

Sirius 800

Hybrid SDI, Audio & IP Routing to 12G, with Unrivalled Processing & Multiviewer Capability

Hybrid video, audio, IP, & 12G-SDI routers with integrated multiviewers and four chassis options from 288x288 to 1152x1152.

The enterprise level Sirius 800 series of routers from Grass Valley offer multi-format, expandable routers with exceptional performance, flexibility and reliability. Offering a range of frame options from 288x288 up to 1152x1152 and beyond with I/O options including SDI, AES, MADI, 12G-SDI, and support for 40 GbE SMPTE ST 2110 IP interfaces.

The Sirius 800 benefits from advanced hybrid processing (AHP) integrating functionality that would otherwise require extensive external modular infrastructure, including audio processing, frame synchronization, clean and quiet switching, video and audio delay and audio sample rate conversion. AHP also includes input embedding with no external loopbacks; a unique, innovative technology from Grass Valley, which typically delivers 30% more usable ports for a given frame size.

Routing

Video and audio routing in a single chassis

Route audio between embedded, AES, MADI and IP sources and destinations — no limitations.

Embed audio on inputs or outputs

Route audio back to an input, replace or move incoming audio channels — no external connections required, no loss of inputs or outputs!

4K UHD and IP Interfaces

4K routing

Route 12G and quad link 4K UHD signals alongside SD, HD, 3G, ASI and audio, in any combination.

IP integration

40 GbE interfaces with redundancy. Supports SMPTE ST 2110, SMPTE ST 2022-6 and SMPTE ST 2022-7.



Advanced Hybrid Processing

The most advanced processing architecture

Frame sync, de-embed, track swap, gain, delay, embed, clean and quiet switch on every input and main output.

All inputs and outputs are format independent

Allowing a mix of formats on a single module. Saves cost, increases system flexibility.

All audio processing is timing independent

De-embed and embed between asynchronous signals — no need to synchronize.

Multiviewers and Monitoring

The most multiviewer outputs in its class

Fit multiviewers to all outputs without losing the router outputs. Up to 180 heads + 576x576 routing in a single frame.

Intelligent system monitoring

Monitoring and alarming of system status, not just video and audio parameters.

True input and output monitoring

Four fully independent monitoring outputs to monitor inputs and outputs in any combination — no “per module” limitations.

KEY FEATURES

Audio

- Embedded, SMPTE ST 2110, MADI, AES3
- Take audio from any input type from AES3 to 12G
- Route to any output

Embedding on Inputs

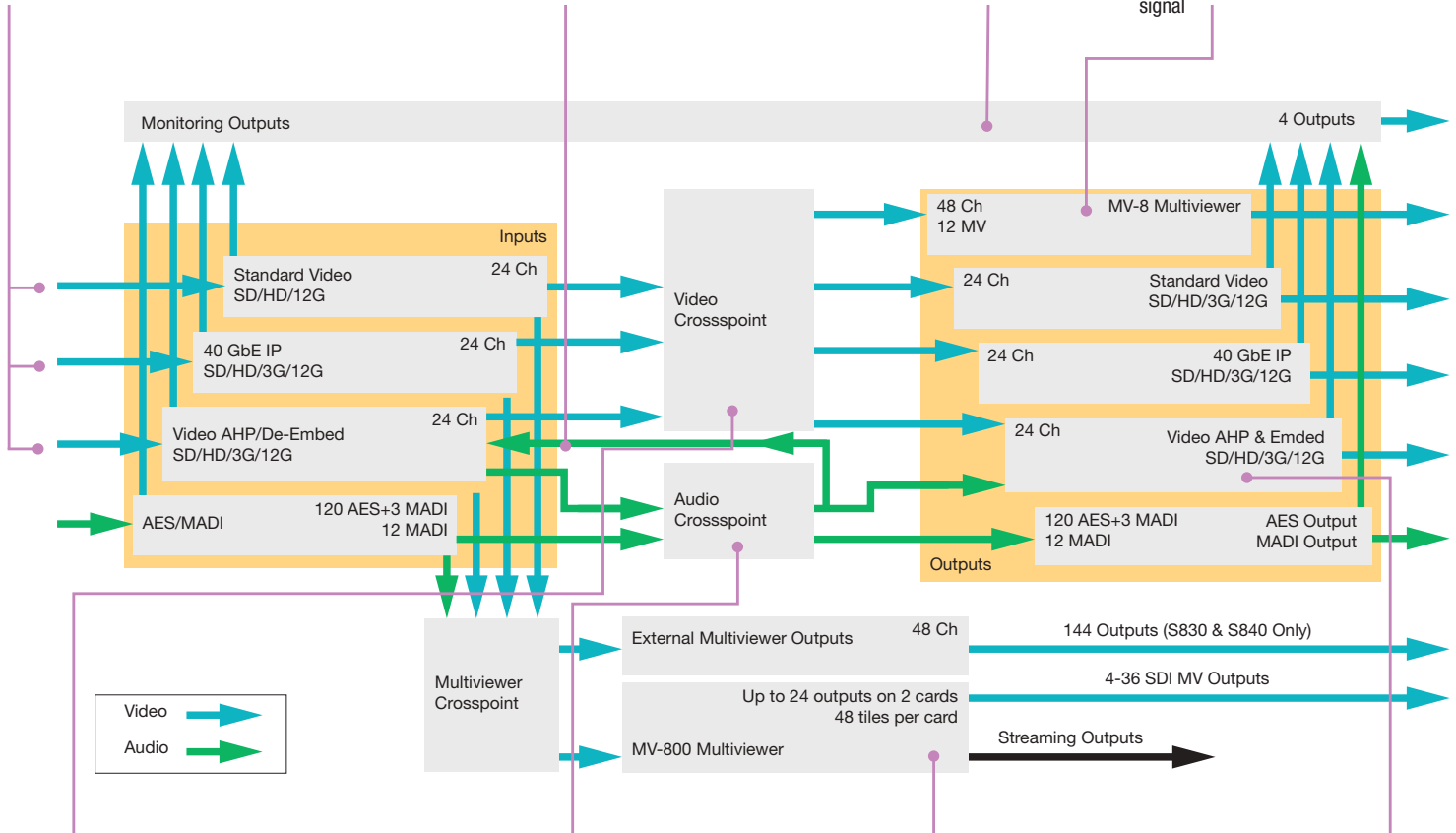
- Internal loop back of audio
- Build new audio channel sets from incoming embedded audio, and routed audio from any other source

True Monitoring

- Monitor router inputs and outputs
- 4 channels from every card, independently routable to 4 monitoring outputs

MV-841 & MV-851 Multiviewers

- Replace any or all output cards with MV-841 or MV-851 multiviewer cards
- 576 SDI outputs PLUS 144 multiviewer outputs to monitor any input or output signal



Any SDI Format, any Frame Rate

- 4 internal timing planes — derived from a single reference input or separate references
- Maintains accurate switching for multiformat and multi frame-rate operations

Asynchronous Audio

- Fully asynchronous audio routing from any input to any output
- Discrete audio sample rates are maintained from input to output

MV-800 Multiviewers

- Additional multiviewers monitor any input — 140 scalars to 24 multiviewer outputs
- Plus low-bandwidth streamed versions for remote monitoring over IP

Intelligent Embedding

- Auto detection of the input format will de-embed from any format automatically
- Auto synchronizing embedding will embed audio from un-synchronized sources with no audio loss

Exceptional Multiviewer Capacity

Multiviewer	Function	Capacity per Router			
		Sirius 830	Sirius 840	Sirius 850	Sirius 850 Dual
MV-800	48x12 multiviewer	2 24 outputs	2 24 outputs	2 24 outputs	4 48 outputs
MV-831	12 multiviewer outputs from 24 SDI inputs and 24 SDI outputs	12 144 outputs	—	—	—
MV-841	48 SDI router outputs plus 12 multiviewer outputs from 48 SDI outputs	—	12 144 outputs	—	—
MV-851	48 SDI router outputs plus 12 multiviewer outputs from 48 SDI outputs	—	—	12 144 outputs	24 288 outputs

Live Production

Power, control and crosspoint redundancy for mission-critical applications.

Requirements

Incoming lines monitoring

Use Sirius MV-800 multiviewers to monitor up to 140 inputs with no effect on the main router capacity.

For more signals, MV-831 monitors an additional 24 inputs, and 24 router outputs, with no loss of SDI I/O.

MV-841 and MV-851 multiviewers can be used to monitor inputs or outputs with no loss of router capacity.

Production switcher & audio mixer integration

SDI, MADI and SMPTE ST 2110 provide IP and more traditional cabled signal interconnections.

Simple, open protocols allow integration to any production switcher and audio mixer, to exchange names, routing and tally info.

Grass Valley's Kahuna and Kula production switchers are the market leaders, with exceptional 4K UHD capability, and Maverik re-configurable control panels.

Kahuna status is simply displayed on all MV-8 series multiviewers.

UHD

Any combination of HD, 3G, single link 4K UHD, or quad link 4K UHD can be routed through the Sirius 800, together with 1080i, 3G/1080p and 4K UHD formats delivered over-high bandwidth IP connections — ideal for 4K UHD productions that also need 1080p, 1080i and SD downconverted copies.

S800 multiviewers can also monitor all formats from SD to 4K UHD, with 4K UHD outputs for highest resolution monitoring.

Production gallery/control room & slo-mo monitoring

Fully flexible multiviewer layouts allow any combination of tile sizes.

Layout objects include audio meters, clocks, tally lamps, UMD names, alarm indications and external equipment status monitoring, signal path displays.

Audio mix re-embedding

Incoming audio can be simply routed back to an incoming video signal, via internal loop back paths, to be re-embedded on any incoming video signal, avoiding costly wrap-around cable paths.

Sirius 800 in Operation

Untimed sources

Sirius 800 frame syncs can re-time all signals to one of four timing planes, with additional timing offsets per channel if required.

Timing settings are stored for each format, and are automatically recalled when that input format is detected.

Missing, swapped audio channels

AHP modules can swap audio channels on incoming and outgoing video.

Audio mixers on AHP cards can also create up to 16 channel mixes using any audio within the router — to create a mono mix, for example.



Sirius 830

- 288x288 video
- Integrated MV-800 and MV-831 — up to 168 multiviewer outputs
- 15 RU



Sirius 840

- 576x576 video
- Integrated MV-800 and MV-851 — up to 180 additional multiviewer outputs
- 27 RU



Sirius 850

- 576x1152 video
- Integrated MV-800 and MV-851 — up to 168 additional multiviewer outputs
- 34 RU



Sirius 850

- 1152x1152 video
- Integrated MV-800 and MV-851 — up to 336 additional multiviewer outputs
- 2x 34 RU

Audio line up level differences

Audio gain adjustment is available on all audio channels on AHP, and audio inputs and outputs.

No signal

Input and output signal status and format is available on the door status screen, external PCs with similar screens, via RollCall or SNMP protocols, and logged in a log server.

MADI and IP inputs have redundant, auto failover inputs.

Catsii connector status indication is an ideal way to see signal status if you're fault finding in the rack.

Satellite delay paths & lip sync

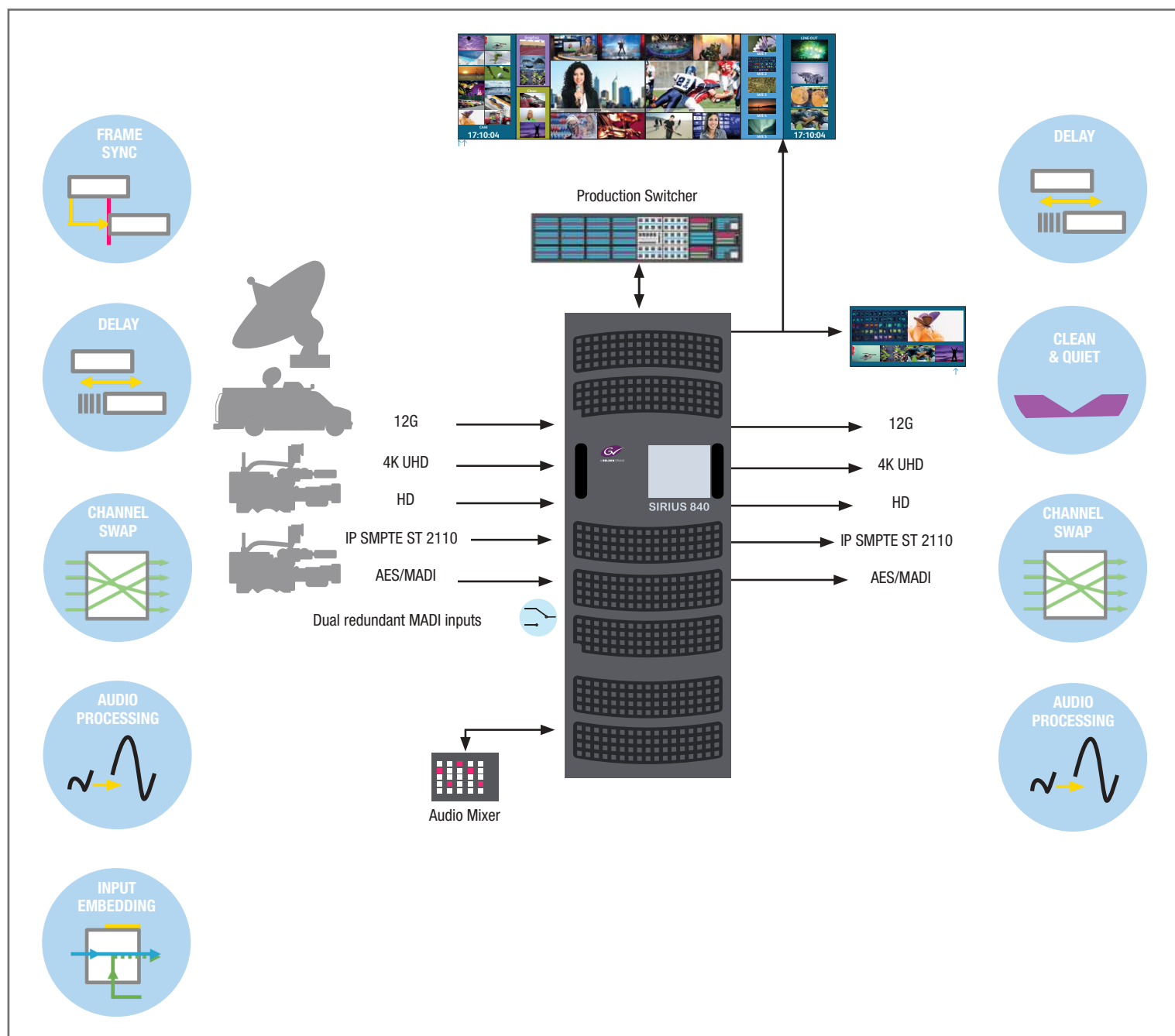
Video and audio delays are independently controllable to enable delay correction.

Unknown downstream equipment

Some equipment is sensitive to SMPTE-compliant switching — line synchronized outputs and audio V-fade router transitions maintain 100% “transition-free” outputs.

Sirius 800 — at the Center of Live Production

Multiformat production, untimed sources, audio adjustments. Multiviewers for production — all handled (plus much more) with Sirius 800.



Studios, Playout Centers, Lines Routing

Resilient, flexible, expandable routing with sophisticated multiviewer capability.

Requirements

Multiformat routing

Sirius 800 has automatic switching between formats for de-embedding, embedding and MV-8 multiviewers. It can monitor all signal formats from SD to 4K UHD.

Coax for local cabling, and fiber interfaces with CWDM options and longer intersite connectivity.

Incoming lines monitoring

Available on all Sirius 830 inputs. Up to 24 MV-800 outputs dedicated to input monitoring.

