Note: Exception for register CMU_CLK_CTRL. In case of write access signalled by aei_status 0b10 the register will be modified each completely disabled bit.

The detailed list of register addresses with return status 0b10 can be found in the appendix.

28.4.2.2 GTM Multi-master and multitasking support

To support multi-master and multi-task access to the registers of the GTM a dedicated write-access scheme is used for critical control bits inside the IP that need such a mechanism. This can be for example a shared register where more than one channel can be controlled globally by one register write access. Such register bits are implemented inside the GTM with a double bit mechanism, where the writing of 0b00 and 0b11 has no effect on the register bit and where 0b01 sets the bit and 0b10 resets the bit. If the CPU wants to read the status of the bit it always gets a 0b00 if the bit is reset and it gets an 0b11 if the bit is set.

28.4.3 ARU Routing Concept

One central concept of the GTM is the routing mechanism of the ARU sub-module for data streams. Each data word transferred between the ARU and its connected sub-module is 53 bit wide. It is important to understand this concept in order to use the resources of the GTM effectively. Each module that is connected to the ARU may provide an arbitrary number of ARU write channels and an arbitrary number of ARU read channels. In the following, the ARU write channels are named data sources and the ARU read channels are named data destinations.

The concept of the ARU intends to provide a flexible and resource efficient way for connecting any data source to an arbitrary data destination. In order to save resource costs, the ARU does not implement a switch matrix, but it implements a data router with serialized connectivity providing the same interconnection flexibility. **Figure 12** shows the ARU data routing principle. Data sources are marked with a green rectangle and the data destinations are marked with yellow rectangles. The dashed lines in the ARU depict the configurable connections between data sources and data destinations. A connection between a data source and a data destination is also called a data stream.

