Presenting

The Rail Guardians

in requirement of the course project for ST699 – Special Topics in Games

Presented By

Soumyaratna Debnath, 22270004,
MTech W&S CSE

Inspired from Eternal Vertex Cover problem, *The Rail Guardians* is a two-player game where the players alternate between defending and attacking positions in a dynamic, strategic showdown.

Minimum Vertex Cover

For a graph G(V, E), as set S ⊆ V(G) is said to be a vertex cover of G if for any (u, v) ∈ E(G) either u ∈ S or v ∈ S.

The size of the smallest vertex cover of graph G is called the minimum vertex cover of G, denoted by mvc(G).
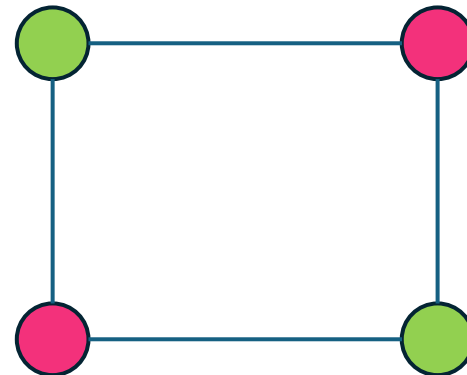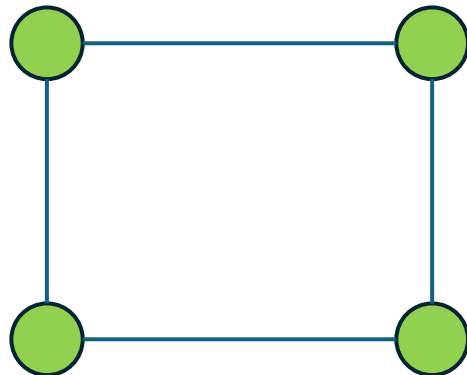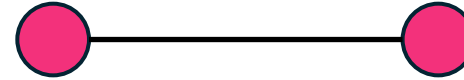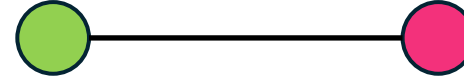
Eternal Vertex Cover

- Dynamic variant of the vertex cover problem.

- Guards are placed on some vertices of a graph.

- In every move, the attacker attacks an edge. In response, the defender moves the guards along the edges in such a manner that at least one guard moves along the attacked edge.

- If such a movement is not possible, attacker wins. If the defender can defend an *infinite sequence of attacks*, defender wins.

- The minimum number of guards with which defender has a winning strategy is called the Eternal Vertex Cover Number of the Graph G known as evc(G).

- Klostermeyer and Mynhardt showed mvc(G) ≤ evc(G) ≤ 2mvc(G)

