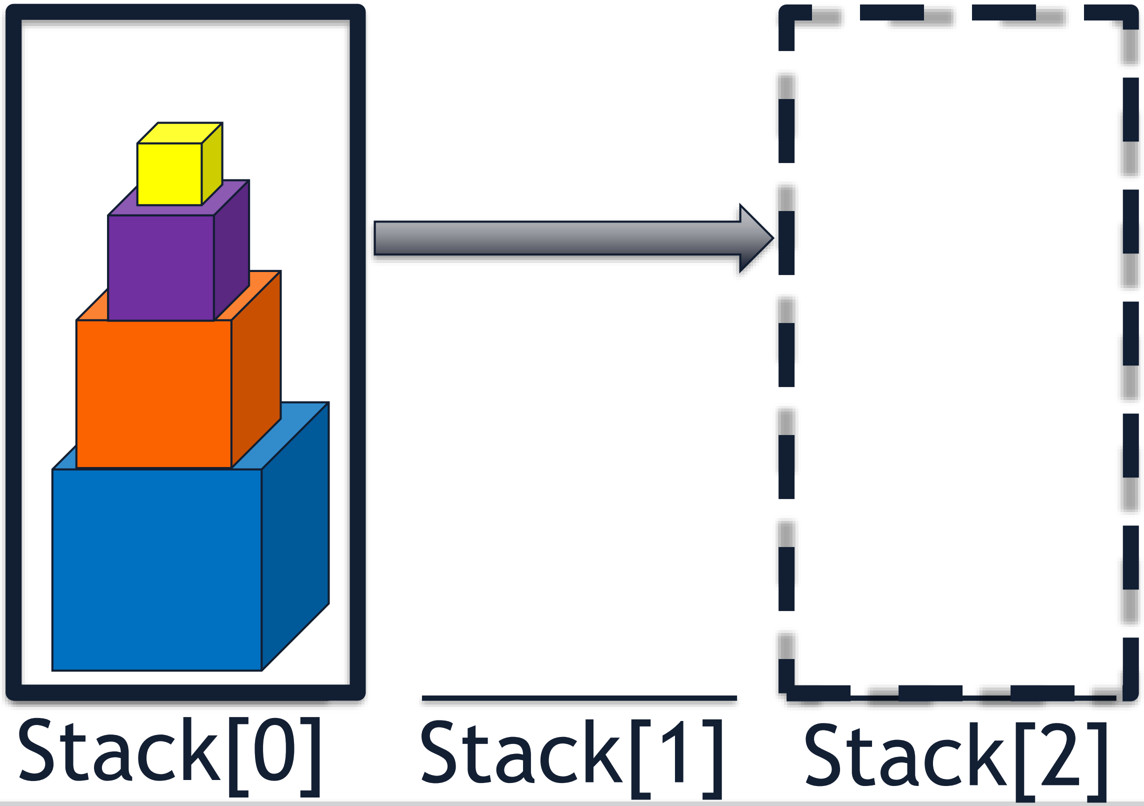
Tower of Hanoi – Solution #2

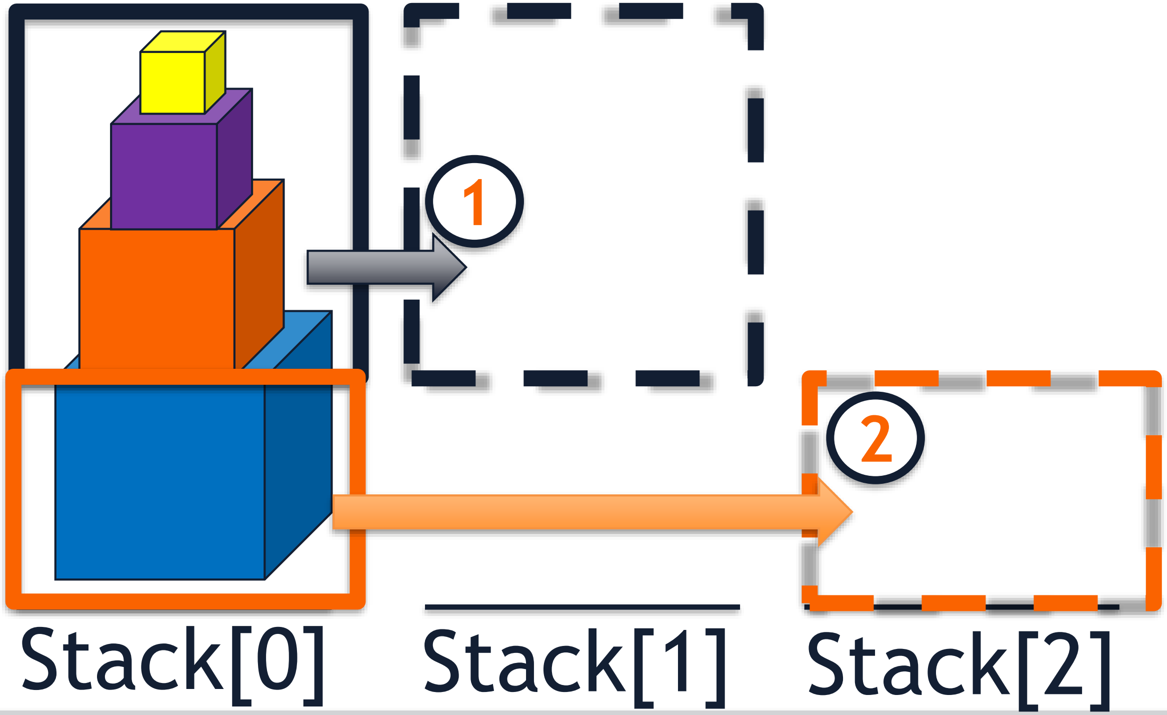
Prof. Wade Fagen-Ulmschneider

ILLINOIS

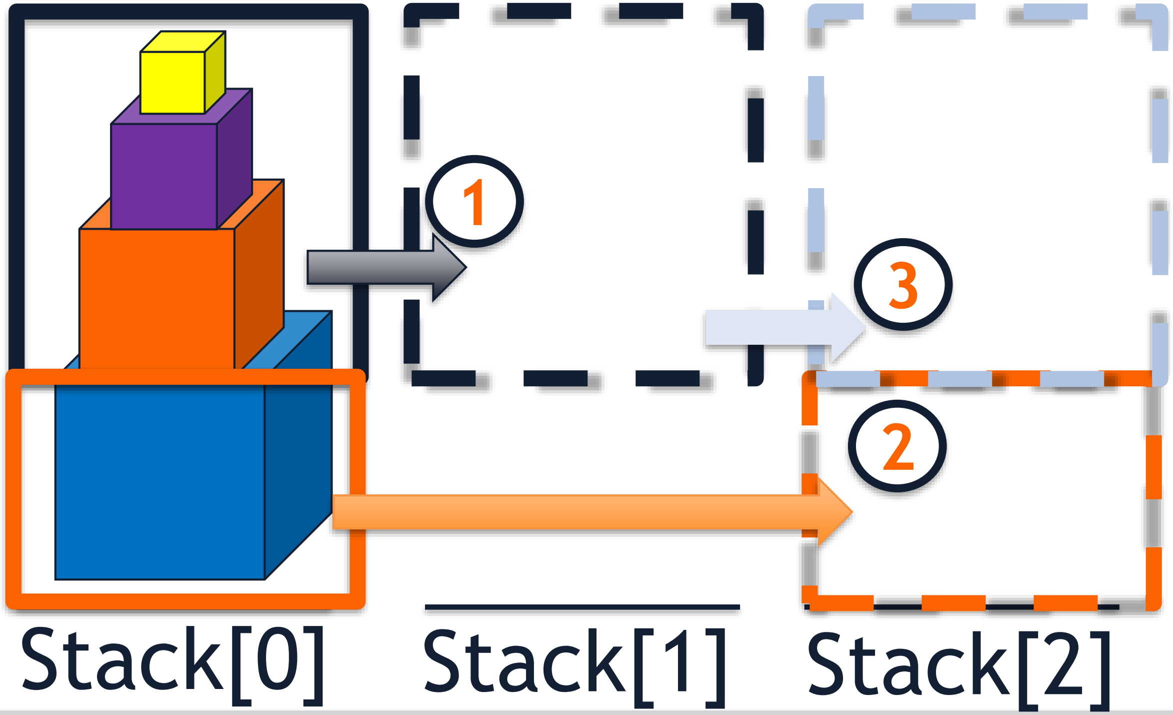
Moves Made:



