



# Intelligent Collision Avoidance

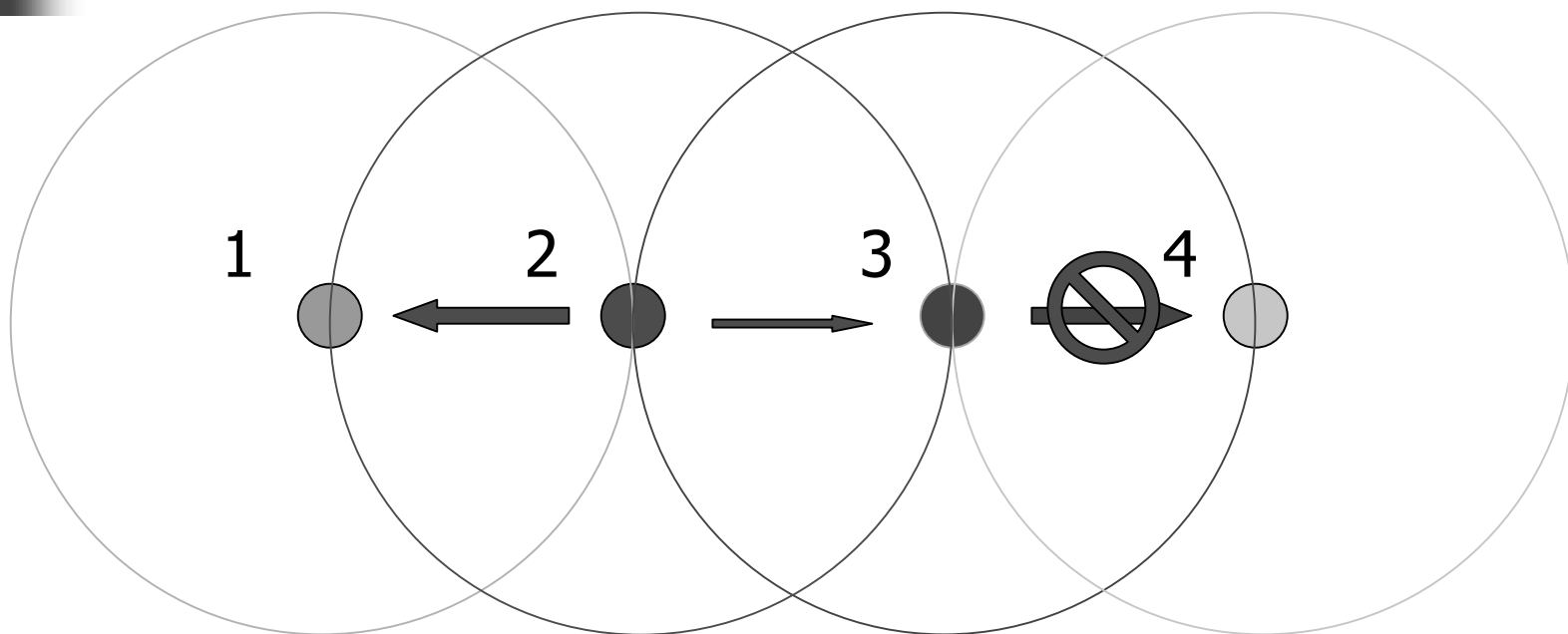
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Gang Peng