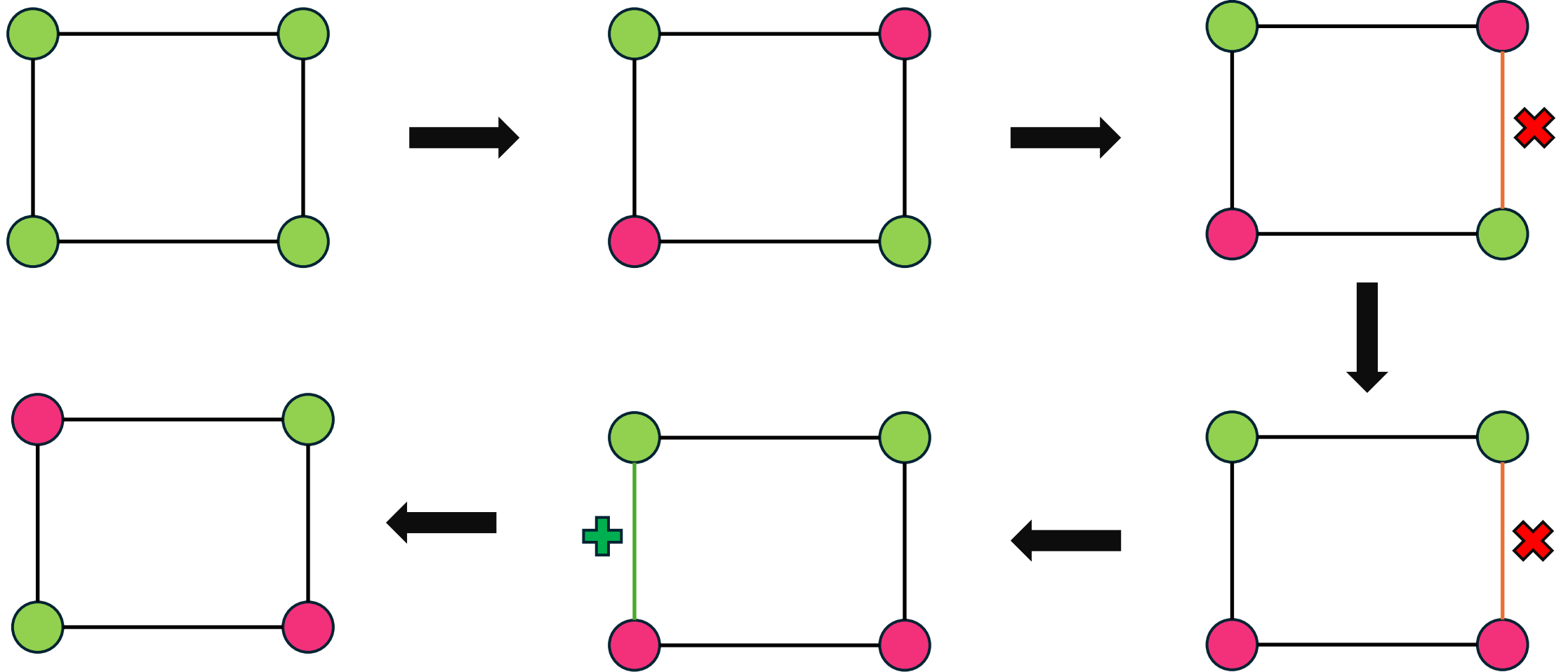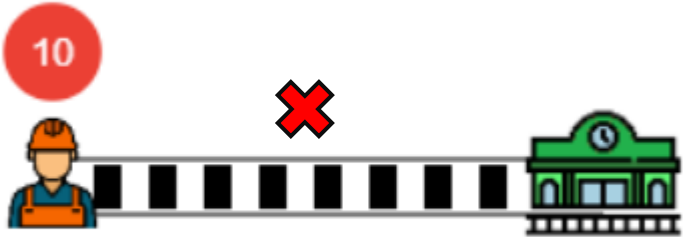# Eternal Vertex Cover – Some intuitions

Eternal Vertex Cover – A walkthrough

Let's get to the GAME !

