Marked ancestor problem

[Alstrup, Husfeldt, Rauhe — FOCS 1998]

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- rooted tree ~ here, static
- each node either **marked** or **unmarked**
- updates:
  - mark(v)
  - unmark(v)
- query: lowest marked ancestor of v

Best bounds:

- $O\left(\frac{\lg n}{\lg\lg n}\right)$ / query, $O(\lg\lg n)$ / update
- $\Omega\left(\frac{\lg n}{\lg\lg n}\right)$ / query, static! (next lecture)
- $\Omega(\lg\lg n)$ / update, via colored predecessor problem in a path

Application: dynamic method dispatching in object-oriented language

- mark if class implements method x
- query when x called on particular class (tree = class hierarchy)
- static for e.g. C++
- dynamic for e.g. Java (here tree also changes)
- OPEN: DAGs from multiple inheritance e.g. Python