

Designers Lighting Forum

DMX: Success After The Specification

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Learning objectives

- Understand why DMX is finding its way into architectural lighting - what it offers over legacy control mechanisms and even over emerging technologies.
- Understand best practices of 'How DMX': protocol limits, wiring constraints, signal management, emergency, addressing and zoning.
- Identify the gaps in scope that can get overlooked in the execution of a DMX lighting system and how minor changes in project documents can avoid finger pointing.
- Demonstrate why DMX is fast becoming the popular choice for lighting designers.

DMX – resources for more information

Entertainment Services and Technology Association (ESTA) - <https://tsp.esta.org/>

American National Standards Institute – <https://ansi.org>

ANSI E1.27-1-2006 (R2021)

ANSI E1.27-2-2009 (R2019)

ANSI E1.31-2018

ANSI E1.20 – 2010

Illuminating Engineering Society – <https://www.ies.org>

And your favorite lighting & control manufacturers are on the end of the phone!

Introduction

Makers of fixtures and their sales agencies have exciting new products to show to the lighting designers, specifiers and engineers...oh and by the way, “this uses DMX for control.”

What did you say? DMX? That is complex, right?

It is our goal today to introduce you to the ingredients and some proven recipes that go into making a project with DMX a success – after the specification and drawings have been completed.



Why DMX?

Legacy technologies: one trick – changing intensity (unless you are in the theater)

- Dimmers, relays, 0-10V, DALI, other manufacturer-specific protocols

DMX control: new tricks – more control and more features

- tuneable white control
- finer dimming resolution, down to 0%
- dynamic colour
- integration with other DMX systems

But with “more control” comes a new wiring scheme, digital addressing and more elements to manage while planning, installing and commissioning a lighting system.

Recipe #1 – dream team

The **lighting manufacturer** has a savvy controls team

The **sales agency** has a savvy controls team

The **controls manufacturer** is experienced controlling DMX equipment

An **integrator** is onboard to manage the DMX installation

The **installer** has been to this rodeo before

How DMX?

How does a DMX controller communicate with DMX fixtures?

How do lighting fixtures need to be commissioned?

How is the signal carried – what cable is needed?

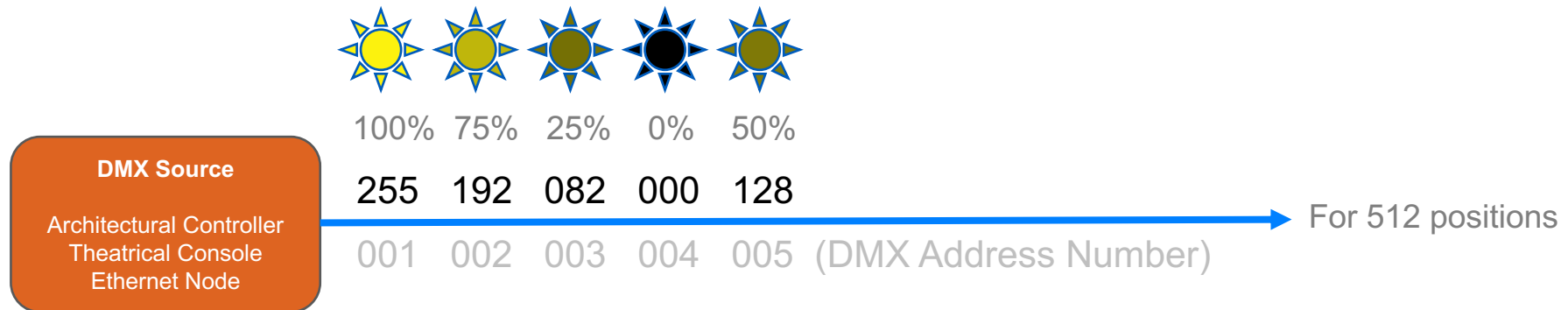
What's the cable topology?

What is termination and why is it needed?

How can it go wrong?

DMX technology

- 512 channels of streaming data - 1 DMX Universe
- Each channel can be a value between 0-255 (0%-100%)
- Devices listen to a specific channel or set of channels constantly
- Data is updated at least 33 times a second



Other protocols, e.g. DALI, only send data “as needed” and the device plays an active part remembering what it should do when the signal arrives. DALI can also stream, but at a fraction of the frequency.

DMX control profiles

Lighting fixtures and DMX devices can use one or more channels. We talk about a fixture's required channels as its device profile and the number of channels a fixture requires as its DMX footprint.