Additional MV-841 and MV-851 multiviewer modules can replace router outputs for additional input monitoring capacity.

System monitoring equipment failure

With MV-8 series multiviewers, alarms from other equipment can be displayed on the multiviewer screens.

Playout & master control integration

Control from any master control system for A/B or Program/Preset switching.

Display automation schedules on multiviewer screens, alongside all playout monitoring screens.

Monitor audio formats, AFD, WSS, CC and V-chip.

Remote monitoring

The factory-installed MV-8xx-H264 option, in conjunction with MV-8 series multiviewers, provides full multiviewer screen with low-bandwidth H.264 video tiles on a desktop PC.

Sirius 800 in Operation

Loss of incoming feed

Signal loss is reported from all Sirius 800 inputs, and is available to router control softpanels, via SNMP, or from a log server.

Multiviewer monitoring adds more immediate alarming options, such as an alarm box on any multiviewer screen. Spotlight monitoring, available on the MV-8 series, will change screen layouts to show the fault and upstream signal path to allow fast diagnosis.

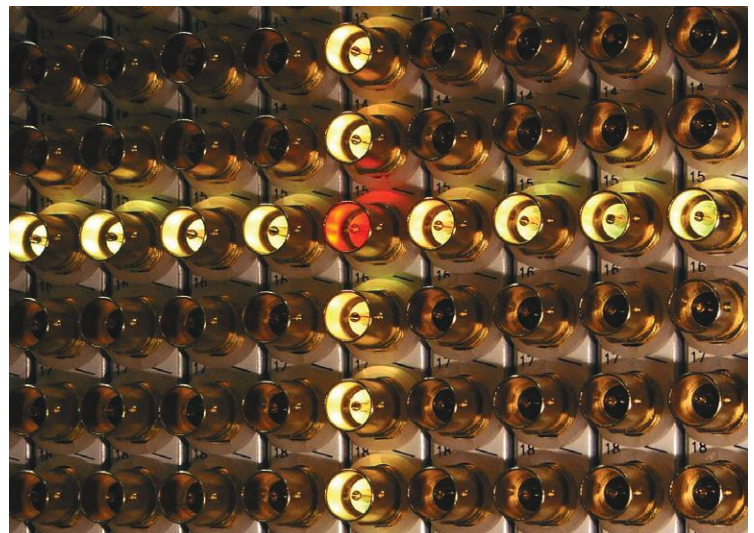
Change of incoming line format

Advanced Hybrid Processing (AHP) modules autodetect the incoming signal format and adapt as needed. De-embedding and re-embedding on inputs and outputs is done to the automatically detected signal type — no need to adjust the router configuration.

Switching to the correct reference is also automatic. The input format and frame rate is reported to the controller, and routes are set automatically using the correct switching reference.

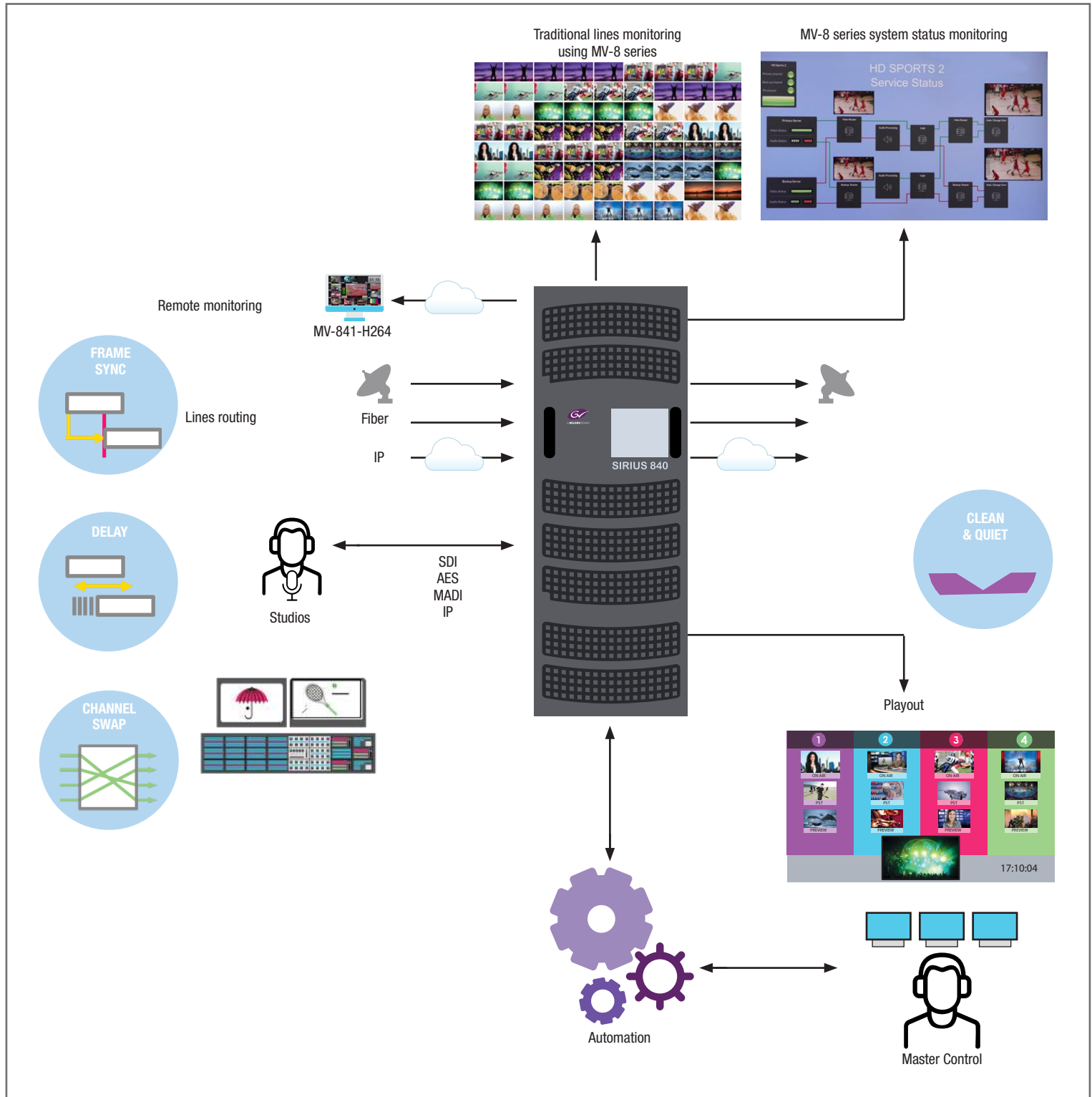
Mixed SDI and IP

Sirius 800 IP modules can be freely mixed with SDI and audio modules in a frame.



Multiformat Operation — Multiviewer Capabilities to Suit All Requirements

Sirius 800 — standalone in a facility, or part of a distributed routing system, with tielines to smaller studio and playout routers. Flexible configuration and control options make either option simple.



Sirius 800 Control

Comprehensive control is critical to get the best from your router.

Sirius 800 has dual redundant controller cards with auto failover. They run an embedded real-time operating system to ensure reliable operation.

Dual redundant connections to external control systems, control panels, PC-based softpanels, automation, tally systems, master control and more make Sirius 800 simple to integrate.

Unique Catsii Technology Simplifies Commissioning and Maintenance

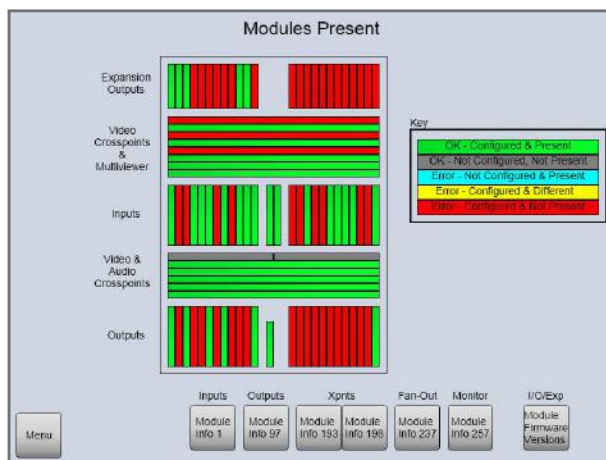
The signal format on every video input and output is easily identified by color coded connector illumination. Individual connectors can be clearly identified when selected from the front panel control.

Door Touchscreen for Comprehensive Status Indication and Control

The touchscreen interface allows quick and easy access to a range of status screens that show router status, and allow emergency control and Catsii setup.

User Configurable Control Screens

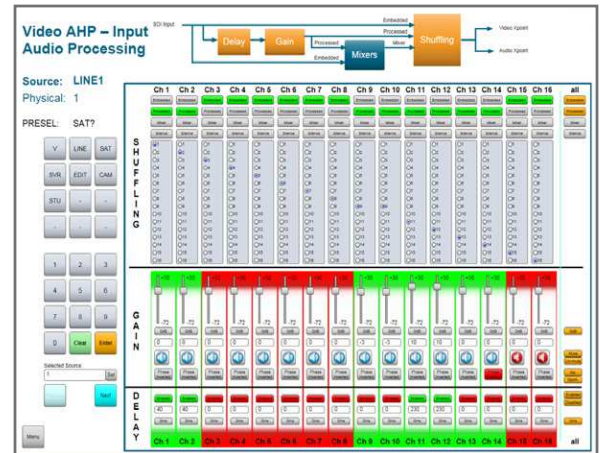
Fully configurable screens allow you to design screens tailored to specific operations, with just the controls needed to simplify operation and minimize operator errors. Detailed technical diagnostics screens allow easy fault identification.



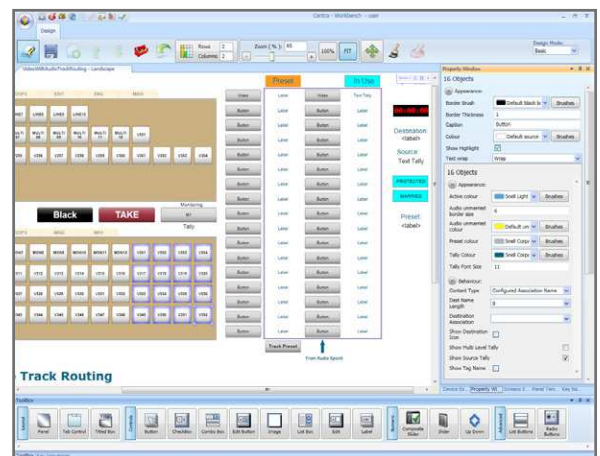
Example status screens



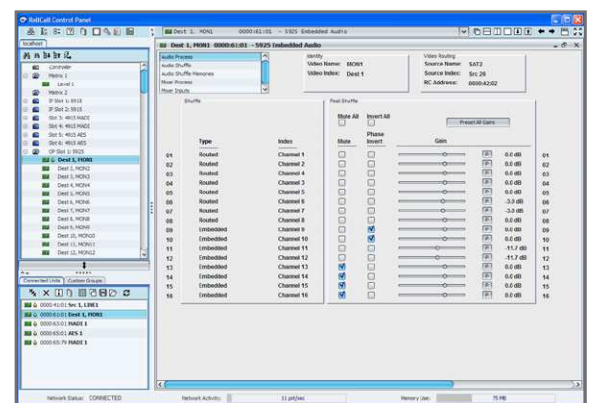
Workbench video & audio routing screen with audio track routing