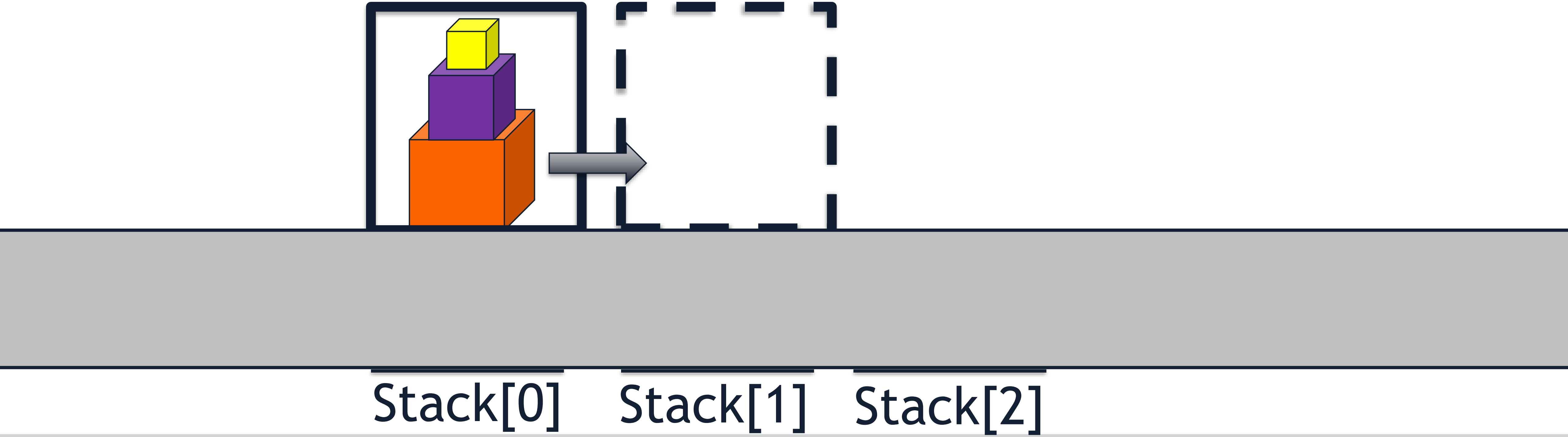
Moves Made:



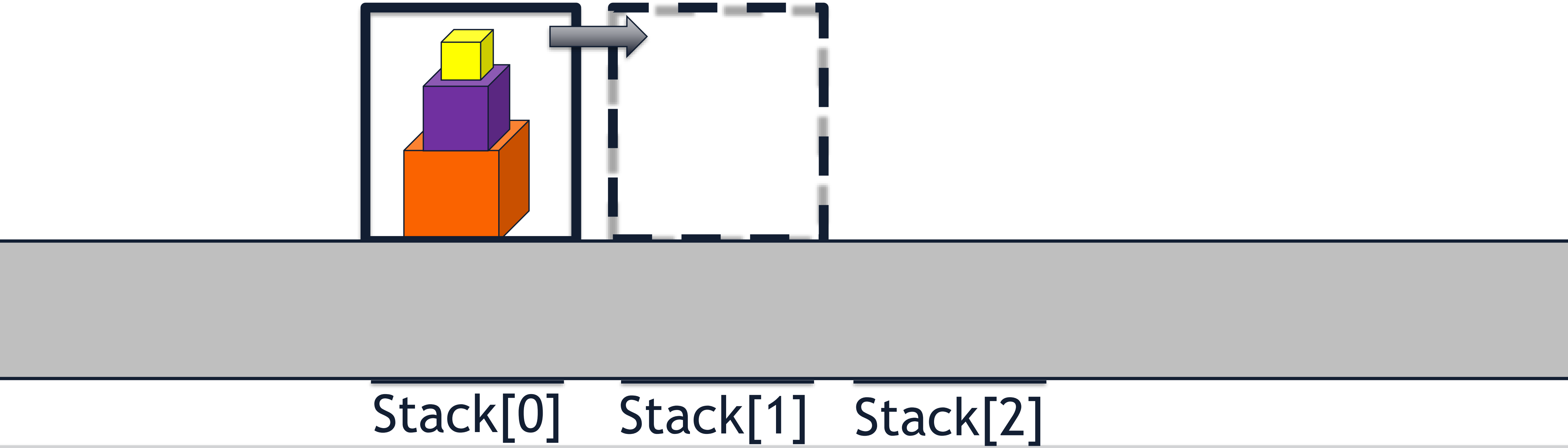
Moves Made:



Moves Made:

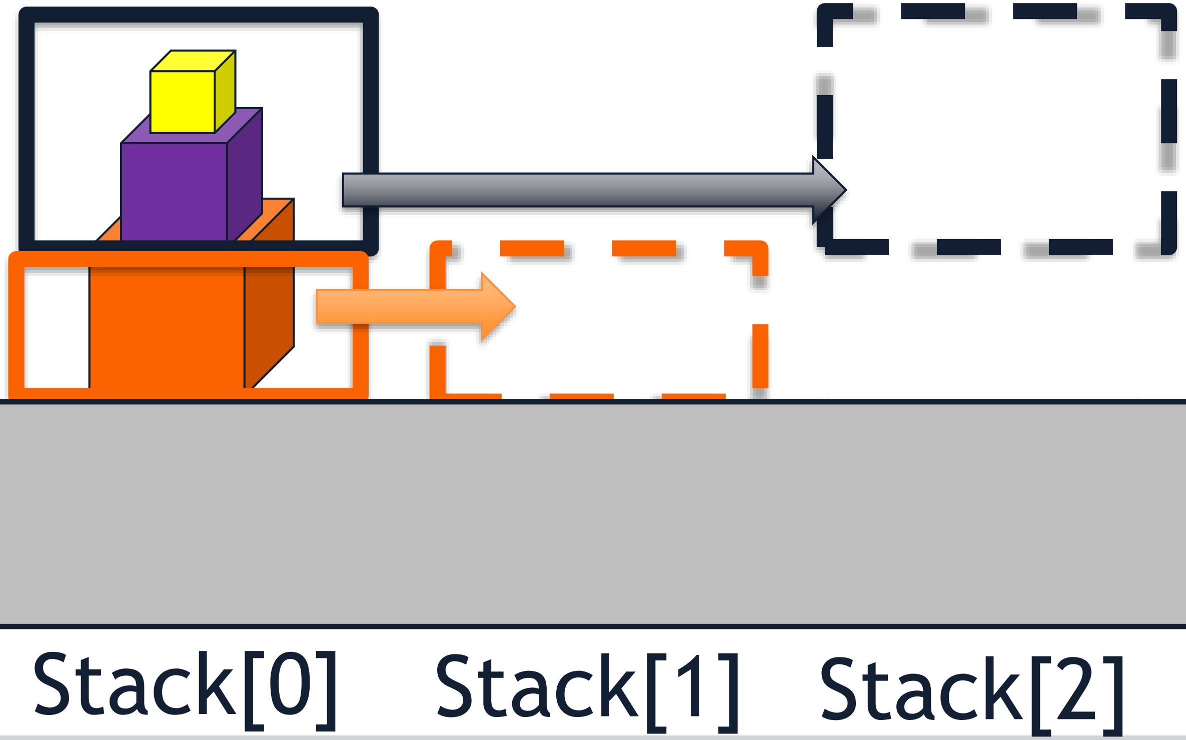


Moves Made:

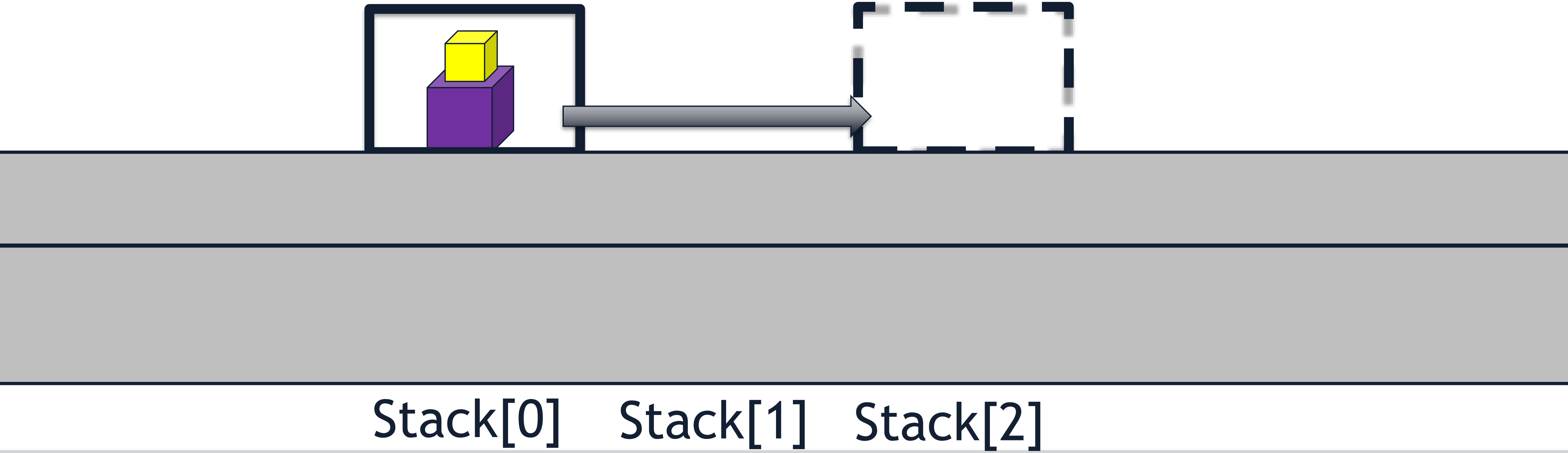


Stack[0] Stack[1] Stack[2]

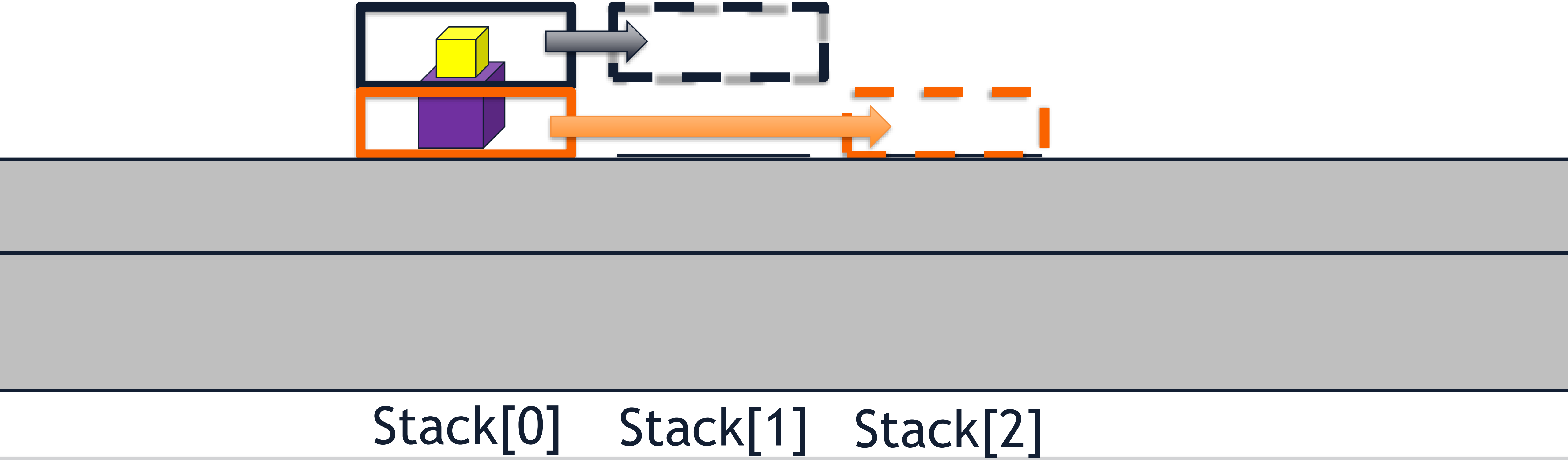
Moves Made:



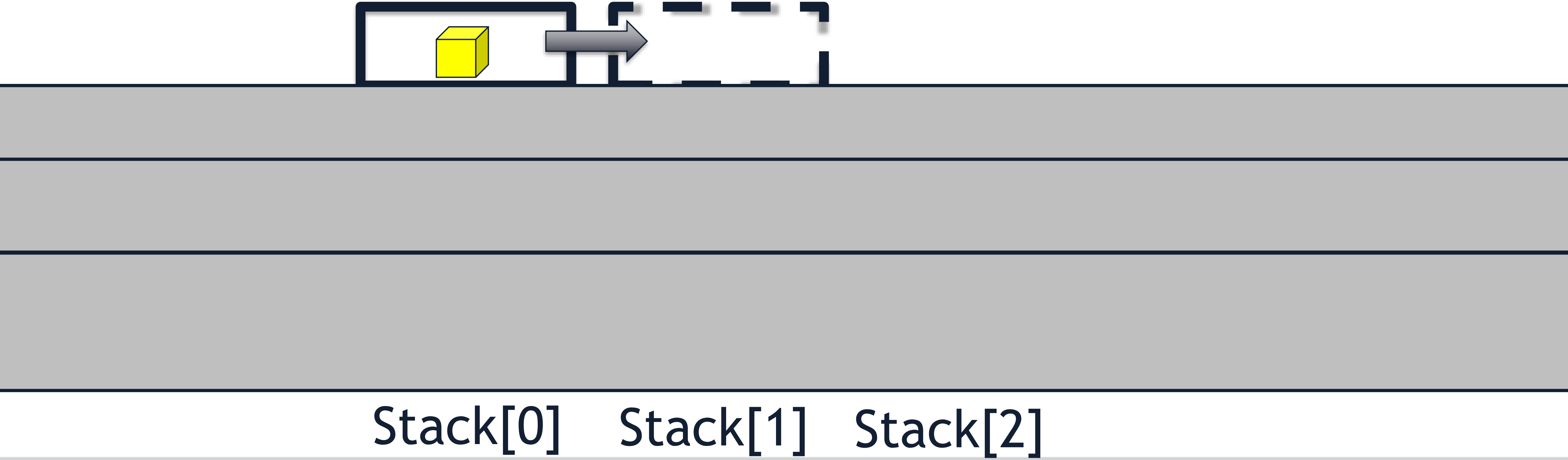
Moves Made:



Moves Made:

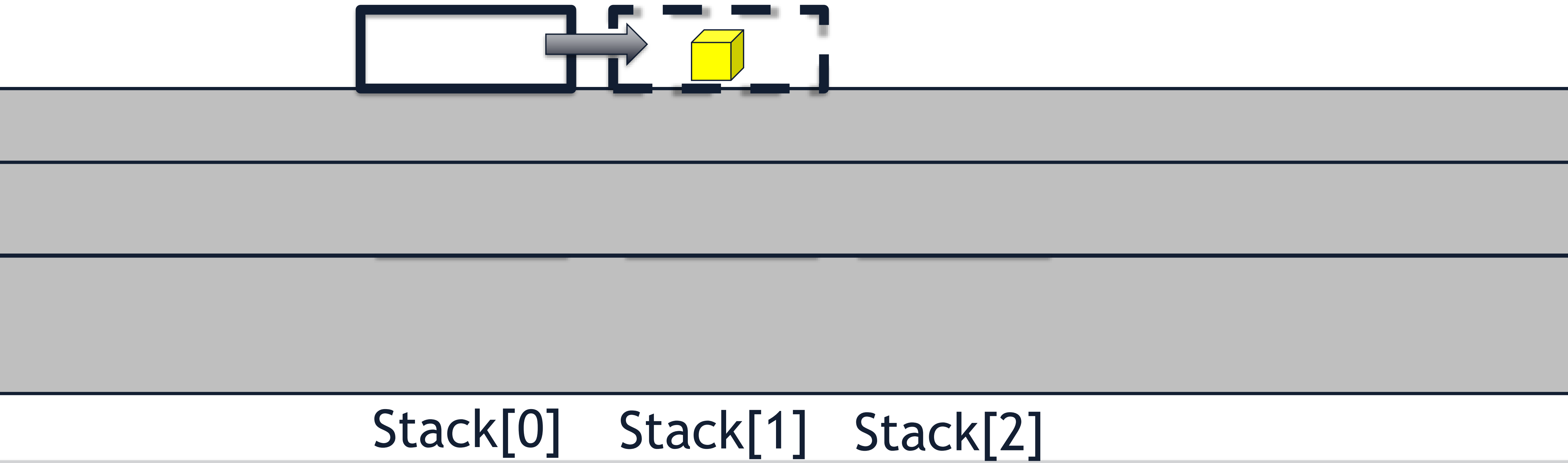


Moves Made:



Moves Made:

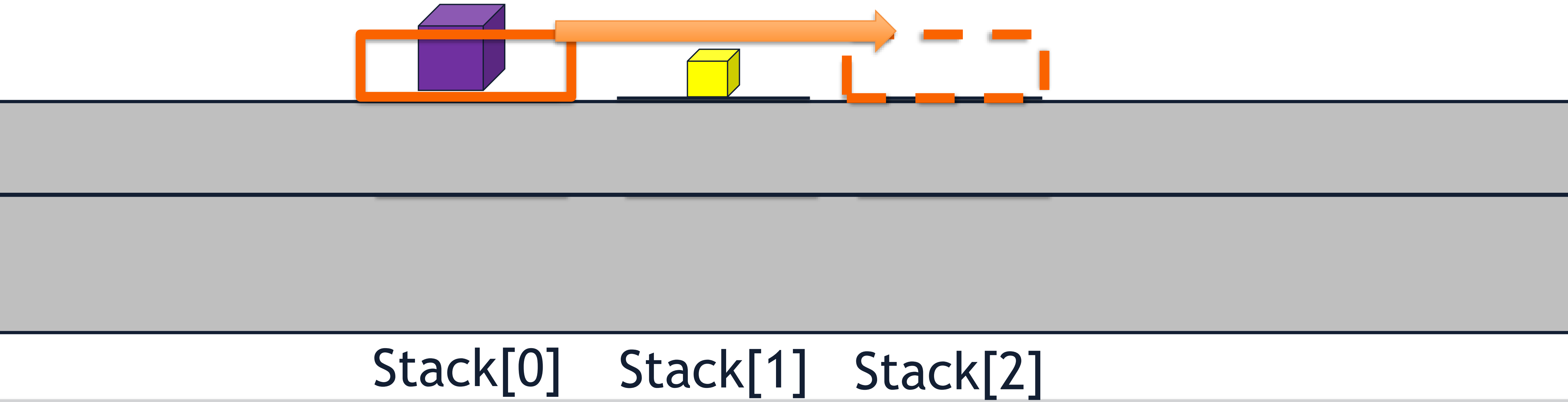
0 → 1



Stack[0] Stack[1] Stack[2]

Moves Made:

0 → 1

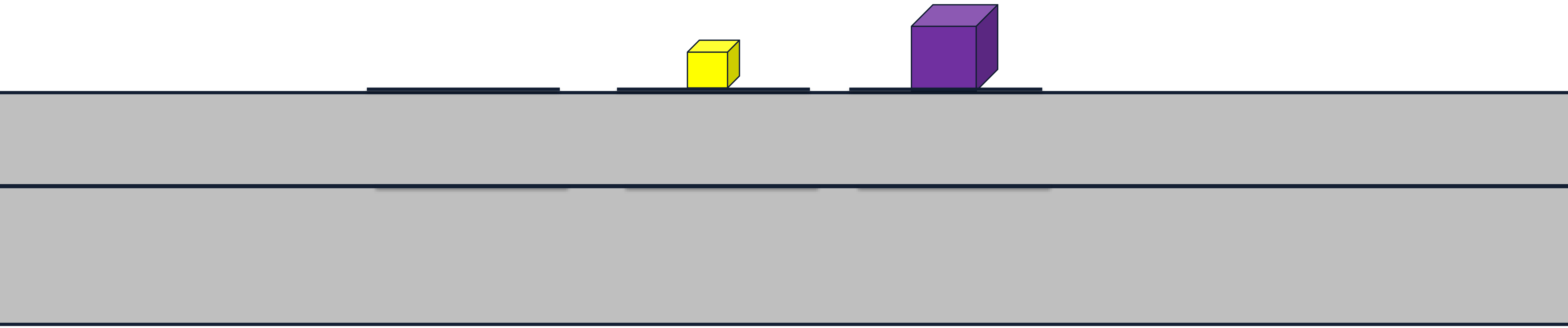


Stack[0] Stack[1] Stack[2]

Moves Made:

0 → 1

0 → 2

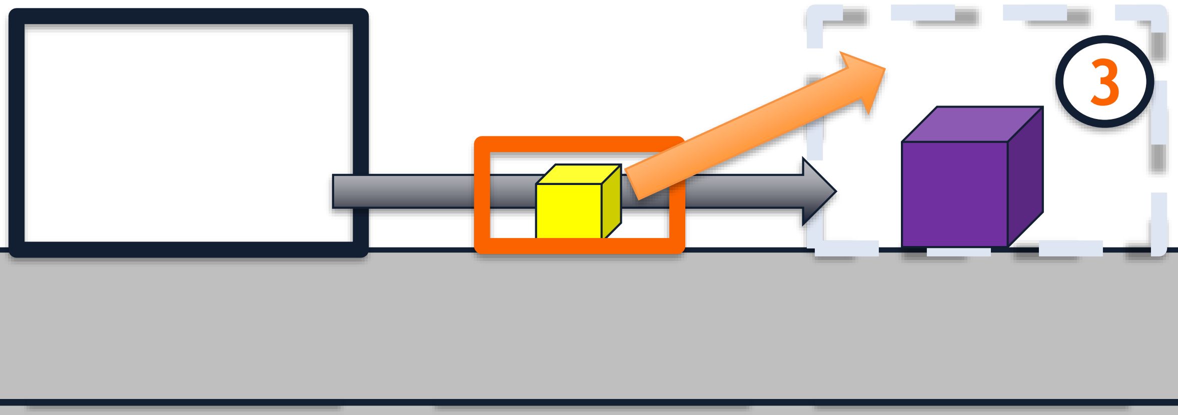


Stack[0] Stack[1] Stack[2]

Moves Made:

0 → 1

0 → 2



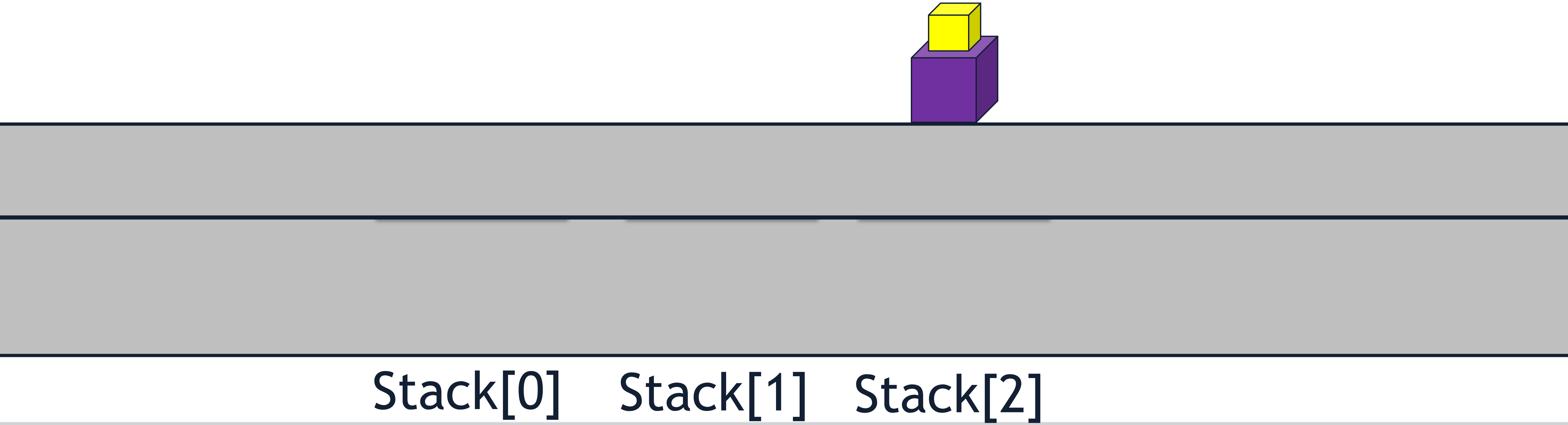
Stack[0] Stack[1] Stack[2]

