Two-Phase Locking to Ensure Serializability:

**Two-phase locking** defines how transactions acquire and relinquish locks. Two-phase locking guarantees serializability, but it does not prevent deadlocks. The two phases are:

1. **A growing phase**, in which a transaction acquires all required locks without unlocking any data. Once all locks have been acquired, the transaction is in its locked point.

2. **A shrinking phase**, in which a transaction releases all locks and cannot obtain any new lock.

The two-phase locking protocol is governed by the following rules:

- Two transactions cannot have conflicting locks.
- No unlock operation can precede a lock operation in the same transaction.
- No data are affected until all locks are obtained—that is, until the transaction is in its locked point.

![Image of two-phase locking protocol]

The two-phase locking protocol

In this example, the transaction acquires all of the locks it needs until it reaches its locked point. (In this example, the transaction requires two locks.) When the locked point is reached, the data are modified to conform to the transaction’s requirements. Finally, the transaction is completed as it releases all of the locks it acquired in the first phase.
Two-phase locking increases the transaction processing cost and might cause additional undesirable effects. One undesirable effect is the possibility of creating deadlocks.