To demonstrate the abilities of my hardware multiplier, I wrote a simple MIPS assembly program to compute the factorial of a 32 bit unsigned integer. The program uses the BNE instruction to loop through and decrement the multiplier until the multiplier is one. Once complete, the program stores the product to the memory address of the original operand.

```
        addi    $31, $0,  0x38
        addi    $3,  $0,  1
        lw      $1,  0($31)
        addi    $2,  $0,  1
ITER:   multu   $2,  $1
        mflo    $2
        addi    $1,  $1,  -1
        bne     $1,  $3,  ITER
        sw      $2,  0($31)
```

Factorial Operand

```
restart

add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[0]}  -radix hex {201F0038}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[1]}  -radix hex {20030001}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[2]}  -radix hex {8FE10000}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[3]}  -radix hex {20020001}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[4]}  -radix hex {00410019}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[5]}  -radix hex {00001012}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[6]}  -radix hex {2021FFFF}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[7]}  -radix hex {1423FFFC}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[8]}  -radix hex {AFE20000}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[9]}  -radix hex {00000000}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[10]} -radix hex {00000000}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[11]} -radix hex {00000000}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[12]} -radix hex {00000000}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[13]} -radix hex {00000000}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[14]} -radix hex {0000000A}
add_force {/CPU_mem_wrapper/CPU_mem_i/memory/U0/mw_U_0ram_table[15]} -radix hex {00000000}

#forcing a clock with 10 ns period
add_force clk 1 {0 5ns} -repeat_every 10ns
#give a reset signal
add_force rst 0
run 2500ps
add_force rst 1
run 5 ns
add_force rst 0
run 5000 ns
```

e.g. compute 10!