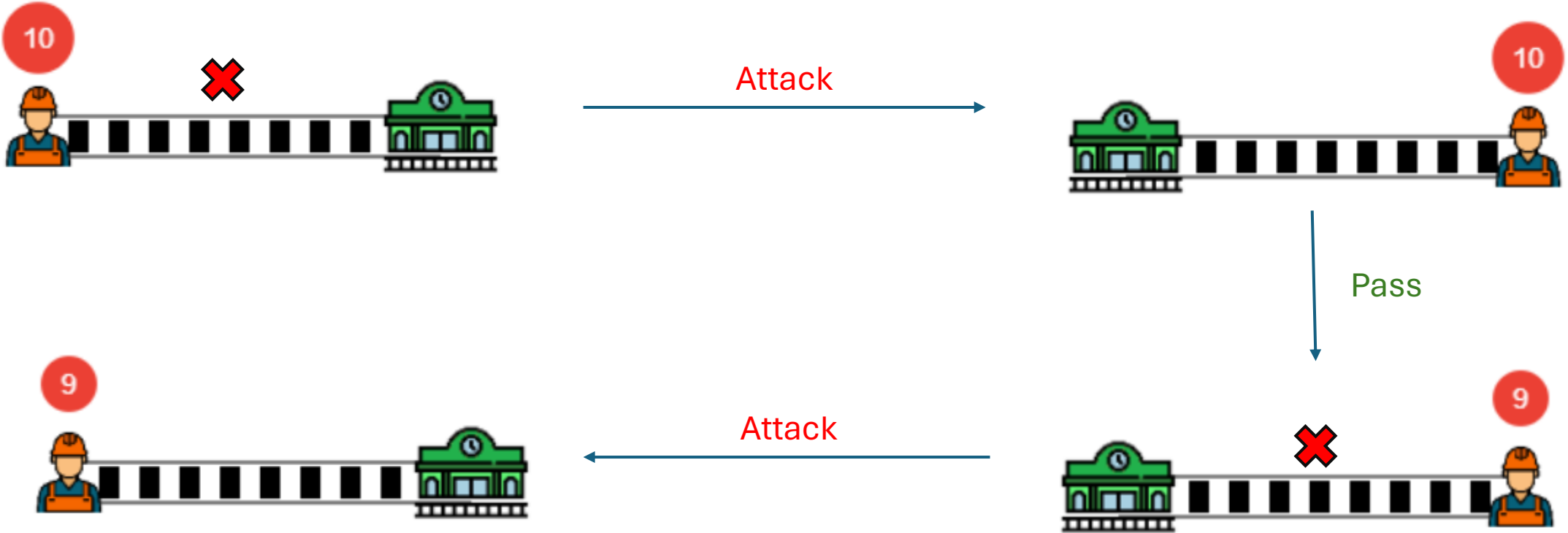# Analysis of Max Score for Energy Aware Eternal Vertex Cover on Linear Graphs

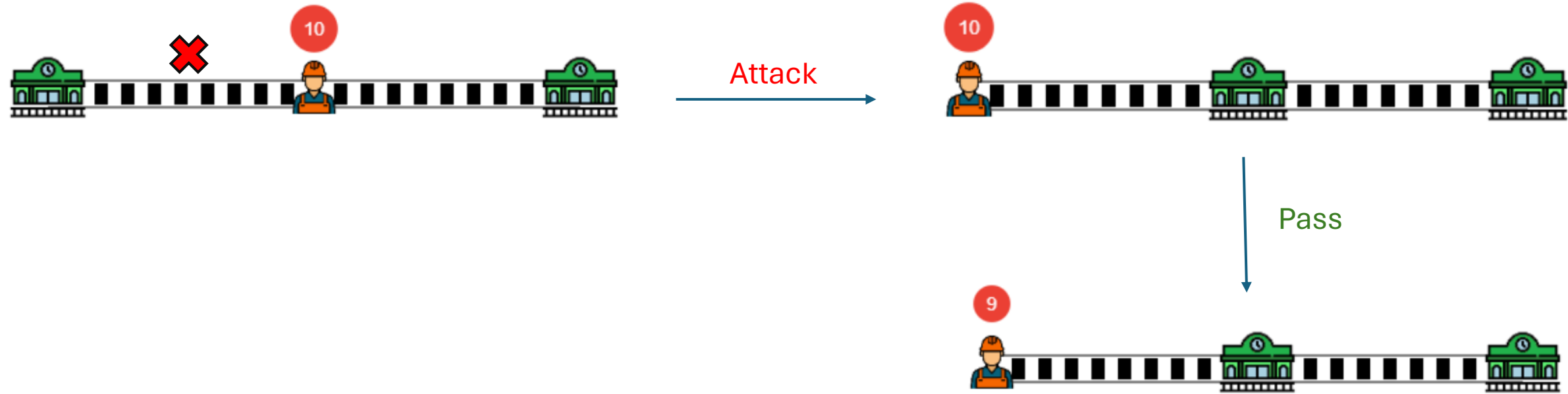| Stations	Builders	Energy	Max Score
2	1	K	**?**

