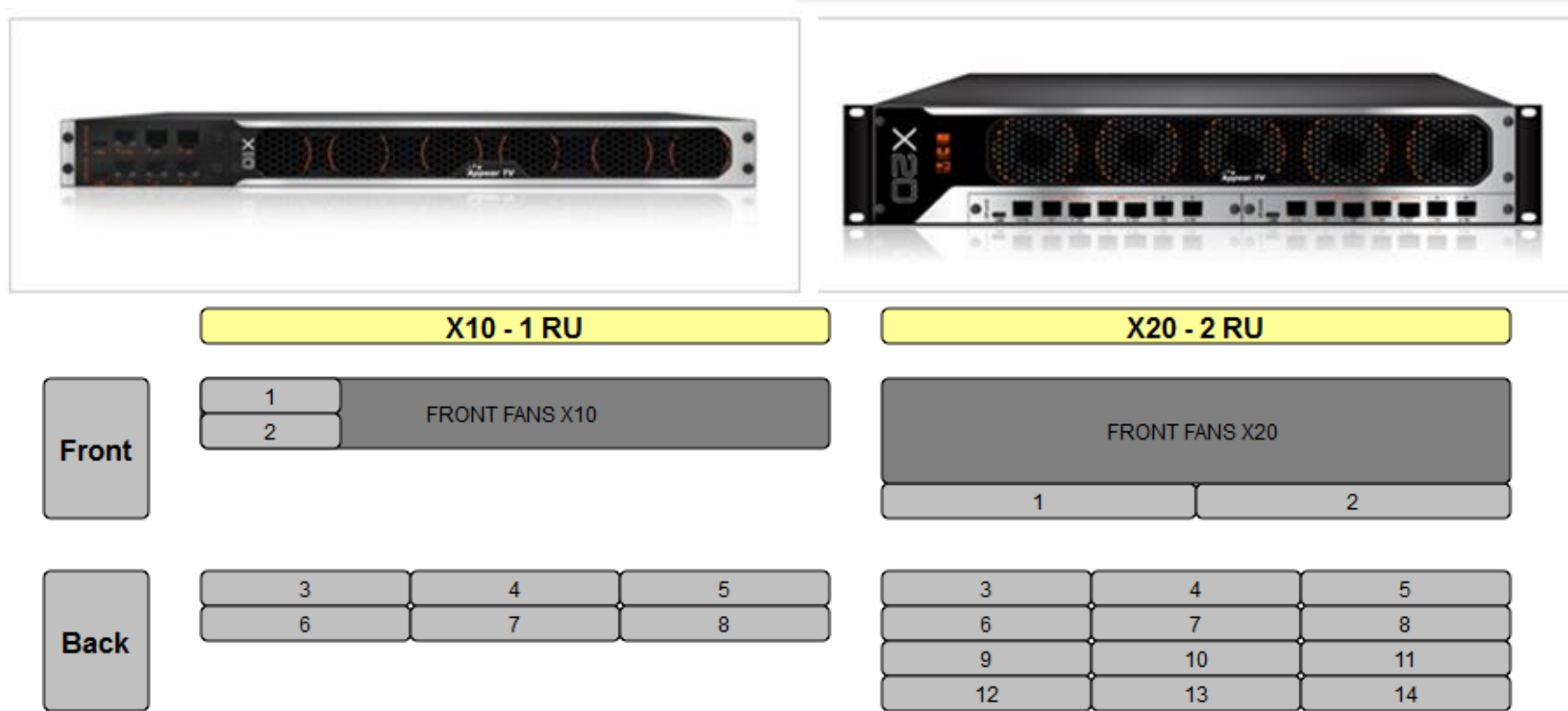




redefining video delivery

X Platform

X Platform Chassis

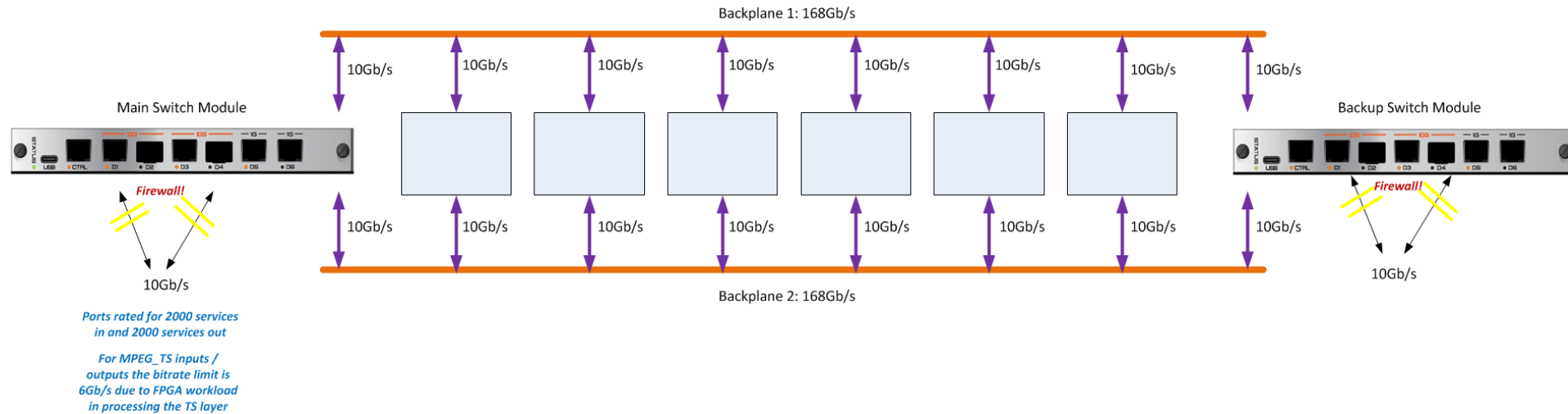


- **6+2 module slots**

- Numbering shows module slot positions
- The +2 slots are for MMI modules (redundant control option)
- Rear modules are identical (can be used in X10 or X20 chassis)
- Redundant hot swap power supply options (-48V option for X20 available, planned for X10)
- Hot swap modules and fans
- Web control with JSON API; Alarm and status reporting via SNMP

- **12+2 module slots**

X Platform backplane connectivity

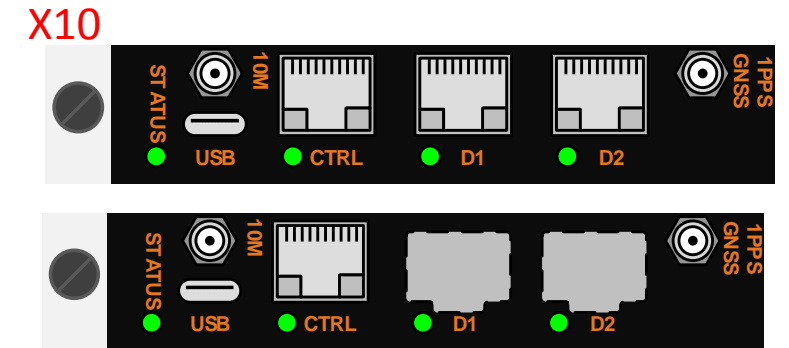


- All modules have 10Gb/s connections IN / OUT of backplane
- Dual backplanes are implemented when a redundant management module is fitted
- Modules connect to both backplanes simultaneously and seamlessly switch traffic
- Failure implications with dual management modules are as follows;
 - Management module failure: seamless management transfer to spare module
 - Backplane failure: Seamless transfer to spare module.
 - Other modules can be duplicated 1+1 and will operate in parallel
- Don't forget this platform majors on IP security, with firewall.

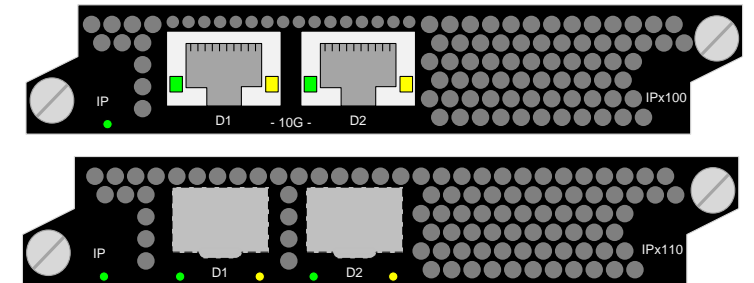
Control modules & Dual IP module



- Data ports:
 - Dual redundant 10G IP I/O, RJ45, SFP+ (either RJ45 or SFP+ on X10)
 - Dual redundant 1G IP I/O, RJ45 (only on X20)
 - Control port 10/100/1000base-T
- Data port modes:
 - Bidirectional or unidirectional (configurable in GUI)
 - Seamless input
 - Cloned output
- 6Gbps MPEG TS rate
- 2000 Streams in and out
- PCR and CBR de-jittering with adjustable delay
- MPEG-2 TS input De-multiplexer (MPTS -> SPTS)
- MPEG-2 TS output Multiplexer (SPTS -> MPTS)

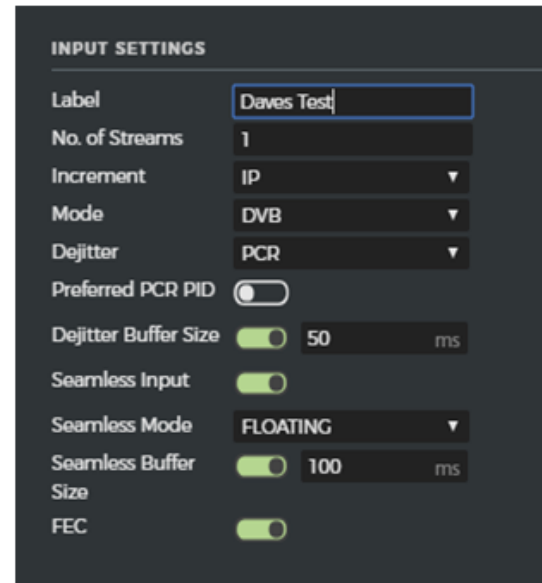


Dual IP



X Platform Latency

- Configurable seamless input buffer (5-150ms)
- Configurable input de-jitter buffer (40-150ms)
- Backplane latency ~1ms



