

PIN Validation Transaction = {transactionId, transactionType, cardId, PIN, startDate, expirationDate}

Figure 11.1. Communication diagram for Validate PIN use case: Valid PIN scenario

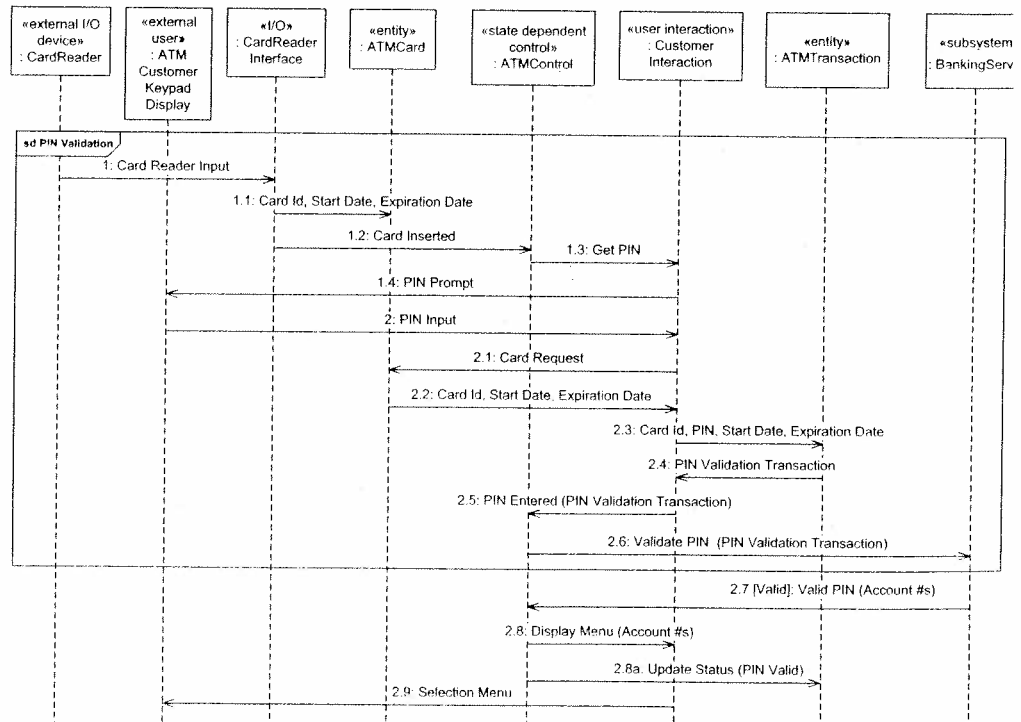


Figure 11.2. Sequence diagram for Validate PIN use case: Valid PIN scenario

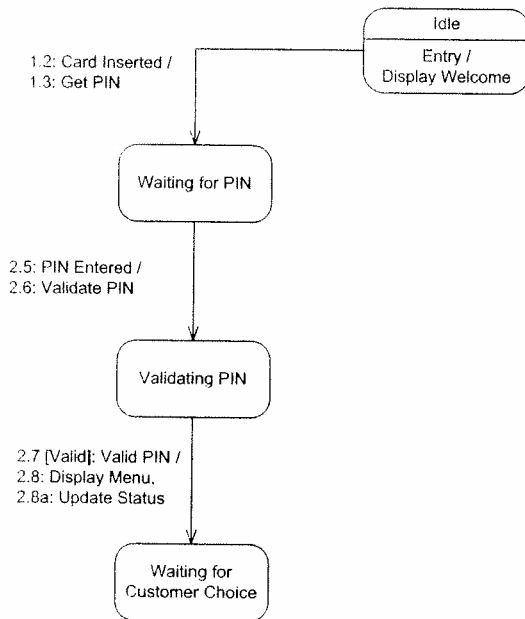


Figure 11.3. Validate PIN statechart: Valid PIN scenario

followed by card data stored (1.1), sending the card inserted event to the ATM Control object (1.2), which results in the state change and the Get PIN action (1.3) sent to Customer Interaction, which outputs the PIN prompt to the customer display (1.4). The message sequence from 2 to 2.9 starts with the user entering the PIN (message 2) to Customer Interaction, followed by retrieving card data (2.1, 2.2), preparing PIN Validation transaction (2.3, 2.4), and sending the transaction to ATM Control (2.5) and from there to Banking Service (2.6). The message sequence from 1 through 2.6 is grouped into a *PIN Validation* segment on the sequence diagram (shown in the box entitled *sd PIN Validation*) in Figure 11.2 for future reference. In this scenario, the Banking Service sends a Valid PIN response (message 2.7) to ATM Control, which eventually leads to Customer Interaction displaying the selection menu to the customer (2.8 and 2.9).

