	î	Created	Major	26/09/2017 15:36:24	26/09/2017 15:36:24	PORT://2/IFM-5/P1/	PORT://2/IFM-5/P1/	5.18		1-10G-LW: Loss of Signal.
	8			00/00/00/2015 00 40	00/00/00/7 45 00 46	ensince the shell of	Multidrop Cor	nsisten	cy Ala	rm

Figure 31 Multidrop Consistency Alarm

4.6.6 HiProvision Add-on: Generic Reporting Engine

Service and port reporting information is available via the Reporting Engine Add-on, see Ref.[24] in Table 2.

4.6.7 MAC Monitor

The MAC Monitor will show the MAC address table of the selected Node (=CSM). This table includes all MAC addresses used on this device except for the MAC addresses that are used in a point-to-point tunnel. More information can be found in Ref. [2Eth] in Table 2.

MAC Monitor via: Dashboard \rightarrow (Monitoring) Network \rightarrow Services \rightarrow \square ;

5. CIRCUIT EMULATION

5.1 General

A Circuit Emulation service (=CES) is a point-to-point packetized TDM service. The following CES types are available:

- SATOP (=Structured Agnostic TDM over Packet) \rightarrow transport all channels transparently;
- ► CESoPSN (=CES over Packet Switched Network) → customized channel transport;
- Differential Clocking / Hitless Switching / Single Path;

The following protocols are supported:

E1 / T1 / C37.94 / Serial / 2W/4W Voice / CODIR / Optical Low Speed Serial.

The involved IFMs convert the legacy data from the legacy links into MPLS-TP packets over the Dragon PTN network, and vice versa. The destination IFM must also compensate for possible jitter and network delays to keep everything synchronized, e.g. via SyncE. The example figure below shows a E1/T1 example but is similar for other protocols.



Figure 32 1 General Circuit Emulation Example with E1/T1

5.2 Configure Service

5.2.1 Service Wizard

Click Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services $\rightarrow \pm$ to open the services wizard. See figure below.

	CASHBOARD							
	LINKS				م	λ 53 l≓	fi 🎽 😪	
	Link Name	-	Link Type					
	PORT://Node2/IFM	1-5/P1/ - PORT://	Ethernet 10G	^				Node3
	PORT://Node2/IFM	1-1/P2/ - PORT://	Ethernet 1G	v			1	<i>~</i>
		×					Node4	
	SuperRing	Iunnel Type	SubRing Col	or				
Services	Supering	cogical rang						
	SERVICES + /	Create Service	M Servi	се Туре		Node5)	

Figure 33 Create Services

The services wizard opens. The list below summarizes every page in the wizard:

Note: The referred IFM manuals in Table 2 often show a lot more info and pictures on the mentionned parameters and settings below. Read the manual of involved IFMs as well!

- Page: Information: Click Next>>;
- Page: Service Name and Type Selection: Example screen below with E1. An overview of all screens of this page per protocol, can be found in the table below.

Steps	Service Wizard - Service Name and Type Selection							
Information	Canica Nama							
 Service Name and Type Selection 								
Service Endpoint Selection	Service Type Circuit Emulation							
Tunnel Selection	Circuit Emulation							
Circuit Emulation Parameters	Protocol E1							
Quality of Service Parameters	Usage SATOP SATOP or							
Quality of Service Parameters Detail	Differential Clocking CESoPSN							
Pseudo Wire Label Selection	Hitless Switching							
Review	Single Path							
Load	Make sure you adjust the Clock Source of the ports used by this service.							
	<< Prev Next >> Cancel							

Figure 34 Service Type: Circuit Emulation Example Screen with E1 – SAToP

- Service Name: enter a name for your service.
- Service Type: Circuit Emulation;
- Protocol: E1 / T1 / C37.94 / Serial / 2W/4W Voice / CODIR / Optical Low Speed Serial. The table below shows each protocol screen. The second table shows a summarized overview and needed parameters in this page per protocol.

Service Name and Type Selection Screen	Service Name and Type Selection Screen
Circuit Emulation	Circuit Emulation Protocol T1 Usage SATOP Differential Clocking Hitless Switching Single Path Make sure you adjust the Clock Source of the ports used by this service. Circuit Emulation Protocol Serial
Usage CESoPSN Mux/Demux Differential Clocking Hitless Switching Single Path Make sure you adjust the Clock Source of the ports used by this service.	Usage SAToP Mux/Demux Image: Clocking Image: Cl
C37.94 Number Of Timeslots 12	Serial Synchronisation Interface Type RS232 Bitrate 1,200 Pin Layout
Circuit Emulation Protocol 2W/4W Voice Usage CESoPSN Only Differential Clocking CESoPSN Hitless Switching Single Path Make sure you adjust the Clock Source of the ports used by this service. 2W/4W Voice Mode 4 Wire Multidrop	Circuit Emulation Protocol CODIR Usage SAToP Mux/Demux Differential Clocking Hitless Switching Single Path Make sure you adjust the Clock Source of the ports used by this service.
Circuit Emulation Protocol Optical Low Speed Serial Usage SAToP Uifferential Clocking Hitless Switching Single Path Make sure you adjust the Clock Source of the ports used by this service. Optical Low Speed Serial Synchronisation Bitrate 307,200 bps FM0 Coding Disabled	

Table 6 Service Name and Type Selection: Protocol Screens Overview

Protocol	Supported IFMs (Refs. in Table 2)	Supported Ports	Usage: SAToP	Usage: CESoPSN	Mux/ Demux (SAToP)	Diff. Clocking	Hitless Switching (+Single Path)	Specific Parameters
E1	2-OLS, 2-C37.94, 4-E1-L/4-T1-L, 16-E1-L/16-T1-L	E1	√	1		~	\checkmark	Page: Circuit Emulation Parameters: Short Haul on E1 Ports
T1	2-OLS, 2-C37.94, 4-E1-L/4-T1-L, 16-E1-L/16-T1-L	T1	√	1		~	\checkmark	Page: Circuit Emulation Parameters: Short Haul on T1 Ports
C37.94	2-OLS, 2-C37.94, 4-E1-L/4-T1-L, 16-E1-L/16-T1-L	C37.94, E1, T1 (at least one C37.94 port needed)	~	1	\checkmark	1	~	Number of Timeslots: for CESoPSN, the number of timeslots that must be transported can be selected. Circuit Emulation Parameters: Short Haul on E1/T1 Ports
Serial	7-SERIAL	7-SERIAL	✓	1	✓		1	 Synchronisation: Synchronous / Asynchronous Interface Type: RS232, RS422, RS485 (Async.), X.21(Sync.), V.35 (Sync.) Bitrate: see §8 Pin Layout (for X.21, V.35): Full, Optimized. Full means that all signals are used, Optimized means that a reduced set of the signals is used → See Ref.[8] for more info.
2W/4W Voice (See also §6)	4-2/4WEM	4-2/4WEM		~			~	 2W/4W Mode: transportation mode 2W or 4W mode selector. Multidrop: check if you want to use multidrop (=combining several PTP services with the same master), unchecked means one PTP service. Page: Service EndPoint Selection (See also §6): Master/Slave: if multidrop is used, one port must be indicated as master.

Table 7 Service Name and Type Selection: Protocol Overview

Protocol	Supported IFMs (Refs. in Table 2)	Supported Ports	Usage: SAToP	Usage: CESoPSN	Mux/ Demux (SAToP)	Diff. Clocking	Hitless Switching (+Single Path)	Specific Parameters
								 Echo On Master: allows inter-slave communication when using multidrop. Send Condition: condition when to send Voice data, E&M is always sent.
CODIR	CODIR	CODIR	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
Optical Low Speed Serial	2-OLS	2-0LS		✓			✓	 Synchronisation: Synchronous / Asynchronous Bitrate: see §8 FM0 Coding (in Sync. mode): Disabled (=default): Normal data (without encoding) is used; Enabled: FM0 encoded data is used. With FM0 Coding enabled, a 0-bit (='space') will always have an extra transition halfway its bit time (=2 phases = biphase) whereas a 1-bit will have no transition within its bit time. M0 Encoded Data FM0 Encoded Data
- Usage:
 - SATOP (=default): one-to-one mapping of timeslots, protocol data is transported transparently. Use this type when a constant 'Differential Delay' is important for your application;
 - CESoPSN: customized mapping of timeslots, only transmit used timeslots with real payload;
- Mux/Demux (only for SATOP): mux/demux multiple services to/from a single E1 port.
 - unchecked (=default): Not possible to mux this service with other services to one E1 port.
 - checked: Possible to mux/demux this service with other services to/from an E1 port. These muxed/demuxed services can either have the same or a different protocol. E.g. Codir, Serial and C37.94 frames can be muxed together to that E1 port1.
 - The muxing/demuxing port will always be **port1** of a 4-E1-L IFM.
 - V.110 (for Serial protocol only):
 - Asynchronous: V.110 is always used to transport serial streams over Dragon PTN;
 - Synchronous: V.110 usage depends on the selected bitrate (see §10);
 - A maximum of 4 point-to-point SAToP services that have checked Mux/Demux, can be muxed/demuxed to/from that same E1 port1.
 - Per extra muxed service to that E1 port1, an extra available E1 port on that 4-E1-L IFM is required and will be disabled for other service connections. E.g, a second muxed service disables the next available port (starting with the lowest port number first) on that 4-E1-L IFM.
 - **NOTE:** After having programmed a muxed service to port1 on the 4-E1-L IFM, this port 1 can only become available again after removing all the muxed services that were programmed to that port1.
- Differential Clocking (when the Clock Source field = adaptive/differential):
 - unchecked (=default): adaptive clocking
 - checked: differential clocking;

Note: The referred IFM manuals in Table 2 often show a lot more info on Differential Clocking, Clock Source settings etc.. (Synchronization / Clock Distribution / Network Timing). So make sure to read the required IFM manual as well.

- Hitless Switching:
 - unchecked (=default): possible data and/or synchronisation loss when switching from active to backup path or vice versa, e.g. because of cable break;
 - checked: no data and/or synchronisation loss when switching from active to backup path or vice versa, e.g. because of cable break;
- Single Path (Hitless Switching): The service can already start up with only one link up, coming out of a two-links-down situation with single path enabled. Do not use this option when 'Differential Delay' is important for your application.

- Specific Parameters per protocol: see previous table.
- Page: Service Endpoint Selection:
 - Select the front ports on the involved IFMs that must be part of this service. Make sure to select the ports in nodes that are linked to a same tunnel. Selecting ports can be done in two ways.
 - Via the table. The tree view can be expanded/collapsed via clicking the expand/collapse buttons. Just click the Selected checkbox to select the desired port;
 - Via clicking the node icons in the network drawing, see general example in §13;
 - (for 2W/4W Voice only:) For a 2W/4W Voice service in multidrop, master(s)/slave(s) must be selected. By default, the end-point is set as slave but can be changed to master by clicking the cell, see figure below. In some network drawings the master will be indicated by see also figure below and §6.



Figure 35 Master/Slave Setting for 2W/4W Voice

Note: Per port, an extra Info field can be filled out later on via Network Hardware \rightarrow Devices \rightarrow Select Node/IFM/Port \rightarrow Generic \rightarrow Info.

- Page: Tunnel Selection: Select the desired tunnels for your service. More info on tunnels, tunnel selection and allowed tunnels can be found in §11;
- Page: Hitless Tunnel Selection (only visible with 'hitless switching' enabled): if no tunnel is listed, it means that no point-to-point tunnel without protection is available anymore. This type of tunnel is needed to create the protection path for hitless switching. Create a new point-to-point tunnel without protection first.
- Page: Circuit Emulation Parameters:
 - Port Parameters (only on E1/T1 ports \rightarrow in E1, T1, C37.94 protocol):
 - Short Haul Link: Long E1/T1 links (>200m, Long Haul) have more E1/T1 signal attenuation than shorter E1/T1 links (<200m, Short Haul). As a result, the E1/T1 signal levels or sensitivity ('0' or '1') on the receiver side depends on the usage of Long Haul/Short Haul links. Check this parameter for Short Haul links and uncheck</p>

it (=default) for Long Haul links. This parameter can be set now at service creation or later on at port level in the IFM \rightarrow port settings.

- Bundle Parameters: fine-tuning of parameters, defaults are OK. More info on these parameters can be found in the referred manuals above.
 - TDM Frames per Packet
 - Jitter Buffer Size
 - Maximum Network Path Delay Difference (only with 'Hitless Switching')
 - Calculated Packetization and Depacktization Delay.

Steps	Service Wizard - Circuit Emulation Parameters								
Information Service Name and Type Selection Service Endpoint Selection Tunnel Selection	Port Parameters PORT://Node1/IFM-8/P3/ PORT://Node2/IFM-10/P3/ Short Haul Link (< 200m)								
Hitless Tunnel Selection	Bundle Parameters								
✓ Circuit Emulation Parameters	TDM Frames per Packet	4 🗘							
Quality of Service Parameters	Jitter Buffer Size	4000 🗘 µsec							
	Maximum Network Path Delay Difference	320 🗘 µsec							
Quality of Service Parameters Detail	Calculated Packetization and Depacketization Delay	4540 µsec							
Pseudo Wire Label Selection									
Review									
land	Only with 'Hitless Switching'								
Load									
	<< Prev	Next >> Cancel							

Figure 36 Circuit Emulation Parameters

- Page: Quality of Service Parameters: QoS (=Quality of Service) is a service traffic handling process in order to provide sufficient service delivery and bandwidth for critical applications. HiProvision provides a few QoS mechanisms, based on the parameters below.
 - Priority (range [0..5], default = 4): priority that will be assigned internally in the Dragon PTN node. 0 indicates the lowest priority (=least important). In the Dragon PTN network, higher priority traffic will be processed before lower priority traffic so that high priority traffic will not be compromised.
 - Frame Size: The CES IFMs convert their incoming signals from the LAN side into Ethernet packets towards the CSM. The Frame Size is the size of these Ethernet packets. The better you know the traffic (and its frame sizes) in your network, the better you can tune the consumed bandwidth on the WAN side. The Frame Size indicates the Ethernet frame size = payload + Ethernet overhead.
 - Frame Size is read-only;
 - Frame Sized depends on:
 - ▶ Page: Service Name and Type Selection → Differential Clocking on or off;
 - ▶ Page: Circuit Emulation Parameters → TDM Frames per Ethernet Packet.

Steps		Service Wizard - Qua	lity of Service I	Paramete	rs		
Information	^						
Service Name and Type Selection							
Service Endpoint Selection							
Tunnel Selection	L	Priority			4	\Diamond	2
Circuit Emulation Parameters	L	Frame Size			1	82	bytes
✓ Quality of Service Parameters							
Quality of Service Parameters Detail							
Pseudo Wire Label Selection							
Review							
Load	~						
				<< Prev	Next >>		Cancel

Figure 37 Wizard: CES: Quality of Service Parameters

- Page: Quality of Service Parameters Detail: see §12. Leave this page as it is, defaults are OK;
- Page: Pseudo Wire Label Selection: leave this page as it is, defaults are OK;
- Page: Review: The selected service ports will be shown: if ok, click Finish, the configuration load manager will be invoked.
- Page: Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info.

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

After this step, your customer applications connected to the front ports of the IFMs should be able to communicate over the Dragon PTN network;

5.2.2 Network Hardware → IFM Settings

No extra settings must be done.

5.2.3 Network Hardware → IFM-Port Settings

Go to Dashboard \rightarrow Network Hardware \rightarrow Device \rightarrow IFM \rightarrow used ports \rightarrow Circuit Emulation \rightarrow

Optimise Jitter Buffer (default = True): The default is OK for most applications. In some special cases, tuning this parameter might be necessary.

