07-E2

图应用

Kruskal算法：并查集

Following the leader, the leader, the leader,

We're following the leader wherever he may go.

这里的人事关系是由一个个“单位”组成的……白天里“单位”是魂，人活在一个一个的单位里……我很庆幸，我是个有单位的人。

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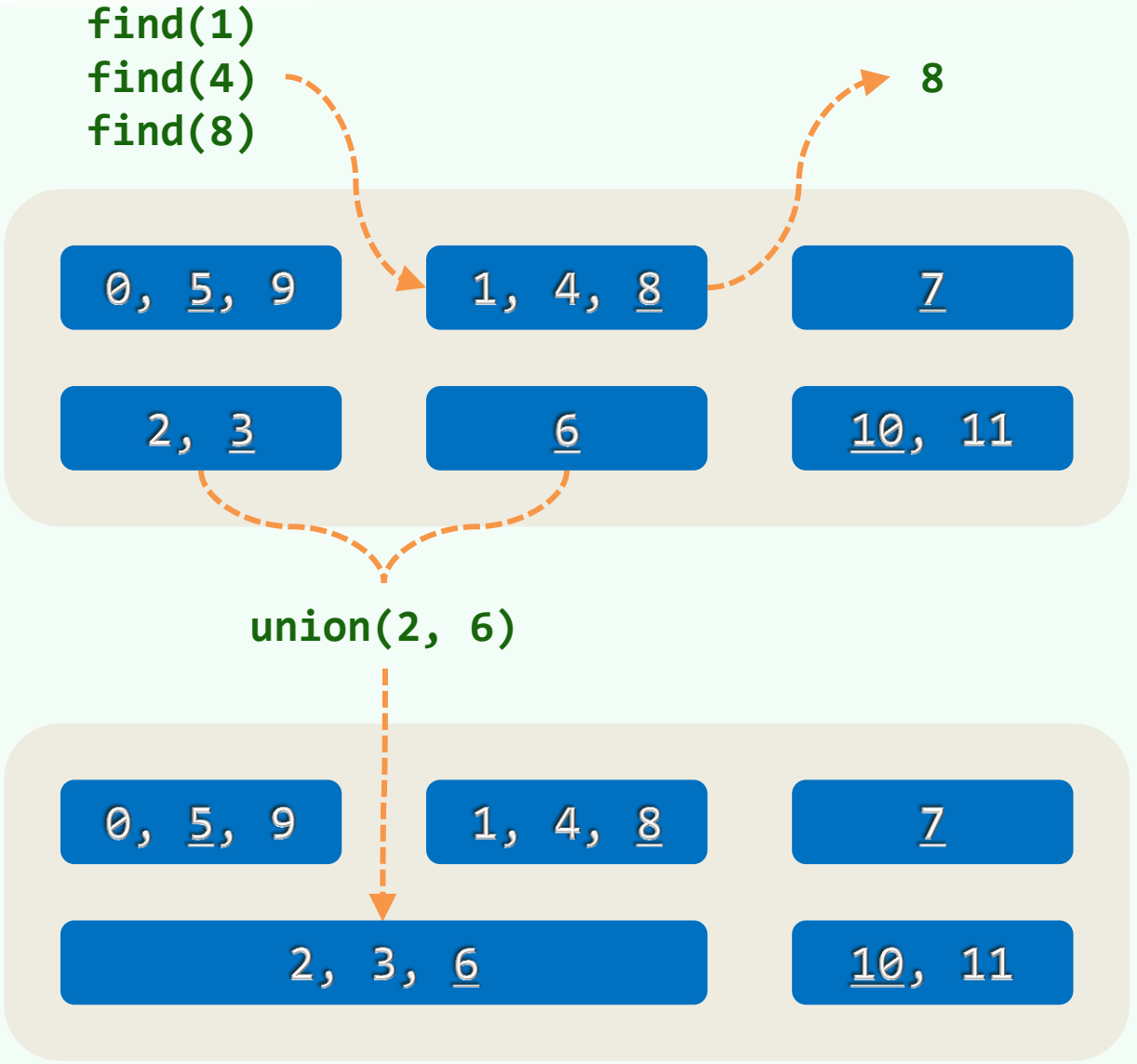
Union-Find

