Introduction to mLAN

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John Strawn
S Systems Inc.

Mike Overlin
Manager, Global mLAN Licensing
Yamaha Corporation of America

November 2003

Target Market

Music Creation
From beginner to professional

Sound Installation

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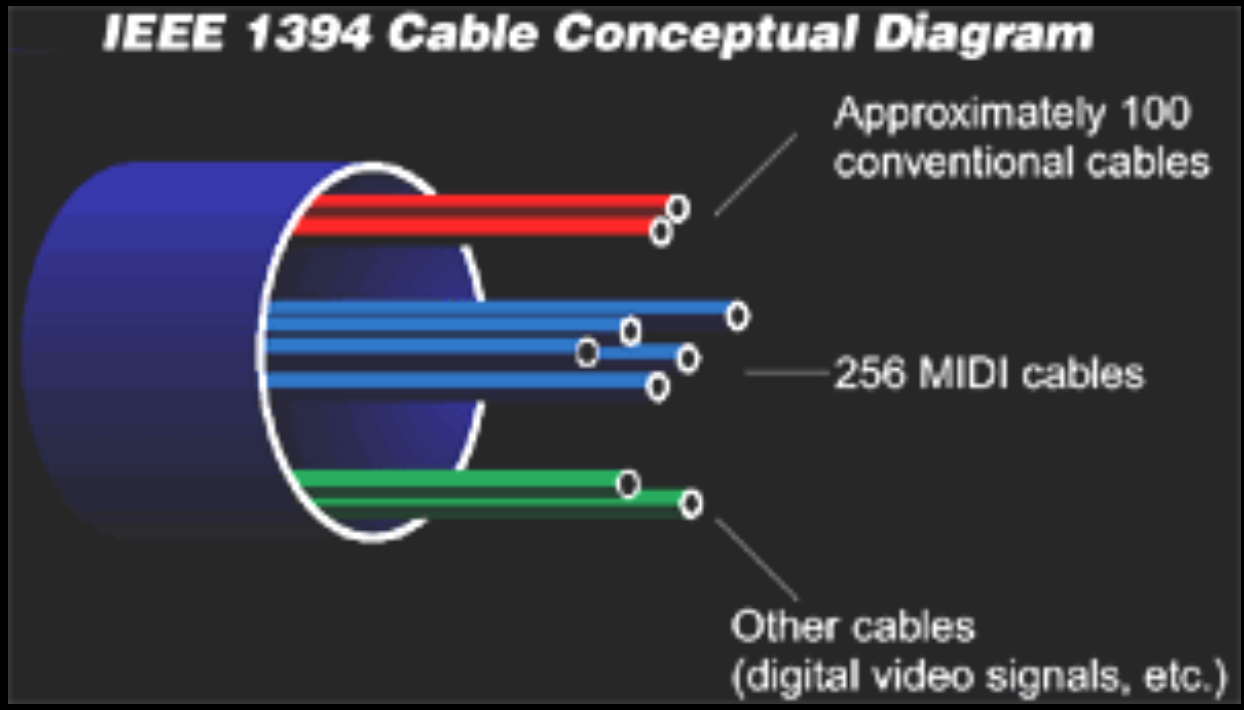
YAMAHA
MOTIF7

KORG
TRITON-Rack
000: Romance Layers

PreSonus
PREAMP 1
PREAMP 2
DIRECT PATCH LINE MIXER
MASTER CONTROL
CLOCK
FIRESTATION

A THICK PIPE



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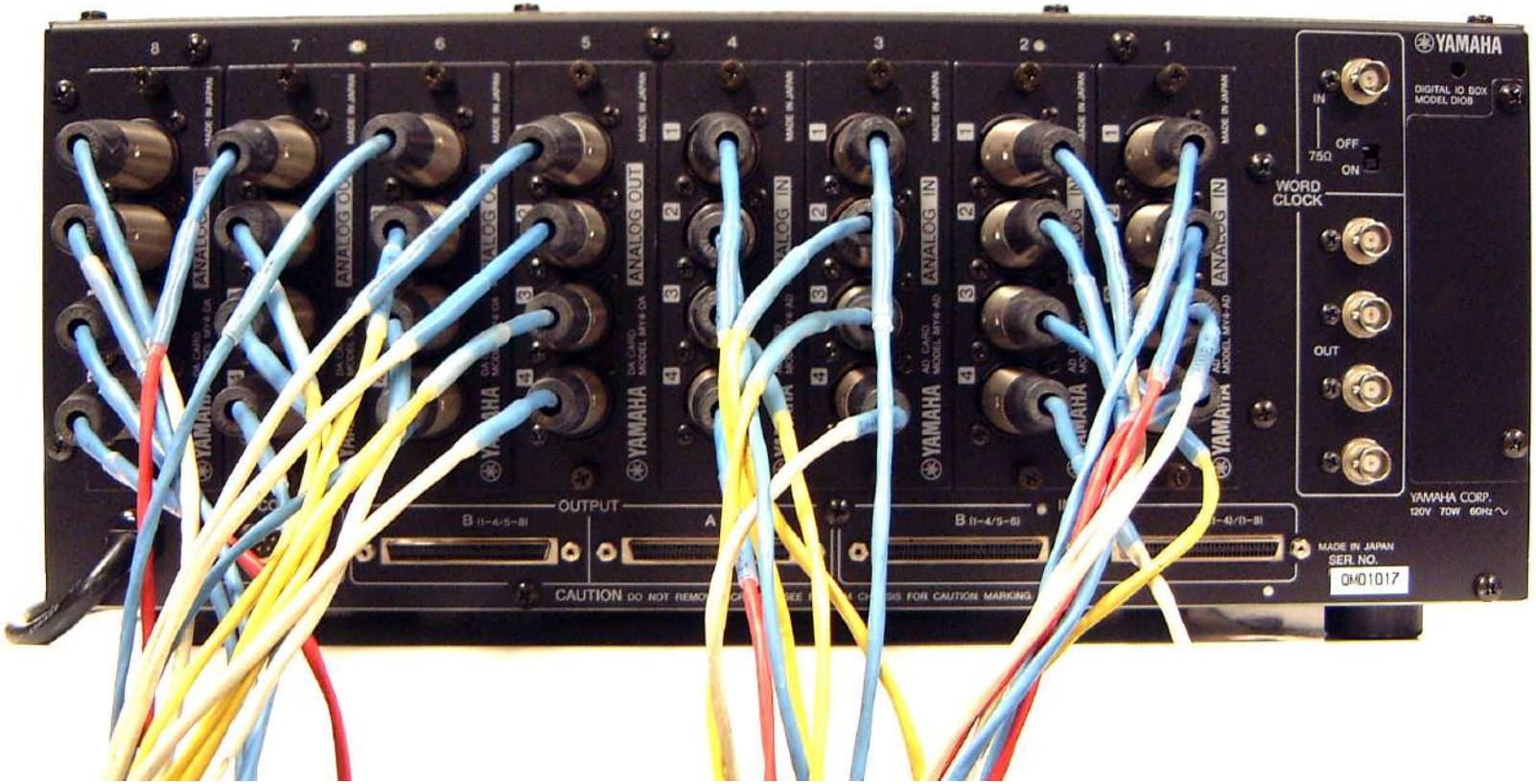

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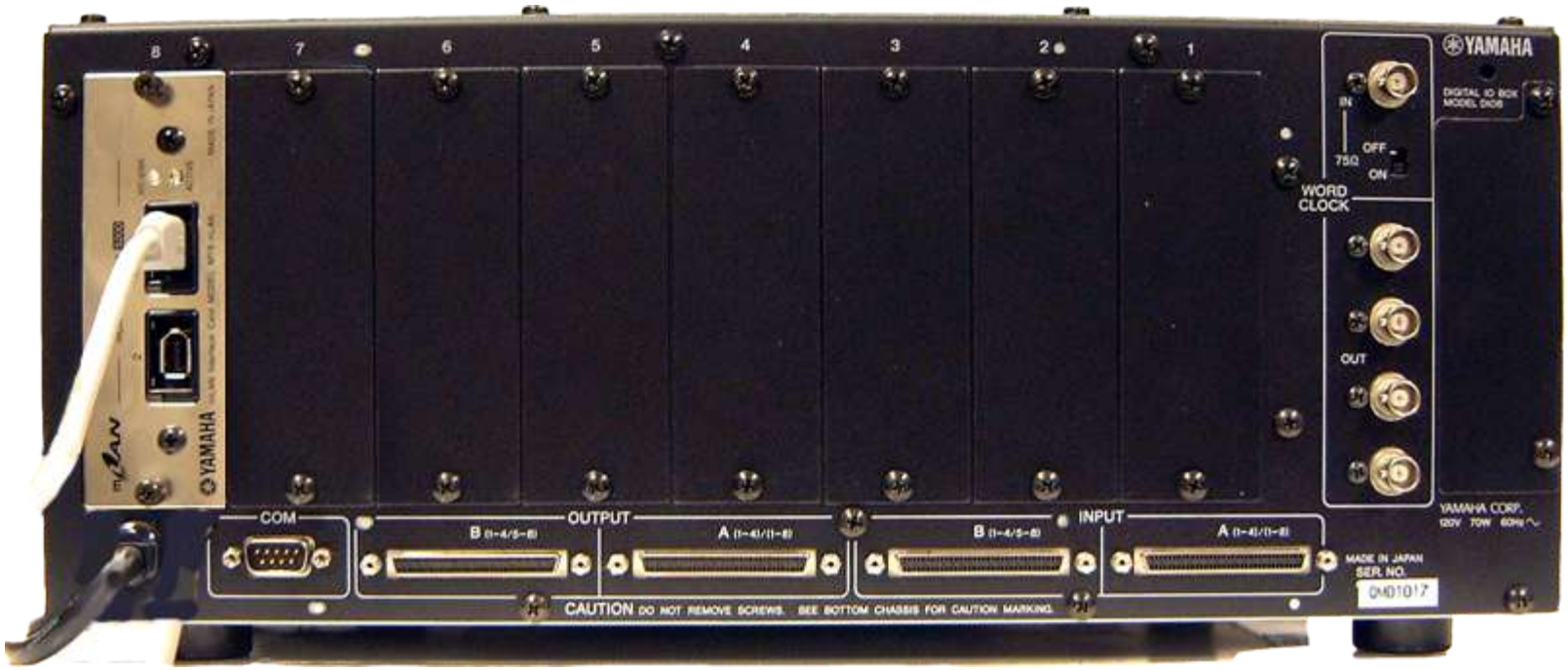

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What is a 1394?

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1394 Bus Specifications

- Serial (not parallel) bus
- Cable and backplane bus
- Automatic assignment of bus topology, ID
  - startup
  - hot-plug
- Unified address space:
  - 10 bits per bus
  - 6 bits for node ID
  - 48 bits for memory inside node

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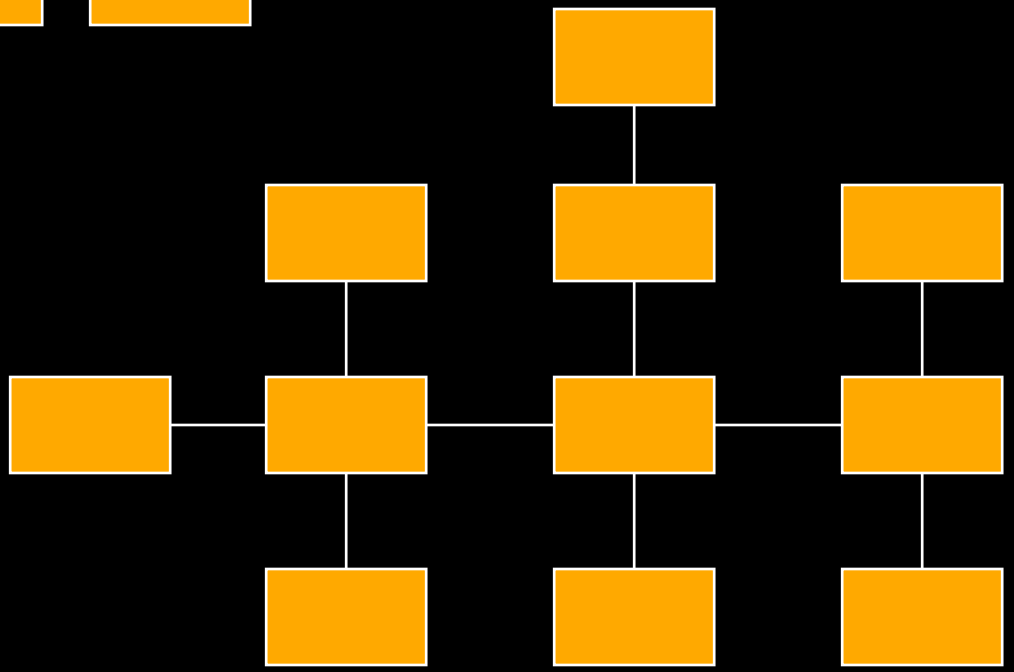
Topology