Stations	Builders	Energy	Max Score
2	1	K	**K**

Stations	Builders	Energy	Max Score
3	1	K	**1**

Stations	Builders	Energy	Max Score
3	2	K	**2K - 1**
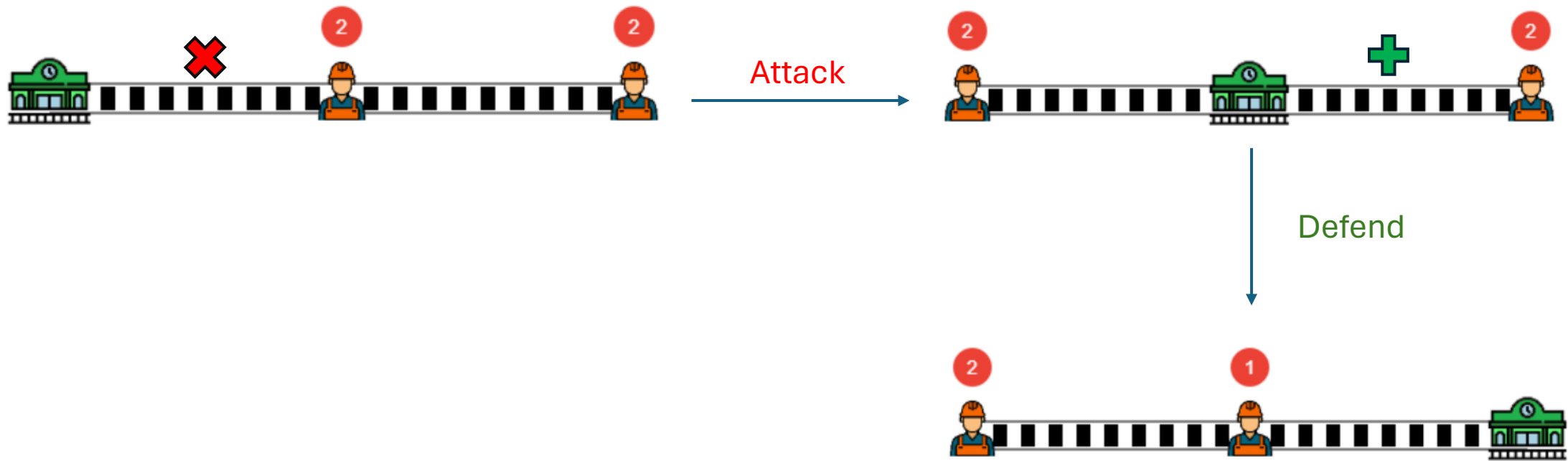
Stations	Builders	Energy	Max Score
4	1	K	0