CAUTION: If differential delay is important and must be as low as possible then make sure to leave Optimise Jitter Buffer = True

CAUTION: If Optimise Jitter Buffer = True, the jitter buffer will be reset for optimal processing 15 or 120 (*) seconds after one of the events below occur. This reset will cause a minimal loss of data:

- CES service creation/modification;
- CES service recovery after a possible service failure;
- Modifying clocking port parameters (clock source, bundle id for E1/T1) in HiProvision;
- (*): 120 seconds for 16-E1-L/16-T1-L IFMs and 15 seconds for the other IFMs.
- Send Data: It can be configured when an adaptive (*) SATOP service starts sending data.
 Immediately (=default): Start sending immediately;
 - After Clock PreLocked: after 120 seconds for 16-E1-L/16-T1-L IFMs, after 15 seconds for the other IFMs;
 - After Clock Locked: after the 'Clock Recovery State' field on port level is in the 'Locked' state;
 - **NOTE:** (*): One of the both service ports has property Clock Source set to 'Adaptive/Differential'

NOTE: Make sure that both ports of the service are configured the same.

- Clock Source: RX Clock, Adaptive/Differential, Internal Clock. This parameter needs to be tuned according to the description in the IFM manual, depending on the desired clocking and timing scenarios.
- ► CESOPSN Clock Source Bundle Id: Each CESOPSN service that is created in HiProvision will automatically get a 'bundle ID' assigned. The value of this 'Bundle ID' can be found in Dashboard → Network → Services → Monitoring Properties → Circuit Emulation (see figure below). This value must be filled out in the 'CESOPSN Clock Source Bundle ID' port property to indicate to which CESOPSN service this port must slave its clock (=adaptive).



Figure 38 Find and Fill out the CESoPSN Bundle ID

▶ For 2W/4W-Voice service: extra parameters might be tuned, see §6.

5.3 Modify Service

After service creation, this service can be modified if needed via:

- ▶ Wizard: Dashboard → Configuration → Connections → Services → select service → \square ;
- Port settings, see §5.2.3;

5.4 Delete Service

After service creation, this service can be deleted if needed via Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services \rightarrow select service $\rightarrow \times$;

5.5 Troubleshooting: Test and Loopback

This service can be tested via loopback settings on IFM level and port level in the Network Hardware tab. See §14 for setting up loopbacks.

5.6 Monitoring

5.6.1 (Configuration) Network Hardware Tile

None

5.6.2 (Configuration) Connections Tile

What has been configured via the service wizard can also be viewed via Dashboard \rightarrow Connections \rightarrow Services \rightarrow select service in the list. Some extra tabs (Service, Pseudo-Wires, Circuit Emulation) with service configuration data will be shown.



Figure 39 (Configuration) Connections Tile: Circuit Emulation Service

5.6.3 (Monitoring) Network Tile

Live service data can be monitored via the Dashboard \rightarrow Network \rightarrow Services \rightarrow select service in the list. The service will be shown in the network drawing. Click P to show extra monitoring properties for this service. Click P to show the used nodes/links/tunnels.

DEVICES LINKS TUNNELS SERVICES PROTOCOLS	LAYERED VIEW 🔍 🔍 🔀 🦀 🧶 💼 - 📾 🗗 🗗 🗗 🗗 🗗 🏛
SERVICES Service Name Service Type Displayed Status EI-CESOPSN Circuit Emulation X	SERVICE LAYER
	Pseudo-Wires Circuit Emulation Alarms Bundle ID TDM Frames per Packet Total Buffer Size (usec) Packetization and Depacketization Delay (usec) Average Network Bandwidth (kbps) Jitter Buffer 300 49152 2896 1712
	Pseudo-Wires Circuit Emulation Alarms Address L-bit Alarm R-bit Alarm Loss of Ethernet Packet MOQUIL Er/Model //EMAC Ealer False False
	MODULE://Node/Irl/M-4/ Talse T

Figure 40 (Monitoring) Network Tile: Circuit Emulation

5.6.4 Performance Counters

Go to Dashboard \rightarrow (Monitoring) Performance \rightarrow Counter Control \rightarrow Service Performance \rightarrow Circuit Emulation Monitoring. See figure below.

A detailed and similar monitoring set-up description (adding counters to graphs etc...) can be found in 'Port Performance' \rightarrow 'CSM Ethernet Port Monitoring' in Ref. [2Net] in Table 2.



Figure 41 Services: Circuit Emulation Monitoring

Table 8 Services: Circuit Emulation Monitoring 'Module' Fields

Field	Values	Description						
Module	value	Monitored module						
Data Rx Packet	packets	The number of received data packets.						
Data Rx Packet Error	packets	The number of received erroneous data packets. The packets had for example a CRC error.						
Data Rx Information Bandwidth	kbps	The reserved module bandwidth for only the payload data on the ingress side. This value remains the same until the HiProvision bandwidth configuration changes.						
Data Tx Packet	packets	The number of transmitted data packets.						
Data Tx Information kbps Bandwidth		The reserved module bandwidth for only the payload data on the egress side. This value remains the same until the HiProvision bandwidth configuration changes.						
Data Reserved Full Bandwidth	kbps	The reserved full module bandwidth including both overhead and payload data. This value remains the same until the HiProvision bandwidth configuration changes.						
Note: Click the Refres	Note: Click the Refresh button for the latest results; Note: Clear the counter values by clicking 🔯;							

Note: 'C' value in cell = current value; 'P' value in cell = previous value;

Table 9 Services: Circuit Emulation Monitoring 'Bundle' Fields

Field	Values	Description	Curative Action
Bundle	value	The monitored bundle or stream	
Total Buffer Initial Fill Level	μs	The start level of the buffer right after resetting/rebooting the IFM	
Total Buffer Size	μs	This is the reserved jitter buffer size. It is the absolute maximum that a buffer level can reach. The size is based on the configuration parameters. If the current buffer level would increase above the buffer size (which is not possible), a buffer overrun occurs and packets are lost.	verify the Service wizard → Circuit emulation parameters / QoS configuration in HiProvision
Total Buffer Minimum Level	μs	The minimum (current) level that has been reached so far	no drifting, and close to minimum size (0) due to network jitter or hitless path interruption, verify buffers configuration, buffer too small?
Total Buffer Current Level	μs	The current fill level of the buffer	if this level is drifting, verify clocking settings master/slave
Total Buffer Maximum Level	μs	The maximum (current) level that has been reached so far	no drifting, and close to maxsize (=size buffer) due to network jitter, verify buffers configuration, buffer too small?
Total Buffer Underrun	count	The number of times that a buffer has underrun. A buffer underrun occurs when the buffer is filled slower than packets in the buffer are processed. As a result, the buffer will finally run empty which results in an underrun. If an underrun occurs, the buffer will be reset to the initial level.	verify clock settings master/slave, jitter buffer might be too small verify the Service wizard → Circuit emulation parameters in HiProvision

Field	Values	Description	Curative Action
Total Buffer Overrun	count	The number of times that a buffer has overrun. A buffer overrun occurs when the buffer is filled faster than packets in the buffer are processed. As a result, the buffer fill level will grow up to the maximum or buffer size, and finally will overflow or overrun. After an overrun, the buffer will be reset to the initial level.	verify clock settings master/slave, jitter buffer might be too small verify the Service wizard → Circuit emulation parameters in HiProvision.
Ethernet Rx Frames	frames	The number of received Ethernet frames.	
Ethernet Rx Sequence Number Drop Errors	frames	The number of received Ethernet frames that were dropped due to an invalid sequence number.	
Hitless Sequence Error	count	The number of times that a sequence number error occurred	
Hitless Overflow	count	The number of times that the hitless buffer (in FPGA) overflow occurred	verify the Service wizard → Circuit emulation parameters / QoS configuration in HiProvision
Hitless Timeout	count	The number of times that a timeout occurred on one of the hitless paths. E.g. pulling out the WAN link of the hitless path will increase the counter by one.	
Reserved Information Bandwidth	kbps	The reserved bundle bandwidth for only the payload data. This value remains the same until the HiProvision bandwidth configuration changes.	
Reserved Full Bandwidth kbps		The reserved full bundle bandwidth including both overhead and payload data. This value remains the same until the HiProvision bandwidth configuration changes.	
Note : Click the Refresh butto	on for the lates	t results; Clear the counter values by clicking 💽;	'C' value in cell = current value; 'P'

value in cell = previous value;

5.6.5 HiProvision Add-on: Generic Reporting Engine

Service and port reporting information is available via the Reporting Engine Add-on, see Ref.[24] in Table 2.

6. CIRCUIT EMULATION: EXTRA INFO ON 2W/4W-VOICE

6.1 General

A point-to-point '2W/4W Voice' service can be configured via creating a Circuit Emulation Service (=CES) with protocol type '2W/4W Voice' and Multidrop unchecked. Check the multidrop checkbox if you want a multidrop service. The multidrop behavior is accomplised via combining individual PTP services with the same master, see further. The E-Signal (E&M signaling) will be transmitted together with the voice data in the '2W/4W Voice service. A maximum of 4 CESs can be configured per 4-2/4WEM IFM if only PTP services are configured. A multidrop service can configure up to 15 PTP services on the same master voice port with a total maximum of 16 CESs per IFM. The table below shows more settings that influence the 2W/4W Voice and E&M signaling behavior.

Table 10 2W/4W Voice E&M Settings

Туре	Parameter	Values	Description				
General	•	·					
Service	Usage	CESoPSN					
Service	Hitless Switching (optional)	No (=default) / Yes	Feature within CESoPSN that provides a safe redundant connection. Yes : switching between active and protection path stays synchronized.				
Service	Single Path (optional)	No (=default) / Yes	Subfeatuer of Hitless Swithcing: Yes: The service can already start up with only one link up, coming out of a two-links-down situation with single path enabled. Do not use this option when 'Differential Delay' is important for your application.				
Service	Mode	4 Wire (=default) / 2 Wire	Mode of voice transportation, via 4 wires or 2 wires.				
Service	Multidrop	No (=default=PTP) / Yes	No = PTP = Point-to-Point. Yes = Multidrop: Accomplished by creating different PTP services that share the same master.				
Service \rightarrow Port	Master/Slave	Slave = default	If multidrop = Yes, at least one port must be configured as master whereas maximum 15 ports can be configured as slave.				
Hardware → Port Property	Clock Source	See Ref. [10] in Table 2	See Ref. [10] in Table 2				
Voice							
Service → Port	Echo On Master	Off (=default) / On	If Multidrop = Yes, Echo on Master will be configurable. This feature allows slaves to communicate with each other. If Echo on Master = On, slaves can communicate with each other.				
Service → Port	Send Condition (only for Voice, not for E&M)	 Active E Signal Rx signal > 50 mV Rx signal > 10 mV (=default) Never send 	If Multidrop = Yes, the condition for sending or transmitting voice signals over the Dragon PTN network can be configured to one of the indicated values. NOTE: the Send Condition does not influence E&M, E&M will always be transmitted. For 2-Wire Voice, it is advised to use 'Rx signal > 50 mV'.				
Hardware → Port Property	Tx Signal Level	-15 dB → +18 dB	0 dB = Default. Tx Signal can be amplified in the indicated range in steps of 3 dB.				
Hardware → Port Property	Rx Signal Level	-15 dB → +18 dB	0 dB = Default. Rx Signal can be amplified in the indicated range in steps of 3 dB.				
E&M Signaling							
NOTE: the Send	Condition has only im	pact on the Voice/Da	ta. E&M will always be transmitted.				
Service \rightarrow Port	Echo On Master	Off (=default) / On	If Multidrop = Yes, Echo on Master will be configurable. This feature allows slaves to communicate with each other. If Echo on Master = On, slaves can communicate with each other.				
Hardware → Port Property	E&M Signaling	Туре 2, 3, 4, 5	Select the E&M signaling type.				
Hardware → Port Property	M Signal Mode	Transparent / Fixed	Transparent: The E-signal on the other side is transmitted transparently to the M output. What comes in on the E side of the other side, goes out transparantly on the M side. If M = transparent on the slave, the E-signal on the master comes out transparently on the M of the slave. If M = transparent on the master, the E- signal of any of the slaves goes out transparently on the M of the master Fixed : The M output will be fixed Off or On depending the 'M Signal Ouput' setting.				
Hardware → Port Property	M Signal Output	Off/On	The M output will be fixed Off or On.				

;	\ , D		ASE 🔯 SI	RVERS	NETWORK I	HARDWARE			DUTS 🕂 NETWORK 🔤	IN PERFORMANCE
DE	VICES	s + 🖉 🗵 🖨	- Q -	⇒ ⇔ <	🕪 🍁 😵	• 🕅 🔟	- • - <	、	PORT://Node1/IFM-10/P1/	
Ľ		🚺 🖬 🖡 s 🔘							Generic	V
	Туре	2	Name	Device ID	Status	Program	Measured	Address	lype	4-2/4WEM Port
		XT-2210-A	Node1	1	•			NODE://Node1/	Info	
		CSM310-A	CSM-1					MODULE://No		
		CSM310-A	CSM-2					MODULE://No		
		+ 4-GC-LW	IFM-1					MODULE://No	Alarm Status	Unknown
		▲ 4-2/4WEM	IFM-10					MODULE://No	CRC Errors	
۱.		4-2/4WEM Port	P1					PORT://Node1/	Circuit Emulation	~
		4-2/4WEM Port	P2					PORT://Node1/	Clock Source	Adaptive / Differential 🍟 🗆
		4-2/4WEM Port	P3		Circu	uit Emula	tion Para	meters de1/	CESoPSN Clock Source	Bundle ID 0
		4-2/4WEM Port	P4					neters	Clock Recovery State	
		 6-GE-L 	IFM-2					MODULE://No	CESoPSN	True 🗸 🗆
		8-FXS	IFM-3		•			MODULE://No	Link Enabled	False 💙 🗆
		▶ 4-E1-L	IFM-4		•			MODULE://No	Optimise Jitter Buffer	True 🗸 🗆
		7-SERIAL	IFM-5					MODULE://No	Specific	Ý
		> 2-OLS	IFM-6		•			MODULE://No	Port Mode	
		2-C37.94-E1-L	IFM-9		Vo	ice and E	&M Para	meters	E & M Signaling	Type 4
		4-CODIR	IFM-7					TYO	M Signal Mode	Transparent V
	•)	XT-2209-A	Node2	2				NODE://Node2/	M Signal Output	0#
	•)	XT-2209-A	Node3	3				NODE://Node3/	E Signal Status	
		XT-2210-A	Node4	4				NODE://Node4/	M Signal Status	
									Tx Signal Level	
									Ry Signal Level	
									Sond Condition	
									Send Condition	- · ·
									lest And Loopback	Ý

Figure 42 Hardware → Port Property: Voice and E&M

6.2 CES: CESoPSN (Point-to-Point)

CESOPSN (=Circuit Emulation Service over Packet Switched Network) is a point-to-point service between two voice ports that uses the timeslots of an E1 frame to transport the data over the MPLS-TP Dragon PTN network. Such a PTP service can be configured per port. This service transports the voice data into the first timeslot and the E&M signaling in the second timeslot of an E1 frame.

The destination module will receive the transported timeslots from the Dragon PTN network and regenerate the voice data and the E&M signaling from it to finally output it on its voice port. Indicate in the service creation if you want to use 4 or 2wire. Make sure that the Multidrop setting disabled. Each end-point or port must be located in a different node.

6.3 CES: CESoPSN (Multidrop)

A multidrop behavior between one master and 'n' (maximum 15) slaves is accomplished by creating 'n' individual CESoPSN Point-to-Point services in HiProvision, between each slave port and the same master port. All these point-to-point (=PTP) services within that multidrop:

- must be configured with the multidrop setting enabled;
- must have the same wire type usage, either 2 or 4wire;
- have exact one (shared) master and one slave The first created PTP service within that multidrop, defines the master. The 2nd, 3rd... PTP service that select the same master at service creation, will be part of that resulting multidrop service;
- Must have the master in a different node than the slave nodes.

CAUTION: Unused ports in a 2-Wire Voice multidrop service must be terminated with a 600Ω impedance.



The figure below shows a multidrop example between one master and three slaves.