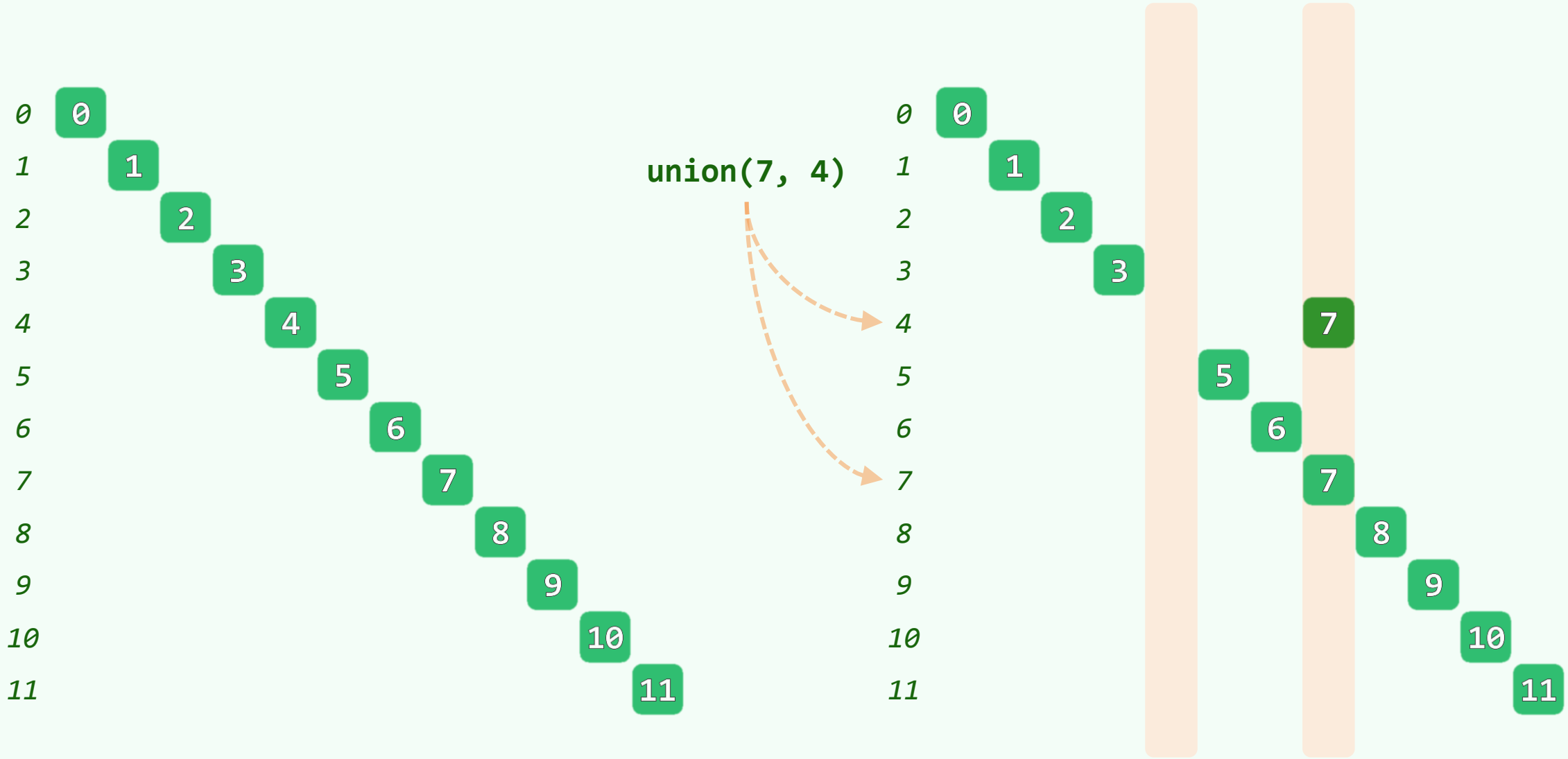
- Union-Find问题
  - 给定一组互不相交的等价类
  - 由各自的一个成员作为代表
- Singleton
  - 初始时各包含一个元素
- Find(x)
  - 找到元素x所属等价类
- Union(x, y)
  - 合并x和y所属等价类
- Kruskal = Union-Find