Daisy Chain

5 nodes – 4 hops

Star

11 nodes – 4 hops



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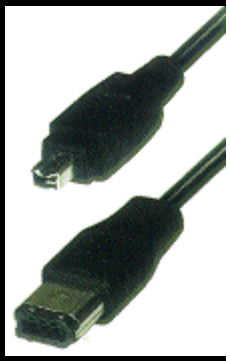
1394 Cable Lengths, Speeds



- Copper – 4.5 meters / 400 Mbps
  - Oki – 20 meters/s400 40 Meters/s200
  - two twisted pair (optional: two power wires)
  - 1394-1995: up to 16 hops, each 4.5 m, = 72 m
- Cat5 – 100 m / S100 (100 Mbps)
- 1394-800 on Cat5 (currently under study)
- POF – 50 m / S100, S200
- HPCF – 100 m / S100, S200
- GOF – 500 m / S400, S800, S1600 (S3200)

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Variants of IEEE 1394

- i.Link, FireWire
- IEEE 1394-1995
- IEEE 1394a-2000
- IEEE 1394b
- 1394.1

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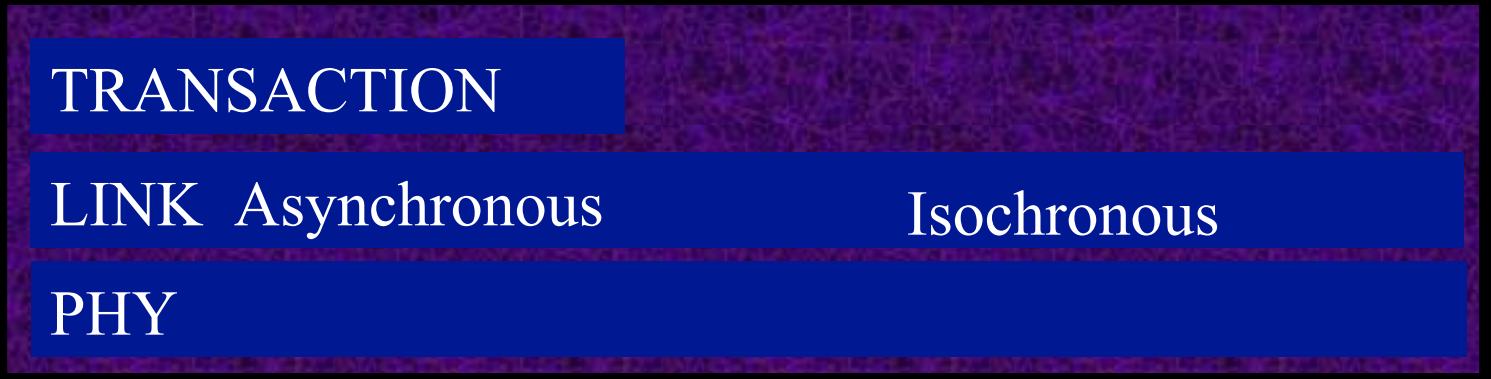
1394 Architecture

- Serial Bus Management
- Control and Status Registers (CSR)
- Bus packets consist of quadlets (32-bit)



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Data transfer

- Variable length packets
- Asynchronous
  - deliver to explicit address
  - acknowledgment (if not broadcast)
- Isochronous (means real time!)
  - broadcast packet delivery
  - variable-length packets
  - regular transfer intervals
  - Automatic cycle manager selection

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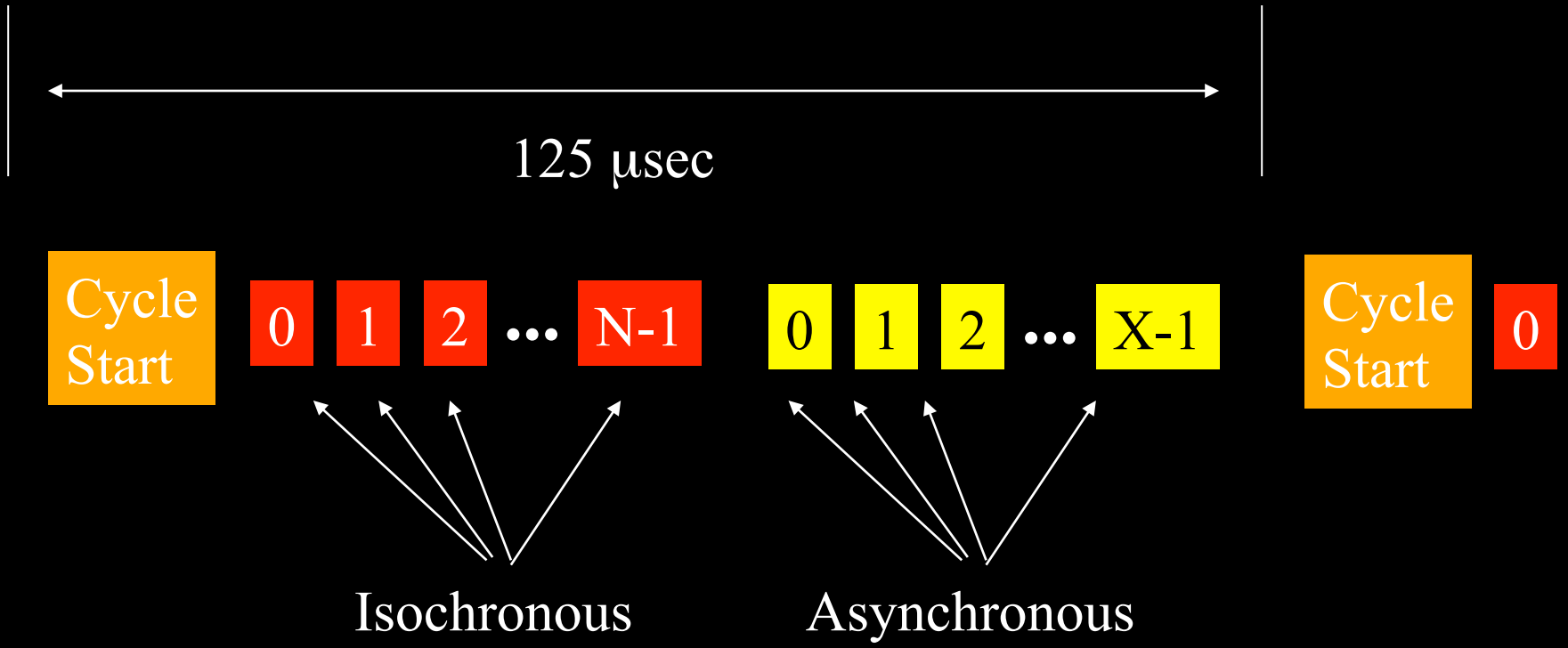
Cycle Structure



After IEEE 1394-1995 Fig 3-16

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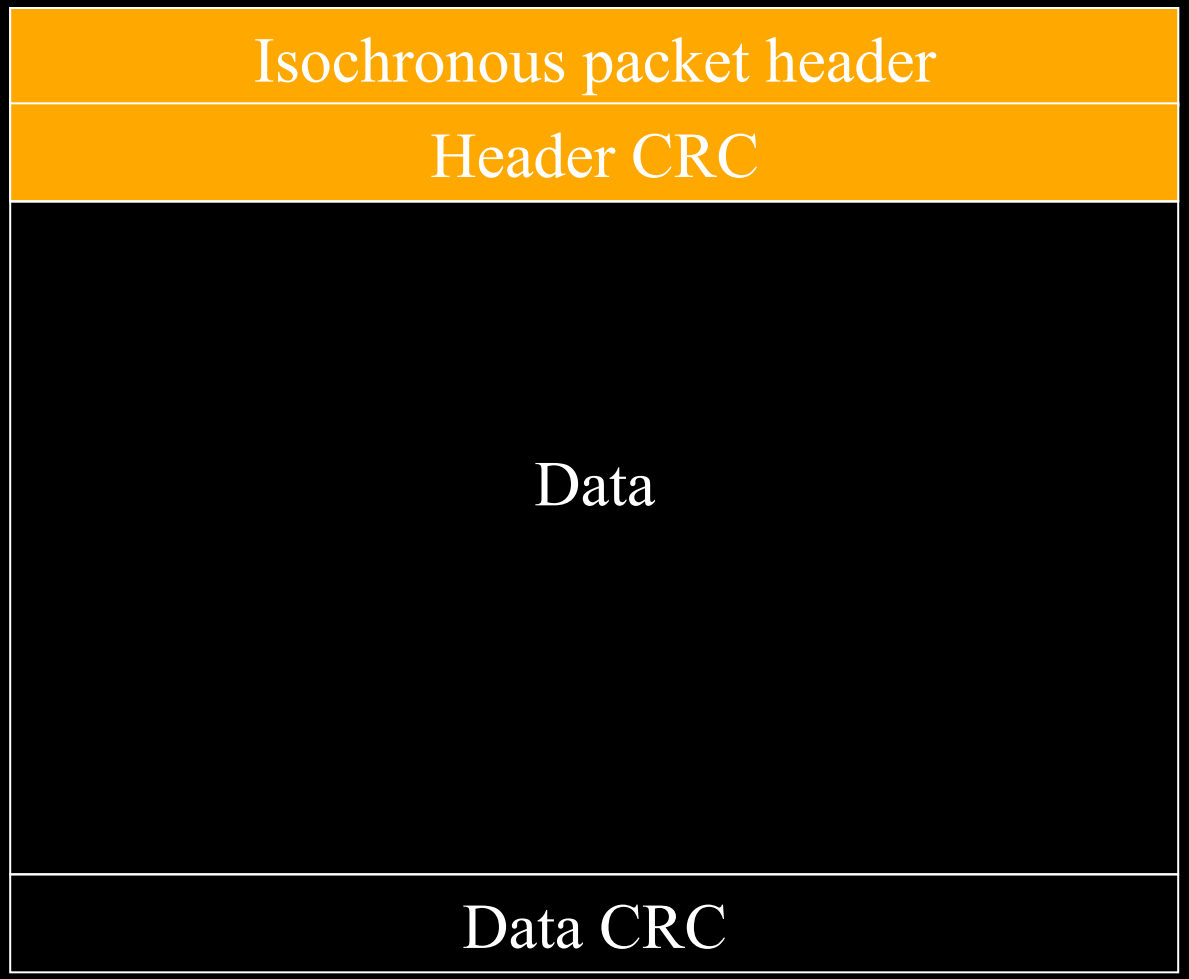
Isochronous Packet



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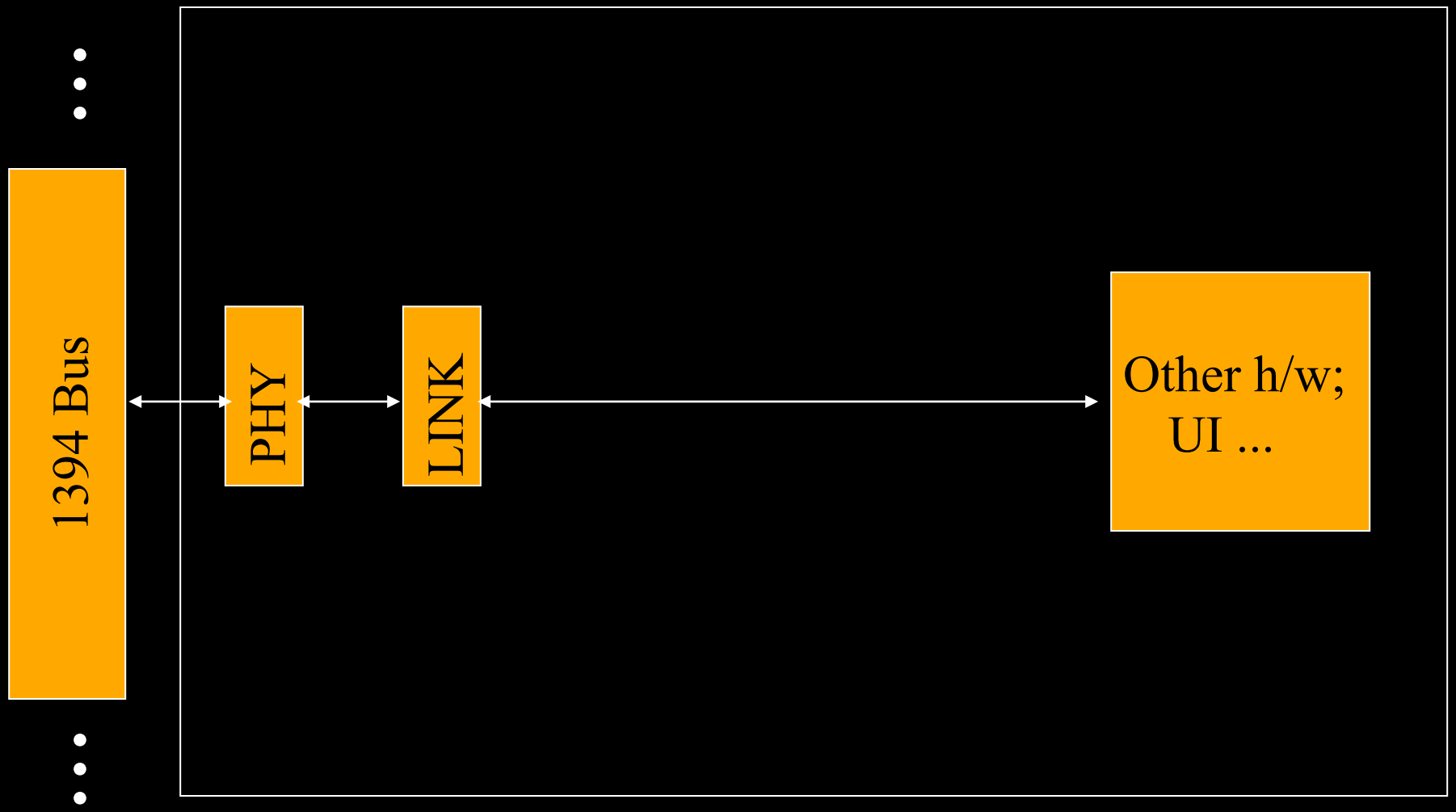
1394 Device Architecture



