* + *J* instruction
    - Control signal *mpc\_jimm\_e*, generated at the m14k\_mpc\_dec module, is 1 for *J* instructions. This signal is used for several tasks.
    - Specifically, let´s analyze generation of signal *preiva\_p*, at module m14k\_edp. Figure 2 from Lab 18 shows a highly simplified version of this signal, where it is assigned directly from the sequential address (*edp\_iva\_i*+4). However, in the soft-core this signal is assigned from a 10-1 multiplexer (*\_preiva\_p\_31\_0\_*). One input to that multiplexer, which is selected when *mpc\_jimm\_e*=1, is *jaddr\_e*.
    - *jaddr\_e* is computed as follows:

*{edp\_iva\_i[31:28], mpc\_ir\_e[25:0], 2'h0}*

* + *JAL* instruction
    - Control signal *mpc\_jimm\_e* is also 1 for *JAL* instructions at the E-Stage, and the effect is the same.
    - Besides, at *m14k\_mpc\_dec*, signal *lnk31\_e* is set to 1 for *JAL* instructions at the E-Stage. This signal has 2 important implications:
      1. *dest\_e*, the destination register to write at W-Stage, is set to 11111.
      2. Signal *maj\_vd\_e* is set, which implies that the Write Strobe for the RF will be set at W-Stage.
    - Two multiplexers, not included in previous figures (at Figure 1 of Lab 16, these multiplexers are connected between signals *edp\_alu\_m[31:0]* and *res\_m[31:0]*, as shown in Figure 1 below), are used for computing the value to write to the Register File (*edp\_wrdata\_w*) in case of a JAL instruction, at the M-Stage:
  + *\_sp\_m\_31\_0\_*: Uses as control signal *mpc\_lnksel\_m*, which is 1 for a JAL instruction at the M-Stage, selecting input signal *x\_pc\_hold*, which contains the address of the second instruction following the branch.
  + *\_asp\_nodsp\_m\_31\_0\_*: Uses as control signal *mpc\_alusel\_m*, which is 0 for a JAL instruction at the M-Stage, selecting input signal *sp\_m*, which is the output of the previous multiplexer (*\_sp\_m\_31\_0\_*).

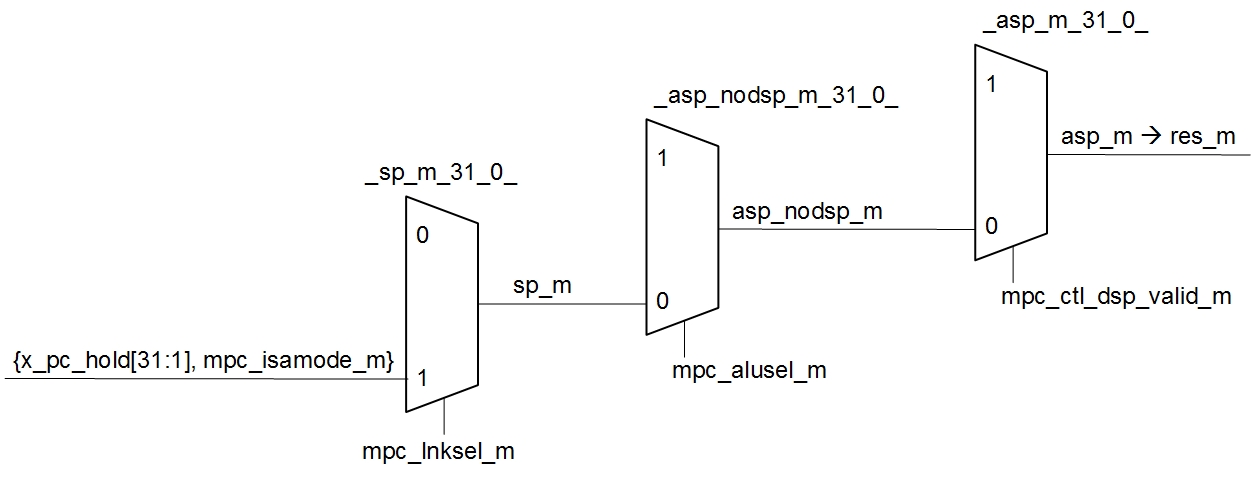


Figure 1. New multiplexers used by the JAL instruction.

* + Other conditional branches
    - Each conditional branch has its own signal, computed at m14k\_dec, which has a different effect in the condition computation.

