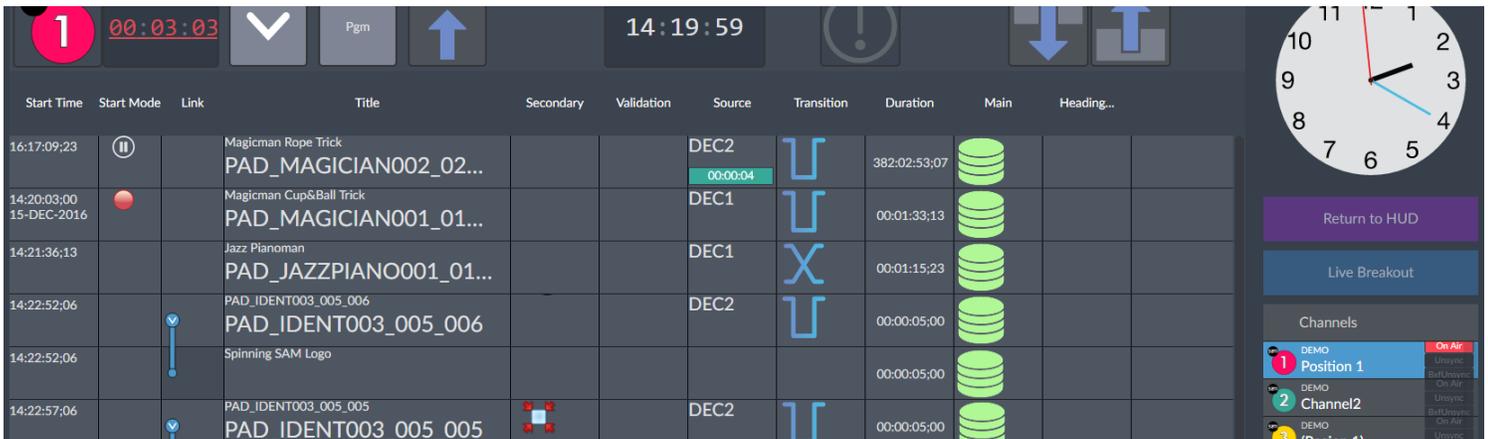


Morpheus Automation

Scalable Playout Automation for Multichannel and Multiscreen Environments



Morpheus Automation is capable of scaling from small, single-channel systems up to very large systems, but always with the greatest reliability. Its scalability is a result of a modular architecture that allows you to build the perfect system based on the services and components you need for your playout operation. Varied modes of redundancy allow any price point and functionality requirement to be met.

The following categories are available on a Morpheus system:

User Interfaces

Easy-to-use interfaces to provide your operators access to complex functions.

Plug-ins

Optional ways to enhance the functionality of your Morpheus system.

External Messaging

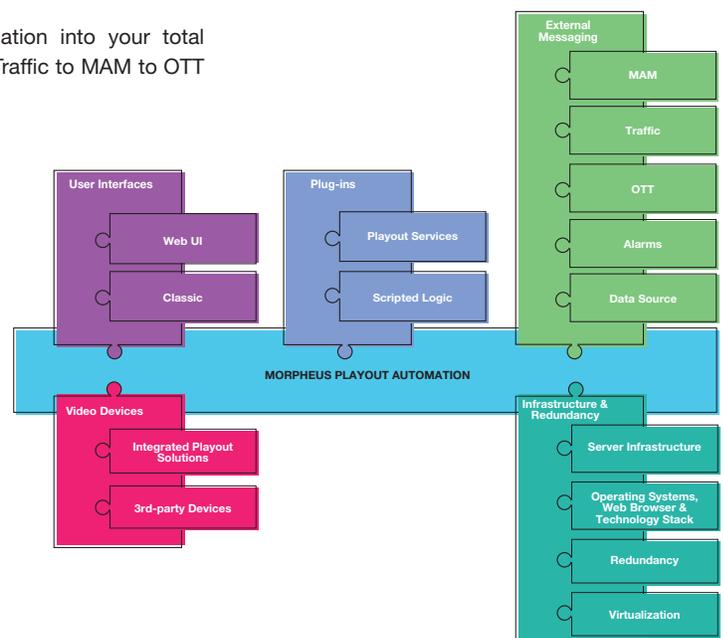
Integrate your playout automation into your total business infrastructure. From Traffic to MAM to OTT delivery, and much more.

Video Devices

The devices controlled by automation that create and modify your video streams to create what your viewers want to see.

Infrastructure & Redundancy

Various levels of resiliency are described to ensure you get the most reliable system for the best value.



KEY FEATURES

- 99.999% reliability
- Uniquely flexible
- Lowers cost of ownership
- The unique MediaBall technology goes far beyond the secondary event structures and macros of other systems
- The ability to easily adapt to changing on-air requirements through the life of the system, lowering the total cost of ownership
- Playlists can be intelligent, with business logic embedded in the event structures. This reduces the demands on scheduling, operators, and reduces on-air errors

Morpheus Channel Types

Master Channel	Standard channel type	Used for most channels
Opt-out Channel	Follows a master channel	Allows platform and regional content variations
Timelink	Links 2 or more master channels at selected points through the playlists	Allows any playlist to become master to the others and drive all simultaneously
Shadow Channel	Time delayed video stream channel mapped to a playlist	Allows individual events to be swapped out at the delay replay time
Rejoin Channel	Join in progress	Supports live events overrunning for US operations

Live Operational Functions

Morpheus excels at live responsive operations. A wide variety of tools assist the operator to control the playout. Most control buttons can be used via classic software interfaces, Morpheus UX web interface or physical hardware buttons.

Take next

- Advanced the playlist to the next event

Hold

- Make the next event a manual start, either manually or as a scheduled trigger

Extend the end time or the duration of the PGM event

- Can be done manually in the playlist or via metadata update from the MAM

Studio control

- Provide distributed control to operational rooms or studios for limited time periods

Commercial hotlist

- Modify the commercial breaks of multiple related channels simultaneously when timing on sports events changes

Gang take

- Link multiple channels together and roll simultaneously

Graphics shotbox

- Use Morpheus UX via the web to trigger secondary events to air

Advanced graphics live sports

- Update and preview sports graphics on ICE before pushing to air manually

Morpheus Event Structures

More advanced event structures can be designed if they are needed to assist a channel's presentation. This will typically be done to add additional business logic if the Traffic system is not able to provide it. Another application would be to harvest data from the live playlist and use those live values to update other events elsewhere.