# Motivation: Exposed Node Problem

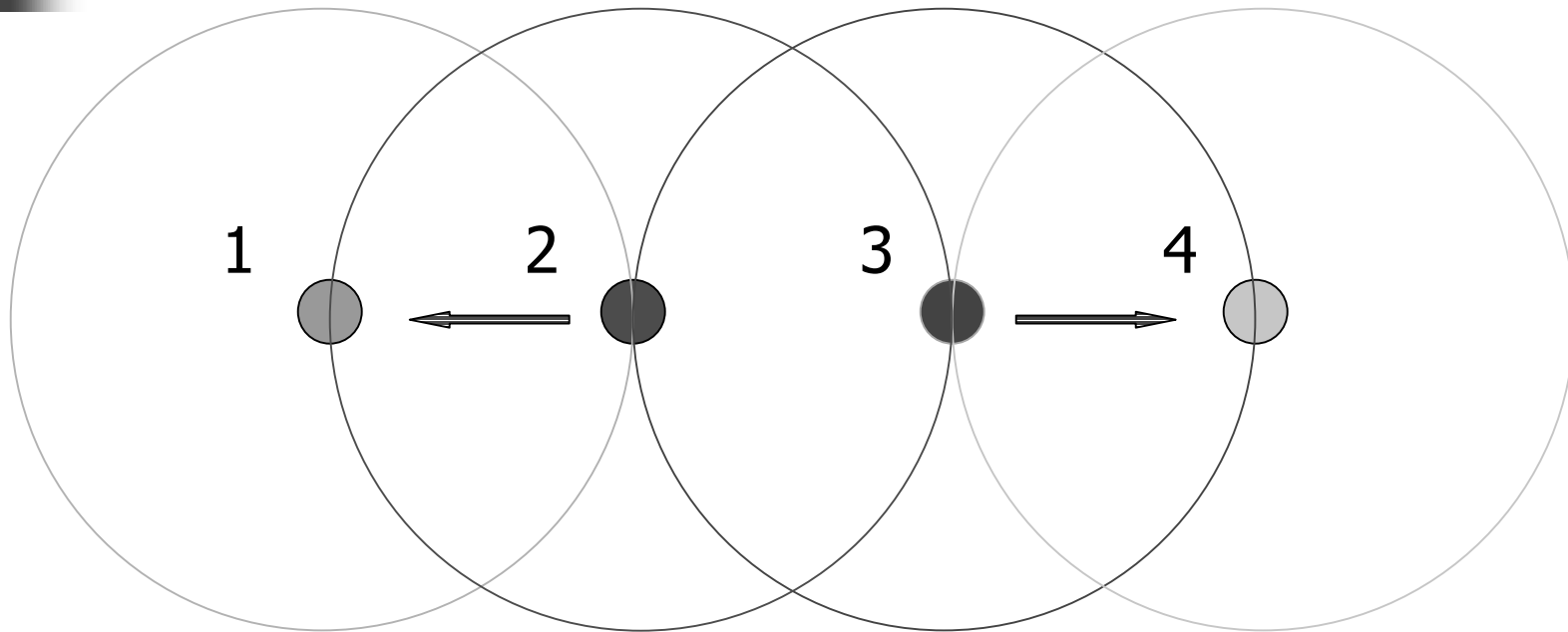


Node 2 starts sending data to node 1

Node 3 also hears the data

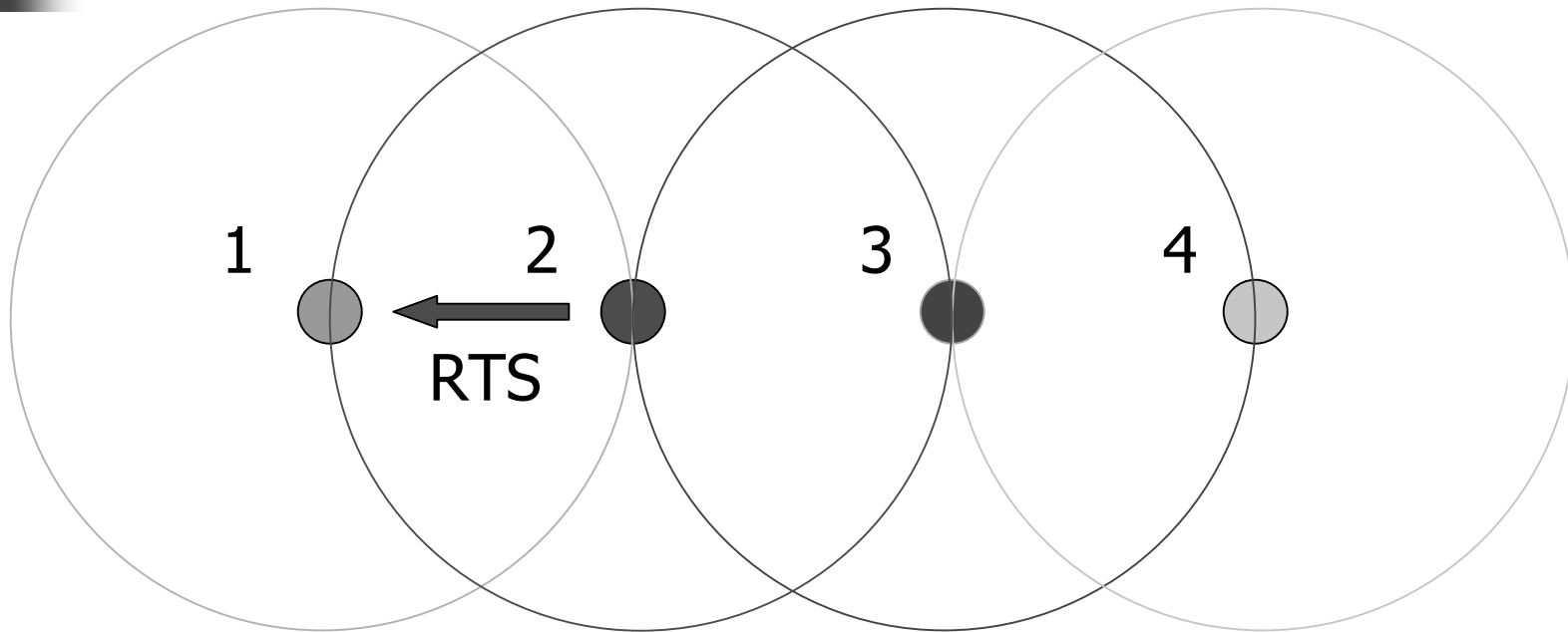
It cannot send any data to Node 4, even though possible

