Multiple Forking: Deconstructed, Unified

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Elementary Forking (1 RO, 1 Fork)

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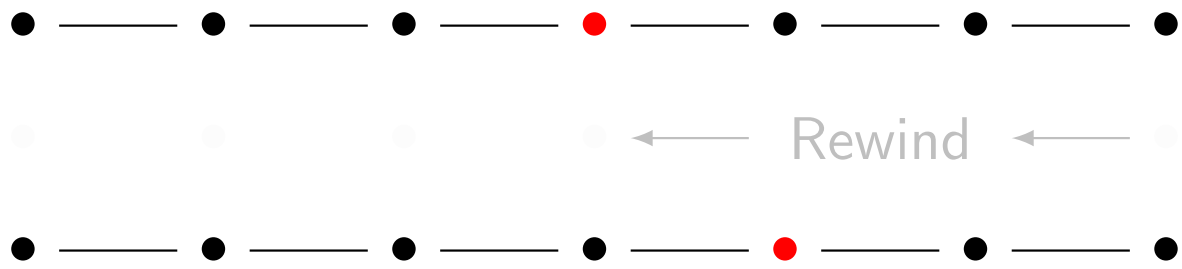

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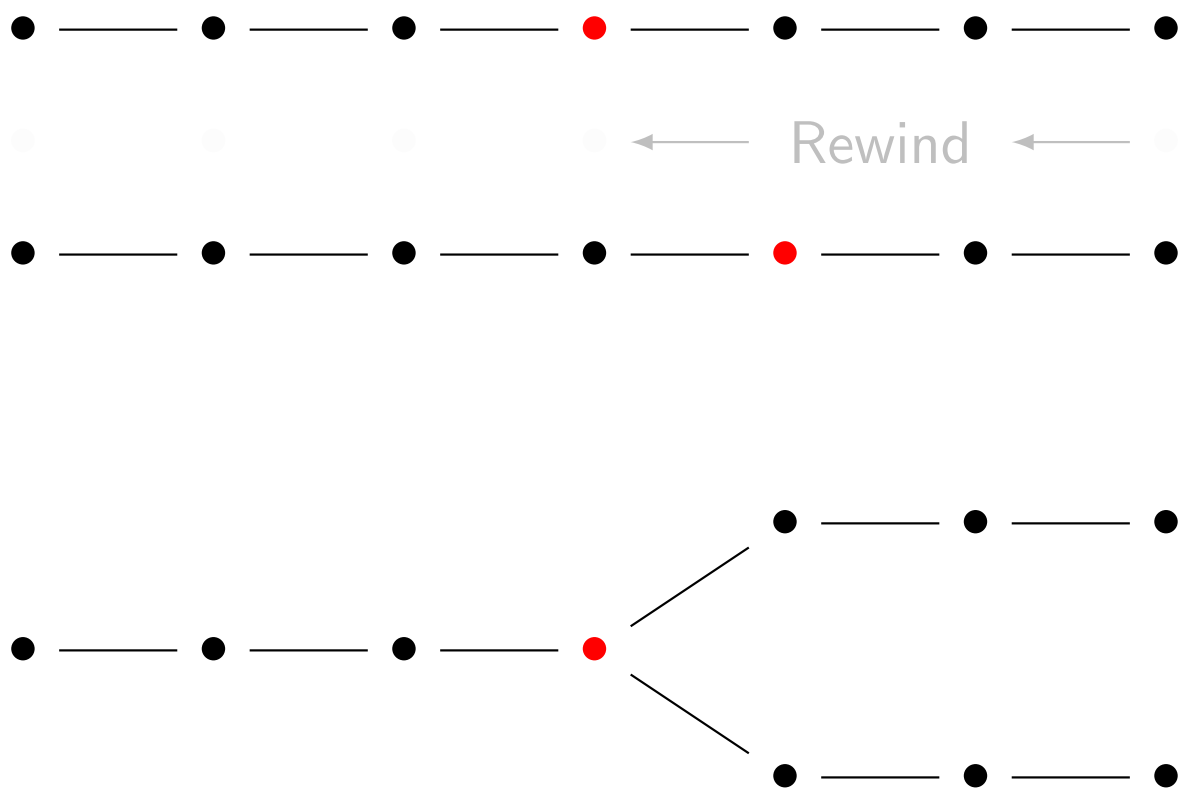

