Develop a protocol for the following system in PROMELA and validate it. The system to be modeled is a telephone system. There are some number of clients in the system. Each client engages in a "call" from time to time.

A two-way call has two participants, a source client (source) and a destination client. A call involves establishing a connection between the two clients, data transfer and disconnection. Initially, all clients are IDLE. In any call, a client can pick another client at random and initiate a call. The call is initiated by sending a request message \( \text{REQ}(\text{sourceid}, \text{destinationid}) \) to the destination client. A client can engage in at most one call at any time. Therefore, if \( y \) receives \( \text{REQ}(x, y) \) and \( y \) is IDLE then it accepts the connection by sending ACCEPT message. Otherwise, \( y \) sends a BUSY signal to \( x \). If \( x \) receives a BUSY signal, it returns to the IDLE state. If it receives a message accepting the connection, then \( x \) enters the CONNECTED state. In the CONNECTED state, each client may send at most one DATA message to the other client. A client may disconnect any time after the connection is established. To disconnect, a client sends a Disconnect message, enters the DISCONNECTING state and waits for the ACK message. On receiving the ACK message, a client moves to the IDLE state.

The basic protocol for two clients with the above features will be provided. You need to redesign the system with 4 clients, A, B, C and D, to address the following:

- If a client has sent a Disconnect message and then receives a Disconnect from the other side, then it can enter the IDLE state without waiting for the ACK, and it also does not send an ACK.
- Client A is only allowed to make a three-way call to B and C. That is, to make a call, it sends a request message to both B and C. The call is established if both clients accept the call. If A decides to disconnect, it must do so with both clients. If any of the other clients wish to disconnect, then an individual disconnection with each client is done.
- B is unreliable and fail. When it fails, it sends a Fail message to all other nodes. After sending the Fail message, B ignores all messages that it receives. However, it may recover at any time after it is has failed. On recovering, it sends Recover message to everyone, and resume normal behavior.

We will discuss the properties that you must verify in the class.