Figure 43 Multiple PTP Services with Same Master result in Multidrop Behavior

6.4 Tone Generation/Level Metering

It is possible to generate test tone signals, see §14.4

7. VOICE

7.1 General

Supported IFMs: 8-FXS (for analog voice), all IFMs with Ethernet ports (for voice over IP). More information on these IFMs can be found in Ref. [8] in Table 2.

A Voice service requires at least one analog (8-FXS) and one Ethernet (4-GC-LW,) port.

The Voice service can set up connections between both analog phones (via 8-FXS) and SIP elements (client, server, trunk) over the Dragon PTN network. SIP elements can be connected to the Dragon PTN network via Ethernet IFMs (e.g. 4-GC-LW, ..., 9-L3A-L). This service operates VLAN based and is routable (with Gateway IP address). Depending on where the call handling must be done, two different modes can be selected:

- Remote extension (FXO Gateway): call handling via FXO gateway to analog public or private telephone networks;
- SIP-server: call handling done in dedicated external SIP server;

A general analog Voice service example can be found in the figure below:



Figure 44 Analog Voice + Voice Over IP Example: Remote Extension



Figure 45 Analog Voice + Voice Over IP Example: SIP Server

7.2 Configure Service

7.2.1 Service Wizard

Click Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services $\rightarrow \pm$ to open the services wizard. See figure below.

	CASHBOARD	Cor	NNECTIONS		
	LINKS				० ० 🖾 📥 🎱 📽 🖹
	Link Name	▼ Link	Туре		
	PORT://Node2/IFM-5/P1/ - PORT:	// Ether	rnet 10G	^	Node3
	PORT://Node2/IFM-1/P2/ - PORT;	// Ether	rnet 1G		
		// 51	110		Node4
	Tunnel Name 🔺 Tunnel	Туре	SubRing Color		
Services	SuperRing Logical	Ring			
	SERVICES Service Name Create Ser	M M	Service Type		Node5

Figure 46 Create Services

The services wizard opens. The list below summarizes every page in the wizard:

- Page: Information: Click Next>>;
- Page: Service Name and Type Selection:
 - Service Name: enter a name for your service.
 - Service Type: Voice;

Create Service Wizard		- 🗆 🗙
Steps	Service Wizard	- Service Name and Type Selection
Information		
Service Endpoint Selection	Service Name	Voice1
VLAN Selection	Service Type	Voice
VLAN Tagging/Untagging		
Tunnel Selection	Voice	
IP Configuration	VLAN ID	3 😡
Quality of Service Parameters	Mode	Remote Extension (FXO Gateway)
Quality of Service Parameters Detail	Routable	M Remote Extension (EXO Cateway)
Service Back End Port Selection	Gateway IP Address	- SIP-Server
Pseudo Wire Label Selection		
MSTP Region Selection		
Review		
Load		
		<< Prev Next >> Cancel

Figure 47 Service Type: Serial Ethernet

- VLAN ID: Set the default VLAN ID in the range [3-3699, 3802-4000] for the Ethernet ports in this service. Ethernet packets with this VLAN ID will be forwarded in this service, other VLAN IDs and untagged packets will be dropped. This behavior can be overruled by a more advanced VLAN processing in the 'VLAN Tagging/Untagging' feature further on this wizard;
- Mode: Remote Extension (FXO Gateway), SIP-Server, see §7.3 for more information;
- Routable (including Gateway IP address): Enable this when your 8-FXS IFMs, FXO Gateway or SIP Server are spread over multiple VLAN IP subnets. When enabling it, also fill out the Gateway IP address via which the FXO Gateway or SIP Server can be reached. One routed voice service is allowed per 8-FXS IFM.

- Page: Service Endpoint Selection: Select the front ports on the involved IFMs that must be part of this service. A Voice service requires at least one analog (8-FXS) and one Ethernet (4-GC-LW,) port. Make sure to select the ports in nodes that are linked to a same tunnel. Selecting ports can be done in two ways:
 - Via the table. The tree view can be expanded/collapsed via clicking the expand/collapse buttons. Just click the Selected checkbox to select the desired port;
 - Via clicking the node icons in the network drawing, see general example in §13;
 - **NOTE:** Per port, an extra Info field can be filled out later on via Network Hardware \rightarrow Devices \rightarrow Select Node/IFM/Port \rightarrow Generic \rightarrow Info.
 - A node can have a maximum of 32767 MAC addresses. By default, per new Voice service, 256 MAC addresses will be added to each LER node of the tunnel in which the service resides (not for point-to-point tunnels). If the maximum number of MAC addresses on a node has been reached, an error warning will pop up. After this warning, you will have to decrease the number of MAC addresses in this node from the other services first via clicking the MAC limit button (see Ref. [2Eth] in Table 2 for more info). See the figure below:

Steps		MAC Limit	Serv	ice Wizard	d - Ser	vic	e Ei	ndp O Ga	oint	t Sel	ection	1		
Information	t/ 7		M	THE THE T	, Externs		+0	ā	5.7		£	. 21		
Service Name and Type Selection	Endpo	int A	Device ID	Type	Select	-								
✓ Service Endpoint Selection		ode1	1	XT-2210-A		^								
VLAN Selection		Node1/IFM-1/P4		4-GC-LW Port										
		Node1/IFM-2/P1		L2 1G FE Port										
VLAN Tagging/Untagging		Node1/IFM-2/P2		L2 1G FE Port										
Tunnel Selection		Node1/IFM-2/P3		L2 1G FE Port			ſ		laded					Inded
ID Configuration		Node1/IFM-2/P4		L2 1G FE Port			L		voder	_				100004
IP Configuration		Node1/IFM-2/P5		L2 1G FE Port										
Quality of Service Parameters		Node1/IFM-2/P6		L2 1G FE Port										
Quality of Service Parameters Detail		Node1/IFM-3/P1		8-FXS Port										
		Node1/IFM-3/P2	\angle	8-FXS Port										
Service Back End Port Selection		FXS Ports:		8-FXS Port										
Pseudo Wire Label Selection		Consumed per	pair	8-FXS Port										
		Node 1/1FIVI-3/PD		8-FXS Port			ſ						<u> </u>	
MSTP Region Selection		Node1/IFM-3/P6		8-FXS Port				-	Node2					lode3
Review		Node1/IEM-3/P7		8-FXS Port										
last		Not Ethernet	Port	8-FXS Port										
Load		Node1/IFM-7/P1		4-DSL-LW Port										
	▶ ⊿ N	ode2	2	XT-2209-A										
		Node2/IFM-1/P1		L3E 1G FE Port										
		Node2/IFM-1/P2		L3E 1G FE Port										
		Node2/IFM-1/P3		L3E 1G FE Port		~								
											<< Prev	N	ext >>	Cancel

Figure 48 Voice: MAC Limit

- Page: VLAN Tagging/Untagging: HiProvision supports VLAN processing for voice services. The Voice service is always VLAN based.
 - ATTENTION: By default, the VLAN processing behavior in this wizard page is as described previously in the 'Service Name and Type Selection' page in this wizard: Only forward packets (ingress and egress) with the configured VLAN ID and drop all the other packets. When changing the settings in the 'VLAN Tagging/Untagging' page, it will overrule the default behavior.
 - The possible VLAN processing actions are described in the table below. Each port in the service can be configured with its own VLAN processing. For applying the same VLAN

processing to multiple ports at once, use the ^{thutiple Settings Mode} button. Configure the VLAN settings and click the apply button ^{thapply}.

Ingress/ Egress	Possible Actions	Description	
Note: A Prio Note: the ac Note: Ingres	Tag is a VLAN tag with VLAN ID = 0 tions are only valid for the configured endpo s and Egress VLAN ID: the configured VLAN IC	ints in the configured service D is the same for both INGRESS and EGRESS	
Ingress	Untagged: Drop	Incoming untagged Ethernet packets will be dropped.	
	Untagged: Tag and forward (<configured id="" vlan="">)</configured>	Incoming untagged Ethernet packets will be tagged with the configured VLAN ID in the range [2-3699, 3802-4000] and forwarded.	
	Priority Tagged: Drop	Incoming priority tagged Ethernet packets will be dropped.	
	Priority Tagged: Tag and forward (<configured id="" vlan="">)</configured>	Replace the priority tag (=VLAN ID 0) in the incoming Ethernet packet with the configured VLAN ID in the range [2-3699, 3802-4000] and forward it.	
Egress	Кеер Тад	The VLAN or Prio tag is kept when sending out the Ethernet packet (transparent transport of packets).	
	Untag	The VLAN or Prio tag is removed from the Ethernet packet when sending out the packet.	
	PrioTag	Replace the VLAN tag with a Priority tag.	



Figure 49 VLAN Based: VLAN Tagging/Untagging

- Page: Tunnel Selection: Allowed tunnels for this service type: point-to-multipoint, logical ring. See §11 to select the desired tunnel;
- Page: IP Configuration: Each 8-FXS module in a Voice service must be assigned an IP address to allow registration to the FXO gateway or the SIP Server later on. Fill out the IP Range Start and click the Auto Assign button. As a result, the 8-FXS modules will get an IP address assigned from this IP range. So all the phones connected to the ports within the

same 8-FXS module have the same IP address. The phones can be differentiated based on the SIP account on application level. These automatically assigned IP addresses can be overruled or manually changed/edited.

Steps		Service Wizard - IP Cor	nfiguration		
Information	IP Range Start		Gateway)		
Service Name and Type Selection		10.0.1/24			Auto Assign
	8-FXS Module IP Address Assignments	Address 🔺	IP Address		
Service Endpoint Selection		MODULE://Node1/IFM-3/	10.0.0.1/24		
VLAN Selection					
VLAN Tagging/Untagging					
Tunnel Selection					
✓ IP Configuration	Assign IP Address to	o 8-FXS module			
Quality of Service Parameters					
Quality of Service Parameters Detail					
Service Back End Port Selection					
			<< Prev	Next >>	Cancel

Figure 50 8-FXS: IP Configuration

- Page: Quality of Service Parameters: QoS (=Quality of Service) is a service traffic handling process in order to provide sufficient service delivery and bandwidth for critical applications. HiProvision provides a few QoS mechanisms, based on the parameters below.
 - Priority: configures the priority that will be assigned internally in the Dragon PTN node. 0 indicates the lowest priority (=least important). In the Dragon PTN network, higher priority traffic will be processed before lower priority traffic so that high priority traffic will not be compromised.
 - Normal (=Non-HQoS) tunnel used: priority range [0..4], default = 3.
 - HQoS tunnel used: priority is inherited from the Tunnel Application Priority [0..6], read-only.
 - Average Frame Size: The 8-FXS IFMs convert their incoming signals from the LAN side into Ethernet packets towards the CSM. The Average Frame Size is the size of these Ethernet packets. The better you know the traffic (and its frame sizes) in your network, the better you can tune the consumed bandwidth on the WAN side. The Average Frame Size indicates the Ethernet frame size = payload + Ethernet overhead.
 - Priority >1: Average Frame Size = 64 bytes, read-only.
 - Priority <=1: Average Frame Size is configurable.</p>
 - Additional Ethernet Port Bandwidth: The Ethernet ports in a voice service consume a bandwidth which consists of voice channels and some additional bandwidth.
 - Number of Voice Channels: (default=1, maximum depends on the available bandwidth on the links) The number of voice channels that go via this port. HiProvision will reserve 100 kbps per voice channel;
 - Additional Bandwidth (kbps): (default=0, maximum depends on the available bandwidth on the links) The additional or extra bandwidth that this port requires in this service to serve non-voice or different applications if any e.g. FTP server, ...

Burst Size (bytes): (default=0, maximum depends on the available bandwidth on the links) The maximum burst size in bytes that can be sent on the service via this port.

Steps		Service V	Nizard - Quality of S Remote Extension (FX	Service Paramet O Gateway)	ers		
Service Name and Type Selection	Priority Average Frame Size				3 0	2	
Service Endpoint Selection	Additional Ethernet	Port Bandwidth 김			04	bytes	vorago
VLAN Selection	Device Name	Туре	Number of Voice Channels	Additional Bandwidth (kbps)	Burst Size (bytes)	F	-rame
VLAN lagging/Untagging	♪ IFM-1/	/P1 L3E 1G FE Port	1	0	0		Size
IP Configuration							
✓ Quality of Service Parameters					Bandwidth	1	
IP Configuration Quality of Service Parameters 					Bandwidth		

Figure 51 Voice: Quality of Service Parameters

- Page: Quality of Service Parameters Detail: see §12. Leave this page as it is, defaults are OK;
- Page: Service Back End Port Selection (only if Ethernet L2/L3 IFMs have been selected in the service): This page shows which Back Back End ports are used towards the CSM, in the participating L2/L3 IFMs in the Voice service. The line towards the CSM shows the bandwidth usage, 0% means all bandwidth still available on that port. Another Back End port can be selected if desired. More info on back end ports in Ref. [2Eth] in Table 2.



Figure 52 Voice: L2/L3 IFM Service Back End Port Selection

- Page: Pseudo Wire Label Selection: leave this page as it is, defaults are OK;
- MSTP Region Selection (only when modifying the Voice service involved in Regions/MSTP (see MSTP in Ref. [2Eth] in Table 2) and adding a L2/L3 IFM which is still part of the default MSTP Region): A configured Voice service can overlap different MSTP regions. When adding a L2/L3 IFM to this service, the IFM will run with default MSTP settings available on the IFM itself (not visible in HiProvision) and indicated by 'Default Region'. Loop protection is guaranteed via this 'Default Region'. If you want to assign this IFM immediately to an existing MSTP Region, select one from the Region drop-down list. If not, leave 'Default

Region' selected. Later on in the MSTP wizard, you can still assign this IFM to a new or existing Region.

Modify iERVICE://VoiceService/Voice2FXC Steps	Added this module/port in Modify step	Service Wizard - MSTP Region Select	tion	- • ×
VLAN Tagging/Untagging Tunnel Selection IP Configuration Quality of Service Parameters Quality of Service Parameters Detail Service Back End Port Selection Pseudo Wire Label Selection V MSTP Region Selection Review	Module MODULE://Node3/IFM	Region Region -3/ Default Region Voice2MSTPRegion		
		<< P	rev Next >>	Cancel

Figure 53 Voice (Modify): MSTP Region Selection

- Page: Review: The selected service ports will be shown: if ok, click Finish, the configuration load manager will be invoked.
- Page: Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info.

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

After this step, your customer applications connected to the front ports of the IFMs should be able to communicate over the Dragon PTN network.

7.2.2 Network Hardware → IFM Settings

No extra settings must be done.

7.2.3 Network Hardware → IFM-Port Settings

No extra settings must be done.

7.3 Configure Voice Protocol

7.3.1 General

The Voice Protocol must be configured to configure extra service properties. An overview can be found below:



Figure 54 Voice Service Elements Overview

7.3.2 Prerequisite

A Voice service must have been created.

7.3.3 Configuration

Go to Dashboard \rightarrow (Configuration) Protocols \rightarrow Protocol Categories \rightarrow Other \rightarrow Voice Protocol \rightarrow (Protocols) +.