For example:

Automated branding

- Harvests data from the future playlist to update the graphics menu events and automatically change if there are playlist revisions

Parameter linking

- Allows values set in any event's parameter to be set in another related event
- Useful to populate a secondary event where the traffic system is unable to schedule it correctly

Manual graphics event update

- Modify the dynamic text fields of the graphics device directly from the playlist

Multipart program

- Link together the notional times of each program part so that any under- or overruns of the live event are automatically applied to the subsequent parts
- Useful to keep the overall schedule timings on track

Break headers

- Allows the contents of a break to be grouped together so they can be viewed as a single event line or expanded. Makes it simple to display total break durations
- Makes applying a single secondary event to the entire break very easy and ensures any secondary event's timings automatically adjust to match the updated break duration

Opt-out headers

- An extension to the break header construction that works across breaks in different channels, allowing an easy comprehension of timing differences between related channels

Schedule Information Object (SIO)

- Groups multiple program parts and the breaks between them as a single entity so that they can be processed as a single item. This is useful to allow BFX updates to those SIOs or to apply MediaBall events across the entire SIO



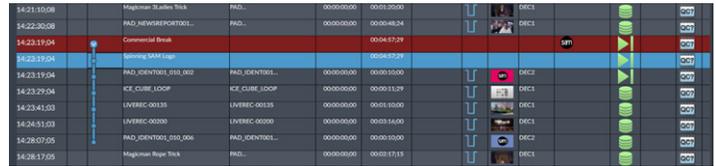
A graphics event with titles and times automatically pulled from the future playlist.

MediaBalls

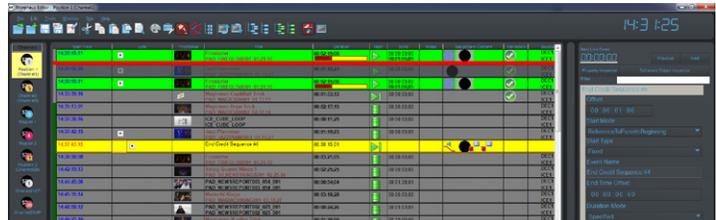
Morpheus has unparalleled support for complex event structures for secondary events. Each secondary event can be scheduled plus or minus any amount offset from its parent (Main) event. Each secondary event may itself have as many secondaries as desired and this can continue for as many layers as necessary.

This complex set of events can be saved as a single item that is known as a MediaBall. This makes it simple for a traffic system to schedule a complex end credits sequence by just referencing the MediaBall name.

Morpheus supports unlimited MediaBall events on each main event.



Expanded break header showing total break duration in Morpheus UX.

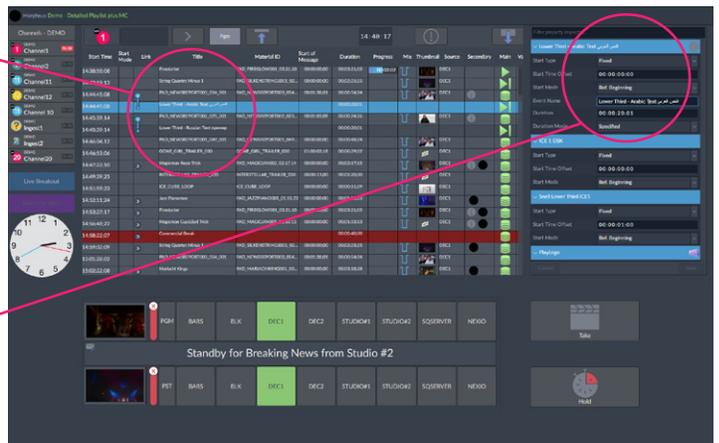
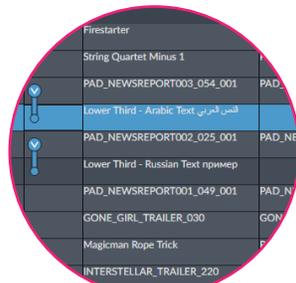


A single MediaBall that has been expanded to show its internal events.

Language Support

International characters sets are supported in Morpheus using Unicode is supported in the following aspects of Morpheus:

- Morpheus Event parameters
- Morpheus metadata
- User-defined labels in Morpheus UX
- Setting text in graphics devices from the playlist



User Interfaces

Morpheus supports a range of user interfaces (UIs). Both classic, installed applications and Morpheus UX — part of Grass Valley’s UX platform, our completely configurable HTML5 web platform. The range of functionality is comprehensive, and each application can be extensively modified to adapt to your operational style. Please discuss with Grass Valley if you require something in addition to the functions described here:

All Morpheus interfaces allow interaction with the live running playlist and making last moment revisions. These interfaces include both standard interfaces and web interfaces.

Morpheus UX

Morpheus is the first product line to adopt Grass Valley’s new UX platform with Morpheus UX. This provides entirely customizable screens by breaking apart previously fixed screen layouts into small widgets that can be rebuilt to any size, shape or quantity. This allows customers to build UIs that are completely tailored to their operations with the powerful web editing tool.

Please go to the Grass Valley website for additional documentation.

