



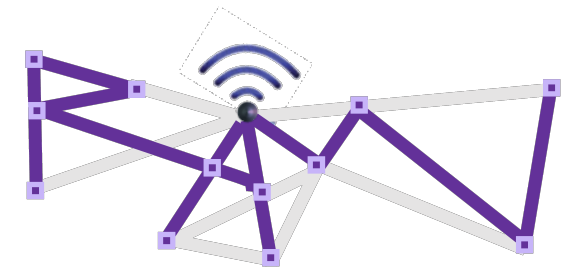
Exploiting Packet Replication and Elimination in Complex Tracks in LLNs

draft-papadopoulos-raw-pareo-reqs-01

Presenter: Georgios Z. Papadopoulos

Authors: G. Papadopoulos, R. Koutsiamanis, N. Montavont and P. Thubert

Outline



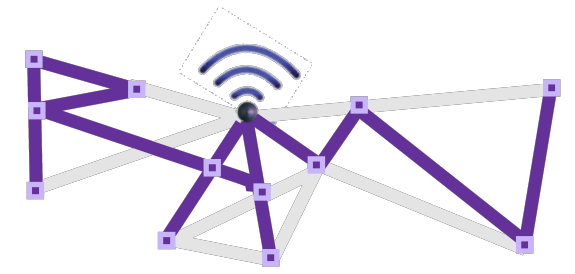
draft-papadopoulos-raw-pareo-reqs-01 :

⇒ Motivation

⇒ PAREO Functions

⇒ Alternative Parent Selection

Outline



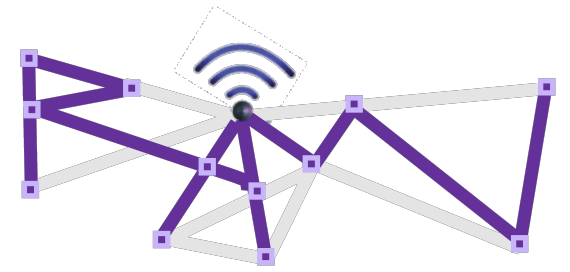
draft-papadopoulos-raw-pareo-reqs-01 :

⇒ *Motivation*

⇒ PAREO Functions

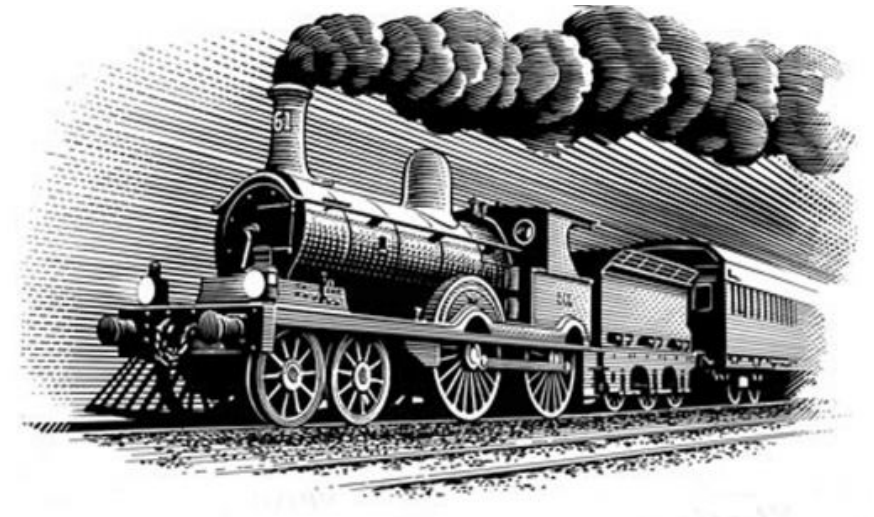
⇒ Alternative Parent Selection

Reliable and Available Communication

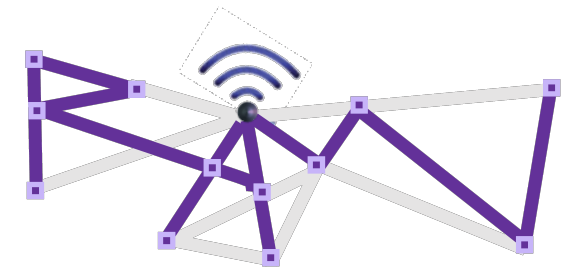


Motivation :

- ⇒ Reliable communication
- ⇒ Guaranteed maximum (bounded) latency
- ⇒ Ultra-low jitter performance



Outline



draft-papadopoulos-raw-pareo-reqs-01 :

