EVERTZ ACADEMY · TIER 2

Standing Up a MAGNUM-OS System

Course information

Course	Standing Up a MAGNUM-OS System
Code	MAGNUM-ACADEMY-L2 MAGNUM-ACADEMY-L2-ONSITE
Provider	Evertz Academy
Format	Instructor-led lab on real hardware
Focus	Standing up a small ST 2110 system

Description

This course is for engineers who stand up and commission MAGNUM-OS systems. Tier 1 is about supporting an operations team on a running system - this course is about building that system in the first place.

The value of the course: you start with factory-default hardware and finish with a small working ST 2110 system - synced, routable, monitored, and ready to hand to operators. Along the way you'll learn the order to do things in, and the checks that catch problems before a show does.

Each student gets their own primary and backup MAGNUM, a MAGNUM-NMS server, a Scorpion6 HDMI endpoint, a multiviewer display, and a VUE-ANYWHERE portal. The class shares a 5700MSC, a NATX, an IPG, an Arista switch, a DreamCatcher, and two UDX MIO blades. Factory firmware and device addresses are already loaded.

There are three prerequisite courses you must pass first before attending this course: IP Networking, Basics of ST 2110, and Linux CLI.

Learning outcomes

By the end of the course, an engineer standing up a system will be able to:

1. Set up a MAGNUM main and backup pair with a single cluster address, synced to the master clock, and connected to MAGNUM-NMS over MAGNUM-SYNC.
2. Add the switch, processors, and Scorpion endpoints to MAGNUM so they can be routed.
3. Route a source to an LM-CORE and confirm PTP before calling the system ready.
4. Turn a full device list into operator names, a multiviewer, and working tally.
5. Install MAGNUM-NMS and manage the SDPs that receivers rely on.
6. Choose the right architecture for a small system using the design notes.

Topics

Introduction: what you're building

A quick overview of the three products and what you'll have built by the end of the course.

- **The goal.** By the end you'll have a small ST 2110 system that can route, a MAGNUM-NMS server monitoring it, and names an operator can actually use.
- **The three products.** MAGNUM is the control system. MAGNUM-NMS handles alarms and stores device configurations. MAGNUM-ANALYTICS gives you deep visibility into the ST 2110 network. This course sets up MAGNUM and MAGNUM-NMS, not Analytics.

Prepare: setting up the MAGNUM environment

Everything else in the course depends on this. The MAGNUM pair needs to agree on time, share one address, report healthy, and be connected to NMS before you add any devices.

- **Know the lab before you change it.** Learn which virtual machines are yours, which equipment is shared (the grandmaster clock, the switch, and the NATX), and why each physical device can only be owned by one MAGNUM. If two MAGNUMs try to control the same device, they conflict.
- **NTP.** Point MAGNUM at the master clock over NTP. Logs and health data are only useful when both servers agree on the time.
- **Cluster address.** Set the cluster address and confirm both servers are members, with the primary active. Operators, NMS, and every other client connect to the system at this address.
- **Emulated devices.** Add emulated devices on your MAGNUM so every student can build the same system without fighting over the shared hardware.
- **Connecting MAGNUM and NMS.** Enable the NMS API so topology, alarms, and configuration actions show up in SDVN. That way your commissioning work all happens in one place.

Devices: adding the switch and processors

Before you can route anything, MAGNUM needs to know about the network switch and the processors, with links that match the actual fiber.

- **Control API vocabulary.** A quick review of the control APIs and products this section depends on (MCS, gNMI, NBM, and others), using the course glossary.
- **Adding the NATX.** Add the lab switch with the right driver and draw its links.
- **Adding the PREFEX.** One PREFEX chassis gets added to MAGNUM twice: once as a gateway and once as a multiviewer. Learn the step-by-step process of making sure these devices are routing properly.
- **Links that match the optics.** Connect the gateway and the multiviewer to the NATX at the bandwidth of the fiber. Routes can only use links that have been drawn.
- **Control methods.** An overview of the different ways MAGNUM-OS can control an IP network. You'll practice these hands-on in the Scorpion section.
- **The OPS nameset.** Build a starting nameset with playout, bars, and multiviewer outputs in names operators will recognize. The engineering names are still there underneath.