Morpheus UX’s available options include:

List views

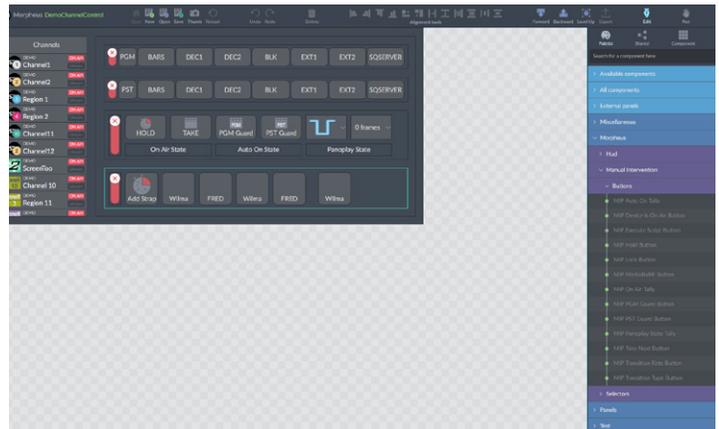
- Toolbar buttons – for list navigation, status
- Widgets – for column fields and status
- RuleSets – to define UI behaviors

Control panels

- Buttons – x15 control types and tallies

Examples (A small selection of the toolbars, widgets and buttons includes:)

- Channel selector
- Status report
- Alarms
- Clock
- Countdowns
- Manual intervention panels
- Message banners
- Navigation
- Property setting
- RuleSets – colors, UI responses
- System heartbeat



Edit mode, showing some options on the right hand side.

Morpheus UX Screen Types

The options above allow you to build any kind of screen, including, but not limited to the list below:

- Multichannel views (with or without playlist controls)
- Single channel views
- Master control switcher panels
- Secondary event Shotbox panels
- Supervisor summary views
- Engineering error views

All the above might be enhanced with playlist controls buttons, countdowns, event status summaries, channel selection buttons, etc.

Panels can show status and other functions from multiple channels and can aggregate status and control from multiple playout automation systems.

Each function has flexibility. For example a countdown could be used in the following ways:

- Countdown to the end of the PGM event
- Countdown to the 1st (or 2nd, or 3rd ...) live event
- Countdown to the commercial break
- Countdown to the graphics event
- Regular expressions can be added to the above to further refine them, for example:
Countdown to the graphics event which has the text 'Lower Third'.



Morpheus Classic User Interface

Morpheus Classic user interfaces are installed applications and provide comprehensive playlist control and monitoring.

A range of applications are available to meet differing requirements.

Edit workstation

Supports:

- Multichannel control from single screen
- Role-based display for different users, or groups of users, with colors, columns, fonts, all customizable
- Media thumbnails
- Media proxies for review

Playlist revisions:

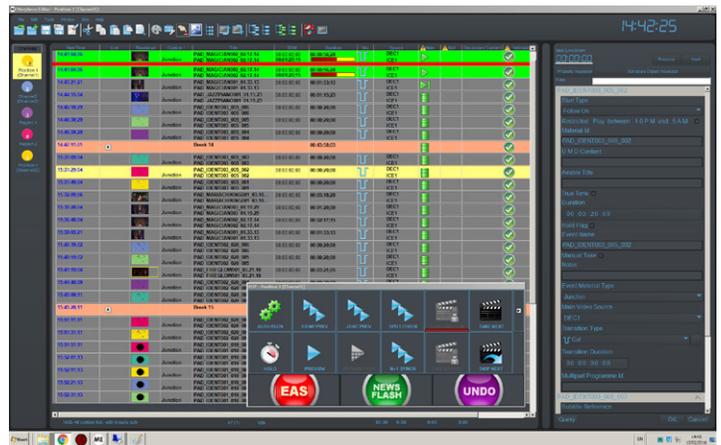
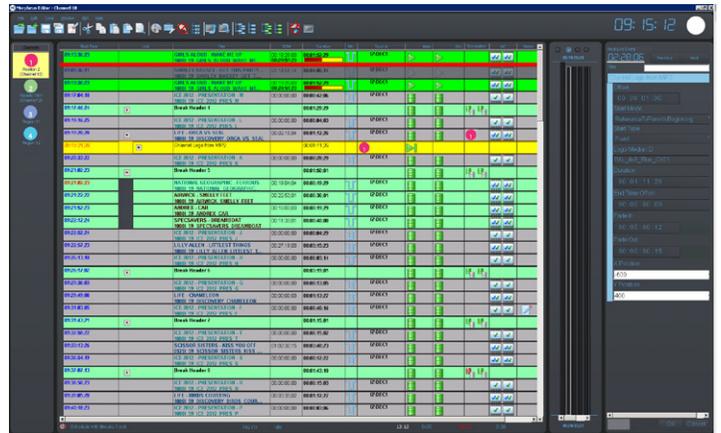
- Media search. Drag-and-drop from search palette to playlist for instant playlist updates
- Cut, copy, paste, drag within the playlist
- Cut, paste between channels, or between online and offline views

Event customization

Unlimited event parameters can be added and displayed to users, but may also be hidden and re-ordered to create user-friendly operations. The values for these parameters may be provided by Traffic, created as defaults by Morpheus, or manually entered by Morpheus operators. Parameters may be defined as read/write or read only, visible or invisible.

Ease migration

The flexible nature of the UI customization makes it easy to build familiar operational environments for operators moving from a legacy system.



Status indications

A short selection of available options includes:

- **Device status** – e.g., video server, graphics device, etc.
- **Material status** – includes database entry and media transfer status
- **Validation** – confirms status of media on the scheduled device – can cover some advanced details such as whether the scheduled inpoint is valid for that file, or whether the audio or subtitle/closed caption file has the correct language available
- Underrun/overrun timing information where a fixed event has been scheduled

Multitenant operations

Control multiple channels in the same system. Group them and restrict access and content sharing to specified channels. Similarly, prevent content from playing out if it has not been QCed.

Have a shared preview channel where all content can be previewed, and separate ownership on main playout channels.

Time display

Give each channel its own local time display. Useful for east/west coast or international systems where core systems, operators and consumers may be geographically separated across multiple timezones.

Additionally, Morpheus UX allows multiple timeclocks to be displayed, allowing both central network time and regional times to be shown.

Other Classic UIs

Palette

Media search for content in the database. Easily drag and drop content into the correct position in the playlist. This can be done very close to air for very last moment playlist changes.

- Search, filter, re-order to refine search results
- Create priority hotlists of standby material
- Add user-defined tabs for secondary events and MediaBalls to add to a playlist

Offline edit workstation

Allows playlists to be revised or created before being loaded into the live online system

Supports copy/paste between offline and online.

