

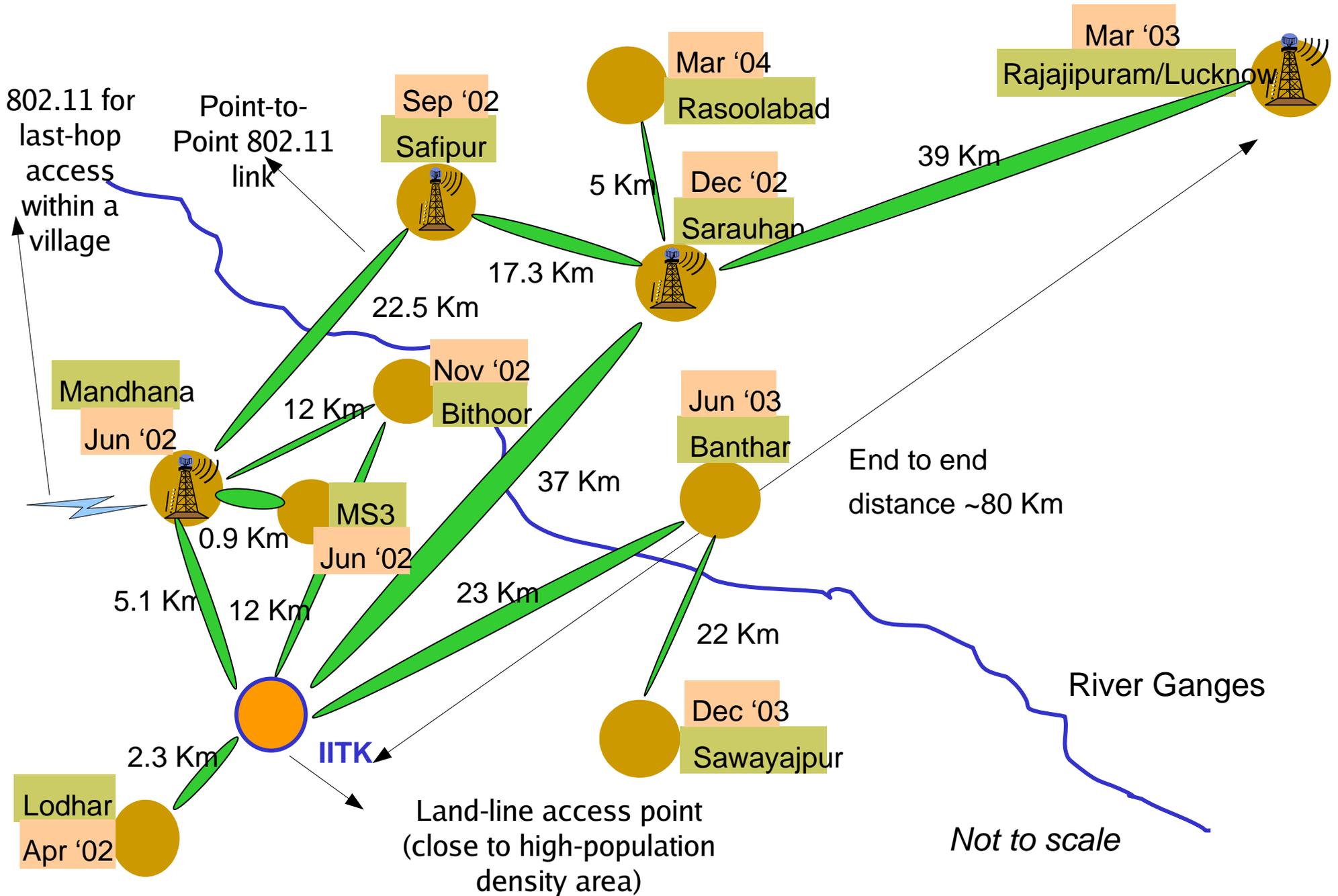
Feasibility Study of Spatial Reuse in an 802.11 Access Network