Single channel fixtures

- White intensity
- Single color intensity
- Warm dimming

Multi-channel fixtures (8 and 16 bit)

- Ww Cw (2 Ch)
- I/RGB/A/W/ (up to 6 ch)
- Int CCT (2 ch)
- Int CCT Hue Sat (4 ch)
- RGBW Pan Tilt (6 ch)

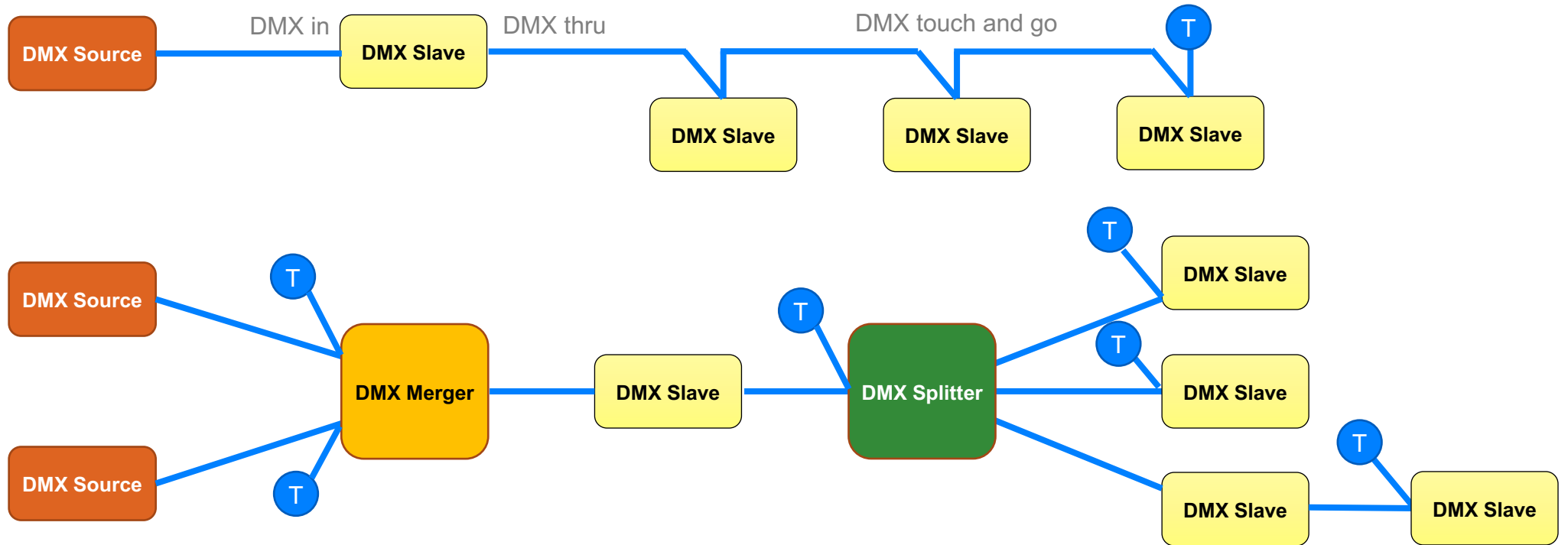
DMX concepts, protocol rules & best practices

- DMX is a streaming RS485 serial protocol requiring a three-conductor wire
- Wire choice must be Cat 5e/Cat 6 cable or one that lists RS485 compatibility
- A strict daisy chain for wiring (no t-taps, splices, loops)
- 1000 feet is a reasonable working limit for total wire length
- 32 “unit loads” on a wire, a.k.a. 32 lighting fixtures
- End of line termination
- Stay clear of high voltage – cannot run in the same conduit as power