Timeplane

Multichannel timeline view of one or more channels. Includes scaling of timelines to different timeline zoom levels and the ability to highlight when an error event is too small to see at the selected zoom level.

HUD

Simplified view of a channel, typically used in live gallery operations for countdowns and secondary voiceover or graphics insertion.

Commercial hotlist

A huge benefit to multichannel live sports or news operations, commercial hotlist allows a single operator to modify the commercial breaks across multiple channels from a single UI. Typically used when an unexpected break needs to go to air at short notice. Each channel will get its own separate break inserted from that single command.

Supports:

- Insert breaks to preset position on all channels
- Take selected breaks to air now
- Abort on-air breaks and return to program

Standby content in the commercial hotlist can be delivered by traffic, or updated manually by the operator at any time using drag and drop from the palette search tool. Once a break has been added to the playlist, its content can still be modified until the moment before the event goes to air.

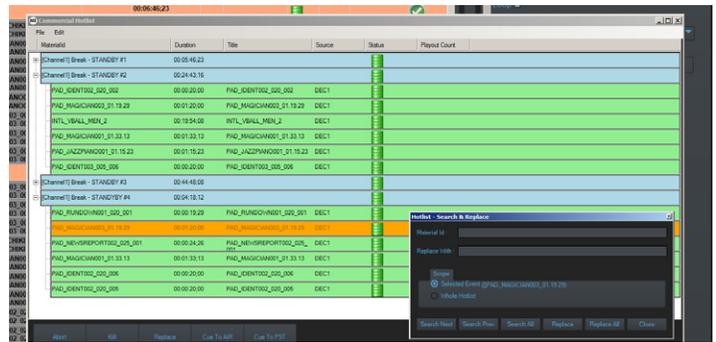
Join-in-progress/deadroll

Frequently used in master control operations in the USA, JIP allows originally scheduled events to continue to countdown even though an over-running live event is still on air. At the end of the live event, the schedule returns to the originally scheduled content as though it had been airing as originally intended. Three modes of JIP operation are available to ensure it can exactly match a preferred way of working. The mode can be selected while the JIP is in progress and definable bumpers can be inserted prior to returning to the programming.

Hourly summary/commercial minutage

Show and print summary of selected material for each scheduled hour. Displayed in both percentage and absolute duration as a separate report.

Additionally, various counters are shown within the main UI to provide an understanding of the current state at a glance.



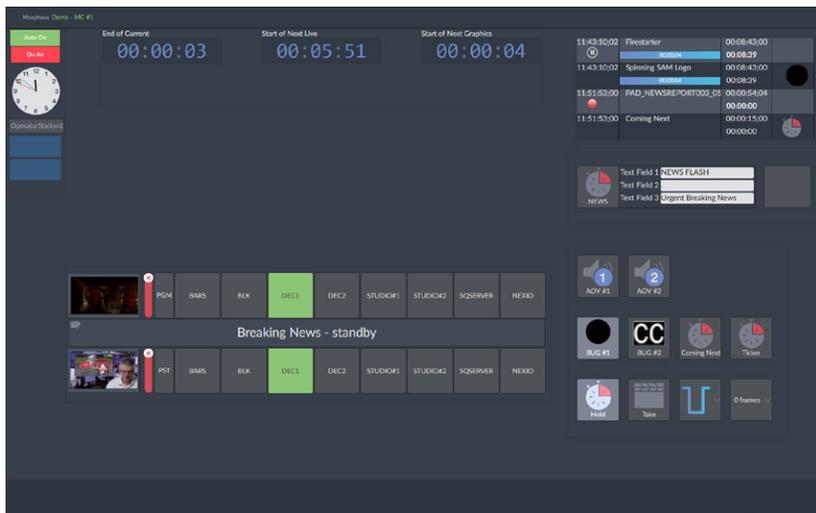
Commercial hotlist view.

Missing material report

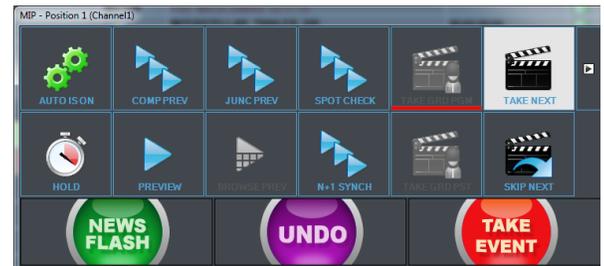
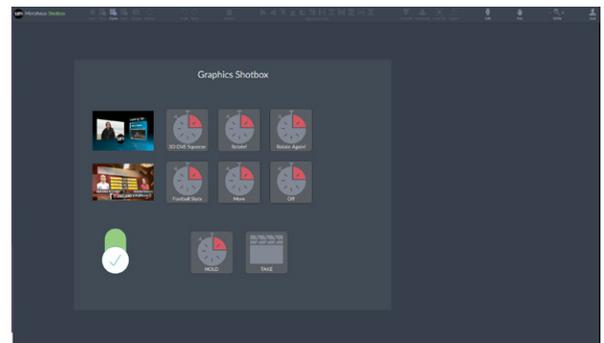
Display, print, export to CSV missing material for one or more selected channels.

Control surfaces

A range of software and hardware panels are supported and these can be linked together so they switch to control the same channel of interest at any moment.



Morpheus UX master control screen.



Classic UI manual intervention panel (MIP).

Playout Services

Morpheus's flexible architecture allows various services or scripts to be applied so that the standard playout automation behaviors can be enhanced.

Standard Playout Services

All services are optional and may not be necessary in your particular system, however the following list of services tends to be deployed in most systems as standard.

Asrun services

Export asruns as either XML files or store in the asrun database for later export. See also Schedule and Asrun Converter to deliver in your preferred format.

Database & material decoration services

Takes selected media database metadata and populates playlist events, allowing values to be dynamically updated and to be more current than those sent by the traffic system via a flat file. (For Traffic interfacing, see BXF)

Live record service

Populates the media database with values set by a record secondary event in the playlist.