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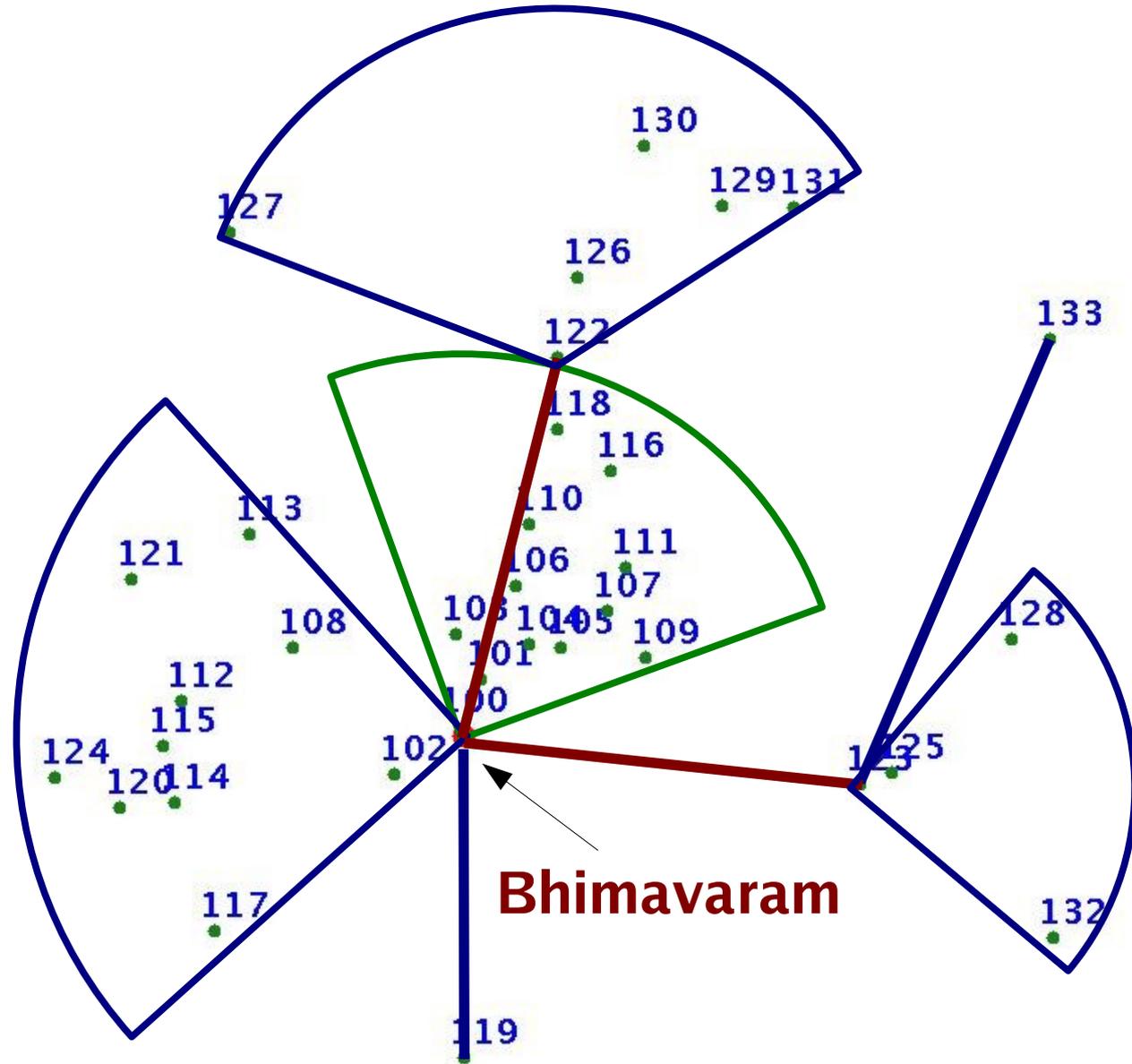
