—— MODULE *Example8_Dining* ——

2 philosophers *Aristotle* and *Bertrand* want to eat spaghetti. This is a simplified dining philoso-
phers problem with only 2 philosophers and 2 forks. Thinking is an implicit action that can
happen any time the philosopher are not eating.

Places named illustratively to model preconditions. Transitions named to model actions that can
occur in the system. The only property we care about in this simple currently is that it does not
deadlock when model checked.

3 places and 6 transitions per philosopher
1 state per fork (1 per philosopher)
$Places \triangleq \{$
    "left_fork_down",
    "right_fork_down",

    "A_has_left_fork",
    "A_has_right_fork",
    "A_is_eating",

    "B_has_left_fork",
    "B_has_right_fork",
    "B_is_eating"
$\}$
$Transitions \triangleq \{$
    "A_grabs_left_fork",
    "A_grabs_right_fork",
    "A_drops_left_fork",
    "A_drops_right_fork",
    "A_starts_eating",
    "A_stops_eating",

    "B_grabs_left_fork",
    "B_grabs_right_fork",
    "B_drops_left_fork",
    "B_drops_right_fork",
    "B_starts_eating",
    "B_stops_eating"
$\}$
$Arcs \triangleq [$
    $left\_fork\_down \mapsto \{$"A_grabs_left_fork", "B_grabs_left_fork"$\}$,
    $right\_fork\_down \mapsto \{$"A_grabs_right_fork", "B_grabs_right_fork"$\}$,

    Aristotle
    $A\_has\_left\_fork \mapsto \{$"A_drops_left_fork", "A_starts_eating"$\}$,
    $A\_has\_right\_fork \mapsto \{$"A_drops_right_fork", "A_starts_eating"$\}$,
    $A\_is\_eating \mapsto \{$"A_stops_eating"$\}$,

    $A\_grabs\_left\_fork \mapsto \{$"A_has_left_fork"$\}$,

$A\_grabs\_right\_fork \mapsto \{\,\text{``A\_has\_right\_fork"}\,\},$
$A\_drops\_left\_fork \mapsto \{\,\text{``left\_fork\_down"}\,\},$
$A\_drops\_right\_fork \mapsto \{\,\text{``right\_fork\_down"}\,\},$
$A\_starts\_eating \mapsto \{\,\text{``A\_is\_eating"}\,\},$
$A\_stops\_eating \mapsto \{\,\text{``left\_fork\_down"},\ \text{``right\_fork\_down"}\,\},$

Bertrand
$B\_has\_left\_fork \mapsto \{\,\text{``B\_drops\_left\_fork"},\ \text{``B\_starts\_eating"}\,\},$
$B\_has\_right\_fork \mapsto \{\,\text{``B\_drops\_right\_fork"},\ \text{``B\_starts\_eating"}\,\},$
$B\_is\_eating \mapsto \{\,\text{``B\_stops\_eating"}\,\},$

$B\_grabs\_left\_fork \mapsto \{\,\text{``B\_has\_left\_fork"}\,\},$
$B\_grabs\_right\_fork \mapsto \{\,\text{``B\_has\_right\_fork"}\,\},$
$B\_drops\_left\_fork \mapsto \{\,\text{``left\_fork\_down"}\,\},$
$B\_drops\_right\_fork \mapsto \{\,\text{``right\_fork\_down"}\,\},$
$B\_starts\_eating \mapsto \{\,\text{``B\_is\_eating"}\,\},$
$B\_stops\_eating \mapsto \{\,\text{``left\_fork\_down"},\ \text{``right\_fork\_down"}\,\}$
$]$
$ArcWeights \triangleq \langle\rangle$ Unspecified arc weights default to 1.
$InitialMarking \triangleq [left\_fork\_down \mapsto 1,\ right\_fork\_down \mapsto 1]$
VARIABLE $Marking$
$vars \triangleq \langle Marking \rangle$

$PN \triangleq$ INSTANCE $PetriNet$ Instantiate it within a namespace.

$M^{*} \triangleq PN\,!\,^{*}(M)$

$Spec \triangleq PN\,!\,Spec$

$Invariants \triangleq PN\,!\,Invariants$