UM11593

PTN3816EVM evaluation board

Rev. 1.0 — 8 June 2021 **User manual**

Document information

Information	Content
Keywords	PTN3816, DisplayPort, Linear Redriver
Abstract	This user manual demonstrates application board capability of interfacing a DisplayPort monitor with a host computer through full size DP connector cable. The application board is intended for use as an evaluation and customer demonstration tool, as well as a reference design.

Revision history

Rev	Date	Description
v.1.0	20210608	Initial version

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2 Introduction

PTN3816 is a DisplayPort high-performance linear redriver, suitable for DisplayPort Upstream (DP source side) and Downstream (DP sink side) applications. It addresses high-speed signal integrity enhancement requirements for the implementation of DisplayPort interfaces in various system platforms and applications.

This document explains in detail how the PTN3816EVM evaluation board should be connected in a system to interface between a host PC and a DisplayPort monitor. The document also illustrates using DIP switch settings to configure the transmitters' and receivers' equalizer settings on the PTN3816EVM evaluation board.

3 Finding kit resources and information on the NXP web site

NXP Semiconductors provides online resources for this evaluation board and its supported device(s) on http://www.nxp.com.

The information page for PTN3816EVM evaluation board is at http://www.nxp.com/PTN3816EVM. The information page provides overview information, documentation, software and tools, parametrics, ordering information and a Getting Started tab. The Getting Started tab provides quick-reference information applicable to using the PTN3816EVM evaluation board, including the downloadable assets referenced in this document.

3.1 Collaborate in the NXP community

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4 Get started

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This section will guide you through the process of setting up and using the PTN3816EVM evaluation board.

4.1 Kit contents/packing list

The PTN3816EVM contents include:

- Assembled and tested evaluation board in an anti-static bag
- Quick Start Guide

4.2 Minimum system requirements

This evaluation board requires a Windows PC workstation. Meeting these minimum specifications should produce great results when working with this evaluation board.

- One PC/Notebook with DisplayPort connector
- One DisplayPort Monitor
- One micro USB cable to provide power to EVK
- Two DisplayPort cables (one to be connected between PC and EVK, and the other one to be plugged between EVK and DisplayPort monitor)
- EVK board

5 Get to know the hardware

5.1 Board features

- DisplayPort connections to PC and Monitor
- Onboard jumper settings for equalizer gain and output swing level

5.2 Board description

The PTN3816EVM evaluation board is designed to redrive DisplayPort signal outputs from a host graphics card, and interface with a DisplayPort monitor or a DP-to-HDMI level shifter on the other side. There is a row of DIP switches on the EVM that can change PTN3816's equalizer, output swing linearity and flat gain settings of the redriver channels.

The PTN3816EVM evaluation board's power is supplied from a micro-USB connector, and an on-board LDO converts 5 V input to both 3.3 V and 1.8 V. 3.3 V is only used to provide power to a downstream cable or level shifter dongle. 1.8 V is used for PTN3816.

5.3 Board components

Overview of the PTN3816EVM evaluation board is shown in Figure 1.