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Structural elements of

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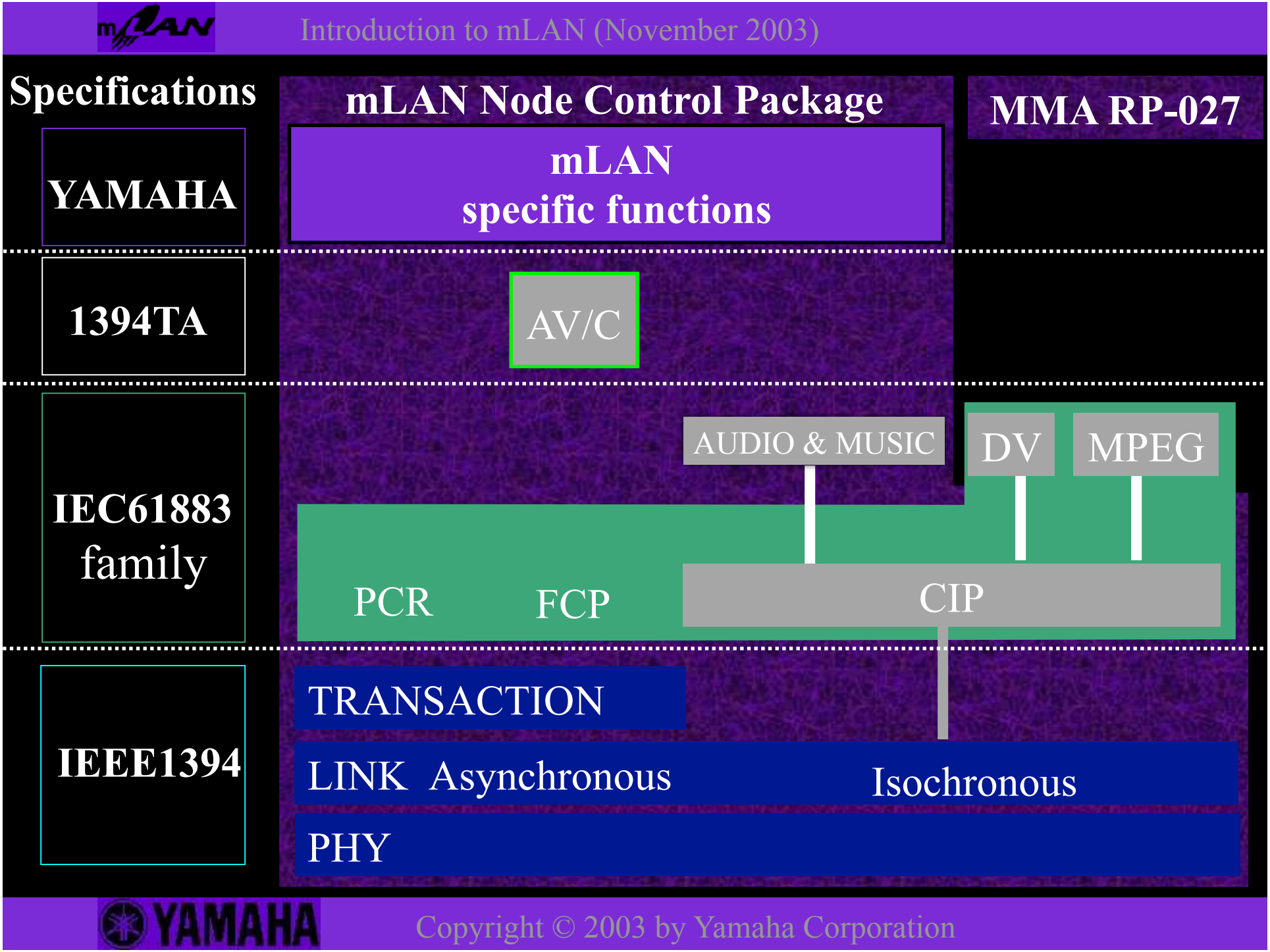

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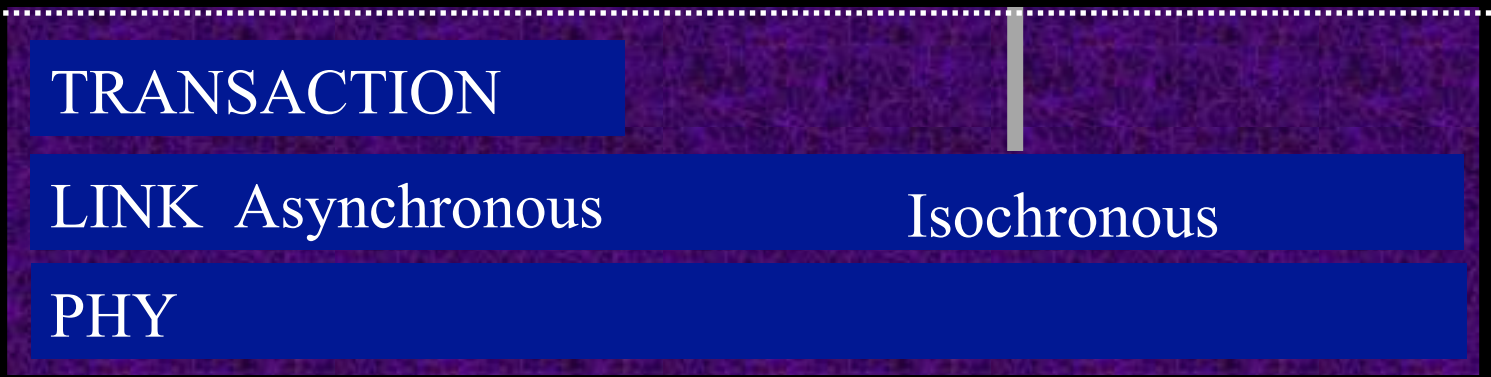
Specifications

YAMAHA

1394TA

IEC61883 family

IEEE1394



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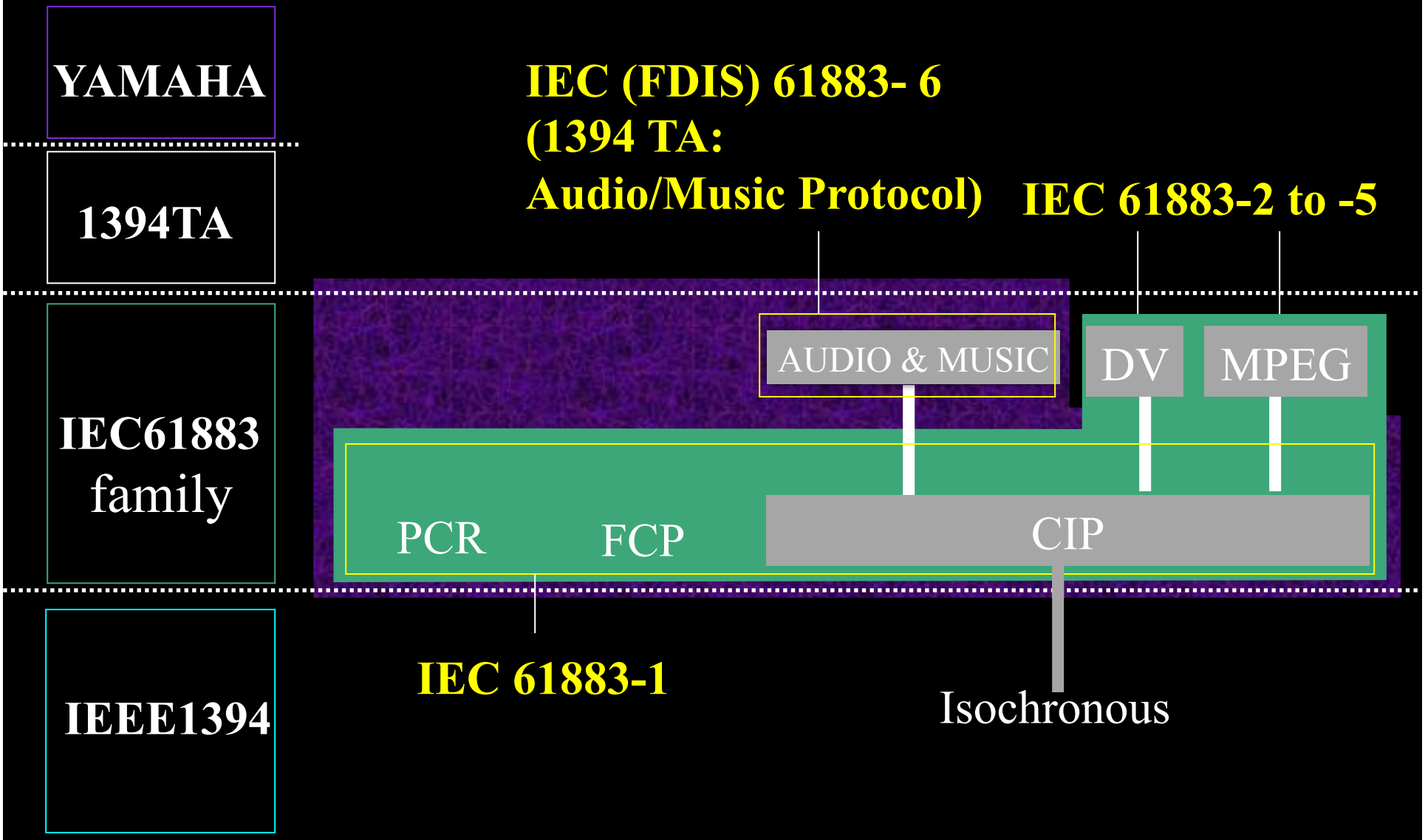
Specifications



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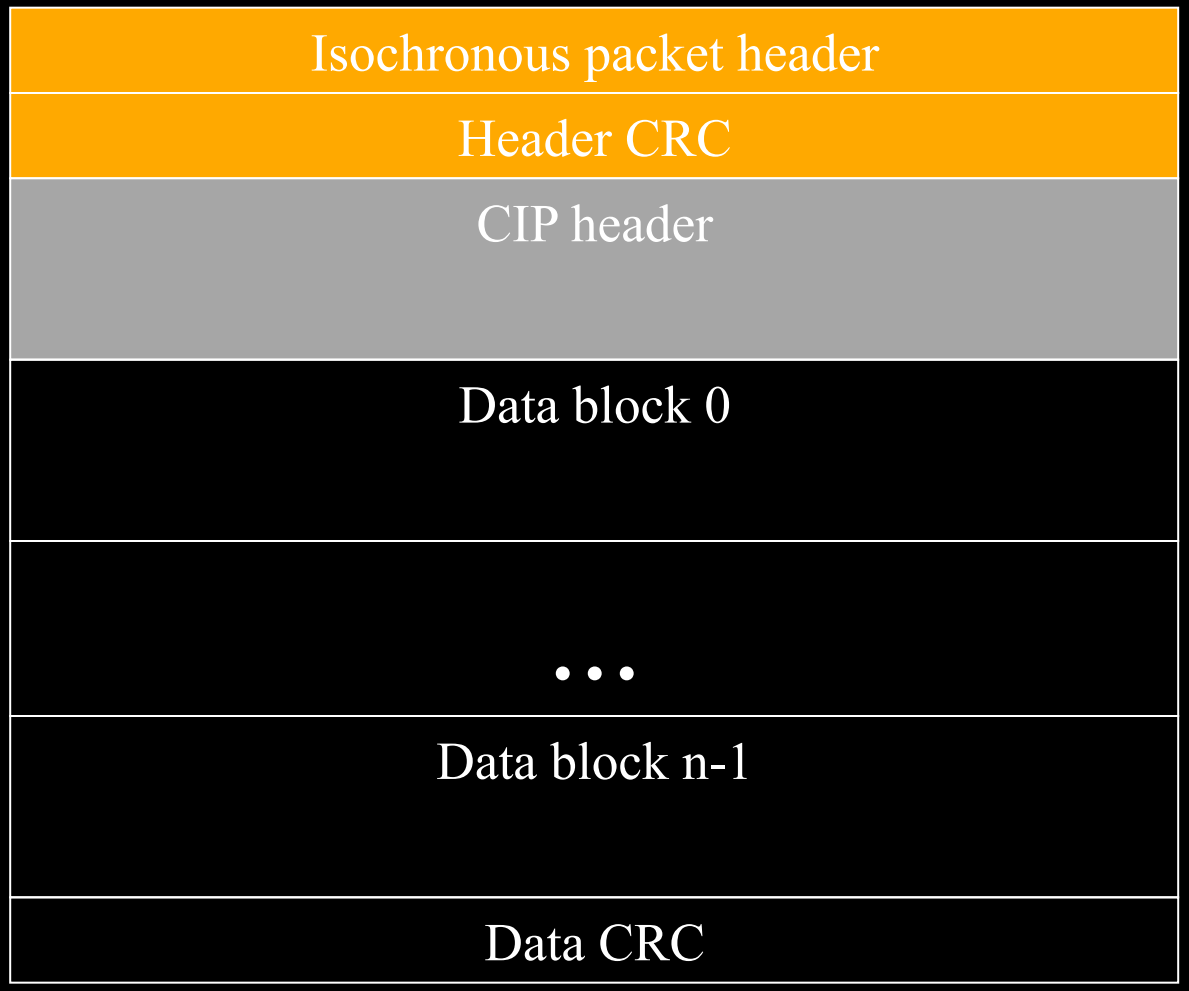
CIP PACKET