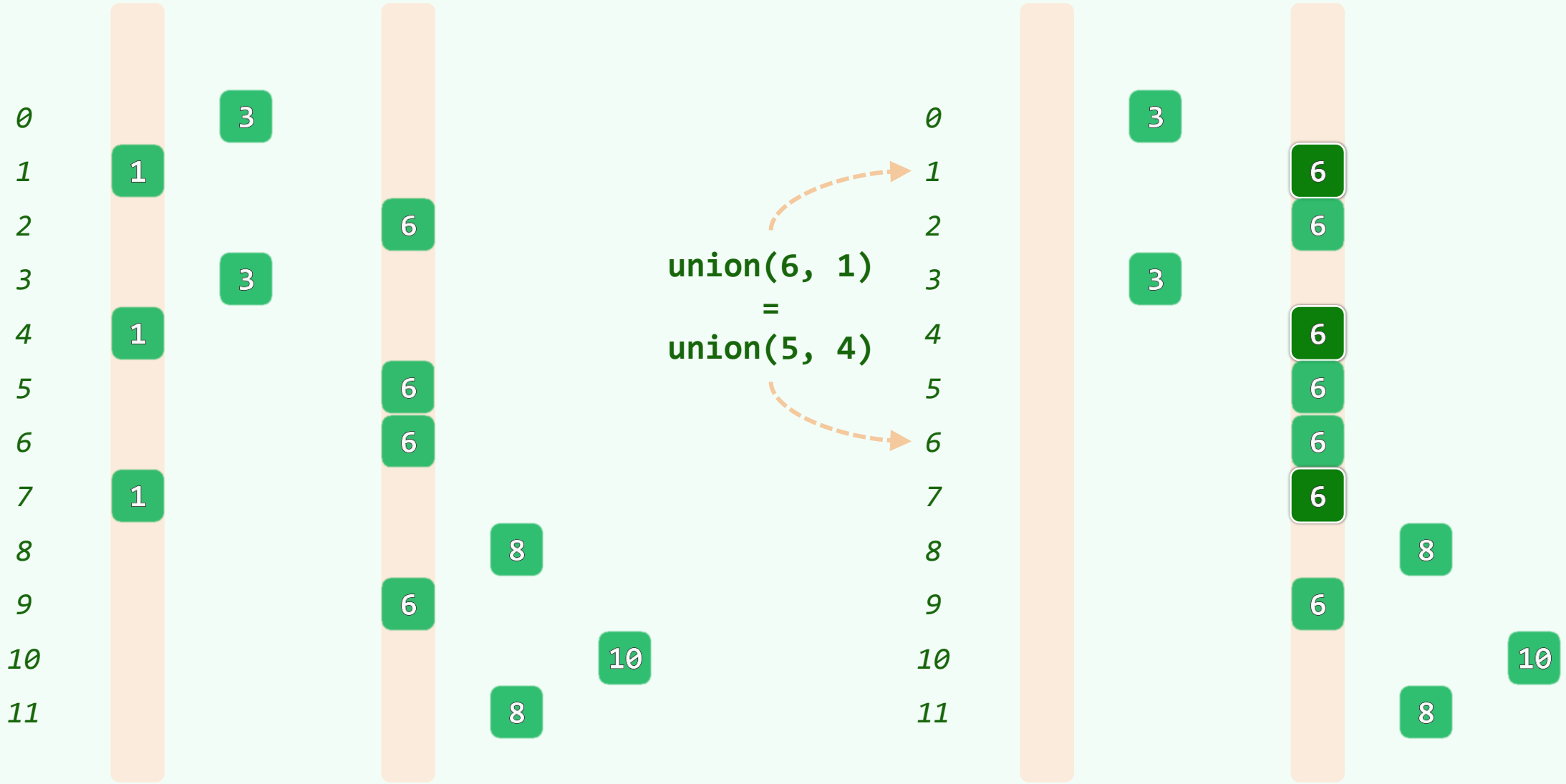
Quick-Find

```
class UnionFind:
    def __init__(self, n):
        self.g = self.n = n; self.group = [ k for k in range(n) ]
        #group[]记录各元素所属子集；初始各成一类，就以[0, n)之间整数标识
    def find(self, k):
        return self.group[k]
    def union(self, i, j):
        iGroup , jGroup = self.group[i] , self.group[j]
        if iGroup == jGroup: return
        for k in range(self.n):
            if (self.group[k] == jGroup): self.group[k] = iGroup
        self.g -= 1
```

