Advanced Balanced Search Tree

Segment Tree

Query

08-XD8

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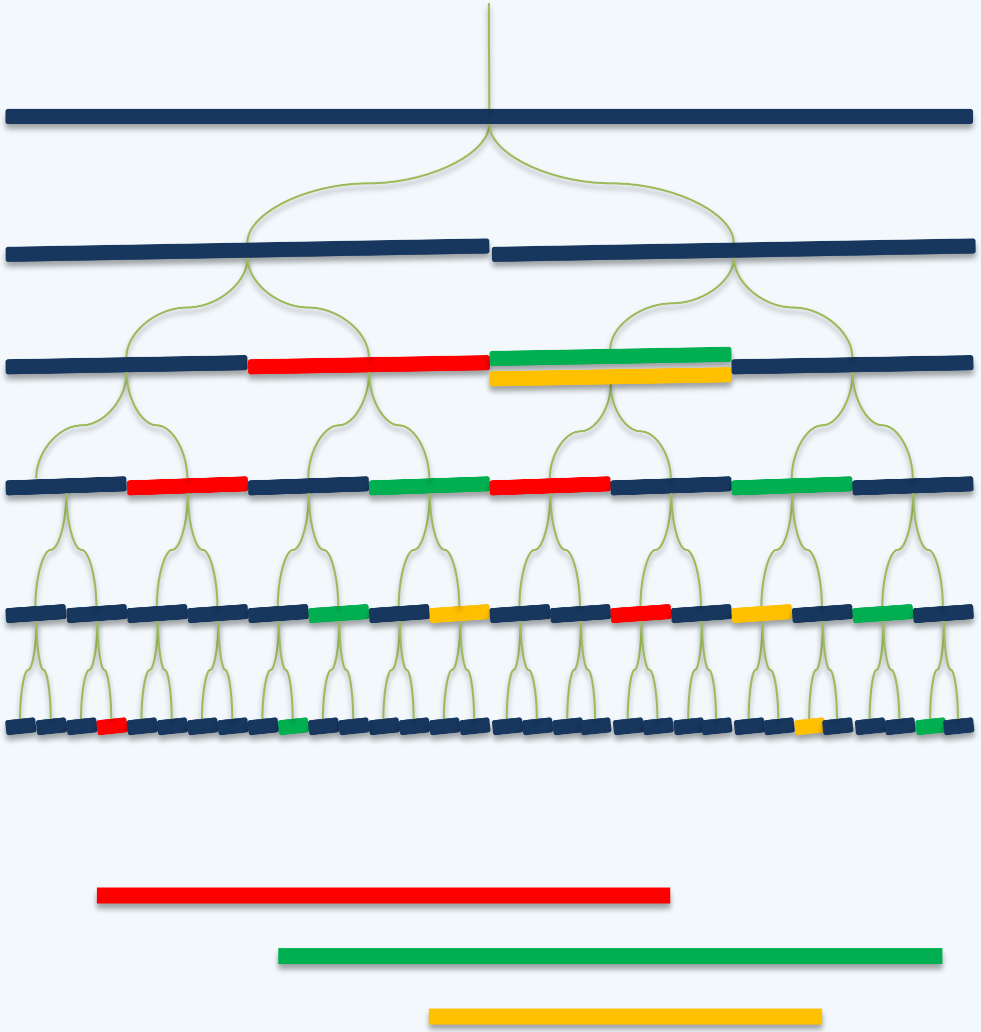
QuerySegmentTree(v, q_x)

```
// Find all intervals
// in the (sub)tree rooted at v
// that contain qx
report all the intervals in [Int(v)]
if ( v is a leaf )
    return
if ( qx ∈ Int( [lc(v)] ) )
    QuerySegmentTree( [lc(v)], qx )
else
    QuerySegmentTree( [rc(v)], qx )
```



