Slides for Chapter 18: Replication

Figure 18.1
A basic architectural model for the management of replicated data

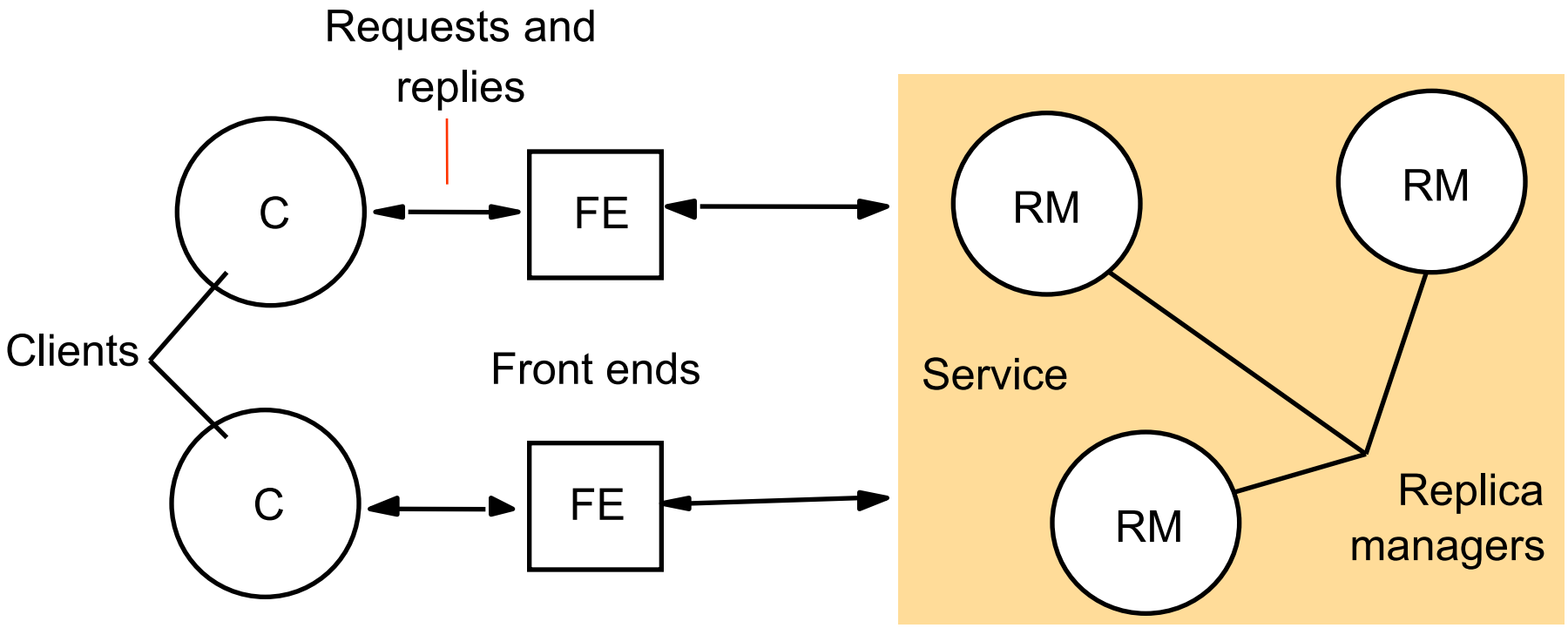

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Figure 18.2
View-synchronous group communication