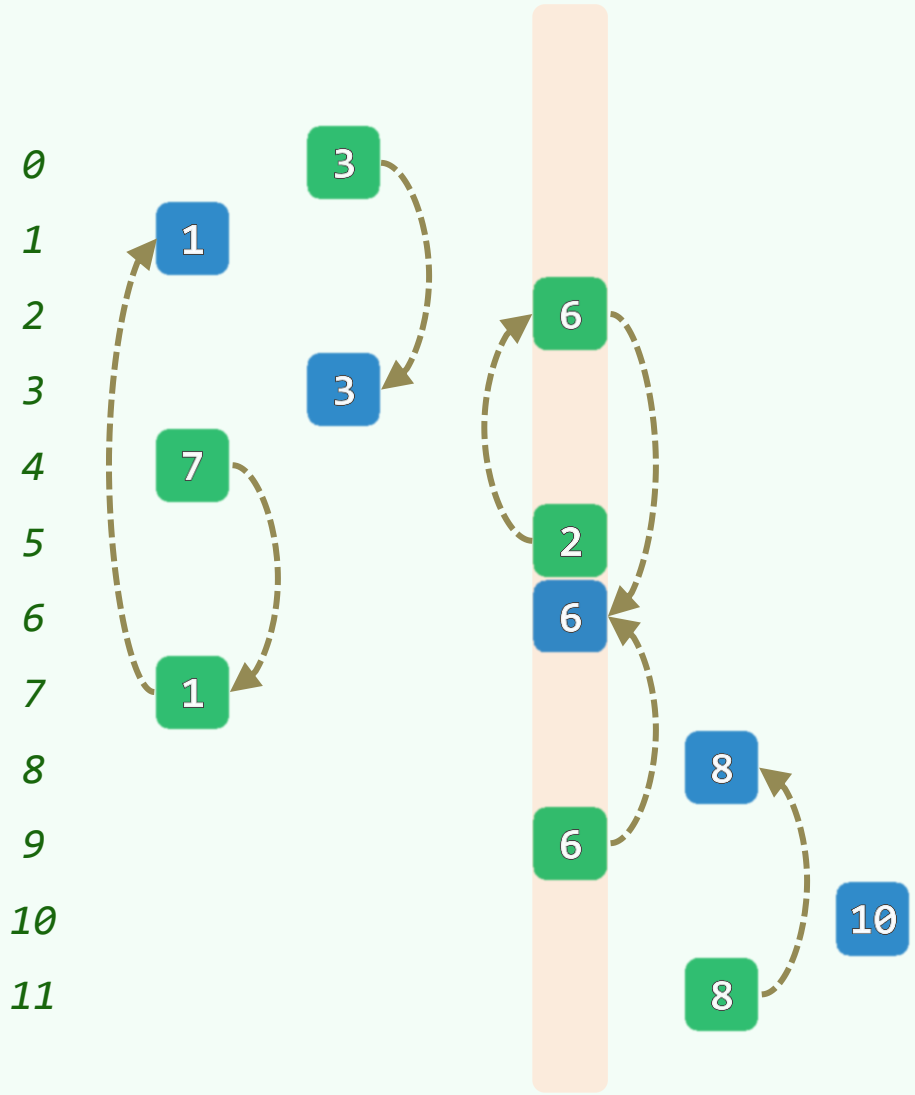
Quick-Find


0 0
1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 10
11 11
union(7, 4)
0 0
1 1
2 2
3 3
4 7
5 5
6 6
7 7
8 8
9 9
10 10
11 11