The screenshot displays a dark-themed settings window titled "INPUT SETTINGS". It contains the following configuration options:

Setting	Value
Label	Daves Test
No. of Streams	1
Increment	IP
Mode	DVB
Dejitter	PCR
Preferred PCR PID	<input type="checkbox"/>
Dejitter Buffer Size	<input checked="" type="checkbox"/> 50 ms
Seamless Input	<input checked="" type="checkbox"/>
Seamless Mode	FLOATING
Seamless Buffer Size	<input checked="" type="checkbox"/> 100 ms
FEC	<input checked="" type="checkbox"/>

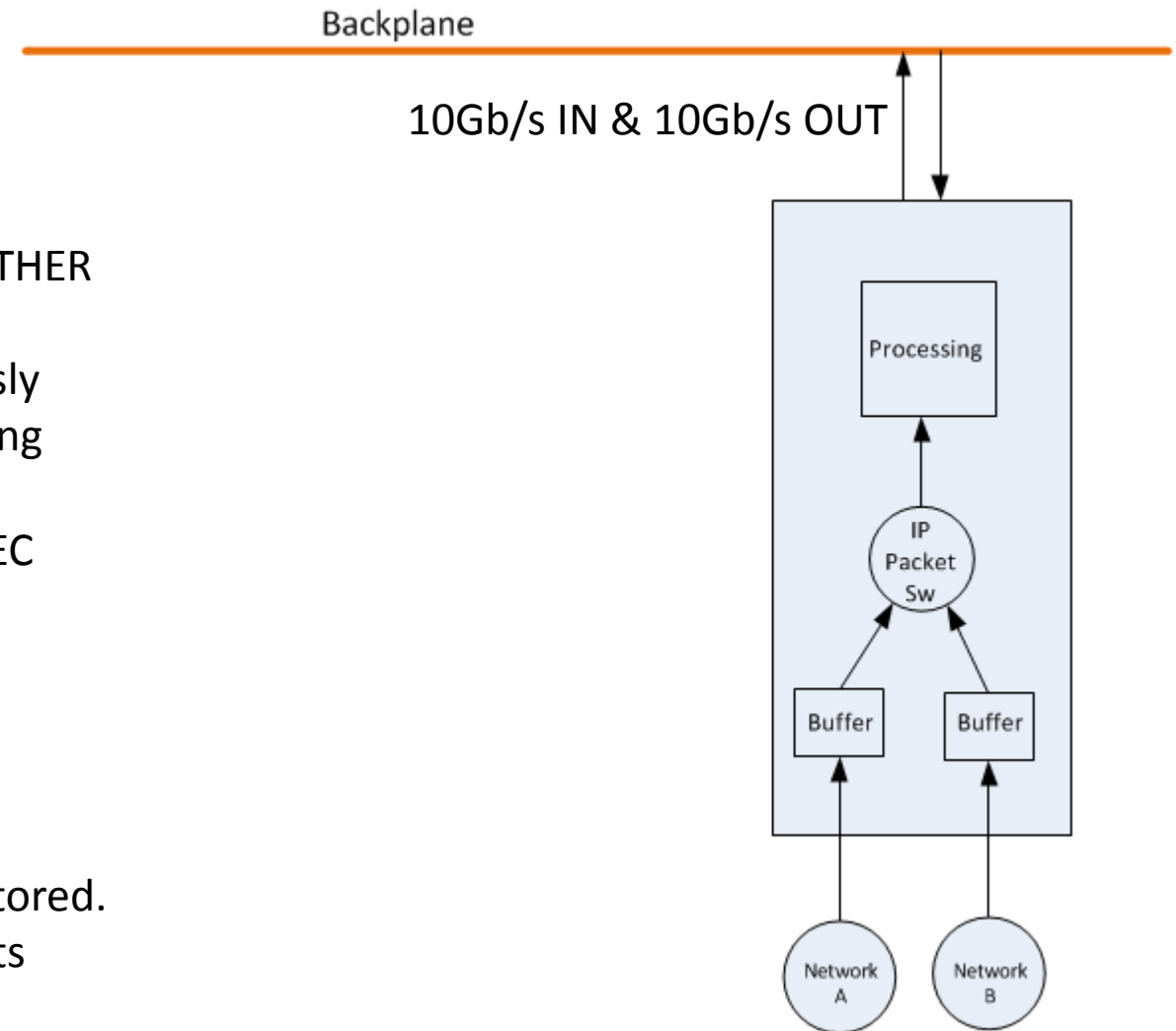
Ingesting IP traffic into control or DIP modules

Seamless Mode

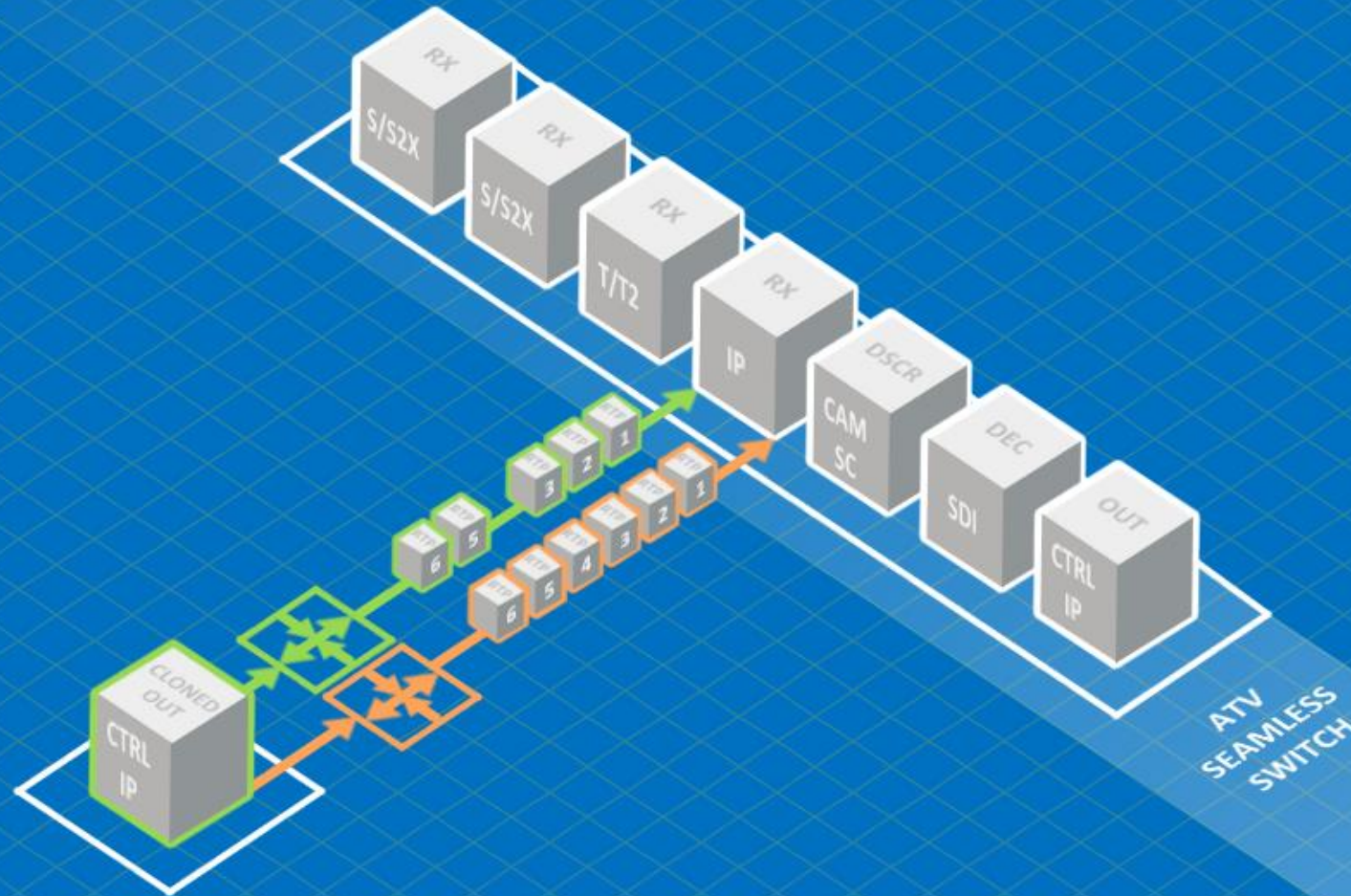
- Incoming IP packets are 'labelled' to allow re-alignment
- Typical method is to use RTP sequence header
- Buffers sufficient to allow >100ms relative network delay
- Once re-synchronised, packet switch selects packets from EITHER network without priority.
- System provides re-construction of missing packets seamlessly
- As long as a packet arrives via one network, a perfect outgoing packet stream will be re-constructed.
- Provides robust error handling and can reduce / eliminate FEC overhead burdens.