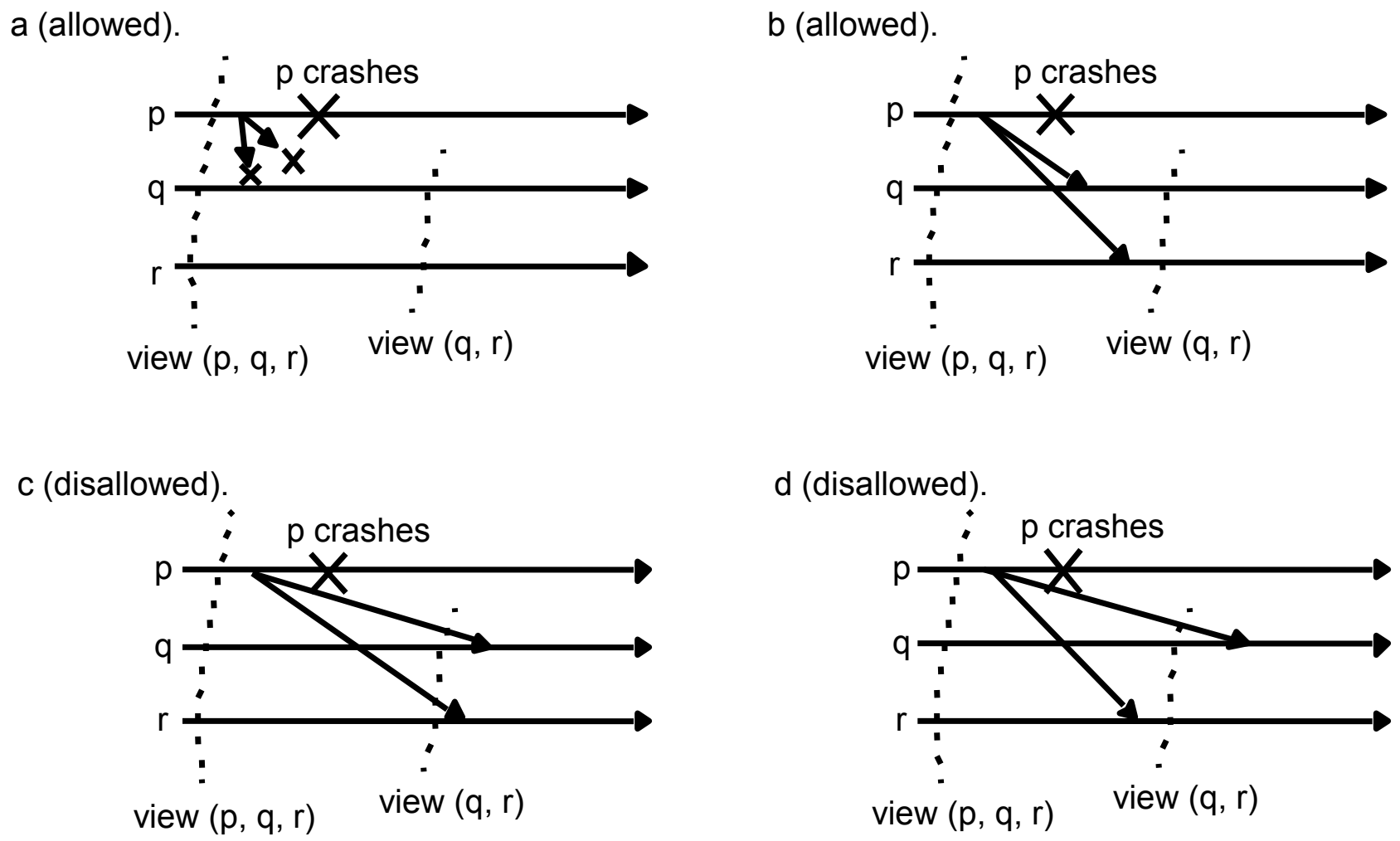

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Figure 18.3
The passive (primary-backup) model for fault tolerance

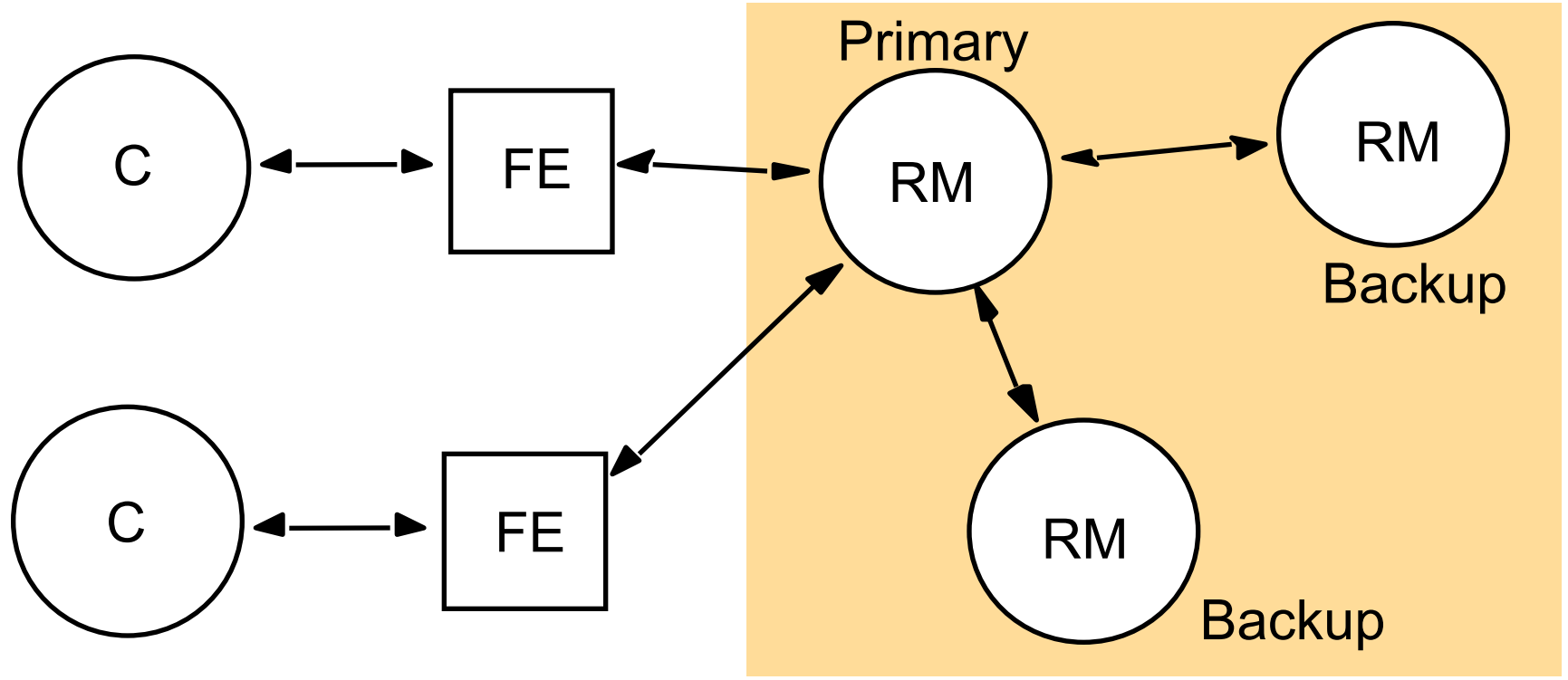

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Figure 18.4
Active replication