Cost: $\mathrm{O}(q)$

Multiple Forking (2 ROs, 1 Fork)

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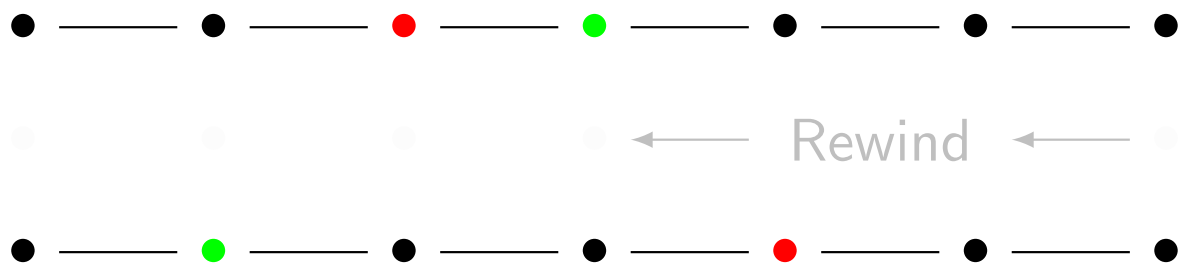
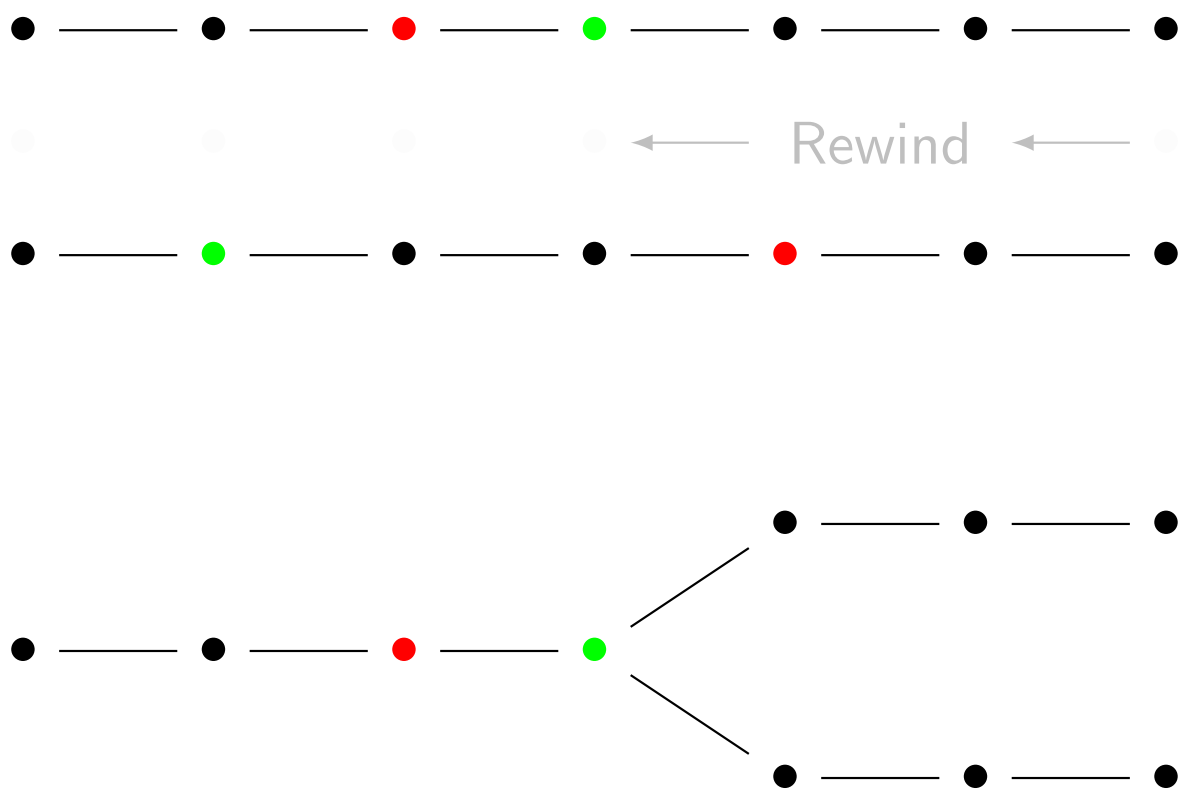
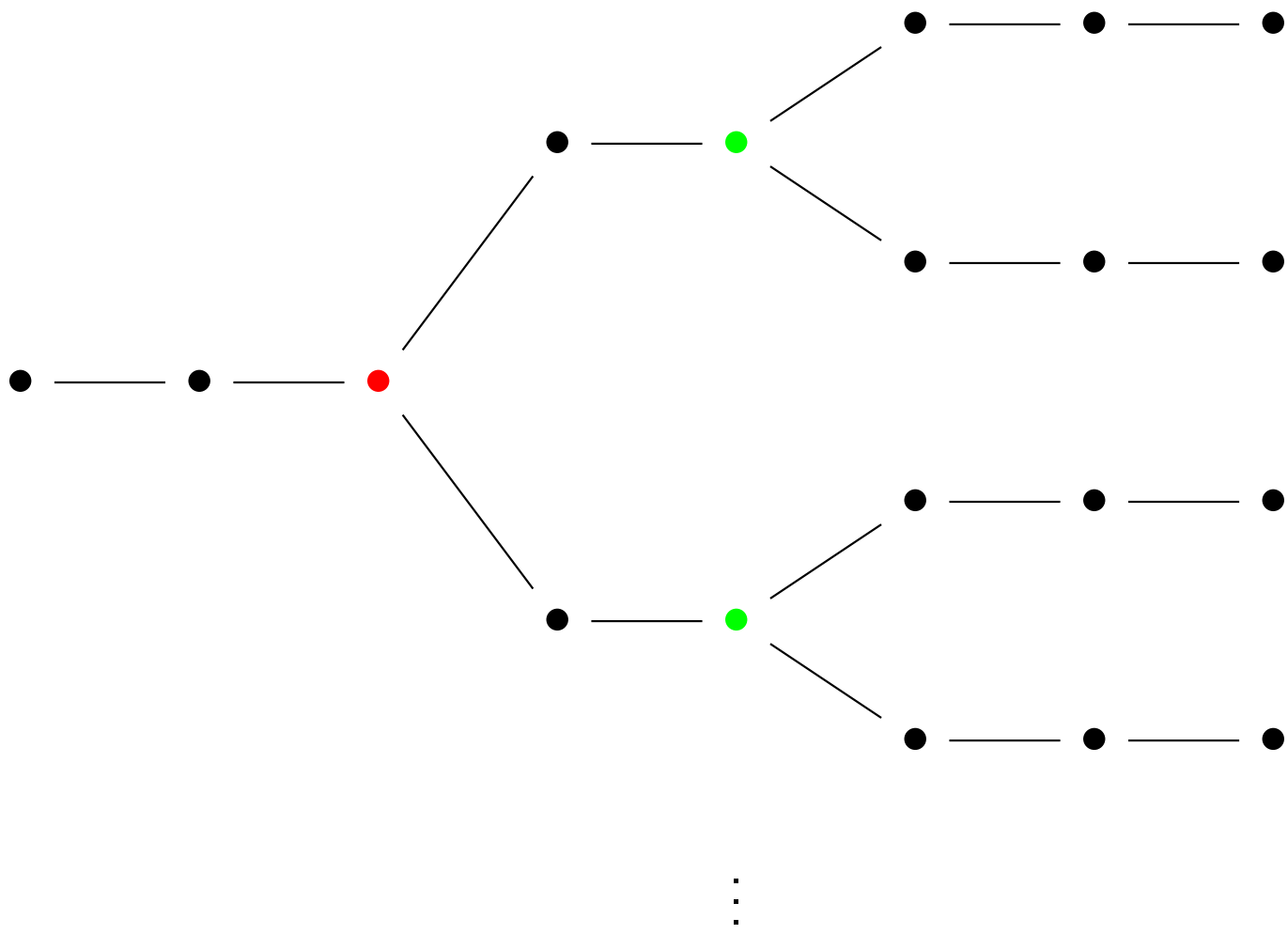