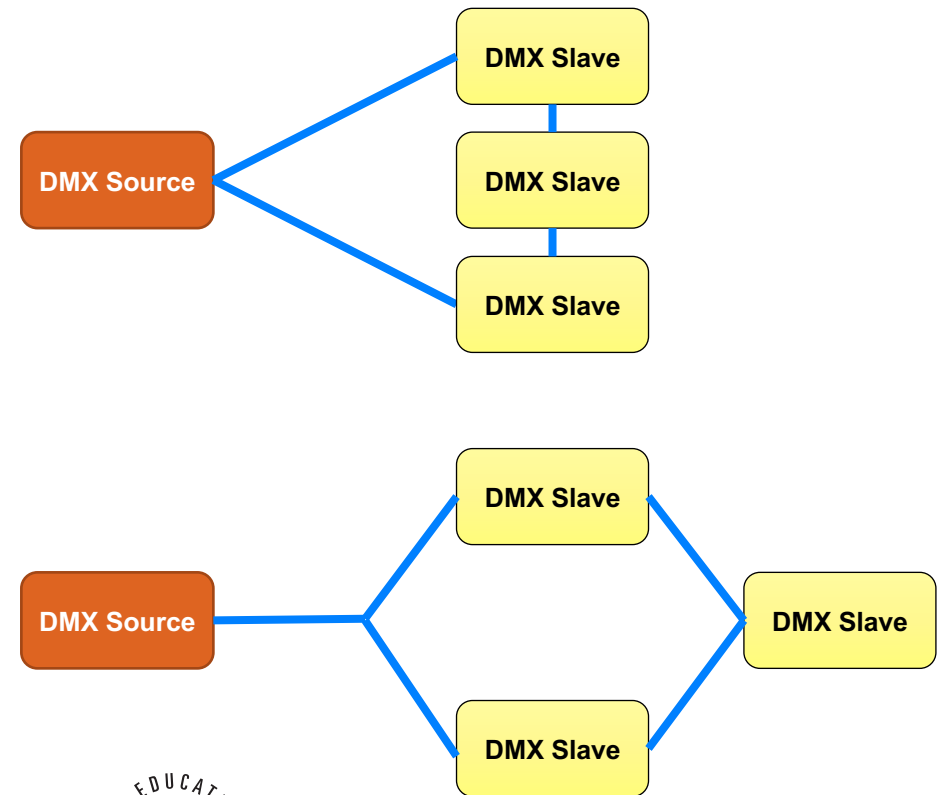
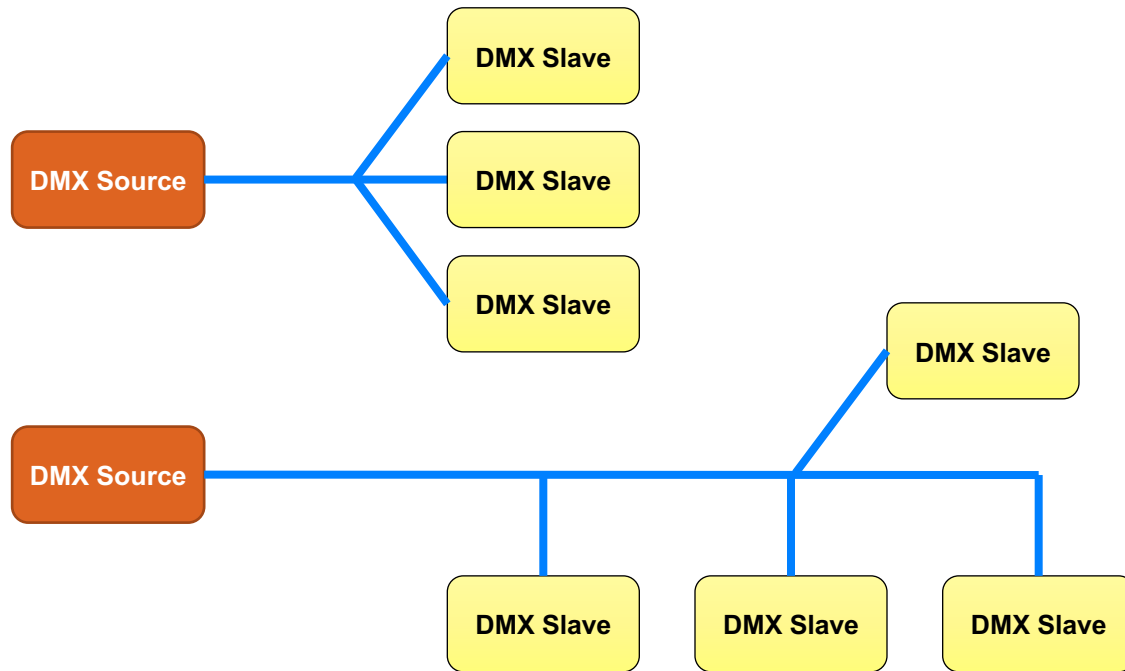
DMX wiring

