

# THPV021 TATU: A FLEXIBLE FPGA-BASED TRIGGER AND TIMER UNIT CREATED ON CompactRIO FOR THE FIRST SIRIUS BEAMLINES



MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATIONS



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**THPV021**

**The problem**

Synchronizing devices, e.g. in a quick scanning operation ("fly-scan")

Tatu as a MASTER signal generator

Tatu as a FOLLOWER and a signal distributor

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**Premises for Tatu**

- Pulses up to 4 kHz, combined and configurable by software
- EPICS as the control platform

- at least one CompactRIO unit available, per beamline hutch (904x, 40 MHz FPGA clock and Linux RT)
- ancillary small code could run in the same CRIO chassis

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**Tatu management**

**MASTER PULSE mode**

Input port acquisition  
Ports IO0 to IO3 (IO8 to IO11, IO16 to IO19)

Event detection (trigger)  
P0 to P3 (P8 to P11, P16 to P19)

Output Generation  
Ports IO4 to IO7 (IO12 to IO15, IO20 to IO23)

Forced Trigger

Tatu as MASTER  
(5 points, 1 per ms)  
4 output portas  
Pulsed width: 150 μs

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**An example of use**

```

$ caput MNC:B:RIO01:9401H:Activate Off (or: 0)
$ caput MNC:B:RIO01:9401H:MasterMode On (or: 1)
$ caput MNC:B:RIO01:9401H:ZeroPulses On (or: 1)
$ caput MNC:B:RIO01:9401H:MasterPulseNumber 10
$ caput MNC:B:RIO01:9401H:MasterPulseLength 1000
$ caput MNC:B:RIO01:9401H:MasterPulsePeriod 500000

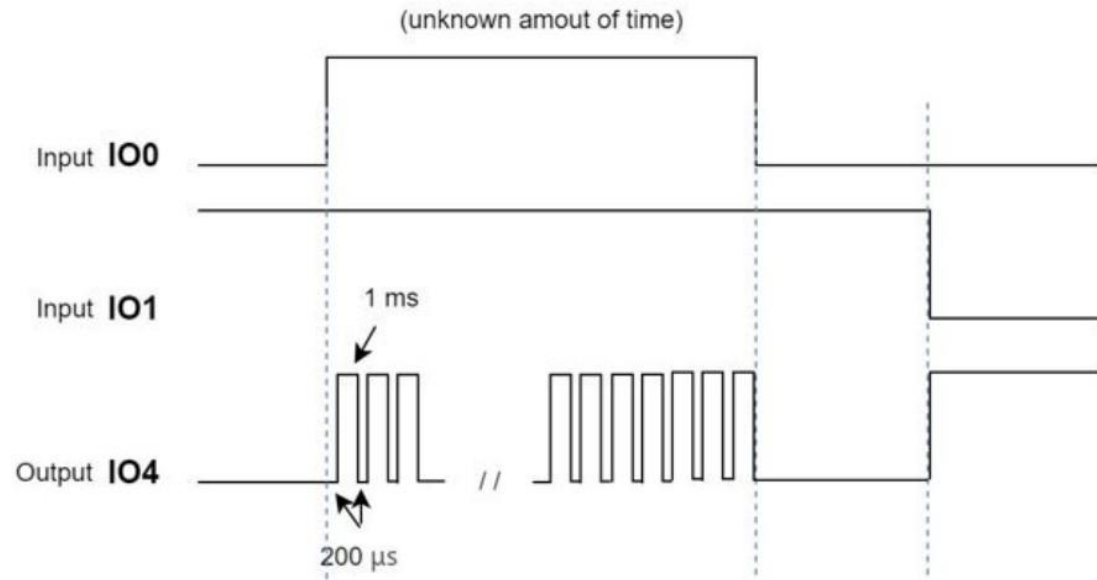
$ caput MNC:B:RIO01:9401H:InputTriggerIO0 Follower (or: 7)
$ caput MNC:B:RIO01:9401H:ConditionIO7:c0 Master pulse (or: 2)
$ caput MNC:B:RIO01:9401H:OutputIO7:c0 Rising pulse (or: 4)
$ caput MNC:B:RIO01:9401H:PulseIO7:c0 200
$ caput MNC:B:RIO01:9401H:DelayIO7:c0 50

$ caput MNC:B:RIO01:9401H:Activate On (or: 1)
    
```