Fast switching non-seamless Mode

- Operates exactly as above but without any packet labels
- Re-synchronising identical packets is no longer possible
- One network is designated MAIN. Buffer occupancy is monitored.
- If the input buffer empties below a threshold, the switch acts
- Provides a fast-acting A/B network switch

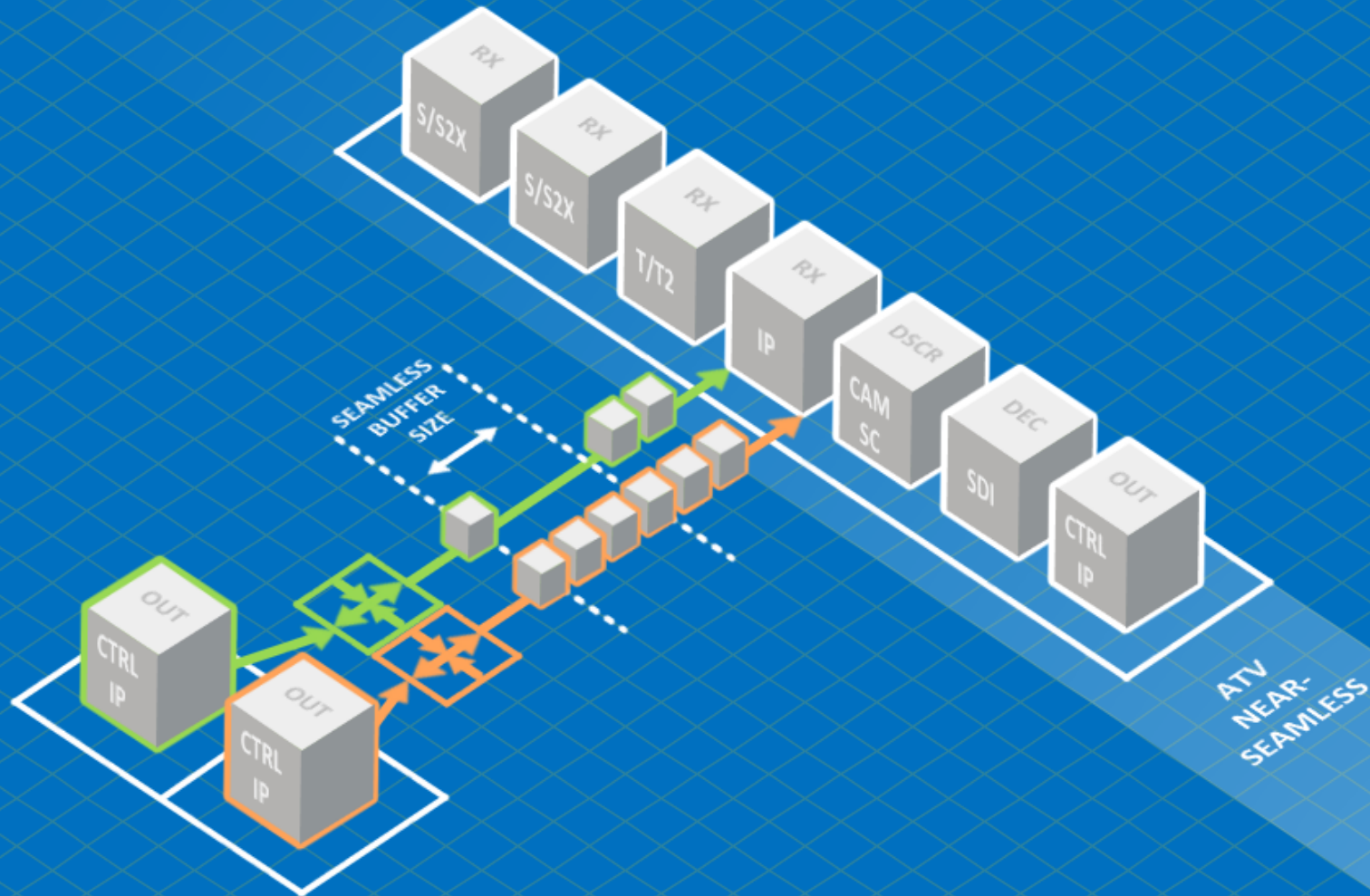


X/XC Network Redundancy: Cloned IP Out & Seamless IP In



- Seamless input redundancy switching on IP level.
- Protects against network packet loss.
- Monitors, aligns and takes IP packets from either A or B network, seamlessly, to re-construct the output.
- Seamless switching in the X chassis is compliant with 'SMPTE 2022-7 Seamless Protection Switching'.

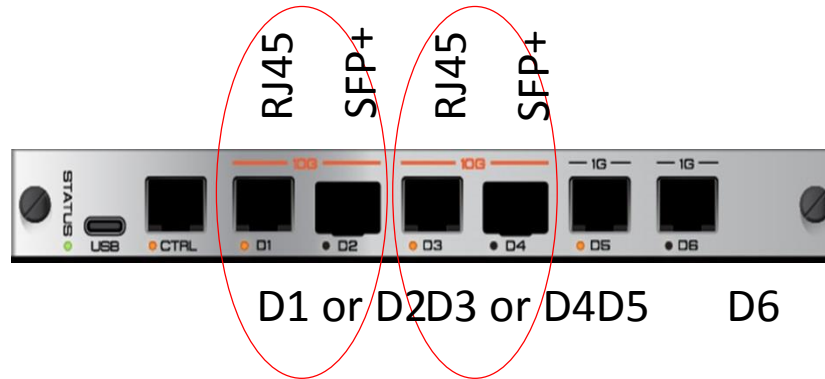
X/XC Source Redundancy: 'Near-Seamless'



- If main and backup input streams are not synchronized, the system will still be able to switch between the streams (but not seamlessly).
- Switching criteria is no reception of IP packets inside the configured seamless buffer.
- Switching will be fast as it is performed on IP level in FPGA.

Outputting IP traffic: Cloned Output mode

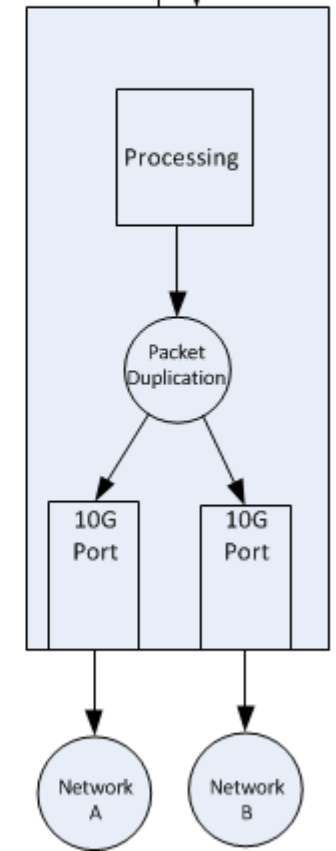
- Cloned output mode (with OSPF support from V1.8 onwards)
- Up to 10Gb/s of traffic replicated on the module
- Output from two separate 10Gb/s ports to provide network redundancy



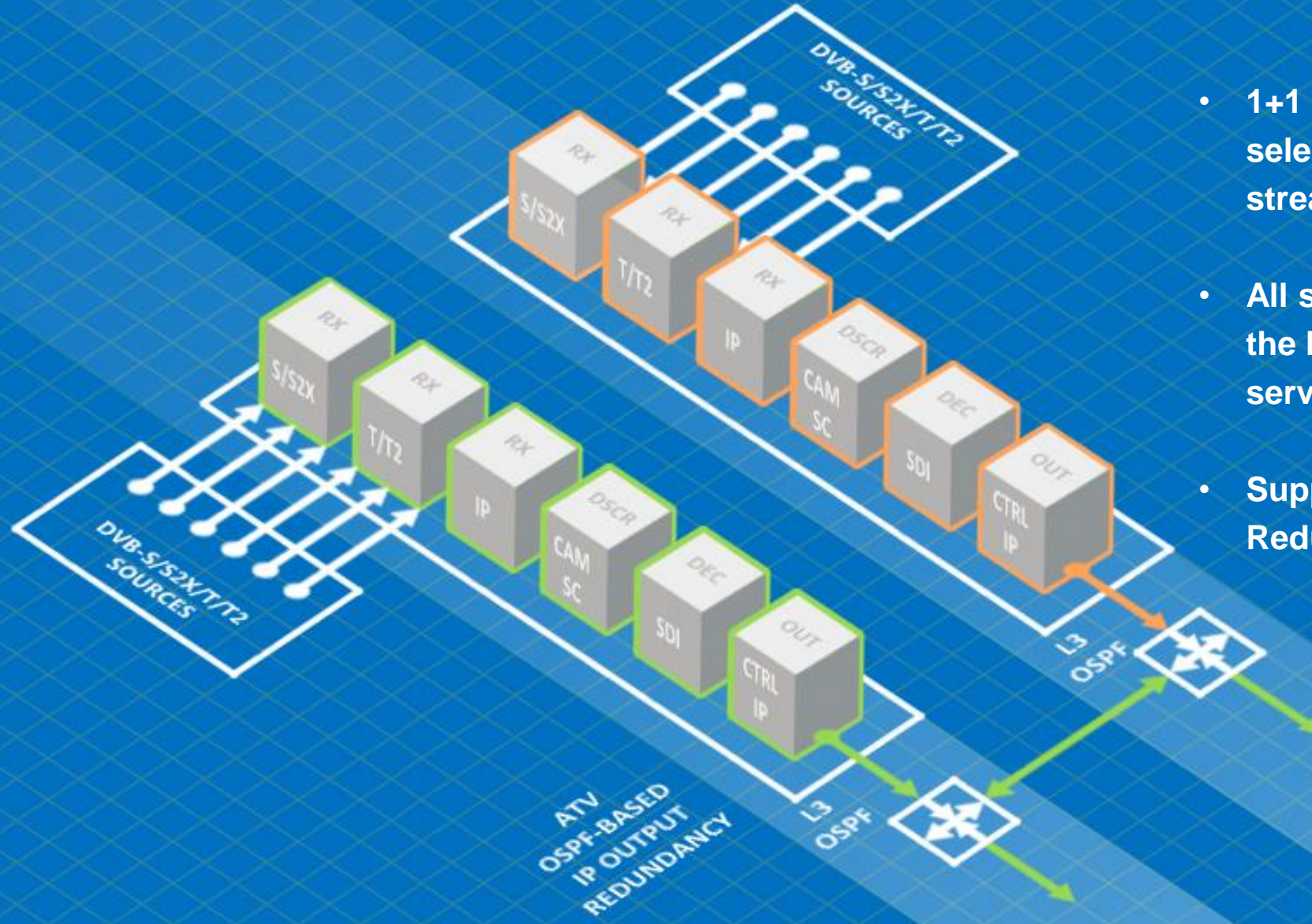
- OSPF Output redundancy implements part of the OSPF protocol in the IP output card
- In response to alarm conditions, OSPF is used to switch IP multicasts individually within a layer 3 router.