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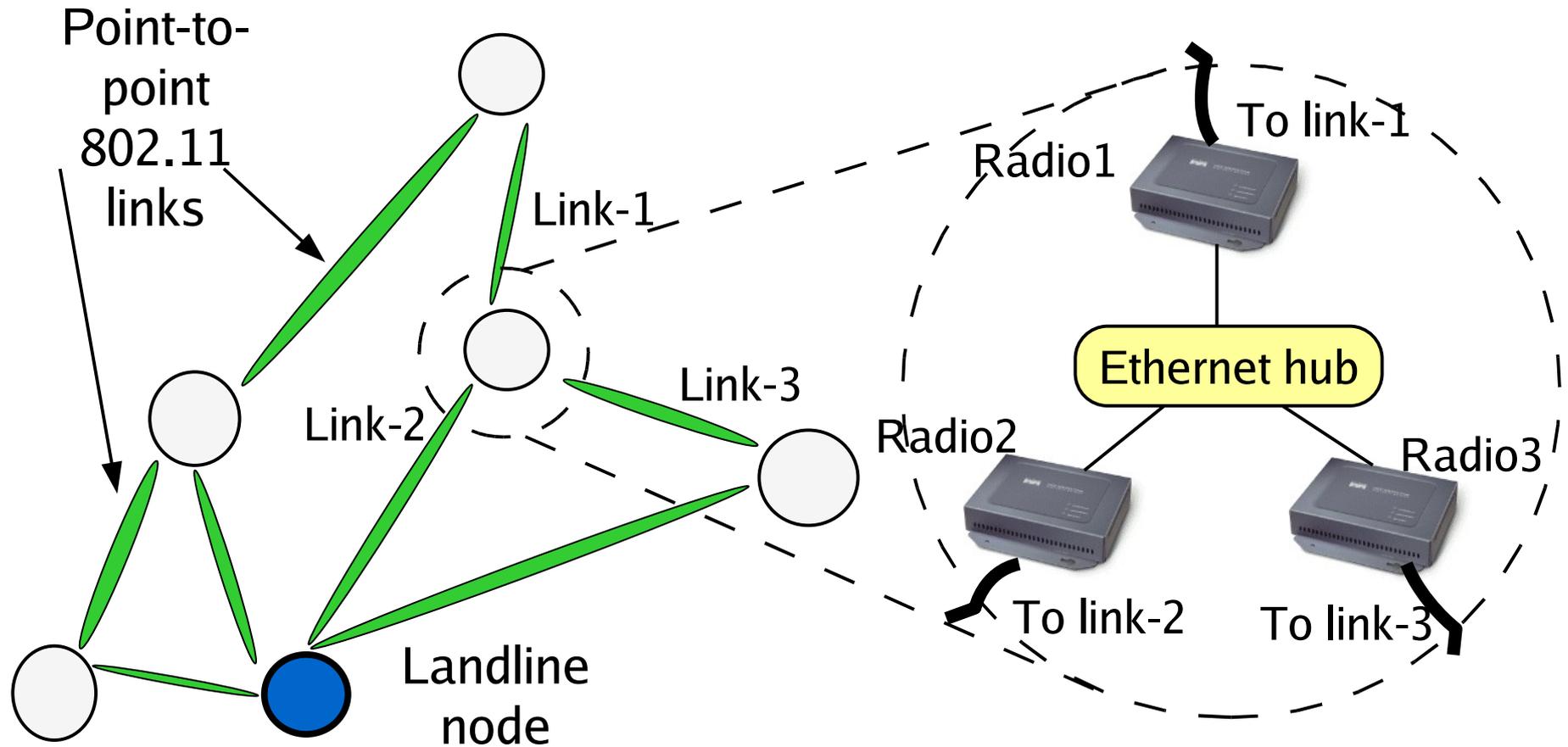
Digital Gangetic Plains (RuralNet)



