12-C

优先级队列

堆排序

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选取

- 在selectionSort()中

  将U替换为H...

- J. Williams, 1964

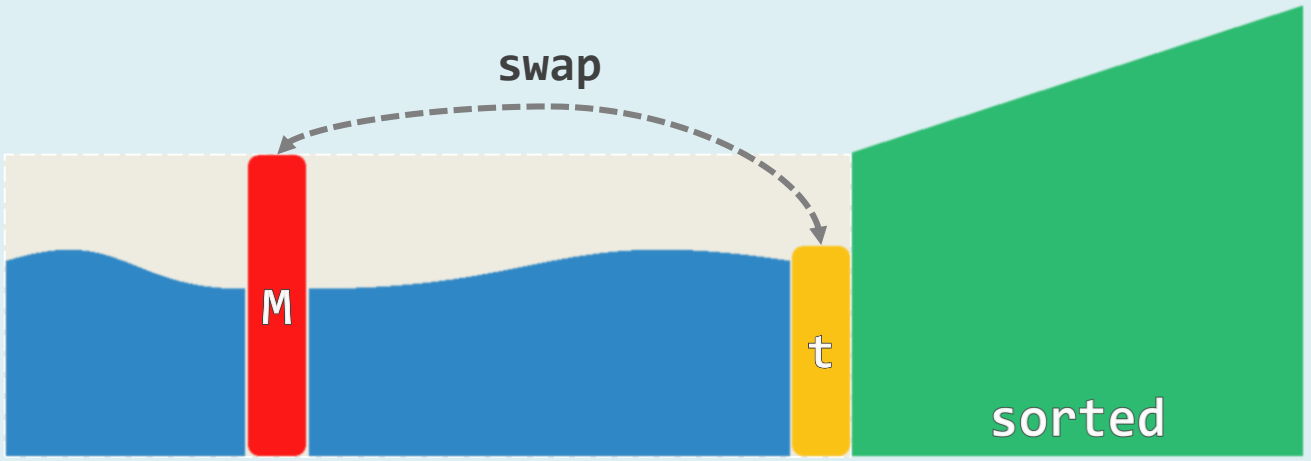
  初始化 : heapify(), $O(n)$

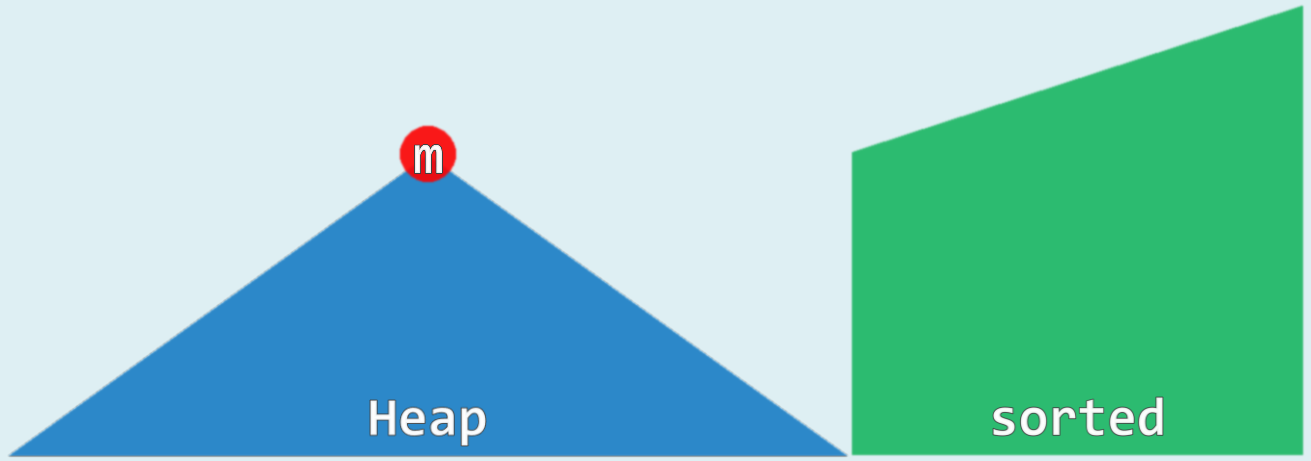