# Exposed Node Problem in 802.11b



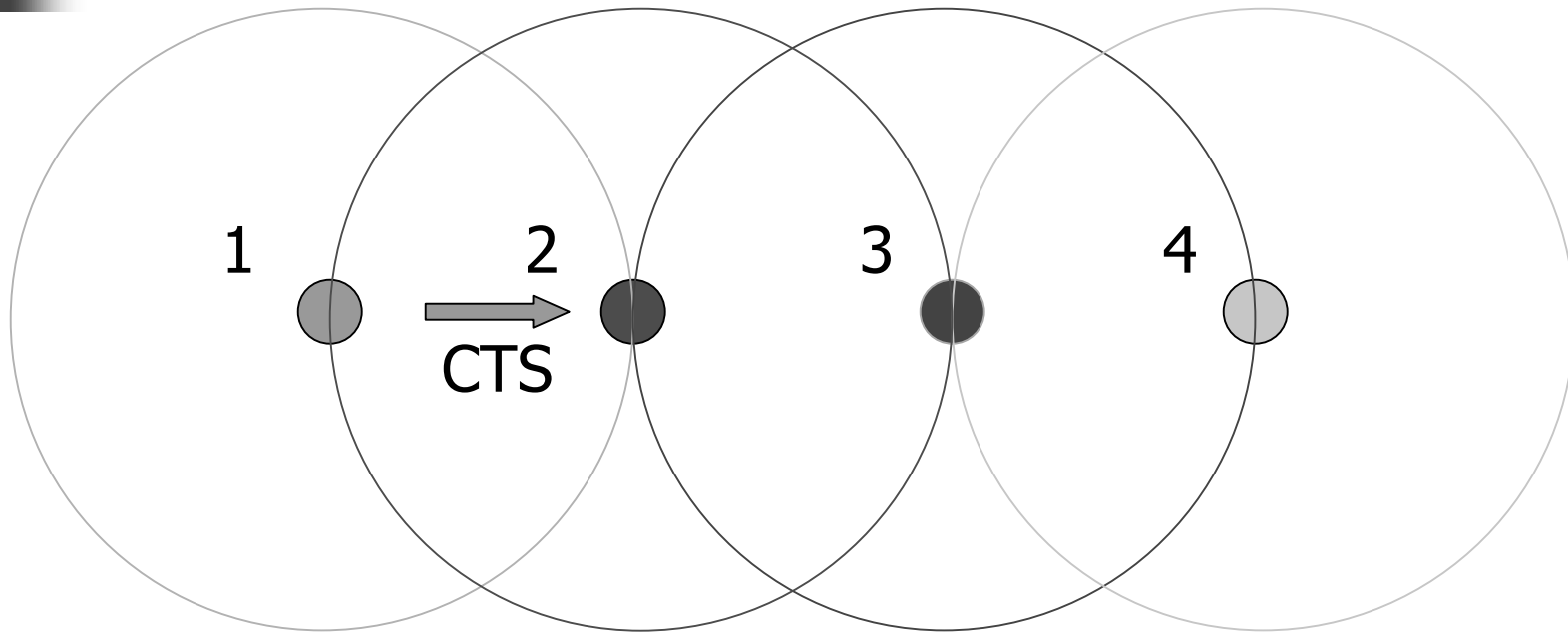
Node 2 and 3 have data to be sent to Node 1 and 4 resp.

# Exposed Node Problem in 802.11b



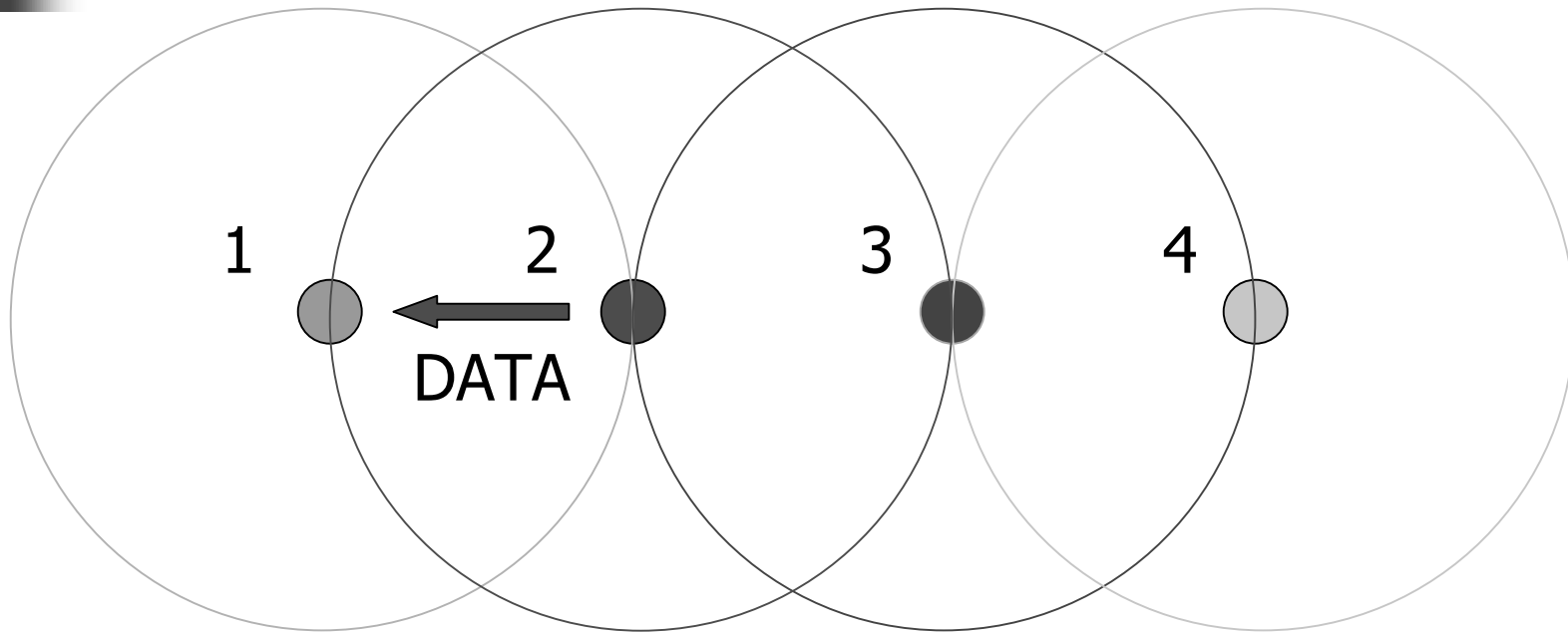
- One of the nodes (say 2) wins the contention and sends RTS
- Other node (node 3 here) hears the RTS and backs off for the duration mentioned in RTS

