

# Digitizer Studio

A tool for high channel count applications



**TELEDYNE SP DEVICES**  
Everywhereyoulook™

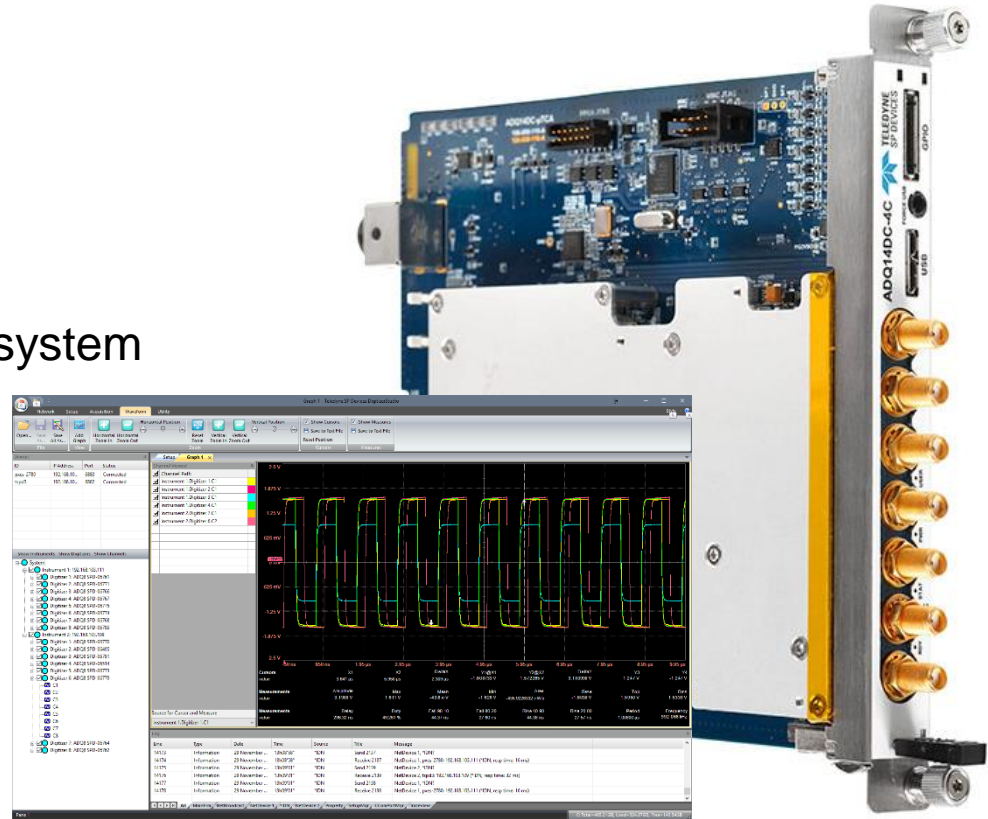
# Agenda

## ADQ digitizer for MTCA.4

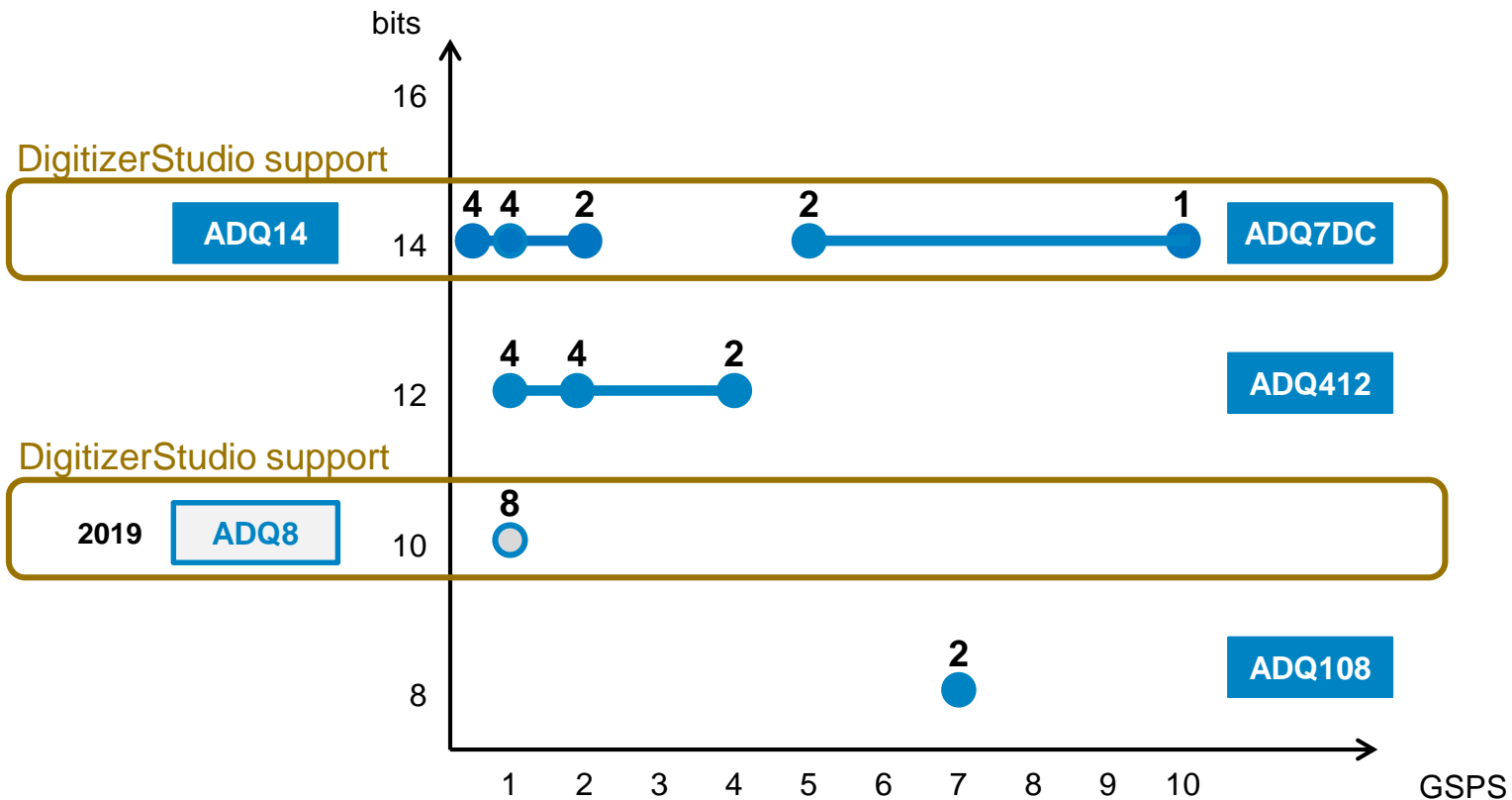
- Hardware
- Firmware
- Software

## System design

- Digitizer Studio controlling a large system
- Trigger a large system



# MTCA hardware

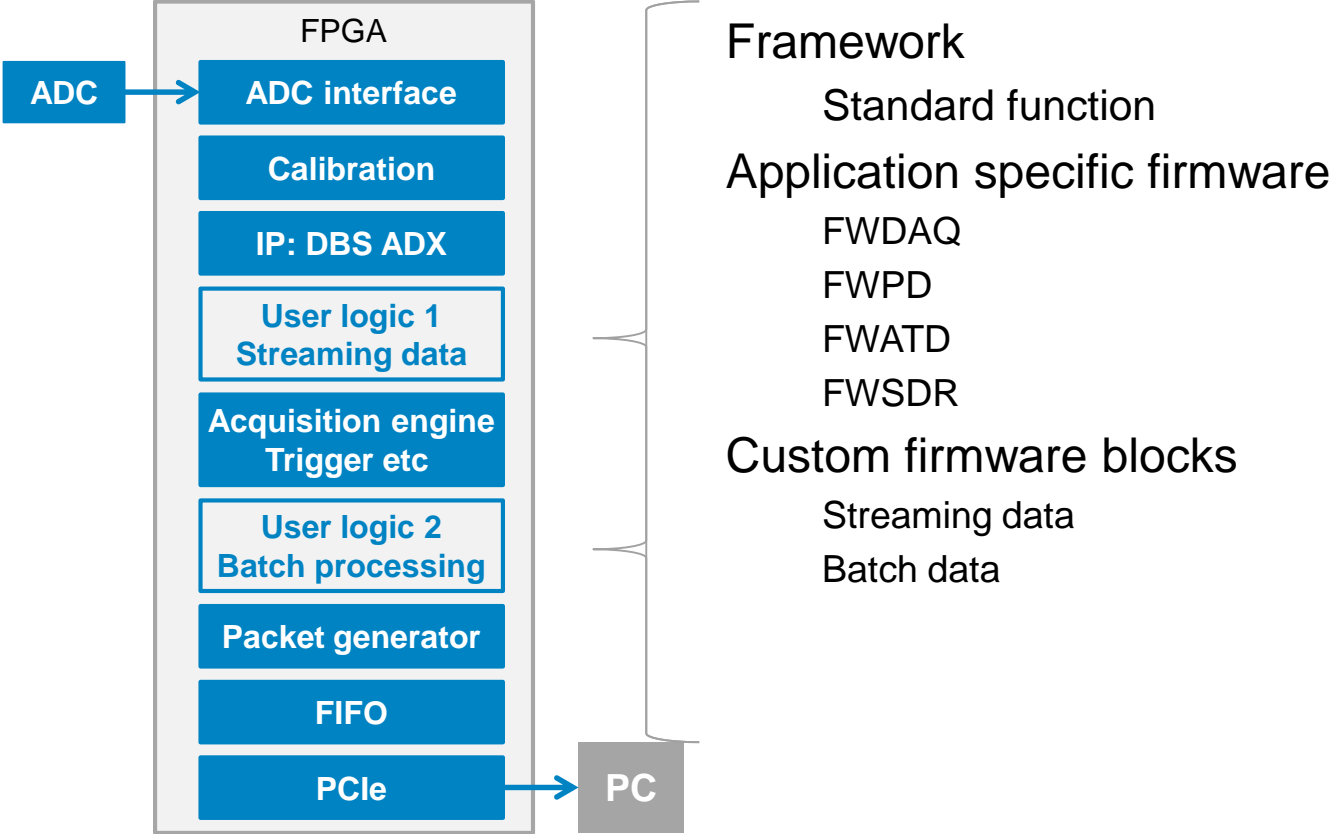


Available

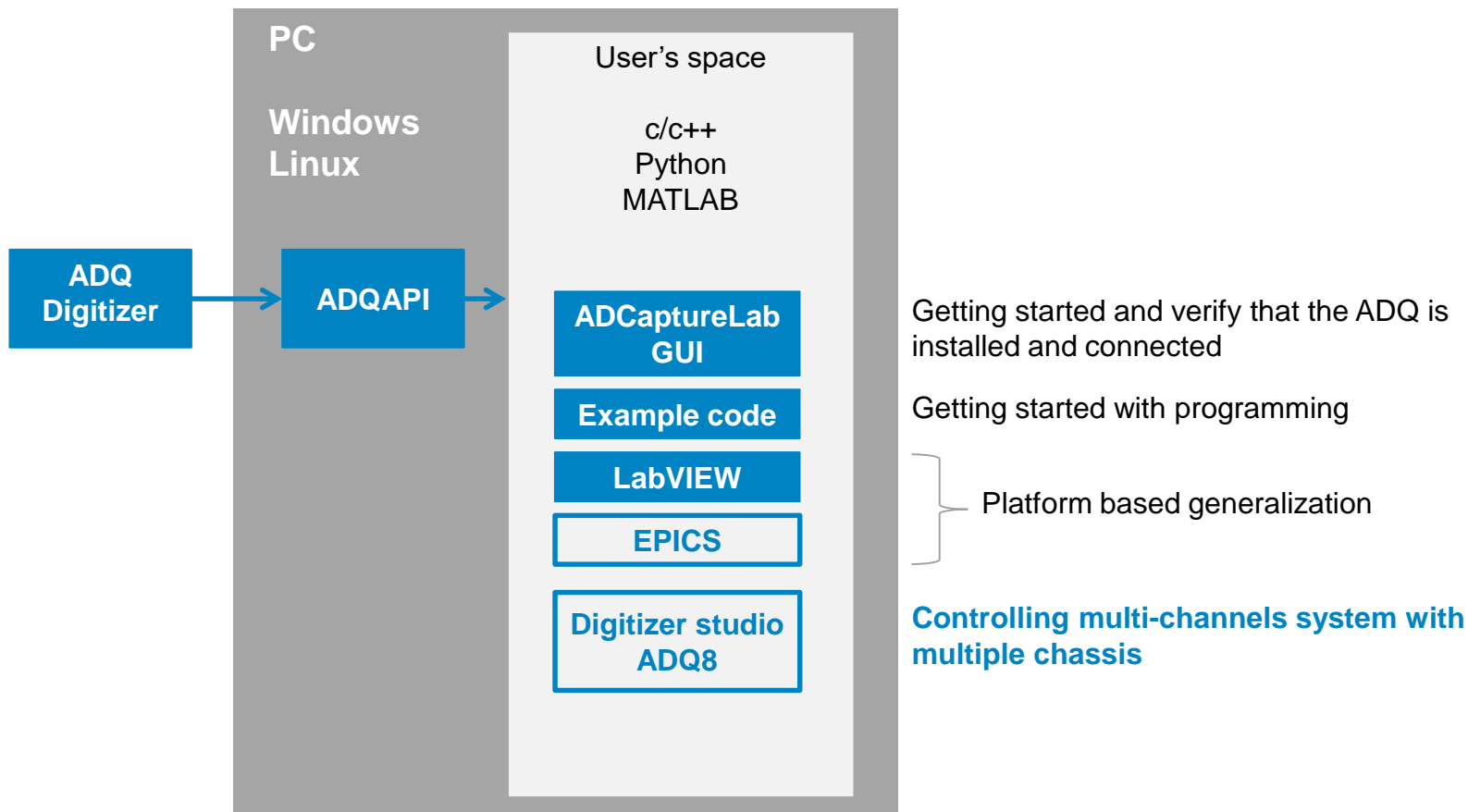
Planned

8 Channels

# Firmware



# Software



# DigitizerStudio set-up and plot

## Set-up acquisition

The screenshot shows the 'Setup' window for Teledyne SP Devices DigitizerStudio. The 'Acquisition' tab is active, displaying a table of channel configurations for four