E) Five-Phase Reservation Protocol (FPRP)

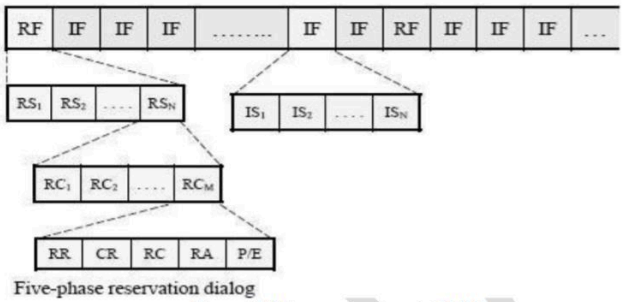


Figure 2.7 Frame structure in FPRP

It is a single-channel TDMA-based broadcast scheduling protocol.

The protocol is fully distributed, that is, multiple reservations can be simultaneously made throughout the network.

The protocol assumes the availability of global time at all nodes.

No ordering among nodes is followed

Nodes need not wait for making time slot reservations.

Time is divided into frames:

Reservation frame (RF) and

Information frame (IF).

Each RF has N reservation slots (RS) and each IF has N information slots (IS). Each RS is composed of M reservation cycles (RCs). Each RF is followed by a sequence of IFs. In order to reserve an IS, a node needs to contend during the corresponding RS.

Based on these contentions, a TDMA schedule is generated in the RF and is used in the subsequent Ifs until the next RF.

During the corresponding IS, a node would be in one of the three states: transmit(T), receive(R) or blocked(B)

The reservation takes following five phases:

1. Reservation request phase:

Nodes that need to transmit packets send reservation request (RR) packets to their destination nodes.

2. Collision report phase:

If a collision is detected by any node during the reservation request phase,then that node broadcasts a collision report (CR) packet. The corr source nodes, upon receiving the CR packet, take necessary action.

3. Reservation confirmation phase:

A source node is said to have won the contention for a slot if it does not receive any CR messages in the previous phase. In order to confirm the reservation request made in the reservation request phase, it sends a reservation confirmation (RC) message to the destination node in this phase.

4. Reservation acknowledgment phase:

The reservation takes following five phases:

1. Reservation request phase:

Nodes that need to transmit packets send reservation request (RR) packets to their destination nodes.

2. Collision report phase:

If a collision is detected by any node during the reservation request phase,then that node broadcasts a collision report (CR) packet. The corresponding source nodes, upon receiving the CR packet, take necessary action.

3. Reservation confirmation phase:

A source node is said to have won the contention for a slot if it does not receive any CR messages in the previous phase. In order to confirm the reservation request made in the reservation request phase, it sends a reservation confirmation (RC) message to the destination node in this phase.

4. Reservation acknowledgment phase:

In this phase, the destination node acknowledges reception of the RC by sending back a reservation acknowledgment (RA) message to the source. The hidden nodes that receive this message defer their transmissions during the reserved slot.

5. Packing and elimination (P/E) phase:

Two types of packets are transmitted during this phase: packing packet and elimination packet.

MACA with Piggy-Backed Reservation (MACA/PR)

It is based on the MACAW protocol with non-persistent CSMA

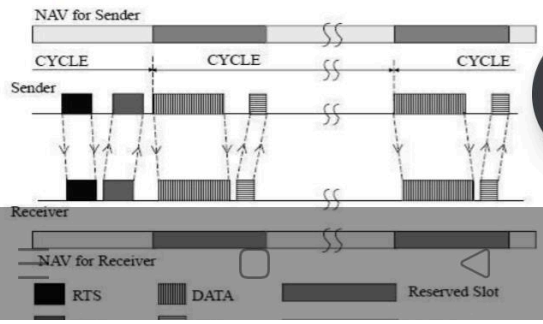
The main components are:

A MAC protocol

A reservation protocol

A QoS routing protocol

It differentiates real-time packets from the best-effort packets. It provides guaranteed bandwidth support for real-time packets.Also, it provides reliable transmission of best efforts packets.



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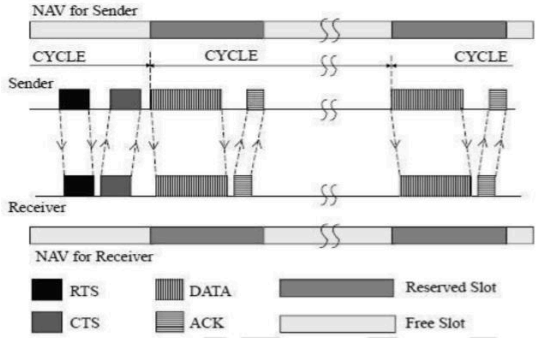


Figure 2.8 Packet transmission in MACA/PR

Time is divided into slots. Each node records the transmit and receive reservations of its neighbors in a reservation-table(RT). For real-time traffic the source first sends an RTS packet, for which the receiver responds with a CTS packet. Now the source sends the first DATA packet of the real-time session.

