

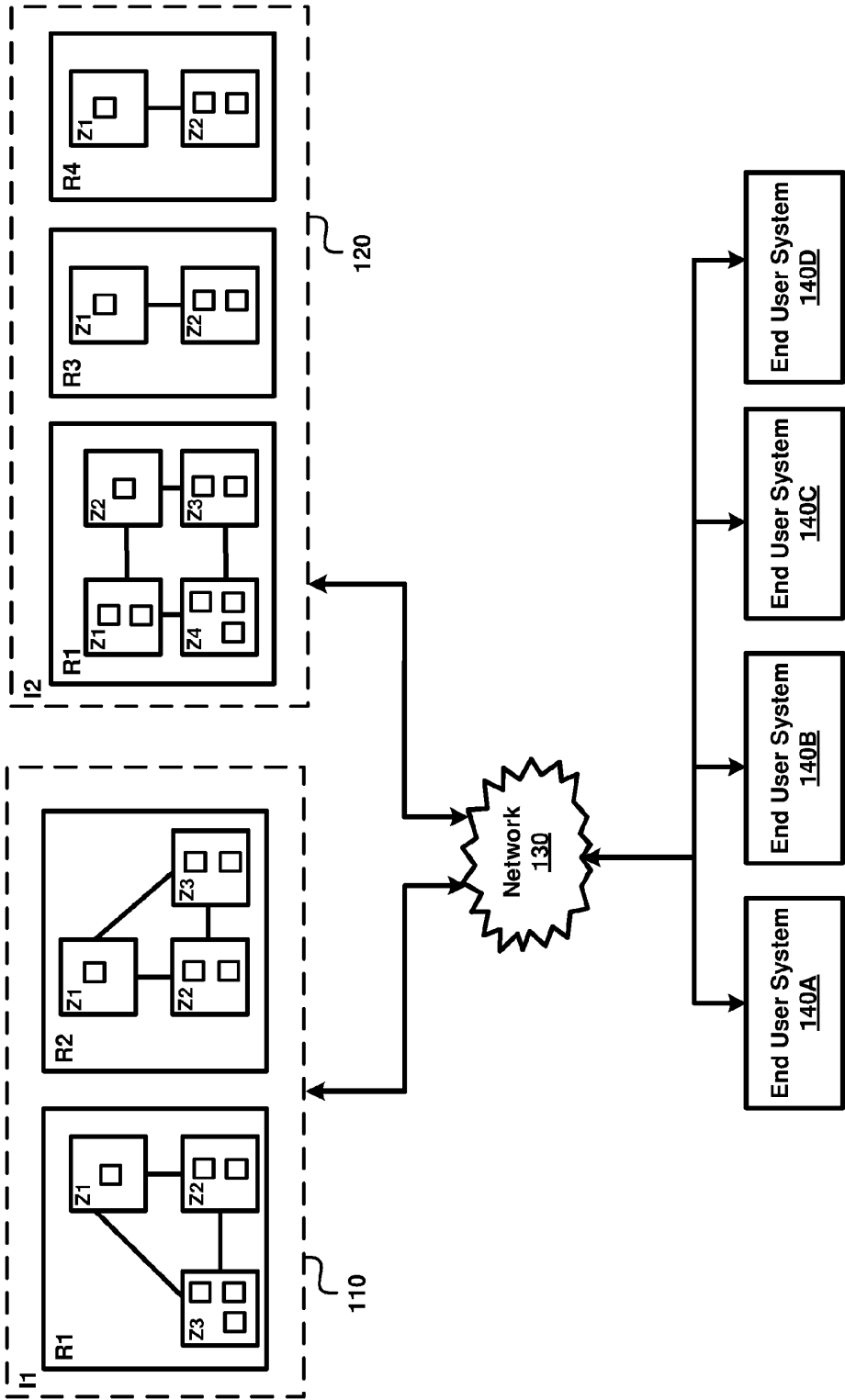


FIG. 1

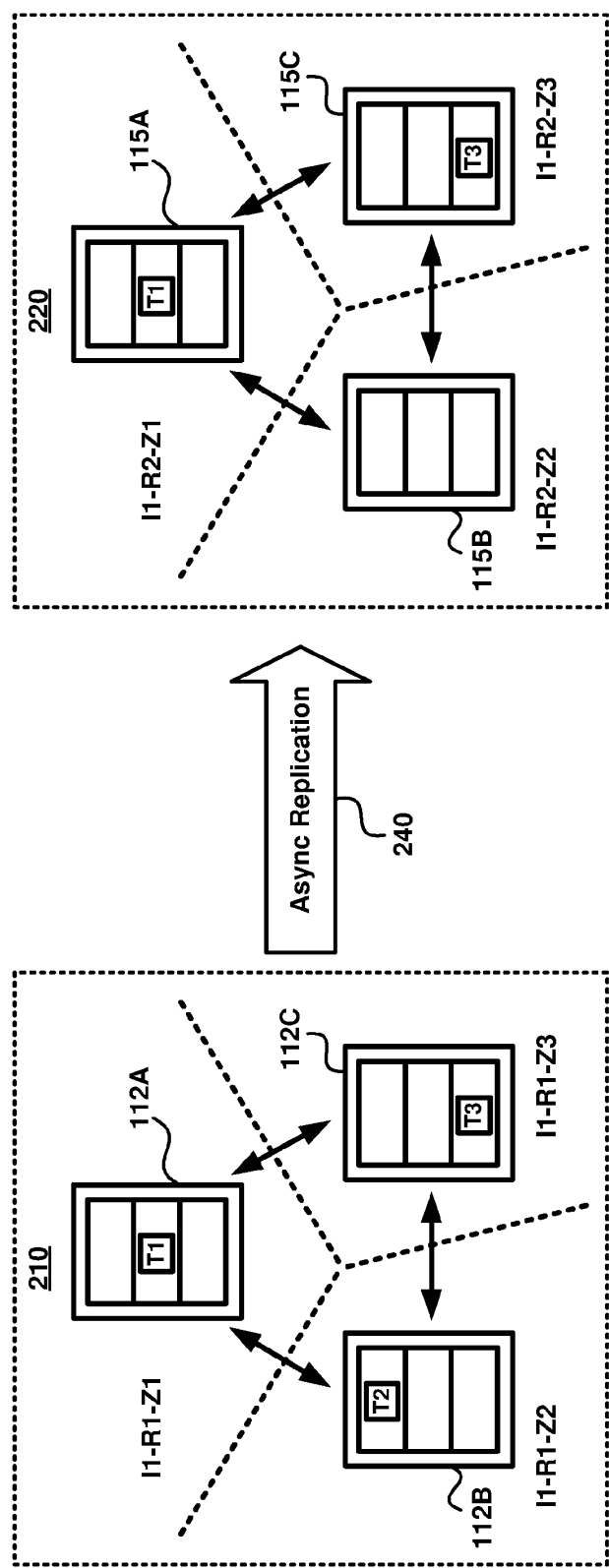


FIG. 2A

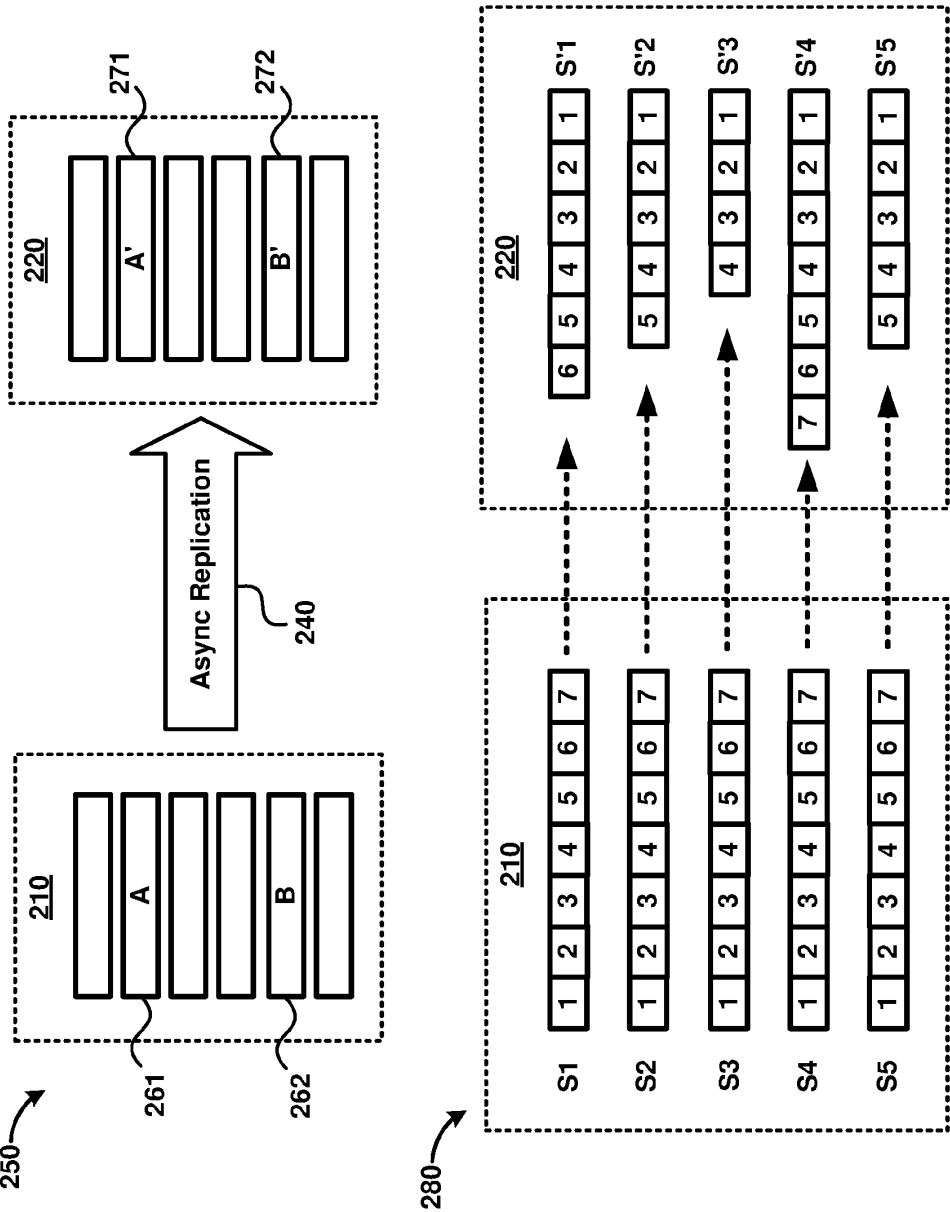


FIG. 2B

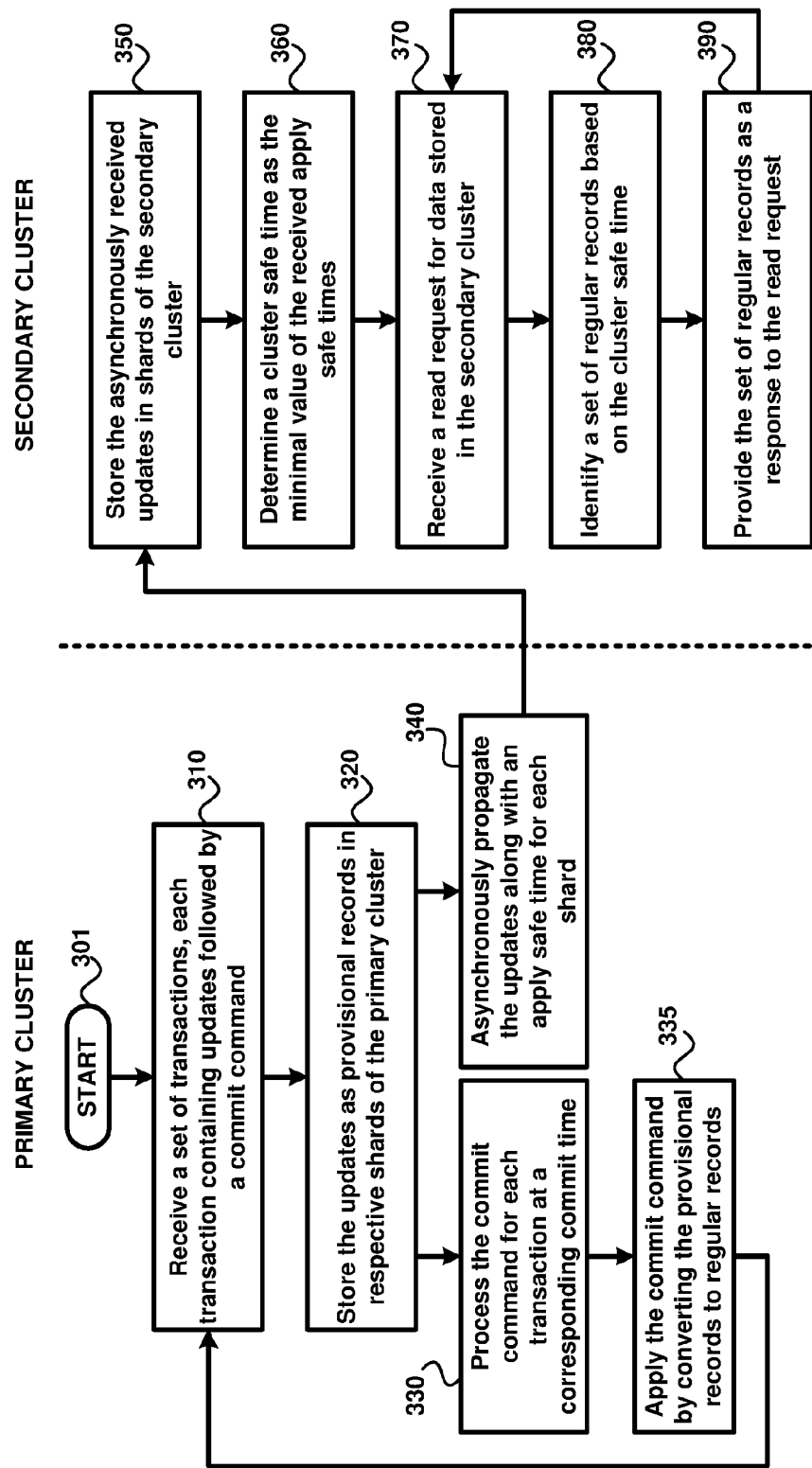


FIG. 3

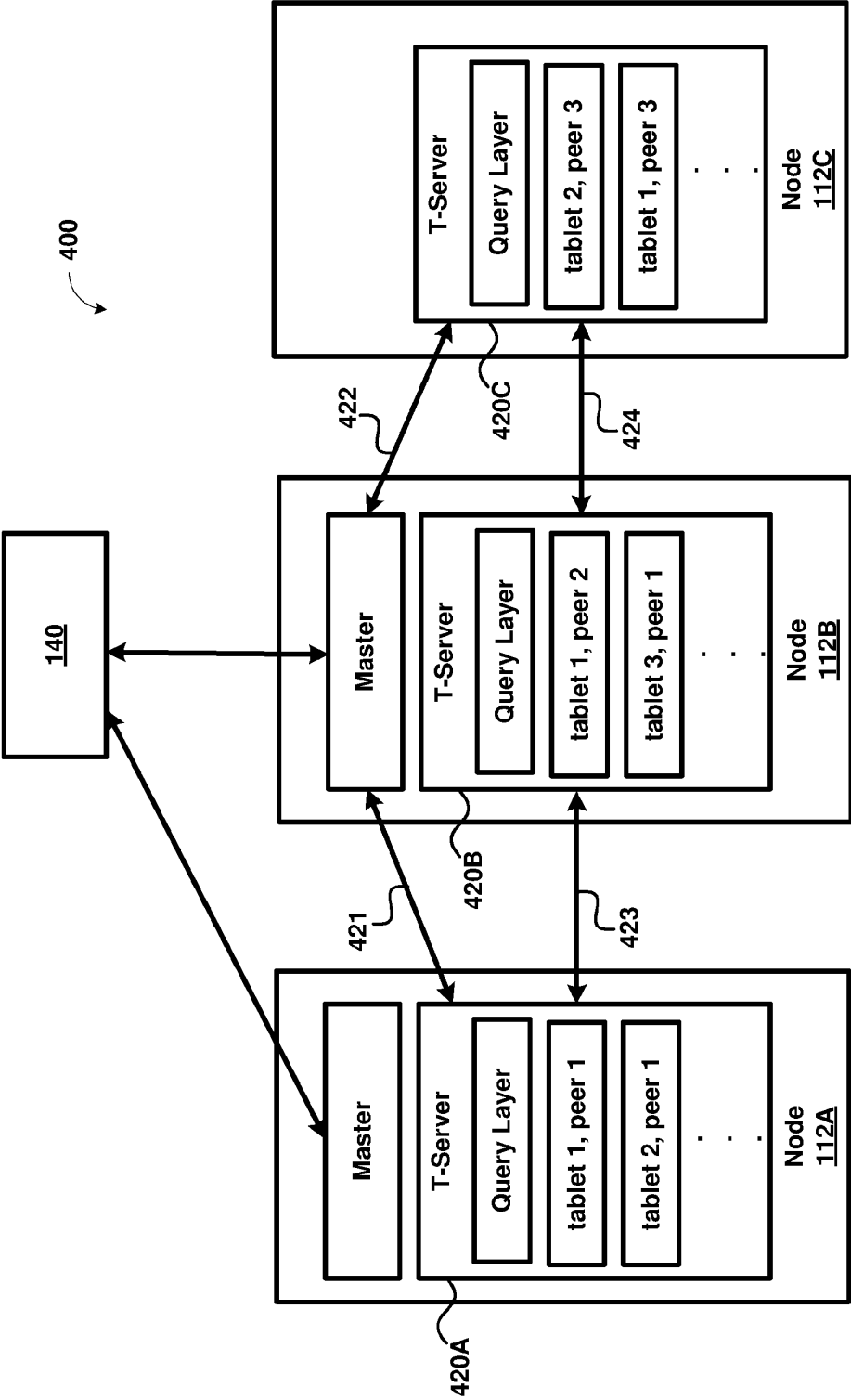