Strict daisy chain



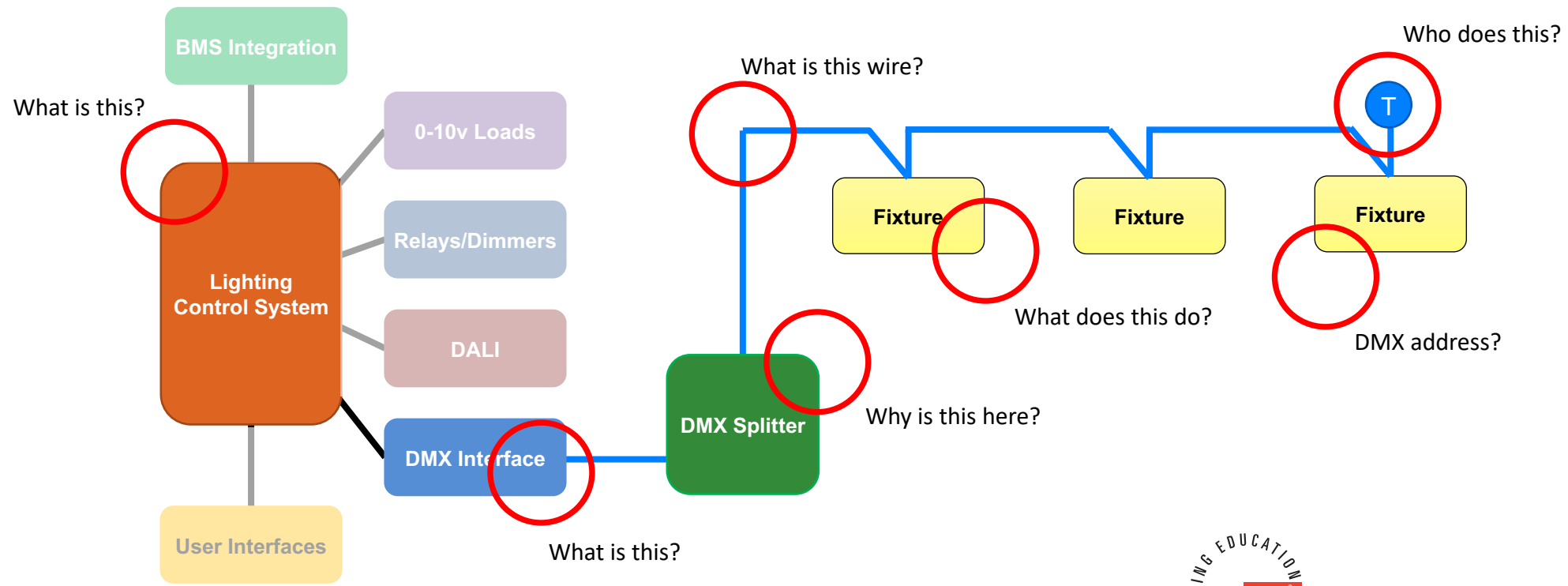
DMX wiring

Non-compliant wiring scheme



What we need to know

Drawings are prepared and spec packages created. These will be the guiding documents that the project teams use for pricing and installation. Will they contain all the information we need to know?