  迭代 : delMax(), $O(\log n)$

  不变性 : $H \le S$

- $O(n) + n \times O(\log n)$

  $= O(n \log n)$





就地

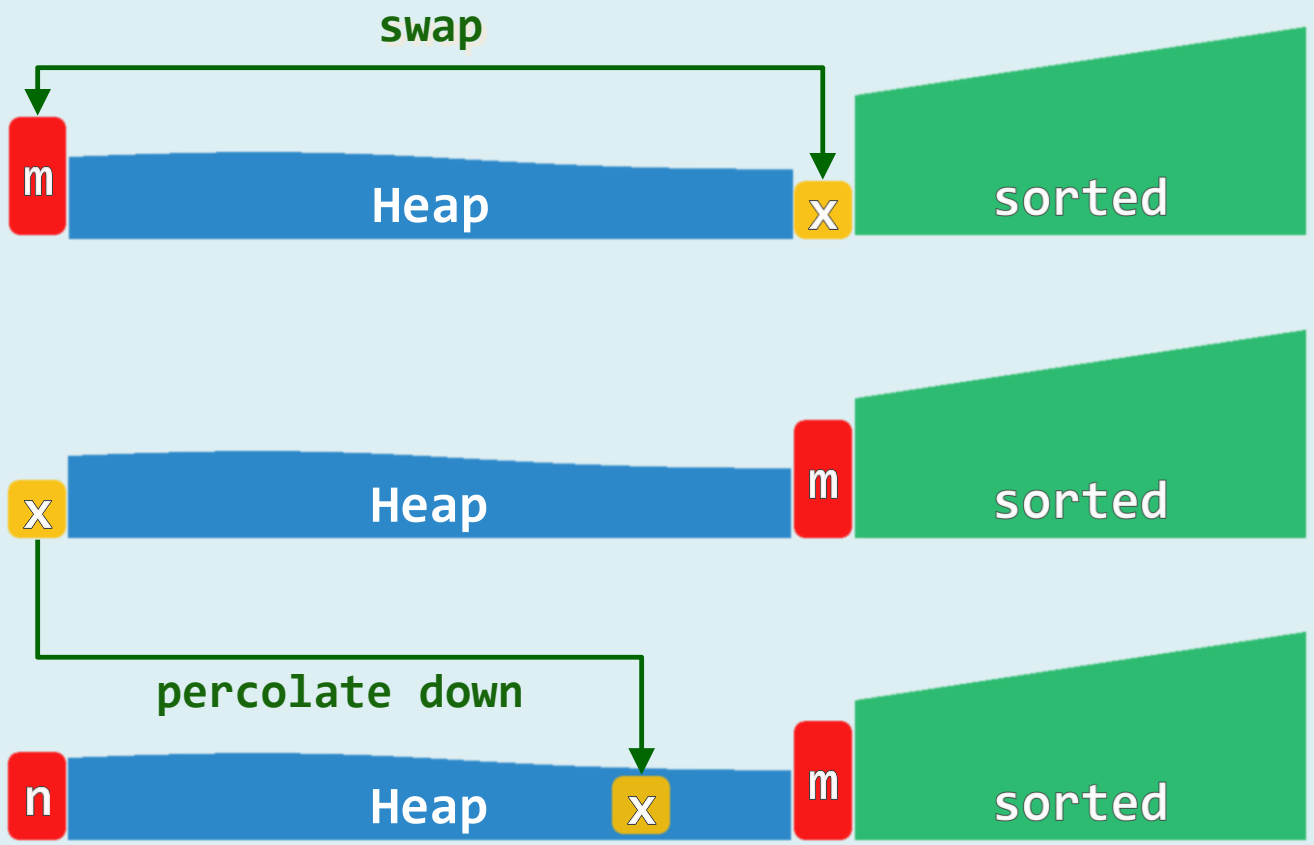
❖ 在物理上

完全二叉堆即是向量

❖ 既然此前有：

- m = H[0]
- x = H[n - 1]