digitizers (Instrument 1, 2, 3, and 4). Each digitizer has four channels (C1-C4) configured with a 5V scale, 0 mV center, 1 Mohm coupling, and 10.0 µs scale. The delay is set to -50 ns, and the sample rate is 1 GS/s. The 'Waveform' tab is also visible, showing a list of instruments and digitizers.

System	Device ID	Digitizer ID	Channel ID	Name	Scale	Center [V]	Coupling	Horizontal Scale [s]	Delay [s]	Num Sample [S]	Sample Rate [S]	NumAverag
Instrument 1	Digitizer 1	C1	C1		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C2	C2		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C3	C3		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C4	C4		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
	Digitizer 2	C1	C1		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C2	C2		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C3	C3		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C4	C4		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
	Digitizer 3	C1	C1		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C2	C2		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C3	C3		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C4	C4		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
	Digitizer 4	C1	C1		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C2	C2		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C3	C3		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1
		C4	C4		5 V	0 mV	1 Mohm	10.0 µs	-50 ns	10 K	1 GS/s	1

## View result

The screenshot shows the 'Waveform' window in DigitizerStudio, displaying the acquisition results. The waveform shows a series of square pulses with a period of approximately 900 ns. The amplitude is approximately 1.875 V. The 'Channel View' shows four channels (Instrument 1.Digitizer 1.C1, Instrument 1.Digitizer 3.C1, Instrument 2.Digitizer 4.C1, and Instrument 2.Digitizer 6.C2) all showing the same waveform. The 'Measurements' table provides statistical data for the waveform.

Measurements	Amplitude	Min	Max	Avg	Best	Top	Rise
Value	3.641 µs	5.990 µs	2.308 µs	-1.608733 V	1.872266 V	3.180968 V	1.247 V

Measurements	Delay	Qty	Fall 90.20	Fall 10.80	Rise 10.80	Rise 20.80	Period	Frequency
Value	296.32 ns	49.26%	44.97 ns	27.60 ns	44.30 ns	27.67 ns	1.0800 µs	892.500 MHz