**The Ashwini
Deployment
(Planned)
West
Godavari,
A.P., India**

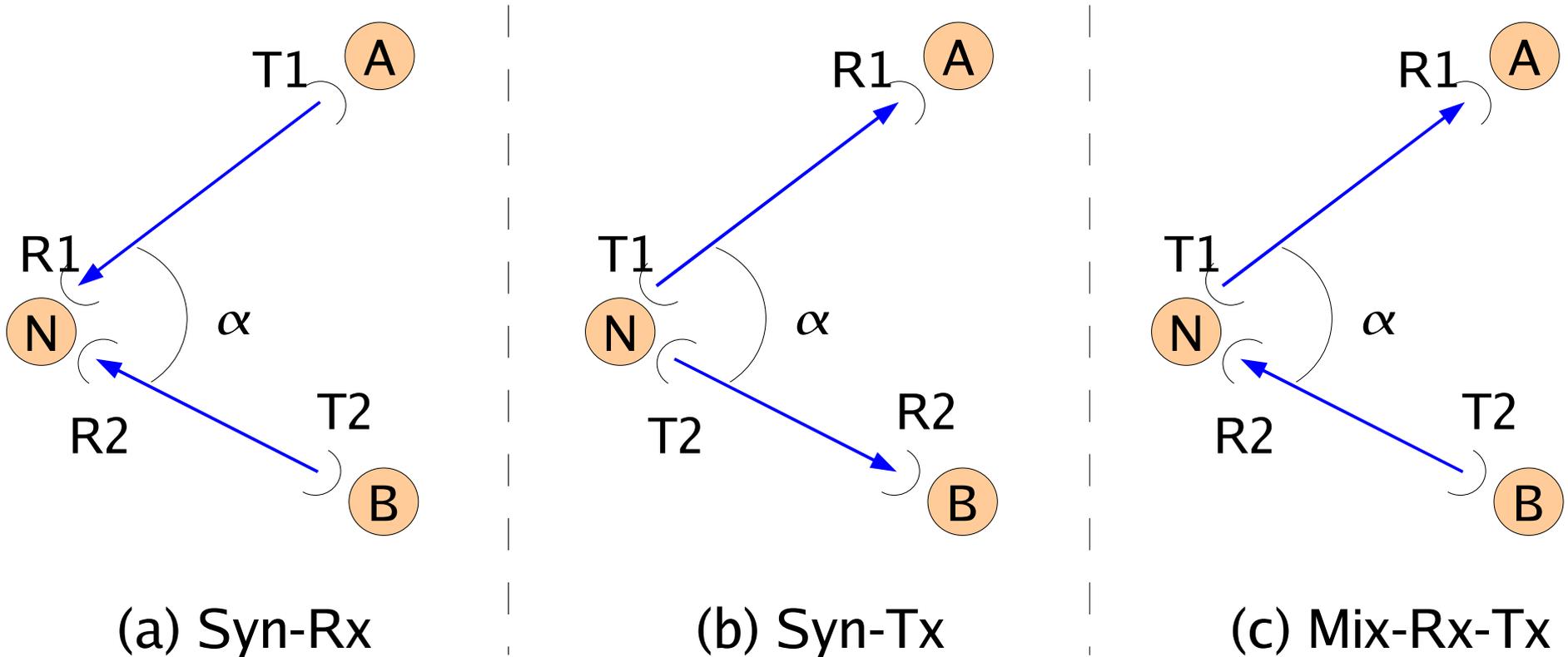


Network Model



- Point-to-point links
- Multiple interfaces (radios) per node
- One directional antenna per link
- Single channel operation