Scorpions: registering the endpoints you'll route

Scorpions are the senders and receivers used day-to-day. Operators can't use them until they're registered, addressed, linked, and bound into a subscription.

- **Who handles registration.** MAGNUM is the NMOS registry and the controller. Devices find it through DNS-SD, and they need to be reachable on the management network. Some of this is MAGNUM setup and some is network setup - knowing which is which is how you get unstuck when registration stalls.
- **Choosing a control method.** Register the device and choose how its network traffic is controlled: MCS (can create links and manage bandwidth), IGMP (works without the switch in MAGNUM's inventory), or gNMI (controls the Arista directly, with links drawn by hand).
- **Drawing links.** Draw links that match the fiber when the control method needs them, and learn when an IGMP setup doesn't need them at all.
- **Encapsulation.** Fill in the primary and backup multicast addresses. Operators only see sources and destinations, but someone has to set up the addressing underneath.
- **Subscriptions.** Intelli-bind video, audio, and ancillary into a single subscription and give it an operator-friendly name. Raw NMOS senders are for engineers. Subscriptions are what operators route.
- **Scorpions on an Arista switch.** Bring Scorpion-2 frames up through the Arista using IGMP, the lab DNS, and a point-to-point subnet on each data port.

- **Inside the Scorpion-6.** Use the module pages, the crosspoint, and the SFP view, and map a MAGNUM video destination to a module. You need to see what's in the frame before you can commission a path through it.

LM-CORE: getting a picture on screen

Seeing a routed source on a screen is the simplest proof the system works. LM-CORE decodes what MAGNUM routes and runs VUE on the display.

- **What LM-CORE does.** Add LM-CORE as a VUE host. Each VUE instance on it (called a seat) has its own login, decode, and registration, and each license covers one seat in use at a time. MAGNUM still does the routing. LM-CORE displays the result.
- **First picture.** Register the seats, connect the data link, and route a source to a video widget. When the picture shows up, you know the link and the license are set up correctly.

PTP: locking to facility timing

ST 2110 depends on PTP being set up correctly. This is the check to run before you call a boundary clock or follower ready.

- **Leaders and followers.** Tell the difference between a root leader locked to GNSS and a boundary clock or follower, on a 5700MSC or a 5800MSC.
- **The PTP checklist.** Check the frequency and time reference, lock behavior, profile, domain, message rates, and marking. On a customer site, their timing document is still the reference.

Packages: VUE web client and device drivers

These packages are what let an operator make routes and change device parameters from VUE.

- **VUE web client.** Install the web client on the main and backup servers. The first license gives you a design studio. Additional licenses are concurrent users, tied to the Server ID and shared with tally and the router web client.
- **Device control (MDL).** Load the MDL driver so VUE can talk to device parameters. Without it, VUE can see a device but can't change anything on it.

Names and tags: building the operator list

Devices get added at full capacity, so the raw list is usually much bigger than what operators need. Names and tags trim it down to what's relevant.

- **Tagging what's real.** Tag the sources and destinations that should appear, and tag subscriptions by direction. Operators should only see what's valid for their show.
- **Namesets per group.** Keep OPS as the baseline. Give each group its own nameset, each operator their own HDMI monitor destination and multiviewer output, and the gateway short show names. Operators should recognize every label on their panel.

Multiviewer: building a layout operators can trust

A multiviewer layout only works if the signal path underneath it works. Check the path first, then design the layout.

- **Choosing how it's operated.** Decide whether operators route to multiviewer inputs directly, or assign sources and let MAGNUM pick the input. The layout design depends on that choice.
- **Checking the path.** Confirm links, PTP, NTP, SDPs, multicast, and the source addresses MAGNUM needs to tune the display, and load the multiviewer driver. Only start designing once these all check out.
- **Building the layout.** Build the multiviewer layout from the assignment on the path you just validated.

Tally: connecting the switcher to the multiviewer

Tally colors tell the director and crew what's on air and what's in preview. This section connects the production switcher's tally to the multiviewer.