Backplane

10Gb/s IN & 10Gb/s OUT

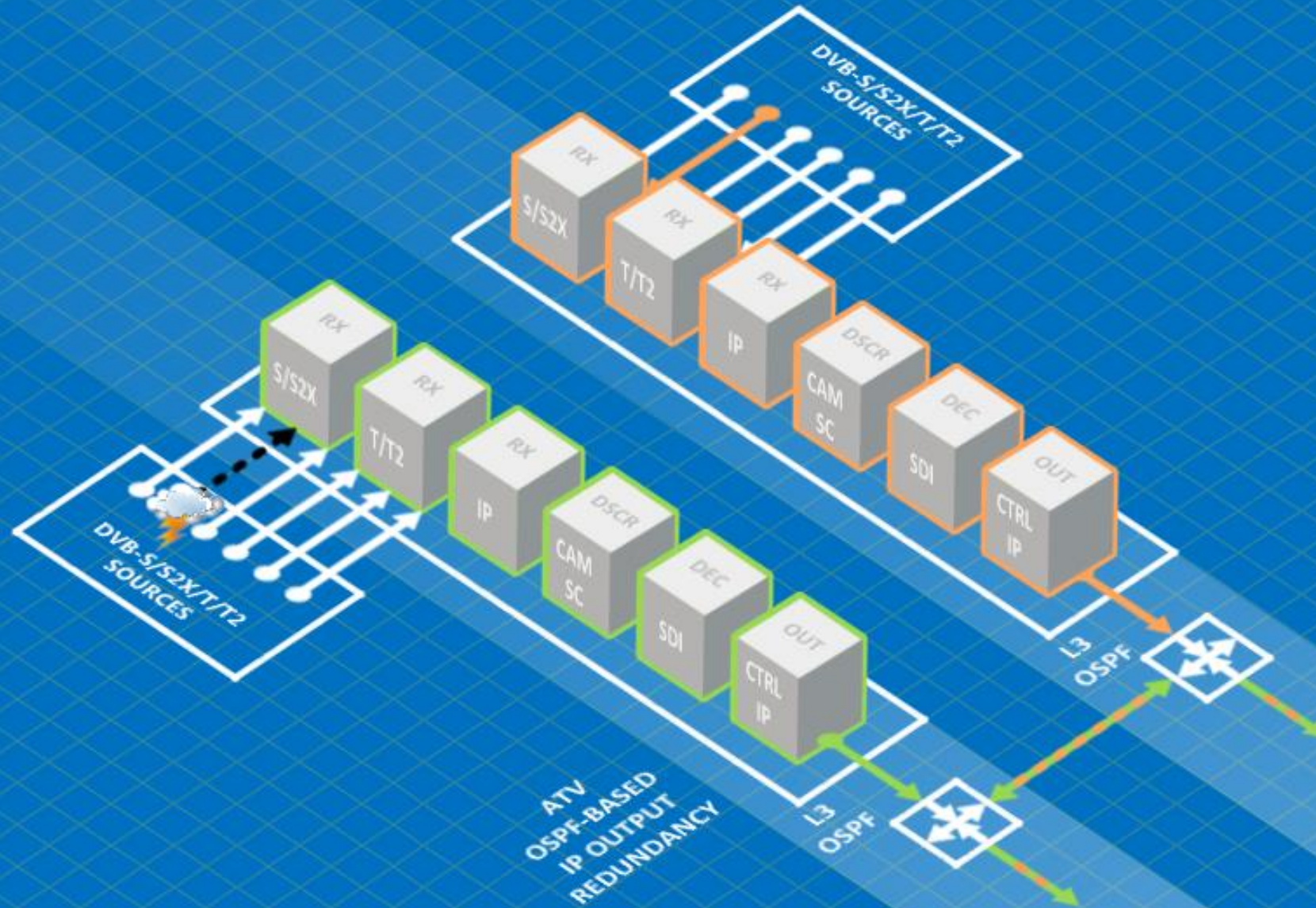


X/XC Device Redundancy: 1+1 w/ OSPF-based Switching

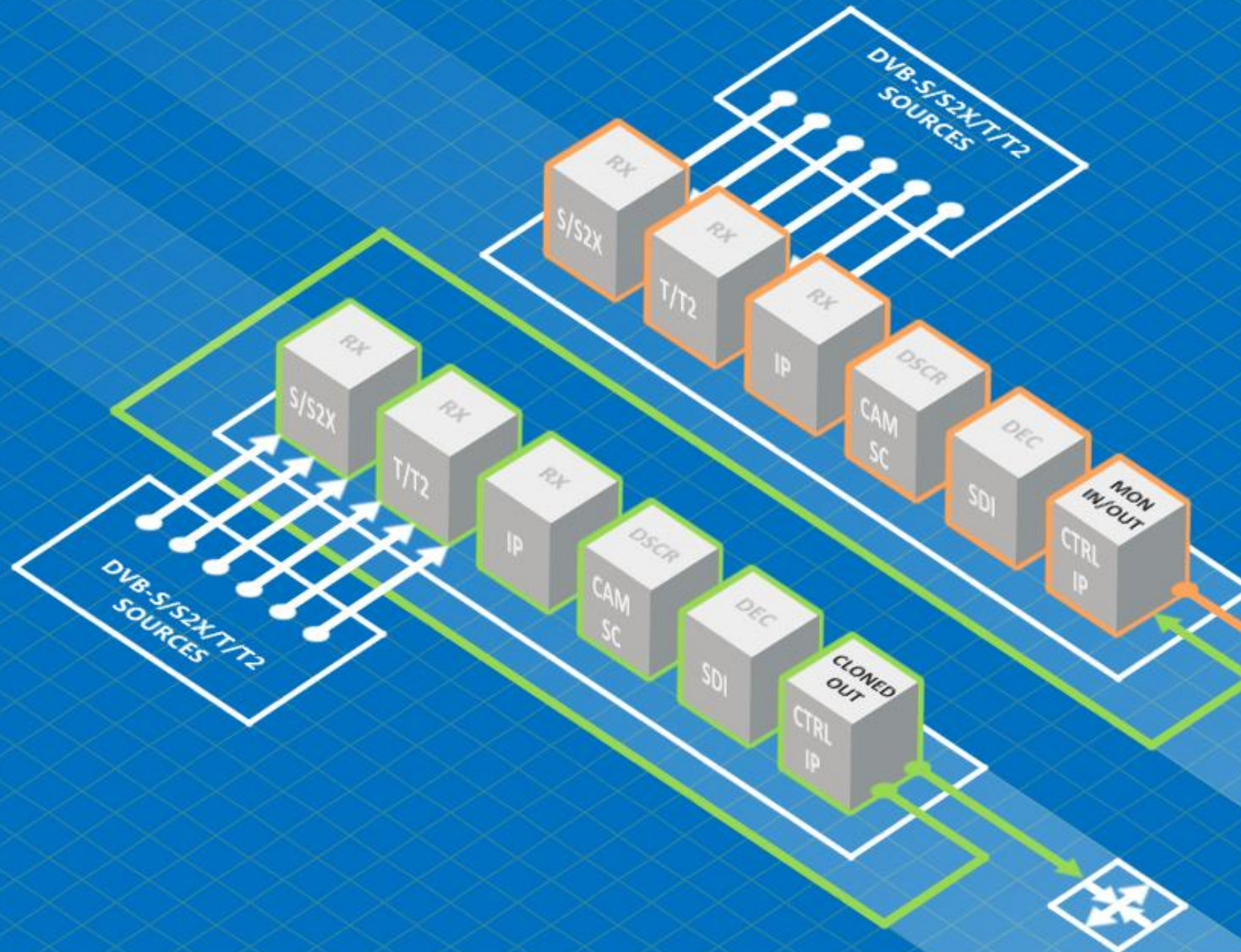


- 1+1 redundancy on selected transport streams.
- All switching handled by the IP network, no servers/NMS required.
- Supports Site Redundancy.

X/XC Device Redundancy: 1+1 w/ OSPF-based Switching

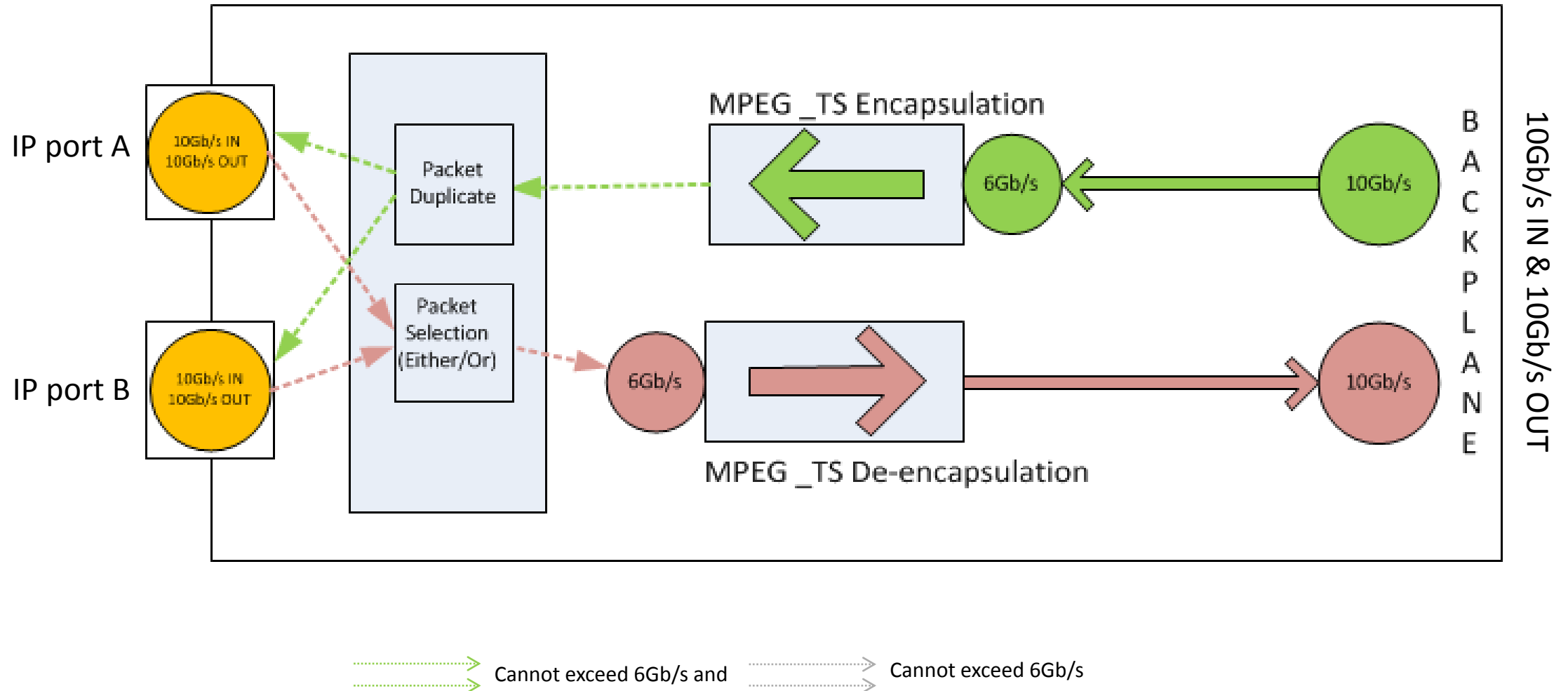


X/XC Device Redundancy: 1+1 'Active – Passive'



- The backup chassis monitors the output streams from the main chassis.
- In case of any failure in the main chassis, the related output streams will be muted, and the backup chassis will turn on its own associated outputs.