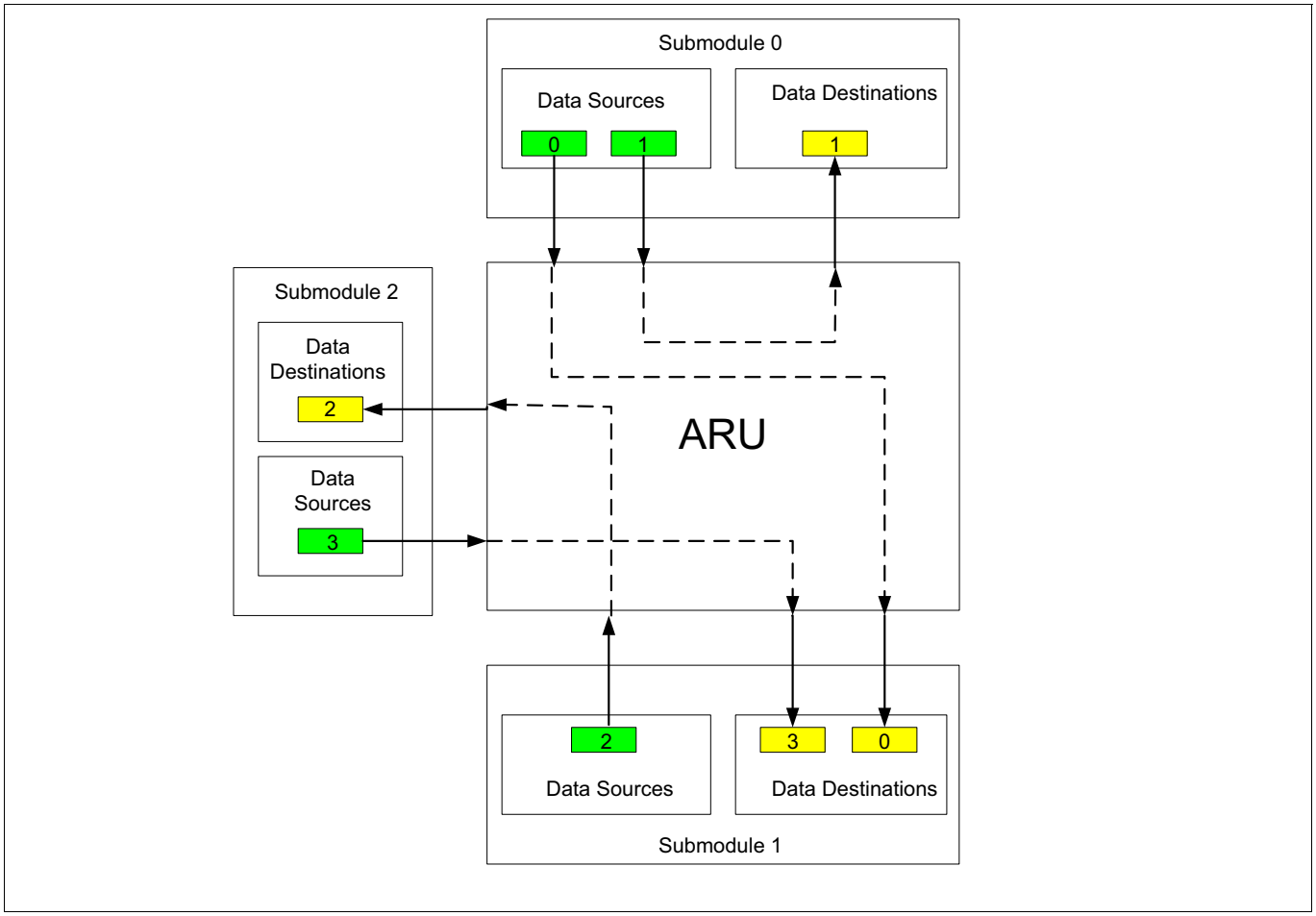

Figure 12 Principle of data routing using ARU

The configuration of the data streams is realized according to the following manner: Each data source has its fixed and unique source address: The ARU read ID.The fixed address of each data source is pointed out by the numbers in the green boxes of **Figure 12**. The address definitions of all available data sources in the GTM can be obtained from the product specific appendix. The connection from a specific data source to a specific data destination is defined by configuring the corresponding address of a data source (i.e. the ARU read ID) in the desired data destination. The configured address of each data destination is pointed out by the numbers in the yellow boxes of **Figure 12**.

Normally, the destination is idle and waits for data from the source. If the source offers new data, the destination does a destructive read, processes the data and goes idle again. The same data is never read twice.

There is one sub-module for which this destructive read access does not hold. This is the BRC sub-module configured in Maximum Throughput Mode (MTM). For a detailed description of this module please refer to chapter “Broadcast Module (BRC)”.

The functionality of the ARU is as follows: The ARU sequentially polls the data destinations of the connected modules in a round-robin order. If a data destination requests new data from its configured data source and the data source has data available, the ARU delivers the data to the destination and it informs both, the data source and destination that the data is transferred. The data source marks the delivered ARU data as invalid which means that the destination consumed the data.

It should be noted that each data source should only be connected to a single data destination. This is because the destinations consume the data. If two destinations would reference the same source one destination would consume the data before the other destination could consume it. Since the data transfers are blocking, the second destination would block until it receives new data from the source. If a data source should be connected

to more than one data destination the sub-module Broadcast (BRC) has to be used. On the other hand, the transfer from a data source to the ARU is also blocking, which means that the source channel can only provide new data to the ARU when an old data word is consumed by a destination. In order to speed up the process of data transfers, the ARU handles two different data destinations in parallel.

Following table gives an overview about the number of data destinations and data sources of each GTM instance type.

Table 8 ARU source and destination address count per instance

Sub-module	Number of data sources per instance	Number of data destinations per instance
ARU	1	0
DPLL	24	24
TIM	8	0
MCS	24	8
BRC	22	12
TOM	0	0
ATOM	8	8
DTM	0	0
PSM	8	8
ICM	0	0
CMP	0	0
MON	0	0
CCM	0	0

28.4.3.1 ARU Round Trip Time

The ARU uses a round-robin arbitration scheme with a fixed round trip time for all connected data destinations. This means that the time between two adjacent read requests resulting from a data destination channel always takes the round trip time, independently if the read request succeeds or fails.

28.4.3.2 ARU Blocking Mechanism

Another important concept of the ARU is its blocking mechanism that is implemented for transferring data from a data source to a data destination. This mechanism is used by ARU connected sub-modules to synchronize the sub-modules to the routed data streams. **Figure 13** explains the blocking mechanism.

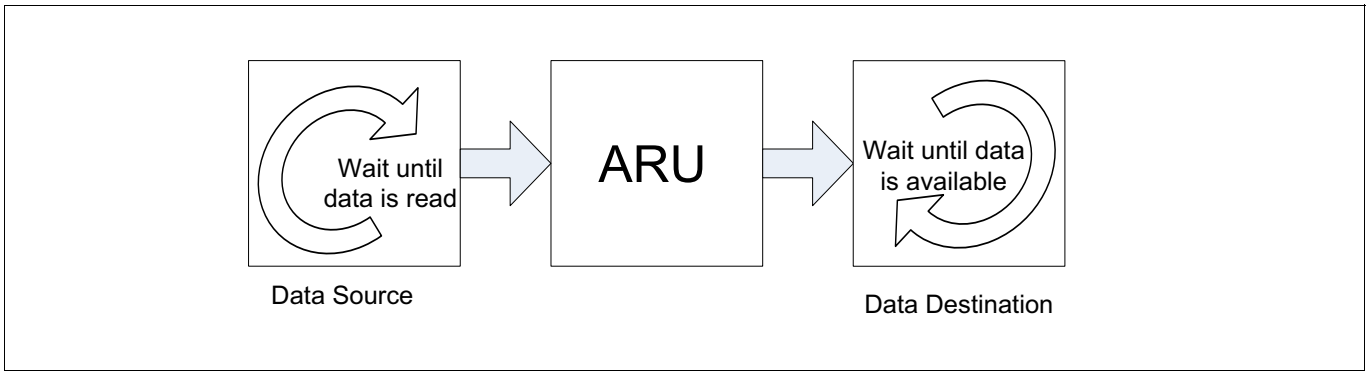

Figure 13 Graphical representation of ARU blocking mechanism