# Exposed Node Problem in 802.11b



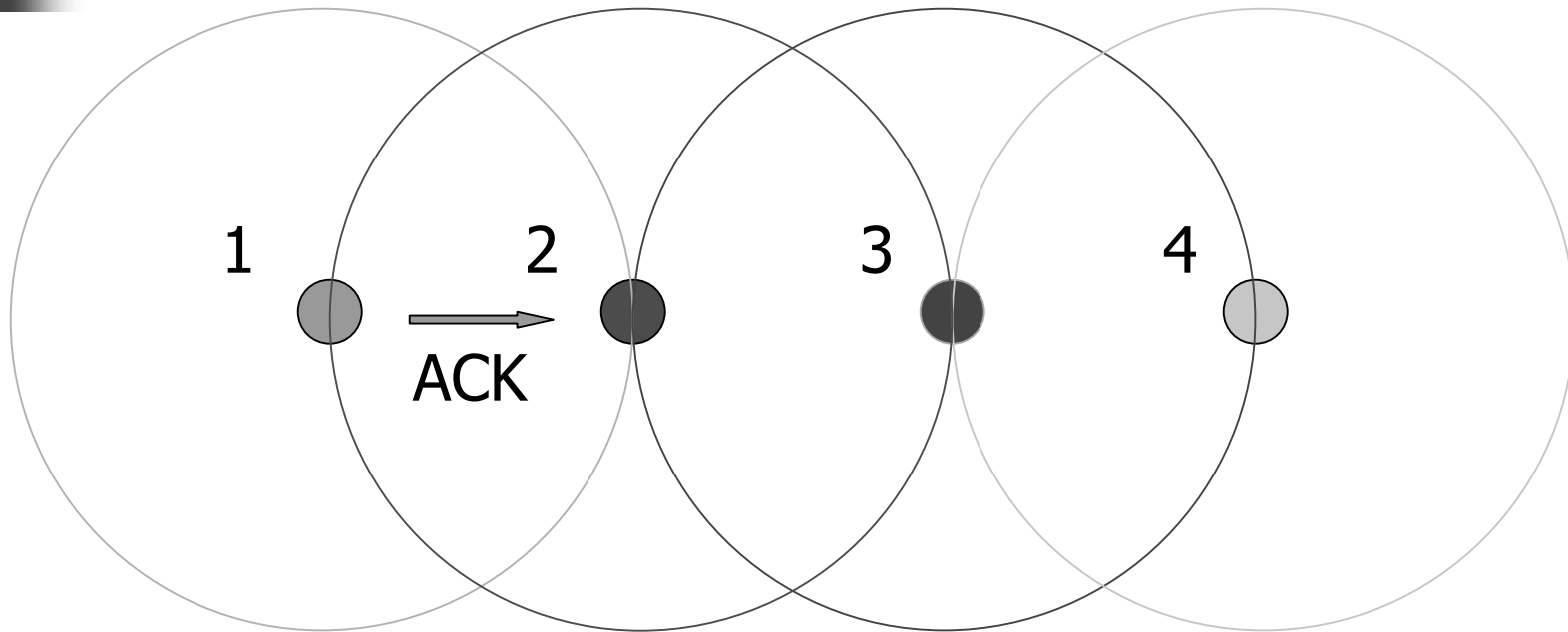
Node 1 sends back CTS

# Exposed Node Problem in 802.11b



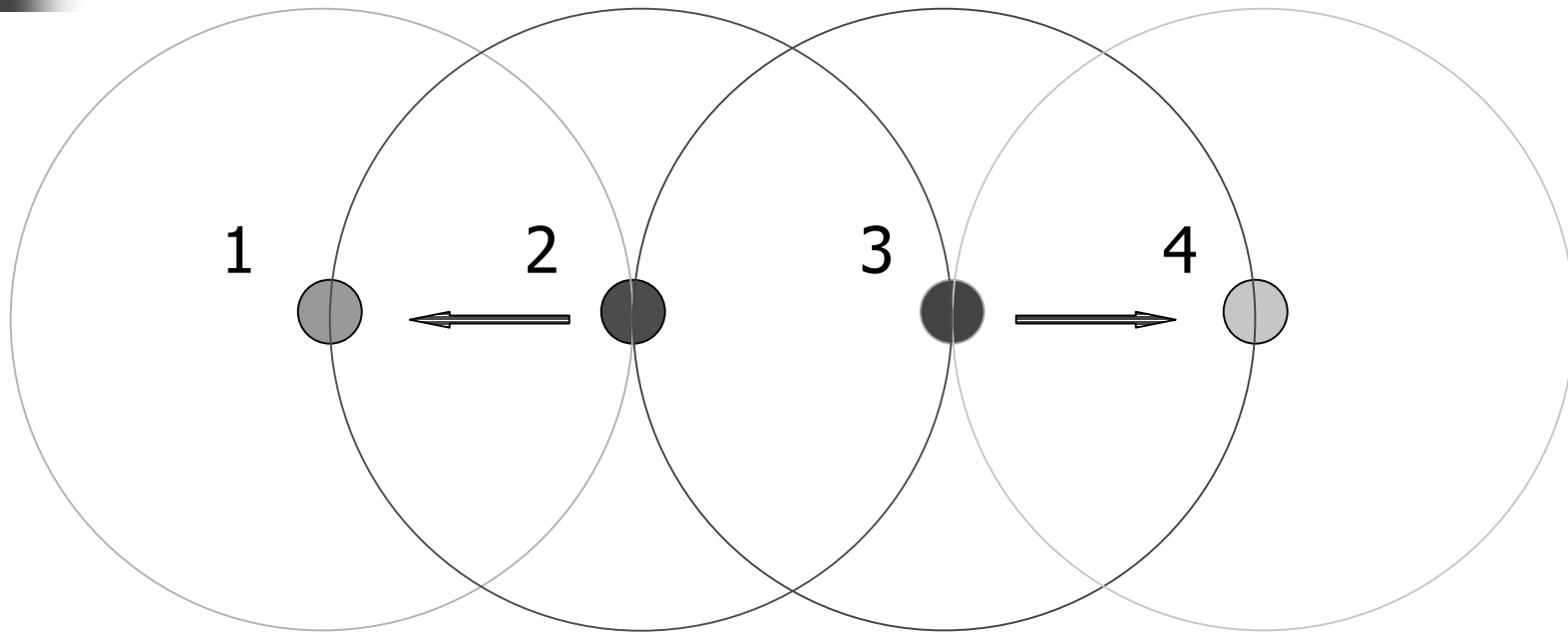
The CTS is followed by DATA from 2

# Exposed Node Problem in 802.11b



The transmission is concluded with an ACK from 1