Workbench input AHP control screen



Workbench softpanel designer screen example

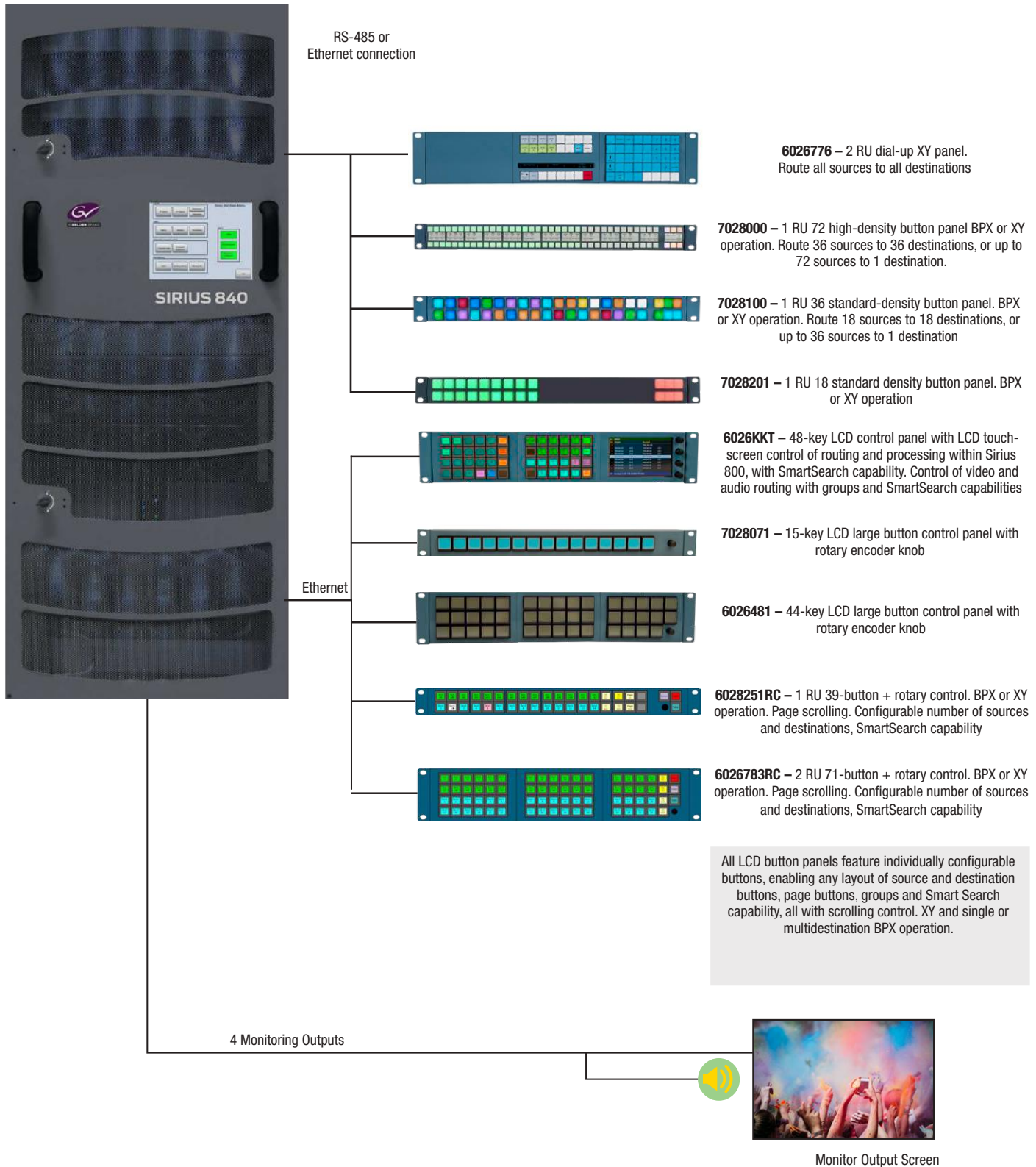


RollCall input processing control screen

Powerful hardware and softpanel control capability

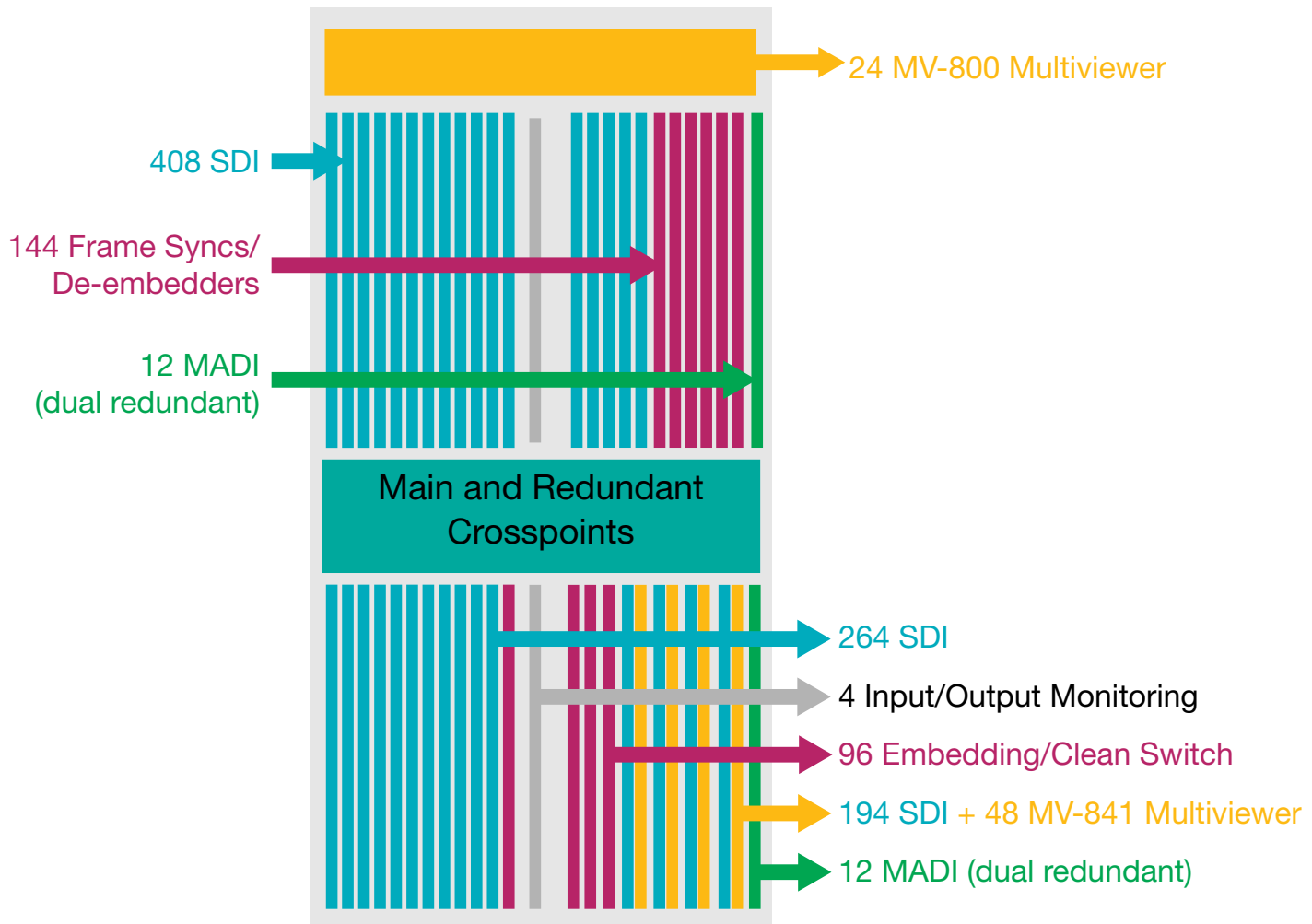
Routing Control Panels

Grass Valley offers a large range of control panels to control standard video and audio routing. Processing is not supported by the control panels.



Typical System Build

Sirius 800 frames can be equipped with any combination of input and output modules. A typical example is shown below.



Sirius 840 – 576x576 chassis

- 552x552 SDI
- 12x12 MADI
- 144 inputs with frame syncs, audio shuffling and processing, de-embedders and re-embedding routed audio
- 12 MADI inputs (dual redundant with auto or manual failover)
- 96 outputs with embedding, clean & quiet switching, frame syncs, audio shuffling and processing
- 12 dual MADI outputs
- 48 multiviewer outputs capable of monitoring up to 192 router outputs and all 576 router inputs
- 36 dedicated multiviewer outputs capable of monitoring 140 router inputs
- 4 fully independent input/output monitoring outputs, with non-blocking access to all inputs and outputs

Sirius Router Selection Grid	Sirius 830	Sirius 840	Sirius 850 (single frame)	Sirius 850 (dual frame)
Size	Up to 288x288	Up to 576x576	Up to 576x1152	Up to 1152x1152
Formats				
12 Gb/s serial	•	•	•	•
3 Gb/s	•	•	•	•
HD	•	•	•	•
SD-SDI	•	•	•	•
IP	•	•	•	•
DVB-ASI	•	•	•	•
AES	•	•	•	•
Fiber connectivity	•	•	•	•
Timecode				
RS-422 machine control				
Stereo analog audio				
MADI	•	•	•	•
Integrated multiviewer outputs	168	168	168	336
Features				
Redundant crosspoints	•	•	•	•
Redundant control card	•	•	•	•
Redundant power supply	•	•	•	•
Front-loading hot-swappable modules	•	•	•	•
Dolby transparent (embedded and AES as applicable)	•	•	•	•
Dolby switching compliant	•	•	•	•
Integrated audio processing	•	•	•	•
Clean and quiet switching	•	•	•	•
Number of video references	4	4	4	4
Number of levels controlled	unlimited	unlimited	unlimited	unlimited
I/O monitoring outputs	4	4	4	4
SNMP router control & monitoring	•	•	•	•
Frames & Control				
Physical size (including redundant PSUs)	17 RU (288x288)	29 RU (576x576)	38 RU (576x1152)	2x 38 RU (1152x1152)
Applications	Line routing/switching centers, medium/large OBs, playout facilities	Line routing/switching centers, medium/large OBs, playout facilities	Line routing/switching centers, medium/large OBs, playout facilities	Line routing/switching centers, medium/large OBs, playout facilities

Services and Support

Grass Valley's customer service offers first-class solutions for optimizing your operations, through world-leading technical support and fast responsiveness during the life of your product.

Training

To ensure that customers experience the full benefits of their switcher, Grass Valley is committed to providing the highest levels of training for Sirius 800 owners, operators and engineers.

Training before and after a system purchase is available worldwide at customer premises, Grass Valley offices or an alternative third-party location. The duration of these training sessions will depend on user requirements.

Courses are available on configuration, technical support, maintenance and familiarization. They can be custom designed to meet specific requirements.

Configuration

All Sirius 800 routers are supplied with a default configuration. This enables routing and processing control from external devices and a default set of softpanel control screens. For trained, experienced users this may well be all that's needed.

For extra peace of mind, and to ensure smooth installation and commissioning of the Sirius 800, several packages are available:

- Database configuration
- Standard database configuration: configuration of routing control
- Advanced database configuration: configuration of routing and processing control
- Multiviewer configuration: configuration of multiviewer screens and interfaces

Commissioning

On-site commissioning packages are available for Sirius 800 routers, covering power and hardware functional checks, connections to other devices, configuration software installation and initial database installation, plus a single-user softpanel installation. A package to get you up and running, confident that your Sirius 800 router is fully functional and installed correctly.

Sirius 800 customer services at a glance

	In Warranty	Out of Warranty (without Router care)	Out of Warranty (with Router care)
9 to 5 phone support	✓	✓	✓
On-line support resources	✓	✓	✓
Advanced part replacement (next-day service)	✓	x	✓
24x7x365 phone support	✓	x	✓
Repair service	not required	✓	not required
Health check	as needed	as needed	as needed

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automation

| Enterprise level automation for powerful multi-channel delivery

Pebble Automation is designed for enterprise level linear channel delivery through any network.

Broadcasters and service providers worldwide entrust the automation of their playout operations to Pebble, and with good reason. Our rigorous approach to understanding your workflows, our skill in designing bespoke systems, our drive for continuous improvement, and our focus on brilliantly delivering exceptional solutions make the decision to choose Pebble Automation a simple one.

Our enterprise Automation software platform delivers robust, best-in-class functionality at a scale that suits your operations and can flex and adapt as your needs change. A powerful centralised ingest, content management and multi-channel solution, it controls mission-critical operations at scores of broadcasters and service providers around the world and is scalable from one to hundreds of channels.

Working with you, we will design a solution to cater for your unique workflows. The Pebble Automation platform's distributed architecture enables you to utilise resources over multiple servers, and its extensive range of device drivers gives you the freedom to deploy the technology that best fits the needs of each of your channels, whether that's the legacy SDI devices which form an integral part of your channel playout, or the newest IP technologies as you add them to your facility.

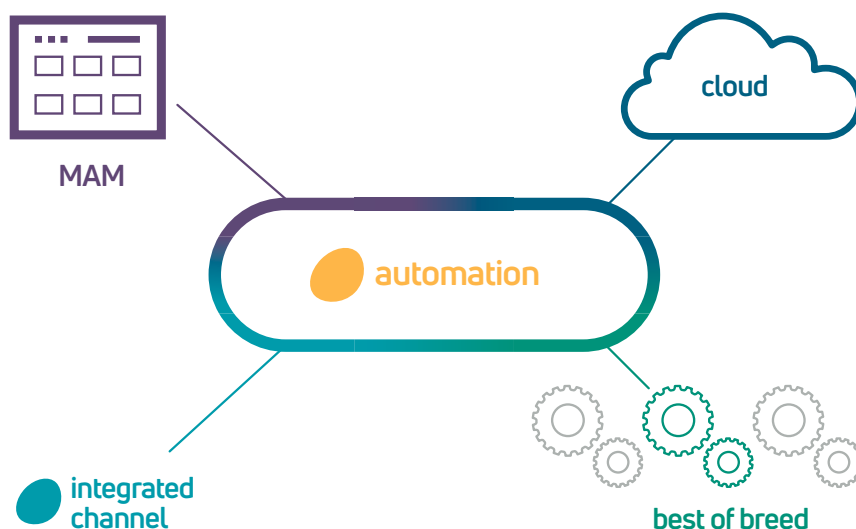
Pebble Automation delivers the power, flexibility and scalability to suit your operations, now and in the future.

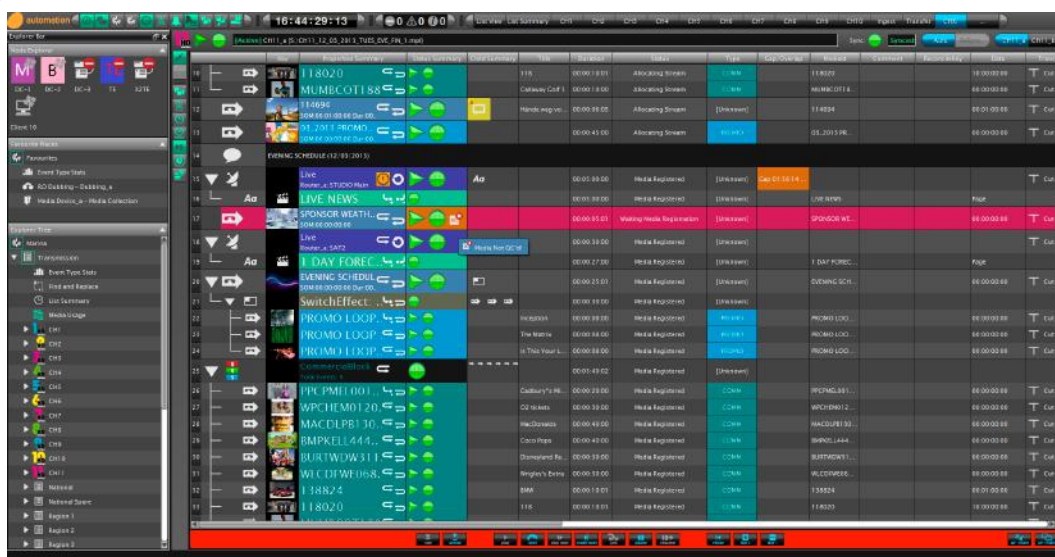
Scalable from one to hundreds of channels and deployable on premise, in virtual machines and in the cloud, Pebble Automation offers exceptional system resiliency. New functionality can be added in and existing functionality modified seamlessly, making it ideal for today's rapidly changing media environment.

Control your best of breed, integrated channel, distributed and virtualised channels from a single UI.



Control your best of breed, integrated channel and virtualised channels from a single UI.





Media Aware

User Rights Management

A comprehensive administrators' toolset for managing and monitoring operator login, activities and audit trails is included.

Unicode Compliance

Operation in multiple languages including Chinese, Japanese and Arabic is available, right down to the metadata and database level. Multiple languages can be handled concurrently, and the entire system can be toggled instantly and completely back to English as required.

Full Audio Track and Multilingual Management

Multiple audio tracks are managed in association with a single stream of video, dynamically selecting the appropriate audio tracks on a per event basis to deliver multilingual services, audio description, audio according to target audience requirements, or audio mixing during voiceovers. Multi-channel audio (e.g., Dolby Digital) can be managed in line with the channel processing capabilities.

Media Aware

Database-driven media management functionality offers automatic caching, purging and conditional file movement, and allows the system to accommodate QC workflows and playout services. Advanced media caching can be driven by playlist schedules in the database before they are loaded into the transmission schedule. Close integration with your preferred MAM vendor is also available.



Operational benefits

Pebble Automation GUI

Line	Key	Properties Summary	Status Summary	Child Summary	Time	Duration	Status	Type	Cap	Channel	Metadata	Comment	Record/Replay	Date	Transition	Rate	Event Type
1	COAST_S3E9P1				00:00:00:00	00:00:00:00	Done	[Unknown]			COAST_S3E9P1			00:00:00:00	T Cut	Fast	PrimaryV
2	COAST_S3E9P2				00:00:00:00	00:00:00:00	Done	[Unknown]			COAST_S3E9P2			00:00:00:00	T Cut	Fast	PrimaryV
3	COAST_S3E9P3	SON 00:00:00:00 Dur: 00:00:00:00			00:00:00:00	00:00:00:00	Running	[Unknown]			COAST_S3E9P3			00:00:00:00	T Cut	Fast	PrimaryV
4	114694	SON 00:00:00:00 Dur: 00:00:00:00			00:00:00:00	00:00:00:00	Running	[Unknown]			114694			00:00:00:00	T Cut	Fast	PrimaryV
5	114694	SON 00:00:00:00 Dur: 00:00:00:00			00:00:00:00	00:00:00:00	Running	[Unknown]			114694			00:00:00:00	T Cut	Fast	PrimaryV
6	114694	SON 00:00:00:00 Dur: 00:00:00:00			00:00:00:00	00:00:00:00	Running	[Unknown]			114694			00:00:00:00	T Cut	Fast	PrimaryV
7	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
8	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
9	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
10	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
11	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
12	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
13	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
14	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
15	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
16	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
17	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
18	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
19	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
20	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
21	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
22	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
23	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV
24	LIVE	Router, a SAT2			00:00:00:00	00:00:00:00	Running	[Unknown]			LIVE			00:00:00:00	T Cut	Fast	PrimaryV

Pebble Remote

The user interface of Pebble Automation can be accessed directly from a client deployed in an on-premises deployment. Alternatively, remote control of multiple sites and multiple channels can be delivered via the Pebble remote interface. Made for cloud-based technology environments, **Pebble Remote** offers security, accessibility, and simplicity in complex channel playout environments.

Streamlined Operations

Pebble Automation's highly flexible and rich user interface can be optimised for individual and group accessibility, exception handling and resource access. This effectively improves service loading and workflow efficiency by simplifying the operator experience. Each operator can control a large number of channels, and desktop layouts can be customised to streamline operational practices and minimise errors.