Stations	Builders	Energy	Max Score
4	2	K	**1?**
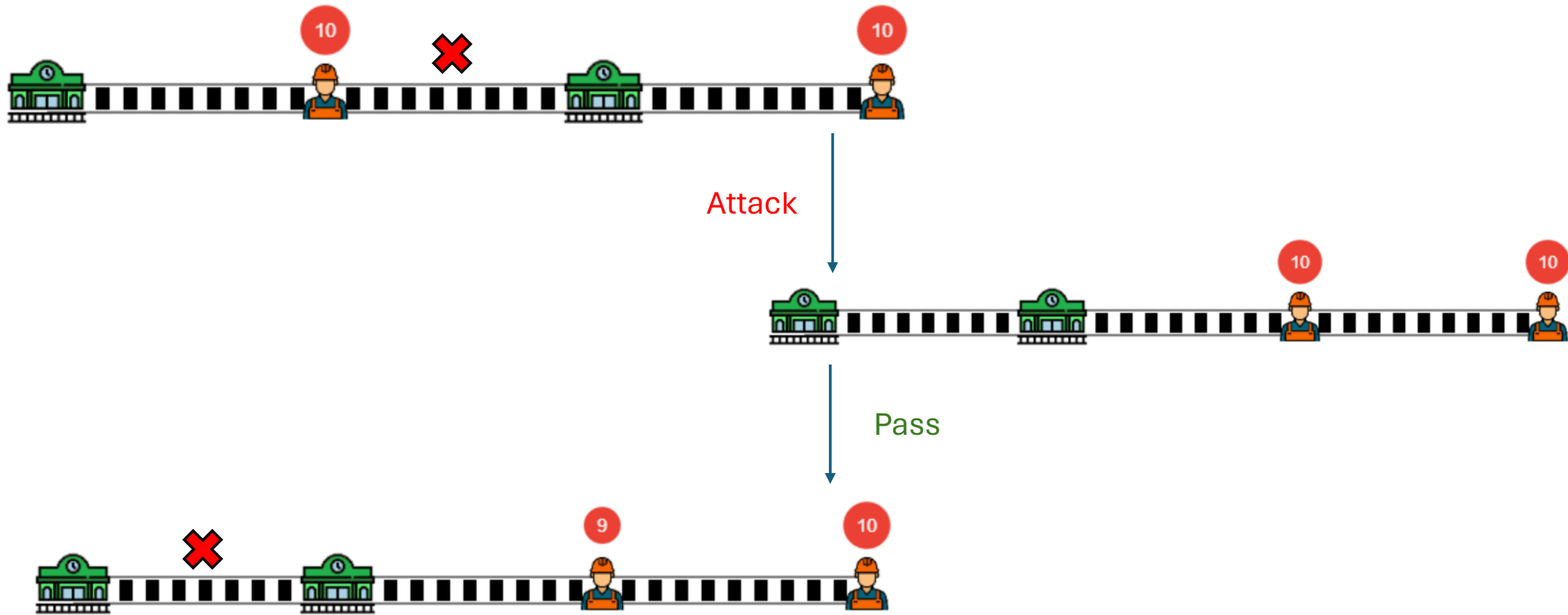
Attack

Pass

Stations	Builders	Energy	Max Score
4	2	K	**2**
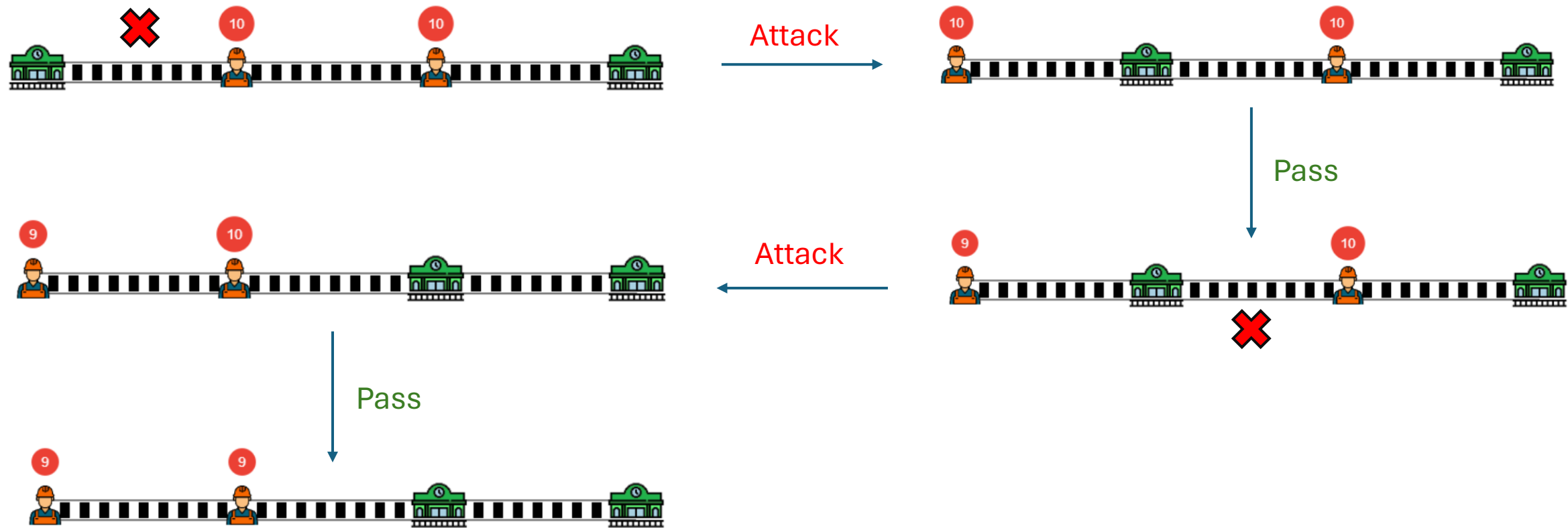
Stations	Builders	Energy	Max Score
4	3	K	**3k - 2**

