

# project4-document

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## 1 Protocol between server and usernodes

The server and usernode send and receive messages using `MessageBody` class, which is a child of the `ProjectLib.Message` and uses a parameter type to record which phase they are at, a filename that records the collage name, and a string array `sources` that records the sources of that collage. The communications between server and client is implemented by `Collage` class, including collecting votes, distributing quorum, counting ack, and committing collage.

## 2 timeout threshold

There are 2 timers, one for the vote and the other for the ack from usernodes. The timeout threshold is 3 seconds, and we assume a message from usernode is lost if it's not delivered in 3 seconds.

## 3 handle lost messages

If the vote is lost, the server declares no as the quorum and abort collage commit. If the ack is lost, the server re-distribute decision to usernode and repeat until it receives ack message.

## 4 recover node failures

The server and each usernode has their log files that stores the last step they were, and we rewrite over the already implemented steps with the new step.

There are three possible failure points for server: start commit, decision made, and committed.

If the failure is at start commit (i.e., before a decision is made), the server take the quorum as no, and distribute the no decision to clients.

If the failure is at decision made, the server pulls the decision, file name of collage, source images, and adds them back to the todo list of collage commit decision. It then distribute the decision to usernodes.

if the failure is at already committed, the server removes the collage from the todo list of collage commit decision.

There are two possible failure points for usernode: vote and decision.

If the failure is at vote, the usernode pulls the vote, and if the vote is yes, it locks the collages and source images.

If the failure is at decision, the usernode pulls the vote, and if the vote is no, it simply removes the collage and source images from the lock; if the vote is yes, it deletes all the images, add them to a set that indicates these images cannot be used again, fsync the files, and finally removes the collage and source images from the lock.