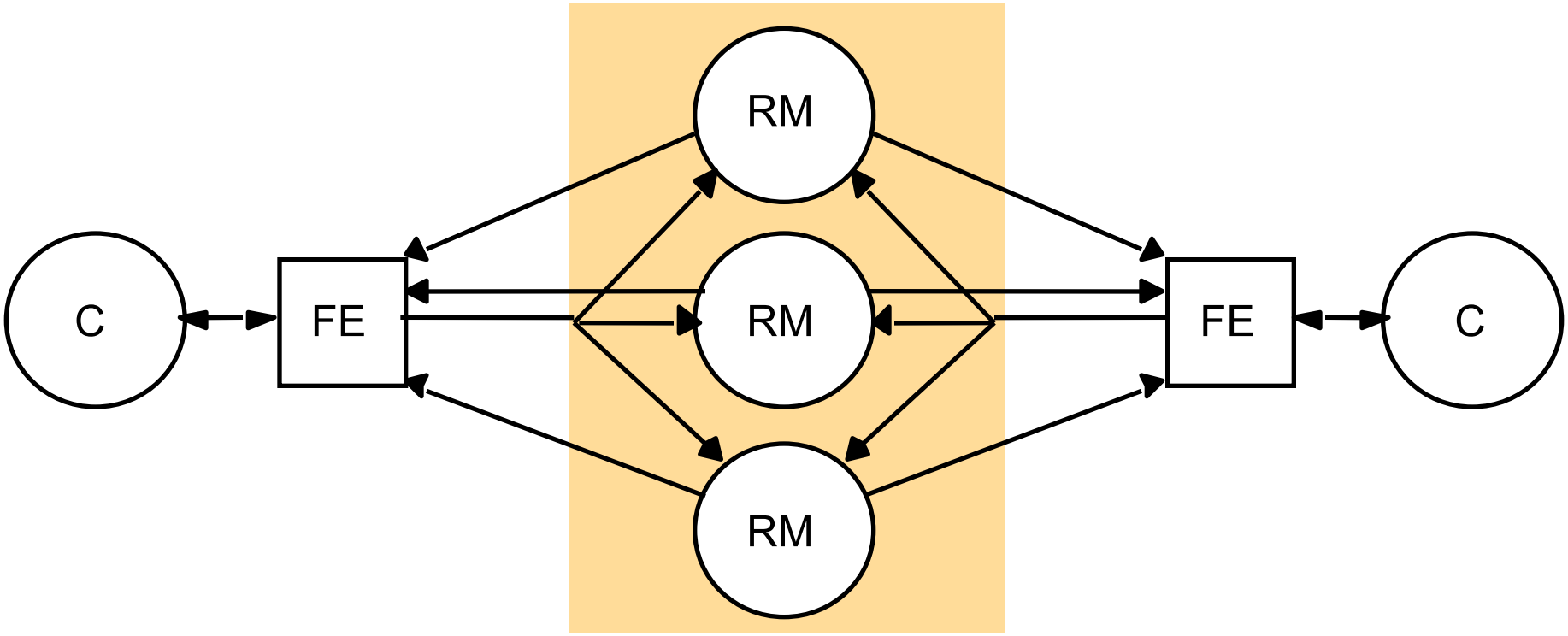

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Figure 18.5
Query and update operations in a gossip service

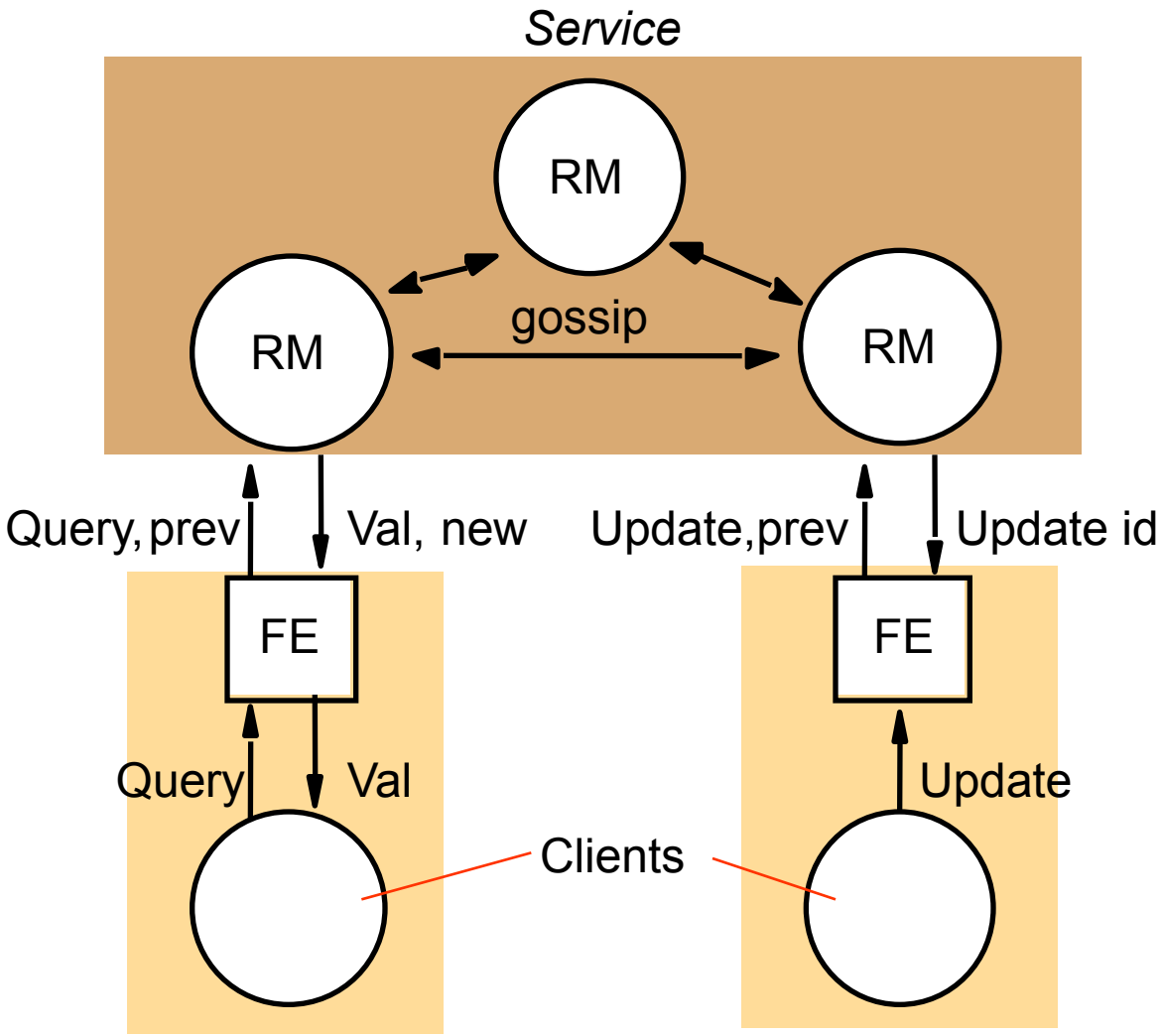

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Figure 18.6
Front ends propagate their timestamps whenever clients communicate directly

