Mutli-Function Timing Unit (MFTU) by Mark Austin

Cost: $3000
Size: 1U chassis

The MFTU is a system whose main intent is to function as a gated timer module that counts the delay based on a given clock, however, it can do so much more than that. The MFTU has a version selection from 0-4095. This allows for many different options preprogrammed into the FPGA that can then simply be selected for the functionality desired by the end user.

The unit really acts as two units in one. There are 2 separate RF CLK Inputs, 2 separate Trigger Inputs, 2 separate Encoded CLK Inputs (BSCLKs), and a TCLK Input. Along with 2 separate groups of 16 channels.
 The trigger is armed for a given channel by one of the 16 different arming TCLK EVENTs for that channel that are settable in Acnet. There are up to 16 different 32-bit delay count values per channel that are settable in Acnet. Depending on which one of the 16 EVENTs armed the trigger determines which one of the 16 corresponding 32-bit delay counts per channel is loaded into that given channel.

Once the arming EVENT (gate) has occurred, the system will wait for a trigger to occur to start the counter. There is a reset EVENT per channel that can be defined depending on the Version number that will disarm the armed trigger. This EVENT could also be one of the 16 channels if they were defined as inputs instead of outputs at build time. There is also an Acnet software clear that will disarm all 16 channels for that group. The trigger can come from either an external TTL trigger, an EVENT on any one of the encoded clocks (could be the same EVENT that armed the trigger), a conglomeration of multiple EVENTs, or anything really. The trigger is dependent upon the version number and is preprogrammed into the system. Once the trigger is received and the counter is started, it will count at the rate determined by the version number. It will be either an internal 50MHz clock, the external RF clock, the frequency of the encoded clock, a 1MHz clock synced with TCLK, one could increment the count upon receiving any of the EVENTs on TCLK or an encoded clock, or anything else as of yet to be determined. Once the counter for that channel is counted, that channel will send a 1uS TTL pulse out that respective channels output. This time could be changed per version number. The first eight channels also have independent Vernier Line Delays that are programmable from 0-255nS for each of the 16 different EVENTs. It can slow the output from the box once the delay count has been counted on a given channel for that specific EVENT. Also, if the external trigger is used instead of an EVENT on one of the encoded clocks, then there is also a Vernier Line Delay on the External Trigger Input that can be programmed from 0-255nS for each of the 16 different EVENTs on channel 1. This triggering will set the Vernier delay for the External Trigger Input based only on the EVENTs that occurred on channel 1 and not any of the other 15 channels. This will slow the input of the trigger into the system for all channels at the same rate.

 If all this is not enough to meet your needs, then contact me. A version can be created to meet your needs. The 16 channels for both groups can also be changed to inputs or outputs in groups of 4. This device can also serve as a clock fan-out, sending either TCLK or either of the encoded clocks on the outputs for certain channels or a combination of both. One could also have inputs and outputs thereby really making the possibilities endless. With the version selector, there are 4096 different possibilities for expansion.

The device is connected to Acnet where certain variables may be input: Arming Gate EVENTs, Delay Counts, Vernier Delays (if applicable), Trigger Delays (if applicable), clear counters, disable channels, and reset the module. More settings could be added should the need arise. Otherwise, the other settings are hard coded into the version selection. The system also has an LCD screen for a display of how the device is configured and current settings.