Depending on the configured voice type in the service, the settings will differ:

- Remote Extension Mode: see §7.3.4;
- SIP-Server Mode: see §7.3.5;

7.3.4 Remote Extension (FXO Gateway) Mode

a. General

- See Figure 54: connections between FXS ← → VoIP Gateway (=FXO Gateway);
- Analog phones in the Dragon PTN network are a remote extension of the public (PSTN) and/or private (PBX) telephone network. The extension is possible via a third party VoIP Gateway (e.g. Patton), in this case an FXO Gateway;
- Analog phones are connected to an FXS interface (8-FXS module);
- FXO Gateways are connected to an Ethernet interface (e.g. 4-GC-LW module);
- Voice switching and telephony feature handling between all phones are performed in the PSTN or PBX;
- DTMF (=Dual Tone Multi-Frequency) must be used for number dialing;
- Analog speech and signaling are converted and packetized by the FXS interface and the FXO Gateway towards the Dragon PTN network;

b. Configuration

- Information: Click Next>>;
- Service Selection: select the Voice service in the list for which you want extra configuration and registration settings. Only the voice services without Voice Protocol configuration yet will be listed. Click Next>>;

Steps	Voice Protocol - Service Selection
Information Service Selection Service Properties	
8-FXS Port Properties Review Load	Service Voice1FXO Voice25XO Voice25IP

Figure 55 Voice Protocol FXO: Service Selection

Service Properties:

- DTMF Transmit Mode: DTMF is a voice-frequency signaling system that generates tones when the caller presses numbers on its phone. This field has only impact when the call has already been set up. During a call, when the caller is requested to enter some extra numbers for selecting a menu (e.g. press '1' for sales, '2' for services etc...), the selected DTMF Transmit Mode below configures how these entered numbers are transmitted on the line. Make sure that this setting matches the setting in the FXO Gateway. Click Next>>;
 - Audio Passthrough: Transports the DTMF tones transparently inband between the two SIP endpoints, the caller and callee. The tones are encoded within the voice. When using this method, it is strongly advised to use a G711 Audio Codec (G729 could compress the tones too much resulting in unrecognized tones at the receiving side);
 - Rtp (=advised for Remote Extension (FXO Gateway)): Inband method that sends DTMF tones separately in dedicated RTP packets, distinct from audio packets.
 - Sip (=default, advised for SIP server): Inband method that sends DTMF tones separately in dedicated SIP packets, distinct from audio packets.

Steps Information Service Selection	Voice Protocol - Service Properties Remote Extension (FXO Gateway)			
✓ Service Properties				
8-FXS Port Properties	DTMF Transmit Mode	Sip		
Review		Audio Passthrough		
		Rtp		
Load		Sip		

Figure 56 Voice Protocol FXO: Service Properties

8-FXS Port Properties: Each phone connected to an 8-FXS port has some properties that can be configured in this page. Click the arrow in the Device Name column to expand/collapse the node to show/hide the 8-FXS ports in this service. Configure the port property via clicking a cell in the port row and start typing to enter or select a value;

Steps		Voice Protocol - 8-FXS Port Properties Remote Extension (FXO Gateway)									
		Device I	Name	Display Name	Telephone Number	Auth User Name	Auth Password	Audio Codec	VoIP Gateway	Remote SIP Port	
Service Selection	►	⊿ Noc	de1								
Service Properties			Node1/IFM-3/P1					G711a	0.0.00	5060	
			Node1/IFM-3/P2					G711a	0.0.00	5060	
 ✓ 8-FXS Port Properties 											

Figure 57 Voice Protocol FXO: 8-FXS Port Properties

Table 12 8-FXS Port Properties	(Remote Extension)
---------------------------------------	--------------------

Field	Values	Description
Device Name	<ports></ports>	Shows the selected 8-FXS ports in the voice service that must be configured.
Display Name (=future support)	<text></text>	Name that must be displayed on the telephone display on the receiver side (=callee) when a call is set up.
Telephone Number	<number></number>	Telephone number that is assigned to the telephone connected to this 8-FXS port (=caller).
Auth User Name	<text></text>	User name assigned to this FXS port. This user name will be used in the SIP messages to authenticate this FXS port to the VoIP Gateway when it requests some client authentication.
Auth Password	<text></text>	Password assigned to this FXS port. This password will be used in the SIP messages to authenticate this FXS port to the VoIP Gateway when it requests some client authentication.
Audio Codec	G711a (=default) G711u G729	Encoding/Decoding standards that encodes/decodes analog voice into digital data or vice versa. G711a is the preferred Codec. Fallback to one of the other Codecs is possible if the SIP-server or remote side does not support this preferred Codec. The G711 codec provides an uncompressed high voice quality but requires almost 3 times more bandwidth (87 kbps) than the G729 codecs (32 kbps) which transmit a more compressed voice quality. So G729 calls have less voice quality than G711 calls, but are still good enough for most calls. So it is a tradeoff between voice quality and bandwidth. When using the Audio Passthrough DTMF transmit mode (see previous), it is strongly advised to use a G711 Audio Codec whereas the G729 could compress the tones too much resulting in unrecognized tones. The G711u (=µlaw) Codec is mostly used in Northern- America and Japan whereas G711a (=A-Law) is mostly used in the rest of the world.
VoIP Gateway	<ip address=""></ip>	Default = 0.0.0.0. IP address of the VoIP Gateway (or SIP server port).
Remote SIP Port	<number></number>	Default = 5060. Indicates the remote SIP port that the VOIP Gateway is listening to for SIP traffic. The local SIP port on the 8-FXS IFM is not configurable and is by default 5060.

- Review: if ok, click Finish. The configuration load manager will be invoked.
- Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info.

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

NOTE: Monitoring info available via Dashboard → (Monitoring) Protocols → Other → Voice or via Dashboard → (Monitoring) Performance → Port Performance → CSM Ethernet Port Monitoring or CSM, L2 and L3 IFM Ethernet Port Monitoring.

7.3.5 SIP-Server Mode

a. General

- See Figure 54: SIP elements like a SIP Phone and VoIP gateways can be registered on and handled by the SIP Server;
- Analog phones are connected to an FXS interface (8-FXS module) which are registered on a SIP Server;
- Voice switching and telephony feature handling for all calls are performed in the SIP Server;
- Possible SIP telephony features depend on the used SIP devices and their interoperability.

b. Configuration

- Information: Click Next>>;
- Service Selection: select the Voice service in the list for which you want extra configuration and registration settings. Only the voice services without Voice Protocol configuration yet will be listed. Click Next>>;



Figure 58 Voice Protocol SIP: Service Selection

- Service Properties:
 - DTMF Transmit Mode: See §7.3.4;
 - Dial Plan Translation Pattern (default = e#r*~, use Reset button to set back to default): The Dial Plan specifies how a 8-FXS IFM must interpret digit sequences dialed by the caller, and how to convert the digit input into an outgoing dial string. The rules will be applied to all the 8-FXS IFMs in the service. Optional, click the Configure button to configure a more advanced Dial Plan - Translation Pattern. NOTE: it is also possible to overwrite this field manually without using the Dial Plan wizard (for advanced users!).

Steps	Voice Protocol - Service Properties	Dial Plan Internal Calls - Allowed First Digit(s)	0 1 2 3 4 5 6 7 8 9
Information Service Selection	SIP-server	Internal Calls - Number Length	4 🖸
✓ Service Properties	DTMF Transmit Mode Sip	External Calls - Supported	
8-FXS Port Properties Review	Dial Plan - Translation Pattern effit"~ Configure Reset	External Calls - First Digit	4 0
Load		Activate Features via * or #	
		Translated Pattern	
		4r*x #r*~ *	r*~ [0136]xxxs
	<< Prev Next >> Cancel		OK Cancel
		Resulting Translated P	attern

Figure 59 Voice Protocol SIP: Dial Plan - Translation Pattern

- Internal Calls Allowed First Digit(s): (default = no allowed first digits = no internal calls allowed) Click the numbers that are allowed as first digit when dialing a number for an internal call.
- Internal Calls Number Length: (default = 4, range [1..10]) Fill out the allowed dialed number length for internal calls e.g. internal number 4831 has length 4.
- External Calls Supported:
 - Checked (=default): external calls supported;
 - Unchecked: external calls not supported.
- External Calls First Digit: (default = 0, range [0..9]) If external calls are supported, fill out the number that must be used as first digit to set up external calls.
- Activate Features via */ #:
 - Checked (=default): telephone features are activated and can be accessed via dialing first the '*' or '#' key. See your SIP-server documentation to find the allowed feature codes;
 - Unchecked: telephone features are disabled.
- Example Resulting Translated Pattern: 4r*x|#r*~|*r*~|[0136]xxxs
 - 4r*x = Indicates that external calls (with first digit = 4) are supported;
 - r*~ = indicates allow any digit (0-9, a-d, *, #) until the timeout or the terminating character is found;
 - #r*~ = allows the digit string to start with '#';
 - *r*~ = allows the digit string to start with '*';
 - [0136]xxxs = Internal calls with a length of 4 characters and starting with 0, 1, 3 or 6 are allowed;

Table 13	Translated	Pattern	Parameters

Parameters	Description
I	separates different possible patterns
r	repeat by following a number (1-9), letter (a-z for 10 to 35 times) or "*", "+" or "." to mean any number of times (255 times)
	repeat previous digit any number of times (0 to 255)
+	repeat previous digit any number of times (0 to 255)
х	match any numerical digit (0-9)
~	match any digit (0-9, A-D, *, #) excluding any specified terminators
ļ	disallows pattern
\$	indicates secondary dialing to follow - used only by fixed dial strings
<:>	replace group to replace left digit(s) with right digit(s)
[]	selection group of candidate digits
[^]	exclusion group of digits
[0-9]	selection range of candidate numerical digits
[a-d]	selection range of candidate letter digits
S	seize on string as only candidate if match to this point
e	specify ending termination digit which follows (usually * or #)
f	pause timeout causes failure instead of dial

Parameters	Description
р	set digit pause to number of seconds which follow (1-9) for current pattern
t	set digit timeout to default for current pattern
-	human readable spacing which is ignored
<space></space>	human readable spacing which is ignored

8-FXS Port Properties: Each phone connected to an 8-FXS port has some properties that can be configured in this page. Click the arrow in the Device Name column to expand/collapse the node to show/hide the 8-FXS ports in this service. Configure the port property via clicking a cell in the port row and start typing to enter or select a value;

Steps	Voice Protocol - 8-FXS Port Properties SIP-server														
	D	evice Name	Display Name	Telephone Number	Auth User Name	Auth Password	Audio Codec	Use Hot Line Dialing	Hot Line Dialing Number	Use Call Waiting	SIP Server	SIP Server (R)	Registration Server	Registration Server (R)	Remote SIP Port
Service Selection	- F - 4	Node1													
Service Properties		Node1/IFM-3/P3					G711a	No		No	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	5060
· · · · · · · · · · · · · · · · · · ·		Node1/IFM-3/P4					G711a	No		No	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	5060
✓ 8-FXS Port Properties	4	Node2													
Review	1	Node2/IFM-5/P1					G711a	No		No	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	5060
		Node2/IFM-5/P2					G711a	No		No	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	5060
Load	4	Node3													
		Node3/IFM-10/P	1				G711a	No		No	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	5060
		Node3/IFM-10/P	2				G711a	No		No	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	5060
														<< Prev Next	Cancel

Figure 60 Voice Protocol SIP: 8-FXS Port Properties

Field	Values	Description
Device Name	<ports></ports>	Shows the selected 8-FXS ports in the voice service that must be configured.
Display Name (=future support)	<text></text>	Name that must be displayed on the telephone display on the receiver side (=callee) when a call is set up.
Telephone Number	<number></number>	Telephone number that is assigned to the telephone connected to this 8-FXS port (=caller).
Auth User Name	<text></text>	User name assigned to this FXS port. This user name will be used in the SIP messages to authenticate this FXS port to the SIP Server when it requests some client authentication.
Auth Password	<text></text>	Password assigned to this FXS port. This password will be used in the SIP messages to authenticate this FXS port to the SIP Server when it requests some client authentication.
Audio Codec	G711a (=default) G711u, G729	See Table 12.
Use Hot Line Dialing	Yes/No	Hotline means that if you pick up a phone or initiate a call, an immediate direct connection will be set up with the configured 'Hot Line Dialing Number' without the need of manual dialing a number yourself. A client that has a hotline configured will not be able to call any other number besides the hot line number.
		Yes: Hot Line dialing is enabled.
Hot Line Dialing Number	<number></number>	Default = empty. Indicates the number that must be dialed when a client with 'Use Hot Line Dialing=Yes' picks up a phone to initiate a call.

Table 14 8-FXS Port Properties (SIP-Server)

Field	Values	Description
Use Call Waiting (future use)	Yes/No	No (=default): The call waiting feature is disabled on this client. This client cannot accept a second call when a first call is already in progress.
		Yes: The call waiting feature is enabled on this client. This client can temporarily suspend or set on hold the first call to accept a second incoming call. This client can switch between the two calls.
SIP Server	<ip address=""></ip>	Default = 0.0.0.0. IP address of the SIP Server.
SIP Server (R)	<ip address=""></ip>	Default = 0.0.0.0. IP address of the Redundant SIP Server.
Registration Server (=future use)	<ip address=""></ip>	Default = 0.0.0.0. IP address of the Registration Server. Current behavior: Registration will be done on the SIP Server.
Registration Server (R) (=future use)	<ip address=""></ip>	Default = 0.0.0.0. IP address of the Redundant Registration Server. Current behavior: Registration will be done on the SIP Server.
Remote SIP Port	<number></number>	default = 5060. Indicates the remote SIP port that the SIP server is listening to for SIP traffic. The local SIP port on the 8-FXS IFM is not configurable and is by default 5060.

- Review: if ok, click Finish. The configuration load manager will be invoked.
- Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info.

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

NOTE: Monitoring info available via Dashboard \rightarrow (Monitoring) Protocols.

7.4 Modify Service/Protocol

After service/protocol creation, this service/protocol can be modified if needed via:

- Service: Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services \rightarrow select service $\rightarrow \mathbb{M}$;
- Protocol: Dashboard → Configuration → Protocols → Protocol Categories → Other → Voice Protocol → select protocol in the protocols list *S*;

7.5 Delete Service/Protocol

After service/protocol creation, this service/protocol can be deleted if needed via:

- ▶ Service: Dashboard \rightarrow Configuration \rightarrow Connections \rightarrow Services \rightarrow select service \rightarrow \bowtie ;
- Protocol: Dashboard → Configuration → Protocols → Protocol Categories → Other → Voice Protocol → select protocol in the protocols list x;

NOTE: A service can only be deleted if its linked protocol has been deleted first.

7.6 Troubleshooting

The protocols monitor can help in troubleshooting. See §7.7.5.

7.7 Monitoring

7.7.1 (Configuration) Network Hardware Tile

None.

7.7.2 (Configuration) Connections Tile

What has been configured via the service wizard can also be viewed via Dashboard \rightarrow Connections \rightarrow Services \rightarrow select service in the list. Some extra tabs (Service, Voice, VLAN Tagging/Untagging/Address Assignments) with service configuration data will be shown.



Figure 61 (Configuration) Connections Tile: Voice

7.7.3 (Configuration) Protocols Tile

Below, you can find the voice protocols monitor via Dashboard \rightarrow (Configuration) Protocols \rightarrow Protocol Category \rightarrow Other \rightarrow Voice Protocol \rightarrow Select Protocol....



Figure 62 Protocols: Voice Protocol Monitor

7.7.4 (Monitoring) Network Tile

Live service data can be monitored via the Dashboard \rightarrow Network \rightarrow Services \rightarrow select service in the list. The service will be shown in the network drawing. Click P to show extra monitoring properties for this service. Click P to show the used nodes/links/tunnels.



Figure 63 (Monitoring) Network Tile: Voice Service

NOTE: No extra monitoring info in the Dashboard \rightarrow Network \rightarrow Protocols available.

7.7.5 (Monitoring) Protocols Tile

Below, you can find the voice protocols monitor via Dashboard \rightarrow (Monitoring) Protocols \rightarrow Protocol Category \rightarrow Other \rightarrow Voice Protocol \rightarrow Select Protocol....