A message arriving at the ATM Control object causes a state transition on the ATM Control statechart (Figure 11.3). For example, Card Reader Interface sends the Card Inserted message (message 1.2 in Figures 11.1 and 11.2) to ATM Control. As a result of this Card Inserted event (event 1.2 corresponds to message 1.2 in Figures 11.1 and 11.2, with the number 1.2 emphasizing the correspondence between the message and the event), the ATM Control statechart transitions from Idle state (the initial state) to Waiting for PIN state. The output event associated with this transition is Get PIN (event 1.3). This output event corresponds to message 1.3, Get PIN, sent by ATM Control to Customer Interaction.

A concurrent sequence is shown in Figure 11.1 with messages 2.8 and 2.8a. ATM Control sends these two messages at the same state transition, so the two message sequences may execute concurrently, one to Customer Interaction and the other to ATM Transaction.

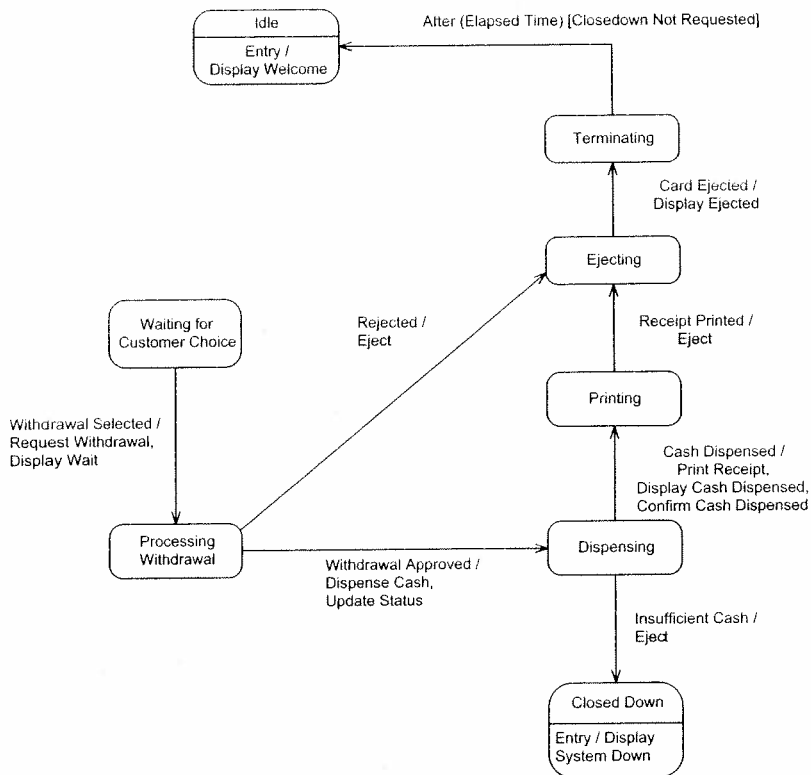


Figure 10.16. Statechart for ATM Control: Withdraw Funds use case with alternatives

addition to the main sequence for the scenario in which cash is dispensed, there are two additional scenarios: withdrawal transaction rejected (transition directly from Processing Withdrawal state to Ejecting State) and insufficient cash in ATM (transition from Dispensing state to Closed Down State).

### 10.3.3 Develop Integrated Statechart

The integrated statechart consists of the integration of the use case-based statecharts, after consideration of alternatives. Thus, the statecharts depicted in Figures 10.9 (Validate PIN use case with alternatives) and 10.16 (Withdraw Cash use case with alternatives) are combined with the statecharts for the other use cases. This statechart would represent the main sequence through each use case together with the alternatives.

Figure 10.17 shows the integrated statechart from the Validate PIN and Withdraw Cash statecharts, with main and alternatives sequences. The main statechart integration point is Waiting for Customer Choice state, the end state for Validate PIN statechart, and the initial state for Withdraw Funds (and also Transfer Funds and Query Account) statechart. However, other statechart integration points are the Ejecting and Confiscating states for the alternative scenarios of Validate PIN.