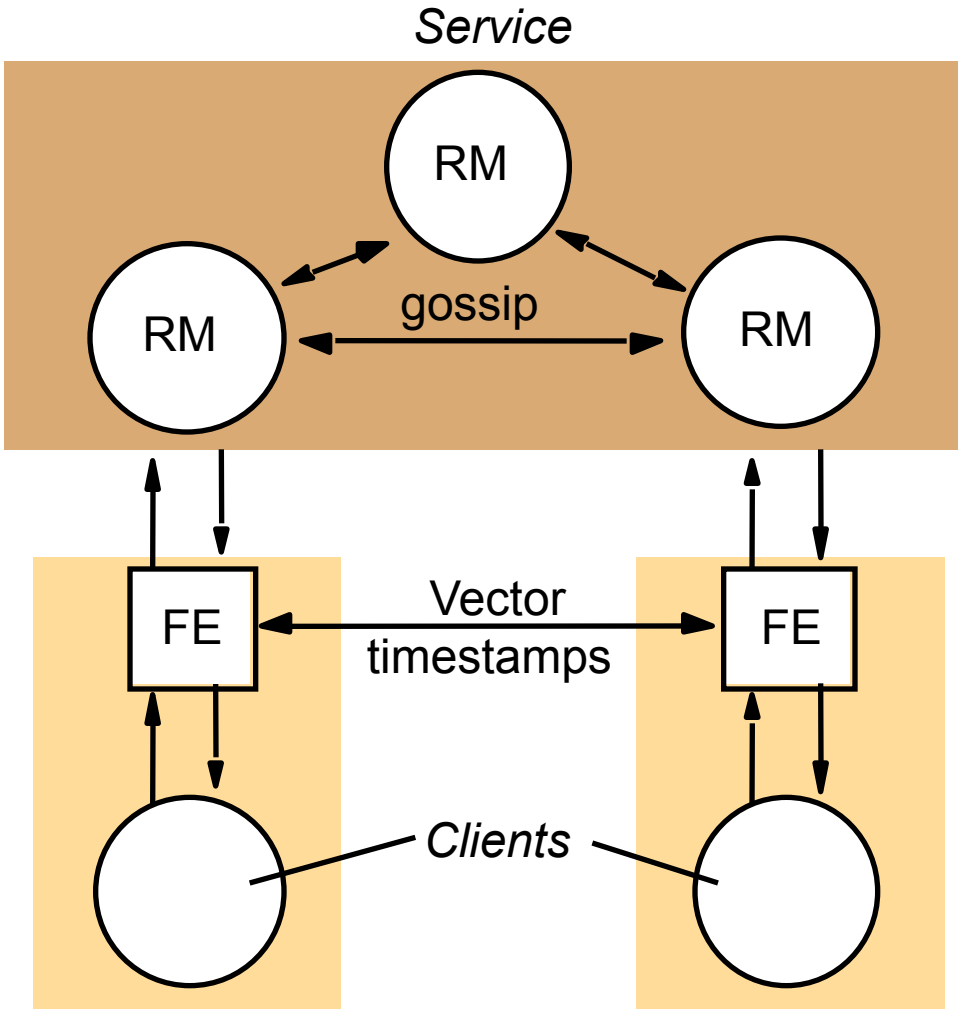

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Figure 18.7
A gossip replica manager, showing its main state components