IP Traffic flow through control module or dual IP module



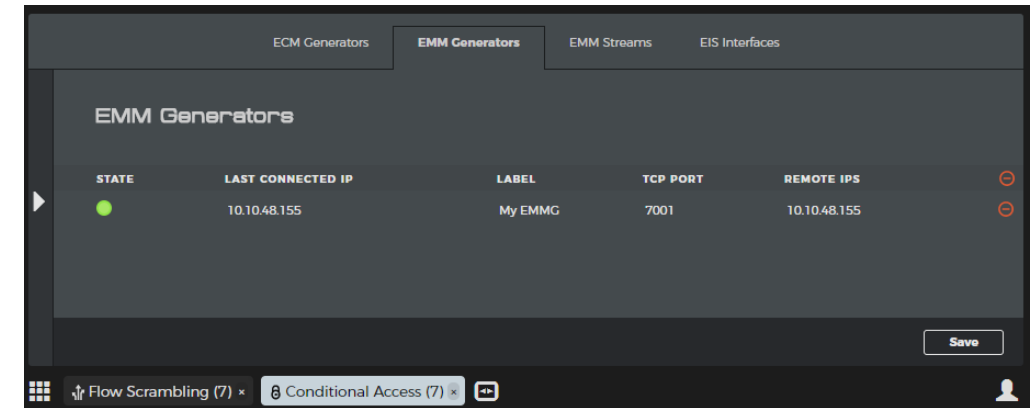
X platform: MPEG Multiplexing

X platform supports a subset of XC multiplexing features:

- You can build MPTS's (if licensed)
- Ability to component / PID filter / PID remap has recently been added
- Ability to pass PIDs / components through will be added (imminent)
- System can generate PSI tables
- Adding the SI capability of XC is NOT on the roadmap

Table	Analyse	Generate	Regenerate	Pass-through	Repetition rate
PAT	*	*			
PMT	*		*		
CAT	*	*	*		
NIT					
SDT Actual	*		*		
SDT Other					
EIT					
TDT					

Scrambling module (DVB-CSA and AES)



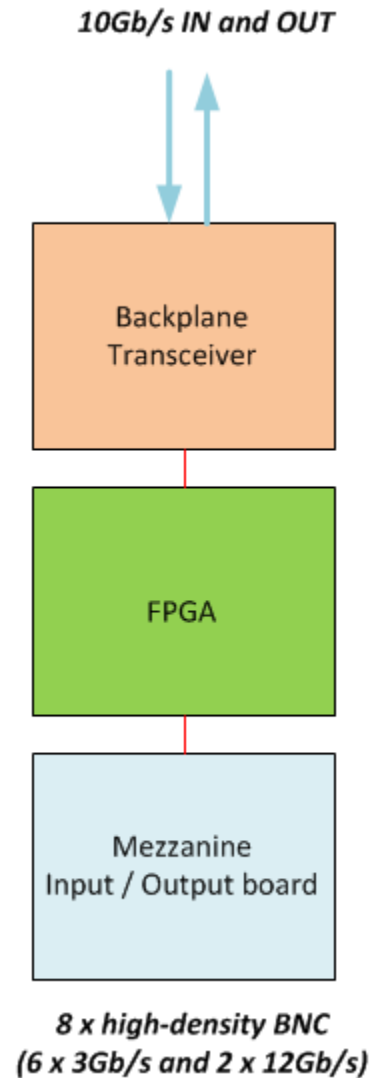
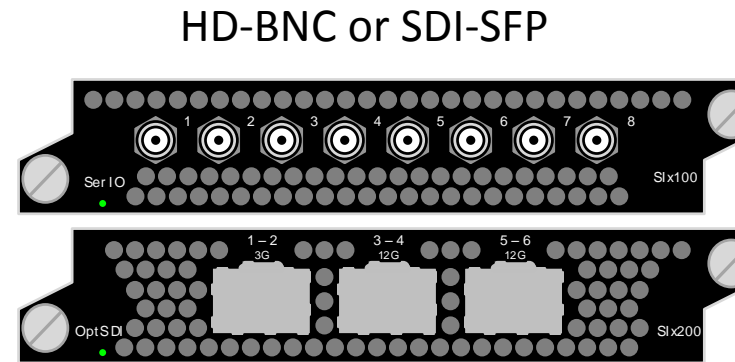
2000 services scrambled with up to 8 simulcrypts (i.e. 8 ECMGs) simultaneously
6Gbps throughput capacity
Redundant SCS ports for redundant network connectivity to CAS servers

Supported scrambling algorithms:

- DVB-CSA v1 (48-bit)
- DVB-CSA v2 (64-bit)
- AES (128-bit)
- BISSv1 mode-1

Bulk descrambler also available (with support for BISSv1 mode-1 and Verimatrix (Standard Security profile) descrambling)

IP <-> SDI Gateway module



Wildcard

ASI mode

Uncompressed

SMPTE 2022-6

TICO UHD

SMPTE 2022-6

TICO HD

SMPTE 2110

JPEG2K

MPEG_TS

Software + license pack options

What is Tico?



THE LIGHTWEIGHT LOW LATENCY CODEC

An extremely small codec in hardware (FPGA / ASIC), highly parallelizable in software (CPU / GPU), preserving full quality

- Visually lossless at 4:1 compression ratio
- Ultra low complexity: low resources from FPGA or GPU mean low power and high service density
- Lower in power and complexity than JPEG2K, but compression ratio also lower for same VQ.

What do the 5 software + license modes offer?

	Wildcard	Uncompressed	TICO UHD	TICO HD	JPEG2K
	ASI mode	SMPTE 2022-6	SMPTE 2022-6	SMPTE 2110	MPEG_TS
Select input / output	By port	By port	By module	By module	By module
Supports ASI In / out	YES	NO	NO	NO	NO
Supports uncompressed video	N/A (MPEG_TS)	Yes	Yes	Yes	No
Supports TICO compression	N/A	NO	YES	YES	NO
Supports JPEG compression	N/A	NO	NO	NO	YES
Supported Resolutions	N/A	SD and HD	UHD Only	HD Only (UHD planned)	HD Only
Density	8 ASI per module	8 or 10Gb/s	2 UHD services	6 or 10Gb/s	4 HD services

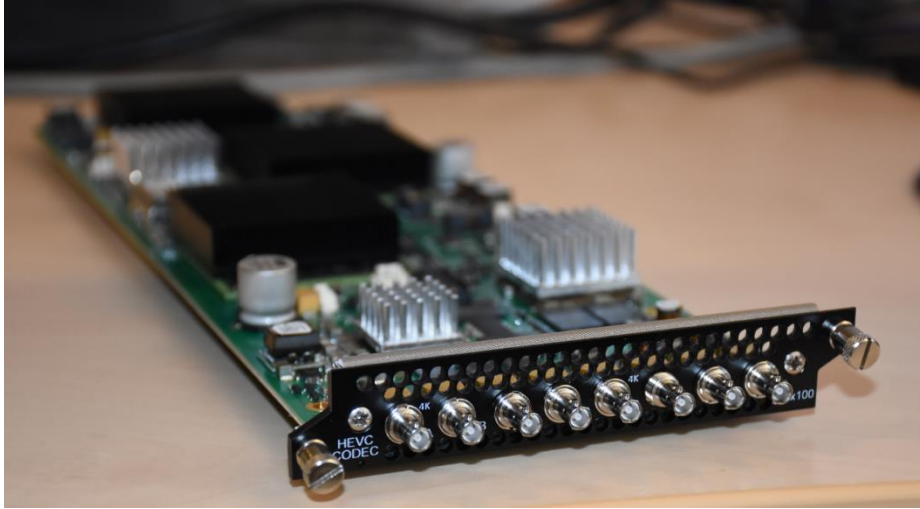
IP <-> SDI Gateway Module Latencies

IP to IP	Wildcard	Uncompressed	TICO UHD	TICO HD	JPEG2K
IP only with minimal buffers	ASI mode	SMPTE 2022-6	SMPTE 2022-6	SMPTE 2110	MPEG_TS
Approx 14ms	Approx. 30ms (ASI to IP and IP to ASI)	Approx 400us	Approx 1.25ms	Approx 1.25ms	From 50ms upwards

Notes:

- Future software release might allow even lower minimum IP buffer sizes to be set so the current 14ms IP delay could be reduced.
- SDI video inputs support auto input detect mode. This works by trying each video option for 400ms in round-robin method

HEVC Encoder / Decoder module



- Primarily required for Satellite transmission
- AVC and HEVC support
- Supports 4K properly
- HDR support
- High density / high efficiency solution
- Choice of latency modes
- 4:2:2 support / 10-bit quantisation support
- Uncompressed IP input / output version planned
- DSP for audio support

Resolution/Mode	Decoder Density	Encoder Density	Current ETE (3.2)
1080i25 Normal	4x	8x	~1.8 s
UHD Normal	2x	2x	~1.7 s
1080i25 Low	4x	8x	~0.8 s
UHD Low	2x	2x	~0.8 s
1080i25 Ultra Low	2x	1x	~0.2 s
UHD Ultra Low	2x	1x	~0.2 s

HEVC

Encoder and Decoder configured to same latency mode.

