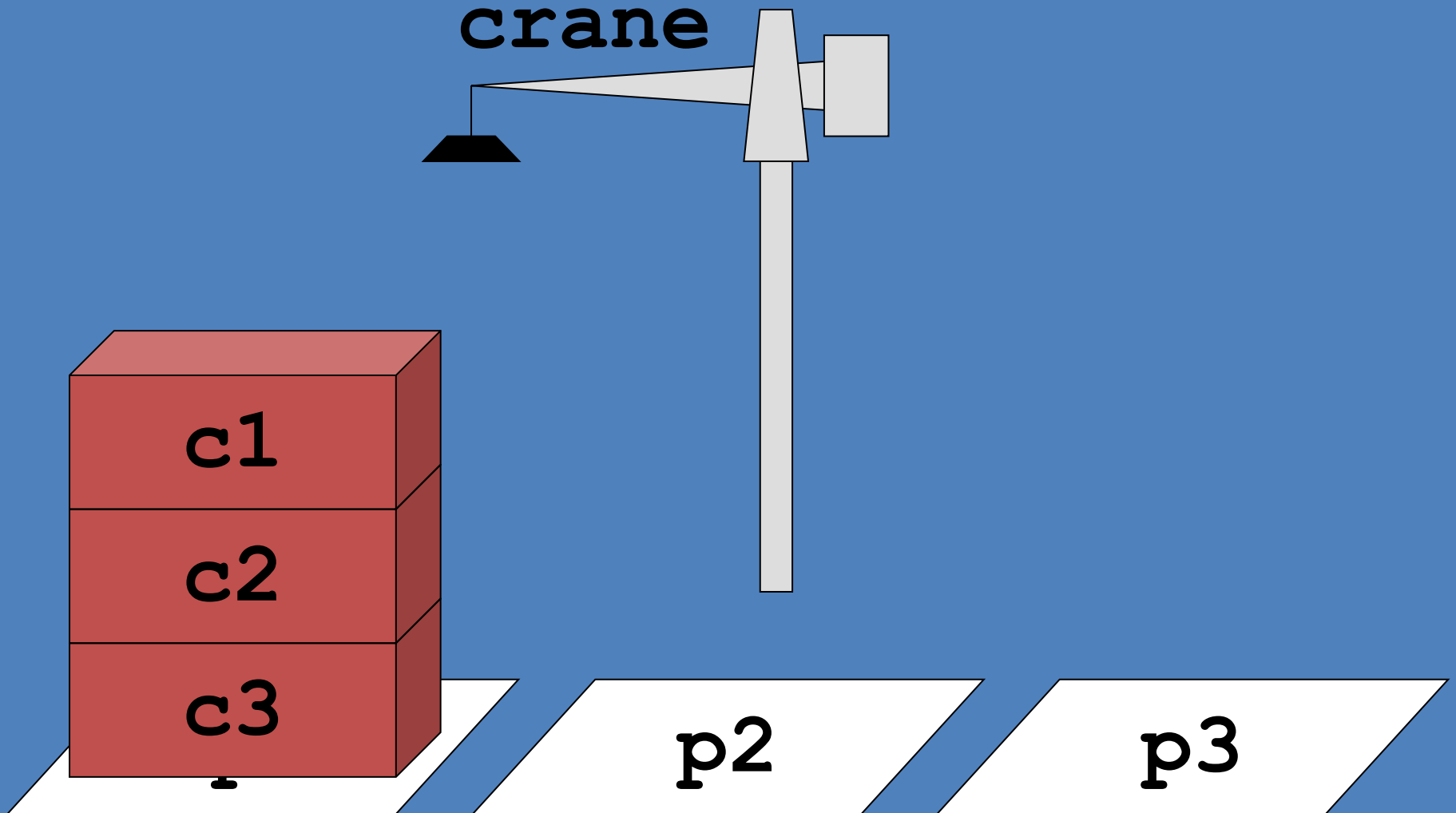


# Stack Moving Example



# STN Methods: DWR Example (3)

- move via intermediate: move stack to intermediate pile (reversing order) and then to final destination (reversing order again)
- $\text{move-stack-twice}(p_o, p_i, p_d)$ 
  - task:  $\text{move-ordered-stack}(p_o, p_d)$
  - precondition: -
  - subtasks:  
 $\langle \text{move-stack}(p_o, p_i), \text{move-stack}(p_i, p_d) \rangle$