Moves Made:

0 → 1

0 → 2

1 → 2

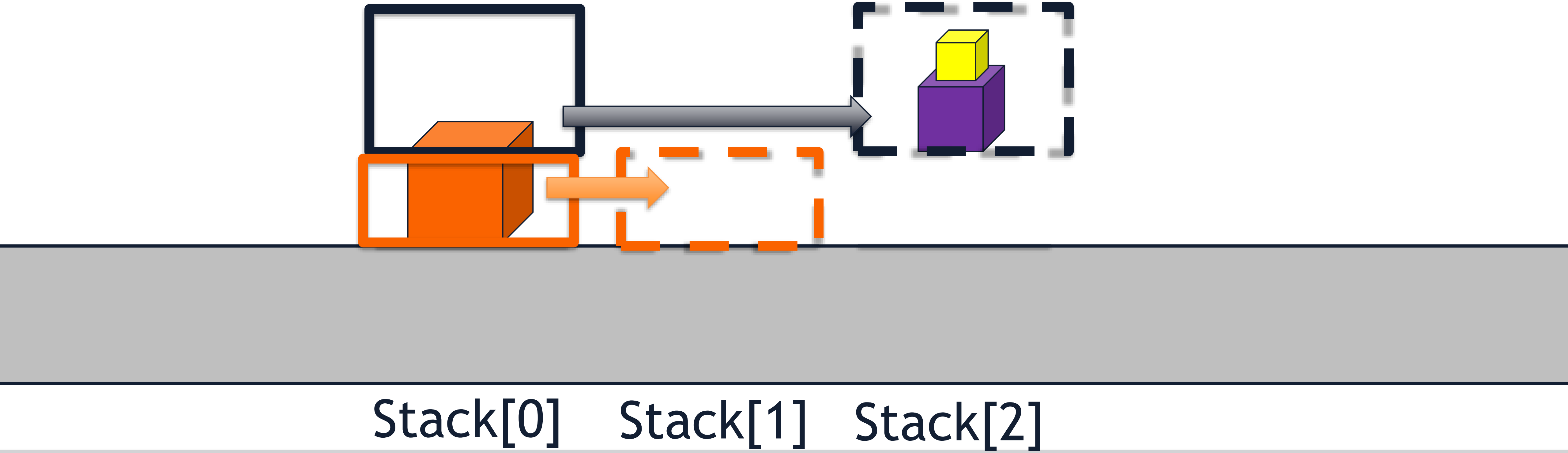


Moves Made:

0 → 1

0 → 2

1 → 2



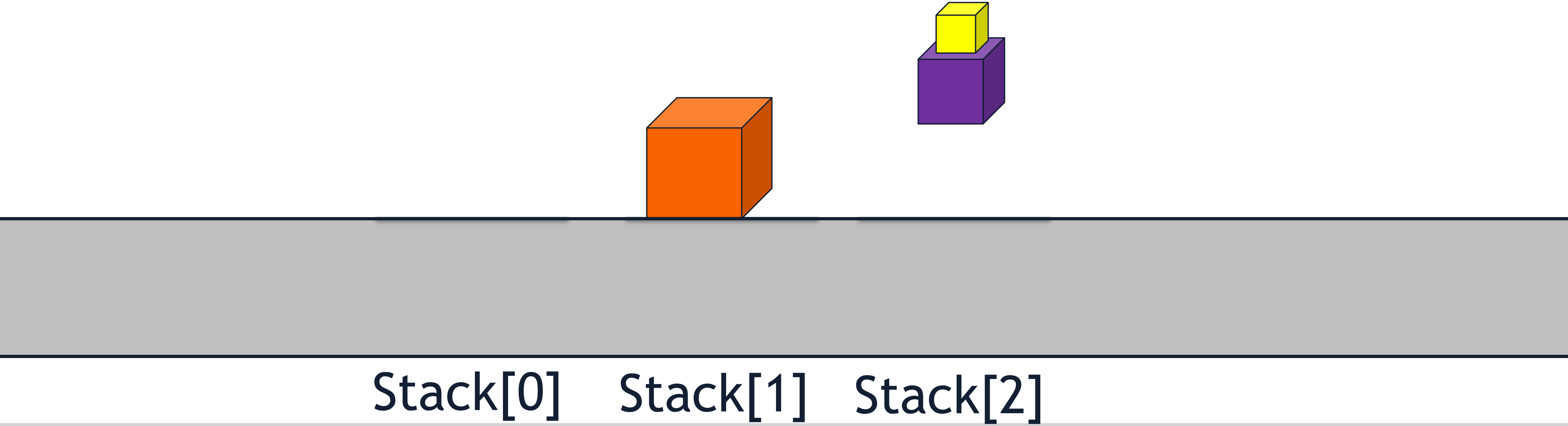
Moves Made:

0 → 1

0 → 2

1 → 2

0 → 1



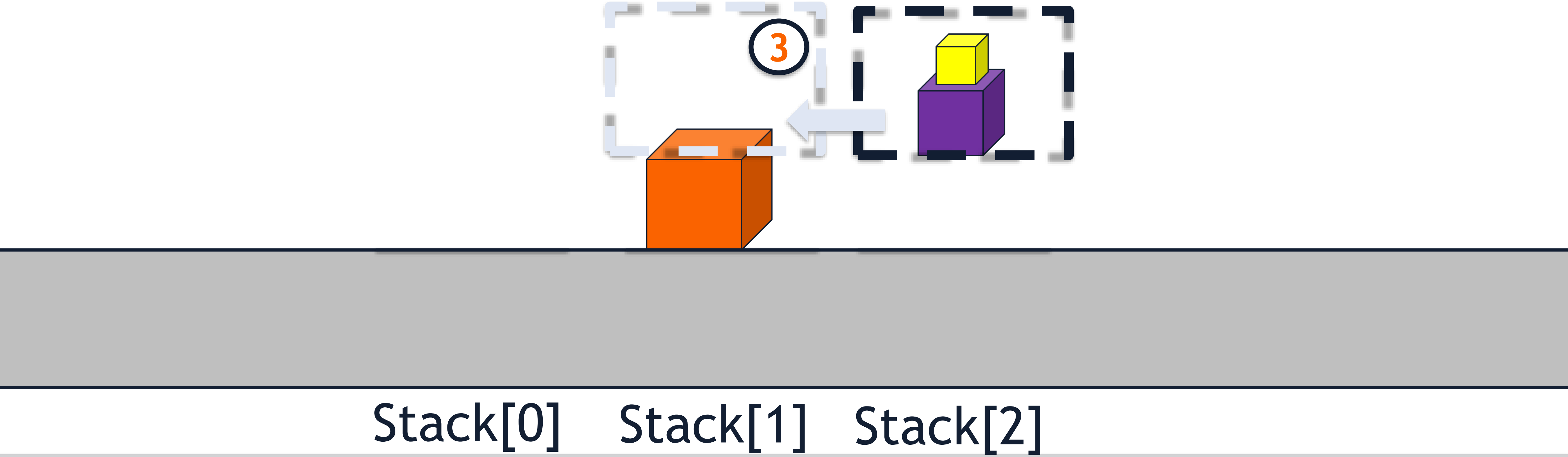
Moves Made:

0 → 1

0 → 2

1 → 2

0 → 1



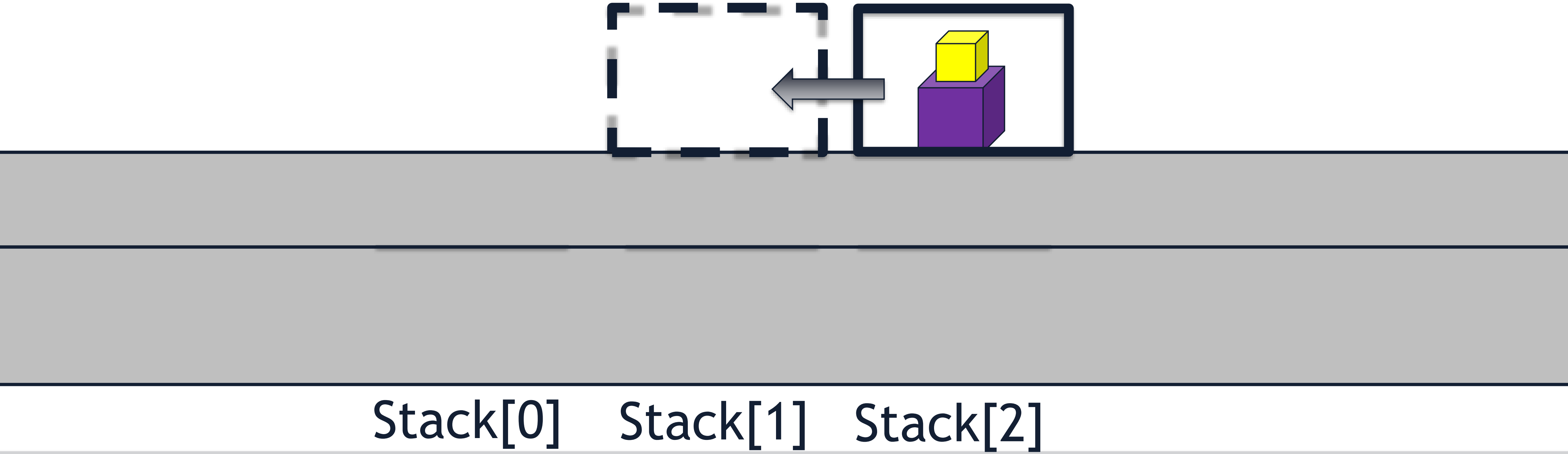
Moves Made:

0 → 1

0 → 2

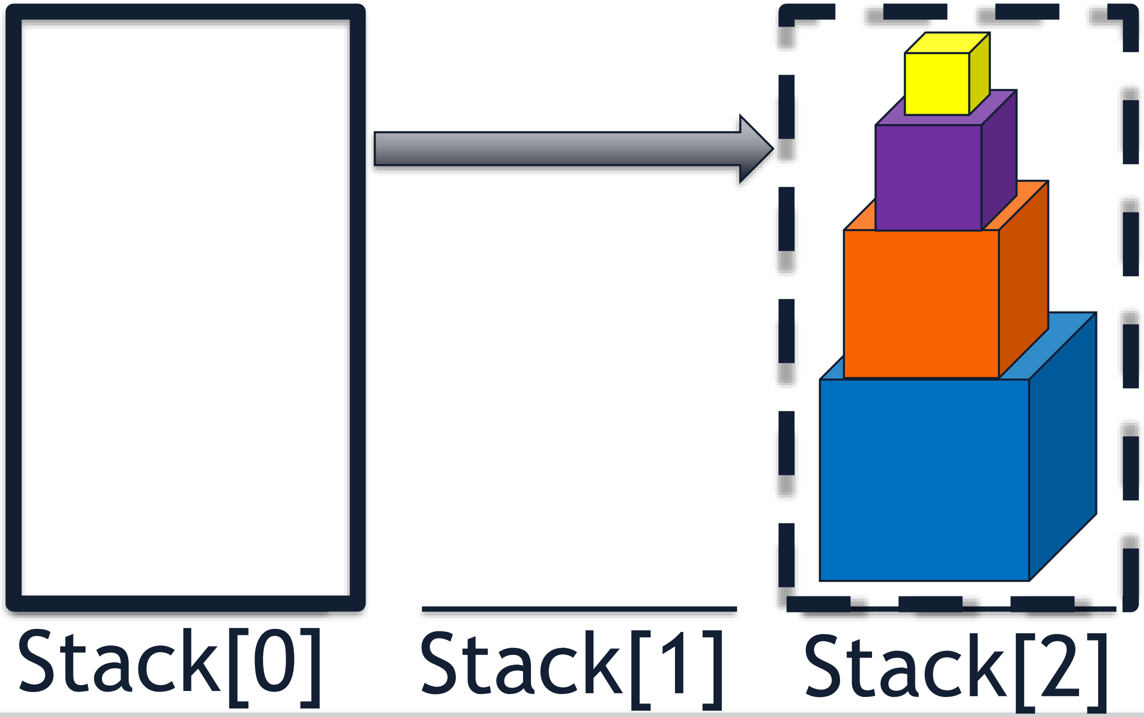
1 → 2

0 → 1



…unrolling, and recusing, and unrolling…

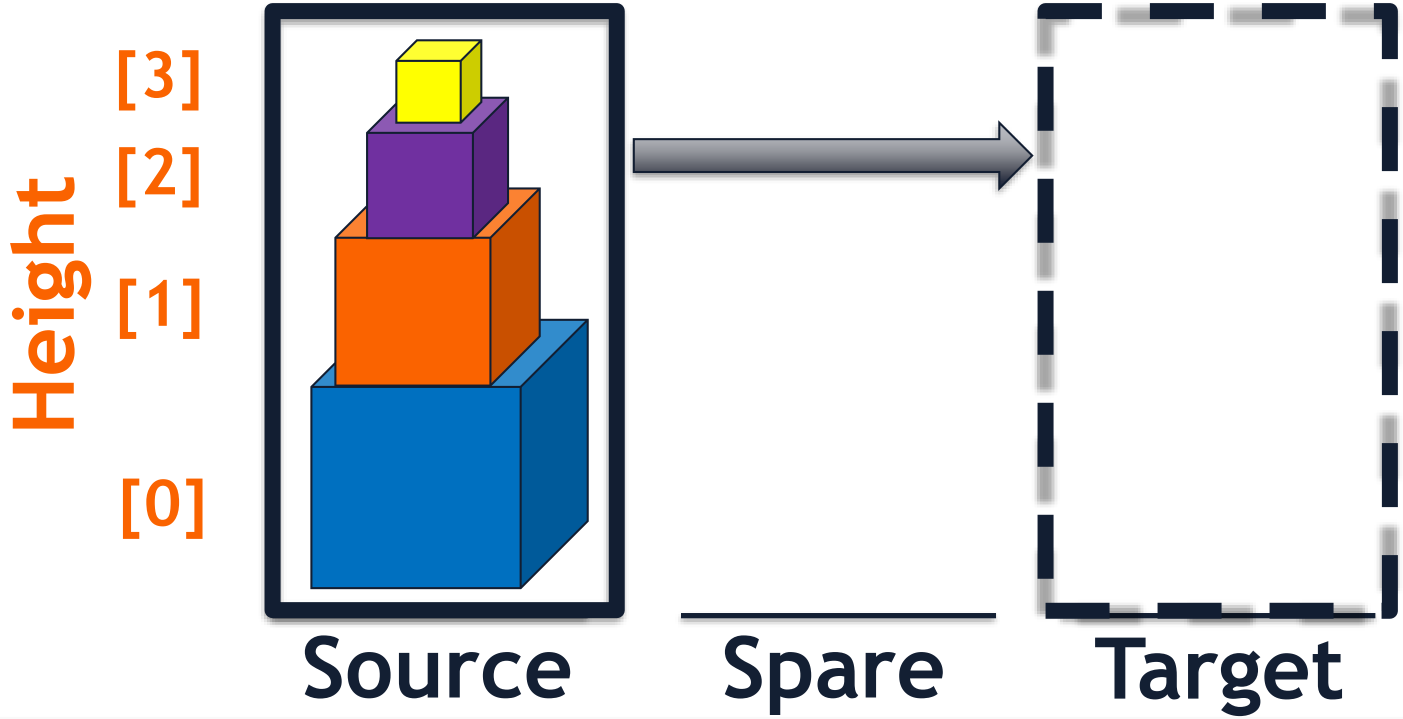
…many moves later…



Stack[0] Stack[1] Stack[2]