Multiple Forking (2 ROs, 1 Fork)



Cost: $O\left(q^2\right)$

Multiple Forking (2 ROs, n Forks)



Cost: $\mathrm{O}\left(q^{2n}\right)$

Applications

1. Proxy Signatures [BPW12]
2. Identity-Based Signatures [GG09]
3. ZK Arguments [CMW13]

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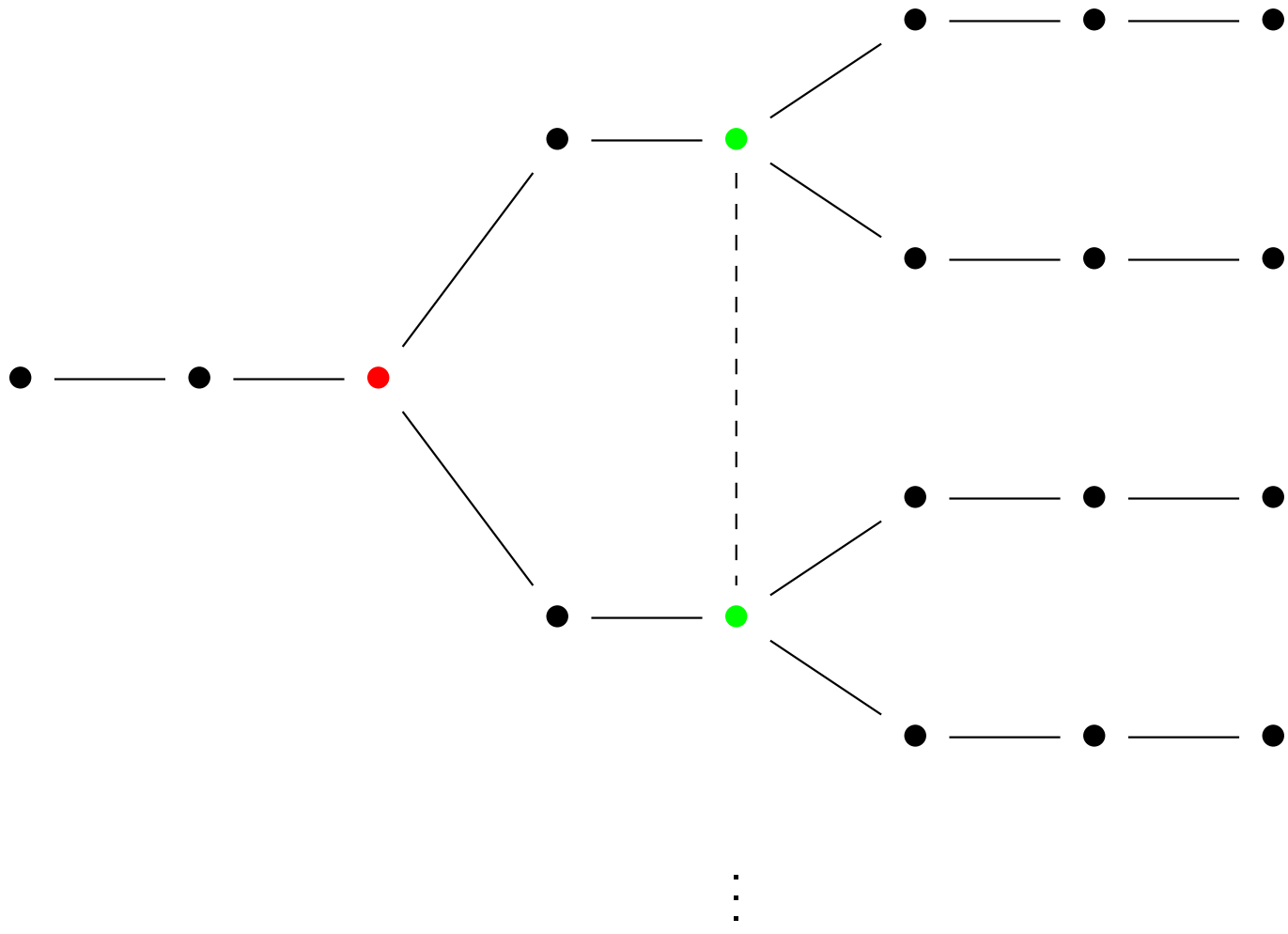
Reduced to $O\left(q^{n}\right)$