Reservation information for the next DATA packet is piggy-backed on this current DATA packet.

On receiving this DATA packet, the receiver updates its reservation table with the piggy-backed reservation information

The receiver then sends ACK packet back to the source,Receiver piggy-backs the reservation confirmation information on the ACK packet

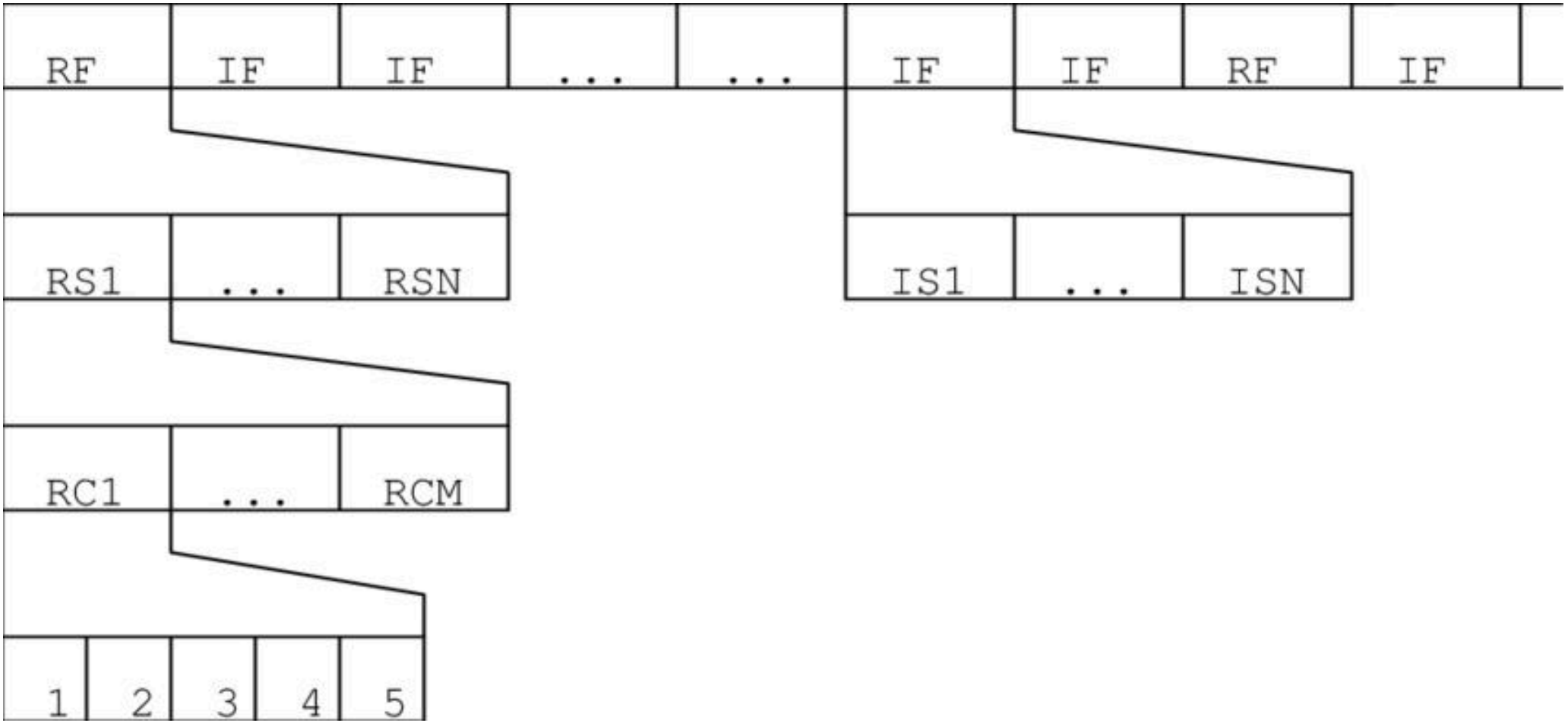
Advantage: It does not require global synchronization among nodes

Drawback: A free slot can be reserved only if it can fit the entire RTS-CTS-DATA-ACK exchange.

G) Real-Time Medium Access Control Protocol (RTMAC)

It provides a bandwidth reservation mechanism for supporting real-time traffic. It has two components:

1) QoS routing protocol is responsible for end-to-end reservation & release of


RF
IF
IF
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...
IF
IF
RF
IF
RS1
...
RSN
IS1
...
ISN
RC1
...
RCM
1
2
3
4
5