Hello and welcome to this presentation of the STM32 Interconnect Matrix. It covers the main features of this matrix, which is widely used to connect various internal peripherals between each other.
The Interconnect Matrix integrated inside STM32 products provides direct connections between peripherals. Applications benefit from these interconnections to ensure time-predictable operations, to decrease power consumption by avoiding complex management of peripheral communications through reading/writing registers using CPU instructions and, in some cases, to reduce the need to loop the signal from a source to a destination through a dedicated GPIO.
The Interconnect Matrix offers two main features. First, it ensures direct and autonomous connections between peripherals, allowing to remove latency in regards to software handling, thus saving GPIO and CPU resources. Second, the interconnection between certain peripherals can even operate during low-power modes.
This slide indicates the list of source and destination peripherals.
Source peripherals are the EXTI, the timers, analog IPs, clocks, RTC and System Error.
Destination peripherals are the timers, Infrared Interface, and analog IPs
The interconnect matrix is further described in the STM32G4 Reference Manual.
This slide and the two next ones describe the various possible uses for the interconnect matrix:

• Synchronizing or chaining timers, for example allowing a master timer to reset or trigger a second slave timer
• Triggering the transition to burst mode and also the configuration update of the HRTIM through a general-purpose timer
• Triggering an ADC through a timer or EXTI event
• Triggering a timer through an ADC watchdog signal when a predefined threshold value is crossed by the analog input
• Triggering a DAC through a timer or EXTI event
• Calibrating HSI16 and LSI clocks, for example measuring the external oscillator LSE frequency by a timer clocked by the calibrated internal oscillator.
Other use cases:
- Starting low-power timers from an RTC alarm, a tamper event or comparator event,
- Implementing blanking windows in COMP modules,
- Connecting internal analog channels to ADC, COMP and OPAMP units,
- Using the COMP outputs as timer external triggers or break inputs.
Other use cases:
- Protecting timer-driven power switches through the direct connection of System Error signals to the timer break input
- Infrared pulse modulation signal waveform generation using 2 timers.
This slide shows a simple example of timer synchronization. The Timer 3 is used as the Master Timer and can reset, start, stop or clock the Timer 2 configured in Slave mode. In this example, Timer 3 is clocking the Timer 2 so that it acts as a prescaler for Timer 2.
Peripherals can be interconnected using the Interconnect Matrix even when the circuit is in a low-power mode. This table indicates in which low-power modes, the interconnection between peripherals remains active.
The low-power modes that can be used are: Run, Sleep and Low-power sleep modes for all interconnections. The connections from the real-time clock or comparators to low-power timers can also be used in Stop0 and Stop1 modes.
For more details about the Interconnect Matrix, refer to the reference manual for STM32G4 microcontrollers. Refer also to these trainings for more information if needed:

- Timers
- Low-Power Timers
- Analog-to-Digital Converter
- Digital-to-Analog Converter
- Comparators
- Operational Amplifiers
- Extended interrupts and event Controller
- Infrared Interface
- Reset and Clock Control
- Real-Time Clock