- **Tally colors.** What red, green, and amber mean, including TSL tally, so the multiviewer matches the conventions the production already uses.
- **Tally grids.** Build a tally grid of displays and triggers. Learn how grid states map to VGPI levels, and when to use AND or OR conditions. The tally color needs to follow the right switcher bus.
- **Tielines.** Link outputs to inputs so MAGNUM can tell the multiviewer which source is on air, in preview, or recording, including sources that arrive as SDI.

NMS: alarms and stored configurations

MAGNUM-NMS is how you find out something has failed, and how you load a known-good configuration onto a replacement device.

- **The three NMS applications.** What the server, the graphics client, and the web client each do, and which one you'll use day-to-day.
- **Firewall ports.** Open the ports NMS needs for SNMP, traps, the database, client traffic, and the web client. If a device can't reach NMS, its alarms never show up.
- **Hardware sizing.** Size the server and client against the recommended MAGNUM-HW-NMS appliance and the published minimum specs.
- **Install and patch.** Install the server, client, and web packages, then apply the class service pack. Clients pick up the server patch when they connect.
- **Getting around the client.** The tree, edit, refresh, apply, names, and search. Everything else in NMS happens here.
- **Adding devices.** Discover devices over SNMP, or sync the devices already in MAGNUM. Any device that stops responding should raise an alarm.
- **Saving and loading configurations.** Save configurations, group them, push one to matching devices, and compare. You'll use this for commissioning, replacing failed devices, and day-to-day changes.
- **Alarms.** Turn traps into alarms, acknowledge what's been fixed, and choose which alarms the operation actually wants to see.
- **Services.** Group devices into a logical service, like a channel, so one alarm represents the whole signal path.
- **Dashboards.** Use graphics dashboards while configuring devices and while monitoring alarms.

SDP: managing stream descriptions

An SDP file describes a stream, and receivers rely on it to know what they're receiving. If you can read, lock, and bulk-edit SDPs, you can fix a format problem across the whole facility.

- **Reading an SDP.** Find the media line, connection, format, PTP reference, and media clock. A receiver rejects an SDP it can't parse, so you want to spot the problem before it does.
- **Editing SDPs.** Use the editor, including User Controlled mode so a device update doesn't overwrite your correction. Use bulk edit, compare, and Fabric Flows when the same fix applies to many streams.

VUE: building the operator panel

The system is done when an operator can actually run a show from VUE. This section covers the hardware, tags, default destination, and routing widgets that make that happen.

- **Choosing the hardware.** The same VUE software runs on a button panel, a touch panel, LM-CORE, or VUE-EDGE. Pick the one that fits the operator's position.
- **One layout, many panels.** Filter by the current device's tags so each VUE shows its own sources and destinations from a shared layout.
- **Default destination.** Build the default-destination workflow so each operator starts on their own monitor.

- **Separating show controls.** Move day-of-show actions into a setup page operators can open, separate from the engineering pages.
- **Routing widgets.** Add nameset, take, lock, protect, default destination, and tag filter controls where operators expect to find them on a router panel.

LDAP: facility logins in VUE

Operators should log into VUE with the accounts the facility already gives them.

- **Connecting to LDAP.** Fill in the provider settings, test the connection, and import the groups. You'll enter the bind password in the product during class. It's working when operators can log in as themselves.

Design: planning the next system

The design notes help you scope the next system: what a facility actually needs, and what it will take to run it.

- **Key design decisions.** Compare network topology, one control room or several, IGMP or SDN, and on-premises multicast or cloud unicast. Each choice changes what you end up building.
- **Audio handling.** Decide where audio gets processed: core shuffling, edge shuffling, IS-08, standardization, and normalization.
- **Single Hot vs. Dual Hot.** Single Hot works when one point of failure is acceptable, such as a small room, a secondary facility, or a lab. Dual Hot is for rooms that need a second live path while keeping the same operating model.

Assessments

Quizzes are taken in the learning system. Assignments and practicals are completed on the training system.