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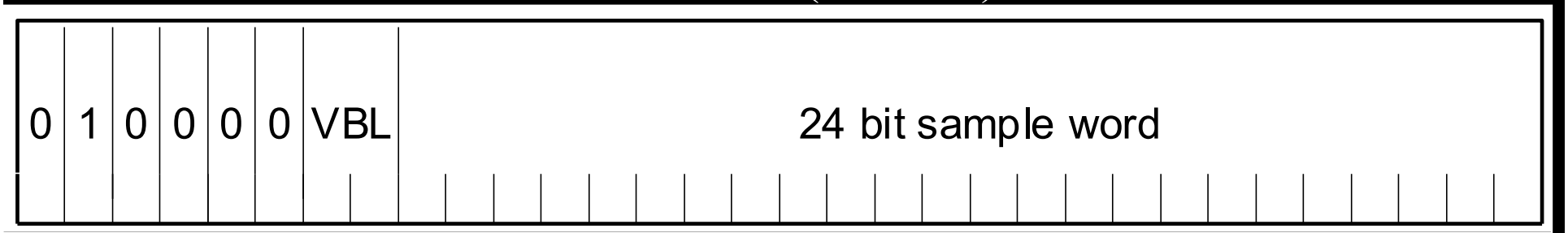
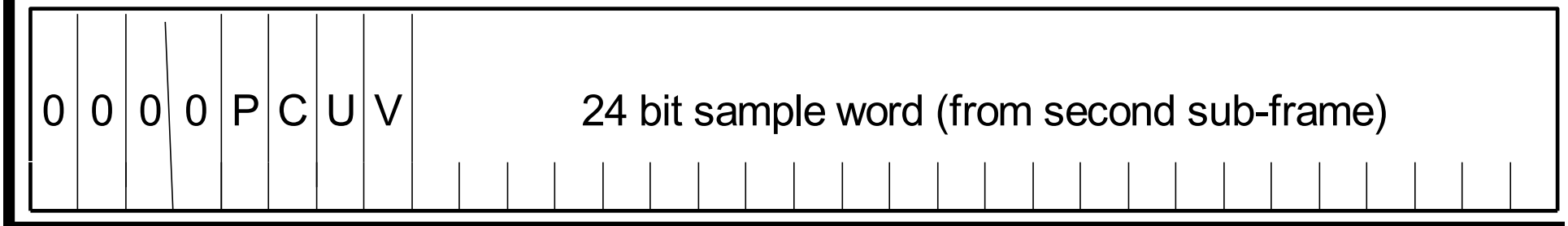
IEC61883-6 Quadlet (32-bit) Formats

Raw audio (AM824)



IEC60958 (“AES/EBU”) conformant (AM824)



Thanks to Richard Foss

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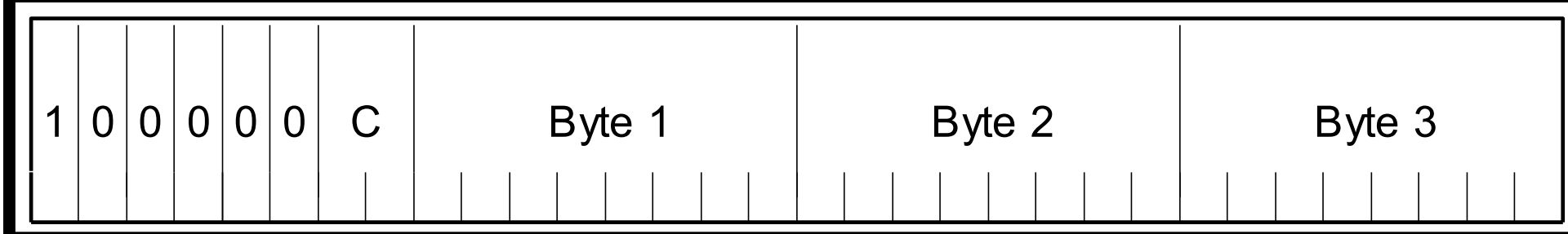
IEC61883-6 MIDI Format

MIDI conformant - format for MIDI data (AM824)



+

MMA RP-027

Thanks to Richard Foss

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Protocol

61883-6 streaming layer overview

- Transmitting
  - Creating a packet from n samples
  - Provide time stamp at specified interval
  - Enough samples arrived to make a packet?
- Receiving
  - Reassemble a stream
  - Playback so the sample is rendered as the associated time stamp indicates.

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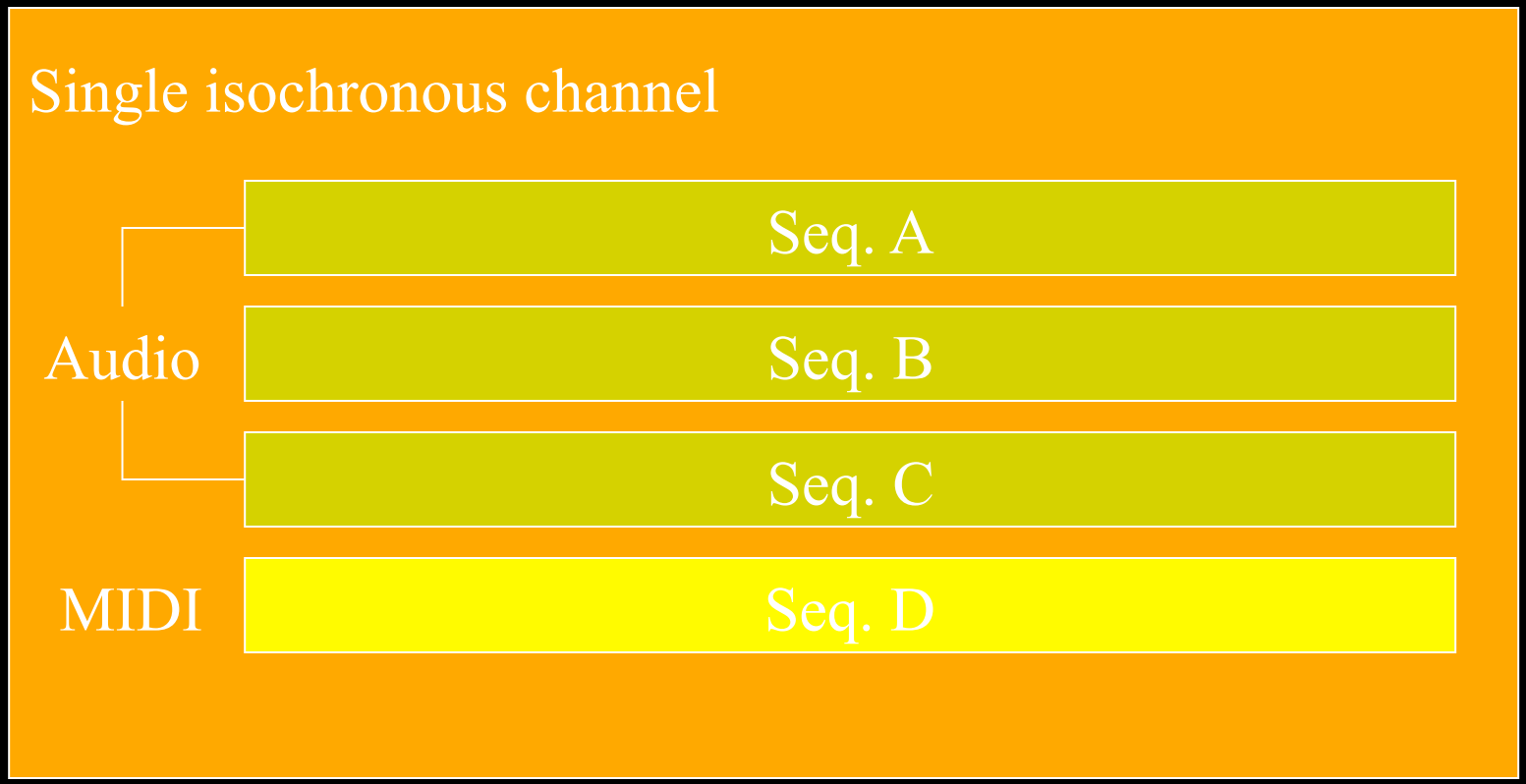
Protocol

Streaming layer overview

Example



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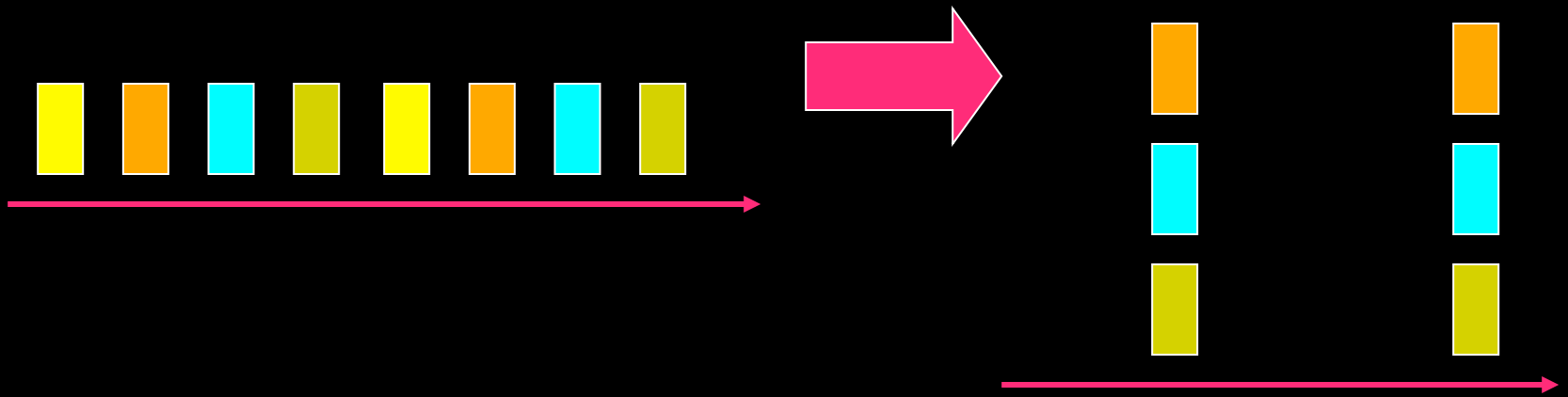
Protocol