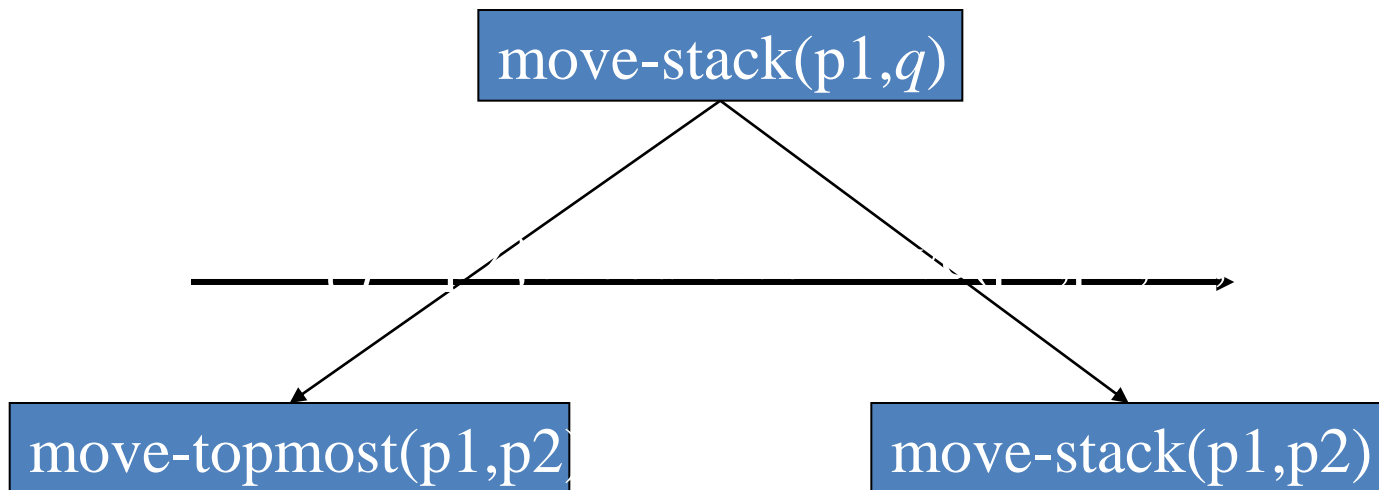
# STN Methods: DWR Example (2)

- move stack: repeatedly move the topmost container until the stack is empty
- recursive-move( $p_o, p_d, c, x_o$ )
  - task: move-stack( $p_o, p_d$ )
  - precondition: top( $c, p_o$ ), on( $c, x_o$ )
  - subtasks:  $\langle$ move-topmost( $p_o, p_d$ ), move-stack( $p_o, p_d$ ) $\rangle$
- no-move( $p_o, p_d$ )
  - task: move-stack( $p_o, p_d$ )
  - precondition: top(pallet,  $p_o$ )
  - subtasks:  $\langle$