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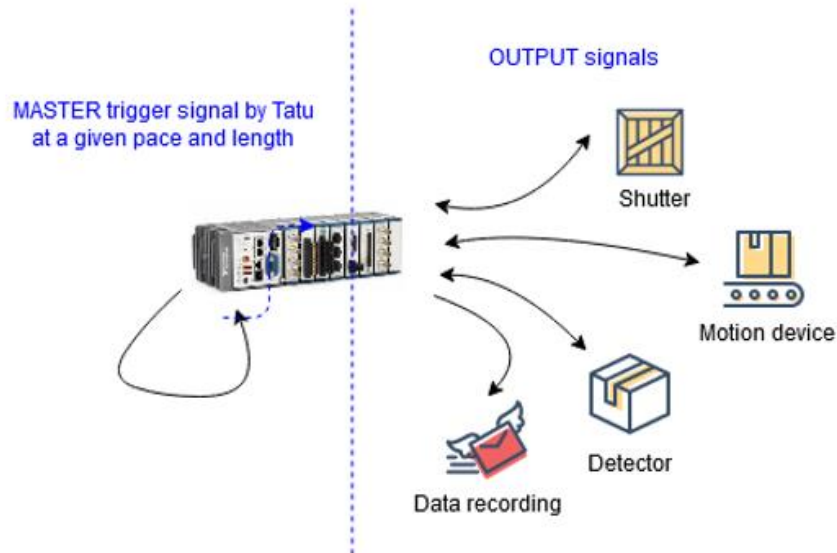
# The problem

Synchronizing devices,  
e.g. in a quick scanning  
operation ("fly-scan")

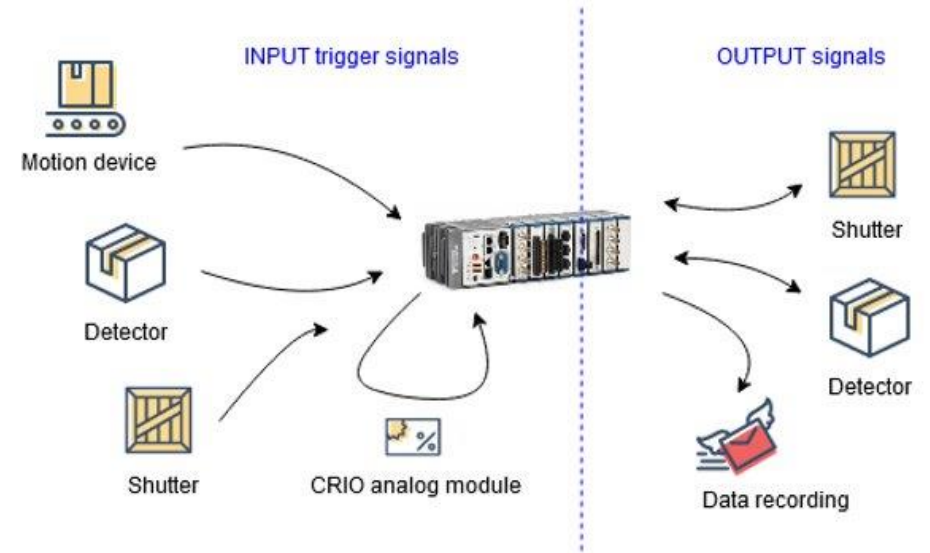


TTL  
signals

Tatu as a MASTER signal generator



Tatu as a FOLLOWER and a signal distributor



# Premises for Tatu



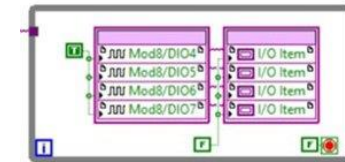
- Pulses up to 4 kHz, combined and configurable by software



- at least one CompactRIO unit available, per beamline hutch (904x, 40 MHz FPGA clock and Linux RT)