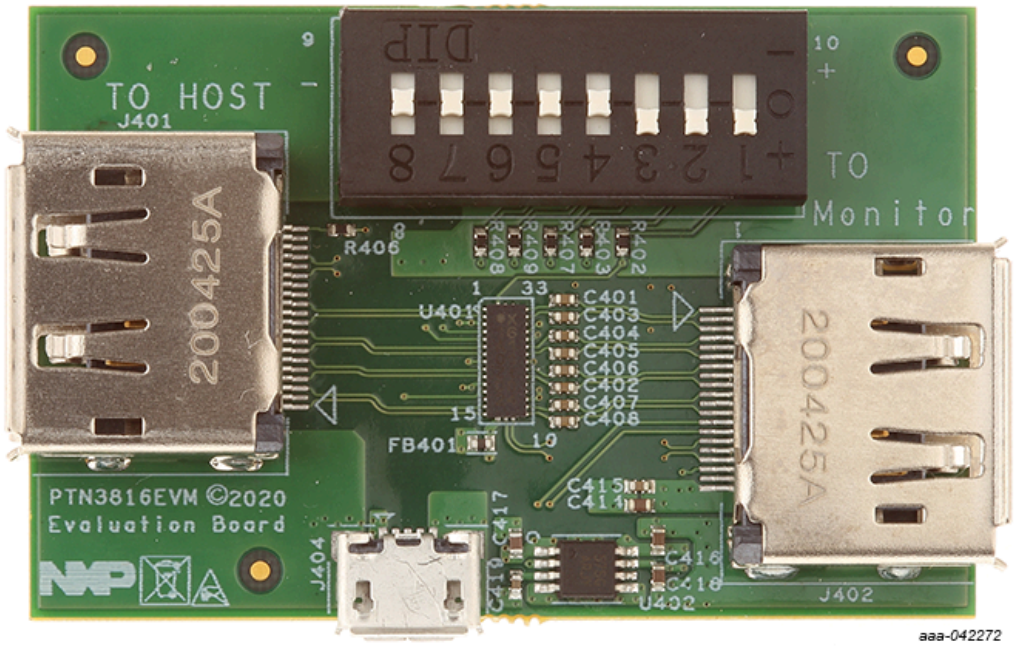


Figure 1. PTN3816EVM evaluation board

5.4 Block diagram

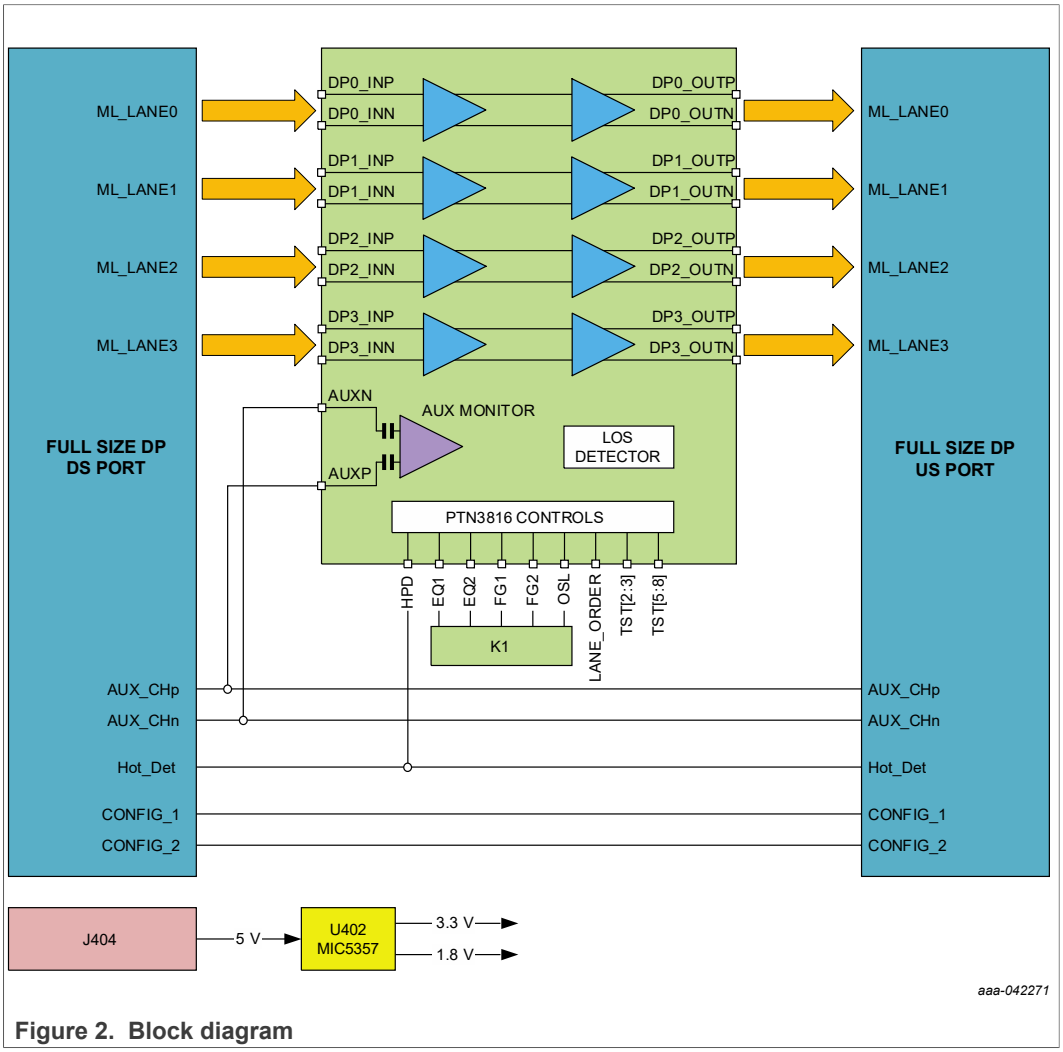


Figure 2. Block diagram