ł	*; D/		VERS			PR ج	OTOCOLS MONITOR	? HELP	ADD-ONS
PF	ото	COL CATEGORIES	t	م 7	× 🖬 🛛				
Г	Prot	ocol Category							
	4	Protocol Interaction			P1			Ð	(S FXS
		Backbone Isolation Guard						C	
Г		MRP							
		RGERP							
	4	ayer 2							
		IGMP Snooping							
L		MSTP			IFM-2				IFM-10
L	4	ayer 3			-				
L		IGMP							
L		PIM							
L		OSPF							
L		Static Routing				_	_		
⊢		Virtual Router			Node1		Node4		Node3
H				Ì	-			,	-
H		DHCP Relay			1-7/P		1-7/P		9/9-1
Þ	Ľ	Voice Protocol	٠		Ę		e e		Ē
L							Voice1		
			l			_	Voice I	_	
PF	ото	COLS	V	/oice A	pplication				
	Prot	ocol		Port			SIP Registration Status	SIP	Registration Status (R)
ŀ	Voic	e1	Þ	- 4	Module: MODUL	.E://Node	3/IFM-10/		
					PORT://Node3/IFI	M-10/P1/			
					PORT://Node3/IFI	M-10/P2/			
			- C						

Figure 64 Protocols: Voice Protocol Monitor

7.7.6 Performance Counters

The used Ethernet ports (either 4-GC-LW ... via CSM, or L2/L3) in this service can be monitored. Go to Dashboard \rightarrow (Monitoring) Performance \rightarrow Counter Control \rightarrow Service Performance \rightarrow 'CSM Ethernet Port Monitoring' or 'L2 and L3 IFM Ethernet Port Monitoring'. See figure below.

A detailed and similar monitoring set-up description (adding counters to graphs etc...) can be found in 'Port Performance' \rightarrow 'CSM Ethernet Port Monitoring' in Ref. [2Net] in Table 2.

	Refresh													
💕; DASHBOAR	ID I MABASE 🎝 SER	VERS	NETWORK HARDWARE		alarms		PERFORMANCE	🚓 PROTOCOLS						×
COUNTER CONTR Display Name	KOL 🔹 🔯													
PORT PERI	FORMANCE	Port	Bytes In	Ucast In Packets	Multicast In Packets	Broadcast In Packets	Disc In Packets	Error In Packets	Unkn Prot Disc In P	Bytes Out	Ucast Out Packets	Multicast Out Pack	Broadcast Out Pac	Disc Out Packets
> L2 and	I L3 IFM Ethernet Port Monitoring	PORT://Node1/IFM-2/8E1/	C:	C.	Ci Di	Ci	Ci Di	C:	C:	C:	Ci Di	Ci	C.	0
CODIR TEST AND	Port Monitoring LOOPBACK PERFORMANCE	PORT://Node2/IFM-1/P2/	Ci Pi	Ci Pi	Ci Pi	Ci Pi	Ci Pi	Ci Pi	Ci Pi	Ci Pi	Ci Pi	Ci Pi	Ci P:	Ci Ri
SYNCE PEI QOS PERF IEEE 1588 F HEALTH M PORT COUNTERS	NORMANCE ORMANCE BERORMANCE IONITOR	C						_						
Device Name	Selected	🔝 🔜 💌 🗡 💷												
Node1 Node2 Node2 Node2 Node2 Node2 Node2 Node2 Node2 Node2	U/FM-1	0.8												

Figure 65 Performance Counters: Voice Service: Ethernet Ports Monitoring

7.7.7 HiProvision Add-on: Generic Reporting Engine

Service and port reporting information is available via the Reporting Engine Add-on, see Ref.[24] in Table 2.

7.7.8 MAC Monitor

The MAC Monitor will show the MAC address table of the selected Node (=CSM). This table includes all MAC addresses used on this device except for the MAC addresses that are used in a point-to-point tunnel. More information can be found in Ref. [2Eth] in Table 2.

MAC Monitor via: Dashboard \rightarrow (Monitoring) Network \rightarrow Services \rightarrow \square ;

8. SHDSL (VIA ETHERNET)

8.1 General

Supported IFMs: 4-DSL-LW, more information on this IFM can be found in Ref. [8] in Table 2.

In a general SHDSL link setup between a customer and network side, one link partner must act as the CO (=Central Office) and the other link partner must act as the CPE (=Customer Premises Equipment). Within the Dragon PTN solution, the 4-DSL-LW module is by default configured as CO. If both SHDSL link partners are configured in the same device mode, the SHDSL link will not synchronize and as a result will not come up. A general SHDSL example can be found in the figure below.



Figure 66 General SHDSL Example

8.2 Configure Service

8.2.1 Service Wizard

To transport SHDSL, an Ethernet service must be configured. Configuring this service in the service wizard is exactly the same as described in the 'Ethernet Services manual', see Ref.[2Eth] in Table 2.

8.2.2 Network Hardware → IFM Settings

Unit Type.
 PAF Mode:

After configuring the service via the service wizard, all IFM settings will be set according to the service configuration. Some individual IFM settings might need extra tuning or must be overruled. Find IFM settings via Network Hardware \rightarrow Devices \rightarrow 4-DSL-LW. Following two parameters can be configured (description further below):

11.04						i		
EVICES		- O - ⇔				」 ⊈ ‡₀ #i "b ∃ ‡₀	MODULE://Node3/IFM-8/	
Туре		Name 🔺	Device ID	Status	Programmed Type Measured Type	Address	Temperature	~
νE	xtDevType4	ExtDev100	100			NODE://ExtDev100/	CPU	°C
► E	xtDevType4	ExtDev101	101			NODE://ExtDev101/	Generic	
► E	xtDevType4	ExtDev102	102			NODE://ExtDev102/	Module Slot IFM-8	
► X	T-2210-A	Node1	1			NODE://Node1/	Module Type 4-DSL-LW	
► X	T-2210-A	Node2	2			NODE://Node2/	Alarm Status Unknown	
a X	T-2209-A	Node3	3			NODE://Node3/	Uptime	
	CSM310-A	CSM-1				MODULE://Node3/CS	Present	
	CSM310-A	CSM-2				MODULE://Node3/CS	Active	
•	4-GC-LW	IFM-1				MODULE://Node3/IFM	Configured Type 4-DSL-LW	
•	6-GE-L	IFM-2				MODULE://Node3/IFM	Measured Type	_
•	2-OLS	IFM-3				MODULE://Node3/IFM	Specific	~
•	4-E1-L	IFM-5				MODULE://Node3/IFM	Busy Configuring	-
•	16-T1-L	IFM-6				MODULE://Node3/IFM	DAE Mode New Contract	
•	1-10G-IW	IFM-7				MODULE://Node3/IFM	NotinService	~
	4-DSL-LW	IFM-8		•		MODULE://Node3/IFM	Unit lype NT Unit	~
	4-DSL-LW Port	P1				PORT://Node3/IFM-8/P	Hardware And Operational Errors	~
	4-DSL-LW Port	P2				PORT://Node3/IFM-8/P	DPLL Recovering Controller Clock	
	4-DSL-LW Port	P3				PORT://Node3/IFM-8/P	DPLL Recovering Port Clock	
	4-DSL-LW Port	P4				PORT://Node3/IFM-8/P	Port Recovering Clock	-
•	7-SERIAL	IFM-9				MODULE://Node3/IFM	Power Settings Update Failed	_
	A-CODIR	IEM-10				MODI II Ev//Node3/IEM	Hardware Error	

Figure 67 4-DSL-LW IFM: Unit Type/PAF Mode

a. Unit Type (=Device Mode)

In a general SHDSL link setup between a customer and network side, one link partner must act as the CO (=Central Office) and the other link partner must act as the CPE (=Customer Premises Equipment). Within the Dragon PTN solution, the 4-DSL-LW module is by default configured as CO. If both SHDSL link partners are configured in the same device mode, the SHDSL link will not synchronize and as a result will not come up.

The powering of the 2-OLS IFM can be configured by the 'Forced Power Mode'. The setting of this parameter determines whether a CSM is required in the node for powering the 2-OLS IFM. Go to Network Hardware \rightarrow Devices \rightarrow 4-DSL-LW \rightarrow Specific \rightarrow Unit Type.

The 'Device Mode' (CO or CPE) of the 4-DSL-LW module depends on the configuration in HiProvision and some DIP switch settings in on the IFM (see Ref. [3] in Table 2).

The 'Device Mode' configuration in HiProvision will always be the master setting. In HiProvision, configure the 'Unit Type' parameter on IFM level as follows:

CO: Unit Type = 'LT Unit'; (LT = Line Termination);

CPE: Unit Type = 'NT Unit'; (NT = Network Termination);

Only when there is nothing configured in HiProvision for this IFM, the DIP switch settings on the IFM board itself come into play.

b. PAF Mode

- PAF: PME Aggregation Function;
- PME: Physical Medium Entities.

PAF or Bonding is a technique where multiple SHDSL links, connected to the 4-DSL-LW module, are combined into one logical link. This results in redundancy and a higher bandwidth for the resulting combined link. Within the SHDSL link, bonding must be configured on either the CO or the CPE, see Table 15. The link partner without bonding configured will slave and negotiate with the link partner that has bonding configured. After the bonding has been negotiated between the CO and CPE, the bonded SHDSL links come up. Different line rates are possible within the bonded links, but the difference between the fastest and slowest link must be less than 4 Mbps. SHDSL ports can be combined or bonded in HiProvision as indicated in Table 15.

NOTE: When using the SHDSL link as LAN, make sure to configure the local and the remote LAN SHDSL links with the same bonding or PAF mode;

Bonding Mode	PAF Mode in HiProvision	Must be Configured on	Port1	Port2	Port3	Port4		
No Bonding	NotInService (=default)		Single	Single	Single	Single		
2 links	34	CO (or LT)	Single	Single		Bonding (P4)		
3 links	234	CO (or LT)	Single			Bonding (P4)		
4 links	1234	CO (or LT)				Bonding (P4)		
2 + 2 links	12 and 34	CPE (or NT)	Во	nding (P2)	Bonding (P4			
Single: No bonding is active on this port;								

Table 15 Bonding Combinations

Bonding (Px): The bonding aggregation is internally mapped on 'Port x'; Only 'Port x' must be used when configuring the service in HiProvision;

When changing the bonding or PAF mode, in some cases the bonded SHDSL links will go down until the new mode has been negotiated again between the CO and CPE.

- Changing the bonding from '2 + 2 links' to another mode;
- Changing the bonding from '4 links' to '3 links' or '2 links';
- Changing the bonding from '3 links' to '2 links';

8.2.3 Network Hardware → IFM-Port Settings

After configuring the service via the service wizard, all port settings of the endpoints in this service will be set according to the service configuration. Some individual port settings might need extra tuning or must be overruled. Go to Network Hardware \rightarrow Devices \rightarrow 4-DSL-LW \rightarrow 4-DSL-LW port.

a. Line Probing

Enable the parameter 'Line Probing'. As a result, the port will automatically check the quality of the SHDSL link. The port will automatically decide which is the best possible bandwidth or Line rate for the available SHDSL link.

£";	DASH	IBOARD	SERVERS		etwork H <i>i</i>	ARDWARE	XTERNAL DEVICES					
DEVIC	CES	+ 🖉 🛛 🗊	- Q - ⇔	⇔ ↔	** %	i 🗗 🗇 🗸	$\cdot \mathbf{x} \mathbf{x} \mathbf{q}$	2 🛼 🗛 🗄 🗄 :	€s ⊕	PORT://Node3/IFM-8/P4/		
Ту	pe		Name 🔺	Device ID	Status	Programmed Type	Measured Type	Address				
•	Ext	DevType4	ExtDev100	100				NODE://ExtDev100/		Generic		<u> </u>
•	Ext	DevType4	ExtDev101	101				NODE://ExtDev101/		Specific		
•	Ext	DevType4	ExtDev102	102				NODE://ExtDev102/		Link Status	Down	× -
•	XT	-2210-A	Node1	1				NODE://Node1/		Link State	L	
•	XT	-2210-A	Node2	2				NODE://Node2/		Attenuation		
∎ ₄	XT	-2209-A	Node3	3				NODE://Node3/		SNR		
		CSM310-A	CSM-1					MODULE://Node3/CS		ShdslMinLineRate	192	✓ □
		CSM310-A	CSM-2					MODULE://Node3/CS		ShdslMaxLineRate	5696	✓ □
	+	4-GC-LW	IFM-1					MODULE://Node3/IFM		Line Probing	Enable	~
	•	6-GE-L	IFM-2					MODULE://Node3/IFM		Linerate		
	•	2-OLS	IFM-3					MODULE://Node3/IFM		PAM Mode	Auto Select	v 🗆
	•	4-E1-L	IFM-5					MODULE://Node3/IFM		PAM Negotiation		
	+	16-T1-L	IFM-6					MODULE://Node3/IFM		Region	Annex BG	v .
	+	1-10G-LW	IFM-7					MODULE://Node3/IFM		Used Region		_
	-	4-DSL-LW	IFM-8					MODULE://Node3/IFM		Forced Power Back Off N	lode No	
		4-DSL-LW Port	P1					PORT://Node3/IFM-8/P		Power Back Off Value	6	
		4-DSL-LW Port	P2					PORT://Node3/IFM-8/P		Power Back Off Far End		
		4-DSL-LW Port	P3					PORT://Node3/IFM-8/P		Power Back Off Near End		
Þ	1	4-DSL-LW Port	P4		•			PORT://Node3/IFM-8/P		Estimated Power Loss	Enable	
	•	7-SERIAL	IFM-9					MODULE://Node3/IFM		CO Supported	LINDIC	
		4-CODIR	IFM-10					MODULE://Node3/IFM		Tx Good Count		
•	XT	-2206-A	Node4	4				NODE://Node4/		Rx Good Count		
•	XT	-2209-A	Node5	5				NODE://Node5/		Fifo Bandwidth in		
•	XT	-2209-A	Node6	6				NODE://Node6/		Fifo Bandwidth Out		
•	XT	-2215-A	Node7	7				NODE://Node7/		W BPDU Guard		
•	XT	-2215-A	Node8	8				NODE://Node8/		BPDU Guard Status		
•	XT	-2215-A	Node9	9				NODE://Node9/		Test And Loopback		~
										Loopback	Off	v 🗆

Figure 68 4-DSL-LW IFM: Line Probing

b. ShdslMinLineRate

Configure the SHDSL Minimum Line Rate (range [192...5696] kbps). The default value is 192 kbps. It can be configured in steps of 64 kbps.

c. ShdslMaxLineRate

Configure the SHDSL Maximum Line Rate (range [192...5696] kbps). The default value is 5696 kbps. It can be configured in steps of 64 kbps.

d. PAM Mode

The line coding or PAM (Pulse Amplitude Modulation) can be configured. When the value is changed, the link has to be disabled and enabled again.

PAM Mode:

- Auto Select (=default) ;
- 16 Pam: uses 3 bits (16 codes) for encoding, possible between 192-3840kbps;
- 32 Pam: uses 4 bits (32 codes) for encoding, possible between 768-5696kbps;

e. Region

The Region can be configured. When the value is changed, the link has to be disabled and enabled again.

- Region:
 - Annex BG (=default): Europe;
 - Annex AF: Nord America;

f. Forced Power Back Off Mode (No/Yes) / Power Back Off Value (0..31) (Future)

(Future support) The power back off algorithm enables 4-DSL-LW IFMs to adjust transmit power according to conditions on the line. Operators can use this feature to manage and reduce crosstalk noise on the network. When the value is changed, the link has to be disabled and enabled again.

- Yes: Lower the transmitter power level of the modem with the 'Power Back Off Value'. This reduces interference to other transmission systems operating on adjacent pairs bundled in the same cable. The transmit power will be reduced adaptively in function of the estimated cable attenuation.
- No: do not lower the transmitter power;

g. Estimated Power Loss (Enable/Disable) (Future)

Future support.

8.3 Troubleshooting: Test and Loopback

This service can be tested via loopback settings on port level in the Network Hardware tab. See §14 for setting up loopbacks on the 4-DSL-LW IFM ports.

8.4 Monitoring

8.4.1 (Configuration) Network Hardware Tile

The SHDSL link status can be verified via the port settings. Go to Dashboard \rightarrow (Configuration) Network Hardware \rightarrow Devices \rightarrow select IFM \rightarrow select port \rightarrow Specific:

- Link State: The link should come up. As a result, the link status should indicate 'up'.
- SNR: as a result of the line probing, the signal-to-noise ratio (=SNR) will be filled out automatically in dB. SNR is an indication of the quality of the signal on the SHDSL link. If the quality or the SNR is too poor, the SHDSL link will not come up. The longer the SHDSL link, and the higher the automatically selected line rate due to line probing, the lower the SNR will be. Make sure that the SNR is at least 6dB or higher. If the measured SNR is lower than 6dB, disable 'Line Probing' and set the Maximum Line Rate lower, until SNR is higher than 6dB.