Streaming layer overview

Audio data or MIDI over 1394

Playback timing



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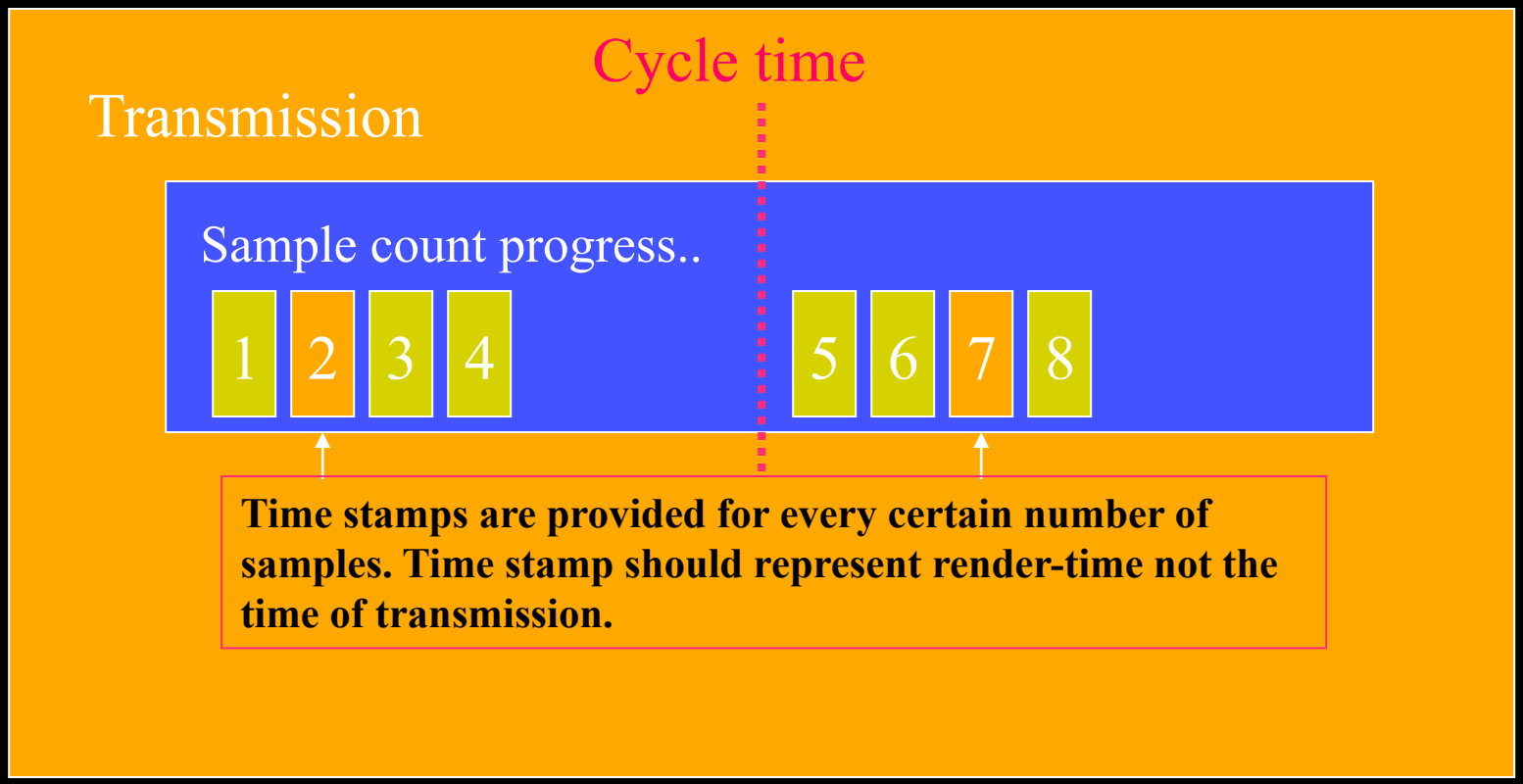
Protocol

Streaming layer overview – audio streaming



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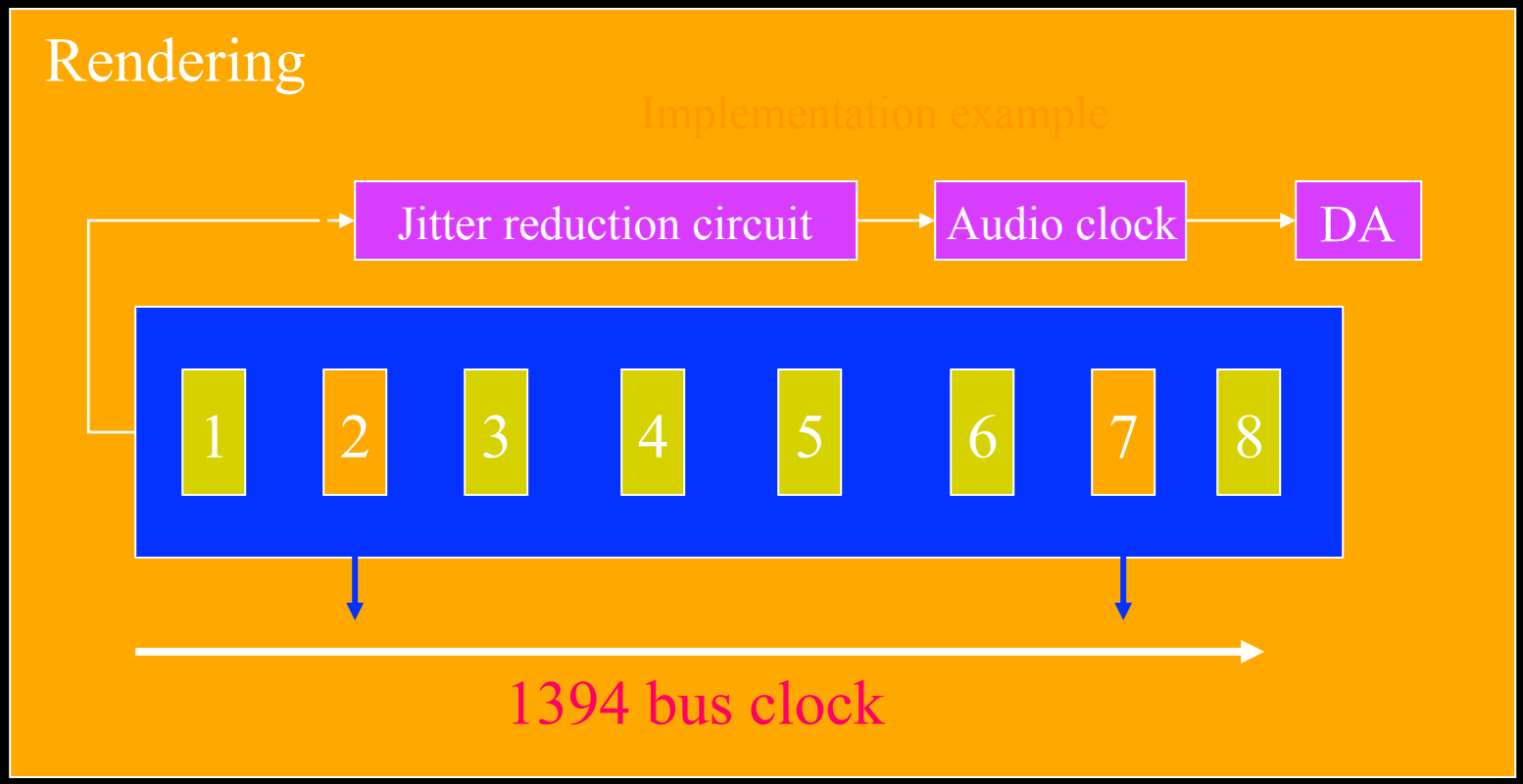
Protocol

Streaming layer overview – audio streaming



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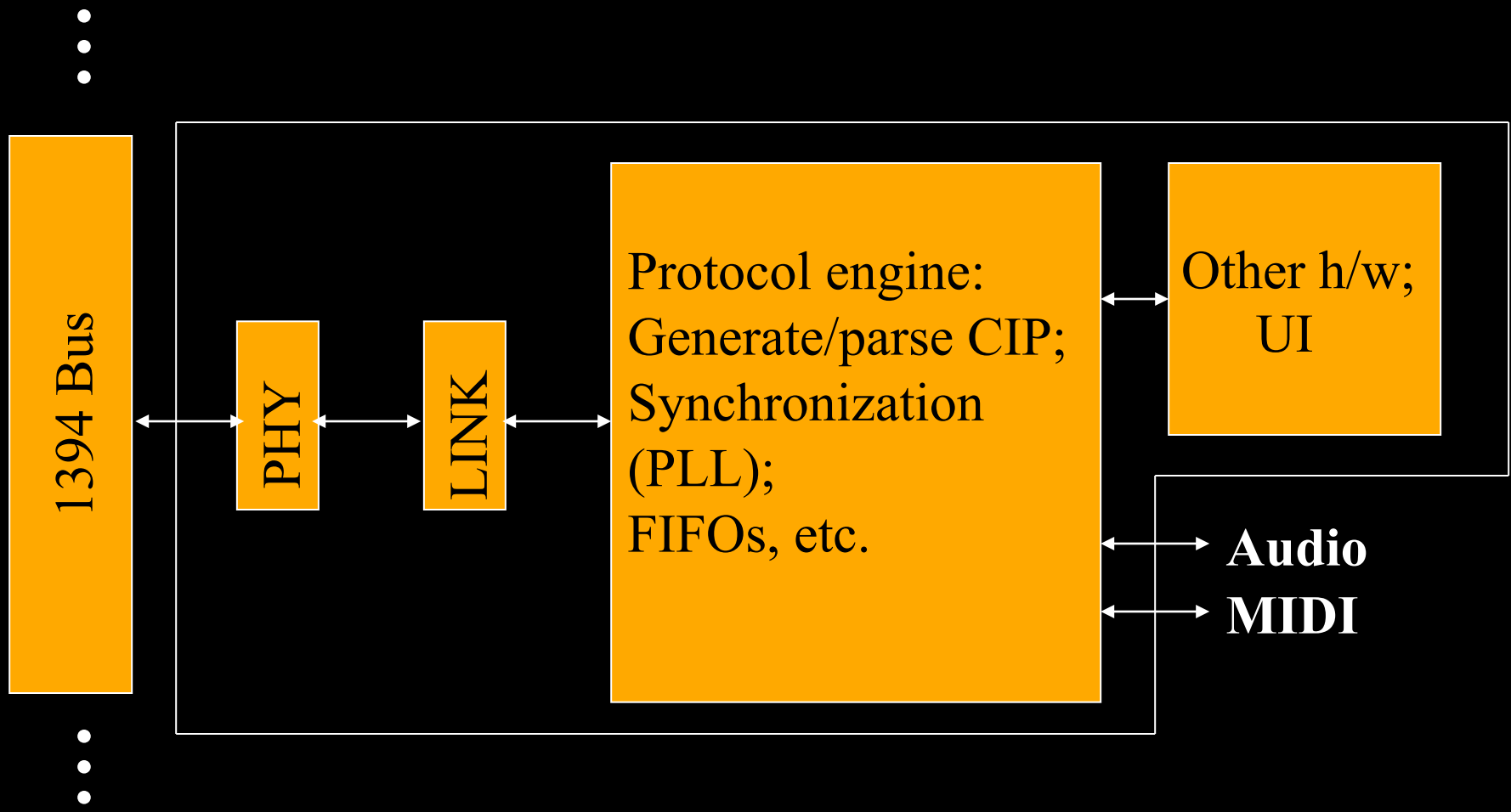
1394 Audio/MIDI Device



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Specifications

YAMAHA

1394TA

IEC61883 family

IEEE1394

AV/C

AV/C - Audio/Visual Control (consumer)

- AV/C specification defines AV/C Subunit
- AV/C Subunit: A logical unit that can be accessed by application software on the Mac/PC for example

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Specifications

YAMAHA

1394TA

IEC61883 family

IEEE1394

mLAN Node Control Package

mLAN- specific functions

MMA RP-027

- Complies with MMA RP-027
- Powerful word clock master management
- Sophisticated distributed connection control

And more...

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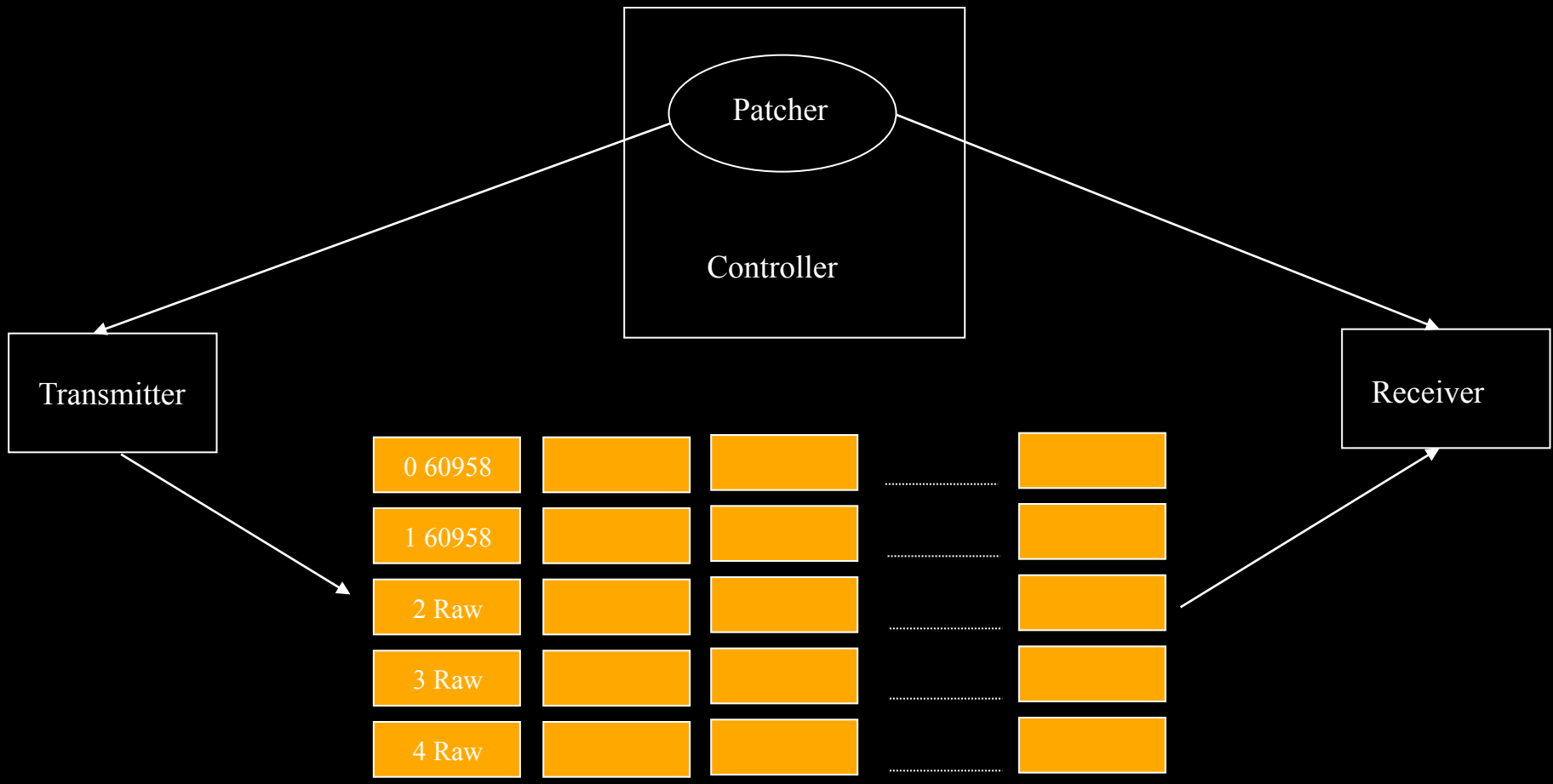
Connection Management