SynRx, SynTx, and Mix-Rx-Tx



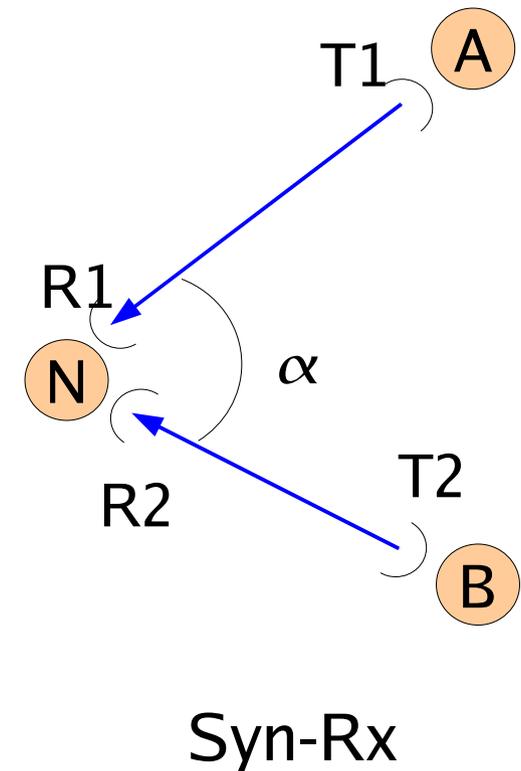
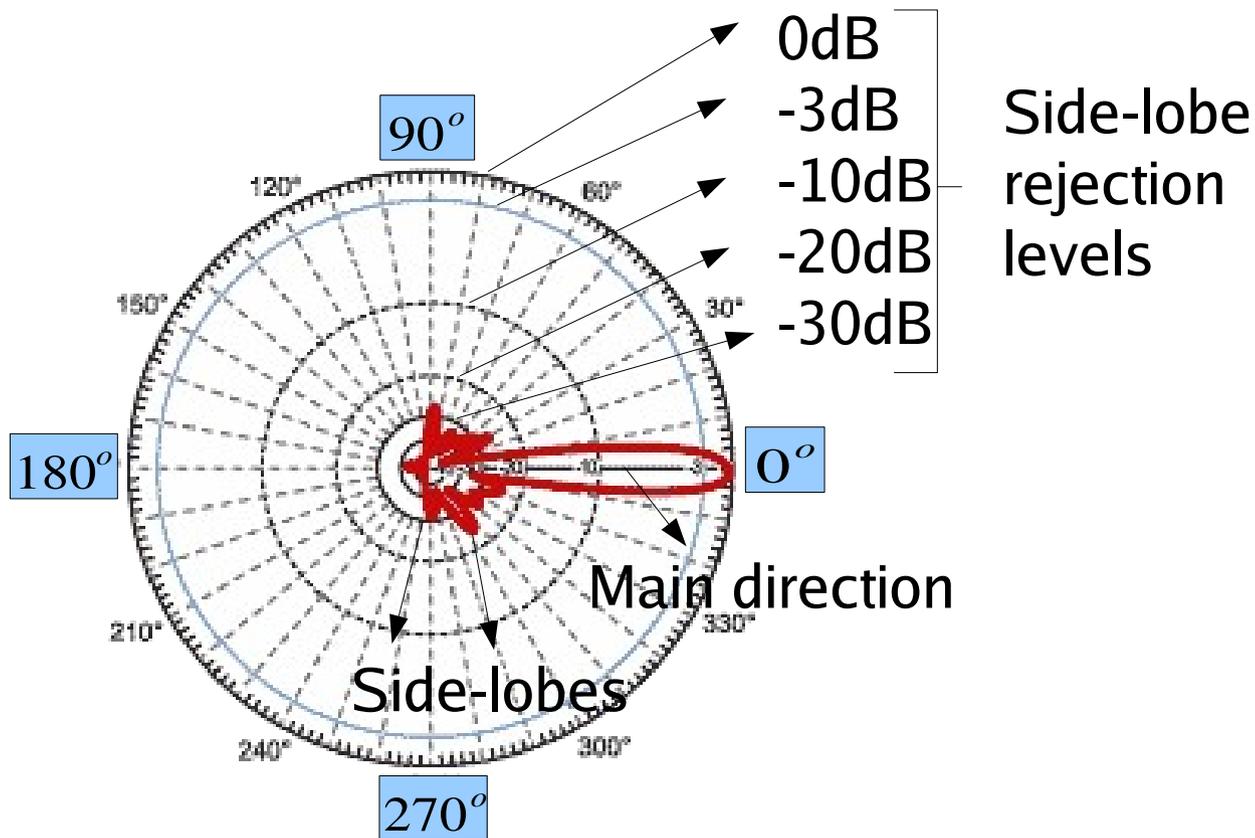
Exposed interface problem within a node:

CSMA/CA (802.11 DCF) inherently allows only one link operation per node

Problems: (a) Immediate ACK, (2) CS back-off

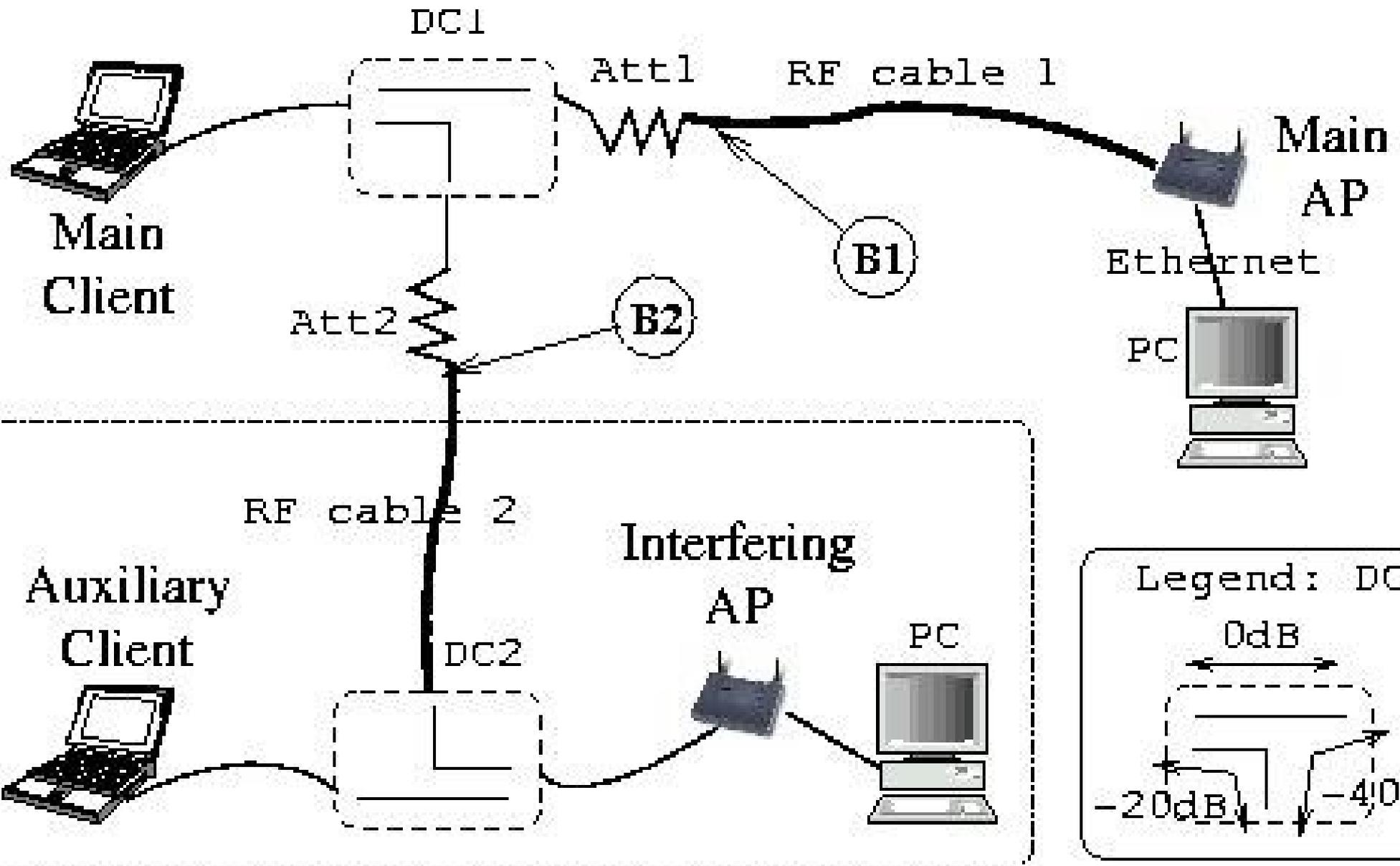
SynOp: SynRx + SynTx

- Links at a node operating simultaneously, synchronously (on the same channel)
- Is this feasible? Yes, under certain conditions