# DigitizerStudio – DigitizerController

Master PC

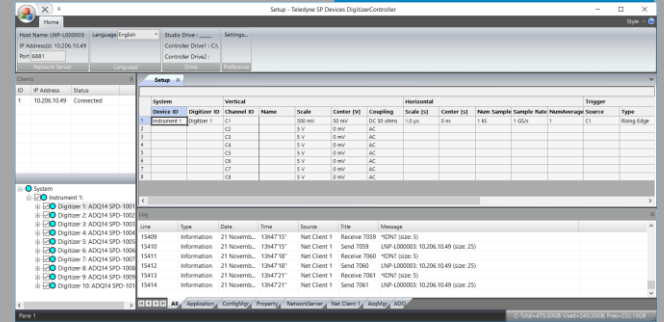
DigitizerStudio



Network

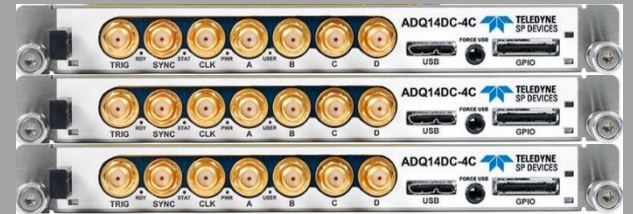
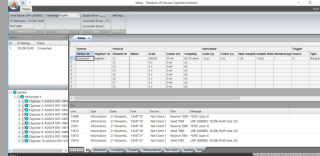
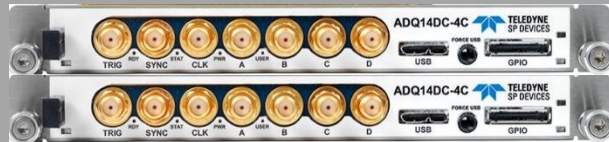
Remote Chassis

DigitizerController



Remote Chassis

DigitizerController



# Trigger method for large systems

Use one channel as trigger for interpolation of trigger timing

<25ps

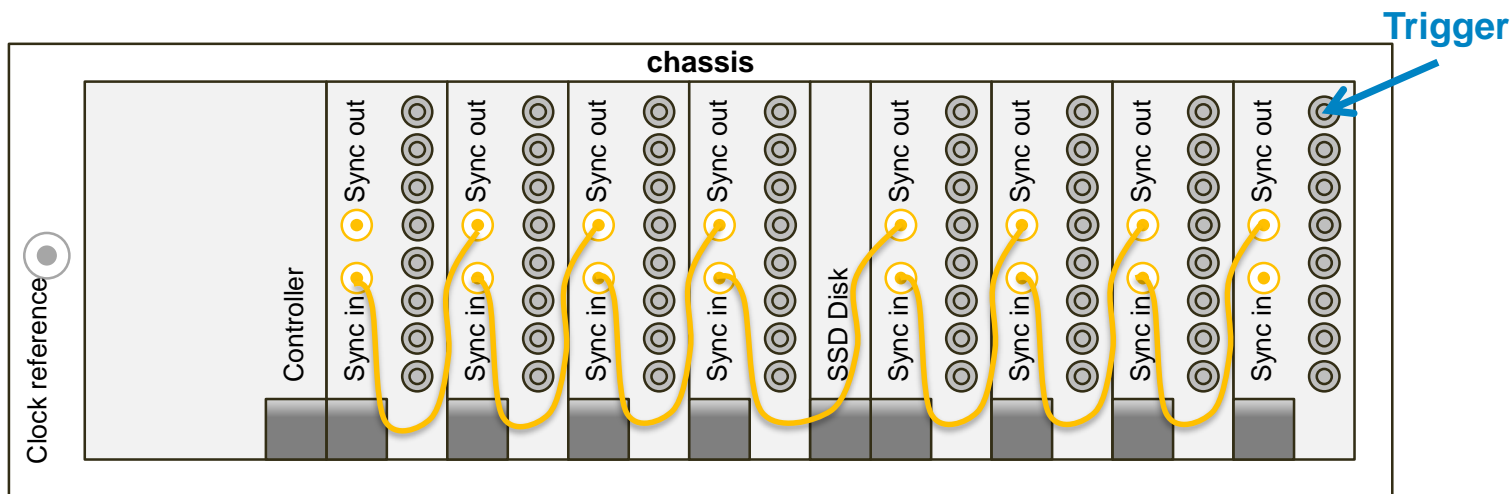
Chassis clock reference for timing alignment

Factory calibration timing between ADQ modules

Daisy chain trigger distribution

Calculate trigger position for each channel

200 ps system skew





# Summary of solutions for large systems

Hardware: ADQ-MTCA.4 (10 – 14 bits, 1 – 10 GSPS)

Control software: DigitizerStudio

System design: Daisy chain trigger for synchronization to 200 ps