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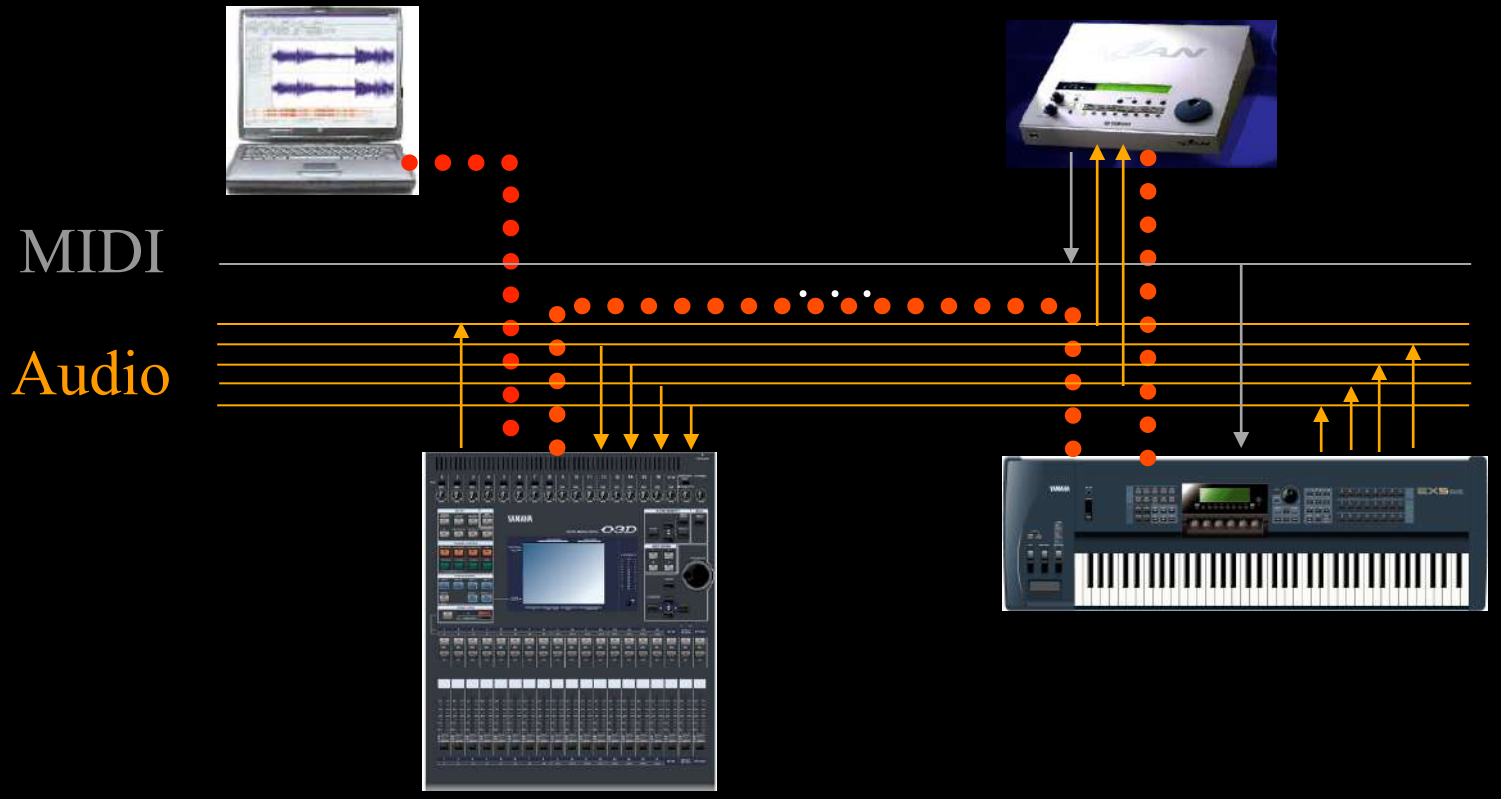
mLAN Connection Management
- in rehearsal studio -



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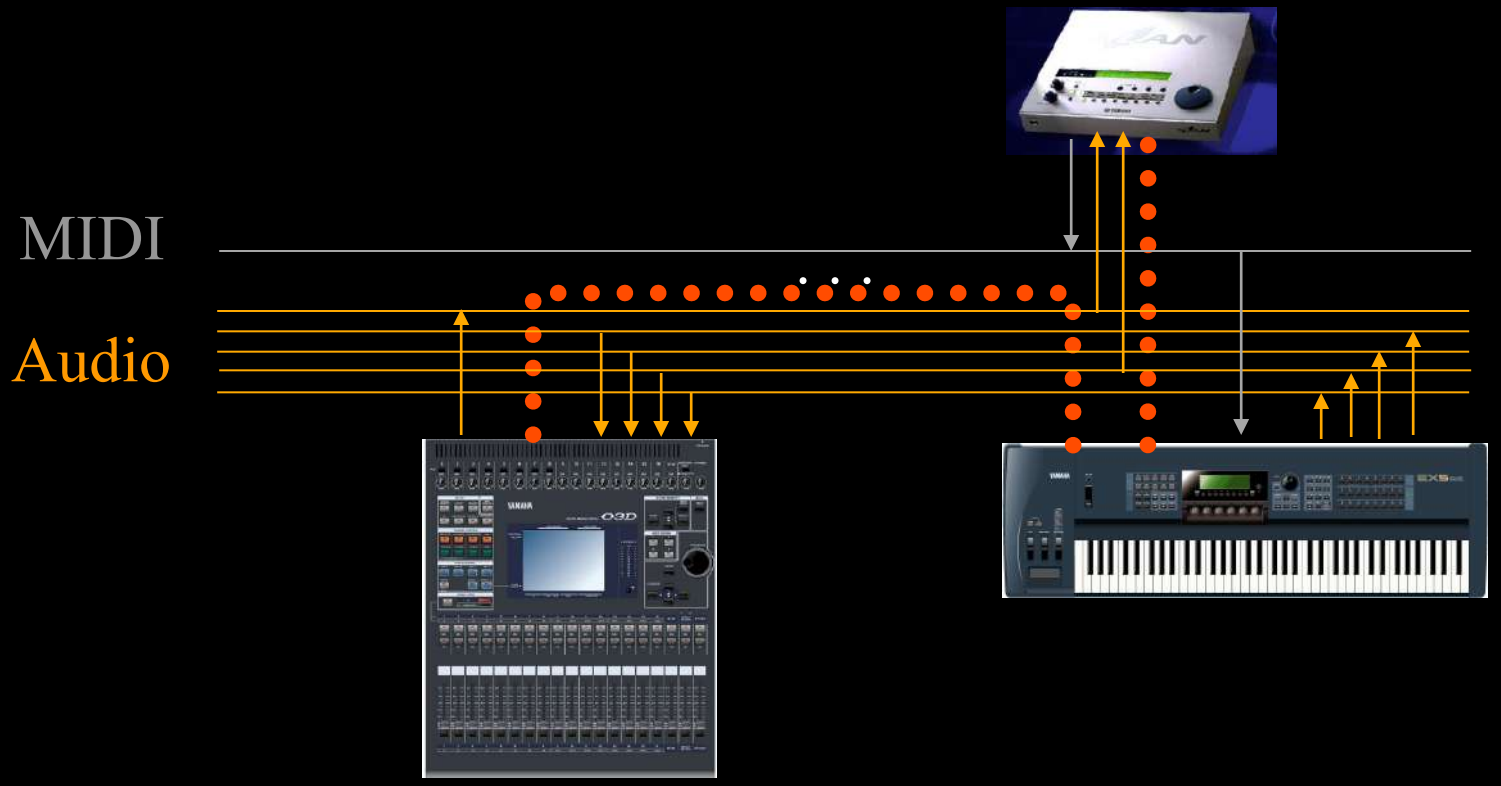
mLAN Connection Management
- on stage -



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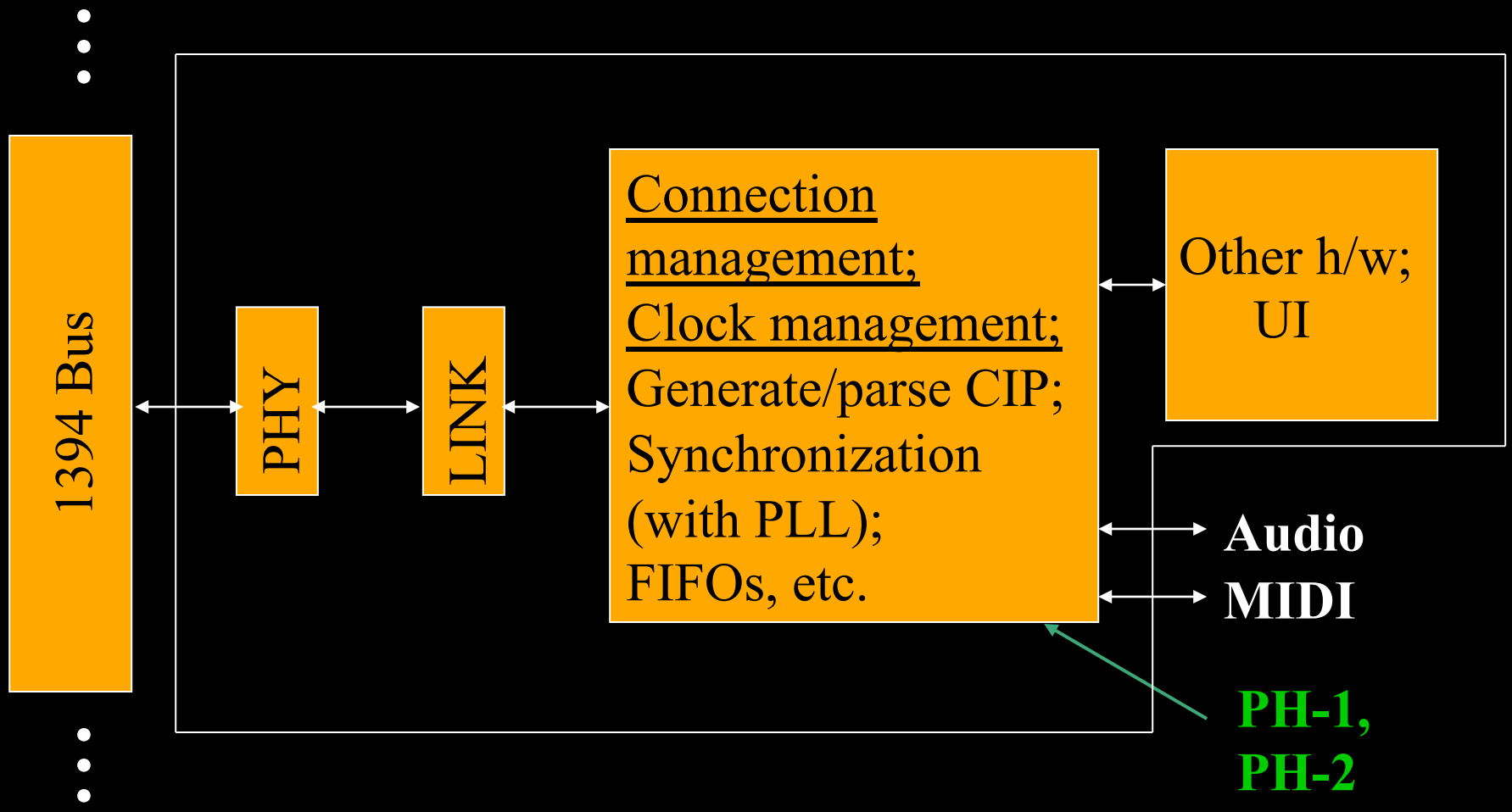
mLAN Device Architecture (1)