Locks decorator service

Prevents playlist events from being deleted by the rules defined in the media management system.

Transfer decorator service

Ensures that any missing content is reported to the media management system and automatically requests its transfer.

Validation service

Ensures the status of the scheduled content is displayed to the operator for the entire list. Can be used on both primary video content and secondary events. Supports more advanced status such as the language in the audio or subtitle file.

Advanced Playout Services

These services are more specific to particular styles of operation, or related to certain purchased options.

Please contact us if there's a service you require that is not listed. Grass Valley regularly adds new functionality and we'd be happy to discuss your requirements.

Alarms service

Emails or event insertion, based on rules.

Separate system alarms are also available for display in the UI and cover alerts for disabled channels, timecode or reference failures and device failures. Alerts can be written as free text in any language.

After Burner service

Adobe After Effects offline rendering of on air graphics. Refer to the separate After Burner datasheet.

BXF services

Several services are available to provide BXF standard data exchange with external BXF systems. Supports:

- Playlist import – includes safety margin to prevent close to air changes
- Asrun export
- Metadata exchange with MAM systems
- Transfer notifications to MAM systems

Data exchange can be done using XML file drop, socket or SOAP.

Grass Valley's BXF implementation adheres to the BXF standards. Some mapping of values may be possible where the external system has implemented a nonstandard form of BXF.

Commercial minutage protection service

Ensures any overrun of commercial minutage rules is explicitly dealt with by automatically revising events in the playlist and so avoiding legal penalties.

Delay shadow channel service

Allows a time delayed server output from a Morpheus channel output to be mapped against a real playlist with offset playlist times. This allows events within the recorded stream to be swapped out and played live where alternate content is required, perhaps due to commercial rights restrictions or technical errors at the original play time.

Device manager service

Allows Morpheus to select alternate playout devices from a specified group. Used to automatically handle failure, or to automatically allocate certain devices to certain channels.

Evergreen provider service

Puts backup material to air from a predefined list of standby material when material is missing in the playlist.

MediaBall insertion service

Automatically inserts MediaBalls against specified events using simple rules.

Missing material service

Inserts alternate content when scheduled items are not present.

N+1 service

Ensures content needed on the backup channel is automatically transferred to the related playout device in advance, to ensure it has all the content it requires in the event of a failure.

Schedule appender service

Automatically appends schedules. See also BXF.

Schedule export service

Automatically exports the current running playlist at a regular interval. See also BXF.

Loop events service

Allows specified sequence of events to loop continuously until a fixed event is reached.

Second screen service

Used in many situations where a parallel system needs current playlist data. Typical uses include OTT encoders, and other content replacement devices that switch out content or add complementary content to specific parts of the video stream.

Scripted Logic

Morpheus supports a scripting mechanism that allows more customized logical functions to be provided without needing to modify the core code or make customer-specific builds of the playout automation software. This allows Grass Valley to be responsive to customer needs while maintaining the optimal performance of Morpheus. The objective of a script is often to perform multiple functions simultaneously so that operations are simplified for users.

If you have something specific you would like to automate to take pressure off operations and ensure complex functions are always reliably handled, please contact us.

Scripts are typically mapped to hardware panel buttons or to soft buttons in the Classic UI or Morpheus UX web UI.

A small selection of example scripts used by a selection of customers today.

- Newsflash – insert new studio event into playlist by breaking on-air event. Return to that timecode of the original event after the newsflash so viewers don't miss anything
- Abort specific secondary events if they are on-air now
- Create a specific comment event when a certain alarm is triggered
- Create immediate router crosspoints to cover failure of specific device
- EAS alert behavior – for more advanced macro functions when the trigger is received
- Disable any missing events within a specified time window so they are skipped
- Various behaviors related to ganging specified channels together to act as one
- Move specified events between different channel lists
- Replace current schedule with an emergency schedule
- Undo take next – return to live program and restore the break that was rolled back into the schedule
- Time-restricted access to playlist control – for providing limited access to the live event for remote or gallery operations

External Messaging Components

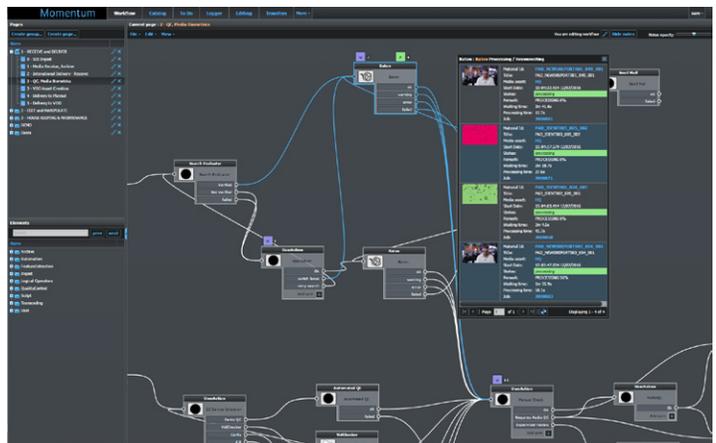
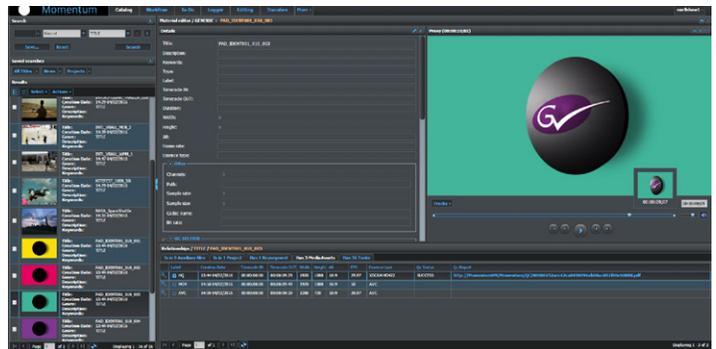
It is essential that any enterprise-grade system should be able to integrate with a wide range of external systems that make up the broadcaster's complete business infrastructure.