Solution Flexibility

Using an extensive third-party product integration portfolio, the system is designed to deliver flawless control of a wide variety of channel types in any combination. That can be for live and unpredictable content, regional opt-outs, simulcast, or simple clip-based channels. Operators are presented with a single unified user interface regardless of the underlying channel technology, minimising training, and maximising operational efficiencies, making this a market-leading solution.

Network advertising integration

Compatible with popular insertion splicing APIs, such as SCTE 30, 104 and 35, Pebble Automation is highly capable in FAST (Free Ad Supported TV) or other networks where regionalisation and opt-outs are commonplace or complex. With configurable management of traffic and list related messages, advertising efficiency and therefore CPM's (Cost per Mille) can be significantly improved.



Sophisticated Event Control

Groups of commonly used events, such as end of program sequences, can be grouped into a single object, simplifying the playout of multiple levels of secondary and even tertiary events. Evergreen content sequences can also be quickly dragged into the playlist.

Smart Panels

Customisation of Pebble Automation is possible using smart panels. These allow your own design of manual control panels to be added for tasks such as routing actions, control of secondary events, and monitoring of on-air sources.

Event Type Stats

For compliance with local regulations, it is often necessary to monitor airtime of types of events during specified time periods. Examples of this would include commercials during a typical viewing hour throughout the day. Channel operators can use these types of statistics for a 24 hour look ahead in schedules, flagging if any issues are forthcoming and enabling remedial actions in time.

Pebble Automation delivers a host of tools to safeguard the smooth playout of all channel types:

- **Summary Cell** – concise at-a-glance display of device and media status
- **Media Validation** – visibility of upstream media validation information where all elements are ready to play
- **Conditional Playout** – context-based playout rules where all playlists are linked with the database and immediate changes can be applied if media is embargoed.
- **Embedded Media Viewer** – high resolution content can be viewed directly in the UI so that content can be QC'd or timecode points allocated for segmentation
- **Join in Progress** – enables the schedule to be re-joined after an overrunning live event



Multichannel Control

System deployment, resilience, availability and serviceability

Deployable on-premises, on virtual machines or in the cloud

Pebble Automation can be deployed on-premises on dedicated off-the-shelf hardware or with virtual machines within private or public data centres. This enables the rapid spin up of temporary channels and sports event channels with control from remote sites or from a centralised on-premises network centre.

Distributed Modular Architecture

Architectural flexibility allows system designs that balance resource and operational requirements. The system's suite of capabilities is built using modular services blocks, providing customers the flexibility to optimise systems based on their logistics, operations, personnel, technological resources, and future business models.

Device Control

Pebble Automation is designed for optimal performance whether working with legacy third party devices, including the newest generation of multi-functional devices, or with hybrid combinations of both. With over 150 device drivers supported, interoperability is ensured. As third-party platforms add features and functionality, their control protocols become more complex and demanding with increased metadata handling and network-based close integration. Pebble Automation keeps pace with these dynamics to continually provide the most elegant and system-oriented solutions.

System Resilience

Pebble Automation's on-premises hardware and software have been designed to deliver high reliability, using software mirroring and network teaming to ensure robust on-air

operations. The system supports a range of features to overcome underlying device failure, including Air Protect, playlist mirroring, redundancy of playlist, encoder and decoder, N+m redundancy and, SQL mirroring as well as automatic controller failover. Playout automation requires 99.999% availability and Pebble Automation is built around auto-recovery, system adaptation, and the ability to adapt to multiple operational contexts to provide maximum system resiliency, availability, and serviceability.

Cloud channels and disaster recovery capability

Pebble Automation is cloud deployable, as is Pebble Integrated Channel. These two components work seamlessly within public cloud providers' infrastructure and benefit from availability zone resilience, IaaS billing and very high scalability. Integration of Pebble Remote means that Pebble Automation can be easily managed in parallel with on-premises based 24/7 systems, whilst also operating in a public cloud. Ideal for disaster recovery or pop-up channels, this Pebble solution offers highly cost-effective flexibility for efficient operations.

IP and ST 2110 Solutions

Pebble Automation optimally manages compressed and uncompressed IP live media signals. As a comprehensive enterprise level solution, MPTS and SPTS embedded data is handled to allow network management for heavy duty tasks such as regionalisation or advertising insertion. When coupled with Pebble Integrated Channel, incoming and outgoing transport streams are intelligently managed through close API control directly from the automation system. Customers can also input NDI signals for a moderately compressed low latency stream. In the IP fully uncompressed domain, three methods of integration exist:



Timeline



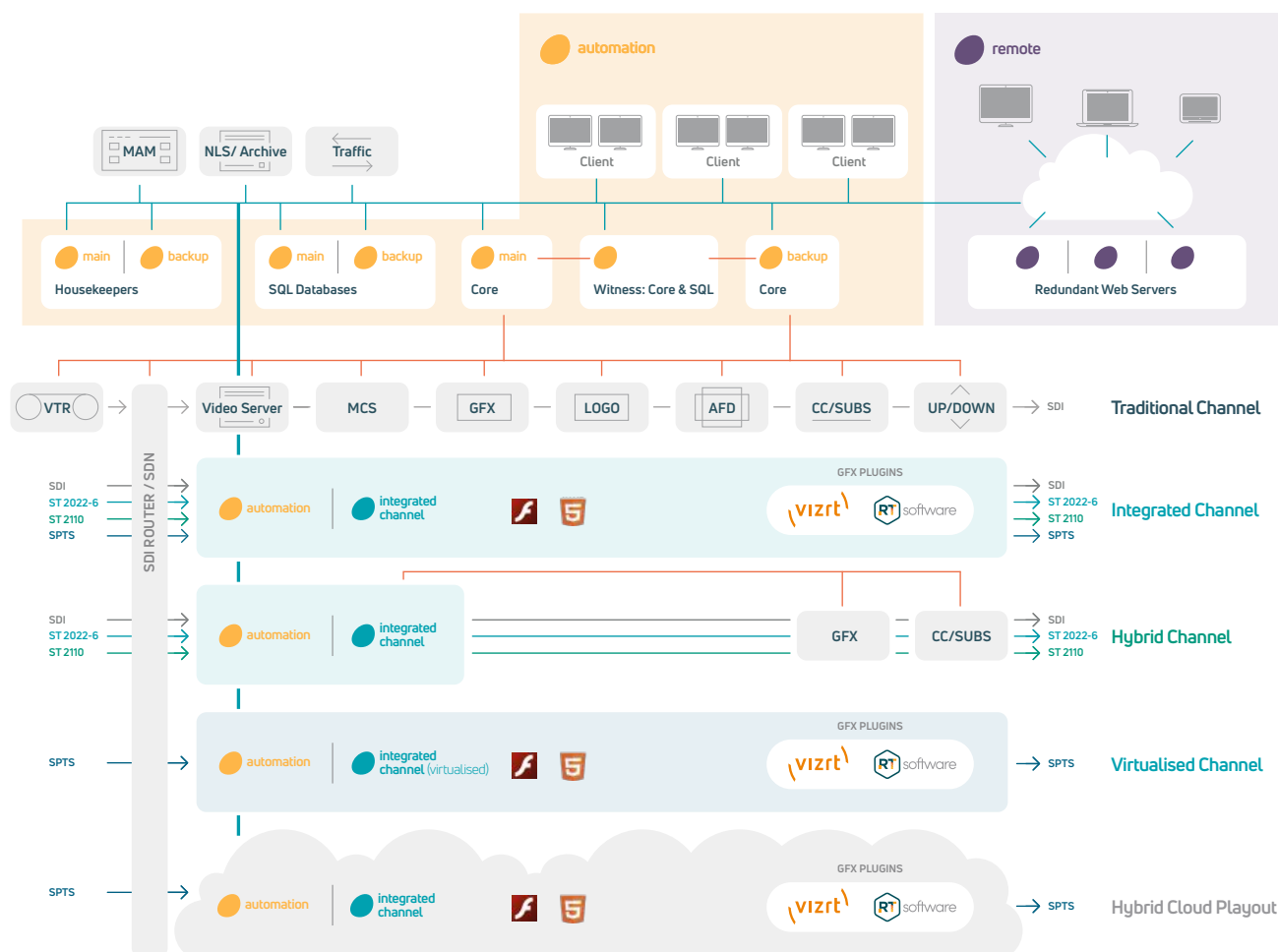
Pebble Control – Offers NMOS (Networked Media Open Specifications) based device discovery, registration, management and routing control as a tightly integrated part of the solution or as a standalone routing component.

Pebble Integrated Channel – Offers ST 2110 signal inputs and outputs directly where third party routing control systems can be used.

Pebble Orchestration – allows multi-step media and process step management via an easy to configure user interface. As part of your playout solution, Orchestration can also interface with AWS S3 buckets as well as via Server Message Block (SMB) to other storage types.

Software Interfaces and API's

Pebble Automation is built on software interfaces and API's. Several methods of software integration are provided including both Representational State Transfer (REST) and Simple Object Access Protocol (SOAP) processes. A multitude of software interfaces are available to systems and devices from many third-party suppliers. To gain more insight into the power available in integrating your own software with Pebble Automation please contact your nearest Pebble representative.



Being a Pebble Automation owner

Follow your path

Multiple development paths can be easily integrated once you are a Pebble Automation customer. Want to go IP but do not want to jump into uncharted waters? Need to go UHD for a new sports channel? Want to improve your cloud technology skills but so far have not deployed remote monitoring and control technology? Then Pebble is the solution for you – we do the heavy lifting, so you don't have to.

Linear Scaling Costs

Dedicated hardware, on-premises virtualised or cloud machines, clients, channels and multiple device deployments can be scaled independently of each other, with the necessary processing power added as required.

User Rights Management

Pebble Automation supports a system of user profiles that allows user privileges to be configured and managed centrally. Encompassing engineering, operator and view only privileges, these are simple to set up and can be specified on a per channel basis. Desktop layouts, UI preferences, device control and media management permissions are all customisable.

Maintainability and Support

Engineering user interfaces allow for simple system configuration by system administrators. With comprehensive error logging built in to enable the swift diagnosis of malfunctions across the system, technical staff can be alerted by alarm warnings and be kept informed of system status via a Simple Network Management Protocol. Remote login and support are delivered, enabling problems to be investigated remotely, and configuration changes to be effected easily.



Unit 1, First Quarter, Blenheim Road
Epsom, KT19 9QN United Kingdom
Tel: +44 1932 333 790 | Email: info@pebble.tv

www.pebble.tv

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integrated channel

Software-defined integrated channel with uniquely flexible pipeline design for on-premises, virtualised and cloud deployments.

Pebble Integrated Channel is a single software product deployable in all necessary scenarios for playout. With powerful signal processing capabilities, outstanding configurability, interfacing capacity and a huge variety of stream or file types, it replicates in software all the functionality of a traditional broadcast playout chain made up of single-purpose devices performing dedicated functions, and it can be customised for all your channel types, from tightly scheduled 'static' channels to highly reactive channels with multiple content formats, complex graphics, and live inserts.

Deployment scenarios include:

- On-premises channels up to UHD
- SMPTE 2110 IP-based channels
- Cloud deployed channels
- Hybrid on-premises and cloud channel combinations
- Cloud pop up channels

Choose your own path

The same software is used to process on-premises UHD channels or cloud channels. Channel hardware support is determined by your objectives and no longer by software limitations. If a channel requires uncompressed SMPTE 2110 or is transport stream based, the only differences become your deployment environment and investment choices.

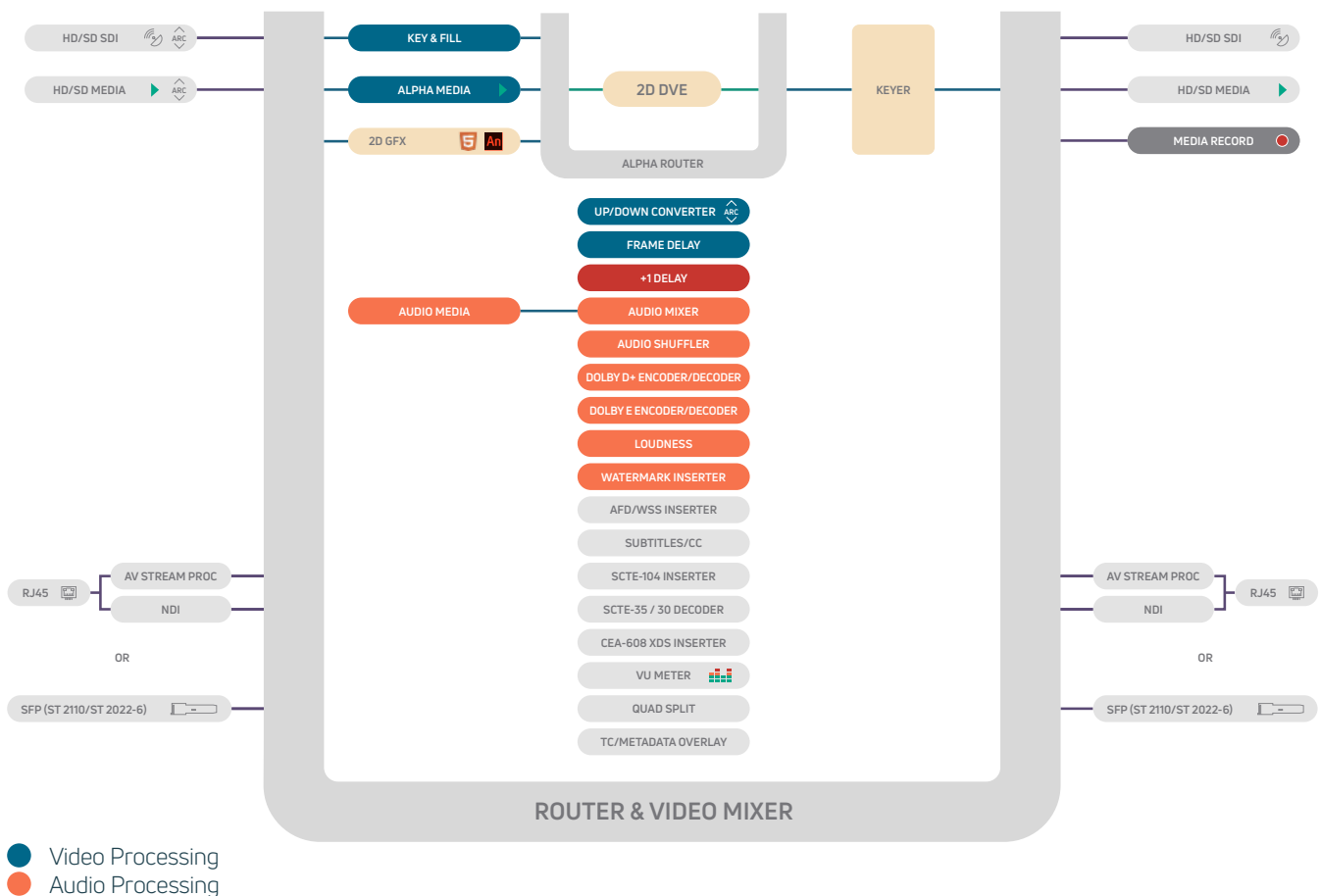
The Evolution to IP-based Services

Broadcast businesses are increasingly looking to evolve IP-based services alongside more traditional delivery methods. Hosting technology within generic data centres or in the public cloud delivers service agility and saves cost, enabling the operator to be situated remotely in a standard data centre environment with all the cost savings that delivers. But not all playout scenarios are possible in the cloud, many are not economically feasible either.

Consequently, Pebble Integrated Channel can support all deployment scenarios with the same core software.