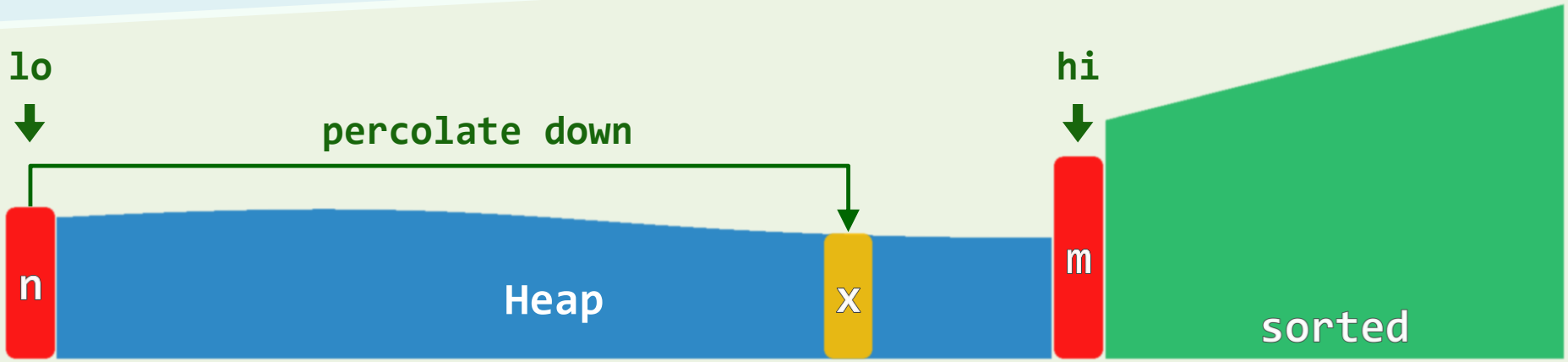
不妨随即就：



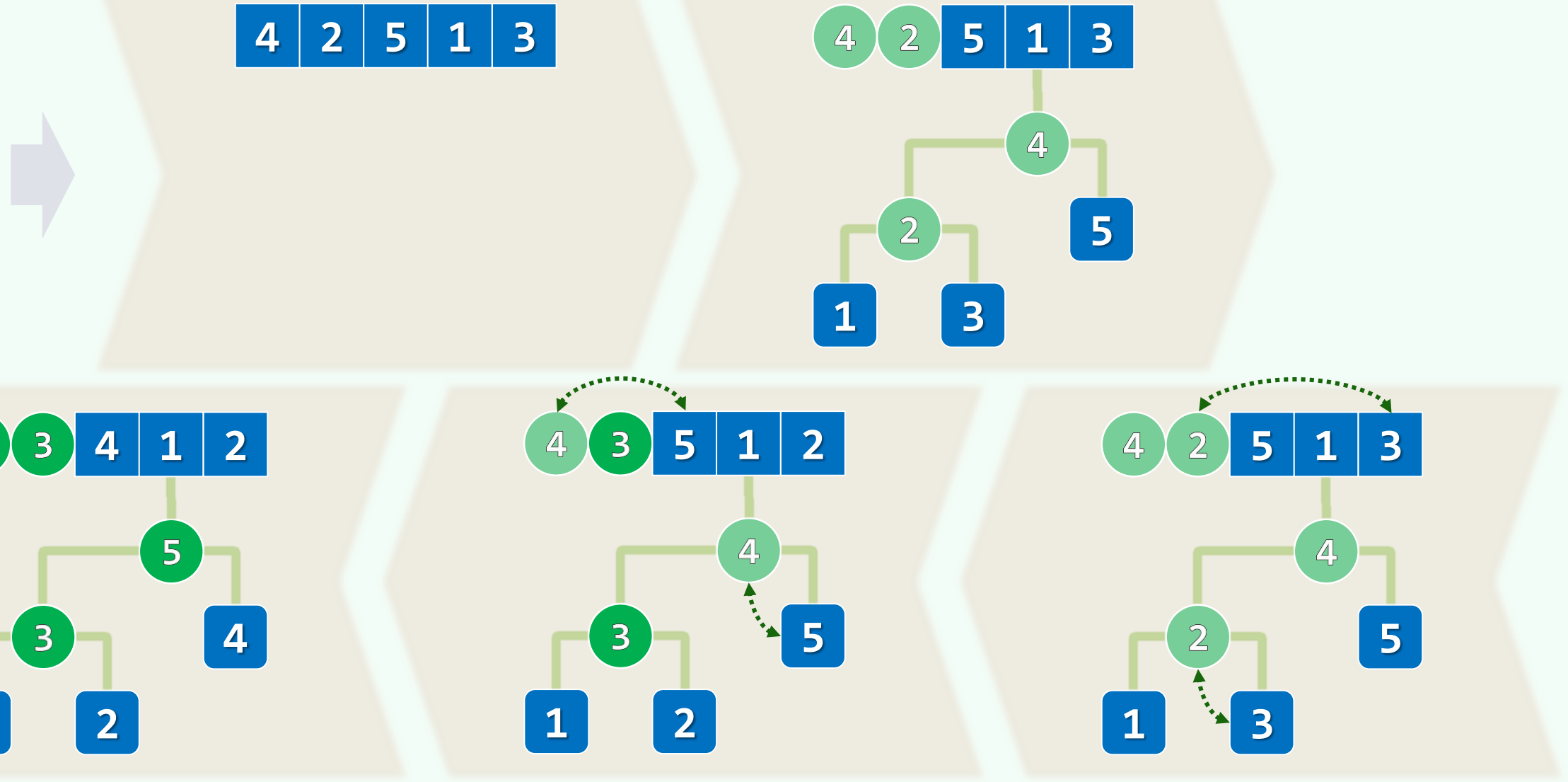
- swap(m , x) = H.insert(x) + S.insert(m)

实现

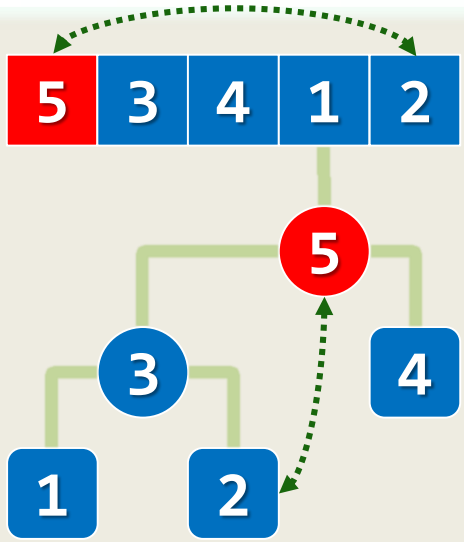
```
template <typename T> void Vector<T>::heapSort( Rank lo, Rank hi ) { //就地堆排序
   T* A = _elem + lo; Rank n = hi - lo; heapify( A , n ); //待排序区间建堆，O(n)
   while ( 0 < --n ) //反复地摘除最大元并归入已排序的后缀，直至堆空
      { swap( A[0], A[n] ); percolateDown( A, n, 0 ); } //堆顶与末元素对换后下滤
}
```

