



Distributed Spanner Approximation

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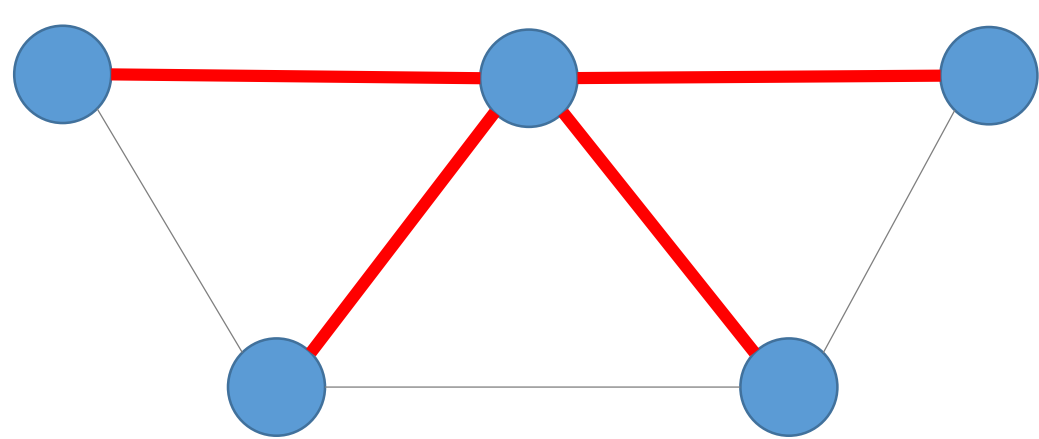
The Distributed Models

- Vertices exchange messages in **synchronous** rounds

The model	Message size
LOCAL	unbounded
CONGEST	$\theta(\log n)$ bits

k -spanners

- Sparse subgraphs that **preserve distances** up to a multiplicative factor of k



- Many **global** constructions: $(2k - 1)$ -spanners with $O(n^{1+1/k})$ edges

Spanner approximation

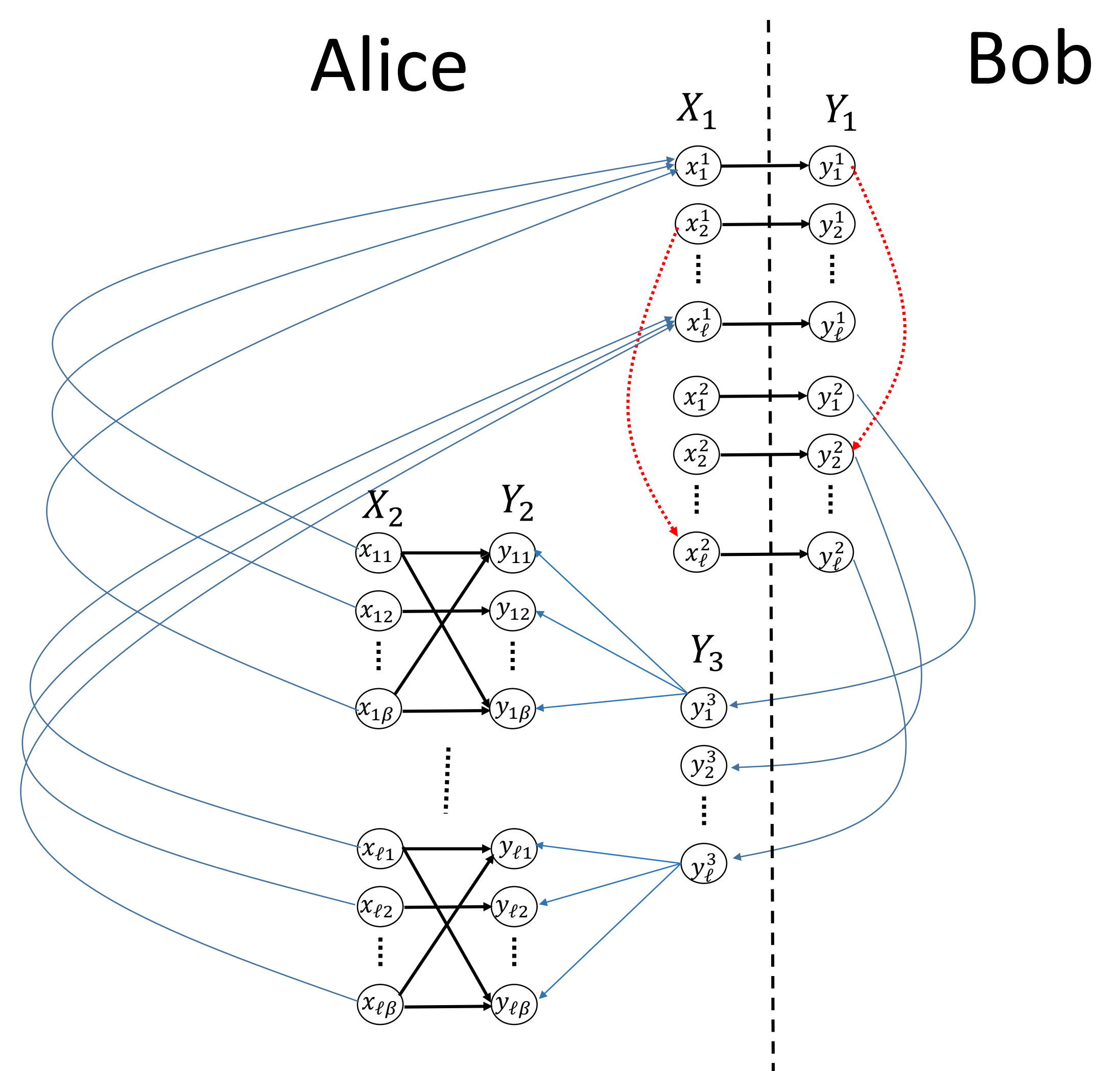
- An α -approximation: Number of edges $\leq \alpha \cdot OPT$
- Many **sequential** algorithms and hardness results

In the LOCAL model:

$(1 + \epsilon)$ -approximation in $O(\text{poly}(\log n / \epsilon))$ rounds

Can we give efficient CONGEST algorithms?

No! at least in directed or weighted graphs.



Directed k -spanner for $k \geq 5$:

Randomized - $\tilde{\Omega}(\sqrt{n/\alpha})$ rounds,
Deterministic - $\tilde{\Omega}(n/\sqrt{\alpha})$

\Rightarrow A strict **separation** between the **LOCAL** and **CONGEST** models