⇒ Motivation

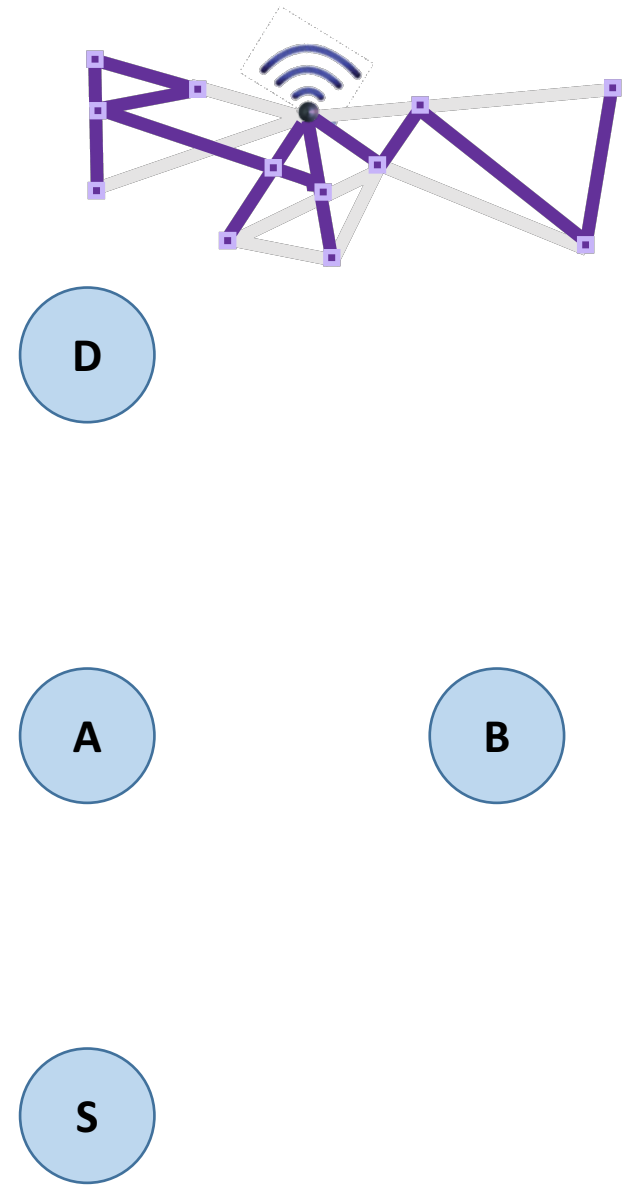
⇒ *PAREO Functions*

⇒ Alternative Parent Selection

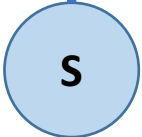
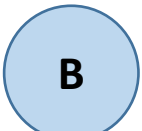
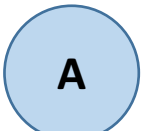
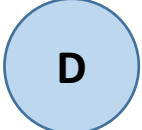
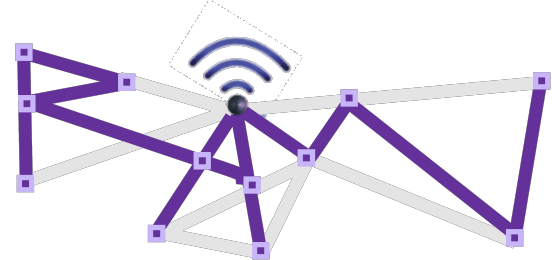
Wireless Topology of 2 hops

Topology :

- ⇒ S is the source device;
- ⇒ D is the destination device;
- ⇒ A and B are the relay devices.

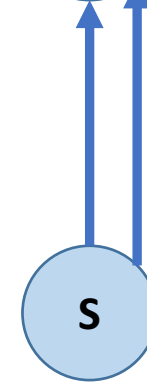
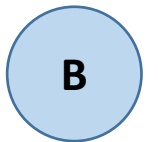
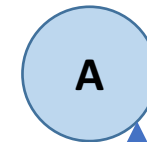
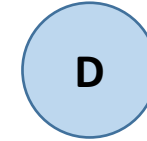
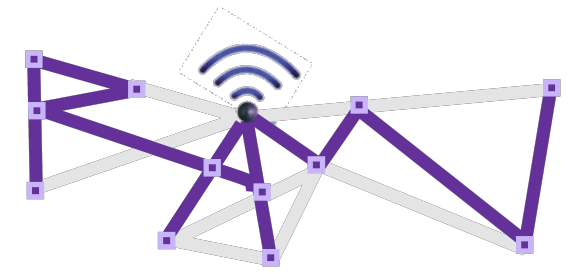


Packet Transmission from S to A



Channel Offset	3		S → A				
	2						
	1						
	0	EB					
		0	1	2	3	4	5
Slotframe							

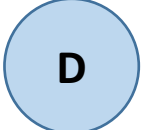
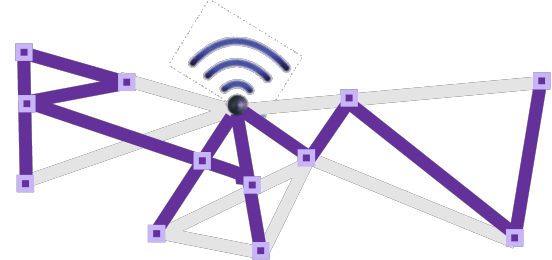
Automatic Repeat reQuest (ARQ)