$\mathcal{O}(r + \log n)$

- Only $\boxed{\text{one}}$ node is visited per level,

  altogether $\boxed{\mathcal{O}(\log n)}$ nodes

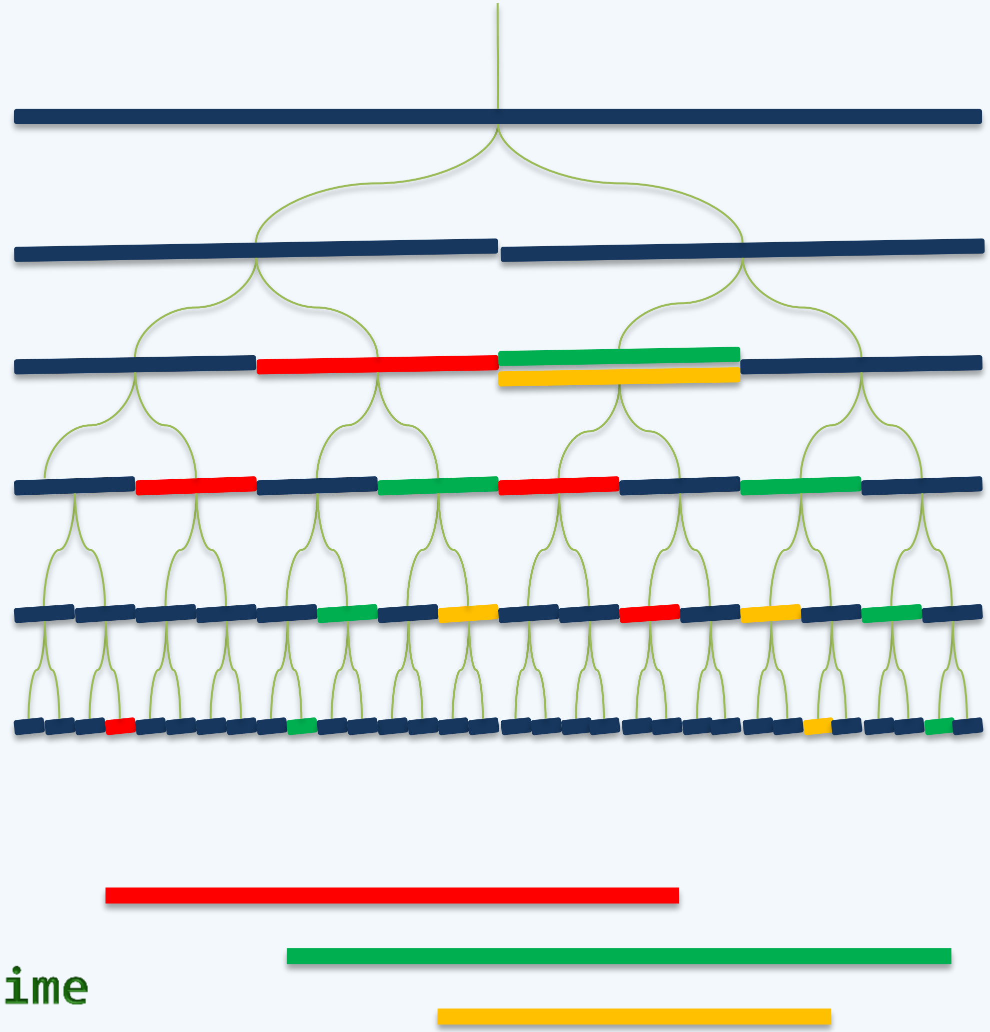
- At each node v

  - the $\boxed{\text{CS}}$ $\boxed{\text{Int(v)}}$ is reported

  - in time

$$1 + |\text{Int}(v)| = \boxed{\mathcal{O}(1 + r_v)}$$

∴ Reporting all the intervals costs $\mathcal{O}(r)$ time



Conclusion

❖ For a set of n intervals,

- a segment tree of size $\boxed{\mathcal{O}(n\log n)}$
- can be built in $\boxed{\mathcal{O}(n\log n)}$ time
- which reports all intervals containing a query point in $\boxed{\mathcal{O}(r + \log n)}$ time