*	DAS	SHBOARD 📄 DATABAS	E SERVERS	S N	etwork H <i>i</i>	ARDWARE	TERNAL DEVICES					
DEV	CES	+ 🖉 🛛 🗊	- Q - ⇔	⇔ ↔	** *	i 🛿 🗆 · 🔍		2 🍋 👫 🗄 🗄 🕯	s	PORT://Node3/IFM-8/P1/	_	
T	/pe	4	Name	Device ID	Status	Programmed Type	Measured Type	Address				
,	E	xtDevType4	ExtDev102	102				NODE://ExtDev102/		Generic		<u>^</u>
	E	xtDevType4	ExtDev101	101				NODE://ExtDev101/		Specific		
,	E	xtDevType4	ExtDev100	100				NODE://ExtDev100/		Link Status	Down	~ 🗆
,	X	T-2206-A	Node4	4				NODE://Node4/		Link State		
,	X	T-2209-A	Node5	5				NODE://Node5/		Attenuation		
	X	T-2209-A	Node6	6				NODE://Node6/		SNR		
	X	T-2209-A	Node3	3				NODE://Node3/		ShdslMinLineKate	192	~ -
	•	1-10G-LW	IFM-7					MODULE://Node3/IFM		ShdslMaxLineRate	5696	✓
	•	16-T1-L	IFM-6					MODULE://Node3/IFM		Line Probing	Disable	~ 🗆
	•	2-OLS	IFM-3					MODULE://Node3/IFM		Linerate		
	•	4-CODIR	IFM-10					MODULE://Node3/IFM		PAM Mode	Auto Select	~ □
		4-DSL-LW	IFM-8					MODULE://Node3/IFM		PAM Negotiation		
		4-DSL-LW Port	P1					PORT://Node3/IFM-8/P		Region	Annex BG	v 🗆
		4-DSL-LW Port	P2		•			PORT://Node3/IFM-8/P		Used Region		
		4-DSL-LW Port	P3					PORT://Node3/IFM-8/P		Forced Power Back Off N	lode No	v .
		4-DSL-LW Port	P4					PORT://Node3/IFM-8/P		Power Back Off Value	6	
	•	4-E1-I	IEM-5					MODULE://Node3/IEM			L.	

Figure 69 Local Mode Indication: Internal Connection

8.4.2 Other

Other monitoring info ethernet service related and is similar to the monitoring info in the manual Ref.[2Eth] in Table 2.

9. SMART SFP

9.1 General

Smart SFP is a hot-pluggable optical transceiver that converts incoming STM/OC frames from a fiber-optic SDH/SONET network into Ethernet frames or vice versa for outgoing frames. This conversion occurs at ports or IFMs that support smart SFP, see Ref.[14] in Table 2.

Smart SFPs must be used in a point-to-point $(1^{st}/2^{nd}$ Smart SFP, see figure below) port based Ethernet service over Dragon PTN.

As a result, Dragon PTN allows to transparently transport synchronous digital bit streams from an SDH/SONET network via the IFMs that support smart SFP. The available Smart SFPs can be found in Ref. [14] in Table 2.

For clocking/synchronization, SyncE (see Ref. [2Net] in Table 2) must be configured in the nodes that have Smart SFPs plugged in.



Figure 1 Example: Smart SFPs Setup / PTP

9.2 Configure Service and Monitor

Prerequisite: Make sure to have two Smart SFPs (with the right speed, see Ref. [14] in Table 2) plugged in somewhere in the Dragon PTN network in an IFM that supports smart SFP. These ports must have been configured as LAN port.

- 1. Configure SyncE (see Ref. [2Net] in Table 2) in the nodes that have plugged in the Smart SFPs;
- 2. In HiProvision, configure a point-to-point port based Ethernet service with these two Smart SFP ports.
 - ► Click Dashboard → Configuration → Connections → Services → + to open the services wizard. See figure below. The services wizard opens. The list below summarizes every page in the wizard

	CASHBOARD		CONNECTIONS				
	LINKS				५ ५ 🔛	🚠 🎽 😪	8±
	Link Name	▼ Li	ink Type				_
	PORT://Node2/IFM-5/P1	/ - PORT:// E	thernet 10G	^			Node3
	PORT://Node2/IFM-1/P2	/ - PORT:// E	Ethernet 1G				•
	TUNNELS + & X	Tunnel Type	SubRing Color		C	Node4	
Services	SuperRing	Logical Ring					
	SERVICES 🛨 🖉 🗶	l n≏ m m	A Service Ty	rpe	Node5		
	Crea	te Services					

Figure 2 Create Services

- Page: Information: Click Next>>;
- Page: Service Name and Type Selection:
 - Service Name: enter a name for your service.
 - Service Type: Ethernet;

Steps	Service Wizard - Servic	e Name and Type	Selection	
Information				
✓ Service Name and Type Selection				
Service Endpoint Selection	Service Name	SmartSFP1		
VLAN Selection	Service lype	Ethernet	<u> </u>	
VLAN Tagging/Untagging	Ethernet			
Tunnel Selection	Usage	Port based	~	
Quality of Service Parameters	Ethernet Type	-	~	
Quality of Service Parameters Detail	VLAN ID		- 0	
Service Back End Port Selection	Select Bandwidth Optimization Group		V	
Pseudo Wire Label Selection	Bandwidth Optimization Name			
Frame Size Configuration	Local Service			
MSTP Region Selection	E-Tree			
Review				
Load				
		<< Pre	v Next >>	Cancel

Figure 3 Smart SFP: Ethernet Service Type / Port Based
- Page: Service Endpoint Selection: Select the front ports on the involved IFMs that must be part of this service. Make sure to select the ports in nodes that are linked to a same tunnel. Selecting ports can be done in two ways:
 - Via the table. The tree view can be expanded/collapsed via clicking the expand/collapse buttons. Just click the Selected checkbox to select the desired port;
 - ▶ Via clicking the node icons in the network drawing, see general example in §13;
- **NOTE:** Per port, an extra Info field can be filled out later on via Network Hardware
 - \rightarrow Devices \rightarrow Select Node/IFM/Port \rightarrow Generic \rightarrow Info
- Page: VLAN Tagging/Untagging: leave this page as it is, defaults are OK.
- Page: Tunnel Selection: Allowed tunnels for this service type: a normal point-topoint tunnel without HQoS. See §11 to select the desired tunnel;
- Page: Quality of Service Parameters: Configure the exact values below:
 - Priority = 1
 - Maximum Frame Size = 1522 bytes (=default)
 - Frame Size Mode = custom frames;
 - Small Frame = 1% : 64 bytes;
 - Custom Frame = 99%: 848 bytes;
 - Large Frame = 0%;
 - Bandwidth & Burst Size Mode: Endpoint Based;
 - Endpoint (useful) Bandwidth:
 - STM-1/OC-3 Smart SFP: 167 Mbps (or 167 000 kbps);
 - STM-4/OC-12 Smart SFP: 655 Mbps (or 655 000 kbps);
- Page: Quality of Service Parameters Detail: see §12. Leave this page as it is, defaults are OK;
- Page: Pseudo Wire Label Selection: leave this page as it is, defaults are OK;
- Page: Review: The selected service ports will be shown: if ok, click Finish, the configuration load manager will be invoked.
- Page: Load: The configuration load manager is a tool that starts and monitors the load process of a HiProvision configuration. Click the Load button to load the new HiProvision configuration into the live network. See Ref. [2Mgt] in Table 2 for more info;

CAUTION: While the loading to the Dragon PTN network is in progress, do not turn off, shut down or restart the HiProvision Server or Agent, since this may cause database corruption and network problems!

- After this step, your customer applications connected to the front ports of the IFMs should be able to communicate over the Dragon PTN network.
- 3. If your Smart SFPs are plugged in and the port is up, HiProvision must show both basic SFP and Smart SFP info after selecting the ports, see figure below. Also the Link Active (LA) LED of the IFM will blink immediately after plugging in the Smart SFPs.
- 4. Each Smart SFP has its own MAC address. It is possible to add extra security to the point-to-point connection. You can configure that the 1st Smart SFP only communicates with the 2nd one and vice versa. This can be done by filling out the **Destination MAC Address** of the

other Smart SFP and setting the **Destination MAC Check** to **true**. This must be done on both Smart SFPs. As a result, if you plug in another Smart SFP with another MAC address, the point-to-point connection will not work anymore.

- 5. Connect your two fiber-optic SDH/SONET points to the Smart SFPs;
- 6. If your link is up and running, the 'TSoP Tx/Rx' counters increase (refresh rate takes a few seconds). Counters can be cleared via the 'Clear Counters' drop down.
- 7. If you think the link is not up and running, you could reboot the smart SFP by selecting a warm (=no traffic loss) or a cold (=traffic loss) reboot in the 'Reboot' dropdown.

CASHBC	DARD 📄 DATABASE	SERVERS	S TT NE	TWORK H	ARDWARE 00 C	ONNECTIONS							
		• Q • ⇔	⇔ ↔	** %	, ₽ □ · ♥	$\cdot \star \times $	2 🎨 🖁	PORT://Node5/IFM-1	st Smart SFF	port	PORT://Node6/IFM 2nd	Smart SFP	port
	∜S ₩							Specific		~	Specific		~
Туре	A	Name	Device ID	Status	Programmed Type	Measured Type	Address	SFP		~	SFP		~
ExtDe	vType4	ExtDev102	102	۰			NODE://ExtDe	SFP	Present		SFP	Present	
 ExtDe 	vType4	ExtDev101	101				NODE://ExtDe	Laser Wavelength		nm	Laser Wavelength		nm
 ExtDet 	vType4	ExtDev100	100				NODE://ExtDe	Туре	GBit_LX	- 1	Туре	GBit_LX	
 XT-22 	206-A	Node4	4			D CER		Signal Status	Ok	_	Signal Status	Ok	
▲ XT-22	209-A	Node5	5			Basic SFF	into for	Optical Transmitter Fault	No	- 1	Optical Transmitter Fault	No	
▶ 1-	-10G-LW	IFM-5				Smar	t SEP	Temperature	56	°C	Temperature	53	90
+ 2-	OLS	IFM-9						Optical Tx Power (+-3dbm	n) -11	dBm	Optical Tx Power (+-3db	m) -11	dBm
+ 4-	2/4WEM	IFM-6				E	1	Optical Rx Power (+-3dbn	n) -10	dBm	Optical Rx Power (+-3db	m) -12	dBm
4-	GC-IW	IEM-8				Extra Info	D/CONTIG	Storm Control		^	Storm Control		~
	-60-IW					for Sma	rt SEP	Smart SFP		~	Smart SFP		~
H	1 st Sn	nart SFP	port				L DORT//Neda9	Type	STM-4		Туре	STM-4	
H	4-GO-LW		·				PORT://Nodes	MAC Address	00:19:3A:00:0C:18	i	MAC Address	00:19:3A:00:0C:08	3
H	4-00-LW Port						PORT://Nodes	Destination MAC Address	00:00:00:00:00:00	_ 8	Destination MAC Address	00:00:00:00:00:00	10 01
	4-GU-LW Port	P3					PORIS	Destination MAC Check	False	✓ □	Destination MAC Check	False	~
· · 9-	-L3A-L	IFM-3				MAC A	ddress	Equipment Failure	False		Equipment Failure	False	
▶ <u>9</u> -	-L3EA-L	IFM-1						Loss Of Signal	False		Loss Of Signal	False	
C	SM310-A	CSM-1					MODULE://No	Tx Loss Of Frame	False		Tx Loss Of Frame	False	
C	SM310-A	CSM-2					MODULE://No	Rx Loss Of Frame	False		Rx Loss Of Frame	False	
▲ XT-22	209-A	Node6	6				NODE://Node	Pemote Parket Loss	False		Pemote Parket Loss	False	
→ 1-	-10G-LW	IFM-6		•			MODULE://No	Local Packet Loss	False		Local Packet Loss	False	
▶ 2-	-OLS	IFM-8					MODULE://No	TSoP Tx Packets	28799955		TSoP Tx Packets	28799955	
+ 4-	-GC-LW	IFM-10		•				TSoP Rx Packets	27677470		TSoP Rx Packets	27677470	
4 4-	-GO-LW	IFM-9				- Clear C	ounters	Clear Counters	False	v	Clear Counters	False	~
	4-GO-IW and c.					Deheet		Reboot	False	~	Reboot	False	~
H	4-GO-IW ZING ST	nart SFP	port			- Repool		TEEE1599 Sottings			TEEE1599 Sottings		
H	4-GO-LW Port						PORT//Nodef	TEEL1500 Settings			TEEL1300 Settings		
	A-GO-LW Port	PA					PORT://Nodef						
É	130-1	IEM-3					MODULE://No						
1 9-	LJA-L	11111-2	1		1		WODULE://Nd	-					

Figure 4 Example: Smart SFPs in HiProvision

9.3 Alarms

Some alarms are provided which can be found in the table below.

Table 1 Smart SFP Alarms

Condition	Alarm 1st Smart SFP	Alarm 2nd Smart SFP
Pull out Rx at 1st Smart SFP	Loss Of Signal, Rx Loss Of Frame	Tx Loss Of Frame, No TDM Payload
Pull out Tx at 1st Smart SFP	no alarms	no alarms
Pull out Rx & Tx at 1st Smart SFP	Loss Of Signal, Rx Loss Of Frame	Tx Loss Of Frame, No TDM Payload
Stop Ethernet traffic going to 1st Smart SFP	Local Packet Loss, Tx Loss Of Frame	Remote Packet Loss
Pull out WAN link between two Dragon PTN nodes	Local Packet Loss, TX Loss Of Frame	Local Packet Loss, TX Loss Of Frame
Pull out 1st Smart SFP	no alarms	Tx Loss Of Frame, No TDM Payload, Local Packet Loss

10. SERIAL BITRATES

Table 2 Bitrates (bps)

Service Type	I	local Mode	Serial Ethernet	Circuit Em			nulation	ulation			
Protocol	Optical	Low Speed Serial			Se	rial		Optical Low Speed Serial			
Usage					SAToP/	CESoPSN		SAToP		CESoPSN	
Mux/Demux					No		Yes	-			
Synchronisation	Async.	Sync.		Async.	Async. Sync. Async. Sync.		Async.	Sync.	Async.	Sync.	
Bitrate (bps)	1200 2400 4800 9600 19200 38400 57600 76800 115200 297600	1x64k (64k) 2x64k (128k) 4x64k (256k) 8x64k (512k) 16x64k (1024k)	1200 2400 4800 9600 19200 38400 76800 115200	1200 1x64k (64k) 2400 2x64k (128k) 4800 9600 29x64k (1856k) 19200 30x64k (1920k) 38400 300 76800 600 115200 1200 2400 4800 9600 14400 19200 38400 57600 115200		300 (*) 600 (*) 1200 (*) 2400 (*) 3600 (*) 4800 (*) 7200 (*) 9600 (*) 12000 (*) 14400 (*) 19200 (*)	600 (*) 1200 (*) 2400 (*) 4800 (*) 9600 (*) 19200 (*) 38400 (*) 1x64k (64k) 2x64k (128k) 29x64k (1856k) 30x64k (1920k)	max bitrate is always 307200 bps	1x64k (64k) 2x64k (128k) 4x64k (256k) 8x64k (512k) 16x64k (1024k) 32x64k (2048k)	1200 2400 4800 9600 19200 38400 57600 76800 115200 297600	1x64k (64k) 2x64k (128k) 4x64k (256k) 8x64k (512k) 16x64k (1024k)
(*) With these selected support these V.110 spe	bitrates, the eds.	v.110 standard will be u	sed to transpor	t the serial s	115200 treams over the D	Dragon PTN r	network. Note: The	e BERT genera	tor on the 4-E1-	L IFM port1	does not

11. WIZARD PAGE: TUNNEL SELECTION

11.1 General

- Prerequisite: tunnels must have been created. See Ref. [2Net] in Table 2 for more info. Different tunnel types are possible:
 - Point-to-Point; MultiPoint; Logical Ring; Subring;

A service connects front ports on one side of the tunnel to the front ports on the other side of the tunnel. The service can be programmed within one tunnel or within multiple combined tunnels with each tunnel already configured before. See figures below:



Figure 5 Service Creation in Tunnels

- **NOTE:** A maximum of eight services can be programmed per tunnel;
- **NOTE:** If one tunnel cannot cover the required service path, multipoint, logical ring and subring tunnels can be combined into one big tunnel to provide the path. Tunnels must be combined in a Tunnel Combination Point, which is a node in which one tunnel ends and the other tunnel starts, see figure below.