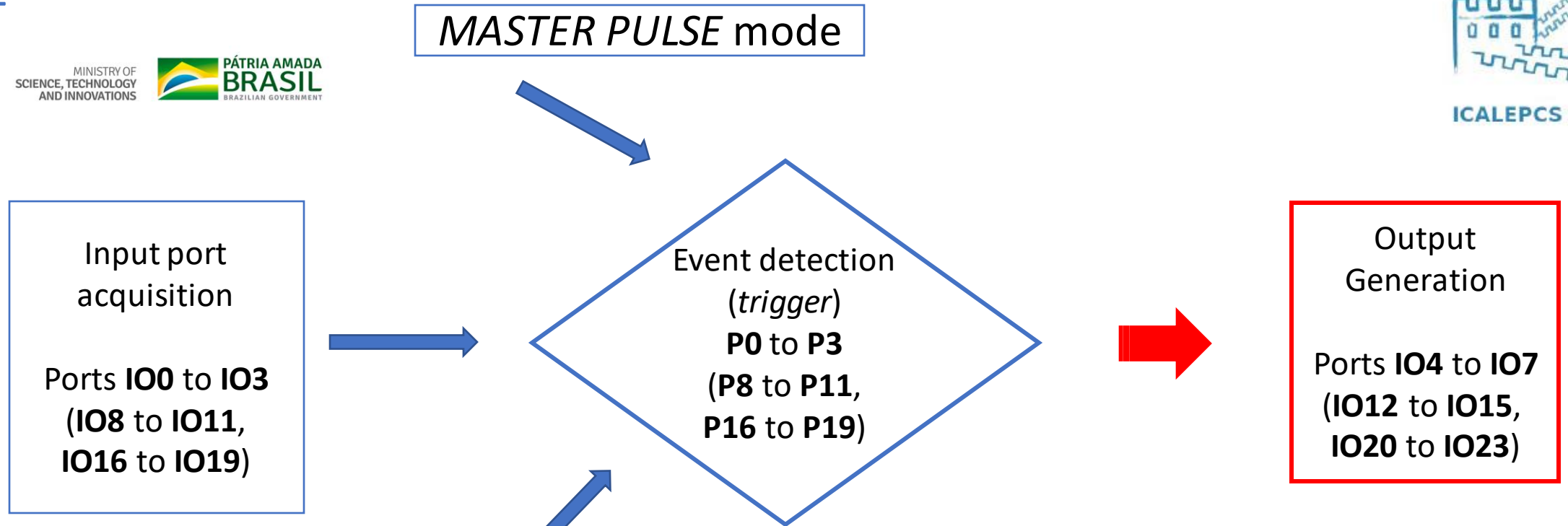


- EPICS as the control platform



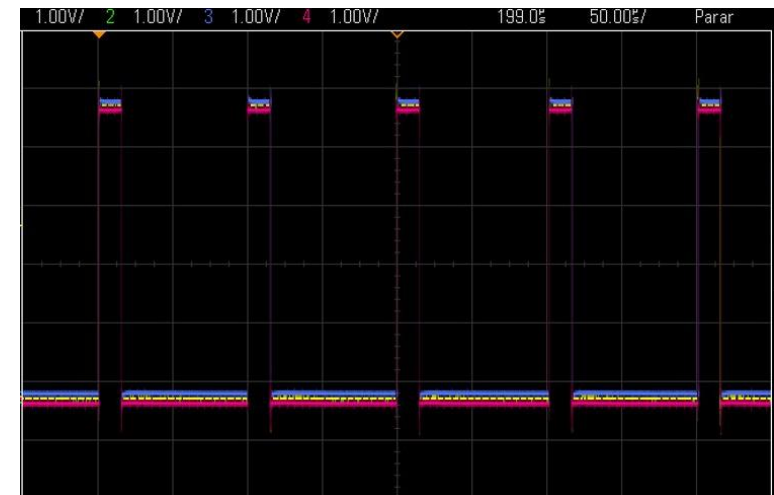
- ancillary small code could run in the same CRIO chassis

## Tatu management

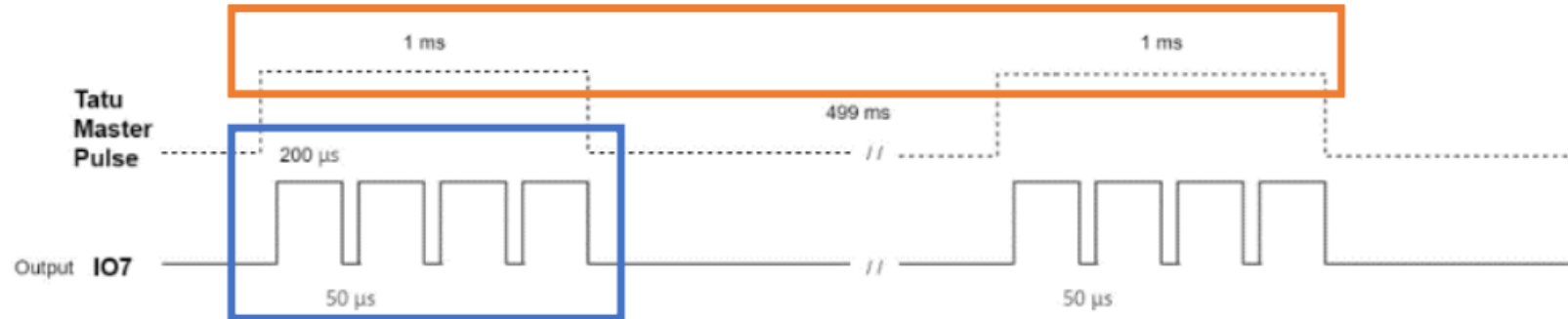


Tatu as **MASTER**  
(5 points, 1 per ms)  
4 output portas

Pulsed width: 150  $\mu$ s



# An example of use



```
$ caput MNC:B:RIO01:9401H:Activate Off (or: 0)
```

```
$ caput MNC:B:RIO01:9401H:MasterMode On (or: 1)
```

```
$ caput MNC:B:RIO01:9401H:Zeropulses On (or: 1)
```

```
$ caput MNC:B:RIO01:9401H:MasterPulseNumber 10
```

```
$ caput MNC:B:RIO01:9401H:MasterPulseLength 1000
```

```
$ caput MNC:B:RIO01:9401H:MasterPulsePeriod 500000
```

```
$ caput MNC:B:RIO01:9401H:InputTriggerIO0 Follower (or: 7)
```

```
$ caput MNC:B:RIO01:9401H:ConditionIO7:c0 Master pulse (or: 2)
```

```
$ caput MNC:B:RIO01:9401H:OutputIO7:c0 Rising pulse (or: 4)
```

```
$ caput MNC:B:RIO01:9401H:PulseIO7:c0 200
```

```
$ caput MNC:B:RIO01:9401H:DelayIO7:c0 50
```

```
$ caput MNC:B:RIO01:9401H:Activate On (or: 1)
```