There are many touchpoints across the various business systems a broadcaster has and while many will be using vendor-specific APIs, in many cases standard interfaces such as BXM can be used.

MAM/Workflow Automation

Morpheus's system integration includes both standardized protocols such as BXM, and other, vendor-specific APIs. Where neither approach is appropriate, Grass Valley can provide a selection of alternate protocols and interfaces to complete the workflow.

Where a single integrated solution is required, Grass Valley can provide Momentum as the MAM and workflow layer. If Momentum is not required, Morpheus is provided with its standard level of media management capabilities.



Grass Valley	Momentum
Tedial	Evolution
Vizrt	Ardome
Evertz	Mediator
TMD	Mediaflex
Various	Customer-specific, internally developed systems

Traffic

In many playout deployments, Grass Valley provides a conversion tool that can take any source format and convert to Morpheus format, and then reverse this for asruns so they can be reconciled after playout.

For any system not listed, please ask. In many cases, the Traffic system will export in a format that is already compatible with Morpheus, or Grass Valley can create a new conversion script to accommodate a new traffic system.

A-Ware	
BOSS	
Broadcast Traffic System (BTS)	
BXF (various)	BXF
Imagine (Harris)	D-Class
Imagine (Encoda)	BIAS
MediaGeniX	What'sOn
Myers	ProTrack
SintecMedia (Pilat)	IBMS / Media Machine
Provys	TVoffice
PTS	Omnibus format
S4M (Solutions for Media)	Native Morpheus XML
TSS	TSS
Wide Orbit	Native Morpheus XML

OTT/Content Switching Systems/Playlist Data Export

Event data synchronization is available in various ways. Often this uses the second screen service (see Services section). Its implementation is agnostic to the end device, and uses standard HTTPS messaging. It has been successfully deployed with the following systems:

Grass Valley	Media Biometrics	ScheduleMatch for schedule-aware monitoring of playout
Elemental	Elemental Live	Rights-restricted content switching in OTT linear delivery (direct real-time control)
Cisco	SCP	Cisco SCP – viewer-specific content switching for Sky Ad-Smart
Yospace	ESAM	Broadcaster's client-side ad insertion for OTT linear delivery

Further OTT control options include insertion of SCTE 104 events into VANC, and direct real-time control of the OTT encoder as though it is a traditional video server (Elemental Live).

For architecture options, please refer to the ICE Multiscreen Delivery application note.

Alarms

Morpheus provides alarms within its user interfaces to highlight problems to the operator in the playout environment. Additional external alerting is also available:

Hardware SNMP

Disks, fans, etc. for Morpheus and ICE servers.

Email alerts

Trigger an email based on a Morpheus/ICE system error.

Event Insertion

Trigger an event to be added to the playlist based on a Morpheus/ICE system error — this function includes controlling external devices.

File Export

Trigger a text file to be exported based on a Morpheus/ICE system error — to be picked up by external monitoring system.

The last three options above can also be triggered based on rules such as when a live event is with a defined period close to air, or if it is deleted from the playlist.

Extended Alarms/Control & Monitoring

Extend the intelligence of alarms and monitoring of your playout system by adding integration with Grass Valley's control and monitoring and Media Biometrics technology.

Grass Valley's control and monitoring may be set up to use its own logic to make downstream switches, for example. But this can still be fed back into Morpheus so that asrun data is consistent and any later analysis can easily understand when the downstream switch was carried out.

It can also receive playlist data and countdowns from Morpheus and display this on the multiviewer.

Media Biometrics signatures can be created by the playout system and they can be monitored at multiple points downstream of playout to automatically identify problems in the output streams. This feature is especially useful for automated exception-based monitoring in larger scale systems.

External Live Data Sources

Live metadata updates from external systems are possible via BXF or Grass Valley interfaces.

Where data is being fed into a graphics device, live RSS tickers for example, this would typically be fed directly to the graphics device, but triggered using a Morpheus event.

Further details of Grass Valley's graphics solutions for ICE can be found in the separate Advanced Graphics datasheet.

Please talk to Grass Valley if your requirement includes control of playout functions via a REST API.

Device Controllers & Integration

Morpheus can control dozens of third-party devices, as well as fully integrated IT playout solutions such as ICE. Hybrid solutions are often deployed where some channels are on third-party devices, and some on ICE. This allows playout operations to migrate at a speed that suits the broadcaster.

All third-party devices require a separate controller (refer to Third-party Control section), with the exception of Grass Valley's ICE channel-in-a-box, or sQ servers, which are more tightly integrated at a lower level to Morpheus.

ICE Integrated Playout Solutions

Grass Valley's ICE channel-in-a-box is widely regarded as the most capable integrated playout solution on the market that meets or exceeds the capabilities of all the third-party devices that it replaces.

ICE is available in various forms.

Please refer to the separate ICE datasheet for full details.

ICE	SDI
ICE SDC	IP streams

Video Servers

Grass Valley	K2, ICE, sQ
Grass Valley (legacy)	Profile, K2 Edge (Publitratics)
360 Systems	TSS
Apella	HDS
Aprisa	VCS
Avid/Pinnacle	MSS
DVS	Venice
EVS	XT2
EditShare	Geevs
Imagine	Nexio
Harmonic	Spectrum, Mediadeck, ChannelPort
Ross	SoftMetal
Seachange	Seachange
Sony	MAV 70

Audio Devices

Dalet	
Starfish	Transcast
Dolby	DP569 encoder

Routers

Many routers support multiple protocols, including Grass Valley's. However there are many subtle variations, so please contact Grass Valley with your detailed requirements so we can confirm.

Grass Valley	General Switcher – SW-P-02
Grass Valley	General Remote – SW-P-08
Grass Valley	RCL
Grass Valley (Miranda, NVISION legacy)	NP0016/17
Imagine (Harris, Leitch legacy)	Pass-through Protocol
Utah Scientific	RCP-1
Evertz	RCP-T01 (Quartz) ES Switch Ten XL Geneos ASCII

Graphics

Some manufacturers have chosen to implement ChyronHego Intelligent Interface (CII), however differences in implementation means specific functionality should be double-checked to confirm it is available in the device you are selecting.