Stations	Builders	Energy	Max Score
5	1	K	0

Stations	Builders	Energy	Max Score
5	2	K	1
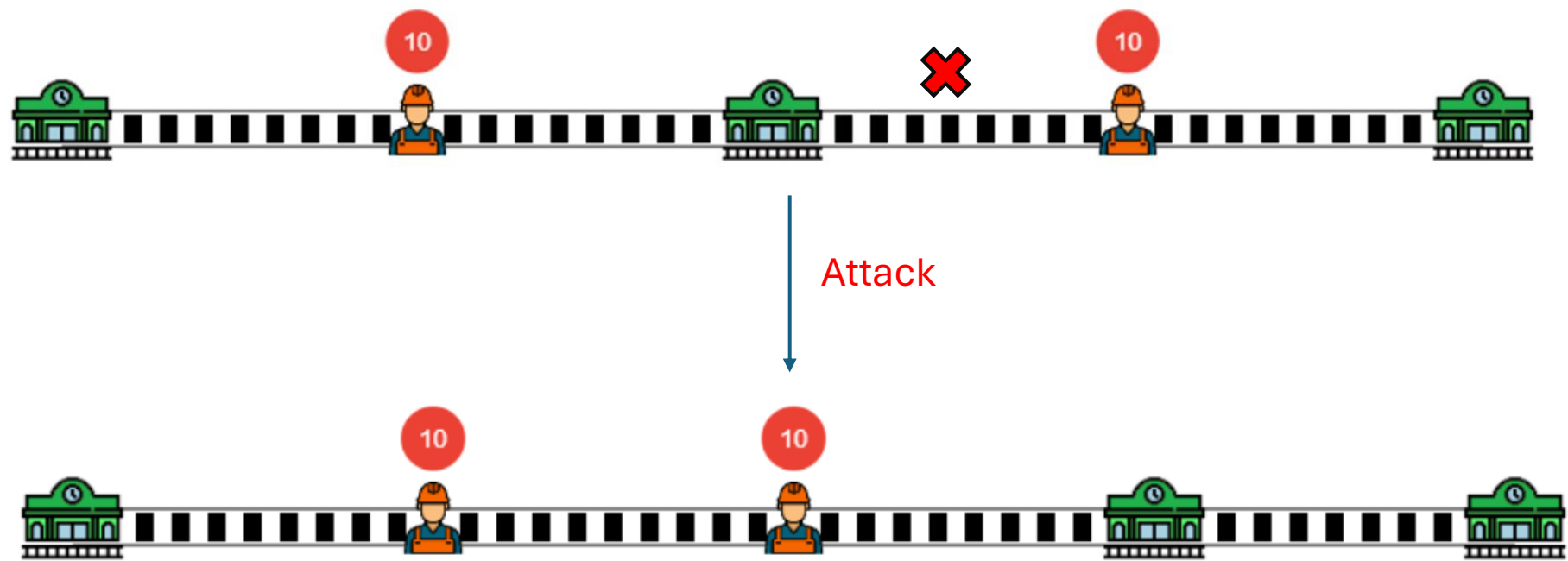
Stations	Builders	Energy	Max Score
5	3	K	?
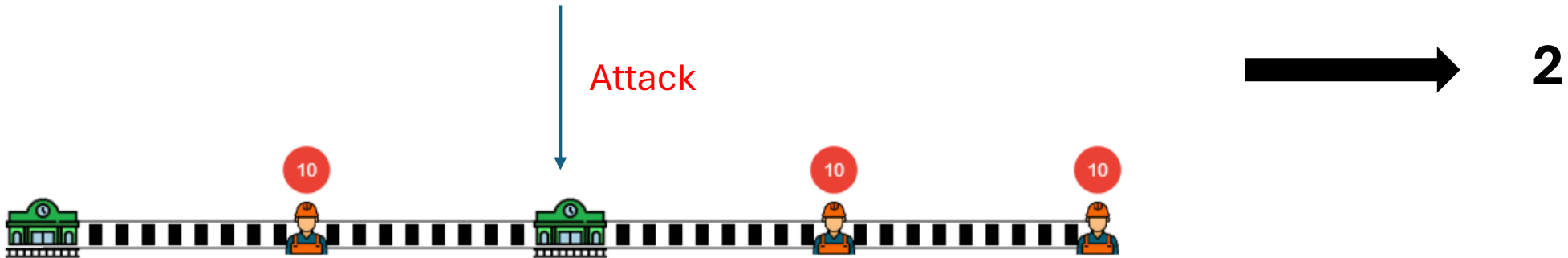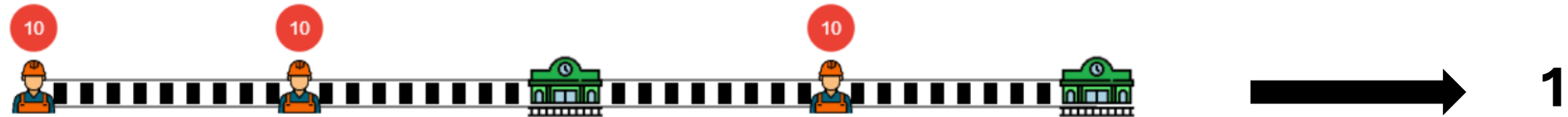
Stations	Builders	Energy	Max Score
5	3	K	**3**