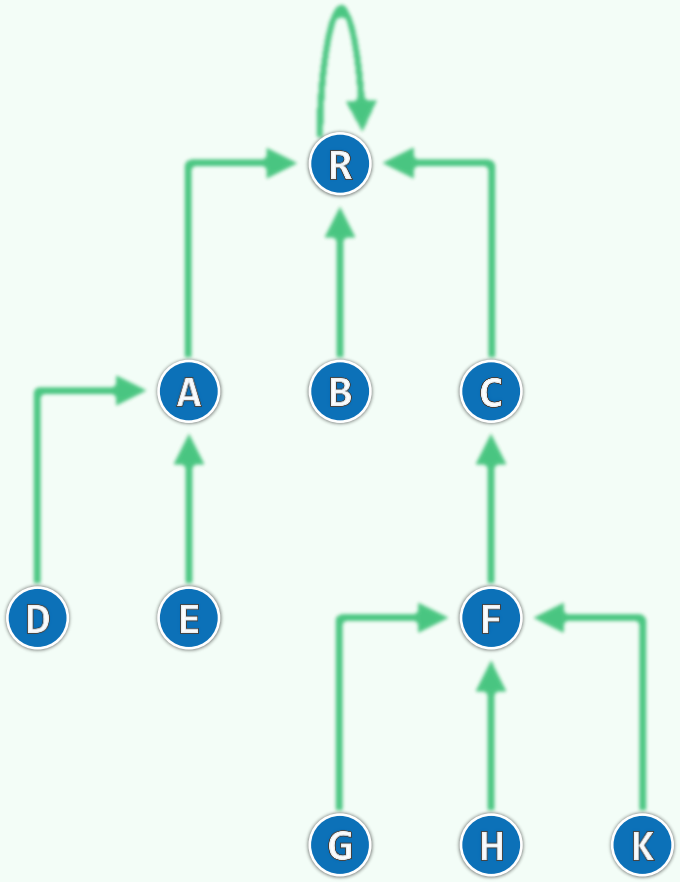
Slow-Union



Quick-Union

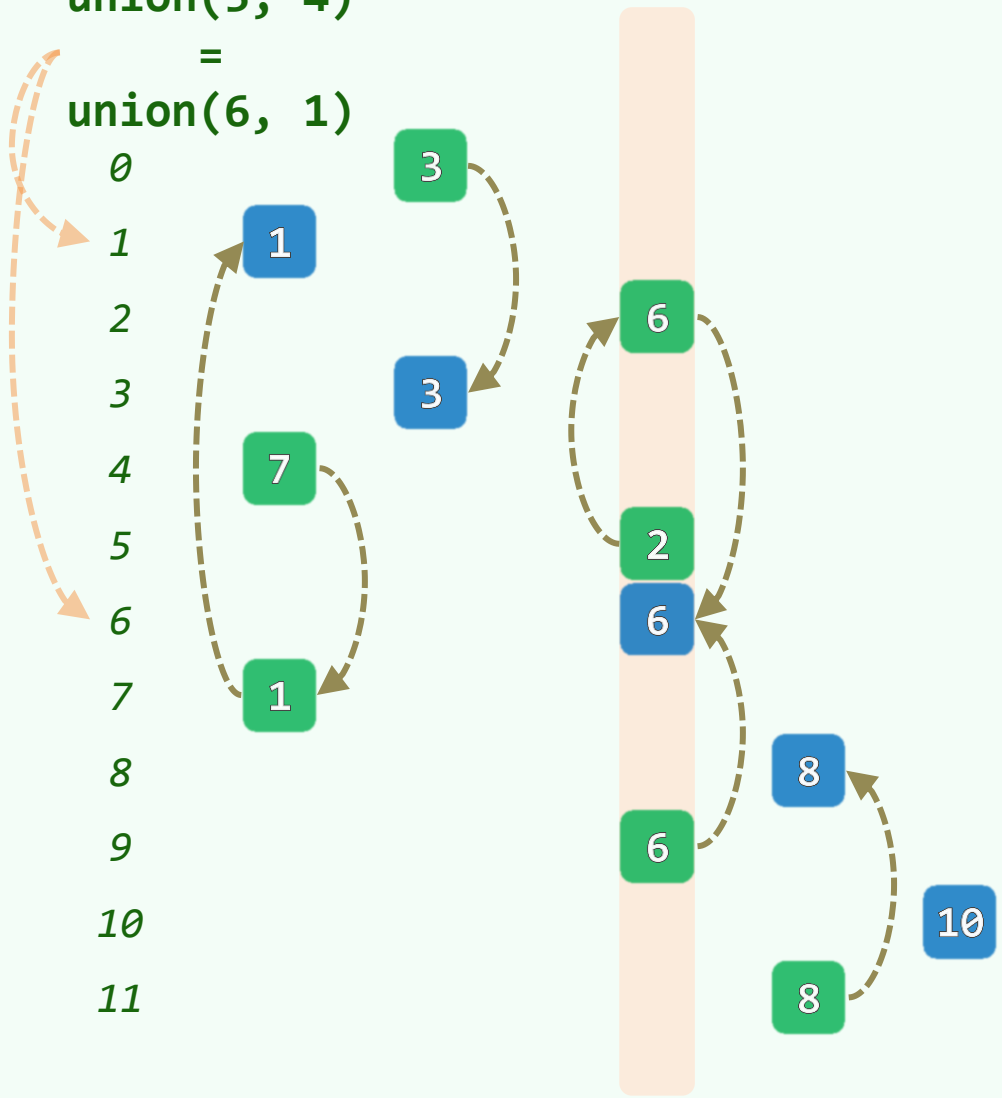


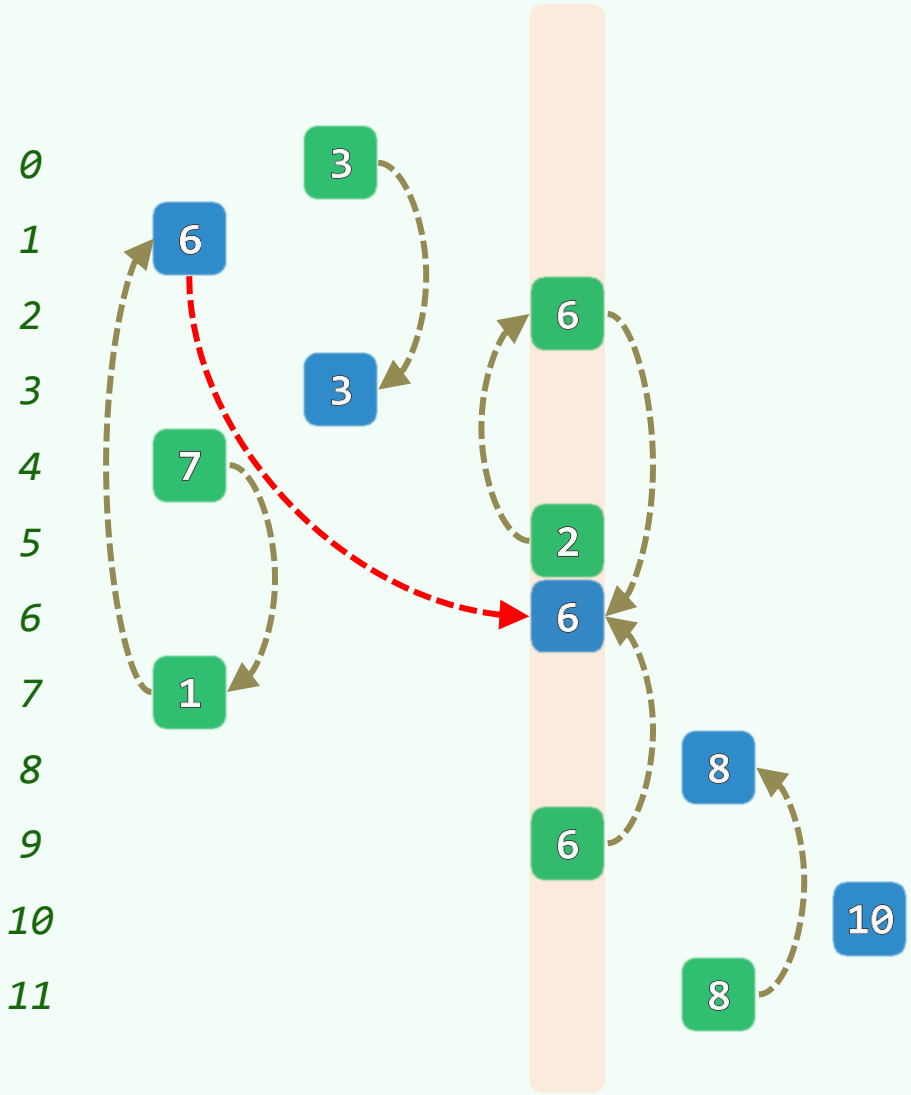
	rank	data	parent
0		H	2
1		E	7
2		F	9
3		B	4
4		R	4
5		K	2
6		D	7
7		A	4
8		G	2
9		C	4



Quick-Union

union(5, 4)
=
union(6, 1)





Path Compression