Figure 6 Service Via Combined Tunnels

11.2 Tunnel Selection

Select the required tunnel(s) from the available tunnels list, via checking the 'Selected' checkbox, to transport your configured service. See figure below.



Figure 7 Ports to Tunnel Match

Tunnels list: The allowed or shown tunnels in the tunnel list depend on your service type.

Table 3 Allowed Tunnel Types per Service Type

Service Type	Point-to-Point		MultiPoint		Logical Ring		Subring	
	Normal	HQoS	Normal	HQoS	Normal	HQoS	Normal	HQoS
Smart SFP (Ethernet)	\checkmark							
Voice			\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Serial Ethernet			\checkmark		\checkmark		\checkmark	
Circuit Emulation	\checkmark							
Local Mode (no tunnel needed)								
= allowed; = not allowed/not possible Note: A service can only use either a normal (=Non-HOoS) or HOoS tunnel, but not a mix of both								

Match (x/y):

- x: number of reachable service ports (or termination points) via this tunnel;
- y: number of selected service ports (or termination points);
- Perfect match: e.g. 2/2: all the selected service ports belong to nodes that are all linked to this tunnel. This tunnel can transport the service;

- Mismatch: e.g. 1/2: at least one of the selected service ports belongs to a node that is not linked to this tunnel. A single selected tunnel with a mismatch cannot transport the required service;
- Selected: checkbox to select the tunnel.
- One tunnel: If only one tunnel is selected, this tunnel has to have a perfect match to transport the required service;
- Combined tunnels: multiple tunnels can be selected or combined (by just selecting them in the tunnel list) into one big tunnel to transport the required service. It is possible to combine single tunnels with a mismatch into one big combined tunnel that has a perfect match for the entire service. Point-to-point tunnels cannot be combined, see Figure 6;
- **NOTE:** If no more tunnel with a perfect match is available in the tunnels list, it is also possible to create a new tunnel via clicking +. In doing so, the tunnel wizard will automatically select the needed devices for this service. After closing the tunnel wizard, the new tunnel will automatically appear in the tunnel list;



Figure 8 Selected Highlighted Tunnel

12. WIZARD PAGE: QUALITY OF SERVICE PARAMETERS DETAIL (READ-ONLY)

CAUTION:

When the real or measured average frame size is reasonably lower than the configured average frame size, extra delay and/or frame loss can occur! Frame loss can be detected and verified via the 'Disc In Packets'/'Disc Out Packets' counters, see 'Port Performance' \rightarrow 'CSM Ethernet Port Monitoring' in Ref. [2Net] in Table 2.

When the real or measured average frame size is reasonably higher than the configured average frame size, a lower BWE will be obtained but traffic will not be influenced.

12.1 General

After configuring the 'Quality of Service Parameters' page in the service wizard and clicking Next>>, the page with 'Quality of Service Parameters Detail' shows up. See figure below. This

page by default shows a nice overview of the bandwidth and burst size usage of your configured service through the network.

Some values are configured, others are calculated by HiProvision based on the configured values. E.g. if the service values are configured, the according service port values will be calculated automatically. Both configured and calculated values are visible in both the network drawing and tables in the Ports and LSPs tabs.

CAUTION: For legacy services, this 'Quality of Service Parameters Detail' must not be adapted. The Ports and LSPs values should remain as calculated by HiProvision. Changing these values could result in packet loss.



Figure 9 Bandwidth/Burst Size Parameters in Detail



Figure 10 Grapic View Option Buttons

- ► Filter button ∑: see §12.2.
- Clear Selection button :: clears selected rows in the Ports/LSPs tab.
- Advanced button ^{the Advanced}: not relevant for legacy services, do not use.
- BandwidthMatch button 2: not relevant for legacy services, do not use.

12.2 Filtering Tables

When a lot of nodes and/or links are in the network or in the tables, scrolling through the table records and comparing values of some records can sometimes be hard. Therefore to

avoid too much scroll work, you can easily filtering out your needed Ports/LSPs to show less records.

12.2.1 Filtering Nodes/Ports

- Via network drawing: Just click one node or one port in the network drawing. The Ports tab becomes active, with the clicked node or port filtered out. Note: Multiple select is not possible via the network drawing.
- Via table: Just click/select the port (device name column) in the Ports tab and click Multiple records can be selected via holding the CTRL or SHIFT key and clicking/selecting ports followed by clicking .
- If you made a wrong selection, just click the is button to clear the selection.
- ▶ Disable the filtering (and show all records) by just clicking the highlighted 🏹 again.

12.2.2 Filtering Links (or LSPs)

- Via network drawing: Just click the link in the network drawing. The LSPs tab becomes active, with the clicked link filtered out. Note: Multiple select is not possible via the network drawing.
- Via table: Just click/select the LSP (direction column) in the LSPs tab and click records can be selected via holding the CTRL or SHIFT key and clicking/selecting LSPs followed by clicking .
- ▶ If you made a wrong selection, just click the 🔟 button to clear the selection.
- ▶ Disable the filtering (and show all records) by just clicking the highlighted ☑ again.

12.3 Values on the Network Drawing



Figure 11 Bandwidth/Burst Size on WAN Side

- [1] = Node input: for this service, a useful bandwidth of 1274 kbps is available from link → node;
- [2] = Node input: for this service, a gross bandwidth of 1712 kbps and gross burst size of 172 bytes is available from link → node;
- [3] = Node output: for this service, a useful bandwidth of 1274 kbps is available from node
 → link;
- [4] = Node output: for this service, a gross bandwidth of 1712 kbps and gross burst size of 172 bytes is available from node → link;



Figure 12 Bandwidth/Burst Size on LAN Side

[1] = Node input: for this service, a useful bandwidth of 1360 kbps and a useful burst size of 128 bytes is available from application → node;

12.4 (Service) Bandwidth Already Configured on WAN Links

CAUTION: 'Bandwidth' in this paragraph always refers to the configured bandwidth!

12.4.1 General

If you want to configure new services, it is always nice to know how much bandwidth has been reserved (or configured) already on the link or how much is still available. This paragraph shows all the info you need to about bandwidth usage within Dragon PTN, in order to configure it as efficiently as possible.

WAN links in the Dragon PTN network are Ethernet 1G, 10G or 40G links. They can carry 1, 10 or 40 Gbps in both directions on the link.

Max. Service Bandwidth = Max. WAN link bandwidth – Reserved bandwidth

- Max. Service Bandwidth = Maximum available bandwidth on a link that a Dragon PTN user can configure in HiProvision when programming an Ethernet service. It also means that no other services are configured yet on this link.
- Max. WAN Link Bandwidth = Link Capacity:
 - The Link Capacity is by default the same as the original bandwidth of the selected link type (1 Gbps, 10 Gbps or 40 Gbps links). However, the Link Capacity can be downscaled to a lower bandwidth if desired, see Link Capacity in Ref. [2Net] in Table 2.
- Reserved Bandwidth depends on:
 - DCN Channel Bandwidth: The DCN channel bandwidth is by default 40 Mbps but can be downscaled to 1.5 Mbps if desired. It is advised to keep 40 Mbps. See DCN Channel in Ref. [2Net] in Table 2.
 - Configured Average Frame Size: Small Frames (64 bytes) is more overhead than Large Frames (1522 bytes).
 - MACsec (1-10G-LW): A link with MACsec on has more overhead than a link with MACsec off;
 - PHY Mode setting (LAN/WAN) (1-10G-LW): WAN setting has more overhead;

The less reserved bandwidth, the more service bandwidth can be configured for applications.

Point-to-point service: a service bandwidth of 'x' Mbps on the link automatically results in a possible endpoint bandwidth of 'y' Mbps on the access port and vice versa.

- 'x' = service bandwidth including 'L2 Ethernet Frame' data and MPLS-TP overhead;
- 'y' = endpoint bandwidth including only 'L2 Ethernet Frame' data;
- 'y' is always less than 'x' with the maximum of 'x' depending on all the existing overhead described above;

By default, the service bandwidth is configured the same in both directions, but can be tuned individually if desired.

The maximum bandwidth on the link is in both directions.

12.4.2 Connections Tab

a. Overview

Via the Connections tab, the bandwidth occupation (%, color) can be shown per link. Click a link in the Links table (see figure) to show the network drawing. The link is encircled in the network drawing and a cross-section of that link with all its details is split out at the bottom section. The link colors indicate the bandwidth occupation severity, which can be adapted via the color slider.



Figure 13 Connection Tab: Bandwidth Information

b. Link Bandwidth Occupation: Percentage, Status Color

Percentage label:

x%: used bandwidth, x percent of the available link bandwidth;

- In the network drawing: If a percentage label hides another percentage label of an underlying link, the top label can be dragged aside after having it clicked first;
- In the network drawing: clicking the solution relayouts the percentage labels on the link;
- Status color = color indication of the bandwidth occupation percentage. The list below shows the colors for the default occupation ranges. The ranges can be modified via the color sliders:
 - green (0-30%): low;
 - orange (30-60%): medium;
 - red (60-80%): high;
 - dark red (80-100%): critical;



Figure 14 Bandwidth Percentage Label and Status Colors

c. Link Details

In the figure below, the selected link shows all its tunnels including all its configured services. Each service also shows its bandwidth. The total bandwidth for the link in one direction from Node $x \rightarrow$ Node y, is the sum of the DCN bandwidth and all individual service bandwidths in that link in that direction, see figures below.

The 'Min. Total Link Bandwidth' including DCN: Indicates the minimum bandwidth that the configured services can address when consuming the bandwidth in the least efficient way (small packets, frame size = 64 bytes). As a result, when programming an additional service in a more efficient way (e.g. frame size = 500 bytes), this value will increase. The more efficient you use the bandwidth, the more total bandwidth can be consumed.

The bandwidth occupation for this link in this direction is 65% (= 543.6/841.937). This results in a red status color for the link according to the color slider settings. The used DCN bandwidth is also shown and depends on the link type, see Ref. [2Net] in Table 2.

NOTE: The grey (=zoom in) 'eye icon' becomes visible when hovering over the tunnel or the service pipes. Click this icon to zoom in. It also shows more detailed information in the right-hand side of the Connections Tab. After zooming in, the black (=zoom out) 'eye icon' becomes visible. Click this icon to zoom out again. Hovering over the labels in the figure below will zoom in the labels for a better view.



Figure 15 Link Details

d. Two Bandwidth Directions in one Link

The bandwidths for a service is by default the same in both directions, but can be tuned differently if desired at service creation time. In the figure below, the thicker a pipe (link, tunnel or service), the more bandwidth it reflects. If the pipe of 'service x' is thicker in one direction than the other, it means that both directions have different bandwidths. The resulting link color is the severest status color of both directions (e.g. red is more severe than green). Also the highest percentage value of both directions will be taken.



Figure 16 Highest Value and Severest Color

13. WIZARD PAGE: SERVICE ENDPOINT SELECTION VIA NETWORK DRAWING

This general example shows how to select service endpoints or ports on a 9-L3A-L IFM (= L3 IFM) via clicking the node icons in the network drawing. This way of working is similar for all services (Serial Ethernet, Circuit Emulation...) and IFM types (4-GC-LW, 7-SERIAL, 4-E1-L/4-T1-L, ...). Below this figure, all possible port icons and colors are explained. Not all port icons are available for all IFM types, but this list just shows a total overview.



Figure 17 Example: Service EndPoint Selection via Network Drawing

A port icon overview can be found below:

- brown LAN port = available for this service, the port number is shown in the port icon when hovering over it;
- brown bold LAN port = selected for this service;
- ▶ white LAN port □ = unavailable for this service, cannot be selected (correct port type but already taken by another service or wrong port type);
- white filled WAN port a = Cannot be selected. In most of the cases, available means not taken at all by any service. In case of an Ethernet IFM (see Ethernet service in Ref. [2Eth] in Table 2) it could mean a VLAN port as well which has already one or more VLAN based Ethernet services configured;
- Only on L2/L3 IFMs (see also Ref. [2Eth] in Table 2 for more info):
 - brown LAG port = available for this service;
 - brown LAG port = selected for this service;
 - white LAG port ^O= unavailable for this service, cannot be selected (correct port type but already taken by another service or wrong port type);
- Only on L3 IFMs (see also Ref. [2Eth] in Table 2 for more info):
 - brown router S: available VRF (=Virtual Routing and Forwarding) port which can be included in the service. Click this icon if this service must only reach possible virtual router and not the front ports in this IFM. If you click this icon, the front ports on this IFM will become unavailable
 - white router X: 1) unavailable VRF port for this service because already included in another service... or 2) automatic included VRF port because normal L3 IFM LAN ports are selected for this service in this IFM.

14. TEST & LOOPBACK CONFIGURATION

14.1 General

Test and Loopback self-tests can be performed in all Circuit Emulation services (=CES) or in the 4-DSL-LW Ethernet service or in the Serial Ethernet service, e.g. when configuring or troubleshooting a service. The available self-test functions are listed below. Where these functions are supported is listed in Table 4.

- Loopbacks: on backplane or front port both supporting two directions: towards line (=application) or network;
- BERT: test traffic generation and verification = Bit Error Ratio Tester;
- ▶ Tone Generation/Level Metering: test tone signal generation.

The table below shows which IFMs support the functionalities:

IFM	Loopbacks		BERT	Tone Generation				
	Backplane	Front Port	One Port per IFM	Per Port	/Level Metering			
√ = supported; = not supported								
4-E1-L/4-T1-L	\checkmark	\checkmark		\checkmark				
16-E1-L/16-T1-L	\checkmark	\checkmark		\checkmark				
4-DSL-LW	✓							
2-C37.94	\checkmark	\checkmark	√ (for C37.94 ports)	\checkmark (for E1/T1 ports)				
7-SERIAL	\checkmark	\checkmark	√ (for CES)					
4-CODIR	\checkmark	\checkmark	\checkmark					
4-2/4WEM	\checkmark	\checkmark			\checkmark			
2-OLS	\checkmark	\checkmark	√ (for OLS ports)	√ (for E1 ports)				

Table 4 Test & Loopback Support

14.2 Loopbacks

14.2.1 General

A loopback can be configured on the backplane (=IFM settings) or front port (=port settings). It just loops back the received traffic on an Rx pin towards its associated Tx pin on a specific port. If a backplane loopback has been configured enabled, all the ports on the IFM will be in loopback. Each loopback can be enabled towards the line interface (=application side) or network side. An overview can be found in the figure below.



Figure 18 Loopback Functionality

14.2.2 Configuration

Go to Dashboard \rightarrow Network Hardware and select a supported IFM or port (from Table 4) in the device list. The settings are shown in the 'Test and Loopback' section on the right-hand side. Always load the configuration into the network to activate it. Activating loopbacks will also generate a 'Test and Loopback active' alarm in HiProvision.

CAUTION: enabling/disabling loopbacks disables/resumes normal service traffic on a port. Verify alarms!