Configurability and Flexibility

Pebble Integrated Channel's software-defined channels are configurable to meet the exact requirements of each service in each deployment. All implementations share the same underlying processing architecture and operate under the control of the Pebble Automation system, making it easy to mirror channels for simultaneous playout from on-premises SDI as well as cloud-based compressed channel distribution.





Key Features:

- Leverages the full power of Pebble Automation's flexible playlist:
 - Can handle dynamic changes to schedules
 - Full validation of media and playout elements
- Simple to use channel design and editing tools with drag and drop
- Comprehensive graphics functionality (2D native or optional 3D plugin – GPU required)
- Flexible audio routing management
- Popular hypervisors supported
- Flexible IP inputs and outputs; supports MPEG2-TS, NDI and SMPTE 2022-6, SMPTE 2110
- Playback from most Network Attached Storage (NAS) systems supporting Server Message Block (SMB)

Key Benefits:

- Full specification and cloud channels with the same software
- Enables migration to an IP and virtualised environment without compromising your channel design or playout operations
- Delivers cost savings by isolating the operator from the technology, as Pebble Automation operators can be located within a standard data centre environment rather than a purpose-built broadcast facility
- Offers a proven solution with multichannel deployments
- Meets the exact requirements of each service thanks to its highly configurable architecture.



IP Inputs and Outputs

Pebble Integrated Channel can support multiple IP inputs and outputs formats including NDI, SMPTE 2110, SMPTE 2022-6, MPEG2-TS over IP with MPEG2 or H.264 compressed video and compressed audio. Quarter resolution MPEG2-TS IP outputs can be used for monitoring purposes either in the **Pebble Automation** Smart Panels or alternative IP stream players. Pebble Integrated Channel can leverage the flexibility of using IP to carry video and audio in a variety of formats.

- ST 2110 20,30,31,40 (Hardware dependent)
- ST 2022-6 (Hardware dependent)
- MPEG2-TS [H.264 and MPEG2 video supported]
- NDI

Using ST 2110 or ST 2022-6 we support seamless redundant streams according to ST 2022-7.



NMOS Integration

Pebble Integrated Channel supports the Network Media Open Specification (NMOS) suite as standardised today including IS-04 up to IS-07 plus conforms to JT-NM TR-1000-1 and best current practices for natural grouping and secure communications. Reliable seamless switching of IP streams for live environments are also supported through ST 2022-7. Telemetry data can be shared with third party

Network Management Systems and other management layers.



Ultra-High Definition and HDR support

Pebble Integrated Channel can support the massive bandwidths required for UHD using the ProRes codec while hardware accelerators must currently be used for XAVC/AVC and AVC Ultra for resolutions of up to 2160p60. HDR input and file capture is supported in Perceptual Quantizer (PQ) and Hybrid Log Gamma (HLG).

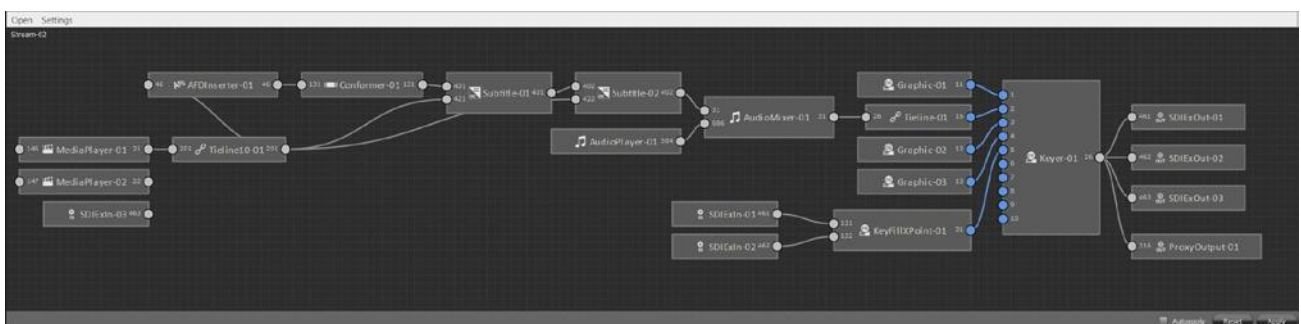
Integrated Control and Monitoring

Pebble offers an integrated remote control and monitoring solutions for all channel implementations. Pebble Remote is based on cloud technology but deployable on-premises or on the public cloud, where combinations of systems can be controlled from the same location. Multi-site operations, disaster recovery systems and hybrid on-premises/cloud solutions can all be integrated into the same control platform.

Software defined pipeline

The software pipeline can be configured to deliver the required video and audio workflows, making it easy to specify the order in which processes such as graphics overlay, Digital Video Effect and Aspect Ratio Conversion are handled within the playout chain.

A flexible pipeline editor enables the logical devices of the pipeline to be configured to meet the exact channel requirements. Configurations can be edited at any time should the channel requirements change.





Video Player

The Video Player can decode and play back video from any of the supported SD, HD or UHD codecs. Each pipeline can support up to 5 video players depending on the hardware chosen to support the software.

Video player features include:

- Seamless back-to-back playback of mixed resolution clips
- Playing clips of single frame duration
- Playing clips whilst the file is transferring
- Playing mixed framerate content with advanced motion adaptive de-interlacer and scaler (hardware required).

Note:

- Representative files should be supplied to Pebble for testing
- Supports MOV QuickTime self-contained or reference files
- Up to 64 audio channels/tracks of stored audio per ID (codec dependent)
- Up to 16 audio output channels for SDI
- Up to 256 audio flows with 64 tracks in ST 2110-30 (theoretical limit)
- Audio sample size can be 16- and 24-bit PCM at 48KHz depending on codec.

The table below lists the range of supported file wrappers and codecs for playback:

STANDARD	CODECS	WRAPPERS
SD	DVCPR025, DVCPR050 & DVCAM DV IMX 30, 40, 50 MPEG2 I Frame & Long GOP	AVI, MOV, MXFOPAtom, MXFOP1a, GXF, LXF AVI, MOV, GXF, LXF AVI, MXFOP1a AVI, MOV, MXFOP1a, GXF, MPG
HD	XDCAM HD, XDCAM EX, XDCAM 422 DVCPR0 HD AVC-Intra DNxHD H264/AVC MPEG2 I Frame & Long GOP XAVC AVC-Ultra AS-11/DPP ProRes	MXFOP1a AVI, MOV, MXFOP1a, MXFOPAtom, GXF, LXF MXFOP1a, LXF MOV, MXFOP1a, MXFOPAtom MP4, MOV AVI, MOV, MXFOP1a, GXF, MPG MXF MXFOP1b MXF MOV
UHD	ProRes XAVC AVC-Ultra	MOV MXF MXFOP1b

Video Recorder

The Pebble Integrated Channel pipeline can be configured with Video Recorders which are controlled by Pebble Automation ingest operations. These include dubbing, scheduled recording or crash record. The Video Recorder can also be controlled by secondary record events and used for clean recording of live programs.

Key features include:

- Encoding profiles, allowing Pebble Automation users to easily change format and codec
- Exporting of clips as they are being recorded
- Inbuilt low-resolution proxy browse transcoding
- Key frame generation
- Multi-Destination recording using XDCAMHD422 or H.264 proxy files.

Master Control

Each Pebble Integrated Channel pipeline has an internal video/audio router. The pipeline editor connects logical devices and routes video to external inputs and outputs. The router also includes master control functionality with several transition types including V-fade, cut-fade, fade-cut and mix. A second Alpha Router connects video and key sources to the keyers. Router tie lines are available for passing video from the main router to the alpha router.

Delay Service

If there is a requirement to delay a channel, perhaps for a +1 hour catch up service or to delay for time zone variations, the optional +hr delay can be configured into pipelines hosted on a standalone server dedicated to delay services or included within the channel pipeline. It is also possible to uniquely brand a delay service with a continuous graphic or one that is

controlled from the master playlist. There are two modes of time delay available within Pebble Integrated Channel, one is designed for baseband delay and the second mode is for compressed MPEG2 transport streams (TS). The key benefit of using the TS delay is that only a single encode is required for a typical baseband and compressed time delay, instead of multiple stages of re-encoding.

Video Conformer

This is a configurable module that provides Aspect Ratio and Up/Down conversion. Operations can be applied to both live and clip-based video. The video conformer will up or down convert video if the resolution of the input video does not match that configured for its output. For instance, the Aspect Ratio Converter (included with the Video Player) ensures that the output video resolution will always match that of the channel. Additional conformers can also be positioned anywhere in the pipeline; to generate down-converted video for a simulcast output for example.

The Video Conformer is configurable for each received Active Format Descriptor (AFD) code and will aspect ratio convert video depending upon the AFD code present on its input video. This AFD code, once, inserted into the Conformer output video, will change with aspect ratio conversion. If the video into the conformer does not have an AFD value, Pebble Integrated Channel will apply a default AFD and ARC. Pebble Integrated Channel complies with SMPTE-2016.

When UHD is a requirement, hardware accelerated scaling and de-interlacing ensures that material that is ingested or played out can be scaled to the correct resolution required.

The table below lists the range of supported file wrappers and codecs for the video recorder:

STANDARD	CODECS	WRAPPERS
SD	DVCPR025, DVCPR050, DVCAM DV IMX 30, 40, 50 MPEG2 I Frame & Long GOP	MOV, MXFOP1a, MXFOPAtom MOV MXFOP1a MOV, MXFOP1a
HD	XDCAM HD, XDCAM EX, XDCAM 422 DVCPR HD AVC-Intra DNxHD H264/AVC MPEG2 I Frame & Long GOP XAVC ProRes	MXFOP1a MOV, MXFOP1a, MXFOPAtom MXFOP1a, MXFOPAtom MXFOP1a, MXFOPAtom MP4, MOV MXFOP1a, MOV MXF MOV
UHD	ProRes XAVC (Specific Hardware Required) AVC-Ultra (Specific Hardware Required)	MOV MXF MXFOP1b



AFD Inserter

This overwrites the AFD data on incoming video with a value from the Pebble Automation playlist, otherwise AFD will pass through unchanged. When positioned upstream of the Conformer, the AFD values in the playlist can change the aspect ratio of the output video.

Keyers

The pipeline can be configured with up to 3 keyers enabling outputs to multiple platforms, each with unique branding. For example, both an SD simulcast, and a streaming web service could be output from the pipeline, each with different graphics. Each keyer has 10 input layers which can be fed video and key from any of the Alpha Router sources. Sources include the Pebble Integrated Channel graphics players, 2D DVE's, optional 3D graphics, external graphics devices and the timeline video sources from the main router.

2D Graphics

Depending on complexity and the host server capabilities each Pebble Integrated Channel pipeline supports up to 10 graphics players that are controlled by secondary playlist events, or manually from the Pebble Automation Smart Panel. Static graphic formats include TGA, GIF, JPEG, PNG, SVG and SWF. Animated graphics are supported through sequential TGA and GIF or SWF (Adobe) files, and graphics can be sized and positioned from within the playlist.

Graphics are created using Adobe Animate CC and can be designed to receive dynamic textual data from the playlist. The data can be included in the traffic schedule or manually entered by the automation operator. Data for text crawls can be supplied from XML or RSS feeds.

Adobe graphics can also control Pebble Integrated Channel DVE's. This provides a powerful method for coordinating graphics and DVE effects from a single secondary event.

HTML5 Graphics

Live HTML5 overlays and animated HTML5 graphics are supported where Pebble Automation can schedule graphic events that are rendered in real-time within Pebble Integrated Channel. Dynamic text and image fields within the graphics can be controlled through automation and defined in the playlist.

Live graphics created by a third party can be scheduled in automation and a pre-defined graphic URL is rendered on top of active video. The third-party application can then control the active URL and trigger the positioning and display of their graphical elements.

Key and Fills

External graphics devices under the control of the playlist can input their key and fill video directly into the pipeline – meaning Pebble Integrated Channel can cater for a wide range of graphics requirements whilst accommodating legacy graphics products and workflows.

2D DVE

Pebble Integrated Channel Digital Video Effects are used to resize and position video on the screen. Five 2D box DVE's are available for squeeze back and picture in picture. These can be controlled by playlist secondary events or from an Adobe graphic.

3D Graphics Plugins

Multiple options exist for graphics plugins. Some solutions may require an optional GPU for graphics rendering.



Audio Players

The pipeline can be configured with 5 Audio Players that will play pre-recorded audio files under the control of playlist secondary events. In this way, multi-lingual Audio Overs from separate audio files can be supported. The audio level, program duck level, fade in/out time and track mixing are all configurable.

Audio Support

- Advanced audio shuffling and substitution using SMTPE 377-4 tagged tracks;
- ISO639-2 Descriptor
- RFC5646 Descriptor
- Private sub tag support (RFC5646 only)

Formats

- WAV
- BWF/BWAV
- AIFF
- Bit Depths (16,24,32)
- Sample rate 48kHz
- Multi-lingual Audio overs up to 8, dynamic ducking for each language
- Dolby Digital and Digital Plus Encoding and Decoding
- Dolby E Encoding and Decoding
- Downmix (2.0 -> 5.1)
- Upmix (5.1 -> 2.0)

Audio Shufflers

The Audio Shufflers are controlled by **Pebble Automation** and can change the arrangement of the audio tracks. The track shuffle for each event can be scheduled or edited manually from the playlist. It can also be automatically controlled from **Pebble Automation** by reading the audio language tags of the source media and comparing these with the preconfigured channel output mapping. The channel can be configured with primary, secondary, and tertiary output mappings to allow audio substitution if first or second choice languages are unavailable.

SCTE Inserter

The Pebble Integrated Channel pipeline can be configured to insert SCTE-35 data into its IP transport stream output or SCTE-104 messages into its uncompressed outputs. The data instructs when downstream devices should switch away and re-join a Pebble Integrated Channel feed, typically to allow the insertion of local programming or commercials. SCTE output data is controlled from the playlist either through explicitly scheduled secondary start and stop events or automatically using a combination of appropriately tagged primary events and rules which determine the type and timing of SCTE messages to be sent.

Loudness Processing

Optional loudness processing dynamically adjusts the loudness of audio in real-time to ensure that Pebble Integrated Channel output follows ITU-R.BS1770-4 based international loudness recommendations including ATSC A/85, EBU R128,

ARIB TR-B32, and FreeTV OP59. Loudness is adjusted on both clip and live feed playout based upon preconfigured profiles. Profiles can be scheduled on an event by event basis

Subtitle/Closed Caption Inserter

This is an optional plug-in and provides Closed Captions and Subtitle support. Multiple inserters can be configured for each pipeline. Each inserter will be driven from a separate subtitle/caption file stored on a Pebble Integrated Channel storage location, making it possible to output multiple subtitle or closed caption languages.

Supported Subtitle features include:

- Multi-language support with validation
- WST and OP47 subtitle insertion into configurable VBI lines and teletext pages.
- Insert open subtitles into video
- Line 21, CEA-608 and CEA-708 closed caption insertion
- Supported file formats include EBU .stl, .pac, .chk, .890, .scr, .scc, .xml (tt)
- DVB Bitmap

SCTE Message Extraction

SCTE-35 messages in the MPEG2-TS inputs are fed to Pebble Integrated Channel and can be read and used by Pebble Automation to switch the local Pebble Integrated Channel output between the live feed and a regional playlist. SCTE-35 messages can also be output over MPEG2-TS.

Packet 31 Insertion

The Pebble Integrated Channel pipeline can be configured to insert Packet 31 data into the program identifier (PID) assigned to the teletext data of an IP transport stream output. The data instructs when downstream devices should switch away and re-join a Pebble Integrated Channel feed, typically to allow the insertion of local programming.