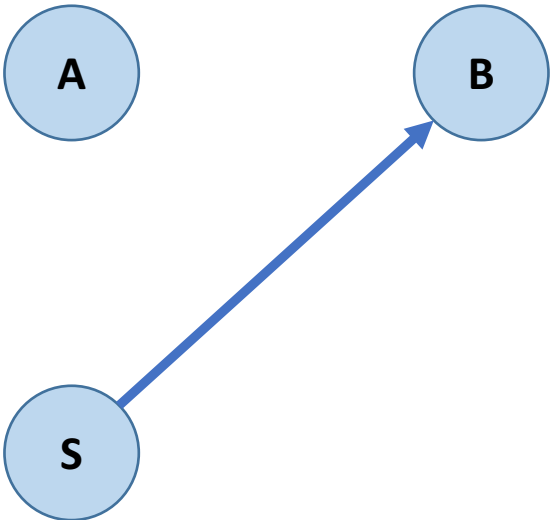
Channel Offset	3		S → A	S → A			
	2						
	1						
	0	EB					
		0	1	2	3	4	5
Slotframe							

Packet Replication

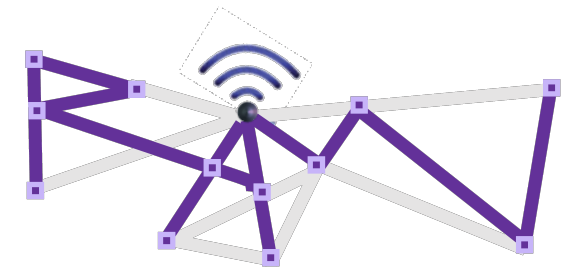
Data packet is sent to both Default & "Alternate" Parents



Channel Offset	3		S → A	S → A			
	2				S → B		
	1						
	0	EB					
		0	1	2	3	4	5
Slotframe							



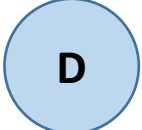
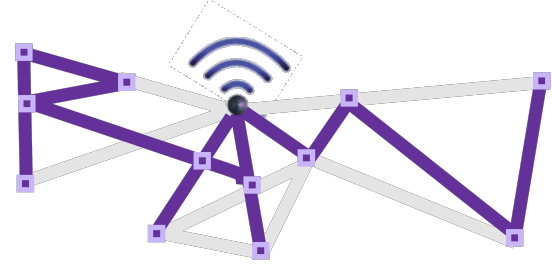
Promiscuous Overhearing



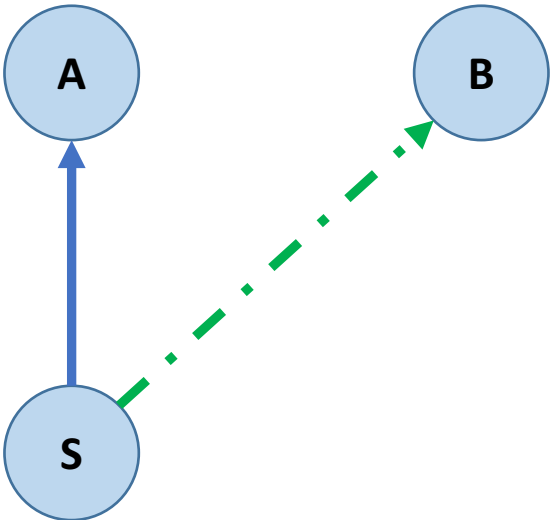
Promiscuous Overhearing :

- ⇒ Wireless medium is broadcast by nature;
- ⇒ Any neighbor of a transmitter may overhear a transmission;
- ⇒ Thus, it increases the probability of the data packet reception at the Destination (D).

Promiscuous Overhearing



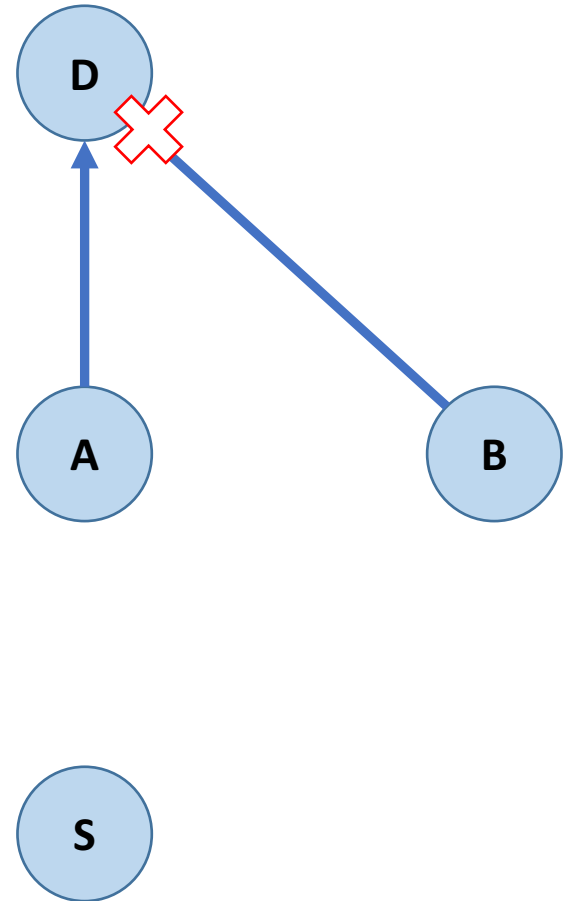
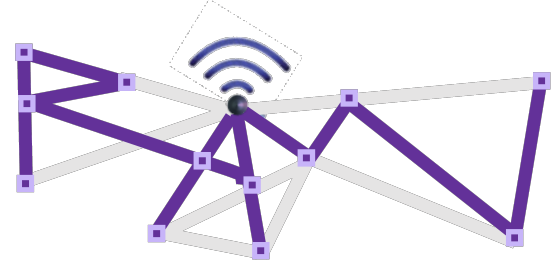
Channel Offset	3		S → A, (B)	S → A, (B)			
	2				S → B, (A)		
	1						
	0	EB					
		0	1	2	3	4	5
Slotframe							