Moves Planned:

move(Source[0…3] → Target)



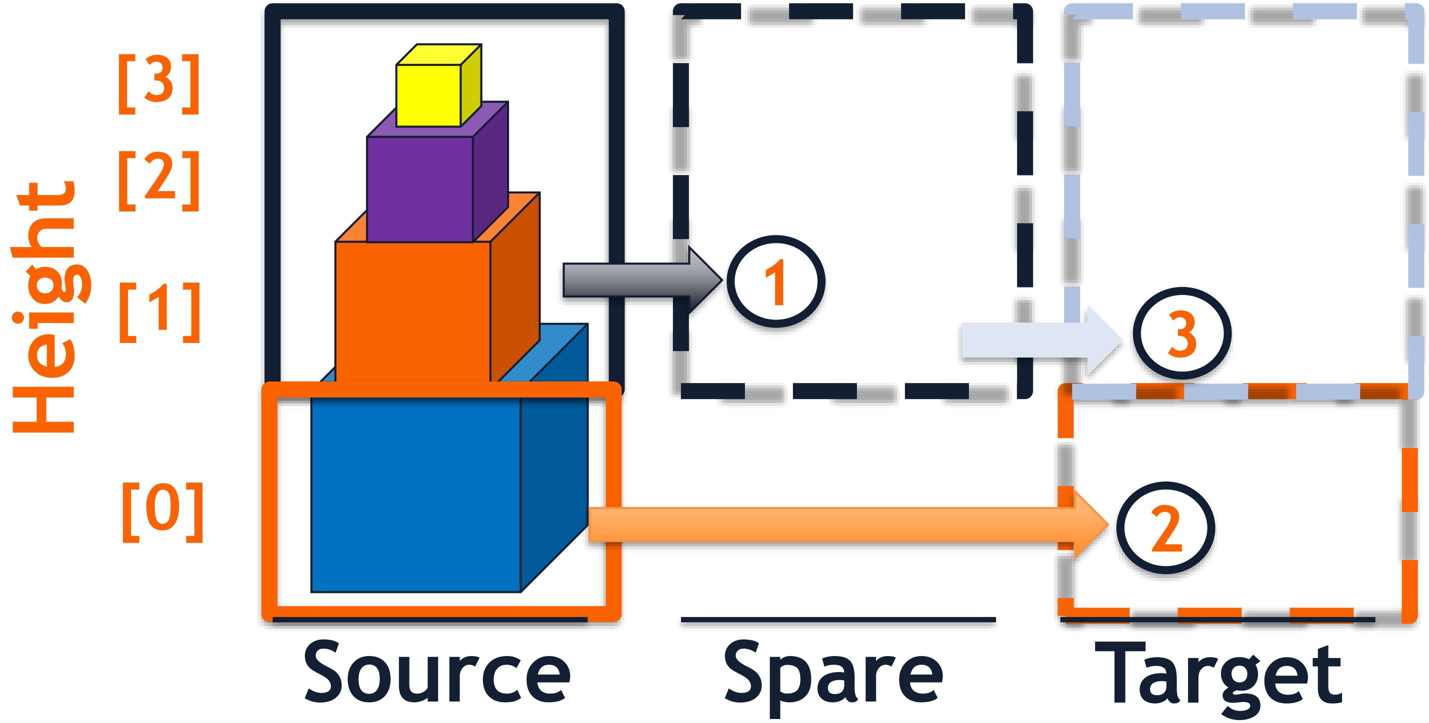
Moves Planned:

move(Source[0…3] → Target)

○ → move(Source[1…3] → Spare)

○ → move(Source[0] → Target)

○ → move(Spare[1…3] → Target)



Moves Planned:

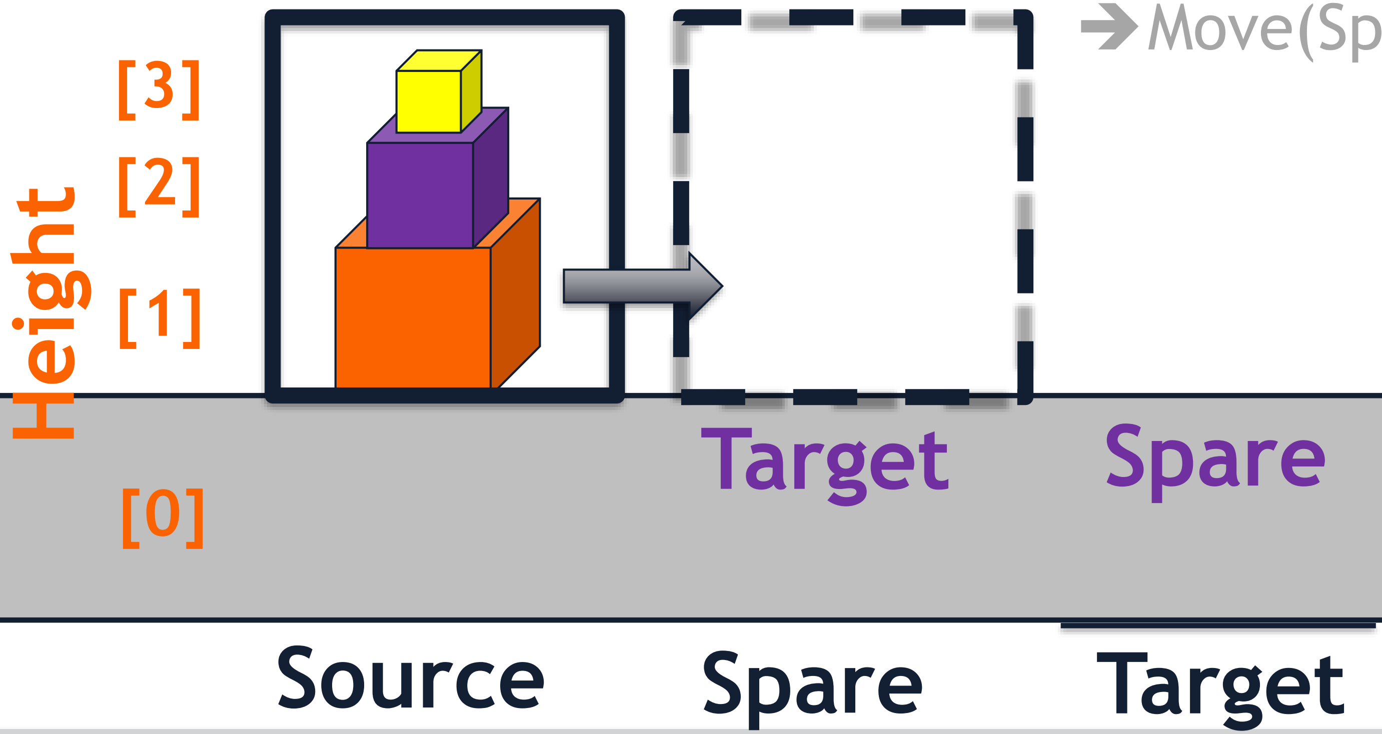
move(Source[0…3] → Target)

➔move(Source[1…3] → Spare)

SWAP: *Old "Spare" is now "Target"!*

➔move(Source[0] → Target)

➔Move(Spare[1…3] → Target)



Moves Planned:

move(Source[0…3] → Target)