			Description		
IFM(1) Loo Ne	Loopback On/Off Network Data		Enable/Disable the backplane loopback towards the network. As a result all/no ports in service will be looped back on the backplane!		
Lo. Da	oopback Line ata	On/Off	Enable/Disable the backplane loopback towards the line or application. As a result, all/no ports in service will be looped back on the backplane!		
Port Lo	oopback(2)	Off Line Network	Off: Disable the front port loopback Line: Enable the front port loopback towards the line or application Network: Enable the front port loopback towards the network		

Table 5 Loopback Settings

(1): Supported on IFMs: 4-E1-L/4-T1-L, 16-E1-L/16-T1-L, 2-C37.94, 7-SERIAL, 4-2/4WEM, 4-CODIR, 2-OLS.

(2): Supported on ports on IFMs listed in (1), including the ports on the 4-DSL-LW IFM. For 7-SERIAL, this setting will only become visible after this port has been configured in a service.

14.3 BERT (=Bit Error Ratio Tester)

14.3.1 General

The BERT module allows the IFM to send test traffic on a selected service port towards the line interface (=application side) or network side. This module also allows to listen on a port for incoming test traffic and verify it.

The test results of the test traffic can be easily monitored via the 'Test & Loopback Performance' in the Dashboard \rightarrow Monitoring \rightarrow Performance tile, see also §14.6.





CAUTION:

- Enabling BERT to send test traffic on a service port will disable the normal service traffic on that port!

- Sending BERT traffic from a 4-E1-L IFM (port 1) using V.110 speeds is not supported, see §10.

14.3.2 Configuration

To configure BERT, go to Dashboard \rightarrow Network Hardware and select a supported IFM or port (from Table 4) in the device list. The BERT settings are shown in the 'Test and Loopback' section on the right-hand side. Always load the configuration into the network to activate them. Activating BERT will also generate a 'Test and Loopback active' alarm in HiProvision.

CAUTION: enabling/disabling BERT disables/resumes normal service traffic on a port. Verify alarms!

Settings	Field	Values	Description			
2-C37.94 IFM	BERT Tx Direction	Port 1 Line Port 1 Network Port 2 Line Port 2 Network	Port n Line : If BERT is enabled, BERT module transmits test traffic towards the line or application side via port n Port n Network : If BERT is enabled, BERT module transmits test traffic towards the network side via backplane port n			
	BERT Rx Direction	Port 1 Line Port 1 Network Port 2 Line Port 2 Network	Port n Line : If BERT is enabled, BERT module listens to the line or application side to receive and verify test traffic via port n Port n Network : If BERT is enabled, BERT module listens to the network side to receive and verify test traffic via backplane port n			
	BERT Tx/Rx Enable	True/False	Enable/Disable both the transmit and receive functionality on the BERT module, only for the C37.94 ports, not for the E1 and T1 ports.			
7-SERIAL IFM 4-CODIR IFM 2-OLS IFM	BERT Tx Direction	Line Network	Line: If BERT is enabled, BERT module transmits test traffic towards the line or application side via the BERT Tx Port (=front port) Network: If BERT is enabled, BERT module transmits test traffic towards the network side via the BERT Tx Port (=backplane port)			
	BERT Tx Port	Port 14 (4-CODIR) Port 1,2,4,6 (7-SERIAL) Port 1,2 (2-OLS)	The port on which the BERT module will transmit test traffic either on the front or backplane port, based on the selected direction.			
	BERT Rx Direction	Line Network	Line: If BERT is enabled, BERT module listens to the line or application side to receive and verify test traffic via the BERT Rx Port (=front port). Network: If BERT is enabled, BERT module listens to the network side to receive and verify test traffic via the BERT Rx Port (=backplane port).			
	BERT Rx Port	Same ports as BERT Tx Ports	The port on which the BERT module will listen to receive test traffic and verify it. Either on the front or backplane port, based on the selected direction.			
	BERT Tx/Rx Enable	True/False	True : BERT module will transmit test traffic on the Tx port and listen on the Rx port to verify incoming test traffic.			

Table 6 BERT Settings

Settings	Field	Values	Description			
			False : BERT module will not transmit test traffic on the Tx port and not listen on the Rx port to verify incoming test traffic.			
	BERT Bitrate (only CES on 7-SERIAL and 2-OLS IFM)	<value 1n=""> 7-SERIAL: n=24 2-OLS: n=64</value>	Set the bitrate for asynchronous CES. The resulting bitrate = n * 4800 bps. 4800 bps (with n=1) is ok if 1200 bps or 2400 bps are required. For synchronous CES, always the service bitrate is taken			
E1/T1 Port (3)	BERT Pattern Select	PRBS 2e9-1 PRBS 2e11-1 PRBS 2e15-1 QRSS	 PRBS = Pseudo Random Bit Sequence; Select which bit test pattern must be generated by BERT: PRBS 2e9-1: Maximum of 8 consecutive zeros and 9 consecutive ones. Bit pattern length = 511 bits. PRBS 2e11-1: Maximum of 10 consecutive zeros and 11 consecutive ones. Bit pattern length = 2047 bits. PRBS 2e15-1: Maximum of 14 consecutive zeros and 13 consecutive ones. Bit pattern length = 32767 bits. QRSS (= Quasi Random Signal Source): Modified version of PBRS that allows 20 consecutive ones. Bit pattern length = 1048575 bits. 			
	BERT Tx/Rx Direction	Line Network	Line: If BERT enabled, BERT module transmits test traffic towards the line or application side and listens to the same side to receive test traffic and verify it. Network: If BERT enabled, BERT module transmits test traffic towards the network side and listens to the same side to receive test traffic and verify it.			
	BERT Tx/Rx Timeslot	<number></number>	The number is a decimal representation of the timeslots that have BERT enabled. Each timeslot represents a bit of the 32/24 timeslots in E1/T1, with E1: timeslot 0, 1,,31 = 1st, 2nd,,32nd bit T1: timeslot 1, 2,,24 = 1st, 2nd,,24th bit Example1 : Enable BERT module on all E1 timeslots: Binary (32 bits): 1111 1111 1111 1111 1111 1111 1111 Decimal = <number> = 4294967295 Example2: Enable BERT module on E1 timeslots 1, 5, 6: Binary (32bits): 0000 0000 0000 0000 0110 0010 Decimal = <number> = 98</number></number>			
	BERT Tx Enable	True/False	BERT module will transmit/not transmit test traffic on the Tx port			
	BERT Rx Enable	True/False	True : BERT module will listen on the Rx port and verify the incoming test traffic False : BERT module will not listen on the Rx port for incoming test traffic			
Note: by defau	ult, all the test traffic gene	eration has been o	disabled			

(2): Only ports that are not configured yet in a Serial Ethernet service will show up

(3): E1/T1 port on either 4-E1-L/4-T1-L, 16-E1-L/16-T1-L, 2-C37.94 IFM or 2-OLS

14.4 Tone Generator/Level Meter

14.4.1 General

Each port on the 4-2/4WEM IFM has a test tone generator that can generate two tones: 1000 or 1500 Hz. Each 4-2/4WEM IFM can measure an incoming voice signal on one selected port. The received voice signal level can be easily monitored via the 'Test & Loopback Performance' in the Dashboard \rightarrow Monitoring \rightarrow Performance tile, see also §14.6.4.

14.4.2 Configuration

Go to Dashboard \rightarrow Network Hardware and select a 4-2/4WEM IFM or port in the device list. The settings are shown in the 'Test and Loopback' section on the right-hand side. Always load the configuration into the network to activate them. Activating it will also generate a 'Test and Loopback active' alarm in HiProvision.

Settings	Field	Values	Description
4-2/4WEM IFM	Level Meter Enabled	True/False	The signal level meter on the 4-2/4WEM IFM will listen/not listen to an incoming voice signal on the selected port (Level Meter Port Selection).
	Level Meter Port Selection	Port14	Select the port which incoming voice signal must be measured. Example: test tones will be have approximately following levels: Test tone 1000Hz: 1V ptp @ 600 ohm results in -6.81dbm Test tone 1500Hz: 1.5V ptp @ 600 ohm results in -3.92dbm These measured levels can be viewed in §14.6.4.
4-2/4WEM Port	ToneNo Tone GeneratorGenerator1000 Hz /1500 Hz		No Tone Generator: Disable the test tone generation n Hz: The test tone generator will generate an n Hz test signal on this port
Note: by default,	all the test tone	e generation has been	disabled

Table 7 Tone Generator/Level Meter Settings

14.5 Combined BERT / Loopback Example

In the example below, activating BERT on one side and activating port loopback on the other side sets up a test traffic flow through a configured CES in the Dragon PTN network. The results can be easily monitored in §14.6.5.



Figure 20 Combined BERT / Loopback

14.6 Monitoring: Test & Loopback Performance

Test and Loopback traffic can be monitored as well via the performance counters. Go to Dashboard \rightarrow (Monitoring) Performance \rightarrow Counter Control \rightarrow Test and Loopback Performance \rightarrow Select your desired protocol to monitor. Each protocol monitoring is described in more detail in the paragraphs below.

14.6.1 E1/T1 Monitoring

E1/T1 monitoring can be found in the figure below. A detailed and similar monitoring set-up description (adding counters to graphs etc...) can be found in 'Port Performance' \rightarrow 'CSM Ethernet Port Monitoring' in Ref. [2Net] in Table 2.

	Refresh										
F	CASHBOARD DATAB	ASE 🏠 SE	ERVERS BIDH PERFORMANCE	DISCOVERY		NETWORK HARDWA		DNS 😭 ALARMS	SOFTWARE	A PROTOCOLS	
С	counter control 🗢 🙍										
	Display Name										
E	PORT PERFORMANCE TEST AND LOOPBACK PERFORMANCE	OPMANCE	Port	BERT Bit Error Count	BERT Sync Loss	BERT Good Seconds	BERT All Zeros Seco	BERT All Ones Secon	BERT Error Seconds	Measure Time (seconds)	
Þ	E1/T1 Monitoring	CITCHICL	PORT://2/IFM-5/P3/	C: 87 P: 87	C: False P: False	C: 61 P: 61	C: 0 P: 0	C: 0 P: 0	C: 3 P: 3	C: 64 P: 64	
E	C37.94 Monitoring				111000						
E	4W Voice Monitoring										
E	CODIR Monitoring			roc v Dofault Ban	1 Pano? Ontion						
PC			CSV LOG								
	Device Name Select	ted	0.9								

Figure 21 Test and Loopback: E1/T1 Monitoring

Field	Values	Description	Curative Action			
Port	value	Monitored port				
BERT Bit Error Counter	bit errors	increasing = NOT OK: The number of bit errors received by the BERT receiver, this should be zero for a successful test.				
BERT Sync Loss	True/False	True : the BERT receiver is not synchronized with the BERT transmitter, the measurement is failing. False : the BERT receiver is synchronized with the BERT transmitter.	True : Verify the clocking settings, BERT settings, broken paths,			
BERT Good Seconds	seconds	increasing = OK: The total amount in seconds that the test traffic received by the BERT receiver was OK, meaning synchronized and no errors				
BERT All Zeros Seconds	seconds	increasing = NOT OK: The total amount in seconds that the BERT receiver was receiving all zeros				
BERT All Ones Seconds	seconds	increasing = NOT OK: The total amount in seconds that the BERT receiver was receiving all ones				
BERT Error Seconds	seconds	increasing = NOT OK: The total amount in seconds that the BERT receiver was receiving bit errors, an increasing value does not result in synchronization loss				
Measure Time (seconds)	seconds	The total amount in seconds that the BERT receiver has been measuring				
Note: Click the Refresh button for the latest results; Note: Clear the counter values by disabling and enabling the BERT via the IFM/port settings in the network hardware tile; Note: 'C' value in cell = current value: 'P' value in cell = previous value:						

Table 8 Test and Loopback: E1/T1 Monitoring Fields

14.6.2 C37.94 Monitoring

C37.94 monitoring can be found in the figure below. A detailed and similar monitoring setup description (adding counters to graphs etc...) can be found in 'Port Performance' \rightarrow 'CSM Ethernet Port Monitoring' in Ref. [2Net] in Table 2.



Figure 22 Test and Loopback Performance: C37.94 Monitoring



Figure 23 Analysing Counter Values

Field	Values	Description	Curative Action
Module	value	Monitored module	
BERT Sync Loss	True/False	True: the BERT receiver is not synchronized with the BERT transmitter, the measurement is failing. False: the BERT receiver is synchronized with the BERT transmitter.	True: Verify the clocking settings, BERT settings, broken paths,
BERT Sync Loss Seconds	seconds	increasing = NOT OK: The total amount in seconds that the BERT receiver is not synchronized with the BERT transmitter	True: Verify the clocking settings, BERT settings, broken paths,
BERT Bit Error Counter	number	increasing = NOT OK: The number of bit errors received by the BERT receiver, this should be zero for a successful test.	
BERT Good Seconds	seconds	increasing = OK: The total amount in seconds that the test traffic received by the BERT receiver was OK, meaning synchronized and no errors	
Note: Click the Refresh bu	tton for the la	atest results;	

Table 9 Test and Loopback Performance: C37.94 Monitoring Fields

Note: Clear the counter values by disabling and enabling the BERT via the IFM/port settings in the network hardware tile; **Note**: 'C' value in cell = current value; 'P' value in cell = previous value;

14.6.3 Serial Monitoring

Exactly the same description as in §14.6.2.

14.6.4 2W/4W Voice Monitoring

2W/4W Voice monitoring can be found in the figure below. A detailed and similar monitoring set-up description (adding counters to graphs etc...) can be found in 'Port Performance' \rightarrow 'CSM Ethernet Port Monitoring' in Ref. [2Net] in Table 2.



Figure 24 Test and Loopback Performance: 2W/4W Voice Monitoring

Table 10 Test and Loopback Performance: 2W/4W Voice Monitoring Fields

Field	Values	Description
Module	value	Monitored module
Signal Level (dBm)	dBm	The 'Signal Level (dBm)' of an incoming voice signal can be measured if 'Level Meter' has been enabled on a specific port, see also § 14.4 for more information and to know which port is being measured. The accuracy of the measurement is +/- 0.5 dBm.
Note: Click the Defresh butten for the latest results:		

Note: Click the Refresh button for the latest results;

Note: 'C' value in cell = current value; 'P' value in cell = previous value;

14.6.5 CODIR Monitoring

Exactly the same description as in §14.6.2.

14.6.6 Optical Low Speed Serial Monitoring

Exactly the same description as in §14.6.2.

15. ABBREVIATIONS

BWE	Bandwidth Efficiency
CAR IP	Central Alarm Reporter Internet Protocol
CES	Circuit Emulation Service
CESoPSN	Circuit Emulation Service over Packet Switched Network
CRMI	Committed Rate Measurement Interval
CSM	Central Switching Module
CSV	Comma Separated Values
DCN	Data Communication Network
HQoS	Hierarchical Quality of Service
IFM	InterFace Module
IP	Internet Protocol
L2	Layer2
LAN	Local Area Network
LER	Label Edge Router
LPS	Linear Protection Switching
LSP	Label Switched Path
LSR	Label Switching Router
MAC	Media Access Control

MPLS-TP	Multiprotocol Label Switching – Transport Profile
MSTP	Multiple Spanning Tree Protocol
MTU	Maximum Transmission Unit
NIC	Network Interface Card
NSM	Node Support Module
NTP	Network Timing Protocol
OAM	Operation and Maintenance
PAF	PME Aggregation Function
РАМ	Pulse Amplitude Modulation
PME	Physical Medium Entities
PSU	Power Supply Unit
РТР	Precision Time Protocol
QoS	Quality of Service
QSFP	Quad SFP
SAToP	Structured Agnostic TDM over Packet
SDH	Synchronous Digital Hierarchy
SFP	Small Form Factor Pluggable
SONET	Synchronous Optical Network
TRM	Transmit Receive Module
TSoP	Transparent Sonet/SDH over Packet
TTL	Time to Live
HiProvision	Dragon PTN Management System
WAN	Wide Area Network
XFP	10 Gigabit Small Form Factor Pluggable