**Precondition List:**

```
#### Initial Conditions
1. Robot not at egg location.
2. Robot not holding egg.
3. Robot not at tomato location.
…

#### Actions
1. **GoToObject**: Robot goes to the egg.
   - Parameters: `?robot, ?egg`
   - Preconditions: `(not (inaction ?robot))`
   - Effects: `(at ?robot ?egg), (not (inaction ?robot))`

2. **PickupObject**: Robot picks up the egg.
   - Parameters: `?robot, ?egg, ?location` (where egg is initially located)
   - Preconditions: `(at-location ?egg ?location), (at ?robot ?location), (not (inaction ?robot))`
   - Effects: `(holding ?robot ?egg), (not (inaction ?robot))`
…

6. **CloseObject**: Robot closes the microwave.
   - Parameters: `?robot, ?microwave`
   - Preconditions: `(not (inaction ?robot)), (at ?robot ?microwave)`
   - Effects: `(object-close ?robot ?microwave), (not (inaction ?robot))`
```

**Task description:**
Microwaving an egg and a tomato on a plate

Precondition Identifier (*P*)

Task Allocator

**Task Decomposition Analysis:**

```
#### General Task Decomposition
1. **Prepare the Plate with Egg** (Skills Required: GoToObject, PickupObject, PutObject)
2. **Prepare the Plate with Tomato** (Skills Required: GoToObject, PickupObject, PutObject)
3. **Microwave the Plate** (Skills Required: GoToObject, OpenObject, PutObject, SwitchOn, SwitchOff, CloseObject)

#### Subtask 1: Prepare the Plate with Egg
  1. Go to egg location.
  2. Pick up egg.
  3. Go to plate location.
  4. Place egg on plate.

#### Subtask Skills Analysis:
- **GoToObject**: Robot goes to the object (egg/plate).
- **PickupObject**: Robot picks up the object (egg/plate).
- **PutObject**: Robot places objects on the plate.

#### Subtask Allocation:
- Robot3 has skills `GoToObject`, `PickupObject`, and `PutObject`. Therefore, assign Subtask #1 to Robot2.

#### Subtask 2: Prepare the Plate with Tomato
…
```

Problem Generator (*G*)

PDDL Validator (*V*)

**PDDL Problem 1:**

```
(define (problem prepare-plate-with-egg)
  (:domain robot2)
  (:objects
    …
  (:init
    …
  (:goal
    …
)
```

**PDDL Problem 2:**

```
(define (problem prepare-plate-with-tomato
  (:domain robot3)
  (:objects
    …
  (:init
    …
  (:goal
    …
)
```

**PDDL Problem 3:**

```
(define (microwave-plate)
  (:domain robot1)
  (:objects
    …
  (:init
    …
  (:goal
    …
)
```

Fast Downward/ LLM Planner

Sub-Plan Combiner

Plan-to-Code Converter

Scenario Simulator

**Final Plan:**

```
# Robot 2 and 3 to Plate, 1 to Microwave
0.000: (GotoObject robot1 microwave)
0.000: (GotoObject robot2 egg)
0.000: (GotoObject robot3 tomato)
1.000: (OpenObject robot1 microwave)
1.000: (PickupObject robot2 egg)
1.000: (PickupObject robot3 tomato)
2.000: (GotoObject robot2 plate)
2.000: (GotoObject robot3 plate)
3.000: (PutObject robot2 egg plate)
3.000: (PutObject robot3 tomato plate)
4.000: (PickupObject robot2 plate)
# Robots 2 to Microwave the Plate
5.000: (GotoObject robot2 microwave)
6.000: (PutObject robot2 plate microwave)
7.000: (CloseObject robot1 microwave)
8.000: (Switchon robot1 microwave)
9.000: (OpenObject robot1 microwave)
```