



4.5.4 Commit Rule and Log Ahead Rule

1) Commit Rule

A.I must be written to nonvolatile storage before commit of the transaction.

2) Log Ahead Rule

If A.I is written to DB before commit then B.I must first written to log.

3) Recovery strategies

(1) The features of undo and redo (are idempotent) :

$\text{undo}(\text{undo}(\text{undo} \dots \text{undo}(x) \dots)) = \text{undo}(x)$

$\text{redo}(\text{redo}(\text{redo} \dots \text{redo}(x) \dots)) = \text{redo}(x)$



(2) Three kinds of update strategy

a) $A.I \rightarrow DB$ before commit

$TID \rightarrow \text{active list}$

$\left[\begin{array}{l} \downarrow \\ \end{array} \right] \left\{ \begin{array}{l} B.I \rightarrow \text{Log} \\ A.I \rightarrow DB \\ \vdots \end{array} \right. \quad (\text{Log Ahead Rule})$

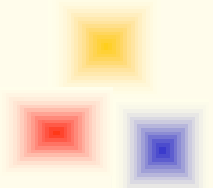
commit $\left\{ \begin{array}{l} TID \rightarrow \text{commit list} \\ \text{delete TID from active list} \end{array} \right.$



The recovery after failure in this situation

Check two lists for every TID while restarting after failure:

Commit list	Active list	
	✓	Undo, delete TID from active list
✓	✓	delete TID from active list
✓		nothing to do



b) $A.I \rightarrow DB$ after commit

$TID \rightarrow$ active list

$\boxed{\downarrow} \left\{ \begin{array}{l} A.I \rightarrow \text{Log} \\ \vdots \end{array} \right. \quad (\text{Commit Rule})$

commit $\left\{ \begin{array}{l} TID \rightarrow \text{commit list} \\ \boxed{\downarrow} A.I \rightarrow DB \\ \text{delete TID from active list} \end{array} \right.$



The recovery after failure in this situation

Check two lists for every TID while restarting after failure:

Commit list	Active list	
	✓	delete TID from active list
✓	✓	redo, delete TID from active list
✓		nothing to do



c) $A.I \rightarrow DB$ concurrently with commit

$TID \rightarrow \text{active list}$

$\left[\begin{array}{l} \downarrow \\ \downarrow \end{array} \right] \left\{ \begin{array}{l} A.I, B.I \rightarrow \text{Log} \\ A.I \rightarrow DB \end{array} \right. \quad \begin{array}{l} \text{(Two Rules)} \\ \text{(partially done)} \end{array}$

\vdots

$\text{commit} \left\{ \begin{array}{l} TID \rightarrow \text{commit list} \\ \left[\begin{array}{l} \downarrow \\ \downarrow \end{array} \right] A.I \rightarrow DB \\ \text{delete TID from active list} \end{array} \right. \quad \begin{array}{l} \\ \text{(completed)} \end{array}$