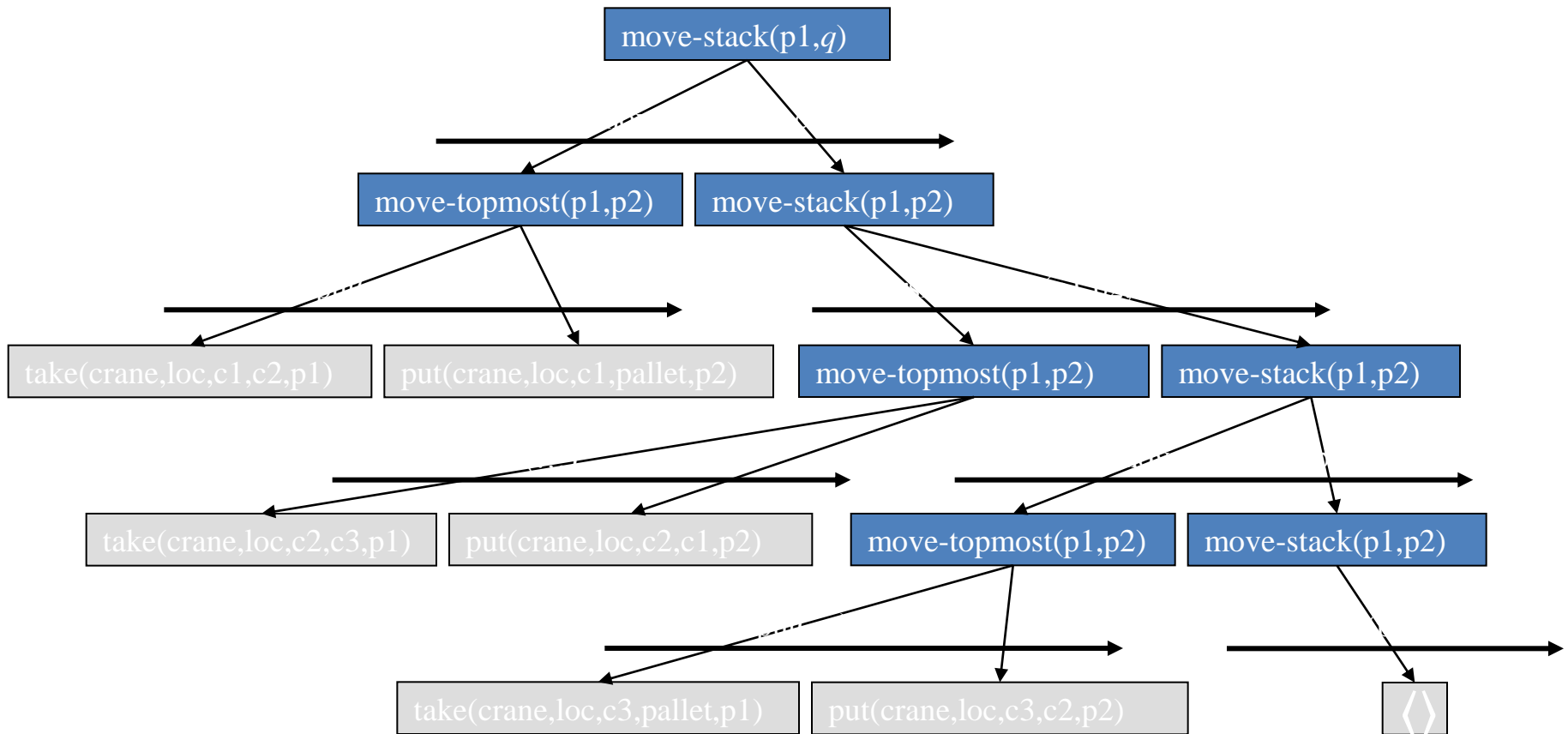
# Method Decomposition: DWR

## Example

- $\delta(t, m_i, \sigma) =$   
 $\langle \text{move-topmost}(p1, p2), \text{move-stack}(p1, p2) \rangle$