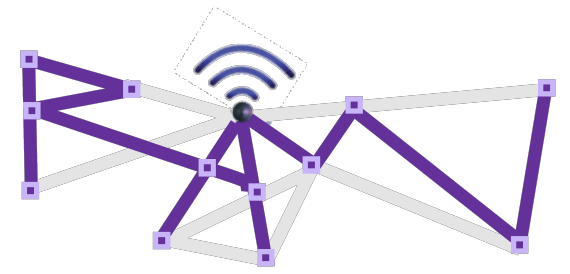
Packet Elimination

Discards the copies of a data packet which was previously received.

Channel Offset	3		S → A, (B)	S → A, (B)			
	2				S → B, (A)		
	1						B → D
	0	EB				A → D	
		0	1	2	3	4	5
Slotframe							



Outline



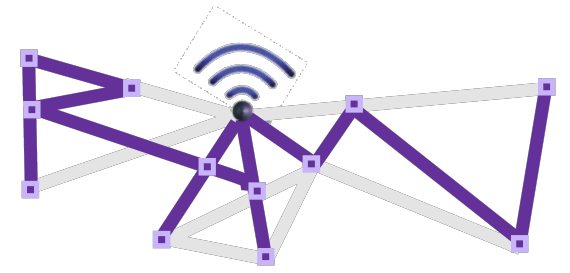
draft-papadopoulos-raw-pareo-reqs-01 :

⇒ Motivation

⇒ PAREO Functions

⇒ *Alternative Parent Selection*

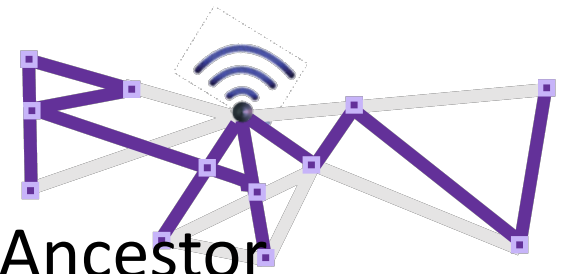
Alternative Parent (AP) Selection



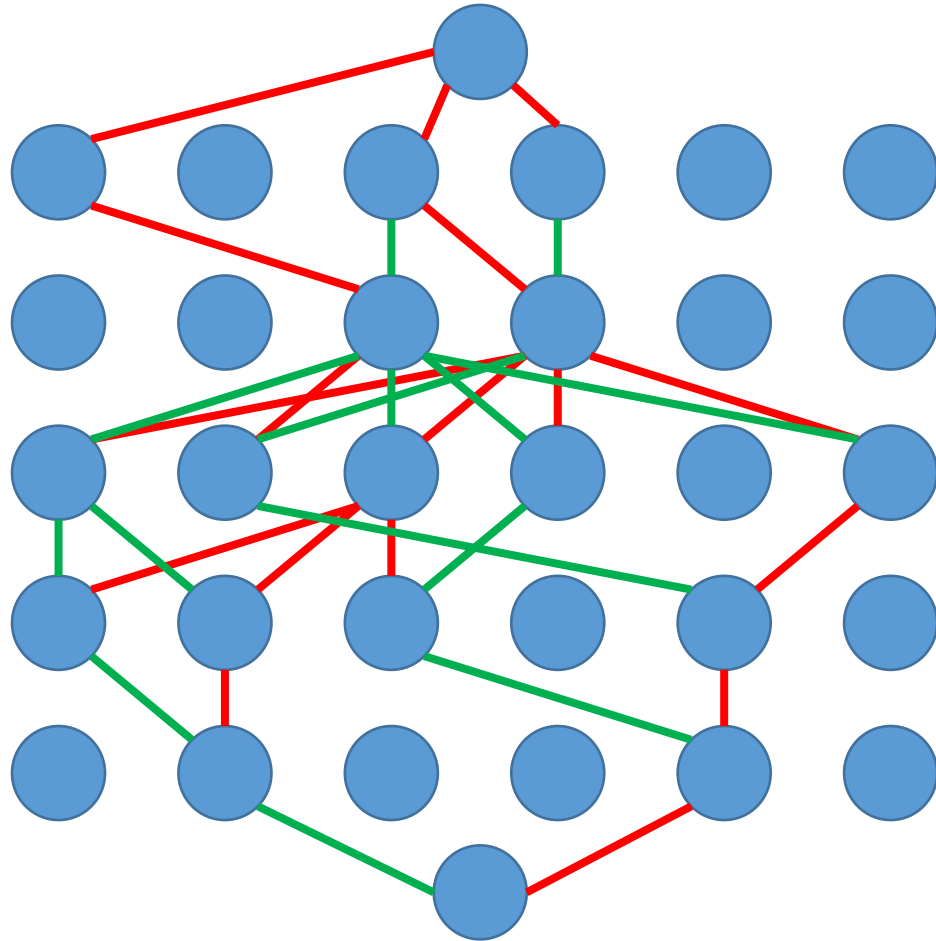
⇒ Control (or mitigate) network flooding by **carefully selecting** the Alternative Parent (**disjoint vs common ancestor pattern**) :