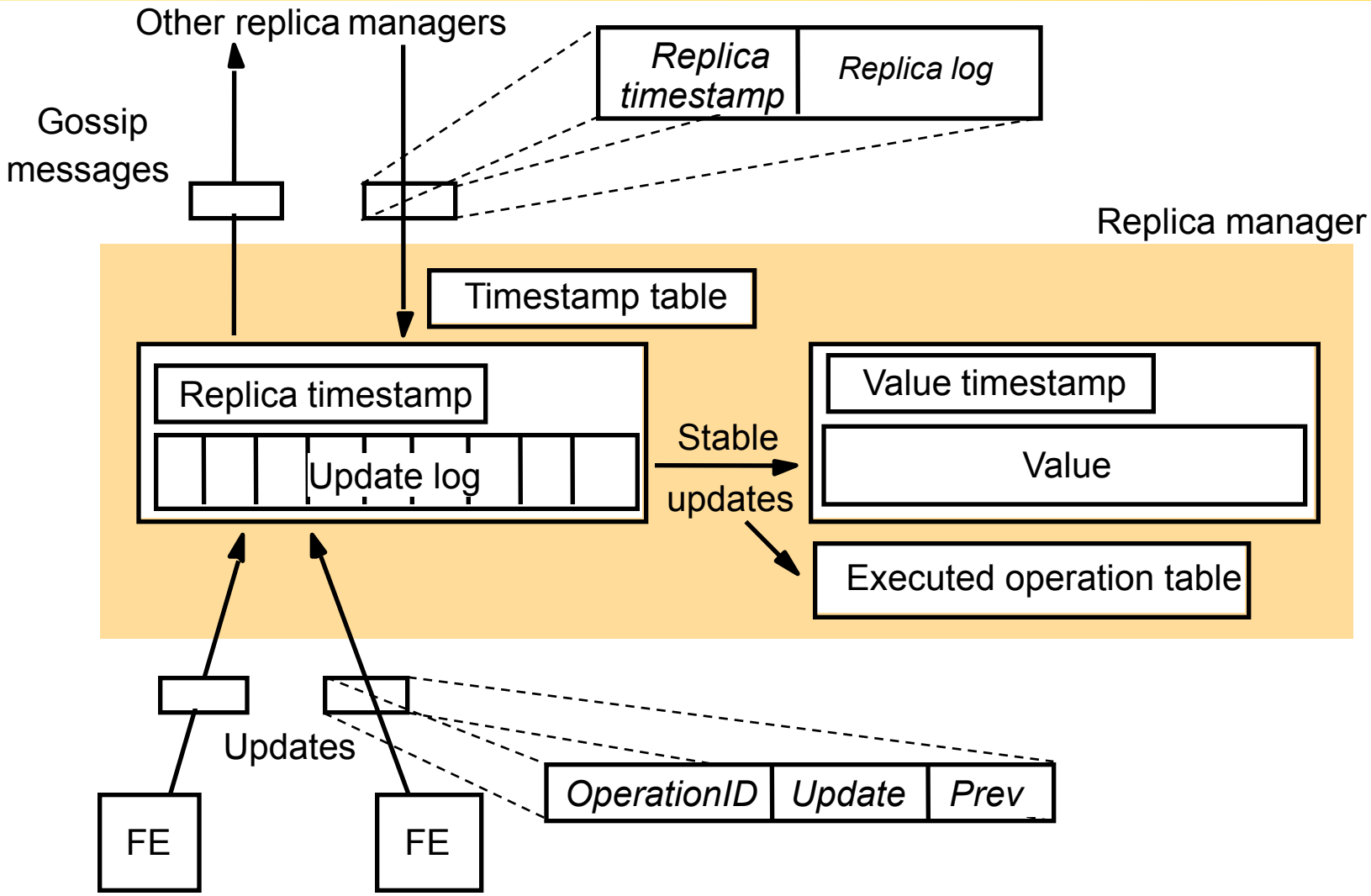

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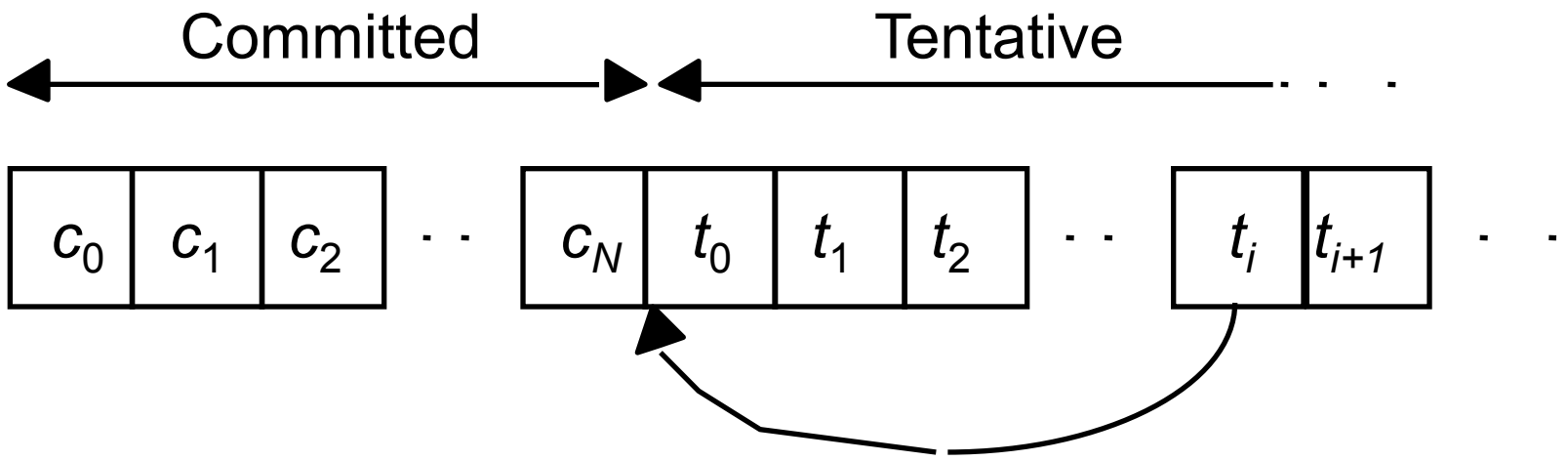
Figure 18.8
Committed and tentative updates in Bayou



Tentative update t_i becomes the next committed update and is inserted after the last committed update c_N.

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Figure 18.9
Transactions on replicated data