If considering an integrated solution, please consider the Advanced Graphics option for ICE for high-quality templated graphics.

Please refer to the separate Advanced Graphics datasheet for ICE to read more, or ask Grass Valley for demo videos.

Grass Valley	Imagstore, Intuition, IQ graphics cards, LGK-3901, Vertigo
RTSoftware	tOG (independent device, or integrated within ICE)
Avid/Pinnacle	Deko
Avid (Orad)	3D Play
ChyronHego	Hyper X, Lyric, Channel Box, Device II
Gee	Inca RTX
Imagine (Harris)	Logomotion, Insciber, Iconstation
PixelPower	Clarity, Logovision
Vizrt	Pilot

Master Control Mixer/Switchers

Grass Valley's ICE offers master control functionality and can be controlled via flexible software panels from the Morpheus UX platform. A hardware panel is also available.

Most master control systems have chosen to implement either Grass Valley's SW-P-32 or the M2100 protocol.

However there are subtle variations in implementation so please confirm the functionality you require is supported for your preferred system.

Grass Valley	ICE, Imagstore, Maestro, NVISION, Presmaster (Miranda legacy), Saturn (Philips legacy)
Evertz / Quartz	EMC / QMC
Imagine (Harris)	IconMaster
PixelPower	Brandmaster
Pro-Bel	Masterpiece, TX Series
Ross	MC-1

Closed Caption / Subtitles

For an integrated solution, Grass Valley's ICE can provide a wide range of closed captioning and subtitling functionality, both file insertion, pass through and live. Refer to the ICE datasheet for more detail.

Grass Valley	ICE
Grass Valley (Softel legacy)	SwiftTX
Cavena	STC
FAB	Subtitler
Screen Subtitles	Polistream

Data Inserters & EPG Devices & SCTE 104 Insertion*

Data inserter is a wide ranging section used to insert into video or deliver as interdependent streams various types of ancillary or supplementary data.

See also OTT Services section.

Grass Valley	Densité*, ICE, IQ modular range*
Grass Valley (Softel legacy)	SwiftTX PDC, Cyclone, MediaSphere
Axon	Synapse
Albrecht	
DITG	Interactive
Divitech (Cisco)	EPG inserter
EventIS	EPG
EEG	EN530 (V-chip)
Evertz	HD480 / 490, HD9089
Mediaware	TS splicer
Motorola	DigiCypher
NDS	StreamServer
Ross	TES-8643
TwoWayTV	

EAS

EAS devices can be controlled by Morpheus and ICE for an integrated playout solution that supports US emergency broadcast alerts.

Each EAS unit has different behaviors. Please contact Grass Valley to discuss your exact workflow.

Digital Alert Systems	DASDEC
Trilithic	EASyCAP
Sage	ENDEC

Encoders

Encoders here refer to stream encoding and are not baseband video signal recorders which are covered in the Video Server section.

Imagine (Digital Rapids)	
Elemental	Elemental Live

General

Various UMDs are supported, including:

Grass Valley	Kaleido
Barco	
Evertz	VIPA
TSL protocol	

For a more flexible and configurable solution, Morpheus UX supports a wide range of countdowns within the completely configurable panels and screens.

Morpheus can also report playout event details on an exception basis when devices fail for example and then export, Material IDs, and other event details for display within the Grass Valley multiviewer.

General Control

GPIs – A Morpheus system can supported an unlimited number of 2461 IQ cards, which each support 16 GPIs.

XML Driver – for any system that does not currently have an API but needs to be controlled by Morpheus, Grass Valley can provide a simple light-weight XML-based interface.

Fully documented, it makes it simple to integrate custom created devices into a Morpheus system.

Third-party Device Control

Grass Valley manufactures a hardware controller to support the third-party device drivers. These are housed in a 3 RU Grass Valley IQ frame, which also supports a huge range of other signal processing modules.

Device control cards can support multiple device drivers and control any combination of IP, serial or GPI control on each card.

Each card can be run as a single controller or dual redundant. Where dual controllers are used, tri-state electronics ensure a live card can be removed with no impact to the control of the attached serial devices.

For more detailed information on the quantity of cards supported in the frame and number of cards required for your playout system, please contact Grass Valley. Each driver has a documented complexity score allowing Grass Valley to accurately assess the loading on each card.



Please note that the IQ frame is not required when using ICE, ICE SDC or sQ servers.

If you require a software-only solution, this can be supported in certain circumstances, please contact Grass Valley for details.

Morpheus Archive Support

The Morpheus media management tools support movement of media between different storage locations. Supported video servers were described earlier. Additionally the following archive devices are also supported.

For enhanced workflow solutions please refer to Grass Valley’s Momentum MAM and Workflow automation.

Vizrt	Ardome
EMC/Avalon	
Front Porch Digital	Diva
IBM	Tivoli
Masstech	Masstore
SGL	Flashnet

* SCTE 104 insertion is supported via compatible modular devices or Grass Valley’s ICE channel-in-a-box. ICE also supports a comprehensive range of other ancillary data insertion, including AFDs, WSS, timecode, userbits.

Infrastructure and Redundancy

Morpheus can be scaled in terms of its resiliency and how it makes use of the underlying hardware in several ways. Its redundancy architecture is flexible to meet your desired cost and infrastructure requirements.

Server Infrastructure

Morpheus can be deployed on any suitable generic IT server (COTS — commercial-off-the-shelf). Grass Valley can ship pre-validated servers, or a customer may select their own. Increasingly customers are choosing to deploy Morpheus on hardware under the management of a virtualization hypervisor, and this may include various blade-type architectures.

Morpheus has been proven by customers to run on servers from the following manufacturers:

Dell	Blade, R610, R620, R630, R430
HP	DL360, DL380, others
Cisco UCS	C240, B200 M4
IBM	Various

Where Grass Valley is asked to provide the servers, we supply Dell, which allows Grass Valley to accelerate the commissioning process by deploying prebuilt server images. Speak to us about any other server you'd prefer to use.