# Exposed Node Problem in 802.11b



Node 2 and 3 enter the contention period again

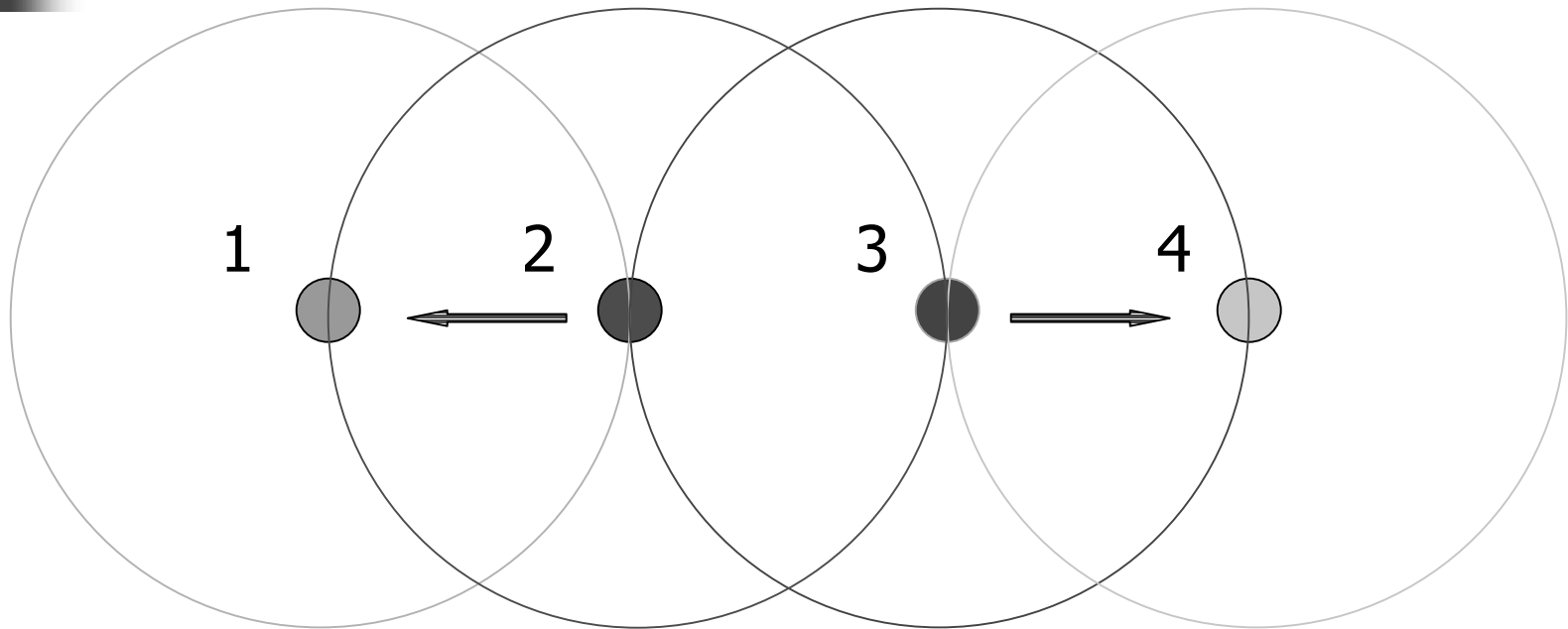


# Our proposal

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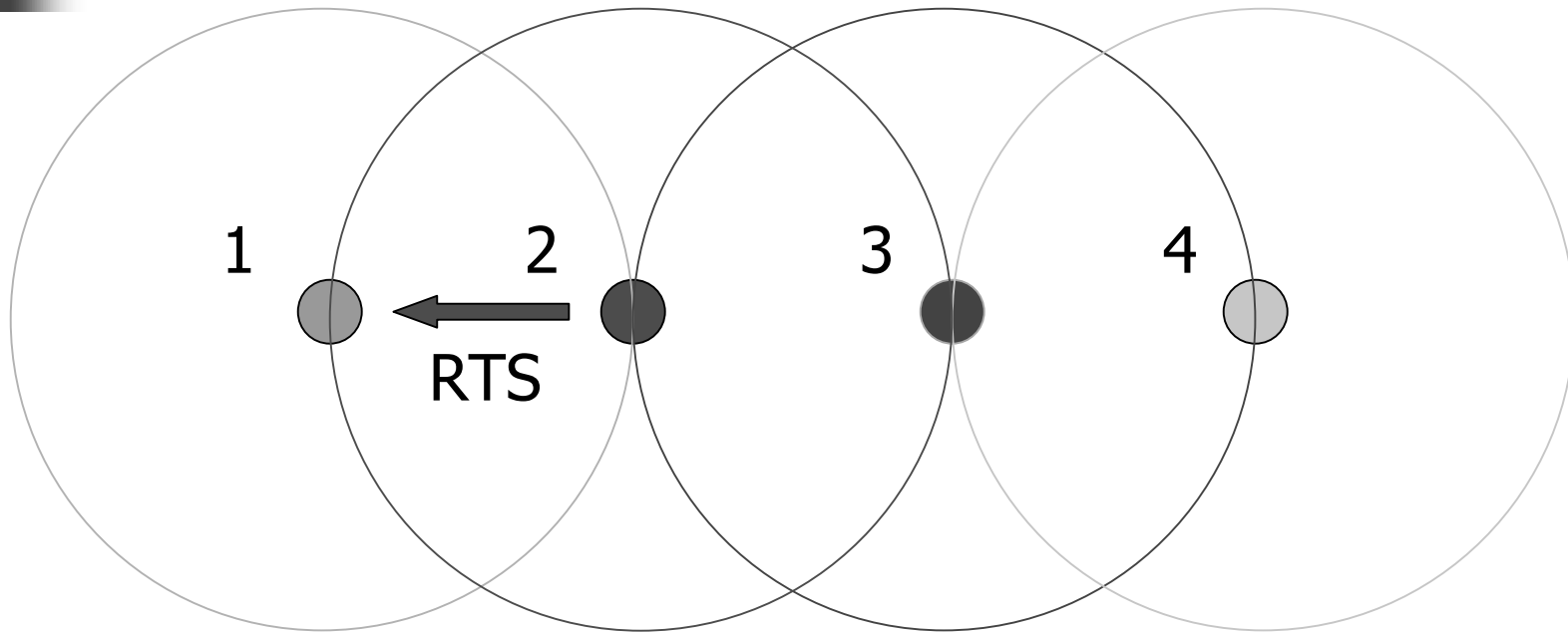