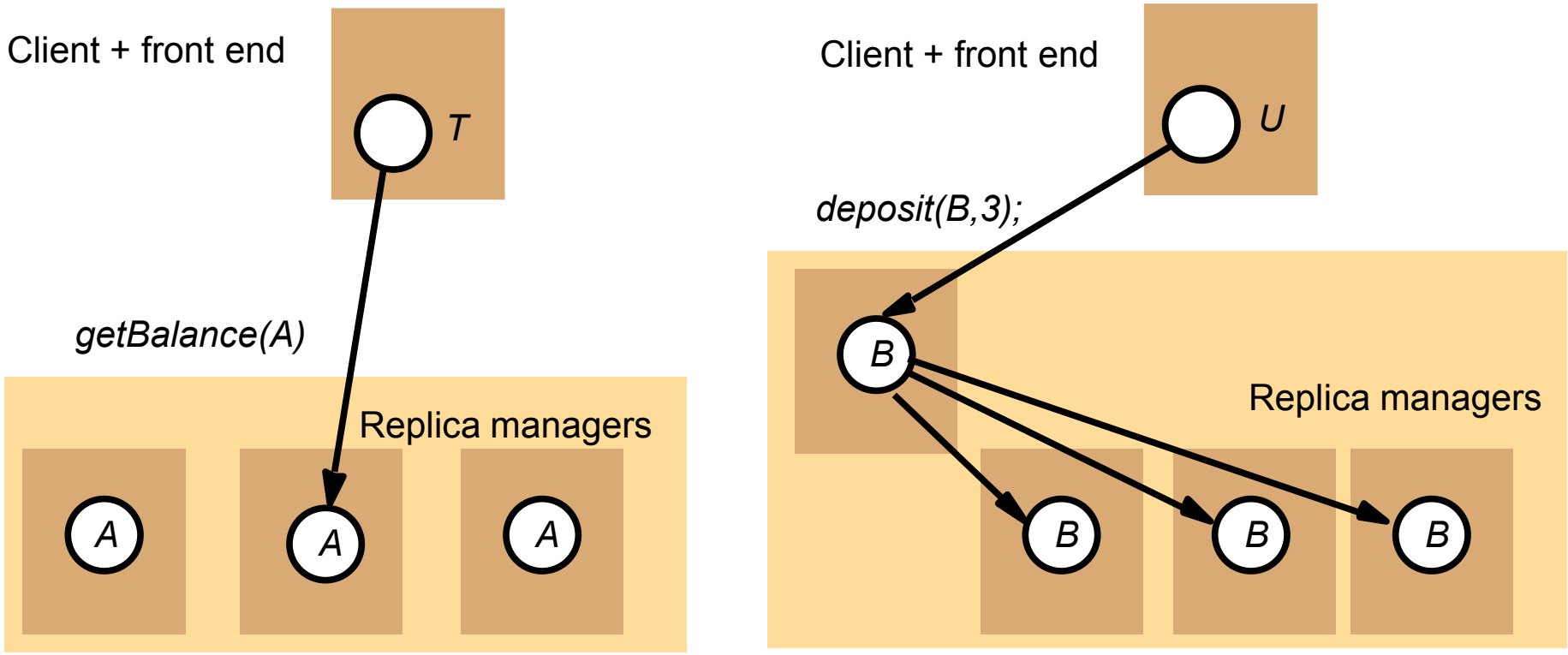

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Figure 18.10
Available copies

