From Few to Many Faults

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Plan

- Problem definition
  - Consensus on its own (binary, strong validity)
  - Three major time models
- Message complexity
  - Dolev-Reischuk
  - Optimistic
  - Decouple n and t
- Results
  - Optimal in synchrony
  - Optimal in partial synchrony
  - Almost optimal in asynchrony
- Technical highlights
  - Expanders!!!

Consensus

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Synchrony	Partial Synchrony	Asynchrony
Δ	Δ after GST	eventually

Communication complexity

- Dolev-Reischuk[1]: $\Omega(n^2)$

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This work: $f \ll t \ll n/3$

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Why consider algorithms for $t \ll n/3$?

System A: $t = 1000$, $n = 3001$

System B: $t = 1000$, $n = 10{,}000$

Why consider algorithms for $t \ll n/3$?

System A: t = 1000, n = 3001

System B: t = 1000, n = 10,000

$$n^2 = 100t^2$$

Results

	Communication	**Resilience**
	Synchrony	
This paper	$\mathcal{O}(n + tf)$	$t < \frac{n}{2}$
Spiegelman et al. [2]	$\Omega(n + tf)$	Any

[2] Spiegelman, A. (2020). In search for an optimal authenticated byzantine agreement. arXiv preprint arXiv:2002.06993.

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Asynchrony		
This paper	$\mathbb{E}(\mathcal{O}((n + t^2) \cdot \log n))$	$t < n/3$
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Technical Highlight

Bipartite Expander

Parties Committees

Bipartite Expander

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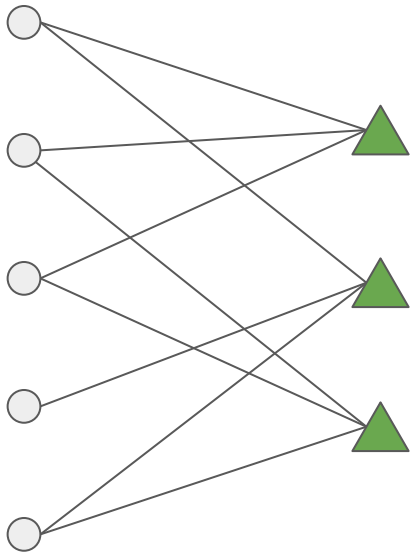

Bipartite Expander

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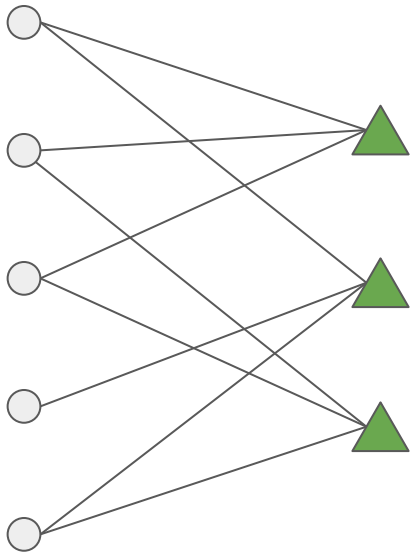

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Bipartite Expander

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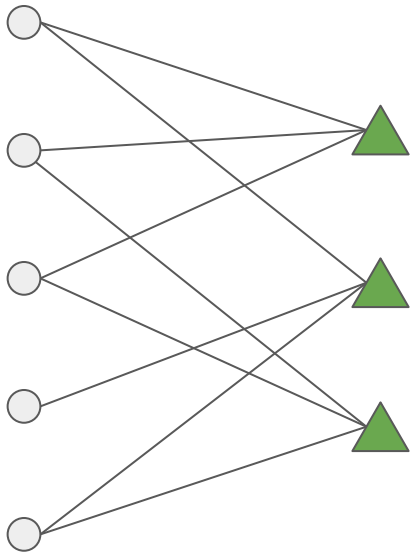
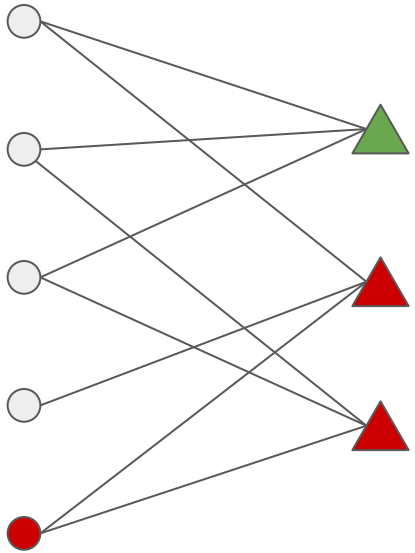


1. Few committees

2. One partie in a tiny fraction of committees

Bipartite Expander

Parties Committees



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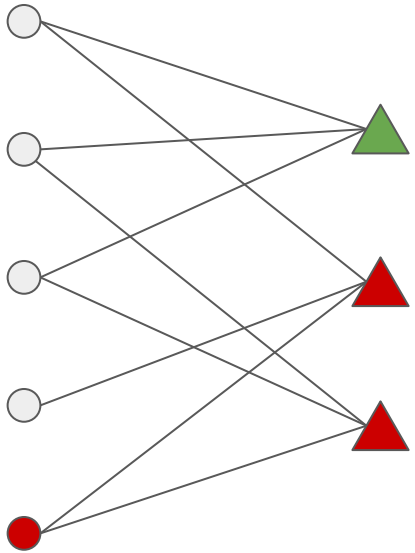

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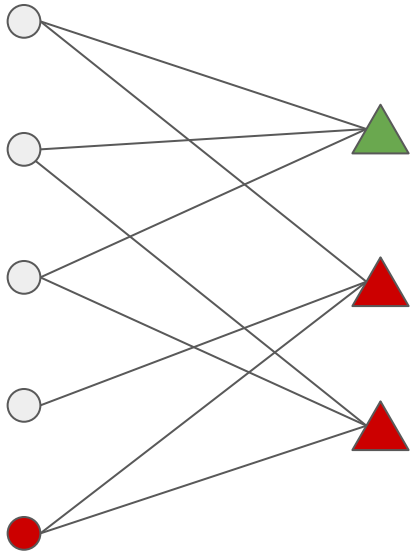

Thank you!

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