Dolby Encoders and Decoders

Dolby Encoders and Decoders are logical devices that can be positioned anywhere in the pipeline. For example, it is possible to decode Dolby E or D to discrete PCM audio from live sources, add audio voiceover and then encode to Dolby E or D.

Watermarking

Support for popular watermarking standards include:

- Nielsen
- Kantar Civolution





Unit 1, First Quarter, Blenheim Road
Epsom, KT19 9QN United Kingdom
Tel: +44 1932 333 790 | Email: info@pebble.tv

www.pebble.tv

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Issue 6, September 2022.





PowerEdge R7525

Unprecedented Performance

The new Dell EMC PowerEdge R7525 Rack Server is a highly adaptable rack server that delivers powerful performance and flexible configurations.

Deliver breakthrough performance, innovation and density for traditional and emerging workloads

- 100%¹ more processing cores and faster data transfer speeds with PCIe Gen 4
- 20%² more memory performance for scale out environments
- Maximized storage and memory configuration option enables HPC, ML/DL/AI and rendering
- 24 direct connect Gen4 NVMe supports all flash vSAN Ready Node
- Balanced core count and GPU to support for maximum numbers of end users

Increase efficiency and accelerate operations with an automated infrastructure

The Dell EMC OpenManage™ systems management portfolio delivers an efficient and comprehensive solution for PowerEdge servers through tailored, automated, and repeatable processes

- Automate server life cycle management with scripting via the iDRAC Restful API with Redfish conformance
- Simplify and centralize one-to-many management with the OpenManage Enterprise console
- Utilize the OpenManage Mobile app and PowerEdge Quick Sync 2 to easily manage servers using a phone or tablet
- Resolve issues with up to 72% less IT effort using automated proactive and predictive technology from ProSupport Plus and SupportAssist.³

Fortify your data center with integrity

Every PowerEdge server is designed with a cyber resilient architecture, integrating security deeply into every phase in the lifecycle, from design to retirement

- Enhance security with platform enablement of AMD Secure Memory Encryption (SME) and Secure Encrypted Virtualization (SEV)
- Operate your workloads on a secure platform anchored by cryptographically trusted booting and silicon root of trust.
- Maintain server firmware safety with digitally signed firmware packages
- Detect and remediate unauthorized or malicious change with drift detection and system lockdown
- Securely and quickly wipe all data from storage media, including hard drives, SSDs and system memory with System Erase

PowerEdge R7525

The new Dell EMC PowerEdge R7525 Rack Server is a highly adaptable rack server that delivers powerful performance and flexible configurations. It is ideal for traditional and emerging workloads and applications like:

- Data Analytics
- All Flash SDS
- VDI

¹ When compared to Dell EMC PowerEdge R7425 server

² When compared to Dell EMC PowerEdge R7425 server

³ Based on June 2018 Principled Technologies Report commissioned by Dell EMC, "Save time and IT effort resolving server hardware issues with ProSupport Plus and SupportAssist", compared to Basic Warranty without SupportAssist. Actual results will vary. Full report: <http://facts.pt/olccpk>

PowerEdge R7525

Features	Technical Specification	
Processor	Two 2 nd or 3 rd Generation AMD EPYC™ Processors with up to 64 cores per processor	
Memory	DDR4: Up to 32 x DDR4 RDIMM (2TB), LRDIMM (4TB), bandwidth up to 3200 MT/S	
Controllers	HBA345, PERC H345, PERC H745, H840, 12Gbps SAS HBA Chipset SATA/SW RAID(S150): Yes PERC11 – H755, H755N	
Storage	Front Bays: Up to 24 x 2.5" with up to 24 NVMe, SAS/SATA (SSD/HDD) Up to 12 x 3.5" SAS/SATA (HDD) Up to 16 x 2.5" SAS/SATA (SSD/HDD) The 24 x 2.5" SAS/SATA backplane won't be available until April block Rear Bays: Up to 2 x 2.5" SAS/SATA (HDD/SSD)	
Power Supplies	800W Platinum 1400W Platinum 2400W Platinum	
Fans	Standard/High Performance/Very High Performance Hot Plug Fans	
Dimension	Height: 86.8mm (3.42") Width: 434.0mm (17.09") Depth: 736.29mm (28.99") Weight: 36.3KG (80lb)	
Rack Units	2U Rack Server	
Embedded Management	iDRAC9 iDRAC RESTful API with Redfish iDRAC Direct Quick Sync 2 BLE/wireless module	
Bezel	Optional LCD bezel or security bezel	
OpenManage™ Software	OpenManage Enterprise OpenManage Enterprise Power Manager OpenManage Mobile	
Integrations & Connections	OpenManage Integrations BMC Truesight Microsoft® System Center RedHat® Ansible® Modules VMware® vCenter	OpenManage Connections IBM Tivoli® Netcool/OMNIBus IBM Tivoli® Network Manager IP Edition Micro Focus® Operations Manager I Nagios® Core Nagios® XI
Security	Cryptographically signed firmware Secure Boot Secure Erase Silicon Root of Trust System Lockdown (requires OpenManage Enterprise) TPM 1.2/2.0, TCM 2.0 optional AMD Secure Memory Encryption (SME) AMD Secure Encrypted Virtualization (SEV)	
Embedded NIC	2 x 1GE LOM	
Networking Options	OCP x16 Mezz 3.0	
GPU Options	Up to three double wide 300W or six single wide 75W accelerators	

PowerEdge R7525

Features	Technical Specification	
Ports	Front Ports 1 x Dedicated iDRAC micro-USB 1 x USB 2.0 1 x VGA Internal Ports 1 x USB 2.0	Rear Ports 1 x USB 2.0 1 x Serial (optional) 1 x USB 3.0 1 x Ethernet 1 x VGA 1 x Power Button
PCIe	Up to 8 x PCIe Gen4 slots	
Operating Systems & Hypervisors	Canonical® Ubuntu® LTS Citrix® Hypervisor Microsoft® Windows Server® with Hyper-V Red Hat® Enterprise Linux SUSE® Linux Enterprise Server VMware® ESXi®	
OEM-ready version available	From bezel to BIOS to packaging, your servers can look and feel as if they were designed and built by you. For more information, visit Dell.com/OEM .	
Recommended support and services	Dell ProSupport Plus for critical systems or Dell ProSupport for premium hardware and software support for your PowerEdge solution. Consulting and deployment offerings are also available. Contact your Dell representative today for more information. Availability and terms of Dell Services vary by region. For more information, visit Dell.com/ServiceDescriptions	
Recommended services	ProSupport Plus with SupportAssist provides proactive and predictive support for critical systems. ProSupport provides comprehensive hardware and software support. Get more from your technology starting on day one with ProDeploy Enterprise Suite deployment offers. For more information, visit Dell.com/Services .	
Dell Financial Services	Deliver results with easy financing. Explore financial options that move at the speed of business. For more information, visit https://www.emc.com/products/how-to-buy/global-financial-services/index.htm	

End-to-end technology solutions

Reduce IT complexity, lower costs and eliminate inefficiencies by making IT and business solutions work harder for you. You can count on Dell EMC for end-to-end solutions to maximize your performance and uptime. A proven leader in Servers, Storage and Networking, Dell EMC Services deliver innovation at any scale. And if you're looking to preserve cash or increase operational efficiency, Dell Financial Services™ has a wide range of options to make technology acquisition easy and affordable. Contact your Dell Sales Representative for more information.

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1U, orientado por valor e densidade, desenvolvido para TI de fins gerais

O Dell EMC PowerEdge R450, com processadores escaláveis Intel® Xeon® de 3ª geração, oferece valor e densidade excepcionais com excelente desempenho.



Inove em escala com cargas de trabalho complexas e em desenvolvimento

O Dell EMC PowerEdge R450 é um servidor de nível básico 1U com soquete duplo, que oferece o melhor valor a organizações que buscam processamento atualizado, E/S e recursos de armazenamento em um modelo denso. Isso permite a você:

- Adicionar energia adicional: adiciona energia adicional com até dois processadores dimensionáveis Intel Xeon de 3ª geração com até 24 núcleos por soquete
- Construído com memória mais rápida: suporta até 16 DDR4 RDIMMS a 2933 MT/s
- Melhorar o throughput, reduzir a latência com até 2 slots PCIe Gen4
- Incluir armazenamento local flexível: oferece até 8 HDDs ou SSDs de 2,5 polegadas; ou até 4 HDDs ou SSDs de 3,5 polegadas
- Suportar requisitos distintivos: perfeitos para infraestruturas menores e demandas leves de virtualização

Aumente a eficiência e acelere as operações com infraestrutura de computação autônoma

O portfólio de gerenciamento de sistemas Dell EMC OpenManage facilita a complexidade do gerenciamento e da proteção da infraestrutura de TI. Com as ferramentas completas e intuitivas da Dell Technologies, a TI pode oferecer uma experiência segura e integrada por meio da redução dos silos de processos e informações para se concentrar no crescimento da empresa. O portfólio do Dell EMC OpenManage é fundamental para seu mecanismo de inovação, proporcionando as ferramentas e a automação que ajudam você a dimensionar, gerenciar e proteger seu ambiente tecnológico.

- O streaming integrado de telemetria, o gerenciamento térmico e a API RESTful com Redfish oferecem visibilidade e controle simplificados para aprimorar o gerenciamento do servidor
- A automação inteligente permite que você habilite a cooperação entre ações humanas e recursos do sistema para aumentar produtividade
- Recursos integrados de gerenciamento de mudanças para o planejamento de atualizações e configuração e implementação completas e automáticas
- Integração do gerenciamento de pilha completa com Microsoft, VMware, ServiceNow, Ansible e muitas outras ferramentas

Resiliência proativa incorporada por meio de um portfólio completo de soluções

Do silício e cadeia de fornecimento e até a desativação do ativo, saiba que seus servidores estão seguros e protegidos com tecnologias inovadoras de Dell EMC e Intel. Oferecemos a confiança da resiliência cibernética com a segurança de nível corporativo que minimiza o risco de qualquer organização, desde as de pequeno porte até hiperescalas.

- Comece sólido com os recursos de segurança da plataforma, mesmo antes de o servidor ser fabricado, incluindo a verificação segura do componente e Silicon Root of Trust
- Mantenha-se sólido com inovações contínuas que fortalecem a resiliência cibernética, como o OpenManage Secure Enterprise Key Manager and Automatic Certificate Enrollment
- Contorne ameaças com inteligência, automação e ferramentas de recuperação que incluem telemetria do iDRAC9, exame do BIOS em tempo real e recuperação rápida do sistema operacional

PowerEdge R450

Fortaleça suas inovações com o Dell EMC PowerEdge R450, o servidor 1U de 2 soquetes desenvolvido para dar alta densidade e valor agregado.

- Infraestrutura de TI pequena
- Máquina virtual leve (densidade de máquina virtual)
- Específico para pequenas empresas

Recursos	Especificações técnicas	
Processador	Até dois processadores escaláveis Intel Xeon de 3ª Geração com até 24 núcleos por processador	
Memória	16 slots de memória DIMM DDR4, compatível com RDIMM de no máximo 1 TB e velocidades de até 2933 MT/s	
Controladores de armazenamento	<ul style="list-style-type: none"> Controladores internos (RAID): PERC H345, PERC H355, HBA355i, PERC H745, PERC H755, S150 Boot interno: módulo SD duplo interno ou subsistema de armazenamento com inicialização otimizada (BOSS-S1): HWRAID 2 SSDs M.2 ou USB PERC externo (RAID): PERC H840 HBA externo (não RAID): HBA355e 	
Compartimentos de unidades	Compartimentos frontais: <ul style="list-style-type: none"> Até 4 SAS/SATA (HDD/SSD) de 3,5 polegadas, máx. de 64 TB Até 8 unidades de 2,5 polegadas SAS/SATA (disco rígido/SSD), máx. de 61,4 TB 	
Fontes de alimentação	<ul style="list-style-type: none"> Modo misto Platinum de 600 W (100–240 Vca ou 240 Vcc) redundante de troca a quente Modo misto Platinum de 800 W (100–240 Vca ou 240 Vcc) redundante de troca a quente <ul style="list-style-type: none"> Redundante de troca a quente de 1.100 W e -48 Vcc (AVISO: funciona somente com entrada de alimentação de -48 Vcc a -60 Vcc) 	
Opções de refrigeração	Resfriamento a ar	
Ventiladores	<ul style="list-style-type: none"> Ventiladores padrão (STD) ou ventiladores SLVR de alto desempenho Até sete ventiladores de troca a frio 	
Dimensões	<ul style="list-style-type: none"> Altura: 42,8 mm (1,7 polegadas) Largura: 482 mm (18,97 polegadas) Profundidade – 734,95 mm (28,92 pol.), sem borda 748,79 mm (29,47 pol.), com borda 	
Fator de forma	Servidor em rack de 1U	
Gerenciamento incorporado	<ul style="list-style-type: none"> iDRAC9 iDRAC Direct iDRAC API RESTful com Redfish iDRAC Service Module Módulo sem fio Quick Sync 2 	
Bezel	Borda de segurança ou borda de LCD opcionais	
Software OpenManage	<ul style="list-style-type: none"> OpenManage Enterprise Plug-in do Power Manager para o OpenManage Plug-in do SupportAssist para o OpenManage Plug-in do Update Manager para o OpenManage 	
Mobilidade	OpenManage Mobile	
Integrações e conexões	Integrações com o OpenManage <ul style="list-style-type: none"> BMC Truesight Microsoft System Center Red Hat Ansible Modules VMware vCenter e vRealize Operations Manager 	Conexões com o OpenManage <ul style="list-style-type: none"> IBM Tivoli Netcool/OMNibus IBM Tivoli Network Manager IP Edition Micro Focus Operations Manager Nagios Core Nagios XI
Segurança	<ul style="list-style-type: none"> Firmware com assinatura criptografada Secure Boot Apagamento seguro Raiz de confiança de silício Bloqueio do sistema (requer iDRAC9 Enterprise ou Datacenter) TPM 1.2/2.0 FIPS, certificação CC-TCG, TPM 2.0 China NationZ 	
Embedded NIC (SATA integrada)	2 x 1 GbE LOM	
Opções de rede	Máx. de 1 x OCP 3.0	
Opções de GPU	NA	
Portas	Portas frontais <ul style="list-style-type: none"> 1 micro USB iDRAC Direct dedicada 1 x USB 3.0 interno 1 VGA 	Portas traseiras <ul style="list-style-type: none"> 1 x USB 2.0 1 serial (opcional) 1 x porta Ethernet do iDRAC 1 x USB 3.0 interno 2 portas Ethernet 1 VGA
	Portas internas <ul style="list-style-type: none"> 1 x USB 3.0 (opcional) 	
PCIe	2 slots PCIe de 4ª geração + 1 PCIe de 3ª geração <ul style="list-style-type: none"> 2 x 16 de 4ª geração (x 16 conectores) de perfil inferior, metade do comprimento 1 x 4 de 3ª geração (x 8 conectores) de perfil inferior, metade do comprimento 	

Recursos	Especificações técnicas
Sistema operacional e hypervisors	<ul style="list-style-type: none"> • Canonical Ubuntu Server LTS • Citrix Hypervisor • Microsoft Windows Server com Hyper-V • Red Hat Enterprise Linux • SUSE Linux Enterprise Server • VMware ESXi <p>Para obter as especificações e os detalhes de interoperabilidade, acesse Dell.com/OSsupport.</p>
Versão pronta para OEM disponível	<p>Da borda ao BIOS ao empacotamento, seus servidores podem ficar como se tivessem sido projetados e desenvolvidos por você. Para obter mais informações, acesse Dell.com/OEM.</p>

Suporte e serviços recomendados

Dell ProSupport Plus para sistemas essenciais ou Dell ProSupport para hardware premium e suporte de hardware para sua solução PowerEdge. Também estão disponíveis ofertas de consultoria e implementação. Entre em contato com o seu representante Dell hoje para obter mais informações. A disponibilidade e os termos dos serviços da Dell variam de acordo com a região. Para obter mais informações, acesse Dell.com/ServiceDescriptions.