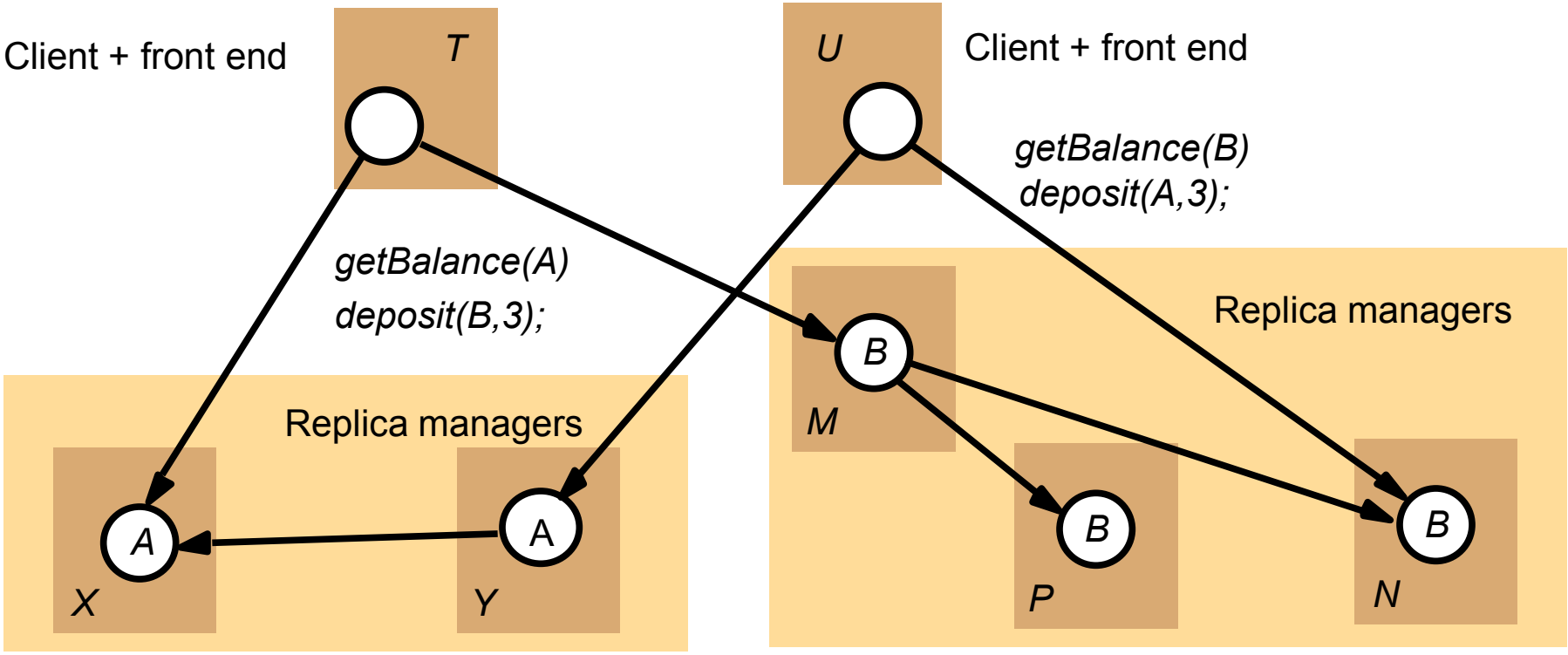

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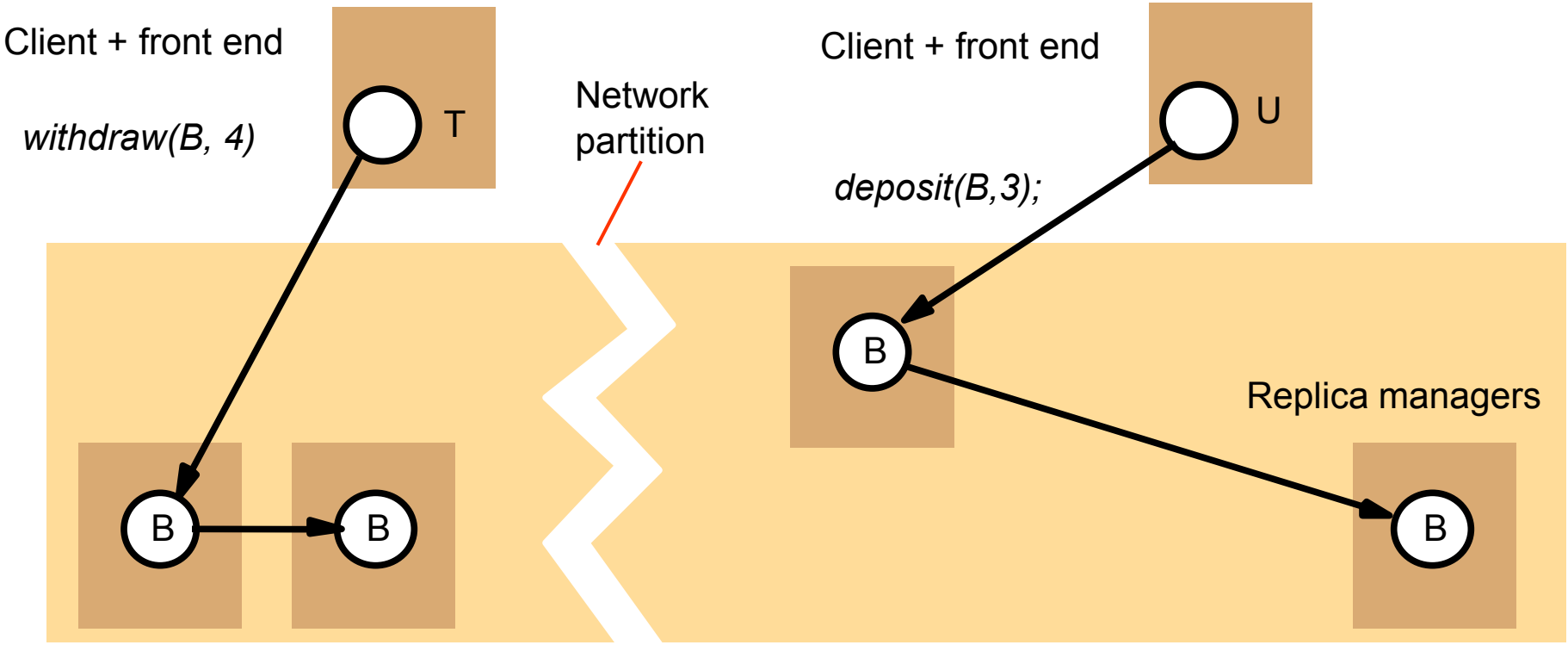
Figure 18.11
Network partition



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Page 810
Gifford's quorum concensus examples

		Example 1	*Example 2*	*Example 3*
Latency (milliseconds)	Replica 1	75	75	75
	Replica 2	65	100	750
	Replica 3	65	750	750
Voting configuration	Replica 1	1	2	1
	Replica 2	0	1	1
	Replica 3	0	1	1
Quorum sizes	*R*	1	2	1
	W	1	3	3

Derived performance of file suite:				
Read	Latency	65	75	75
	Blocking probability	0.01	0.0002	0.000001
Write	Latency	75	100	750
	Blocking probability	0.01	0.0101	0.03

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Figure 18.12
Two network partitions

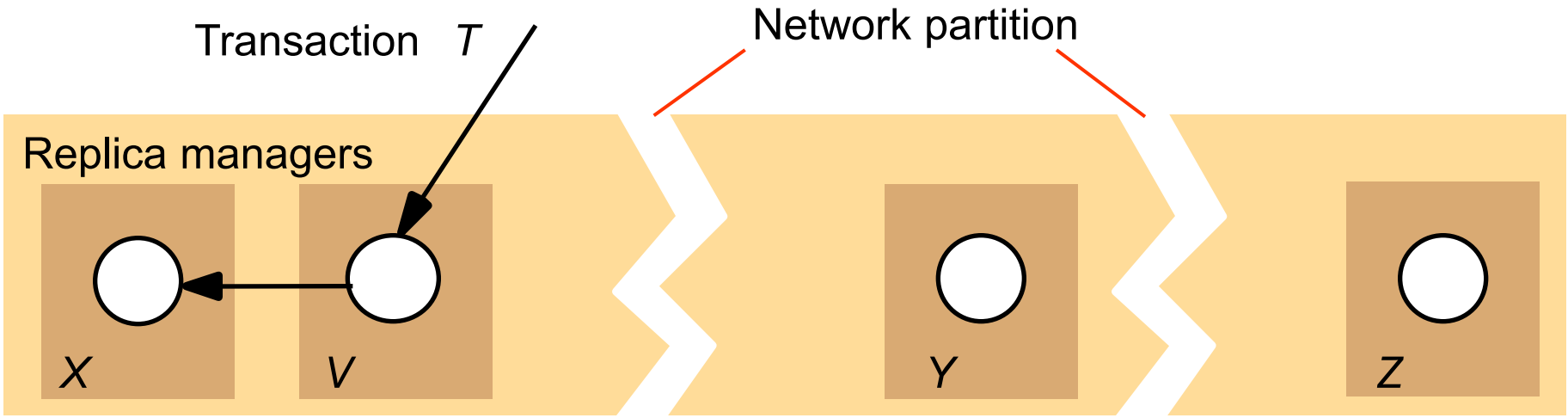

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Figure 18.13
Virtual partition

