



Sistemi distribuiti: introduzione



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Sistemi Concorrenti e Distribuiti
Tullio Vardanega, tullio.vardanega@math.unipd.it

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Sistemi distribuiti: introduzione

Terminology

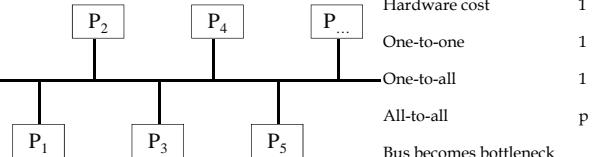
- Communication is *one-to-one* when one processor sends a message to another one
- In *one-to-all* or *broadcast*, one processor sends a message to all other processors
- In *all-to-one* communication, all processors send their message to one processor
- Other forms of communication include *gather* and *all-to-all*

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Bus topology



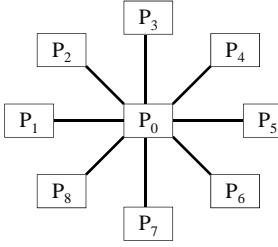
Hardware cost	1
One-to-one	1
One-to-all	1
All-to-all	p
Bus becomes bottleneck	

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Star topology



Hardware cost	$p - 1$
One-to-one	1 or 2
One-to-all	$p - 1$
All-to-all	$2 \cdot (p - 1)$

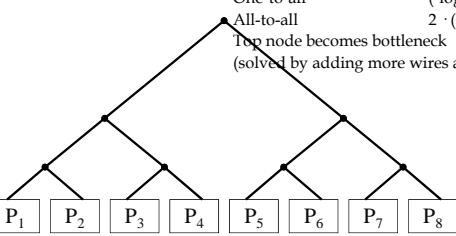
Central processor becomes bottleneck

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Tree topology



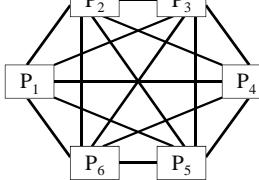
Hardware cost	$2p - 2$, with p power of 2
One-to-one	$2 \cdot {}^2 \log p$
One-to-all	$({}^2 \log p) \cdot (1 + {}^2 \log p)$
All-to-all	$2 \cdot ({}^2 \log p) \cdot (1 + {}^2 \log p)$
Top node becomes bottleneck (solved by adding more wires at the top [fat tree])	

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Fully connected topology



Hardware cost	$p \cdot (p - 1)/2$
One-to-one	1
One-to-all	$[{}^2 \log p]$
All-to-all	$2[{}^2 \log p]$
Hardware cost increases quadratically with p	

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