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vendas e suporte

PowerEdge R7515

Powerful performance and scalability



The Dell EMC PowerEdge R7515 rack server is a highly scalable single-socket 2U rack server that delivers outstanding performance and TCO.

Deliver breakthrough performance, innovation and density for traditional and emerging workloads

Data center evolution starts with modern platforms that scale easily and are optimized for application performance. The PowerEdge R7515 is built upon a scalable system architecture and provides choice and flexibility to meet performance demands. High-level specifications:

- 100%¹ more processing cores and faster data transfer speeds with PCIe Gen 4
- 20%² more memory performance for scale out environments
- Direct connect SAS/SATA/ NVMe for vSAN Ready Nodes
- High core count performance for highest VM density in a single-socket design
- Multi-die architecture offers low latency and floating-point performance for Big Data and Containers

Increase efficiency and accelerate operations with an automated infrastructure

The Dell EMC OpenManage™ systems management portfolio delivers an efficient and comprehensive solution for PowerEdge servers through tailored, automated, and repeatable processes.

- Automate server life cycle management with scripting via the iDRAC Restful API with Redfish conformance.
- Simplify and centralize one to many management with the OpenManage Enterprise console.
- Utilize the OpenManage Mobile app and PowerEdge Quick Sync 2 to easily manage servers using a phone or tablet.
- Resolve issues with up to 72% less IT effort using automated proactive and predictive technology from ProSupport Plus and SupportAssist.**

Fortify your data center with integrated security

Every PowerEdge server is designed with a cyber resilient architecture, integrating security deeply into every phase in the lifecycle, from design to retirement.

- Enhance security with platform enablement of AMD Secure Memory Encryption (SME) and Secure Encrypted Virtualization (SEV).
- Operate your workloads on a secure platform anchored by cryptographically trusted booting and silicon root of trust.
- Maintain server firmware safety with digitally signed firmware packages.
- Detect and remediate unauthorized or malicious change with drift detection and system lockdown.
- Securely and quickly wipe all data from storage media including hard drives, SSDs and system memory with System Erase.

PowerEdge R7515

The Dell EMC PowerEdge R7515 Rack Server is a highly scalable Single-socket 2U rack server that delivers performance and outstanding TCO. It is ideal for the following workloads and applications:

- Software-Defined Storage (SDS)
- Virtualization
- Data Analytics

¹ Based on Dell Internal analysis, August 2019

² Based on Dell Internal analysis, August 2019

**Based on June 2018 Principled Technologies Report commissioned by Dell EMC, "Save time and IT effort resolving server hardware issues with ProSupport Plus and SupportAssist", compared to Basic Warranty without SupportAssist. Actual results will vary. Full report: <http://facts.pt/olccpk>

PowerEdge R7515

Features	Technical Specification	
Processor	One 2 nd or 3 rd Generation AMD EPYC™ Processor with up to 64 cores	
Memory	DDR4: Up to 16 x DDR4 RDIMM (1TB), LRDIMM (2TB), bandwidth up to 3200 MT/S	
Controllers	HW RAID: PERC 9/10 - HBA330, H330, H730P, H740P, H840, 12G SAS HBA Chipset SATA/SW RAID(S150): Yes	
Drive Bays	Front Bays Up to 8 x3.5" Hot Plug SATA/SAS HDDs Up to 12x 3.5" hot-plug SAS/SATA HDDs Up to 24x 2.5" Hot Plug SATA/SAS/NVMe	Rear Bays Up to 2x 3.5" hot-plug SAS/SATA HDDs Internal: 2 x M.2 (BOSS)
Power Supplies	750W Titanium 750W Platinum	1100W Platinum 1600W Platinum
Fans	Stanadard/High Peformance Fan N+1 Fan redunadancy	
Dimensions	Height: 86.8mm (3.42") Width: 434.0mm (17.09") Depth: 647.1mm (25.48") Weight: 27.3 kg (60.19 lb)	
Rack Units	2U Rack Server	
Embedded mgmt	iDRAC9 iDRAC RESTful API with Redfish iDRAC Direct Quick Sync 2 BLE/wireless module	
Bezel	Optional LCD or Security Bezel	
OpenManage™ SW	Consoles OpenManage Enterprise OpenManage Enterprise Power Manager Mobility OpenManage Mobile Tools Dell EMC RACADM CLI Dell EMC Repository Manager	Dell EMC System Update Dell EMC Server Update Utility Dell EMC Update Catalogs iDRAC Service Module IPMI Tool OpenManage Server Administrator OpenManage Storage Services
Integrations & Connections	OpenManage Integrations BMC Truesight Microsoft® System Center Redhat® Andible® Modules VMware® vCenter™	OpenManage Connections IBM Tivoli® Netcool/OMNibus IBM Tivoli® Network Manager IP Edition Micro Focus® Operations Manager I Nagios® Core Nagios® XI
Security	Cryptographically signed firmware Secure Boot Secure Erase	Silicon Root of Trust System Lockdown TPM 1.2/2.0, TCM 2.0 optional
Embedded NIC		
Networking Options (NDC)	2 x 1GbE 2 x 10GbE BT 2 x 10GbE SFP+ 2 x 25GbE SFP28	
GPU Options:	Up to 4 Single-Wide GPU(T4); Up to 1 Full-Height FPGA	

PowerEdge R7515

Features	Technical Specification	
Ports	Front Ports 1 x Dedicated iDRAC direct micro-USB 2 x USB 2.0 1 x Video	Rear Ports: 2 x 1GbE 1 x Dedicated iDRAC network port 1 x Serial 2 x USB 3.0 1 x Video
PCIe	Up to 4: 2 x Gen3 slots 2 x16 2 x Gen4 slots 2 x16	
Operating Systems & Hypervisors	Canonical® Ubuntu® Server LTS Citrix® Hypervisor™ Microsoft® Windows Server® with Hyper-V Red Hat® Enterprise Linux SUSE® Linux Enterprise Server VMware® ESXi®	
OEM-ready version available	From bezel to BIOS to packaging, your servers can look and feel as if they were designed and built by you. For more information, visit Dell.com/OEM .	
Recommended support	Dell ProSupport Plus for critical systems or Dell ProSupport for premium hardware and software support for your PowerEdge solution. Consulting and deployment offerings are also available. Contact your Dell representative today for more information. Availability and terms of Dell Services vary by region. For more information, visit Dell.com/ServiceDescriptions	
Recommended services	ProSupport Plus with SupportAssist provides proactive and predictive support for critical systems. ProSupport provides comprehensive hardware and software support. Get more from your technology starting on day one with ProDeploy Enterprise Suite deployment offers. For more information, visit Dell.com/Services .	

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A dark, high-contrast photograph of a server room with rows of server racks and overhead lighting.

FS S5860 Series Switches Data Sheet

Contents

Product overview	3
Product highlights	3
Platform details	4
Platform benefits	9
Software requirements	10
Product specifications	10
Quality certification	12
Optics supported	12
Warranty, service and support	12
Ordering information	13
Additional information	13
Document history	13

Product overview

FS S5860 Series Switches are high-performance and strong-security 10G L3 enterprise switch with 760Gbps/2.56T switching capacity. FS S5860-20SQ and S5860-24XB-U are based on Broadcom® BCM56170, S5860-48SC is based on Broadcom® BCM56873.

The S5860-20SQ 24-port 10Gb Ethernet layer 3 switch features 20x 1G/10G downlinks, 4x 10G/25G SFP28 and 2x 40G QSFP+ (can be split into 4x 10G SFP+) uplinks that all support virtual stacking. This managed enterprise switch adopts cutting-edge Broadcom chips to deliver 760 Gbps switching capacity and 565 Mpps forwarding rate. It is packed with redundant hot-swappable power supplies, dual hot-swappable smart fans and hardware-level dual-flash chip for superior processing performance and network reliability. FS agile S5860-20SQ managed switch is ideal for large-scale campus network aggregations, small and medium-sized network cores to meet the needs of high-speed, safe, intelligent enterprise networks.

S5860-24XB-U is FS-developed next-generation L3 multi-gigabit hybrid optical/electrical switch. This switch features 24x 100M/1000M/2.5G/5G/10GBase-T and 4x 1/10G SFP+ with 4x 10G/25G SFP28 uplinks. With wired and wireless convergence, it also complies with PoE++ standard. This managed enterprise switch support virtual stacking, adopts cutting-edge Broadcom chips to deliver 760 Gbps switching capacity and 565 Mpps forwarding rate. It is packed with redundant hot-swappable power supplies, hot-swappable smart fans for superior processing performance and network reliability. It is ideal for campus network access/aggregation, 10 GE data center server access, and high-speed wireless device access.

The S5860-48SC 48-port 1G/10G Ethernet layer 3 switch features 48x 1G/10G downlinks, 8x 40G/100G QSFP28 uplinks that all support virtual stacking. This managed enterprise switch adopts cutting-edge Broadcom chip and ARM A9 Quad-Core CPU to deliver 2.56T switching capacity and 1,904 Mpps forwarding rate. It is packed with redundant hot-swappable power supplies, 3+1 hot-swappable smart fans and hardware-level dual-flash chip for superior processing performance and network reliability. The S5860-48SC managed switch is ideal for large-scale campus network aggregations, small and medium-sized network cores to meet the needs of high-speed, safe, intelligent enterprise networks. Also, this cost-effective campus network switch comes with an industry-leading 5-year limited lifetime warranty and 30-day return policy.

Product highlights

- Broadcom Chip, Support Stacking on All Optical Ports
- 1+1 Hot-swappable Power Supplies, Smart Fans
- Support QoS, DHCP, BGP, VRRP, QinQ, etc.
- Support WEB/CLI/SNMP/SSH for Flexible Operation
- Network Monitoring through Sampled Flow (sFlow)
- Support SSH, ACL, AAA, 802.1X, RADIUS, TACACS+, etc. for Security
- IPv4/IPv6 Dual-Stack for Future Network Expansion
- Up to 24 PoE++ Ports, Total Budget 740W (Only for S5860-24XB-U Switch)
- Flexible 1G/10G/40G/100G Interface Speeds, All 100G Ports can be Split into 4x 25G Ports (Only for S5860-48SC Switch)

Platform details

Switch models and configurations

Figures 1 through 3 show the FS S5860 series switches.

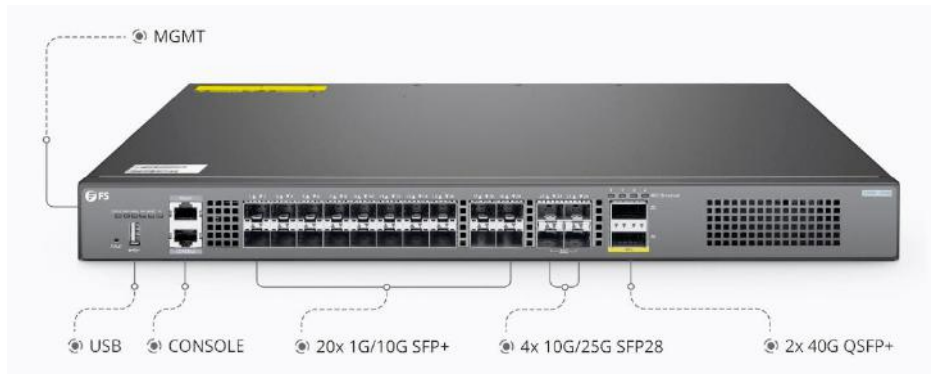


Figure 1.

S5860-20SQ, 24-Port Ethernet L3 Switch, 20 x 10Gb SFP+, with 4 x 25Gb SFP28 and 2 x 40Gb QSFP+, Support Stacking, Broadcom Chip

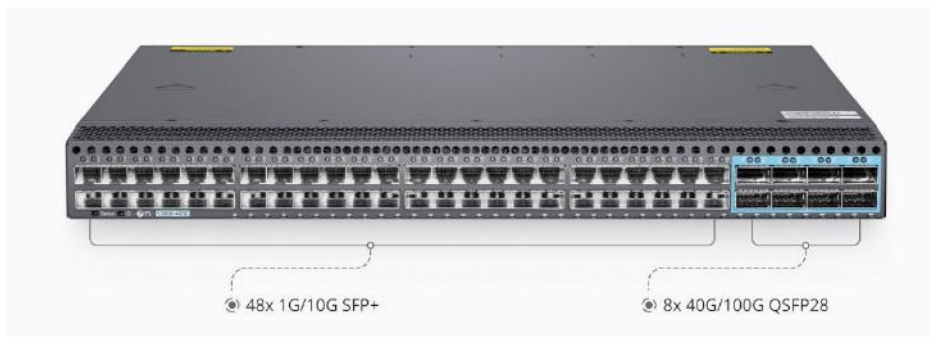


Figure 2.

S5860-48SC, 48-Port Ethernet L3 Switch, 48 x 10Gb SFP+, with 8 x 100Gb QSFP28, Support Stacking, Broadcom Chip

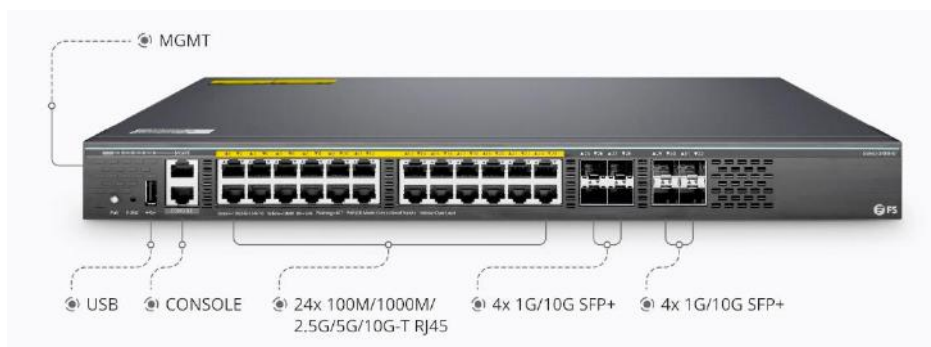


Figure 3.

S5860-24XB-U, 24-Port Ethernet L3 PoE++ Switch, 24 x 10GBASE-T/Multi-Gigabit, 4 x 10Gb SFP+, with 4 x 25Gb SFP28, Support Stacking, Broadcom Chip

Switch configurations and port density

Table 1 shows the FS S5860 series configurations and port density.

Table 1. Switch configuration and port density

FS P/N	S5860-20SQ	S5860-48SC	S5860-24XB-U
Description	24-Port Ethernet L3 Fully Managed Pro Switch, 20 x 10Gb SFP+, with 4 x 25Gb SFP28 and 2 x 40Gb QSFP+	48-Port Ethernet L3 Fully Managed Pro Switch, 48 x 10Gb SFP+, with 8 x 100Gb QSFP28	24-Port Ethernet L3 Fully Managed Pro PoE++ Switch, 24 x 10GBASE-T/Multi-Gigabit, 4 x 10Gb SFP+, with 4 x 25Gb SFP28
Port			
1G port density	20	48	28
10G port density	24	48	32
25G port density	4	-	4
40G port density	2	8	-
100G port density	-	8	-
10G port density with breakout cable	32	80	32
25G port density with breakout cable	4	-	4
40G port density with breakout cable	2	8	-
Management ports	1	1	1
Console port	1	1	1
USB port	1	1	1
Memory and processor			
Switch chip	BCM56170	BCM56873	BCM56170
CPU	ARM A9 Single-Core CPU, 1.25GHz	ARM A9 Quad-Core CPU, 1.2GHz	ARM A9 Single-Core CPU, 1.25GHz
DRAM	1GB	4GB	1GB
SDRAM	1GB	4GB	1GB
Flash memory	1GB	8GB (EMMC)	1GB

FS P/N	S5860-20SQ	S5860-48SC	S5860-24XB-U
Latency	1.11μs	7.56μs	1.11μs
Packet buffer	4MB	32MB	4MB

Note:

RJ45 ports can be used as 100M/1/2.5/5/10G ports for Ethernet connection, does not support 1G-T copper transceivers.