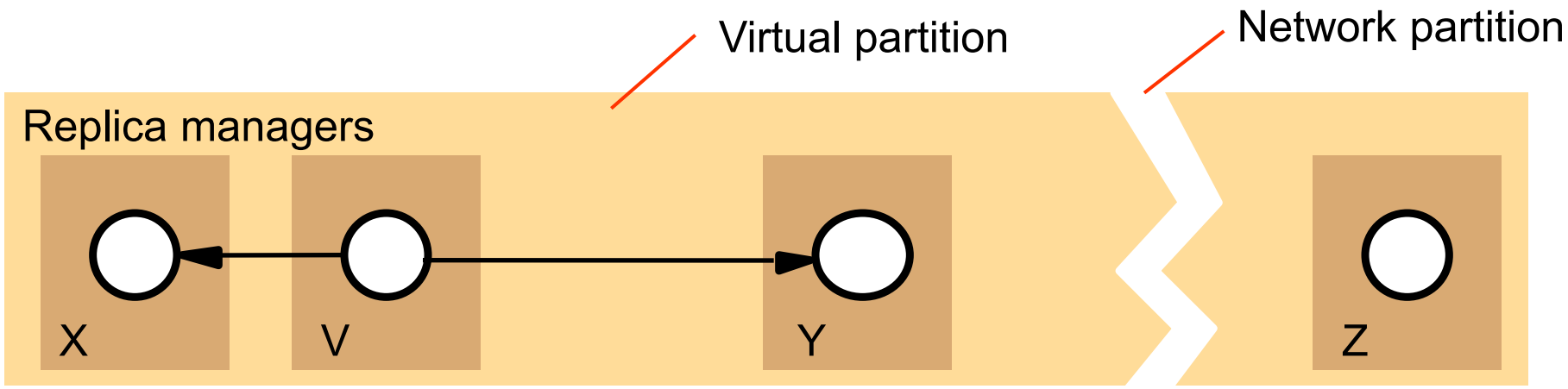

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Figure 18.14
Two overlapping virtual partitions

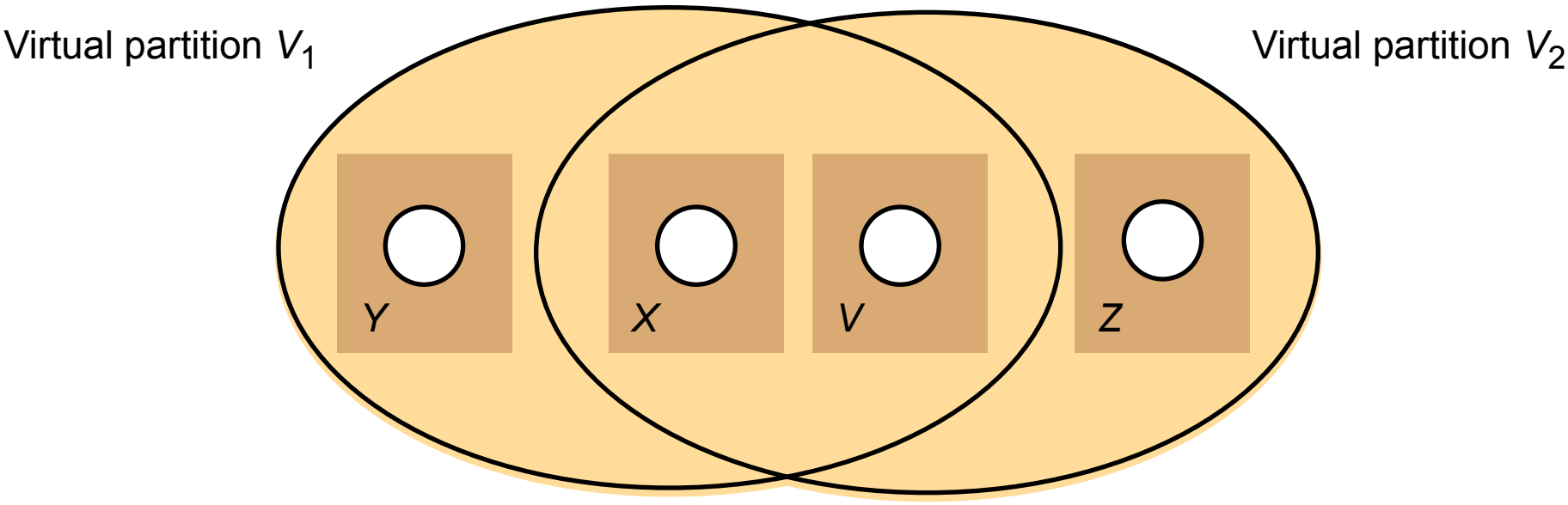

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Figure 18.15
Creating a virtual partition

Phase 1:

- The initiator sends a *Join* request to each potential member. The argument of *Join* is a proposed logical timestamp for the new virtual partition.
- When a replica manager receives a *Join* request, it compares the proposed logical timestamp with that of its current virtual partition.
  - If the proposed logical timestamp is greater it agrees to join and replies *Yes*;
  - If it is less, it refuses to join and replies *No*.

Phase 2:

- If the initiator has received sufficient *Yes* replies to have read and write quora, it may complete the creation of the new virtual partition by sending a *Confirmation* message to the sites that agreed to join. The creation timestamp and list of actual members are sent as arguments.
- Replica managers receiving the *Confirmation* message join the new virtual partition and record its creation timestamp and list of actual members.

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