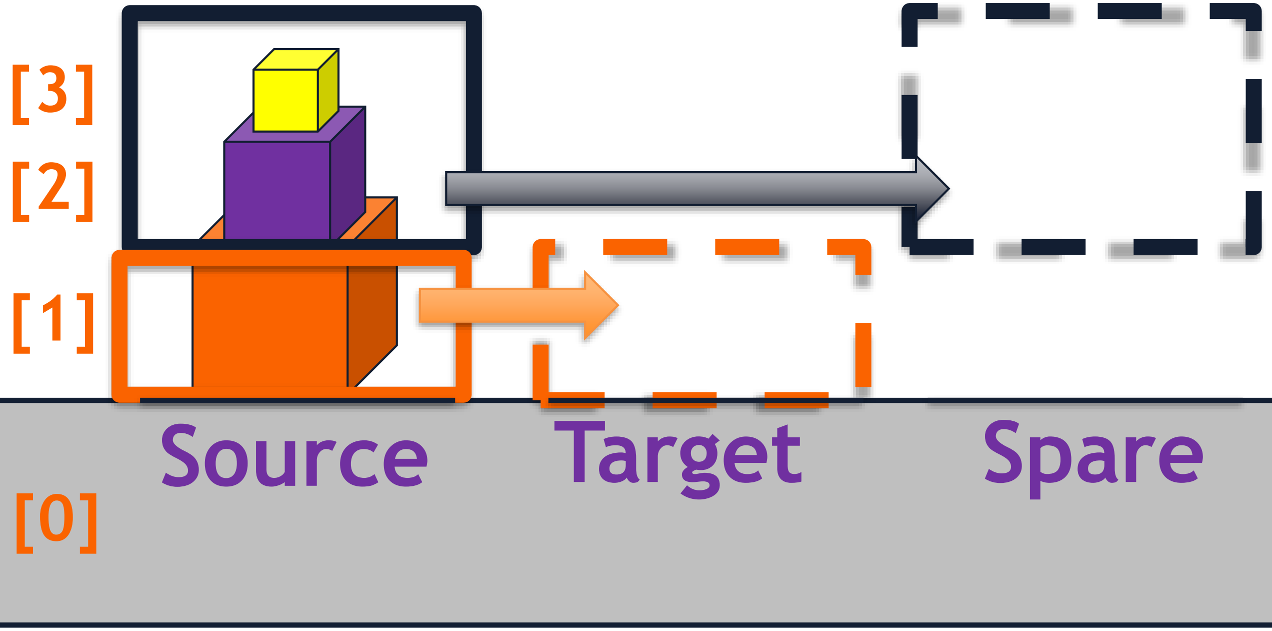
→ move(Source[1…3] → Spare)

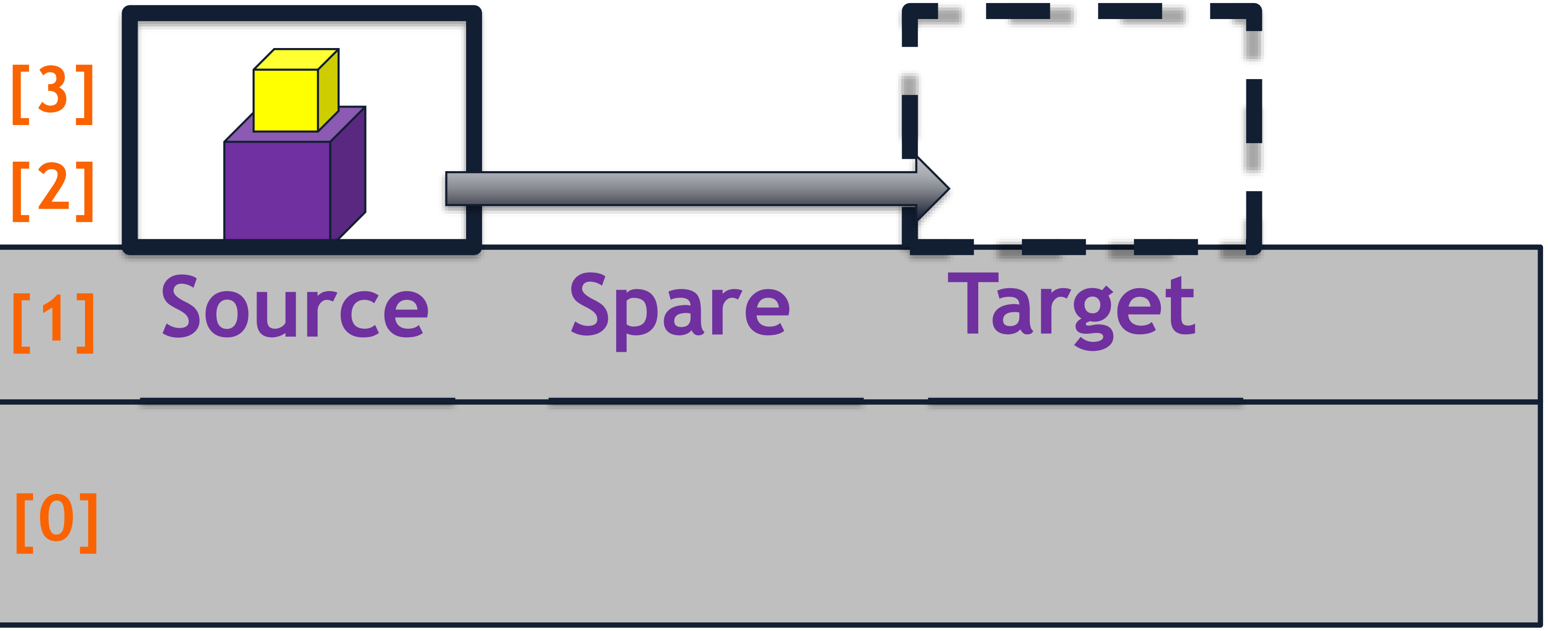
SWAP: Old "Spare" is now "Target"!

- → move(Source[2…3] → Spare)
- → move(Source[1] → Target)
- → Move(Spare[1…3] → Target)

→ move(Source[0] → Target)

→ Move(Spare[1…3] → Target)





Moves Planned:

move(Source[0…3] → Target)

→move(Source[1…3] → Spare)

→move(Source[2…3] → Spare)

→move(Source[3…3] → Spare)

→move(Source[2] → Target)

→Move(Spare[3…3] → Target)

→move(Source[1] → Target)

→Move(Spare[1…3] → Target)

→move(Source[0] → Target)

→Move(Spare[1…3] → Target)

Moves Planned:

```
move(Source[0…3] → Target)
➔move(Source[1…3] → Spare)
    ➔move(Source[2…3] → Spare)
        ➔move(Source[3…3] → Spare)  ➔  ...
        ➔move(Source[2] → Target)   ➔  ...
        ➔Move(Spare[3…3] →  Target) ➔  ...
    ➔move(Source[1] → Target) ➔ ...
    ➔Move(Spare[1…3] → Target) ➔ ...
➔move(Source[0] → Target) ➔ ...
➔Move(Spare[1…3] → Target) ➔ ...
```

Moves Planned:

```
move(Source[0…3] → Target)
➔move(Source[1…3] → Spare) ➔ ...
➔move(Source[0] → Target) ➔ ...
➔Move(Spare[1…3] → Target) ➔ ...
```

Moves Planned:

```
move(Source[start…end] → Target)
➔move(Source[(start+1)…end] → Spare) ➔ ...
➔move(Source[start] → Target) ➔ ...
➔Move(Spare[(start+1)…end] → Target) ➔ ...
```

cpp-tower-solution2/Game.cpp

```cpp
void Game::_move(
  unsigned start, unsigned end,
  Stack & source, Stack & target, Stack & spare,
  unsigned depth
) {
  cout << "Planning (depth=" << depth++ << "): Move [" << /* ... */

  // Check if we are only moving one cube:
  if (start == end) {
    // If so, move it directly:
    _moveCube( source, target );
    cout << *this << endl;
  } else {
    // Otherwise, use our move strategy:
    _move(start + 1, end  , source, spare , target, depth);
    _move(start    , start, source, target, spare , depth);
    _move(start + 1, end  , spare , target, source, depth);
  }
}
```