- Carry out parallel data transmissions to improve throughput
- Utilize the information from RTS for estimating parallel transmission duration
- Utilize the absence of CTS to avoid collisions

# Our Scheme



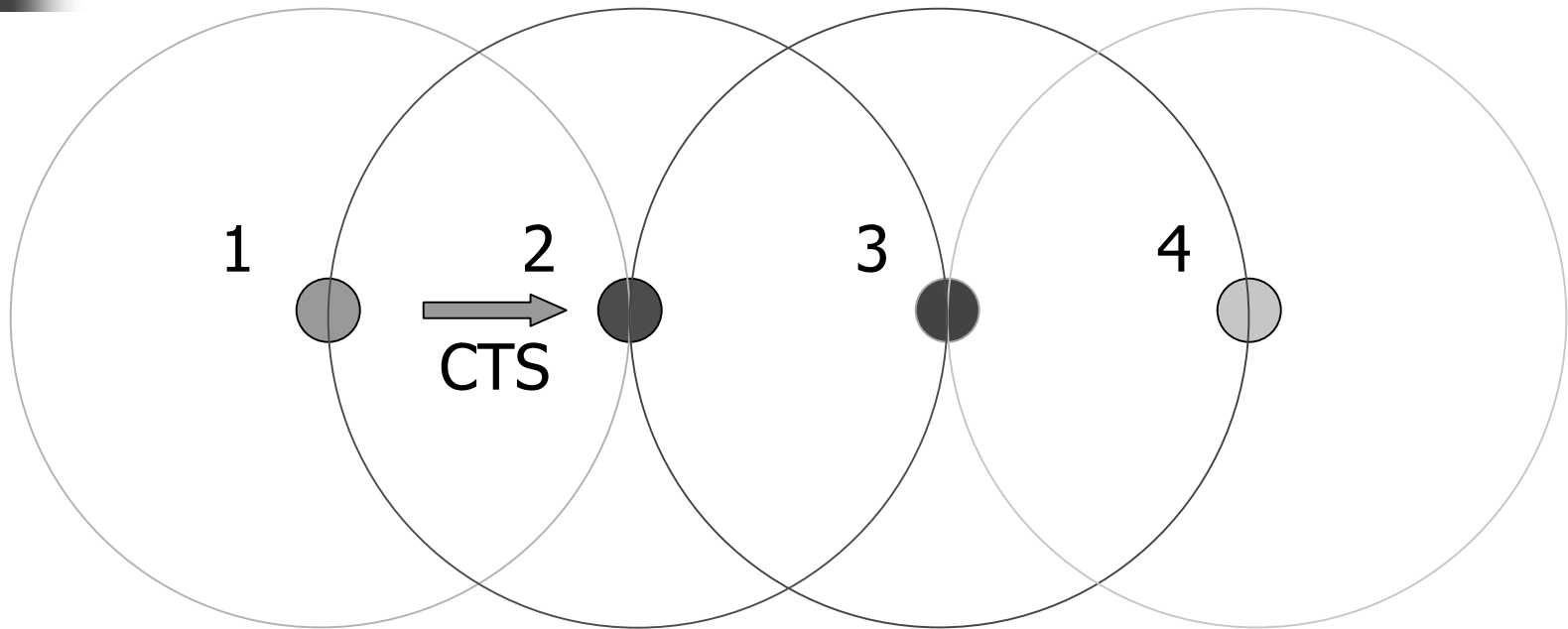
Node 2 and 3 have data to be sent to Node 1 and 4 resp.