FIG. 4A

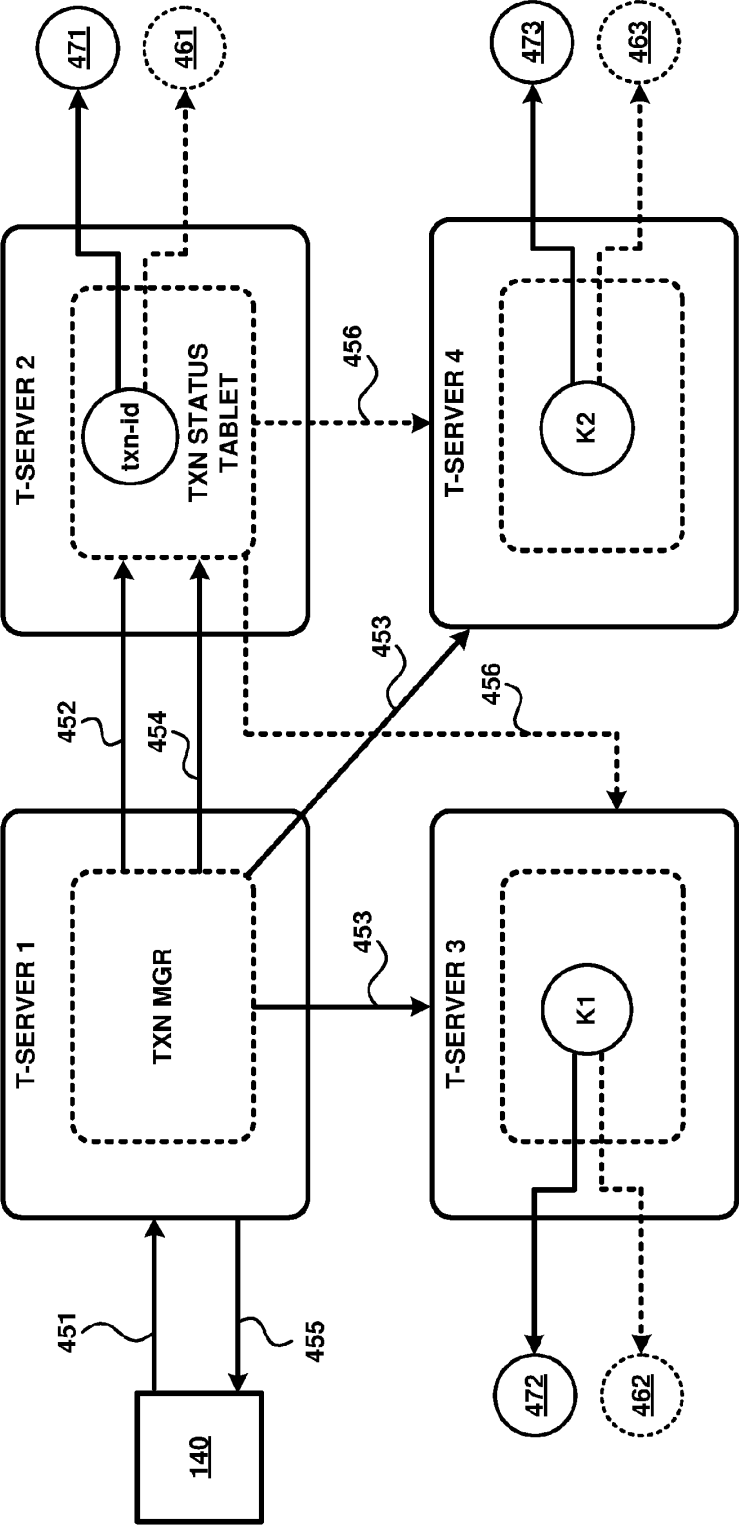


FIG. 4B

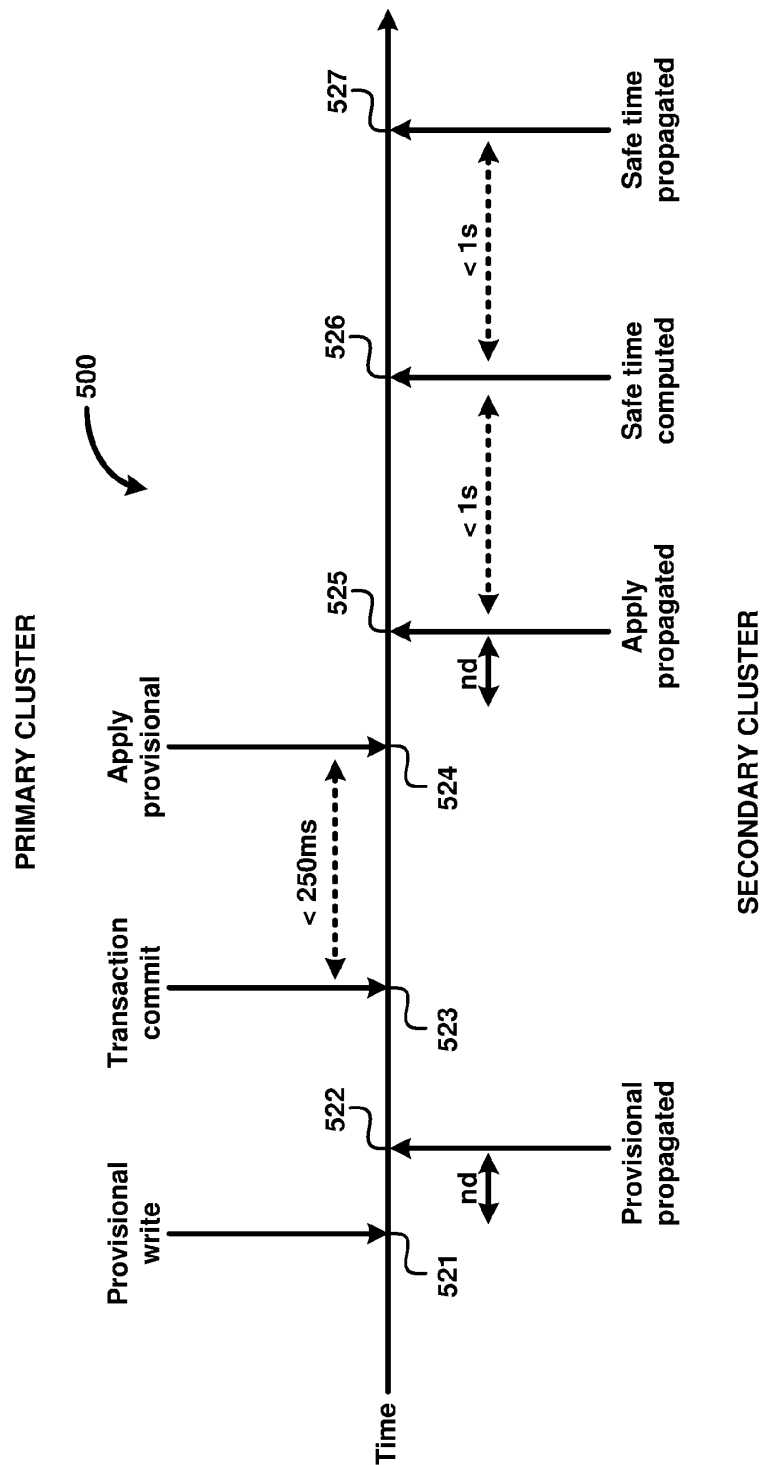


FIG. 5A

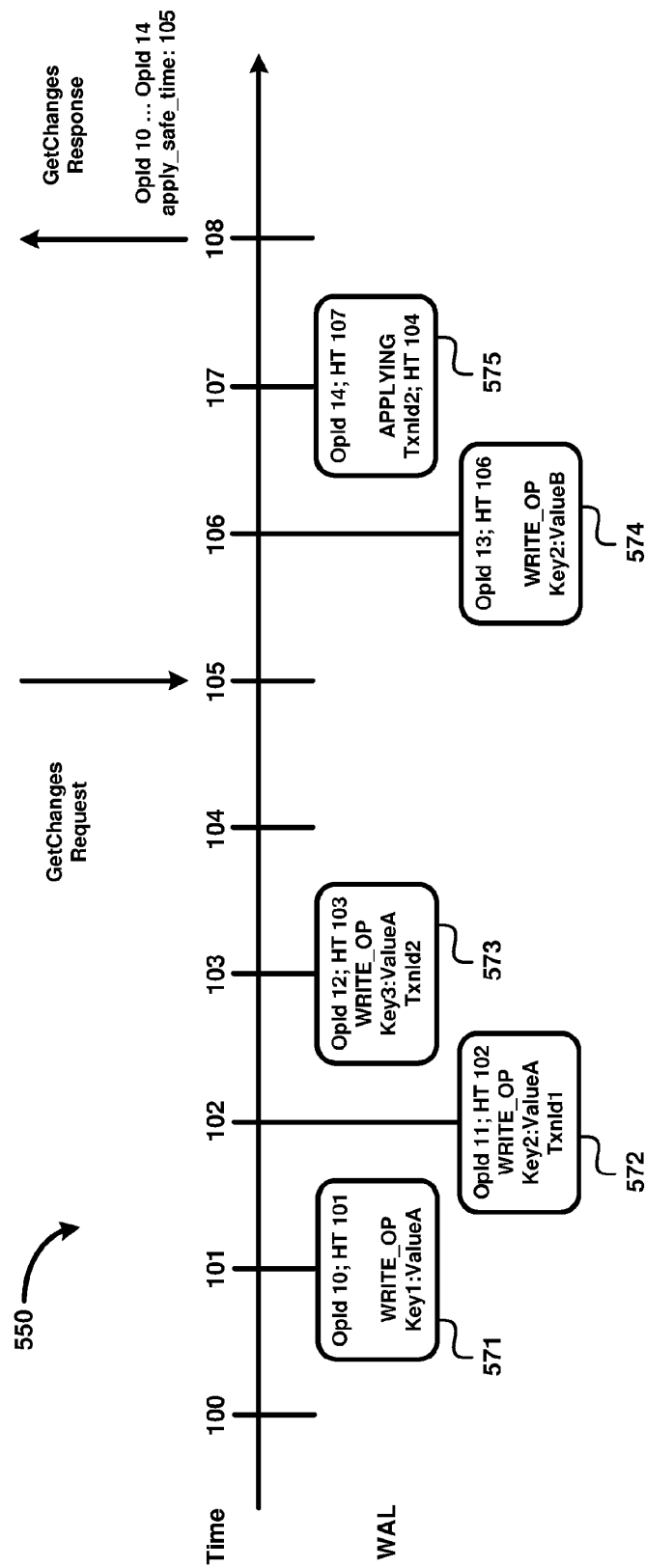


FIG. 5B

PRIMARY CLUSTER

Time	Operations	Visible txns
