# Gossiping with interference in radio chain networks

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In this paper, we study the problem of gossiping with interference constraint in radio chain networks. Gossiping (or total exchange information) is a protocol where each node in the network has a message and wants to distribute its own message to every other node in the network. The gossiping problem consists in finding the minimum running time (makespan) of a gossiping protocol and efficient algorithms that attain this makespan.

**Transmission model** The radio chain network is modeled as a symmetric dipath $P_n$, where the vertices represent the nodes and the arcs represent the possible communications. A call $(s, r)$ is defined as the transmission from the node $s$ to the node $r$, in which $s$ is the *sender* and $r$ is the *receiver* and $(s, r)$ is an arc of the dipath. The network is assumed to be synchronous and the time is slotted into *steps*. We suppose that each device is equipped with a half duplex interface; so, a node cannot both receive and transmit during a step.

**Interference model** Furthermore, communication is subject to interference constraints. We use a binary asymmetric model of interference based on the distance in the communication digraph like the ones used in [1, 2, 6]. Let $d(s, r)$ denote the distance, that is the length of a shortest directed path, from $s$ to $r$ in $P_n$ and $d_I$ be a non negative integer. We assume that when a node $s$ transmits, all nodes $v$ such that $d(s, v) \leq d_I$ are subject to the interference from $s$ transmission. So two calls $(s, r)$ and $(s', r')$ do not interfere if $d(s, r') > d_I$ and $d(s', r) > d_I$. During a given step only non interfering (or compatible) calls can be done and we will define a round as a set of such compatible calls. We focus here on the case where $d_I = 1$.

**Main result** This problem has been studied in general in [5] where approximation results are given (see also the survey [4]). In [3] we solved completely the gossiping problem in radio ring networks within this model. Here we determine exactly the minimum number of rounds $R$ needed to achieve a gossiping when transmission network is a dipath $P_n$ on $n$ nodes and the interference distance is $d_I = 1$. We first prove the lower bound and then give gossiping algorithms which meet this lower bound.

**Theorem 1** *The minimum number of rounds $R$ needed to achieve a gossiping in a chain network $P_n$ ($n \geq 3$), with the interference model $d_I = 1$ is :*

$$R = \begin{cases} 3n - 5 & n \geq 4 \\ 5 & n = 3 \end{cases}$$

# References


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