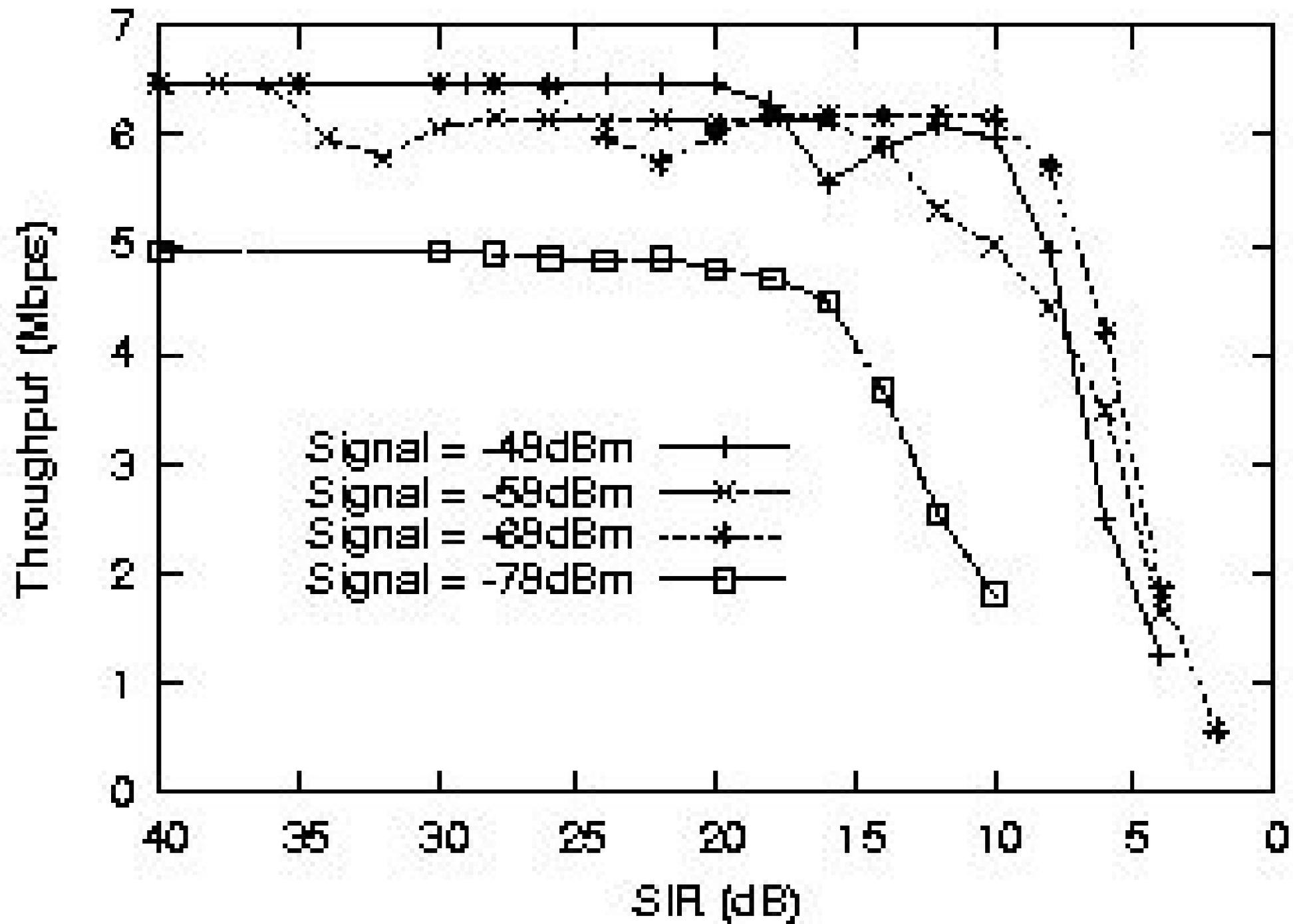


$$\left| P_{R_1} - P_{R_2} \right| \leq SL_{\alpha} - SIR_{reqd}$$

Experimental Setup



Interference vs. Throughput



Conclusions

- Simultaneous [Synchronous Operation \(SynOp\)](#) possible with parabolic grid antennae
- SynOp has subsequently been verified on field
 - See [HotNets-2004](#) and [Mobicom-2005](#) papers
- Further work:
 - [More rejection](#) possible at higher angles of separation
 - [Adjacent channels](#) can be used
- SynOp has implications for network design in other wireless technologies too: e.g. [WiMax](#)