

```
# [...]

# EXTENSION 2019-07-24

#-----
# Decrease breakpoint IDT entry DPL to USER_LEVEL in order for it to be
# called from the User Module processes.
#-----
carica_gate 3          breakpoint LIV_UTENTE

# EXTENSION 2019-07-24

# [...]

# EXTENSION 2019-07-24

# initialize bpattach IDT gate subroutine
carica_gate TIPO_BPA a_bpattach LIV_UTENTE

# initialize bpwait IDT gate subroutine
carica_gate TIPO_BPW a_bpwait LIV_UTENTE

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# initialize bpdetach IDT gate subroutine
carica_gate TIPO_BPD a_bpdetach LIV_UTENTE

# SOLUTION 2019-07-24

# [...]

# EXTENSION 2019-07-24

#-----
# IDT gates subroutines assembly definitions.
#-----

#-----
#-----
a_bpattach:
    .cfi_startproc
    .cfi_def_cfa_offset 40
    .cfi_offset rip, -40
    .cfi_offset rsp, -16
    call salva_stato          # save current process state
    call c_bpattach           # call C++ subroutine implementation
    call carica_stato         # load new process state
    iretq                     # return from interrupt
    .cfi_endproc

#-----
#-----
a_bpwait:
    .cfi_startproc
    .cfi_def_cfa_offset 40
    .cfi_offset rip, -40
    .cfi_offset rsp, -16
    call salva_stato          # save current process state
    call c_bpwait             # call C++ subroutine implementation
    call carica_stato         # load new process state
    iretq                     # return from interrupt
    .cfi_endproc

# EXTENSION 2019-07-24

# SOLUTION 2019-07-24

#-----
```

```
#-----
a_bpdetach:
    .cfi_startproc
    .cfi_def_cfa_offset 40
    .cfi_offset rip, -40
    .cfi_offset rsp, -16
    call salva_stato                # save current process state
    call c_bpdetach                # call C++ subroutine implementation
    call carica_stato              # load new process state
    iretq                          # return from interrupt
    .cfi_endproc

# SOLUTION 2019-07-24

# [...]

#-----
# Interrupt 3 - Breakpoint exception.
# Sets the parameters for and calls the C++ exception handler. A new process is
# scheduled in the C++ implementation.
#-----
breakpoint:
    .cfi_startproc
    .cfi_def_cfa_offset 40
    .cfi_offset rip, -40
    .cfi_offset rsp, -16
    call salva_stato                # save current process state

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    movq $3, %rdi                  # exception type
    movq $0, %rsi                  # exception error
    movq %rsp, %rdx                # %address contained in rsp
    call c_breakpoint_exception    # call C++ exception handler

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    call carica_stato              # load new process state
    iretq                          # return from interrupt.
    .cfi_endproc

# [...]
```