- *Considering that the Packet Replication procedure increases the traffic in a network, when proposing solutions for Alternative Parent Selection, they should be efficient enough to mitigate the uncontrolled packet duplications.*

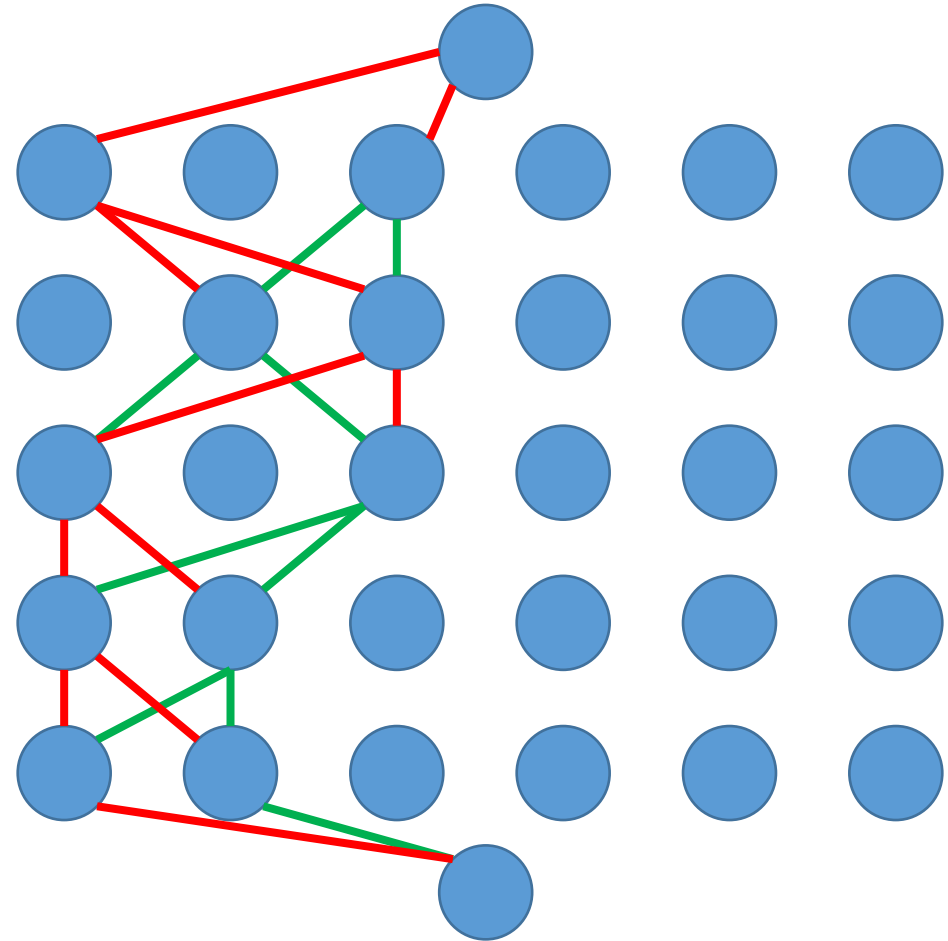
Alternative Parent (AP) Selection



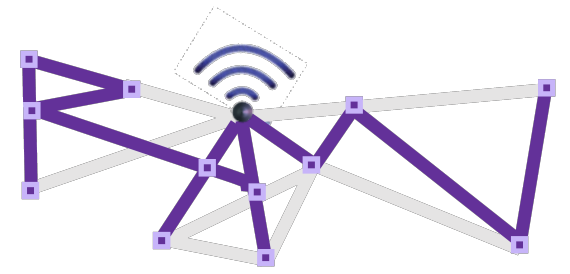
Disjoint



Common Ancestor

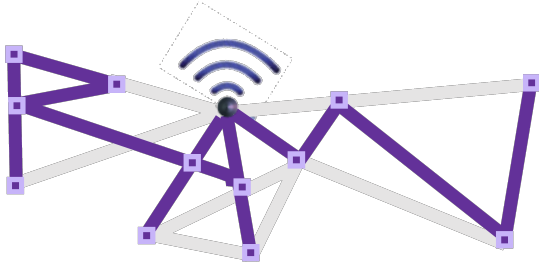


Alternative Parent Selection



One possible option is to select the Alternative Parent as the one having *common ancestor* with the Default Parent.