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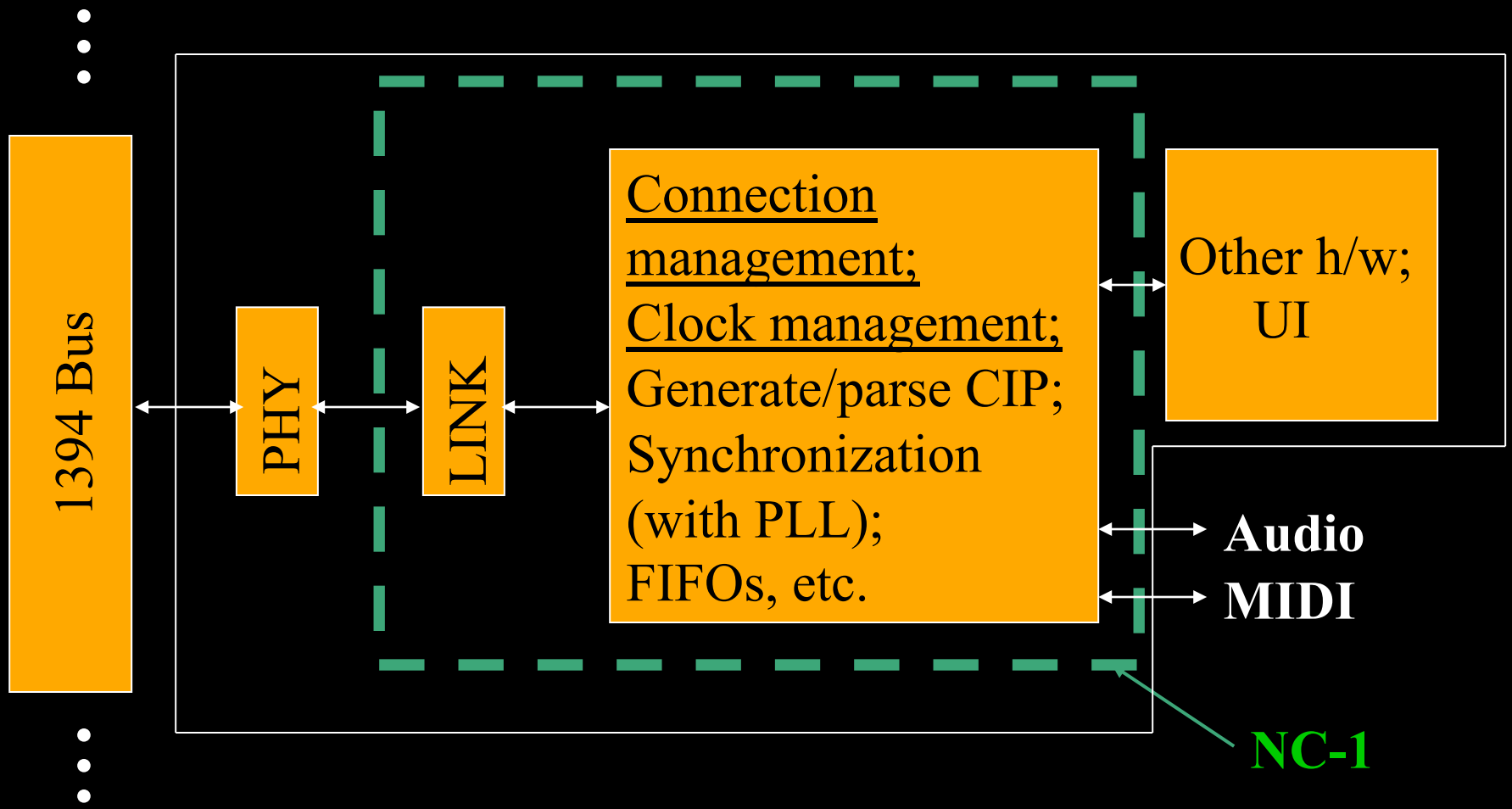
mLAN Device Architecture (2)



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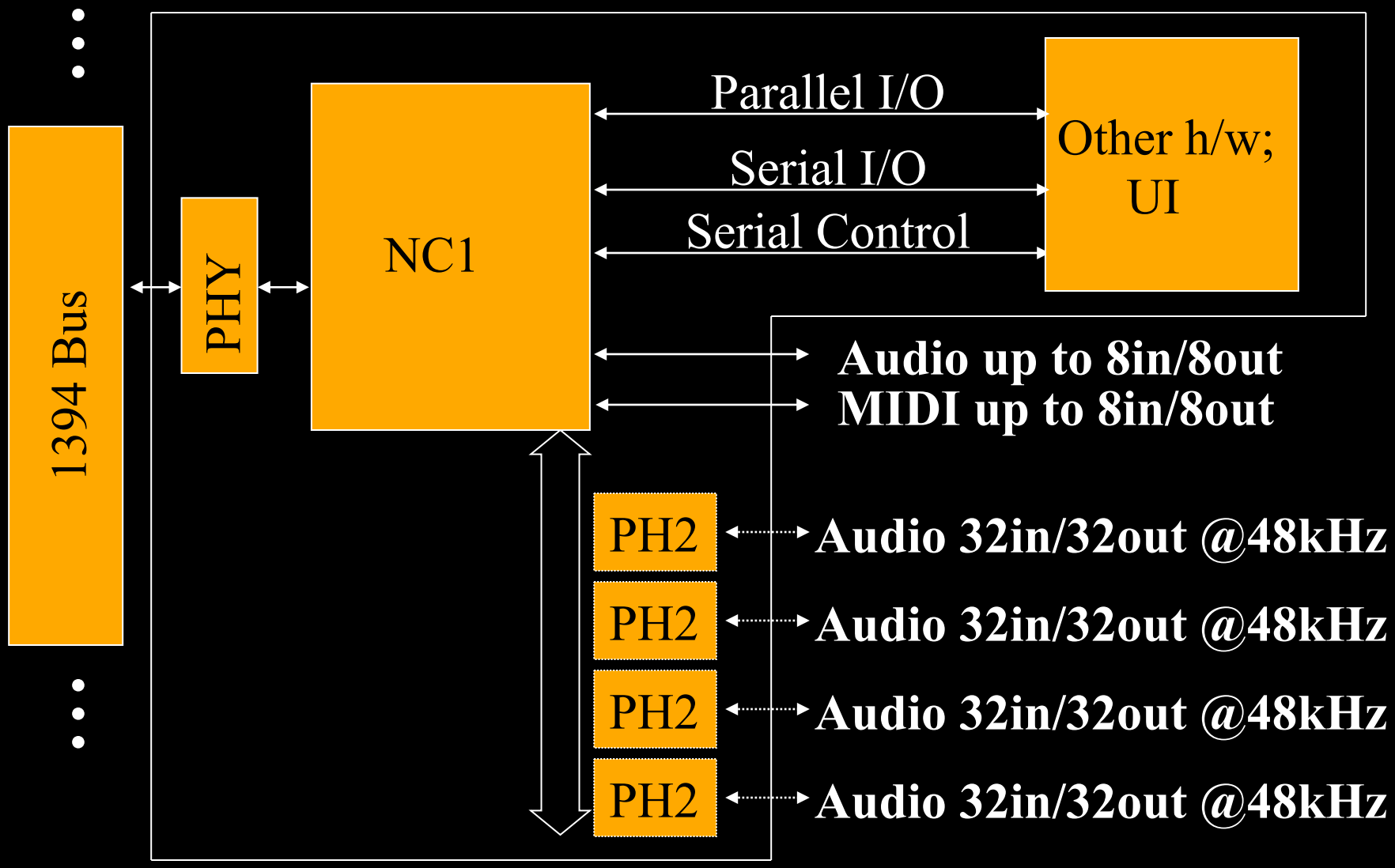
NC1/PH2 Combination



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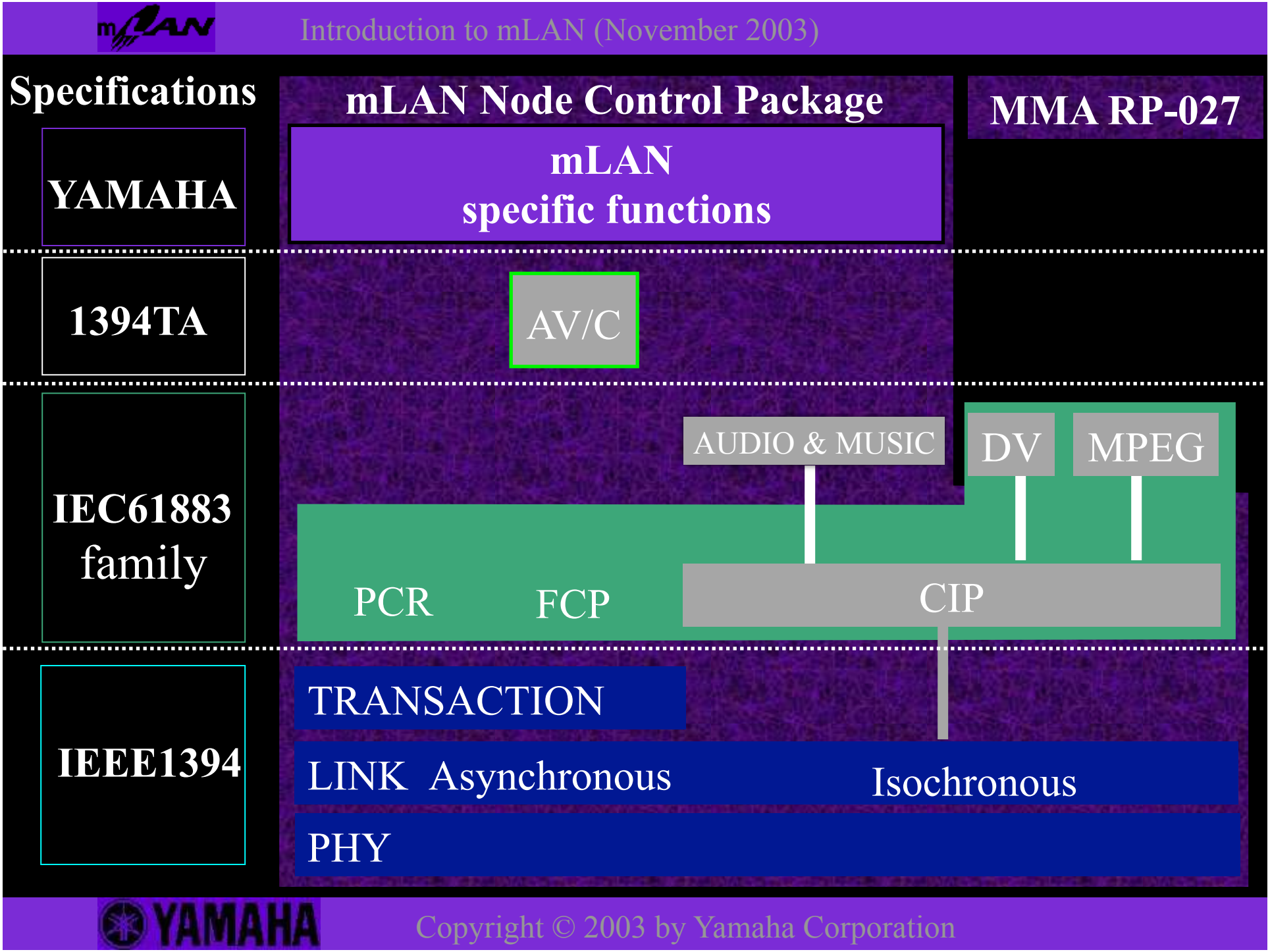