Quizzes

Part	Quiz	Topic
Prepare	IP assignment	The addressing model for this lab
Prepare	NMS and SDVN	What SDVN gains once the NMS API is enabled
Devices	PREFEX and NATX	How the NATX and both PREFEX halves are added and linked
Devices	Orchestration and control	Control methods in MAGNUM-OS
Scorpions	Information technology	What MAGNUM owns, and what DNS and the network must provide
Scorpions	IGMP and Arista	When links are created, drawn, or left out
Scorpions	Multicast encapsulation	IP, multicast, and encapsulation
Scorpions	Intelli-bind and subscription	Binding video, audio, and ancillary into one subscription
Scorpions	Scorpion, Arista, and NATX	IGMP through the Arista fabric
LM-CORE	LM-CORE	Seats, licenses, and the job of the core
Packages	VUE web client	Where the client sits, and how licenses are counted
Packages	Parametric control	The MDL path from package to the Devices app
Multiviewer	Router and multiviewer	The two operating models
Multiviewer	Validation	Checks required before a layout is trusted
Tally	Tally grid	States, VGPI levels, AND, and OR
Tally	Tieline requirements	How an active switcher input becomes a multiviewer tally
Tally	Comprehension	Grid, tieline, and the on-air color
NMS	Firewall ports	Which ports are required, and which can move
NMS	Compute	The preferred appliance, and the server and client minimums
NMS	Install, run, and patch	Server, graphics client, web client, and the service pack
NMS	GUI	Menus, edit, refresh, and apply
NMS	Discovery	SNMP discovery and MAGNUM-SYNC
NMS	Device management	Save, group, directed load, and compare
SDP	SDP	The fields a receiver expects

Assignments

Part	Assignment	What you submit
Prepare	Health metric screenshots	The cluster and NTP health views from the lesson
Multiviewer	2x4 plus 2 layout	The layout built on the training multiviewer
NMS	Import configuration groups	The tree elements named in the assignment
SDP	SDP engineering	A multiviewer SDP that shows you as the author
VUE	Default destination	A workflow for the seat's default destination

MAGNUM-NMS practicals

Practical	What you do
Install and patch	Install the 1.2.0.0 server stack and apply service pack 1.2.2.0
GUI	Work the client tour: tree, edit, refresh, apply, names, and search
Discovery	Bring devices in by SNMP or by MAGNUM-SYNC
Device management	Save a configuration, group it, push it to matching devices, and compare

Glossary

Term	In this course
MAGNUM	Control system, NMOS registry, and router controller. Main and backup in this class.
MAGNUM-NMS	Alarms and stored device configurations. Formerly VistaLink PRO. Its own server.
MAGNUM-ANALYTICS	Deep visibility for an ST 2110 network. Formerly INSITE.
SDVN	The MAGNUM web apps for devices, links, ports, discovery, and related configuration.
VUE	The operator and engineering surface. On LM-CORE in this lab, and in the browser as VUE-ANYWHERE.
LM-CORE	The 1RU media core that decodes a routed signal and runs the VUE seats.
Seat	One VUE process: its own context, login, decode, and registration. One license is one concurrent seat.
NATX	Evertz IP switch fabric. Links are drawn. A 100G optic is recorded on the first of four ports.
PREFEX	1RU FPGA processor, added once as a gateway and once as a multiviewer.
Scorpion	Modular frame brought in through NMOS. The Scorpion-6 lesson covers modules, crosspoint, and SFPs.
NMOS	IS-04 registration and IS-05 connection. MAGNUM holds the registry.
DNS-SD	How nodes find that registry in this course.
IGMP	Joins that MAGNUM sends for an endpoint. The network's PIM builds the multicast trees.
MCS	Arista media control. Can create links and manage bandwidth when the switch is licensed.
gNMI	Direct control and telemetry on the Arista, with links drawn by hand.
NBM	Cisco control API named in the course glossary, alongside MCS, NATX, EXE, IPX, and cloud fabrics.
Intelli-bind	Attaches NMOS video, audio, and ancillary to one subscription.
Encapsulation	Primary and backup stream addresses held for a sender.
SDP	The text description of a flow. Receivers treat it as the authority.
Nameset	Names a panel shows. OPS is the class baseline. Each group adds its own.
MDL	Driver package between VUE and a device's parameters.
Tieline	Logical output-to-input join used to find which multiviewer source should tally.
PTP	Precision Time Protocol. In this lab the 5700MSC is the root leader.