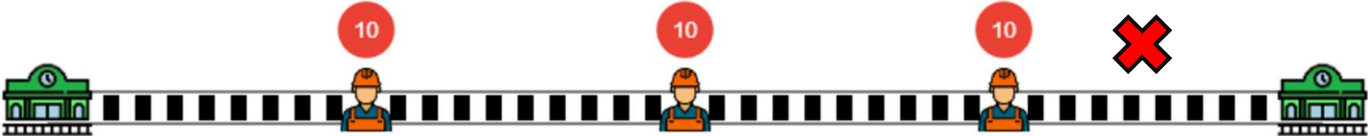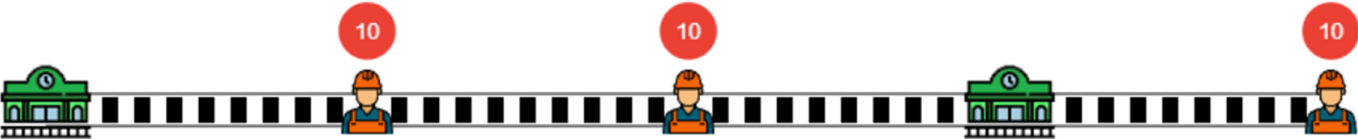
Stations	Builders	Energy	Max Score
5	4	K	**4K - 3**

Observation Summary

Stations	Builders	Energy	Max Score
2	1	K	K
3	1	K	1
3	2	K	2K − 1
4	1	K	0
4	2	K	2
4	3	K	3K − 2
5	1	K	0
5	2	K	1
5	3	K	3
5	4	K	4K − 1

Thank You

Acknowledgement