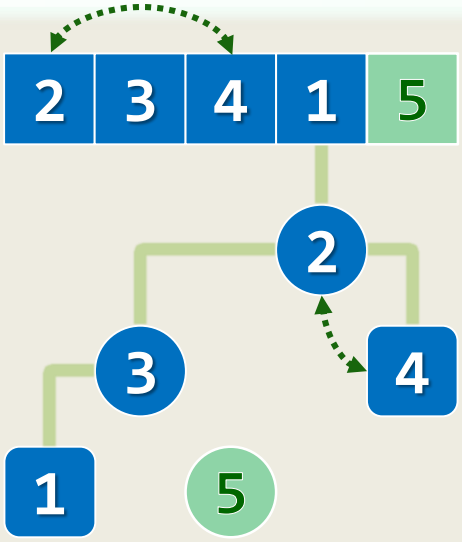


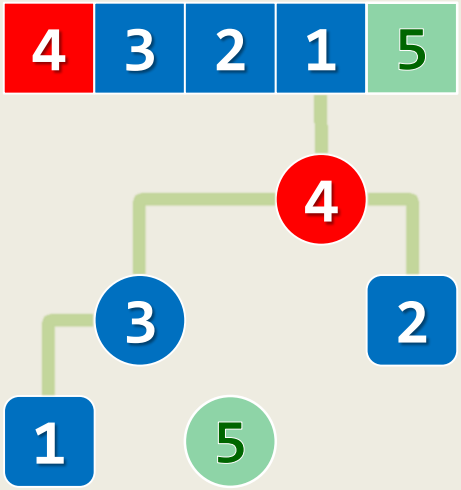
实例：建堆

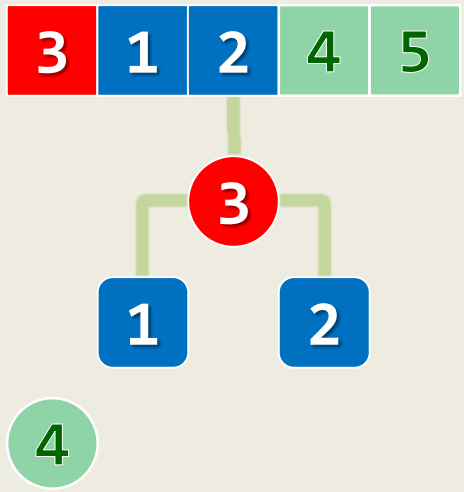


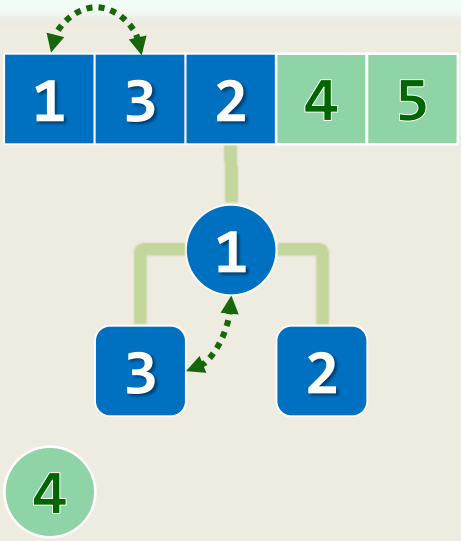
实例：选取 + 调整（1/2）

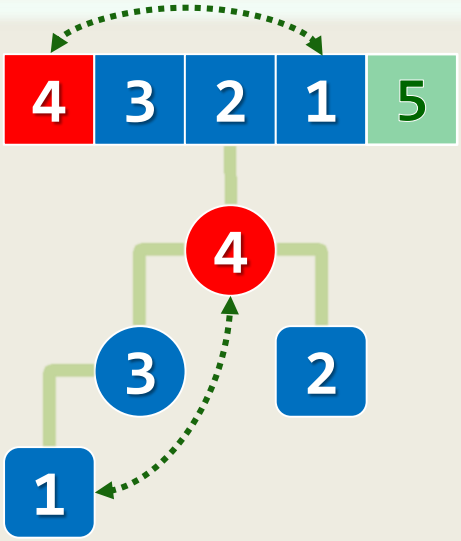

5 3 4 1 2
5
3 4
1 2


2 3 4 1 5
2
3 4
1 5


4 3 2 1 5
4
3 2
1 5


3 1 2 4 5
3
1 2
4


1 3 2 4 5
1
3 2
4


4 3 2 1 5
4
3 2
1

实例：选取 + 调整（2/2）