# Our Scheme



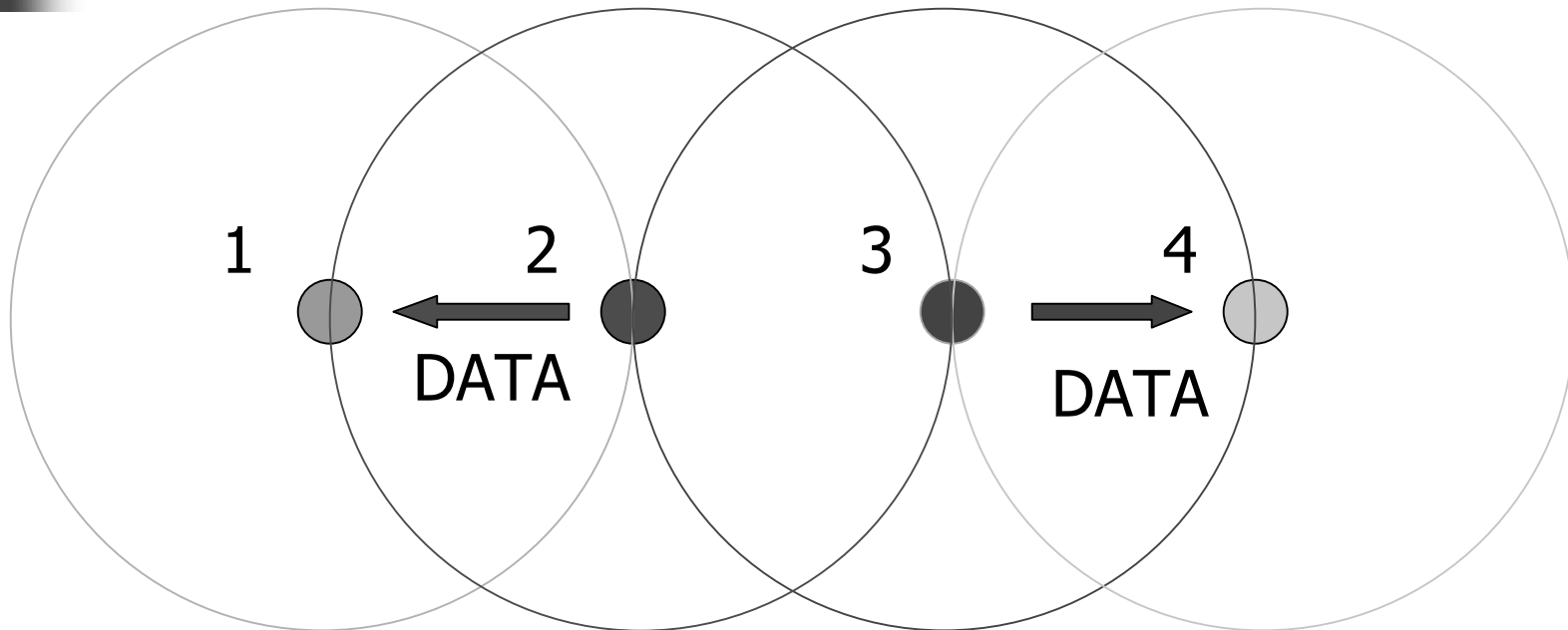
- One of the nodes (say 2) wins the contention and sends RTS
- Other node (node 3 here) hears the RTS and notes down the duration field

# Our Scheme



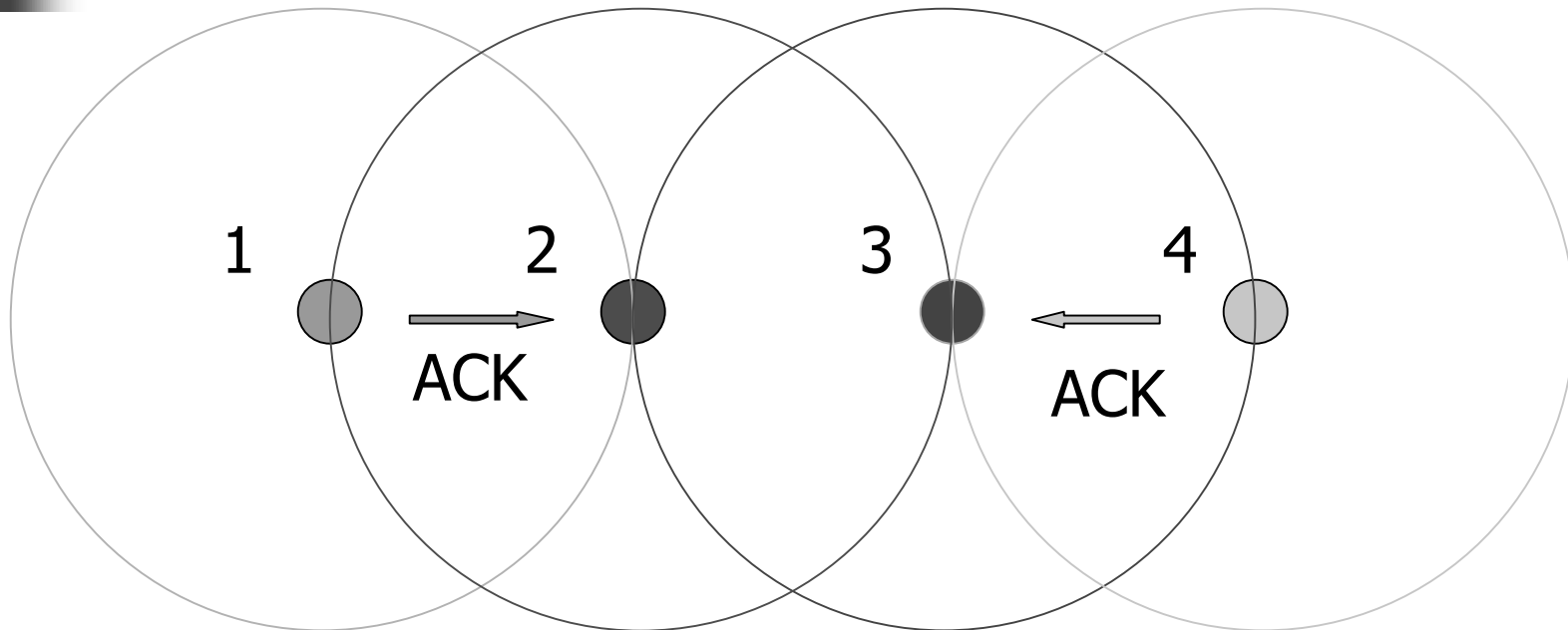
Node 1 sends back CTS, Which is NOT heard by 3