Resolution/Mode	<u>Decoder Density</u>	<u>Encoder Density</u>	<u>Current ETE (3.2)</u>
1080i25 Normal	4x	8x	~1.8 s
1080i25 <u>Low</u>	4x	8x	~1.0 s
1080i25 Ultra <u>Low</u>	2x	8x	~0.4 s

AVC

Encoder and Decoder configured to same latency mode.

Video Rescaling and de-interlacing will reduce the density. Currently 1080i/720p -> 1080p and 1080i/720p -> SD is supported.

HEVC Encoder Configuration - Templates

Video Profiles

NAME	CODEC	VIDEO FORMAT	BITRATE	USAGE
4k p50	HEVC	3840x2160p50	15 Mbps	In use by 2 services
4k p50 DECODER	Decode	3840x2160p50	-	In use by 2 services

Edit

GENERAL

Label: 4k p50

Latency: Normal

VIDEO

Frame Rate: 50

Vertical Resolution: 2160

Horizontal Resolution: 3840

Chroma Sampling: 4:2:0

Bit Depth: 8

Scanning Mode: Progressive

Aspect Ratio: 16x9

Fallback Aspect Ratio: 16x9

CODEC

Codec: HEVC

Profile: Main

Level: Auto

Tier: Main

Bitrate: 15 Mbps

GOP Mode: Dynamic

GOP Structure: IPB

Max B Frames: 8

GOP Size: 64

Hierarchical GOP: Yes

LDB: Yes

Coding

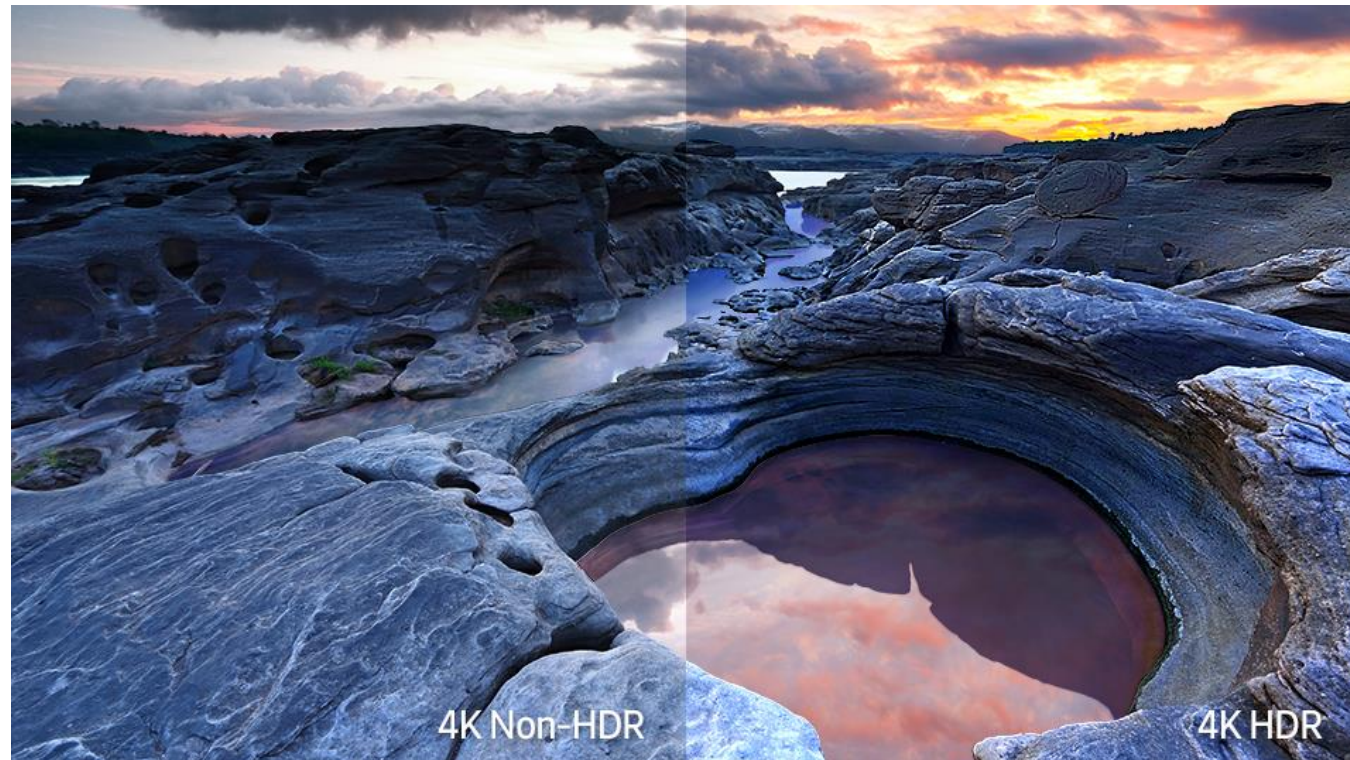
Audio Profiles (9)

Services (9)

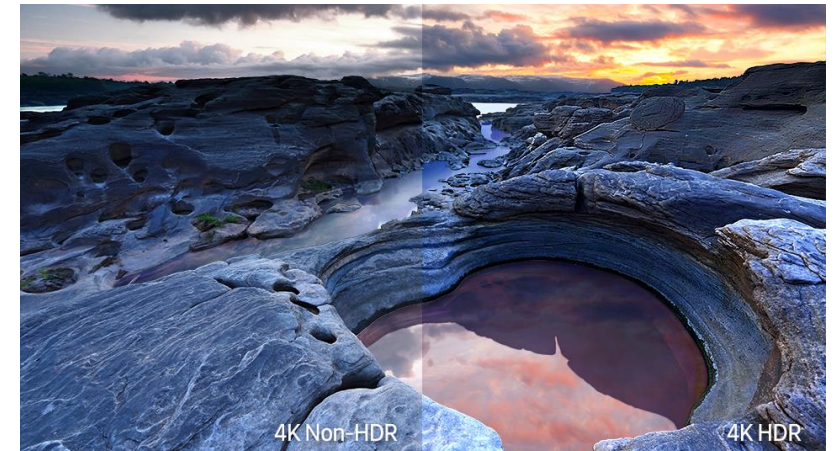
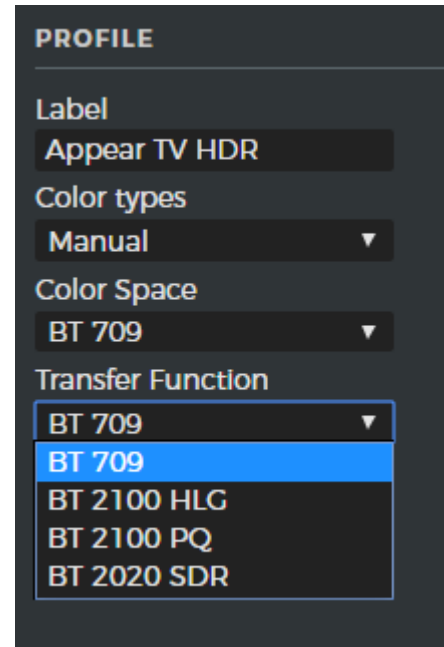
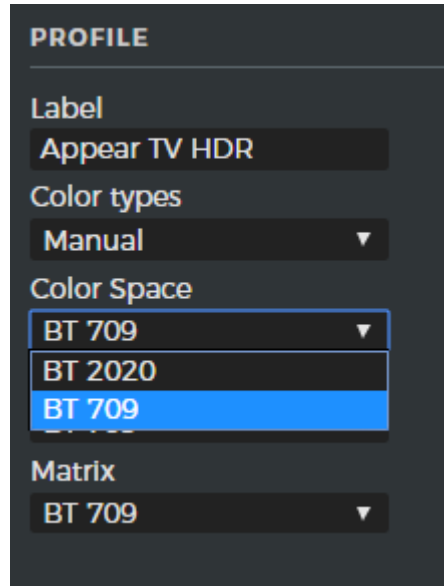
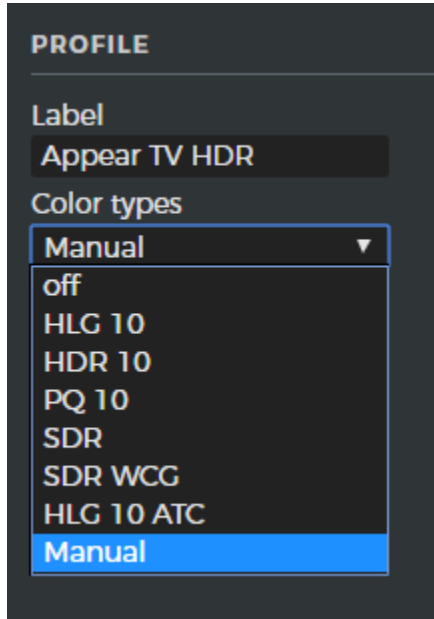
Video Profiles (9)

HEVC Encoder module and HDR

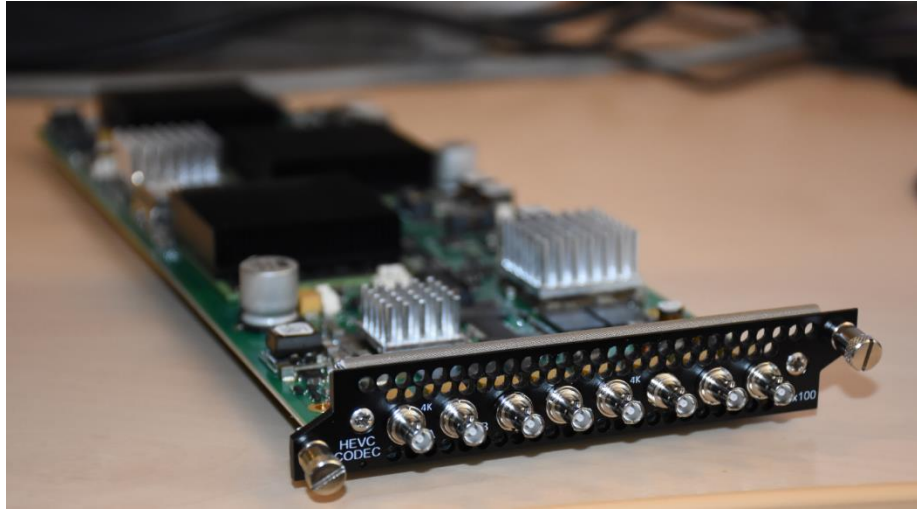
- The HEVC encoder and decoder support the 10-bit profiles that HDR requires
- Both are compliant with non-proprietary HDR formats
- There are several applicable formats, including HDR-10, HLG-10 and HDR-10+. All signal metadata within the HEVC SEI layer.
- Currently, the encoder must be manually configured for the HDR standard being used. At a later date, this will be extracted from VANC and set automatically.