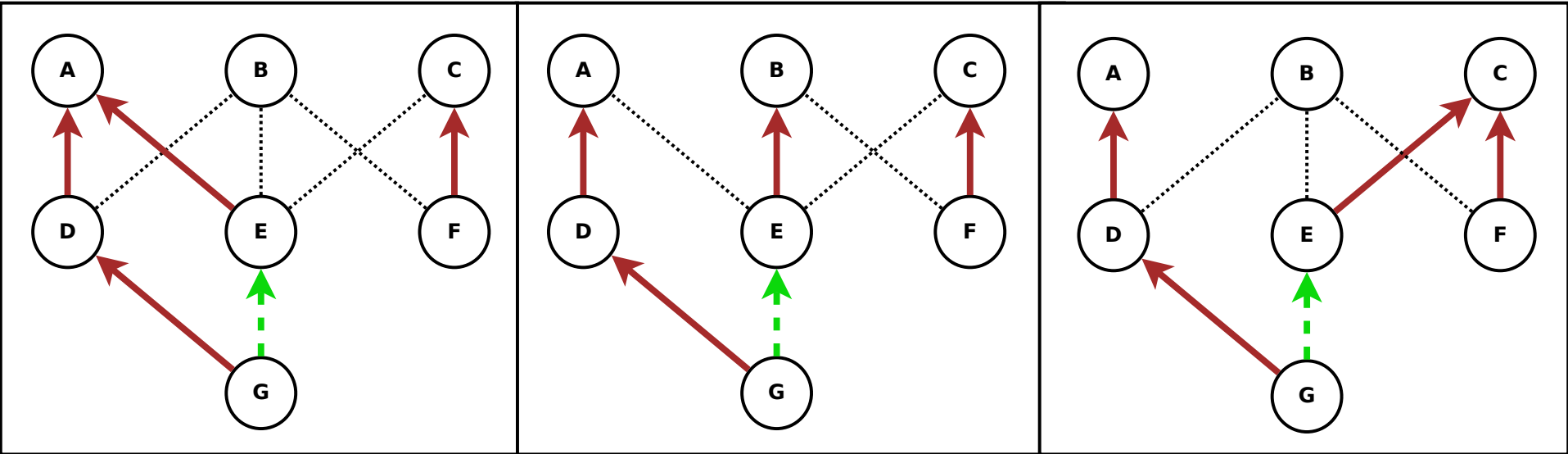
Common Ancestor (CA) pattern



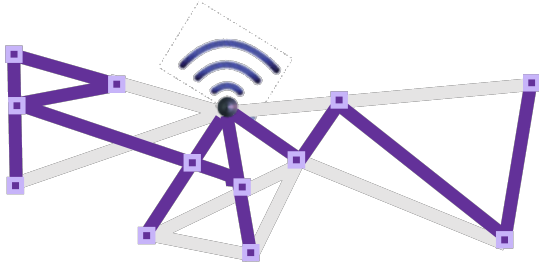
Strict CA

Medium CA

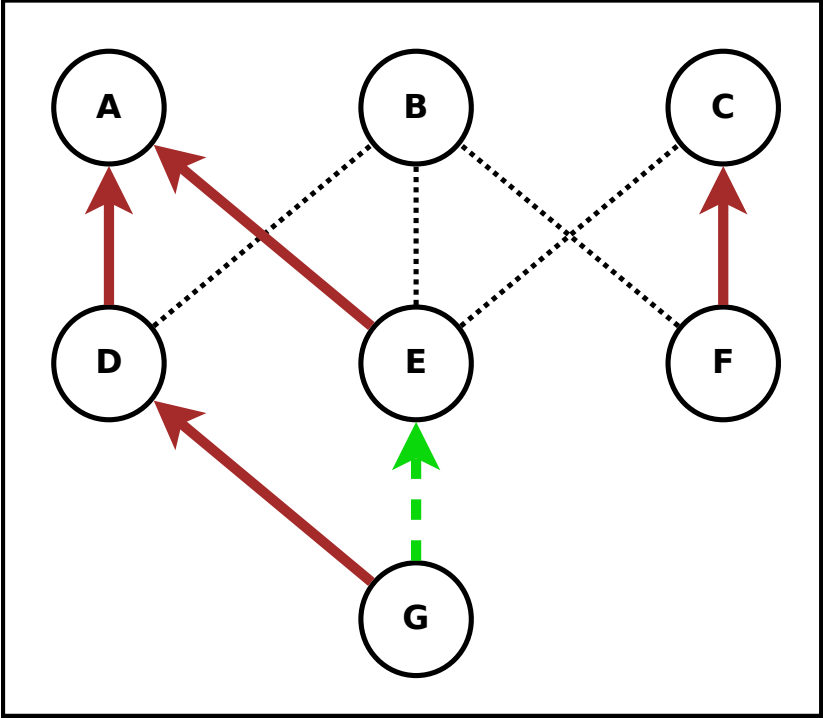
Soft CA



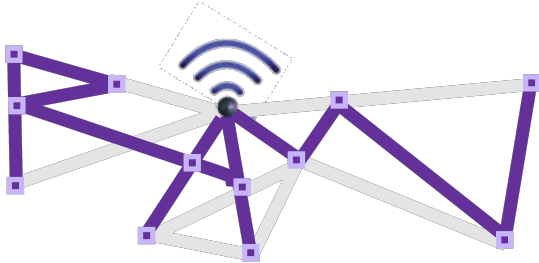
Common Ancestor : Strict mode



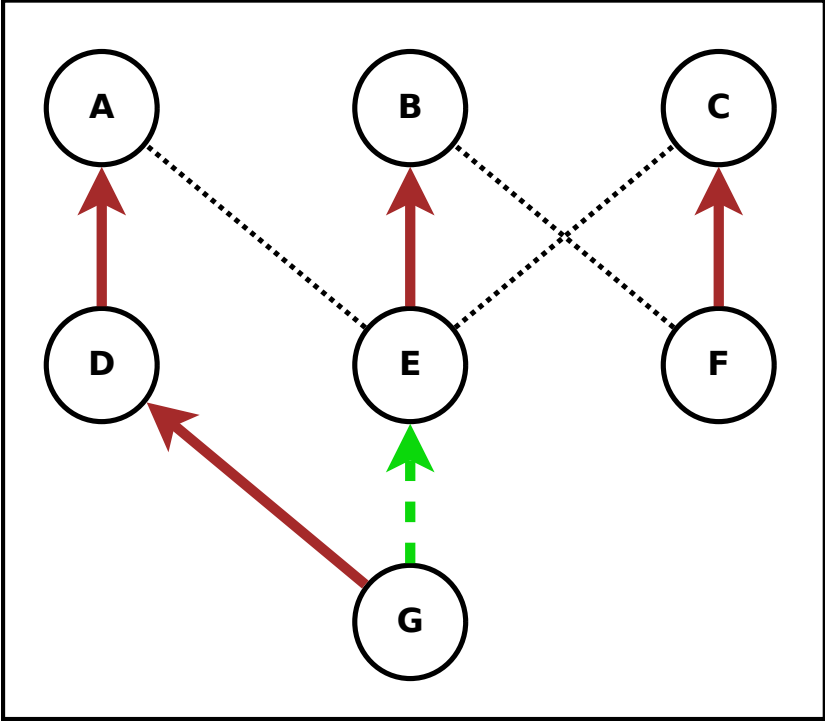
$$PP(PP) = PP(AP)$$



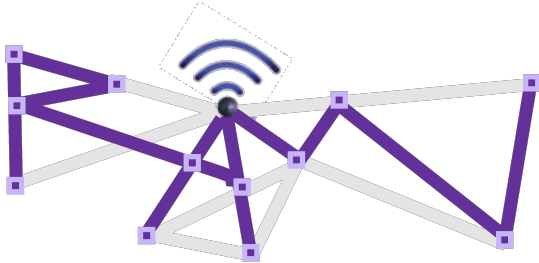
Common Ancestor : Medium mode