5.5 PTN3816EVM evaluation board schematics

5.5.1 PTN3816EVM evaluation board schematic

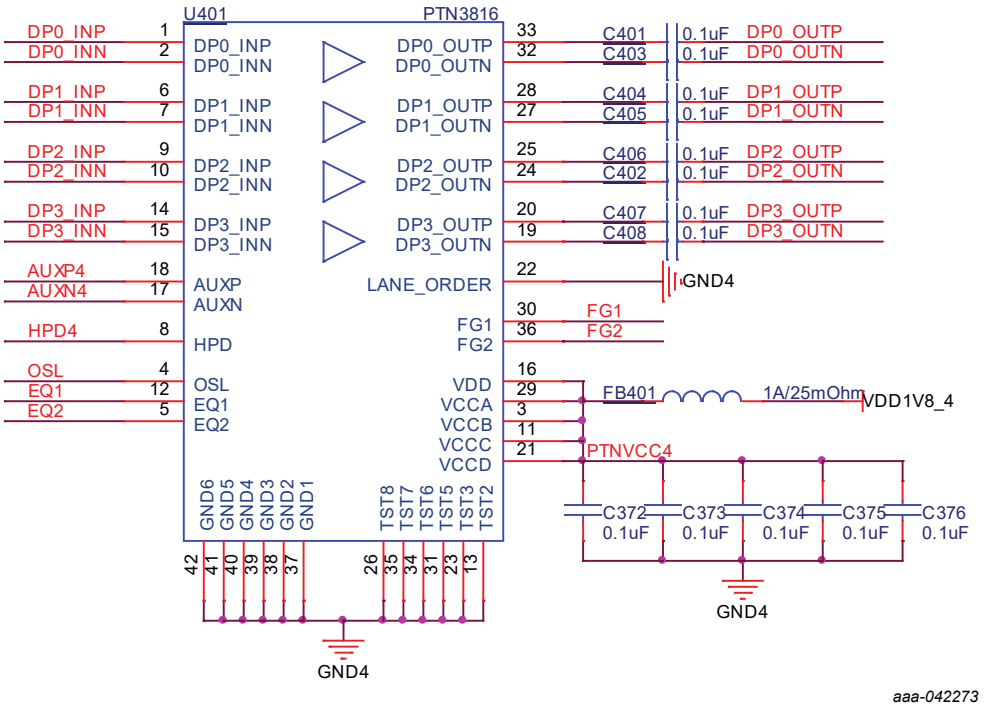
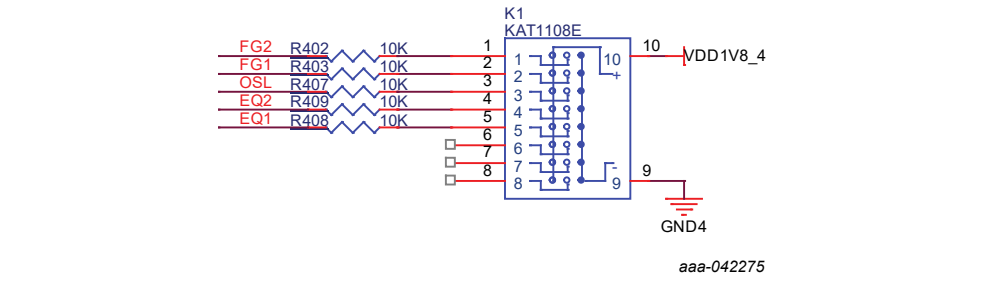