Observation 1: Index Independence



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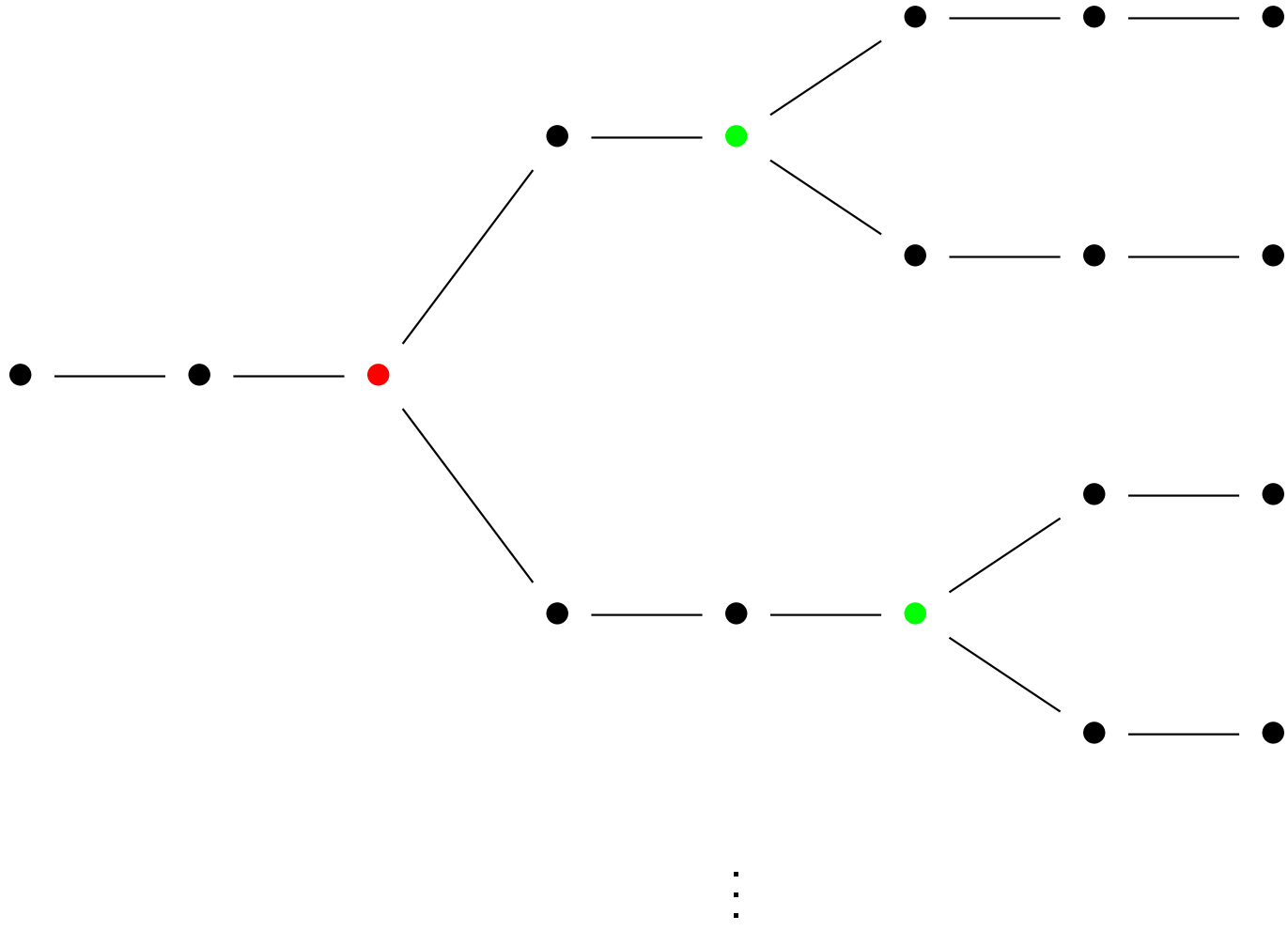
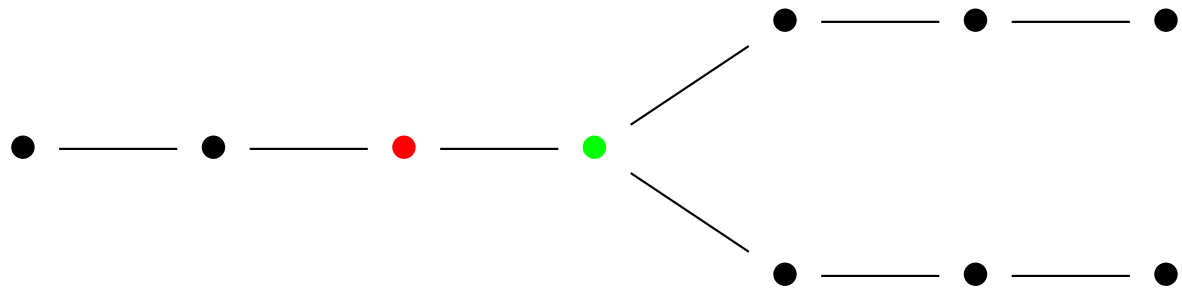
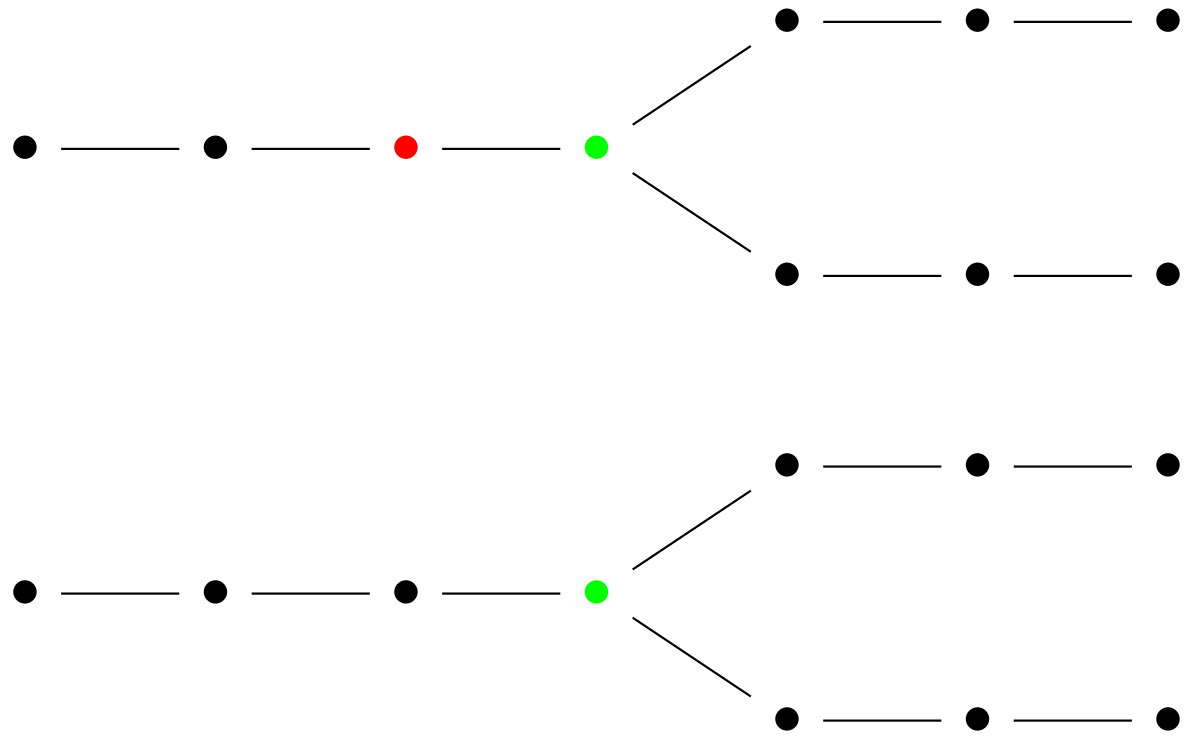


Observation 2: R-O Dependence



Observation 2: R-O Dependence



"R-O binding"

Result

Index Independence + R-O Dependence

Cost *per* fork: down from $\mathrm{O}\left(q^2\right)$ to $\mathrm{O}\left(q\right)$
Total cost: down from $\mathrm{O}\left(q^{2n}\right)$ to $\mathrm{O}\left(q^n\right)$

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Unified Model for Multiple Forking (eprint: 2013/651)

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Other applications of R-O Dependence?

Thank you!

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Fork you.

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Well, let me get my coat.