SFP+ ports can be used for 1/10G connection.

SFP28 can be used for 10/25G connection.

QSFP+ can be used for 40G or 4x 10G connection.

QSFP28 can be used for 40G/100G or 4x10G/4x25G connection.

Power supplies and fans

The FS S5860 Series switches ship with the dual 1+1 redundant AC power supply as default.

Table 2 provides more details on the FS S5860 series power supplies and fan specifications.

Table 2. Power supply and fan specifications

Description	S5860-20SQ	S5860-48SC	S5860-24XB-U
Power supply	Dual 1+1 redundant power supplies (AC)	Dual 1+1 redundant power supplies (AC)	Dual 1+1 redundant power supplies (AC)
Fan number	2x Hot-swappable Fans	4x Hot-swappable Fans (3+1 Redundancy)	3x Hot-swappable Fans (2+1 Redundancy)
Airflow	Front-to-Back	Front-to-Back	Front-to-Back and Left-to-Back
Acoustic noise	<78dB	<78dB	<78dB
Maximum fan speed	18000rpm	23500rpm	18000rpm
Max. power consumption	85W	300W	120W (without PDs) 860W (with PDs)
Power max rating	150W	550W	515W
Input-voltage range and frequency	<ul style="list-style-type: none"> Rated voltage range: 100-240VAC; 50-60Hz Maximum voltage range: <ul style="list-style-type: none"> -AC input: 90-264VAC; 47-63Hz; -High-Voltage DC input: 192 V DC to 288 V DC 		
Power supply efficiency	85% (220Vac 50% load)	92% (230Vac 50% load)	90% (230Vac 100% load)
Input current	3A (MAX) at 90V	8A (MAX) at 90V	7A (MAX) at 90V

Description	S5860-20SQ	S5860-48SC	S5860-24XB-U
Output ratings	Main output: 12V 12.5A	Main output: 12V 45A Standby output: 12V 2.1A	Main output: 12V 11.25A Standby output: 53.5V 7.11A
Output holdup time	20ms	12ms	11ms
Power-supply input receptacles	C13	C13	C13
Power cord rating	10A	10A	10A
PoE standard	-	-	IEEE 802.3af/at/bt
PoE power budget	-	-	370W (single-power); 740W (dual-power)

Stacking

The FS S5860 Series switch models are designed for stacking switches as a single virtual switch, enabling customers to have a single management plane and control plane for up to 152 access ports.

Table 3 lists the supported stacking options.

Table 3. Supported stacking options

Part Name	S5860-20SQ	S5860-48SC	S5860-24XB-U
Stacking ports	Port 1~26 (20*10G, 4*25G, 2*40G)	Port 1~56 (48*10G, 8*100G)	Port 1~32 (24*10G-T, 4*10G, 2*40G)
Supported stack members	Stack with other S5860-20SQ or S5860-24XB-U with the same OS version	Stack with other S5860-48SC with the same OS version	Stack with S5860-20SQ or other S5860-24XB-U with the same OS version
Maximum number of VSL links	8	48	8
Number of members	2	2	2

Note:

All 10G/25G/40G ports can be stacked via transceivers or DAC/AOC cables, support port mixing but does not support speed reduction in the same VSL. For S5860-20SQ and S5860-24XB-U, when using the 25G ports, you can configure a single port as a stack port; each 25G port is a stack-group. For S5860-48SC, when using the 10G ports, you can configure a single port as a stack port; each 10G port is a stack-group.

Switch performance

Table 4 shows performance specifications for the FS S5860 series switches.

Table 4. Performance specifications

Performance for all S5860 Series Switches	S5860-20SQ	S5860-48SC	S5860-24XB-U
Switching capacity	760 Gbps	2.56 Tbps	760 Gbps
Forwarding rate	565 Mpps	1904 Mpps	565 Mpps
Total number of MAC addresses	32000	32000	32000
Total number of IPv4 routes (indirect routes)	16000	16000	16000
Total number of IPv4 host routes (direct routes and ARP)	16000	16000	16000
Total number of IPv6 routes (indirect routes)	4094	14000	4094
Total number of IPv6 host routes (direct routes and NDP)	4000	35000	4000
Total number of IPv4 multicast routes	4000	16000	4000
Total number of IPv6 multicast routes	2000	8000	2000
QoS ACL scale	2500	4500	2500
Security ACL scale	2500	4500	2500
VLAN IDs	4000	4000	4000
STP virtual ports (port* VLANs) for MST	64	64	64
Total switched virtual interfaces (SVIs)	4094	4094	4094
Jumbo frame	9216 bytes	9216 bytes	9216 bytes

Platform benefits

Table 5 lists the software spotlights for the FS S5860 series switches.

Table 5. Software spotlights

Functionality	Description
For Wi-Fi 6 wireless APs (Only for S5860-24XB-U switch)	Support 100M/1000M/2.5G/5G/10GBase-T adaptive Ethernet ports All RJ45 ports support IEEE 802.3bt 90W PoE
Virtual stacking for simplified management	Up to 2 units stacking Simplified network management Fault recovery within milliseconds All 10G/25G/40G ports support stacking
Sound security protection policies	Detected by professional vulnerability scanning tool (Nessus) Support hardware-based IPv6 ACLs Support hardware CPU protection mechanism Support DHCP snooping Support the secure shell (SSH) and SNMPv3 Support network foundation protection policy (NFPP)
High reliability	Support the spanning tree protocols (STPs) Support virtual router redundancy protocol (VRRP) Support rapid link detection protocol (RLDP) Support rapid Ethernet uplink protection protocol (REUP) Support bidirectional forwarding detection (BFD) Support Ethernet Ring Protection Switching (ERPS)
Perfect compatibility performance	Support IEEE802.3 standard protocols, enabling good interoperability with other brands of equipment at the forwarding level Compatible with standard protocols such as MSTP/OSPF/RIP/BGP/VRRP/SNMP/IS-IS/DHCP/NTP of other equipment
Easy network maintenance	Support SNMP (managed by Zabbix), RMON, log and configuration backup Support Syslog, Web-based management, Telnet, SSH, Openflow, Netconf CLI style is similar to Cisco, easy to learn
IPv4/IPv6 dual-stack multi-layer switching	Support line-rate IPv4/IPv6 dual-stack multi-layer switching Support RIP, OSPFv2, IS-ISv4, BGP4, static routing, RIPv4, OSPFv3, ISISv6, and BGP4+ Support IPv6 addressing, ICMPv6, path MTU discovery
QoS	Support classifying and controlling various flows Support 802.1p, IP ToS, traffic filtering, SP, WRR Support flow bandwidth control, forwarding priority, and other flow policies
Strong multi-service support capability	Support the IPv4 and IPv6 multicast functions Support IGMP snooping, IGMP, MLD, PIM, MSDP Support IGMP source port and source IP check function
Energy efficiency	Hardware architecture to reduce energy consumption and noise Variable-speed axial fans to intelligently control the fan speed

Software requirements

The FS S5860 Series Switches run on FS OS Software version.

Table 6 lists the latest software requirements for the switch models.

Table 6. Latest software requirements

FS P/N	Description	Latest software requirements
S5860-20SQ	S5860-20SQ, 24-Port Ethernet L3 Switch, 20 x 10Gb SFP+, with 4 x 25Gb SFP28 and 2 x 40Gb QSFP+, Support Stacking, Broadcom Chip	FSOS 12.4_B0101P1S6 Software
S5860-48SC	S5860-48SC, 48-Port Ethernet L3 Switch, 48 x 10Gb SFP+, with 8 x 100Gb QSFP28, Support Stacking, Broadcom Chip	FSOS 11.0_B13S4 Software
S5860-24XB-U	S5860-24XB-U, 24-Port Ethernet L3 PoE++ Switch, 24 x 10GBASE-T/Multi-Gigabit, 4 x 10Gb SFP+, with 4 x 25Gb SFP28, Support Stacking, Broadcom Chip	FSOS 12.4_B0101P1S6 Software

Product specifications

Table 7 shows the product specifications for the FS S5860 series switches.

Table 7. Product specifications

Description	S5860-20SQ	S5860-48SC	S5860-24XB-U
Environmental			
Operating temperature	32°F to 122°F (0°C to 50°C)	32°F to 113°F (0°C to 45°C)	32°F to 113°F (0°C to 45°C)
Storage temperature	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)	-40°F to 158°F (-40°C to 70°C)
Operating humidity	10% to 90% (Non-condensing)	10% to 90% (Non-condensing)	10% to 90% (Non-condensing)
Storage humidity	5% to 95% (Non-condensing)	5% to 95% (Non-condensing)	5% to 95% (Non-condensing)
Temperature alarm	Supported	Supported	Supported
Acoustic noise	<78dB	<78dB	<78dB
Physical specifications			
Dimensions (HxWxD)	1.72"x17.32"x12.99" (43.6x440x330mm)	1.73"x17.4"x15.24" (44x442x387mm)	1.74"x17.32"x17.81" (44.1x440x452.5mm)
Rack units (RU)	1 RU	1 RU	1 RU
Weight	10.14 lbs (4.6kg)	10.14 lbs (4.6kg)	21.6 lbs (9.8kg)

Description	S5860-20SQ	S5860-48SC	S5860-24XB-U
Distance	-	-	100M

Electrical

Voltage (auto ranging)	100-240VAC	100-240VAC	100-240VAC
Frequency	50-60Hz	50-60Hz	50-60Hz
Current	3A Max	3.6A Max	3A Max
Power rating (maximum consumption)	85W	550W	515W (single-power); 1030W (dual-power)

Mean-time between failures

MTBF (hours)	>366000	>300000	>233000
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Connectors

Connectors and cabling	<ul style="list-style-type: none"> 1/10GBASE-T ports: RJ-45 connectors, 4-pair Cat5E/Cat6/Cat6a UTP cabling SFP transceivers: LC fiber connectors (single-mode or multimode fiber) SFP+ transceivers: LC fiber connectors (single-mode or multimode fiber) SFP28 transceivers: LC fiber connectors (single-mode or multimode fiber) QSFP+ transceivers: MPO and LC fiber connectors (single-mode or multimode fiber) QSFP28 transceivers: MPO and LC fiber connectors (single-mode or multimode fiber) FS StackWise stacking ports: copper-based FS StackWise cabling Ethernet management port: RJ-45 connectors, 4-pair Cat5 UTP cabling Management console port: RJ-45-to-DB9 cable for PC connections
Power connectors	<ul style="list-style-type: none"> Customers can provide power to a switch by using the internal power at the back of the switch Internal power supply connector: The internal power supply is an auto-ranging unit. It supports input voltages between 100 (115 for 1100WAC) and 240 VAC. Use the supplied AC power cord to connect the AC power connector to an AC power outlet

Standards

Standards	802.1s, 802.1w, 802.1x, 802.1ad, 802.1d, 802.1p, 802.1q, RMON, SNMPV1 V2 V3
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Quality certification

At FS, our Quality Commitment lies in all aspects of processes, resources, and methods that enable us to build superior networks for our customers. Through a quality policy focusing on continuous improvement of products and services, we're able to achieve the highest levels of satisfaction for our customers. To that end, every FS employee is accountable for contributing to the value of the products and services we deliver.

Figure 4 shows some of the authoritative certifications obtained by FS S5860 Series Switches.



Figure 4.

Optics supported

For details about the optical modules available, visit:

S5860-20SQ: [Transceivers DACs and AOCs Supported on S5860-20SQ Switch](#)

S5860-48SC: [Transceivers DACs and AOCs Supported on S5860-48SC Switch](#)

S5860-24XB-U: [Transceivers DACs and AOCs Supported on S5860-24XB-U Switch](#)

Warranty, service and support

FS S5860 Series Switches enjoy 5 years limited warranty against defects in materials or workmanship. For more information for FS Returns & Refunds policy, visit <https://www.fs.com/policies/warranty.html> or https://www.fs.com/policies/day_return_policy.html

FS provides a personal account manager, free professional technical support, and 24/7 live customer service to each customer.[support.html](#)

- Professional Lab: Test each product with the latest and advanced networking equipment.
- Free Technical Support: Provide free & tailored solutions and services for your businesses.
- 80% Same-day Shipping: Immediate shipping for in-stock items.
- Fast Response: Direct and immediate assistance from an expert.

For more information, visit https://www.fs.com/service/fs_support.html

Ordering information

Table 8 provides the ordering information for S5860 series switches.

Table 8. Ordering information

FS P/N	Product description
Switch hardware	
S5860-20SQ	S5860-20SQ, 24-Port Ethernet L3 Fully Managed Pro Switch, 20 x 10Gb SFP+, with 4 x 25Gb SFP28 and 2 x 40Gb QSFP+, Support Stacking, Broadcom Chip
S5860-24XB-U	S5860-24XB-U, 24-Port Ethernet L3 Fully Managed Pro PoE++ Switch, 24 x 10GBASE-T/Multi-Gigabit, 4 x 10Gb SFP+, with 4 x 25Gb SFP28, Support Stacking, Broadcom Chip
S5860-48SC	S5860-48SC, 48-Port Ethernet L3 Fully Managed Pro Switch, 48 x 10Gb SFP+, with 8 x 100Gb QSFP28, Support Stacking, Broadcom Chip

Additional information

For more information about the S5860 Series Switches, contact your account manager or visit https://www.fs.com/search_result?keyword=S5860

Document history

New or revised topic	Described in	Date
Updates to FS S5860 Series Switches Data Sheet	FSOS 11.0(5)B13S4 Software of S5860-48SC supports ERPS	11/1/2022
Updates to FS S5860 Series Switches Data Sheet	Updated all	8/15/2022



Shenzhen (China)

Address: 24F, Yingfeng Center, Haitian 2nd Rd,
Nanshan District, Shenzhen
Tel: +86 (755) 8357 1351
Email: sales@feisu.com

Delaware (United States)

Address: 380 Centerpoint Blvd, New Castle,
DE 19720, United States
Tel: +1 (888) 468 7419
Email: us@fs.com

Munich (Germany)

Address: NOVA Gewerbepark Building 7, Am
Gfild 7,85375 Neufahrn bei Munich, Germany
Tel: +49 (0) 8165 4099 260
Email: de@fs.com

Singapore

Address: 30A Kallang Pl, #11-10/11/12 Singapore
339213
Tel: +65 6443 7951
Email: sg@fs.com

Wuhan (China)

Address: 9-14F, Optical Valley Software Park
A7, Guanshan Ave, Wuhan
Tel: +86 (027) 8808 9195
Email: sales@feisu.com

Birmingham (United Kingdom)


Address: Regus Edmund House, 12-22 Newhall
Street, Birmingham, B3 3AS
Tel: +49 (0) 8165 4099 260
Email: uk@fs.com

Melbourne (Australia)

Address: 57-59 Edison Rd, Dandenong South,
VIC 3175, Australia
Tel: +61 3 9693 3488
Email: au@fs.com

Tokyo (Japan)

Address: JS Progress Building, 4-1-23 Heiwajima,
Ota-ku, Tokyo 143-0006
Tel: 03-5826-8305
Email: jp@fs.com



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