100	Base	Base
101	T11 Begin	Base
102	T11 Update A, C	Base
103	T12 Begin	Base
104	T12 Update B	Base
105	T12 Update A	Base
106	T11 Commit	T11
107	T13 Begin	T11
108	T13 Update B	T11
109	T13 Update C	T11
110	T12 Commit	T11, T12
111	T14 Begin	T11, T12
112	T14 Update A	T11, T12
113	T14 Update C	T11, T12
114	T15 Begin	T11, T12
115	T14 Commit	T11, T12, T14
116		T11, T12, T14
117	T15 Update B,C	T11, T12, T14
118	T13 Commit	T11, T12, T14, T13
119		T11, T12, T14, T13
120		T11, T12, T14, T13
121		T11, T12, T14, T13
122		T11, T12, T14, T13
123		T11, T12, T14, T13
124	T15 Commit	T11, T12, T14, T13, T15
125		T11, T12, T14, T13, T15
126		T11, T12, T14, T13, T15
127		T11, T12, T14, T13, T15
128		T11, T12, T14, T13, T15
129		T11, T12, T14, T13, T15
130		T11, T12, T14, T13, T15
131		T11, T12, T14, T13, T15
132		T11, T12, T14, T13, T15
133		T11, T12, T14, T13, T15
134		T11, T12, T14, T13, T15
135		T11, T12, T14, T13, T15