For fully integrated virtualized playout, consider using a single commodity IT system to run both Morpheus and ICE SDC under the same hypervisor. Refer to separate ICE SDC documentation for infrastructure requirements and further guidance.

For full details on server specifications, please refer to the separate PC and Server Specification document.

Operating Systems, Web Browser & Technology Stack

Morpheus servers	Windows Server 2012R2
Morpheus desktop workstation	Windows 7, 10
Morpheus UX	Google Chrome

Grass Valley's server installations are based on the following technology stacks:

- Windows Server 2012R2
- .Net v4.5
- On-Time v6.04
- MS SQL 2014

System communication

IP multicast is used to communicate between the different nodes of the system. Please discuss with Grass Valley if you are planning a cloud-based deployment so we can advise on how a system can be built to handle multicast restrictions.

System timing and reference

Morpheus is traditionally provided with station clock and timing using blackburst reference and LTC for station clock. This would be fed into the system via a Grass Valley 2461 IQ card.

Alternatively Morpheus can sync to your PTP Master Clock for system timing.

Browser support

Morpheus UX is built on HTML5. Grass Valley recommends using Google Chrome for Morpheus UX.

Hardware controllers

Where hardware controller cards are required, these run on OnTime, a real-time operating system widely used in the automotive and aerospace industries, and widely deployed across Grass Valley's router range.

These 2461 controller cards are described in the earlier Third-party Device Control section.

Network ports

Grass Valley can provide a list of ports that should be opened across networks on request.

Redundancy

Redundancy options cover all types of failure scenario and options can be selected to match budget and preferred operational modes. Please refer to Grass Valley's separate redundancy documentation for more detail on these options:

Redundancy Name	Description	Technology
Core Eventstore server redundancy	Mirrored for high availability	MS SQL
Morpheus system duplication	Duplicate entire systems and select sets of channels to sync or run synchronized	Grass Valley Panoplay, for channel redundancy Used for multisite sync and disaster recovery
Main/guard	Parallel control of playout servers	Grass Valley device control
N+1 channels	Shared backup playlists	Cost-effective solution for backup in event of channel failure
Missing content replacement	Automated replacement of material close to air time	Definable evergreen content

Virtualization

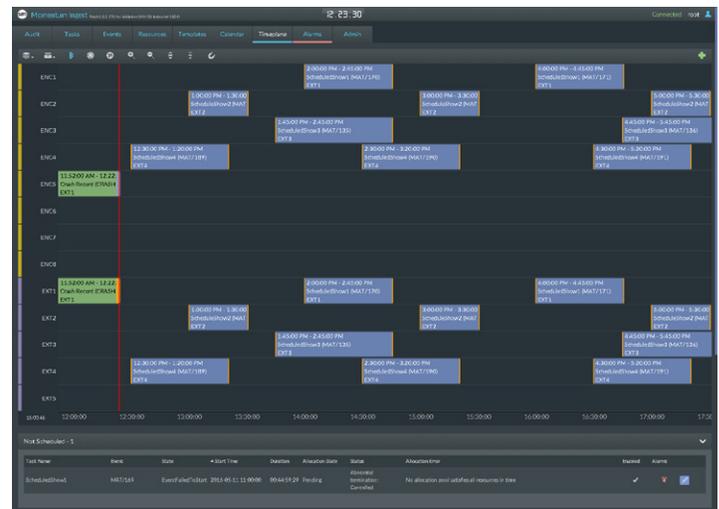
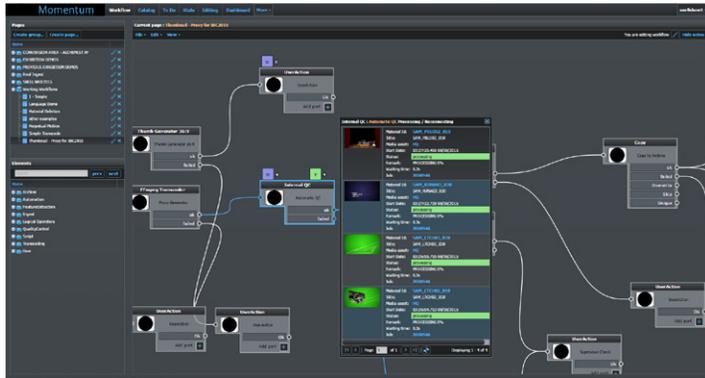
Virtualization is supported by Morpheus and has been successfully deployed by customers for many years. The customer selects the virtualization platform they prefer and ensures it meets the performance requirements of Morpheus as described in the recommended server infrastructure document.

Additional redundancy models may then become available, such as migrating servers using VMWare's VMotion, but are subject to customers testing their precise requirements. Grass Valley would recommend that customers have virtualization experts guide them on the best architecture for their situation.

Ingest & Media Management

Morpheus sits within a comprehensive suite of tools for a complete end-to-end solution from lines ingest through to MAM and workflow automation. This allows Morpheus to provide VOD delivery and automated QC functions. Further details of these products can be found in Momentum Ingest, and Momentum MAM & Workflow documents.

Where content production needs to be added to the system, this can be provided using Grass Valley’s manual and automated editing tools, which are integrated within the common Momentum orchestration layer. Please contact Grass Valley for more details.



Grass Valley — End-to-end Solutions

For an integrated single-vendor solution, consider the following Grass Valley SDI and IP products, which can interface to Morpheus and ICE playout:

ICE/ICE SDC	Channel-in-a-box (SDI/IP)
sQ servers	Ideal for fast turnaround edit requirements
Routers	Sirius, Vega, Pyxis, Halo plus integration with Grass Valley IP routing strategy
Momentum	MAM and workflow automation
Momentum Ingest	Baseband lines ingest
Kahuna/Kula	Production switcher — used under Morpheus control for 4K UHD and other broadcasts
Fusion/RollCall/IQ Modular	All values from the huge range of IQ modular products can be controlled or monitored by Morpheus
Media Biometrics	Tight integration with playout ensures on-air problems are rectified quickly
Multiviewers	Send updated playlist status information into the multiviewer display



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