Figure 3. PTN3816EVM evaluation board schematic

5.5.2 PTN3816EVM evaluation board control switches



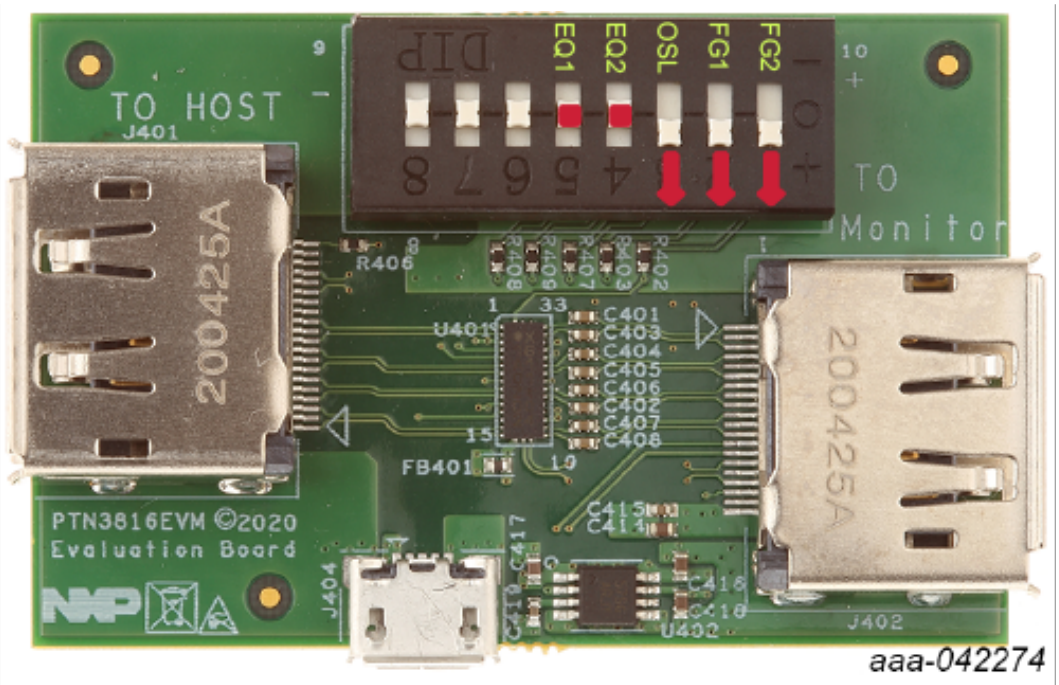


Figure 4. PTN3816EVM evaluation board control switches

By default, the DIP switches are set to the following configurations. The settings are suitable for 2-meter DP cable connected on both sides of the evaluation board (2-meter cable between host PC and EVM, and 2-meter cable between EVM to a DisplayPort monitor). User should change the setting if longer cable or channel conditions are degraded.

- Flat gain = -0.7 dB; FG2 = 1, FG1 = 1
- Output swing linearity = 950 mVppd; OSL = 1
- Equalizer = 10.2 dB @ 8.1 Gbps; EQ2 = HiZ, EQ1 = HiZ

Table 1. Flat gain configuration

FG2	FG1	Flat gain (dB) of individual DP lanes			
		Lane 3	Lane 2	Lane 1	Lane 0
LOW	LOW	0.7	0.7	0.7	0.7
LOW	OPEN	0.7	0.7	0.7	-0.7
LOW	HIGH	0.7	0.7	-0.7	0.7
OPEN	LOW	0.7	0.7	-0.7	-0.7
OPEN	OPEN	0.7	-0.7	0.7	0.7
OPEN	HIGH	0.7	-0.7	-0.7	0.7
HIGH	LOW	-0.7	0.7	0.7	0.7
HIGH	OPEN	-0.7	-0.7	0.7	0.7
HIGH	HIGH	-0.7	-0.7	-0.7	-0.7

Table 2. OSL configuration

OSL	Line driver output swing linearity (OSL) governing -1 dB compression level
OPEN	650 mVppd
LOW	800 mVppd
HIGH	950 mVppd

Table 3. EQ[2:1] configuration: Flat gain -0.7 dB

Peaking Gain is the equalization gain at specific frequency relative to gain at 100 MHz and for typical Flat Gain (FG) value of -0.7 dB