FIG. 6A

PRIMARY CLUSTER

610	641	642	643	644	645	646	647	648	649
Time	Tablet A	AST1	Pred1	Tablet B	AST2	Pred2	Tablet C	AST3	Pred3
100		100	P1		100	P1		100	P1
101		101	P1		101	P1		101	P1
102	T11 Update	102	P2	T11 Update	102	P2		102	P1
103		103	P2		103	P2		103	P1
104		104	P2	T12 Update	104	P2		104	P1
105	T12 Update	105	P2		105	P2		105	P1
106		105	P3		105	P3		106	P1
107		105	P3		105	P3		107	P1
108		105	P3	T13 Update	105	P3		108	P1
109		105	P3		105	P3	T13 Update	109	P2
110		105	P3	T11 Apply	109	P3		110	P2
111	T12 Apply	105	P3		109	P3		111	P2
112	T14 Update	105	P3	T12 Apply	112	P4		112	P2
113		105	P3		113	P4	T14 Update	113	P2
114		105	P3		114	P4		114	P2
115	T11 Apply	114	P3		115	P4		114	P3
116		114	P3		116	P4		114	P3
117		114	P3	T15 Update	117	P2	T15 Update	114	P3
118		114	P3		117	P3		114	P3
119		114	P3		117	P3	T13 Apply	114	P3
120		114	P3	T13 Apply	120	P4		114	P3
121		114	P3		121	P4		114	P3
122	T14 Apply	122	P4		122	P4		114	P3
123		123	P4		123	P4		114	P3
124		124	P4		123	P3		114	P3
125		125	P4		123	P3	T15 Apply	114	P3
126		126	P4	T15 Apply	126	P4	T14 Apply	126	P4
127		127	P4		127	P4		127	P4
128		128	P4		128	P4		128	P4
129		129	P4		129	P4		129	P4
130		130	P4		130	P4		130	P4
131		131	P4		131	P4		131	P4
132		132	P4		132	P4		132	P4
133		133	P4		133	P4		133	P4
134		134	P4		134	P4		134	P4
135		135	P4		135	P4		135	P4

FIG. 6B

SECONDARY CLUSTER

610 Time	661 Tablet A (Delay: 4)	662 AST1	663 Tablet B (Delay: 8)	664 AST2	665 Tablet C (Delay: 2)	666 AST3	670 Safe time	680 Visible txns
100		96		92		98	92	Base
101		97		93		99	93	Base
102		98		94		100	94	Base
103		99		95		101	95	Base
104		100		96		102	96	Base
105		101		97		103	97	Base
106	T11 Update	102		98		104	98	Base
107		103		99		105	99	Base
108		104		100		106	100	Base
109	T12 Update	105		101		107	101	Base
110		105	T11 Update	102		108	102	Base
111		105		103	T13 Update	109	103	Base
112		105	T12 Update	104		110	104	Base
113		105		105		111	105	Base
114		105		105		112	105	Base
115	T12 Apply (CT:110)	105		105	T14 Update	113	105	Base
116	T14 Update	105	T13 Update	105		114	105	Base
117		105		105		114	105	Base
118		105	T11 Apply (CT:106)	109		114	105	Base
119	T11 Apply (CT:106)	114		109	T15 Update	114	109	T11
120		114	T12 Apply (CT:110)	112		114	112	T11, T12
121		114		113	T13 Apply (CT:118)	114	113	T11, T12
122		114		114		114	114	T11, T12
123		114		115		114	114	T11, T12
124		114		116		114	114	T11, T12
125		114	T15 Update	117		114	114	T11, T12
126	T14 Apply (CT:115)	122		117		114	114	T11, T12
127		123		117	T15 Apply (CT:124)	114	114	T11, T12
128		124	T13 Apply (CT:118)	120	T14 Apply (CT:115)	126	120	T11, T12, T13, T14
129		125		121		127	121	T11, T12, T13, T14
130		126		122		128	122	T11, T12, T13, T14
131		127		123		129	123	T11, T12, T13, T14
132		128		123		130	123	T11, T12, T13, T14
133		129		123		131	123	T11, T12, T13, T14
134		130	T15 Apply (CT:124)	126		132	126	T11, T12, T13, T14, T15
135		131		127		133	127	T11, T12, T13, T14, T15