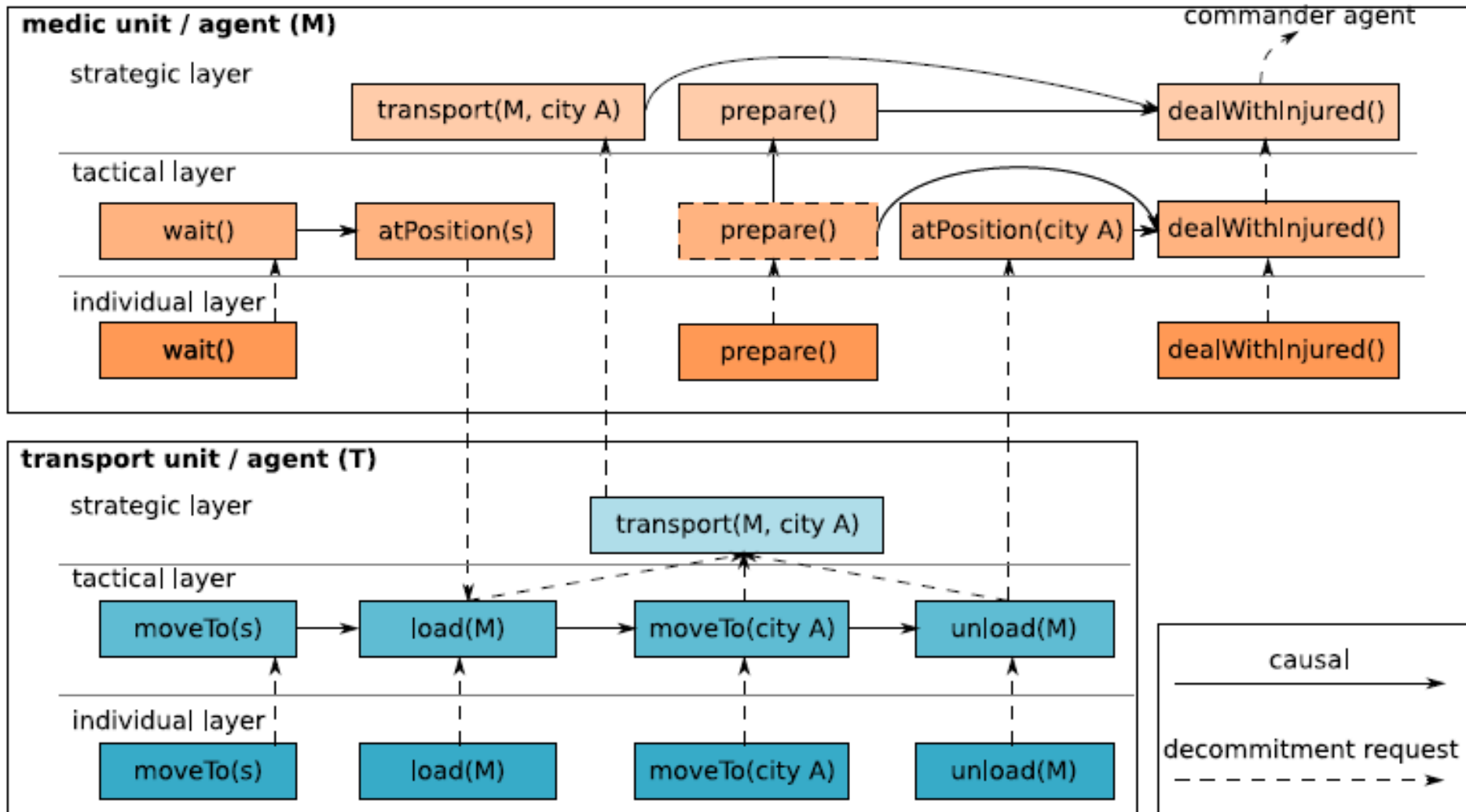
# Decomposition Tree: DWR Example



# HTN Methods: DWR Example (2)

- move stack: repeatedly move the topmost container until the stack is empty
- recursive-move( $p_o, p_d, c, x_o$ )
  - task: move-stack( $p_o, p_d$ )
  - network:
    - subtasks:  $\{t_1 = \text{move-topmost}(p_o, p_d), t_2 = \text{move-stack}(p_o, p_d)\}$
    - constraints:  $\{t_1 < t_2, \text{before}(\{t_1\}, \text{top}(c, p_o)), \text{before}(\{t_1\}, \text{on}(c, x_o))\}$
- move-one( $p_o, p_d, c$ )
  - task: move-stack( $p_o, p_d$ )
  - network:
    - subtasks:  $\{t_1 = \text{move-topmost}(p_o, p_d)\}$
    - constraints:  $\{\text{before}(\{t_1\}, \text{top}(c, p_o)), \text{before}(\{t_1\}, \text{on}(c, \text{pallet}))\}$

# HTN action example



speed: normal  
current time: 29



C - toggle communication    I - toggle entity info    A - toggle agentdata  
N - toggle node IDs    E - toggle events    M - toggle 2D/3D