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Ongoing Development

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63 Node Demonstration

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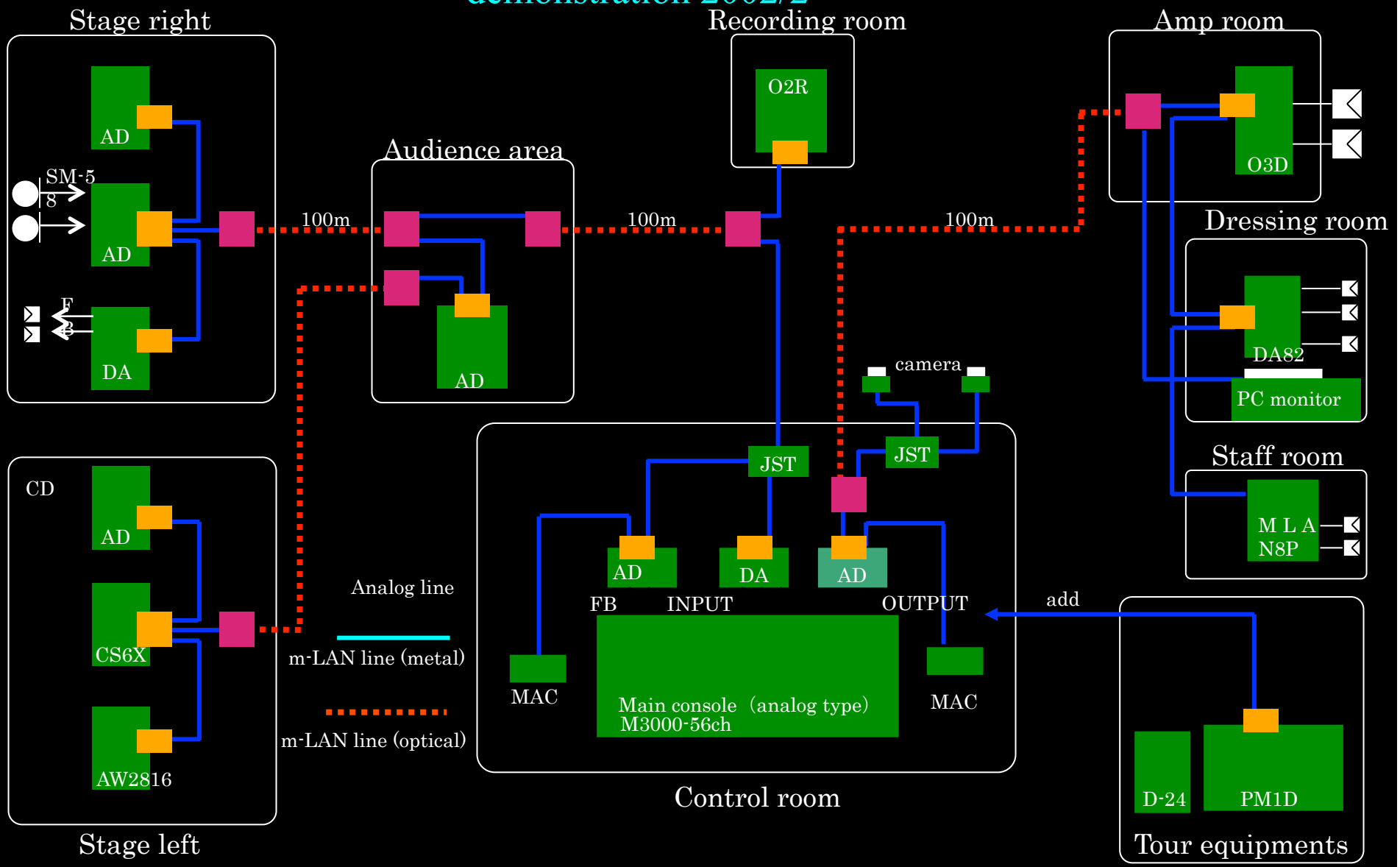
demonstration 2002/2



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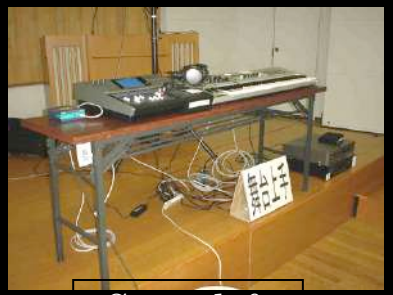
Demonstration 2002/2

Stage right



Stage left

Amp room

Audience area

Dressing room

Control room

Tour equipment

Staff room

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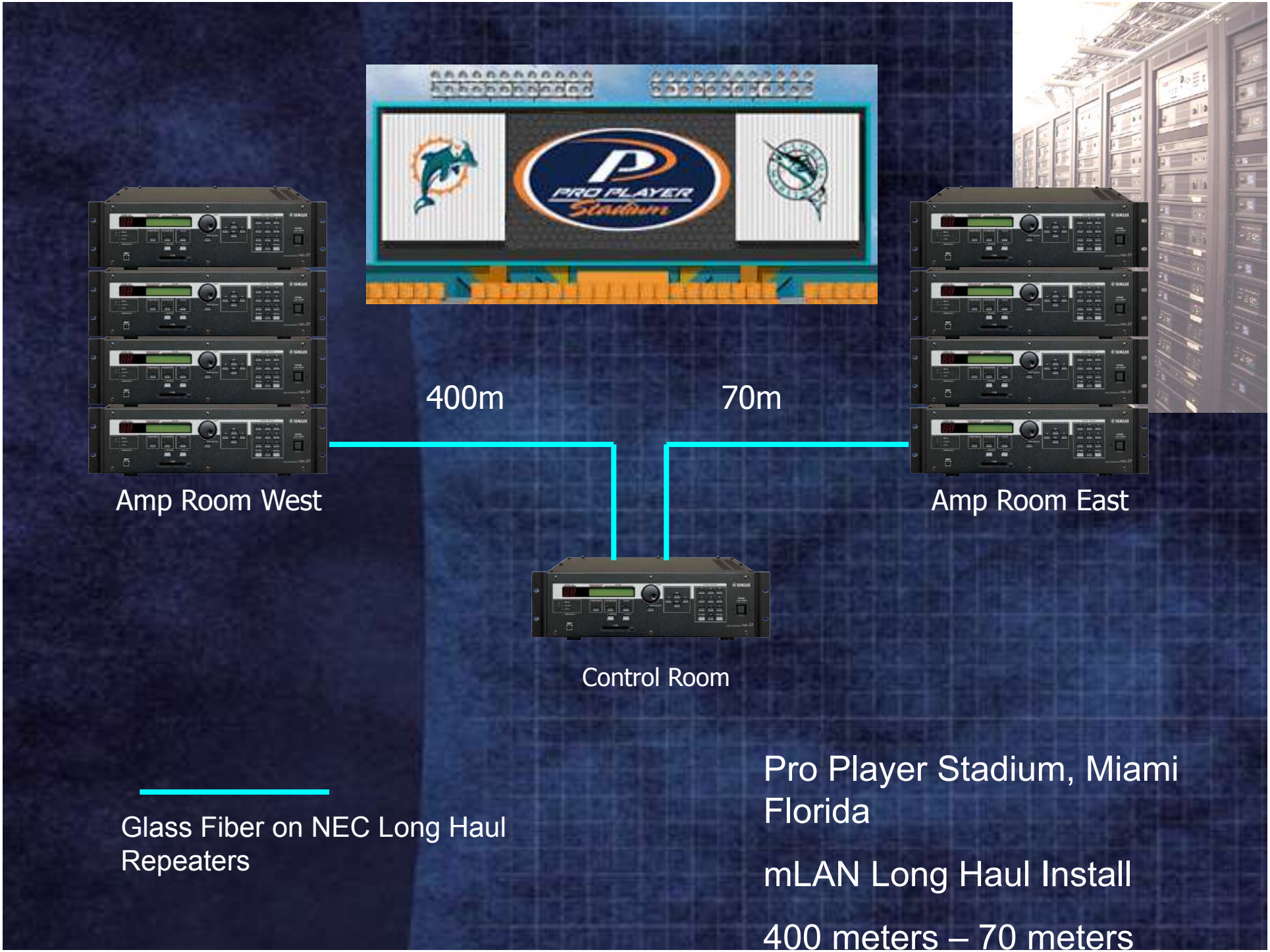
PRO PLAYER Stadium
400m
70m
Amp Room West
Amp Room East
Control Room
Glass Fiber on NEC Long Haul Repeaters
Pro Player Stadium, Miami Florida
mLAN Long Haul Install
400 meters – 70 meters

Example installation (YAMAHA Hall)

Control Room

Hall

Amp Room

30 m

50 m

50 m

Announce Booth

Projection Room

Location	Ginza Tokyo Japan
Seats	524
Volume	1,733 m^3
Architect	RAYMOND Architectural Design Office,INC.

GET CONNECTED mLAN YAMAHA

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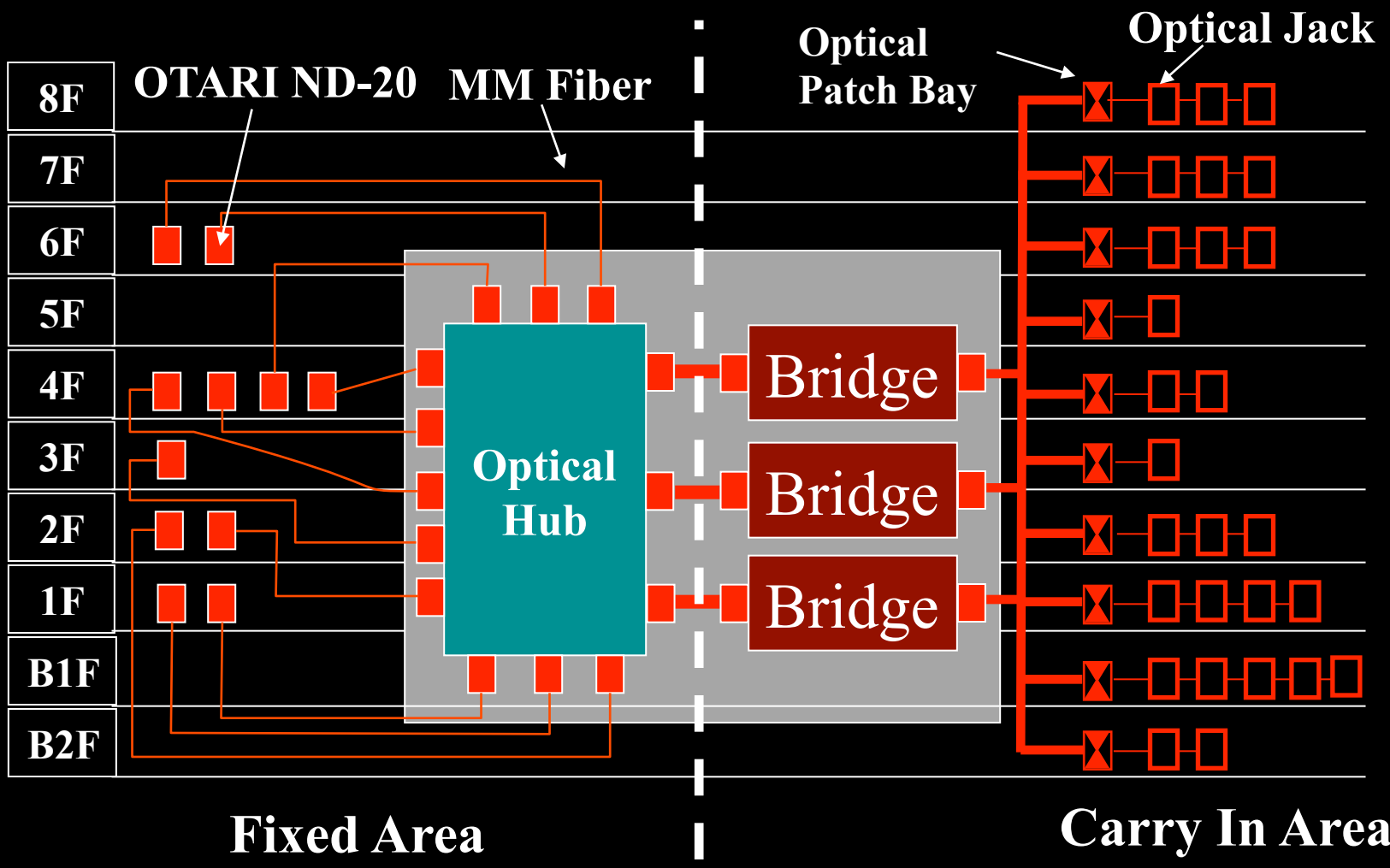
mLAN for a Key TV Station



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- Latter Day Saints Conference Center
- Queen Mary II

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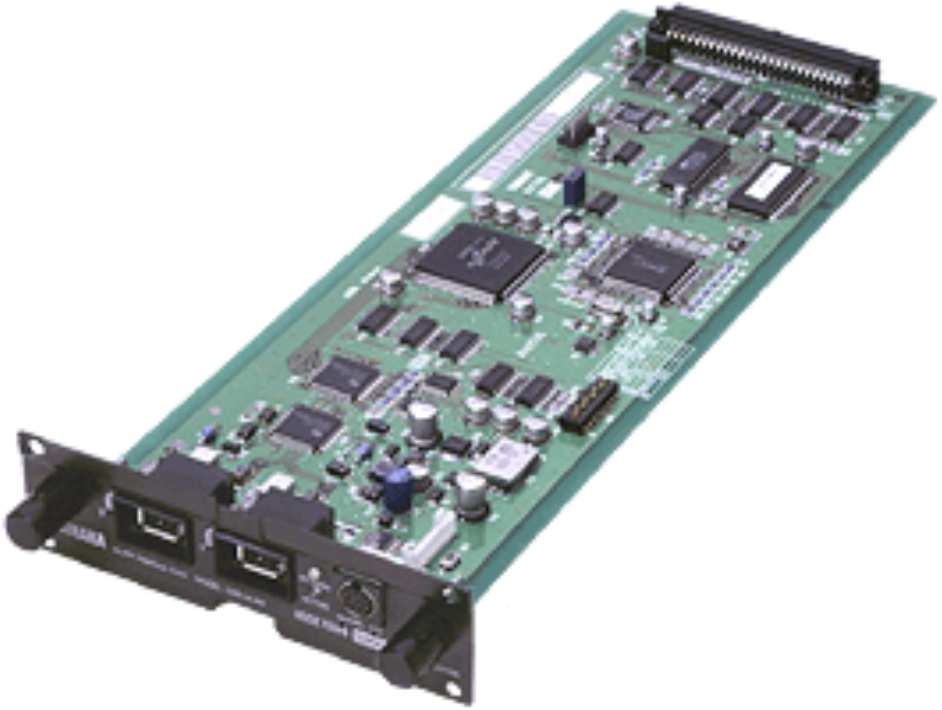

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