EQ2	EQ1	Unit	Gain at 100 MHz	0.81 GHz	1.35 GHz	2.7 GHz	4.05 GHz	6.75 GHz	8 GHz	10 GHz
LOW	OPEN	dB	-1.1	-0.1	-0.2	0.6	1.3	2.6	3.4	3.8
OPEN	LOW	dB	-1.1	0.0	-0.1	0.8	1.6	3.1	4.0	4.6
HIGH	HIGH	dB	-1.1	0.3	0.2	1.6	2.6	4.7	5.9	7.2
HIGH	OPEN	dB	-1.1	0.9	1.0	2.7	4.0	6.9	8.4	10.2
HIGH	LOW	dB	-1.0	1.6	2.0	4.0	5.8	9.3	11.1	13.3
OPEN	HIGH	dB	-1.0	2.3	2.8	5.3	7.4	11.4	13.4	15.9
LOW	HIGH	dB	-1.0	3.1	3.8	6.7	9.1	13.6	15.8	18.4
OPEN	OPEN	dB	-0.9	3.7	4.7	7.7	10.2	15.2	17.5	20
LOW	LOW	dB	-0.9	3.7	4.7	7.7	10.2	15.2	17.6	20

Table 4. EQ[2:1] configuration: Flat gain 0.7 dB

Peaking Gain is the equalization gain at specific frequency relative to gain at 100 MHz and for typical Flat Gain (FG) value of 0.7 dB

EQ2	EQ1	Unit	Gain at 100 MHz	0.81 GHz	1.35 GHz	2.7 GHz	4.05 GHz	6.75 GHz	8 GHz	10 GHz
LOW	OPEN	dB	0.5	-0.2	-0.4	-0.1	0.1	1.0	1.6	2.0
OPEN	LOW	dB	0.5	-0.1	-0.3	0.1	0.4	1.5	2.3	2.8
HIGH	HIGH	dB	0.5	0.1	0.0	0.7	1.3	3.0	4.1	5.4
HIGH	OPEN	dB	0.5	0.6	0.5	1.6	2.6	5.1	6.6	8.4
HIGH	LOW	dB	0.6	1.1	1.3	2.8	4.2	7.5	9.3	11.6
OPEN	HIGH	dB	0.6	1.7	2.0	4.0	5.7	9.7	11.7	14.2
LOW	HIGH	dB	0.6	2.4	2.8	5.3	7.4	11.9	14.2	16.8
OPEN	OPEN	dB	0.7	2.9	3.7	6.2	8.6	13.6	15.9	18.4
LOW	LOW	dB	0.7	2.9	3.7	6.2	8.6	13.6	16.0	18.4