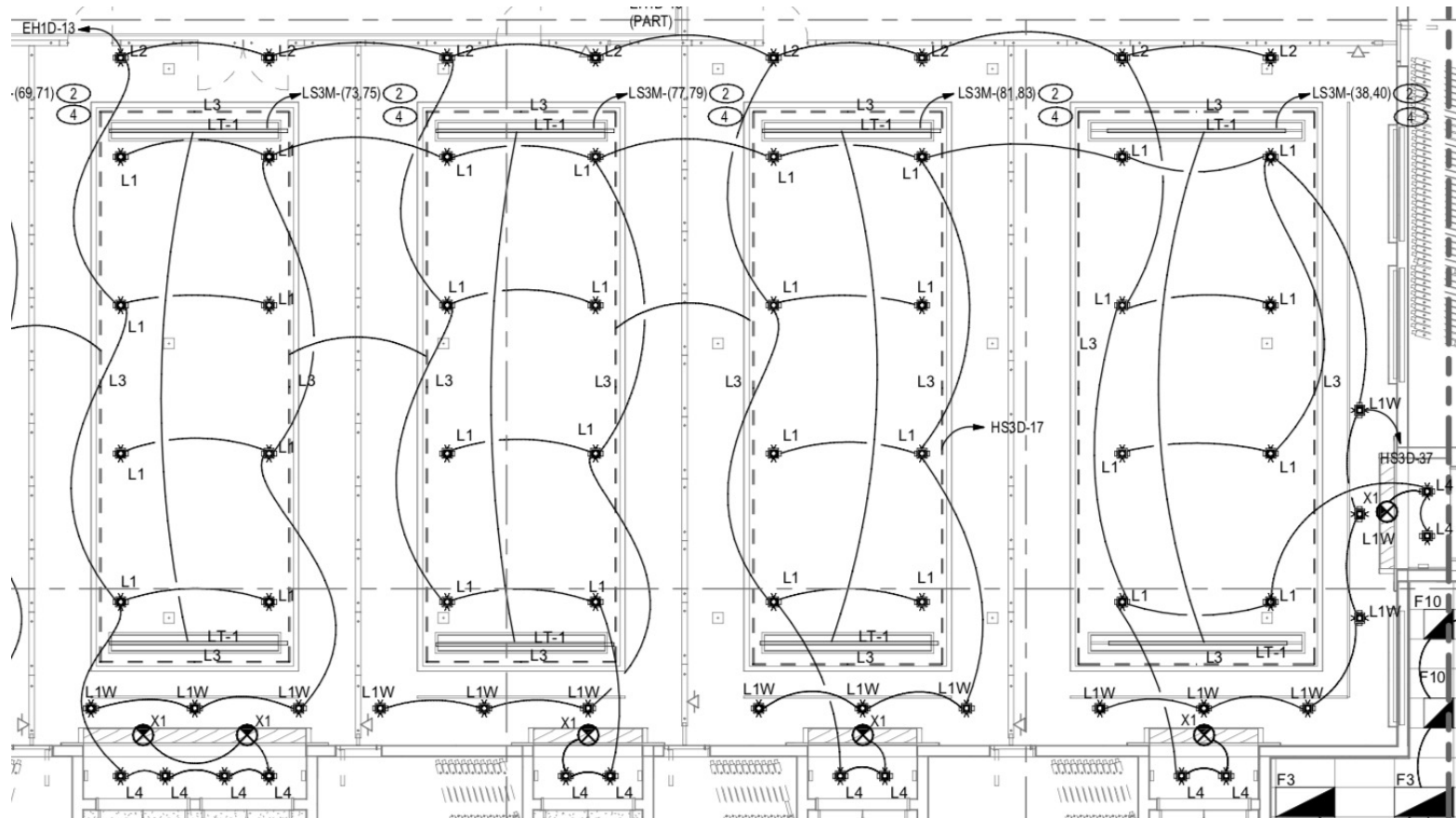


Recipe #2 – planning & people

Finding all the information needed to build a working system.

- Know your fixtures!
- Plan the wiring runs and know who will perform EOL terminations.
- Are there sufficient DMX outputs to connect home runs to?
- Who will address the fixtures and test wiring runs?
- What is the control narrative and sequence of operations for the DMX system?
- Do any of the DMX fixtures or scenes require integration with other disciplines?

DMX project “Take-Off”



Fixture types observed:

L1 = Load Type DMX

L1W = Load Type DMX

L2 = Load Type DMX

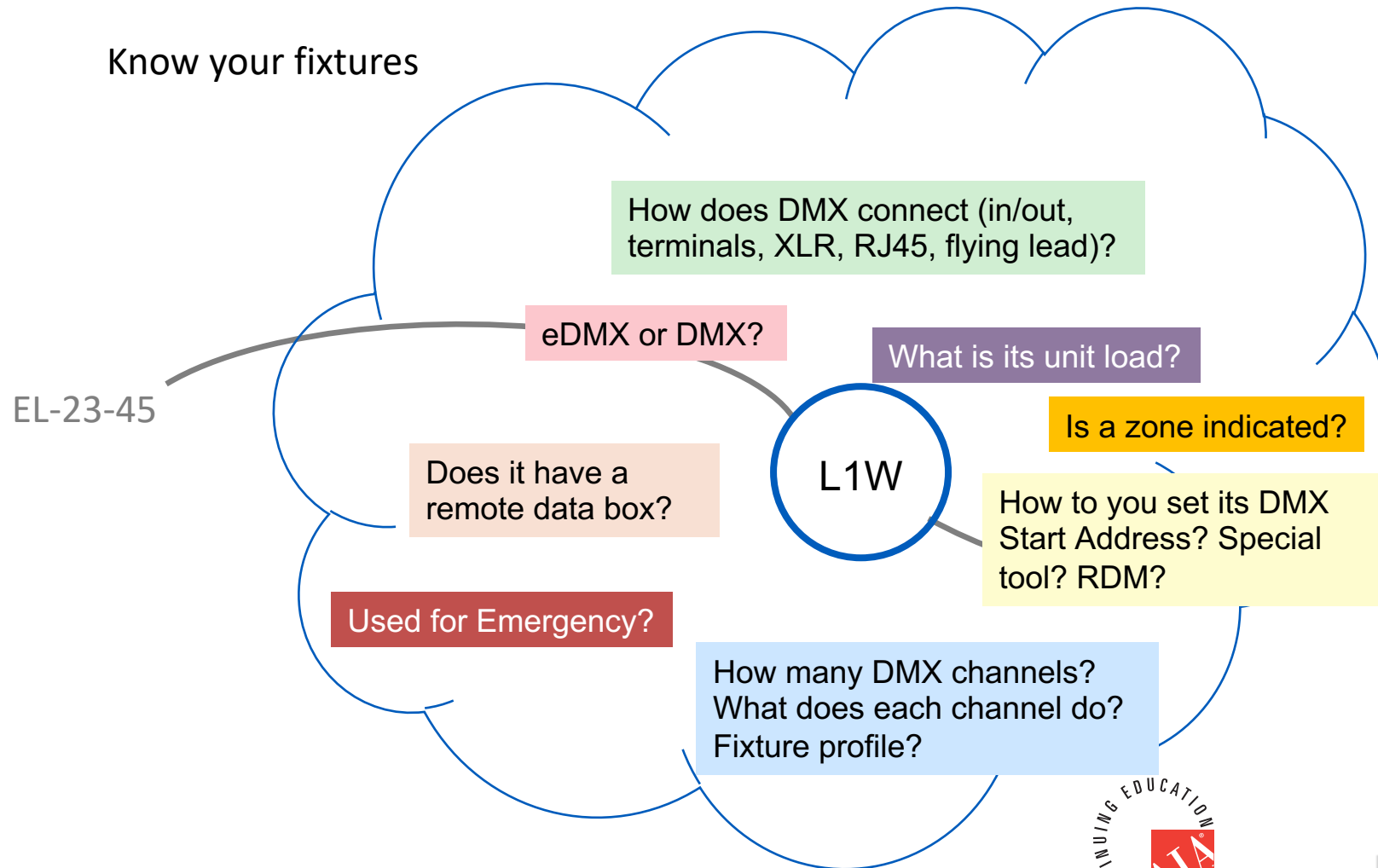
L3 = Load Type DMX

L4 = Load Type DMX

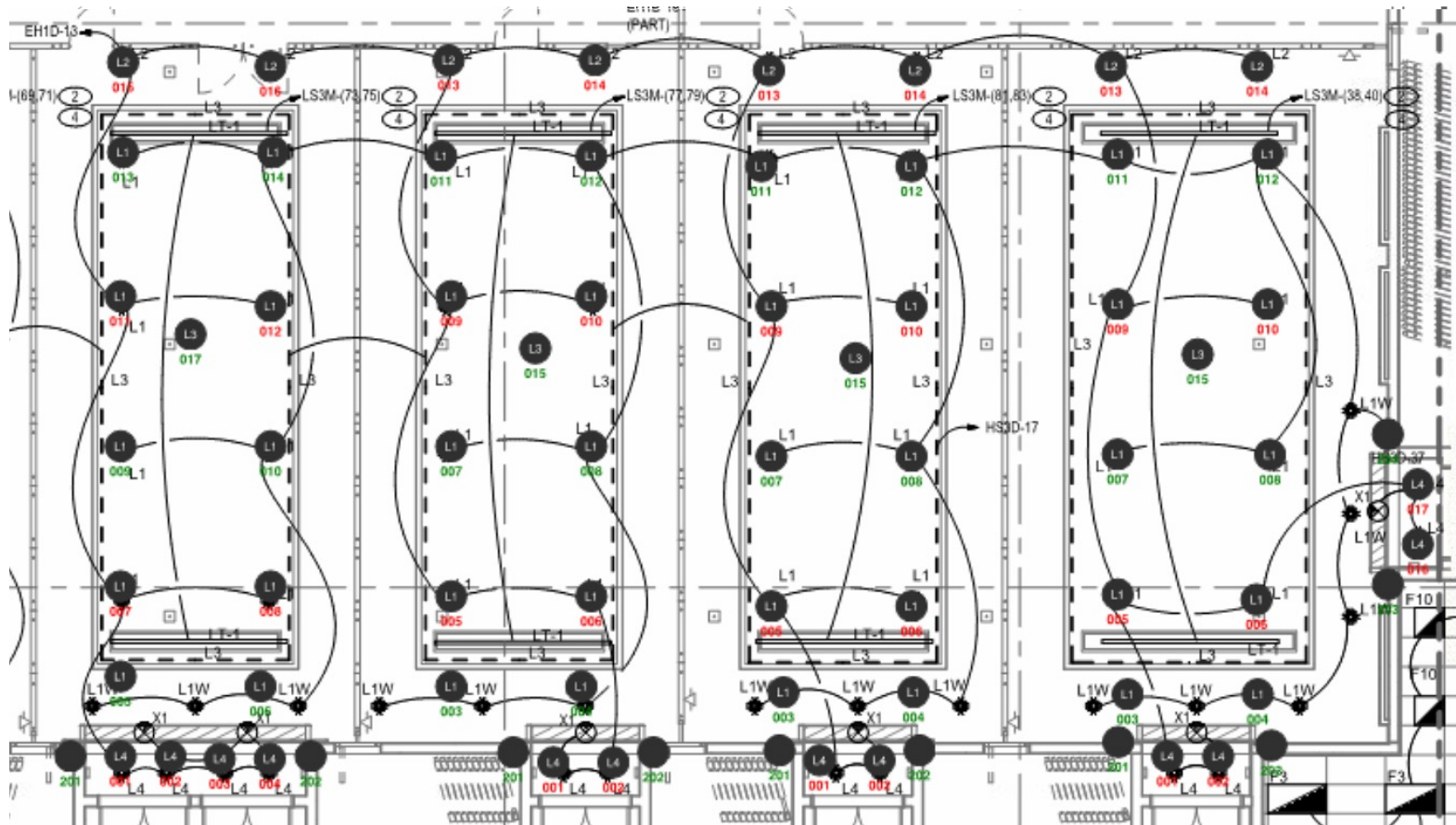
Data sheets have no mention of DMX characteristics. More info is needed.

DMX project "Take-Off"

Know your fixtures



DMX project “Take-Off”