FIG. 6C

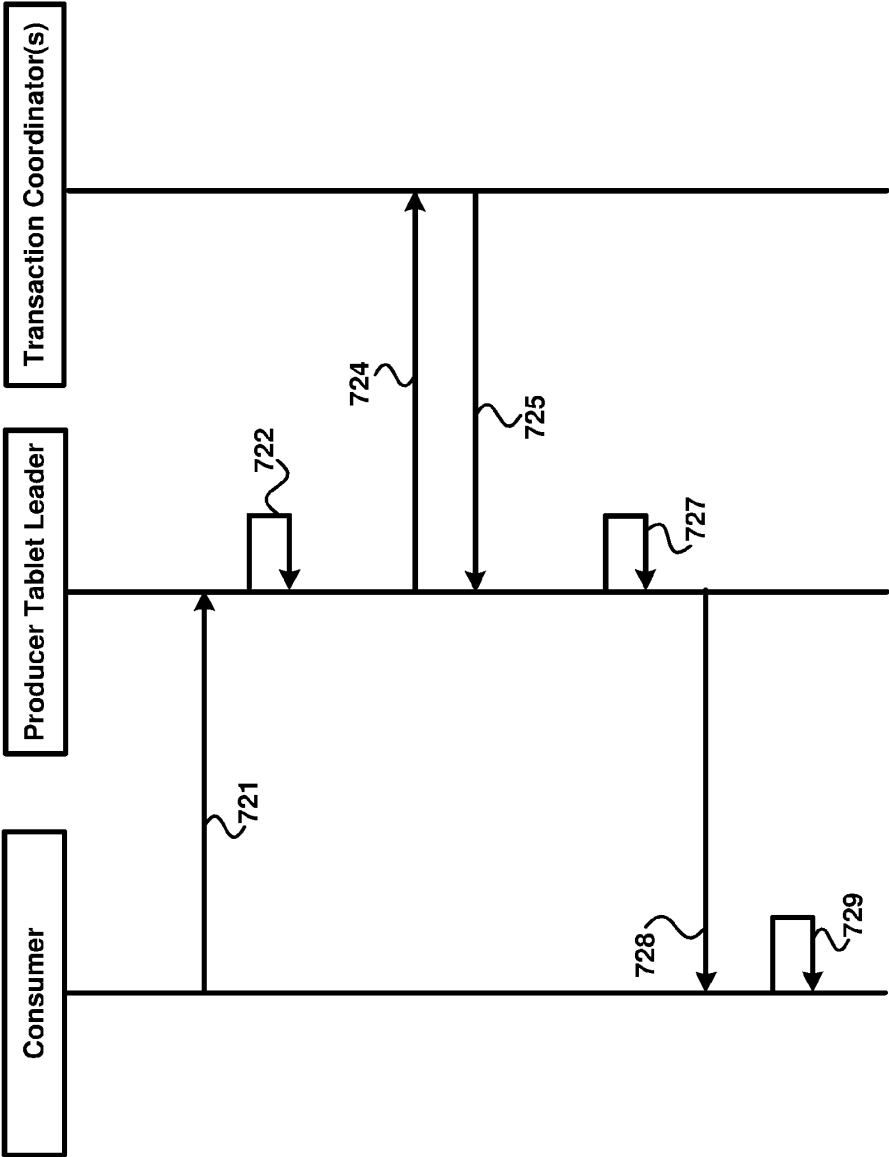


FIG. 7

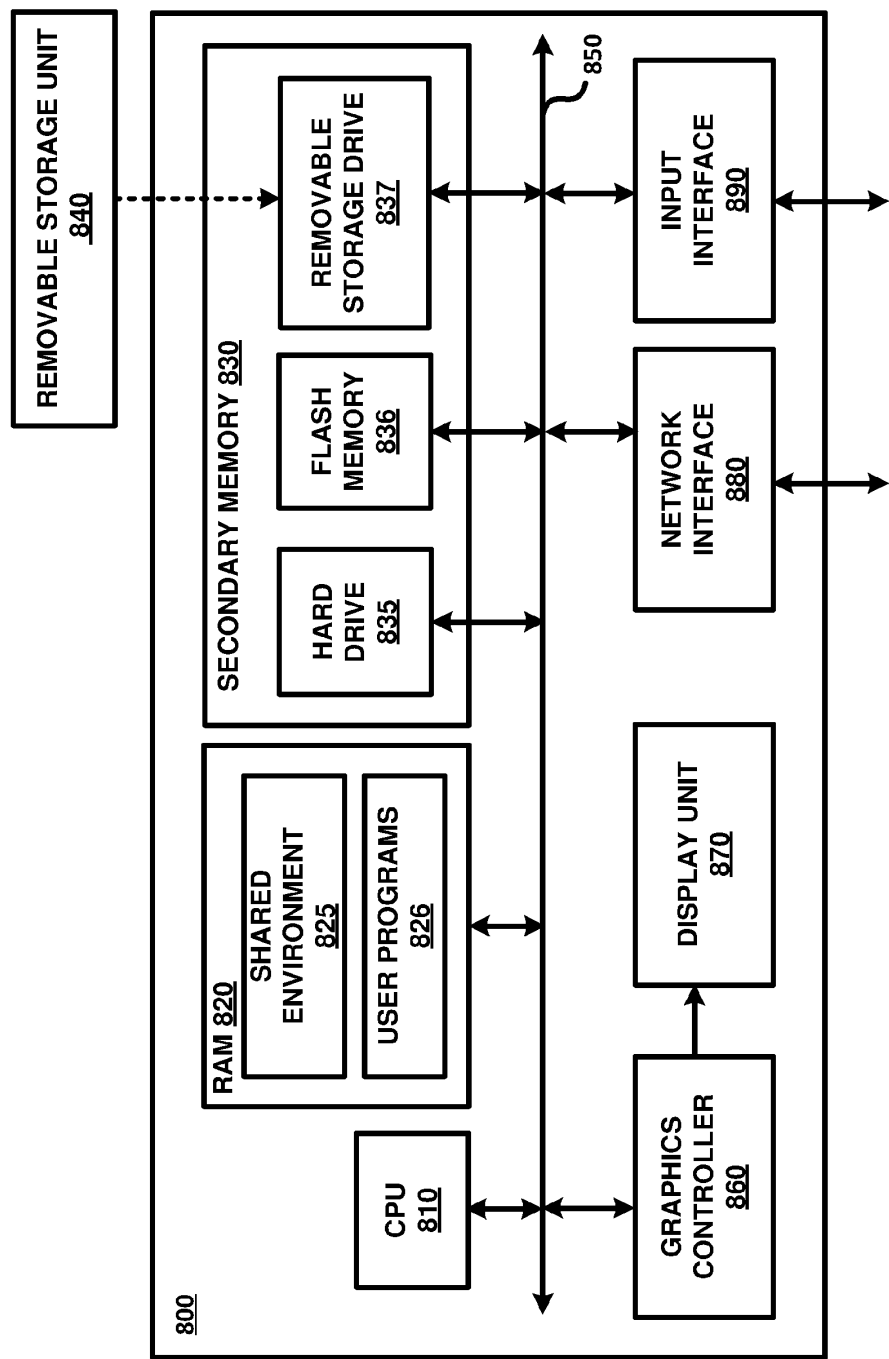


FIG. 8