HEVC Encoder module and HDR – Supported standards

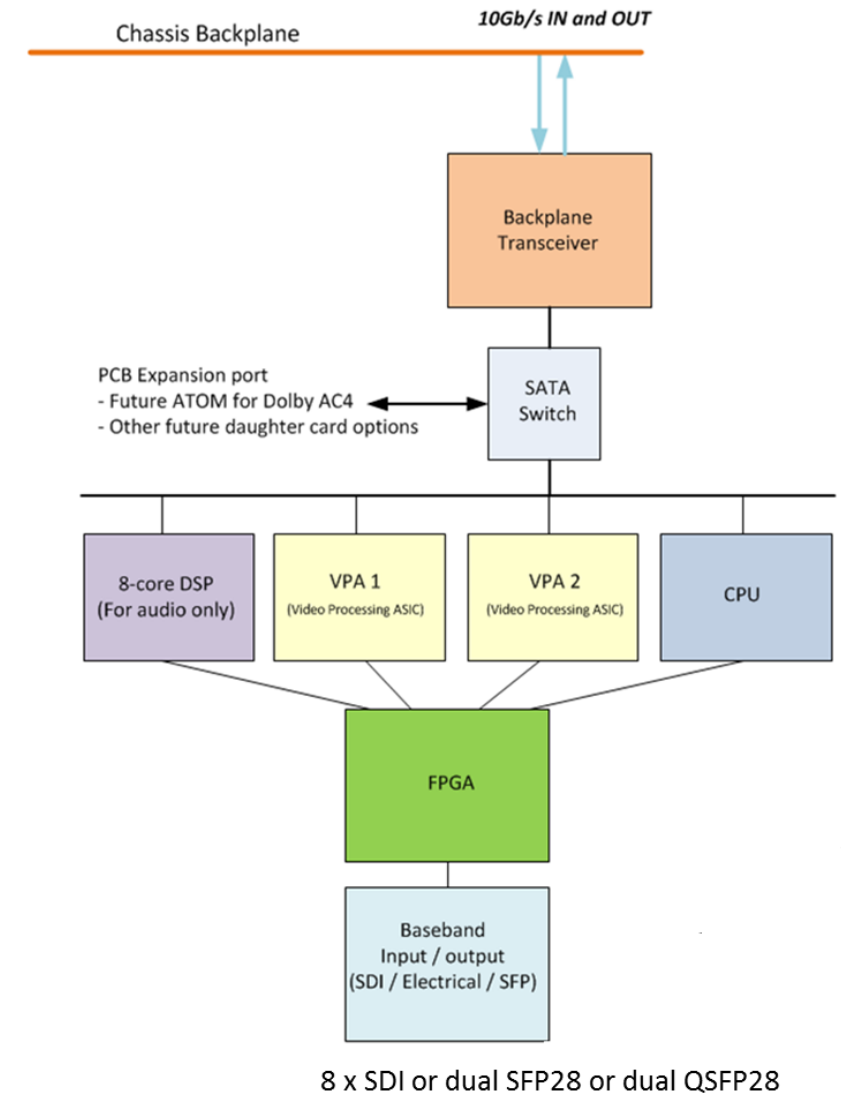


HEVC Encoder / Decoder module: Audio



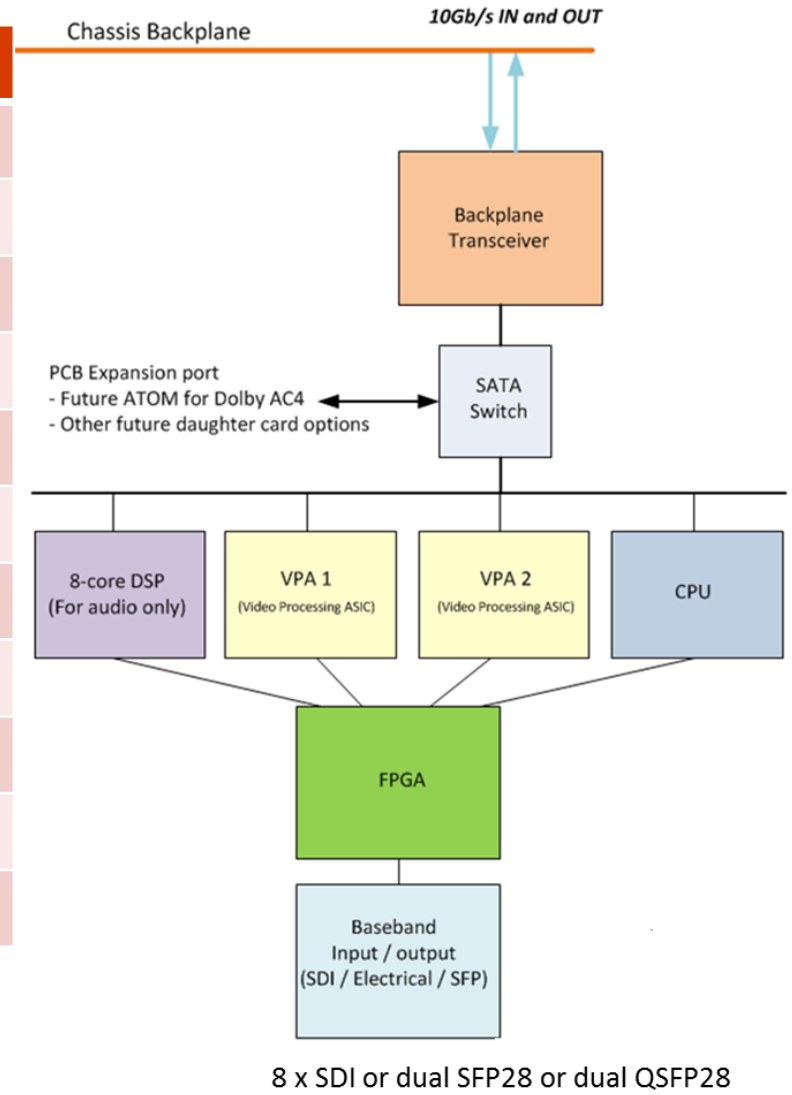
Audio Function	Supported
Pass-through	PCM, Dolby E, Dolby D, DD+
E (decode) for transcode to...	Dolby D, DD+
Multi-channel conversion	7.1 to 5.1, 7.1 to 2.0, 5.1 to 2.0
MPEG1-L2	Supported
AAC	Supported

Only transparent passthrough supported in ULL mode....see next slide!