Observations

We see 74 fixtures

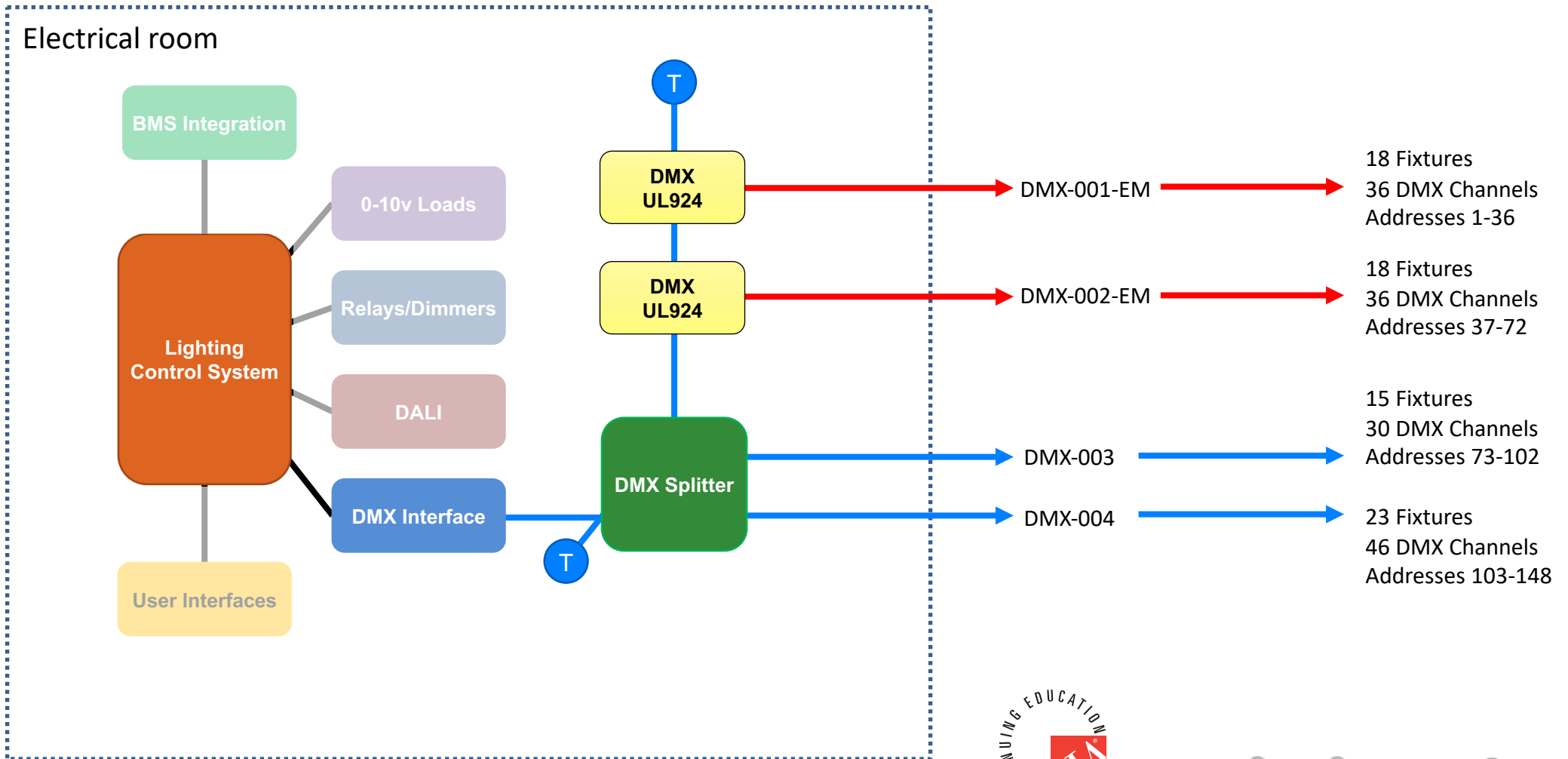
We need multiple DMX home runs

36 fixtures are emergency

(2) Emergency DMX home runs

(2) Regular DMX home runs

DMX project “Take-Off”



DMX project “Take-Off”

Fixture ID	Type	Room Number	Fixture Profile	DMX Footprint	DMX Address	Zone	DMX Home Run	EM	Emergency DMX Transfer Unit	DMX FEED	Elec. Rm
B1A33-006	L1	101	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C
B1A33-007	L1	101	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C
B1A33-008	L1	101	Ww Cw	2		CC	DMX-A33			DMX 3	IDF Room C
B1A33-009	L1	101	Ww Cw	2		CC	DMX-A33			DMX 3	IDF Room C
B1A33-010	L1	101	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C
B1A33-011	L1	101	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C
B1A33-012	L1	101	Ww Cw	2		CC	DMX-A33			DMX 3	IDF Room C
B1A33-013	L1	101	Ww Cw	2		CC	DMX-A33			DMX 3	IDF Room C
B1A32-007	L1	102	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C
B1A32-008	L1	102	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C
B1A32-009	L1	102	Ww Cw	2		CC	DMX-A32			DMX 3	IDF Room C
B1A32-010	L1	102	Ww Cw	2		CC	DMX-A32			DMX 3	IDF Room C
B1A32-011	L1	102	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C
B1A32-012	L1	102	Ww Cw	2		CC	DMX-EM-013	Yes	EMERG-07-02	DMX 1	IDF Room C

What can be overlooked?

- Educate the installer on wire type, wiring rules and termination
- Know your fixtures; their wiring, addressing and footprint
- Planning the DMX home run wiring
- Control system choice to match up with system intent
- Who will address the fixtures and test DMX wiring?
- Is there a control narrative and sequence of operation?
- Who will setup the control system and who will set levels and scenes?

DONE

DMX: success **within** the spec

	Lighting Designer	Fixture Maker	Sales Rep	Electrical Eng.	Installer
Fixture makers provide DMX control details on datasheets		X			
Detail DMX wire type, rules and termination on drawings				X	
DMX addressing schedule on drawings				X	
DMX home runs indicated on drawings				X	
Require DMX wire and signal testing during installation					X
A control narrative for integration and sequence of operation**	X			X	
List of responsibilities for DMX installation and commissioning	X			X	

**The IES standard on documenting control intent narratives and sequences of operation will be LP-16 when it is published

Objectives once again

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Questions?

Many thanks for being with us! We hope you have had a great LEDucation 2022!

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This concludes The American Institute of Architects Continuing
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