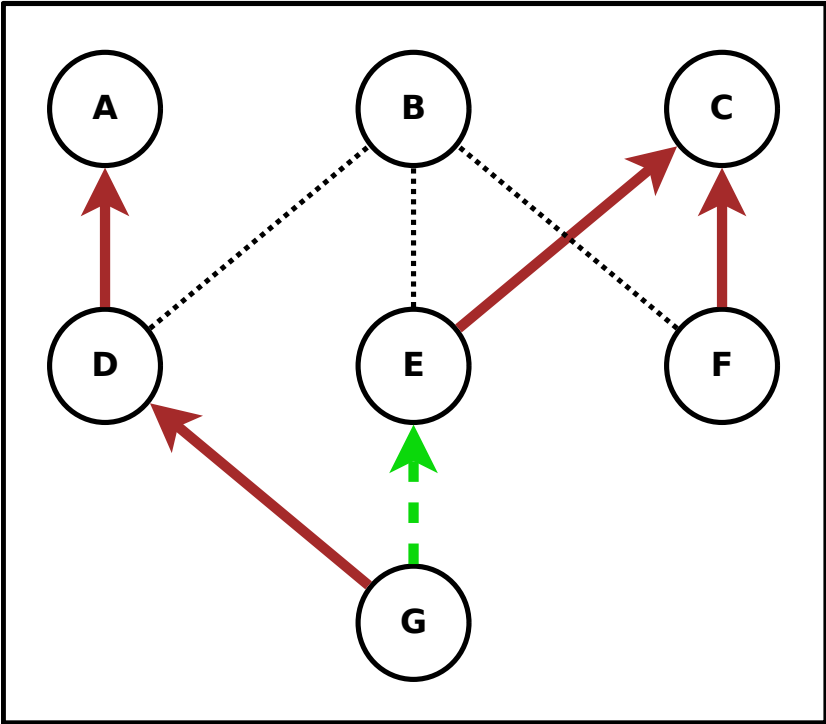
$$PP(PP) \in PS(AP)$$



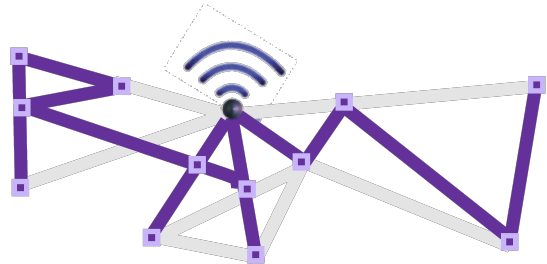
Common Ancestor : **Soft** mode



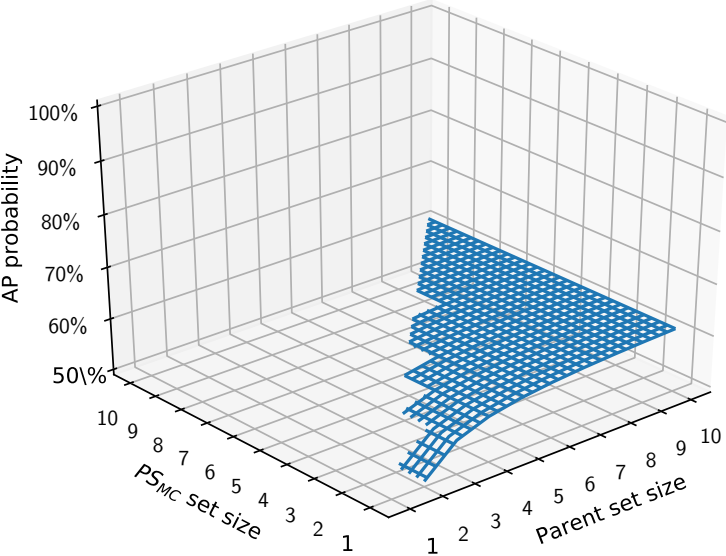
$$PS(PP) \cap PS(AP) \neq \emptyset$$



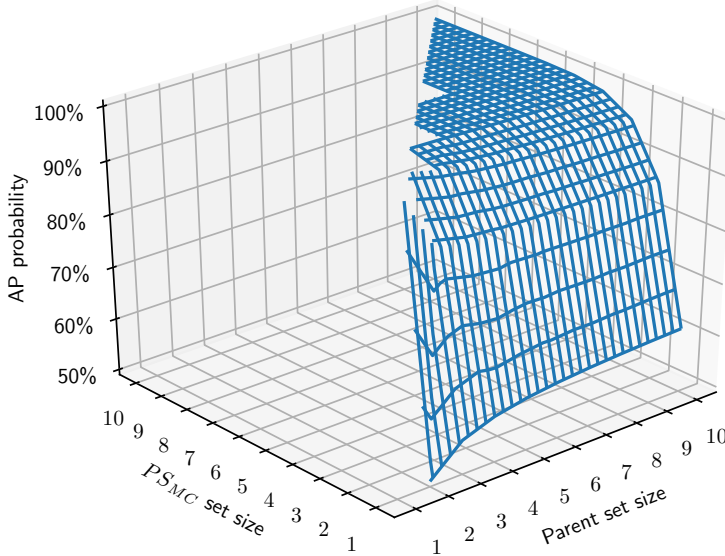
Common Ancestor : Probabilities



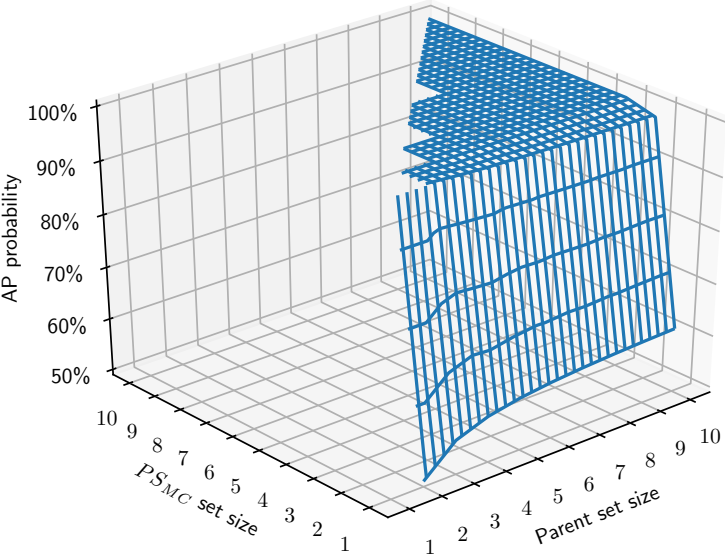
Probability of finding an Alternative Parent



Strict CA

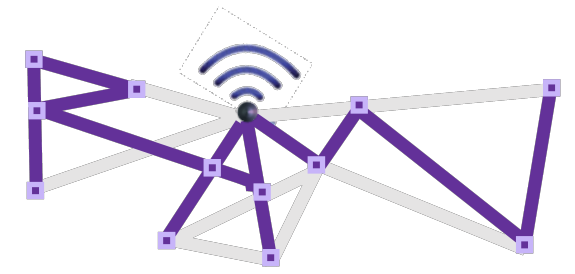


Medium CA



Soft CA

Summary and next steps



⇒ PAREO Functions

⇒ Alternative Parent Selection

⇒ Next steps :

⇒ Add a Section on Constructive interference.

⇒ More items to include that we are missing?

⇒ Questions to the WG :

⇒ Volunteers to REVIEW the draft.

⇒ Position in the WG? / Adopt as WG document?

⇒ Transform it to Architecture draft (maybe)?