

How to define and use a combinable function

version	1.0.0
scope	Example. This code is provided as example code for a user to base their code on.
description	How to define and use a combinable function
boards	Unless otherwise specified, this example runs on the SliceKIT Core Board, but can easily be run on any XMOS device by using a different XN file.

Combinable functions represent tasks that can be combined to run on a single logical core.

If a task ends in an never-ending loop containing a select statement, it represents a task that continually reacts to events:

```
void task1(args) {
    .. initialization ...
    while (1) {
        select {
            case ... :
                break;
            case ... :
                break;
            ...
        }
    }
}
```

then this kind of tasks can be marked as *combinable* by adding a special attribute:

```
[[combinable]]
void counter_task(char *taskId, int n) {
    int count = 0;
    timer tmr;
    unsigned time;
    tmr :> time;
    // This task perfoms a timed count a certain number of times, then exits
    while (1) {
        select {
            case tmr when timerafter(time) :> int now:
                printf("Counter tick at time %x on task %s\n", now, taskId);
                count++;
                if (count > n)
                    return;
                time += 1000;
                break;
        }
    }
}
```

```
    }  
  }  
}
```

A combinable function must obey the following restrictions:

- ▶ The function must have void return type.
- ▶ The last statement of the function must be a while(1)-select statement.

Several combinable functions can be run in parallel with a *combined* par. This will run them on the same logical core using co-operative multitasking:

```
int main() {  
  [[combine]]  
  par {  
    counter_task("task1", 5);  
    counter_task("task2", 2);  
  }  
  return 0;  
}
```

When tasks are combined the compiler will create code that first runs the initial sequence from each function (in an unspecified order) and then enters a main loop. This loop will enable the cases from the main selects of each task and wait for one of the events to occur. When the event occurs a function is called to implement the body of that case from the task in question before returning to the main loop.

You cannot use the [[combine]] attribute directly in a par with tile placements but can nest par statements e.g.:

```
int main(void) {  
  par {  
    on tile[0]: task1( ... );  
    on tile[1]: task2( ... );  
    on tile[1]:  
      [[combine]]  
      par {  
        task3( ... );  
        task4( ... );  
      }  
  }  
  return 0;  
}
```

The above program will run task1 on a logical core on tile[0] and task2 on its own logical core on tile[1]. A further logical core on tile[1] will run both task3 and task4 by using co-operative multitasking.



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