# Our Scheme



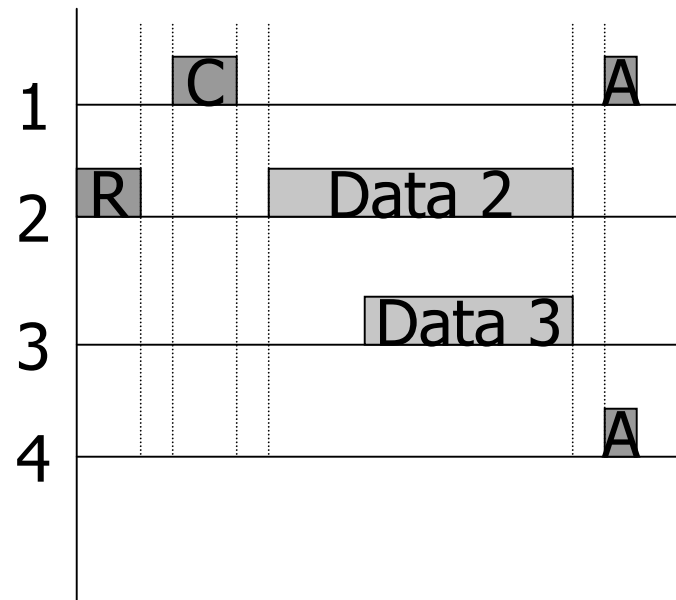
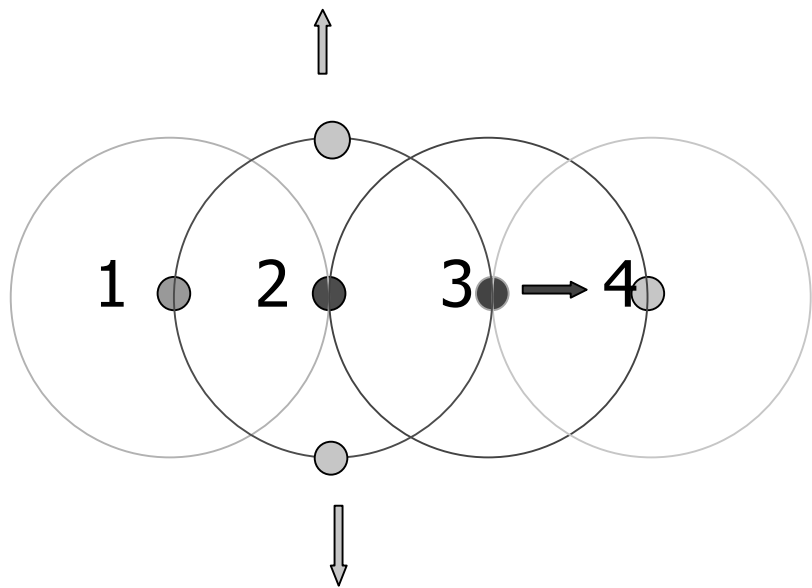
- The CTS is followed by DATA from Node 2
- Absence of CTS at Node 3 helps in concluding Node 3 that Node 1 is unreachable from Node 3
- Node 3 initiates a data transfer in parallel without RTS/CTS

# Our Scheme



- Node 3 fragments the data intelligently to avoid collision of DATA and ACK at Node 2
- The transmissions are concluded with ACKs from Nodes 1 and 4

# Possible gains



- Minimum throughput is always equal to 802.11b
- Can be manifold depending on the orientation of nodes



# Issues

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- - Increased power consumption
- + Throughput is never compromised
- - Scalability depends on the ratio between the Hearing Range and Sense Range. ( $1 < 2$ )
- Need to choose the fragment size intelligently for parallel data transmission
- RTS/CTS threshold determines the MAX fragsize that can be sent without CA.



# Proposed Work

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- Run the protocol through NS2 simulator
- Study power consumption and throughput relation
- Study the performance gains for different physical topologies
- Verify that the proposed solution is correct (at least by studying various scenarios)