5.5.3 DisplayPort upstream and downstream connectors

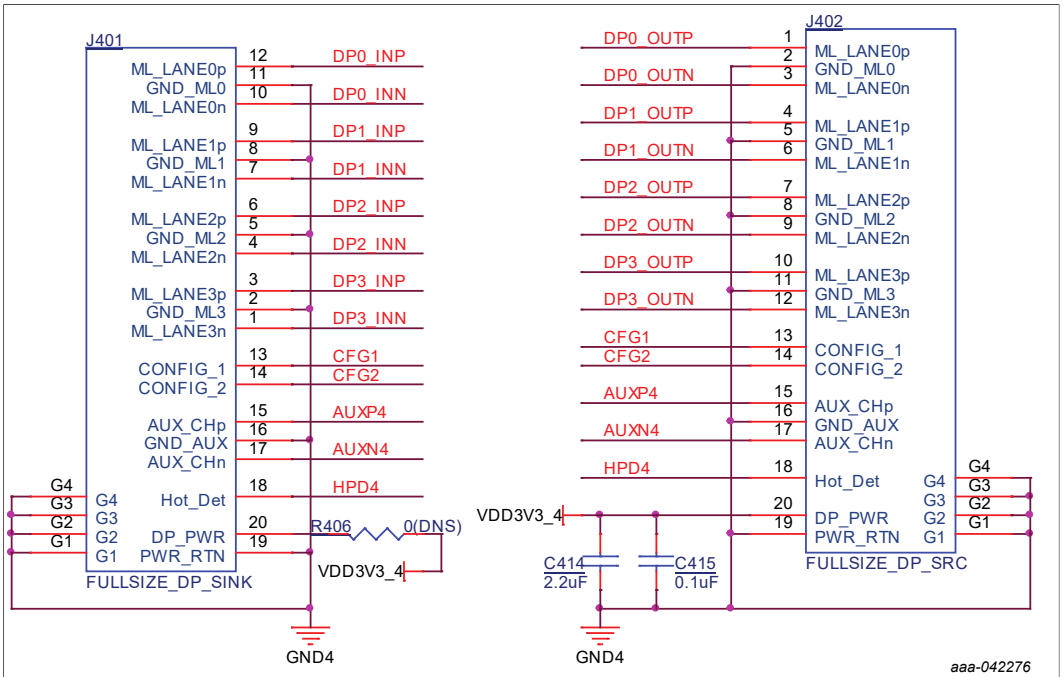


Figure 5. DP upstream and downstream connectors

5.5.4 Power supplies

Power to the add-in-card can be supplied from either PCIe gold finger's 3.3 V, or from an external 5 V barrel input. When all eight pieces of PTN3816 are active, the AIC can consume up to 2 A of current. It is recommended to use external 5 V supply (close J17 pin 1-2) for evaluation.

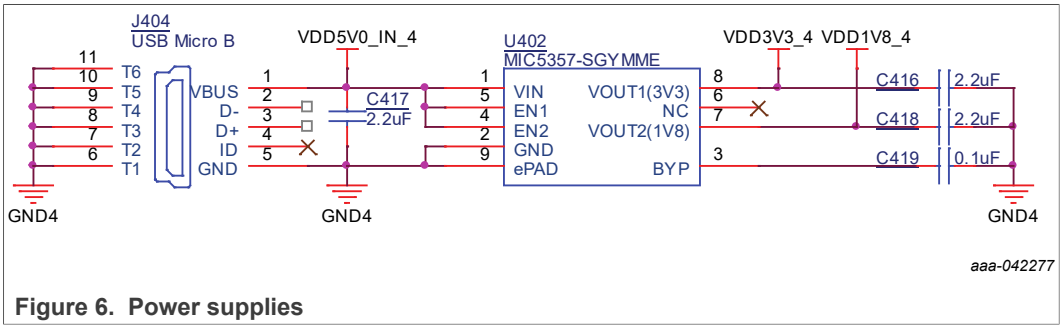
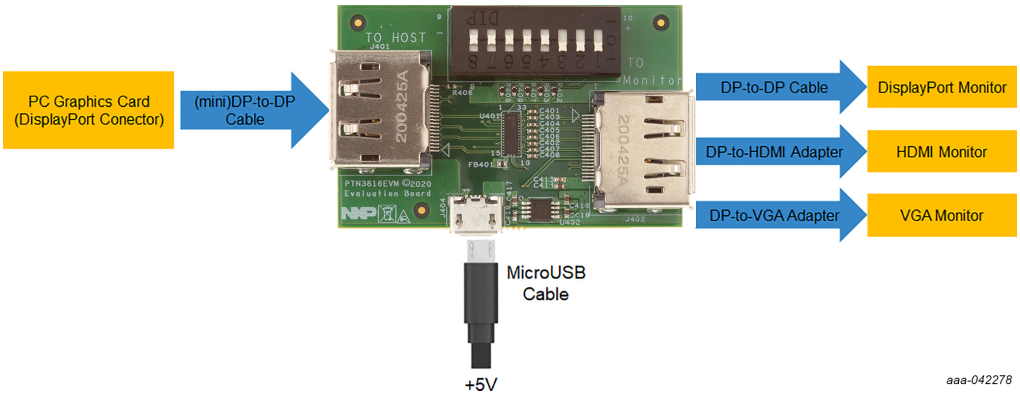


Figure 6. Power supplies

6 Configure the hardware



The PTN3816EVM evaluation board should be powered with a 5 V power supply using a MicroUSB cable (J404). DisplayPort connector on the left side of the board (J401, marked as “TO HOST”) should be connected to a PC’s graphics card through a DisplayPort Cable. DisplayPort connector on the right side of the board (J402, marked as “TO Monitor”) can connect to one of the following for evaluation purposes:

- DP-2-DP cable → to DisplayPort monitor
- DP-2-HDMI adapter → to HDMI monitor
- DP-2-VGA adapter → to VGA monitor

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