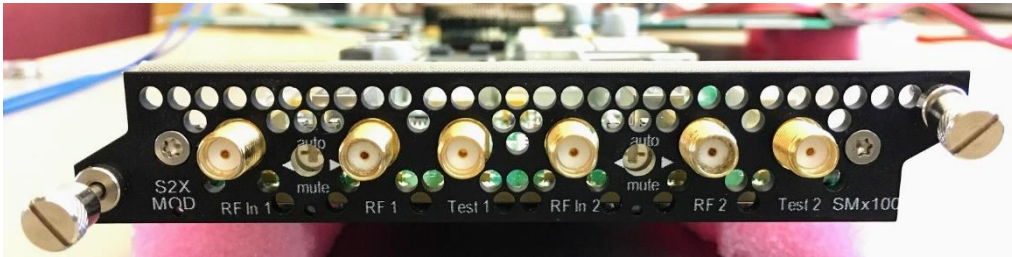


HEVC Encoder / Decoder module: Audio

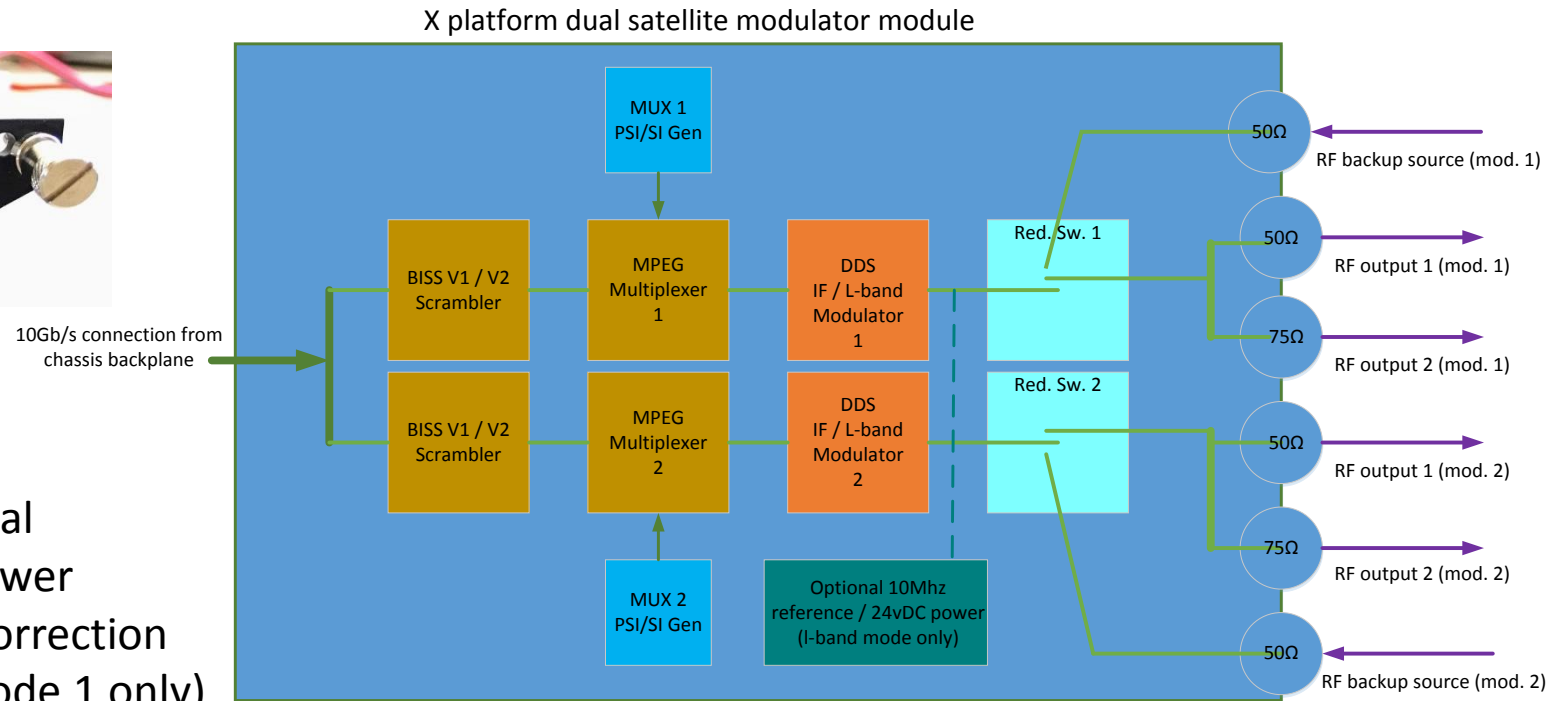
Audio Codec/Function	Normal/Low	Ultra Low
MPEG1 Layer 2 Encode	Yes	No
AAC LC Encode	Yes	No
AAC HEv1 Encode	Yes	No
AAC HEv2 Encode	Yes	No
Dolby Digital Encode	Yes	No
Dolby Digital Plus Encode	Yes	No
Dolby E to any TxC	Yes	No
Dolby Digital PT	Yes	No
Dolby Digital Plus PT	Yes	No
Dolby E PT	Yes	No
Transparent PT (PCM, Dolby etc.)	No	Yes



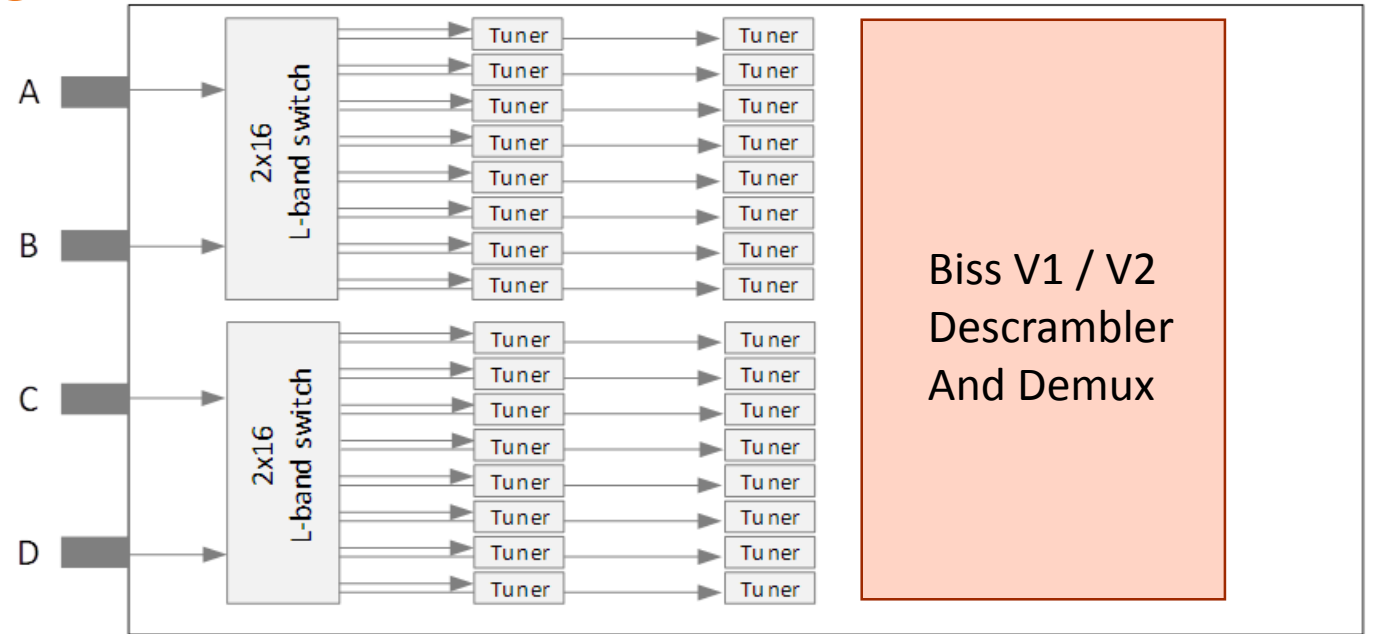
Satellite Modulator Module



- Dual modulators per module
- Switchable L-band / IF
- Supports DVB S / S2 / S2x + professional
- Optional 10Mhz reference and 24V power
- Group delay and amplitude linearity correction
- Integrated BISS V1 and V2 support (mode 1 only)
- DVB Carrier_ID support
- Integrated RF changeover switch for easy 1+1 redundancy (with another X10 / X20 or 3rd party RF source)
 - The protection switch has a manual over-ride on the modulator front panel but when in AUTO mode will use the alarms and RF power detection from the main and backup chassis to implement 1+1 redundancy switching
 - The physical switch is failsafe and will switch to the backup position should power be lost to the main chassis.



Satellite demodulator Module



- Advanced platform with new hardware design
- 4 x L-band inputs on front panel
- Each pair of inputs passed through an integrated 2x16 L-band switch
- The switch feeds a total of 16 demodulators (X2).
- ***NOTE: for number of available demodulators depends on requirements; please check chart on following slide for details!***
- Integrated BISS V1 and V2 descrambling (mode 1 only). No service limit but all services must use same BISS key (per Tp)
- Demodulator supports all practical DVB-S2x modes relevant for mobile contribution

Satellite demodulator Module - benefits

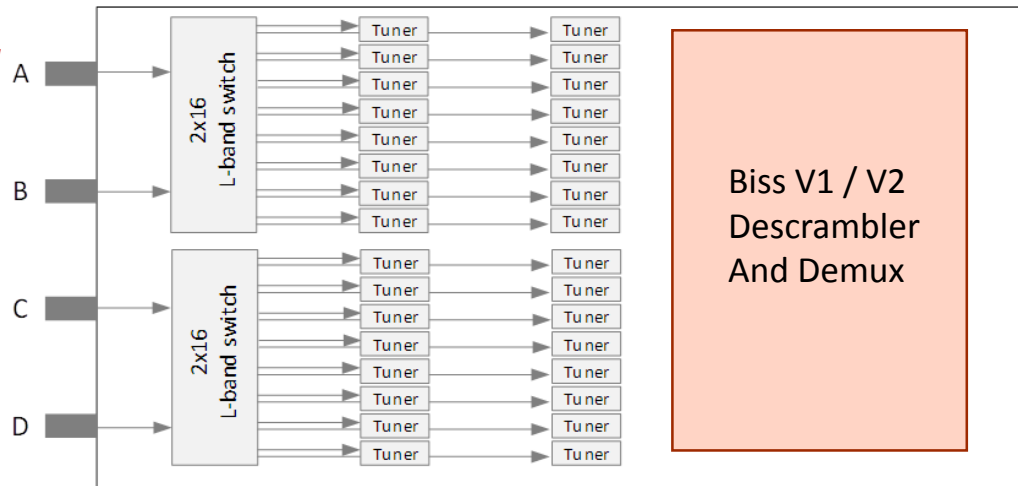
Satellite DTH

Horizontal / High band A

Horizontal / Low band B

Vertical / High band C

Vertical / Low band D



Feature	Specification	Version
RF	Number of transponders	4-32 1.0
	Number of transponders per connector	1-16 1.0
	Carrier Frequency	950-2150MHz 1.0
	Input level	-77 to -10dBm, @16APSK-9/10, 30MBd 1.0
	LNB signalling	22kHz continuous tone and 0/13/18V DC, max 400mA 1.0
	Baud rate	0.5 - 64MBaud 1.0
Demod	S2x profiles	Broadcast and interactive 1.0
	Baud rates (<= 8 transponders)	256-APSK, max 32MBaud
		128-APSK, max 36.5MBaud
		64-APSK, max 43MBaud
		32-APSK, max 51MBaud
		QPSK-16APSK, max 64MBaud
	Baud rates (32 transponders)	256-APSK, max 11MBaud
		128-APSK, max 13MBaud
		64-APSK, max 15MBaud
		32-APSK, max 18MBaud
		16APSK, max 22.5MBaud
TS	FEC rate	All FEC rates 1.0
	FEC frame	Normal, short 1.0
	DVB-S	QPSK, 1.5 - 64MBaud 1.0
	Bitrate	256Mbps per transponder 1.0
	Dejitter	CBR 1.0
	Fixed key	Raw CSA and AES-128 1.0
Misc	BISS mode-1	BISSv1 and BISSv2 1.0
	BISS mode-E	BISSv1 and BISSv2 Q4 '18
	BISS mode-CA	BISSv2 Q1 '19
	Blind scan	
	Carrier ID	DVB
	Constellation view	Display received symbols in GUI
	VLSNR	Not possible

- For DTH applications the new modulator saves L-band distribution costs and provides extra-high density.

Satellite Contribution

- For contribution the demodulator offers support for the parts of the DVB-S2x standard that are relevant for mobile contribution at a lower price-point than has been seen before.

THANK YOU!

