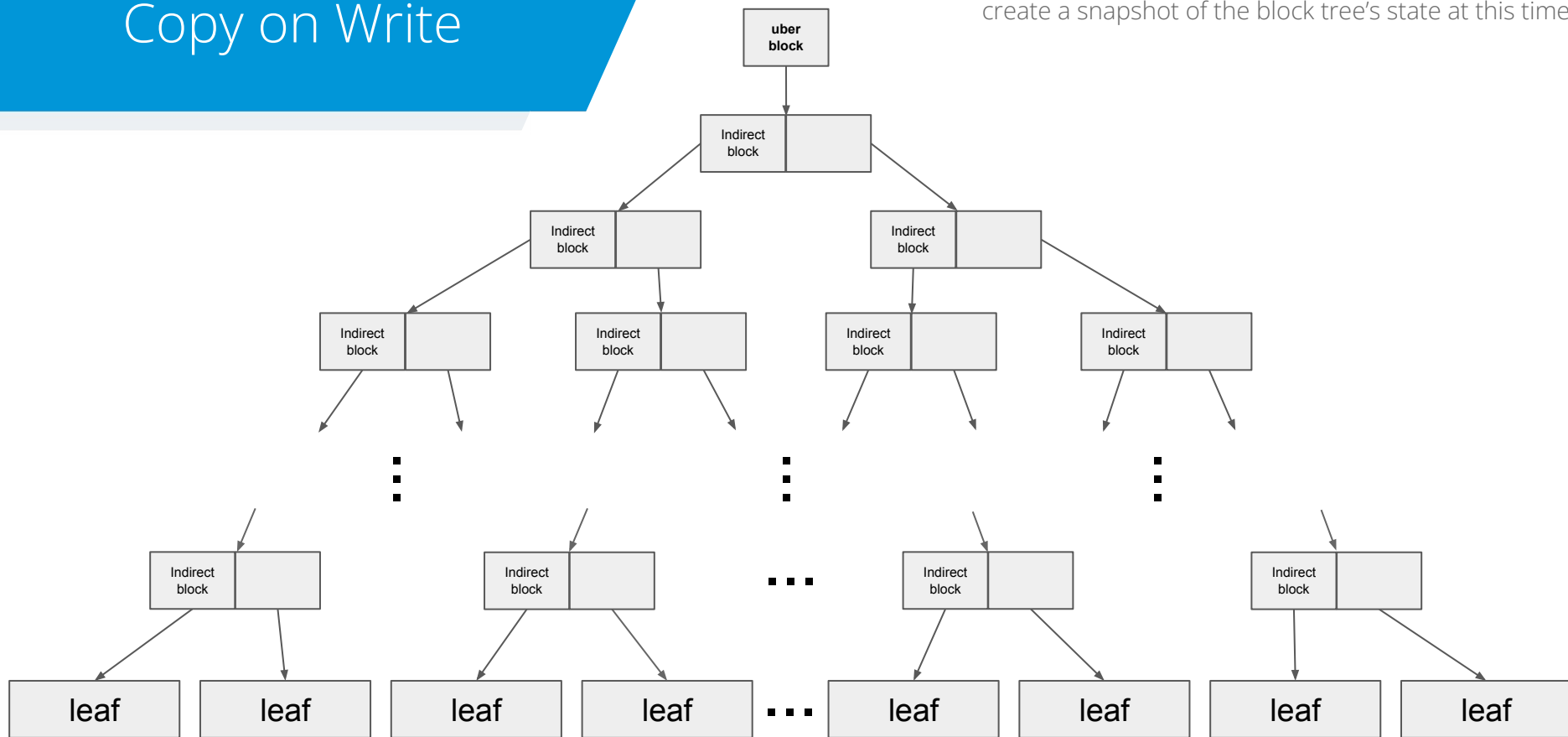


ZFS Copy on Write

# Snapshots and Data Recovery

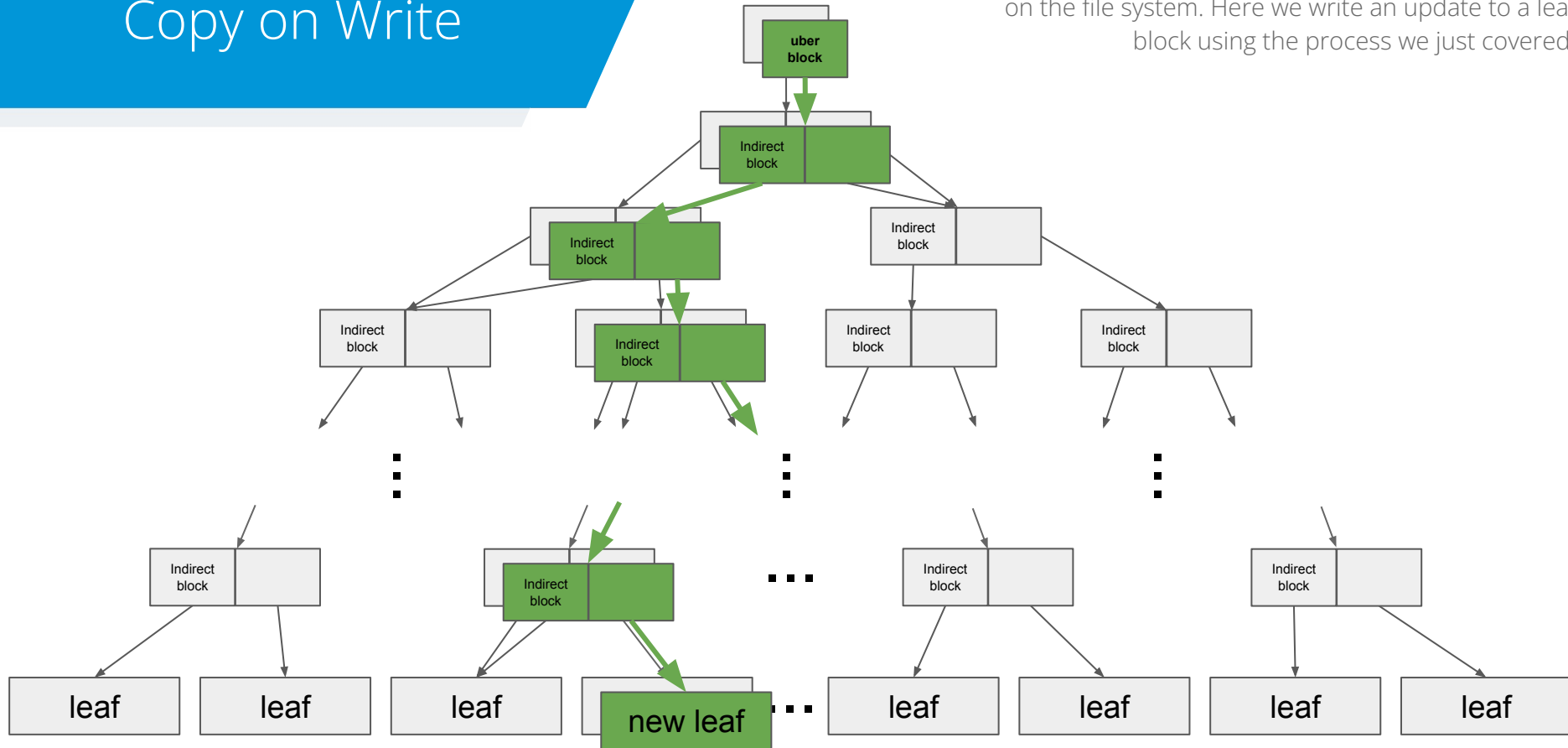
# Copy on Write

We start with our normal block tree and tell ZFS to create a snapshot of the block tree's state at this time.



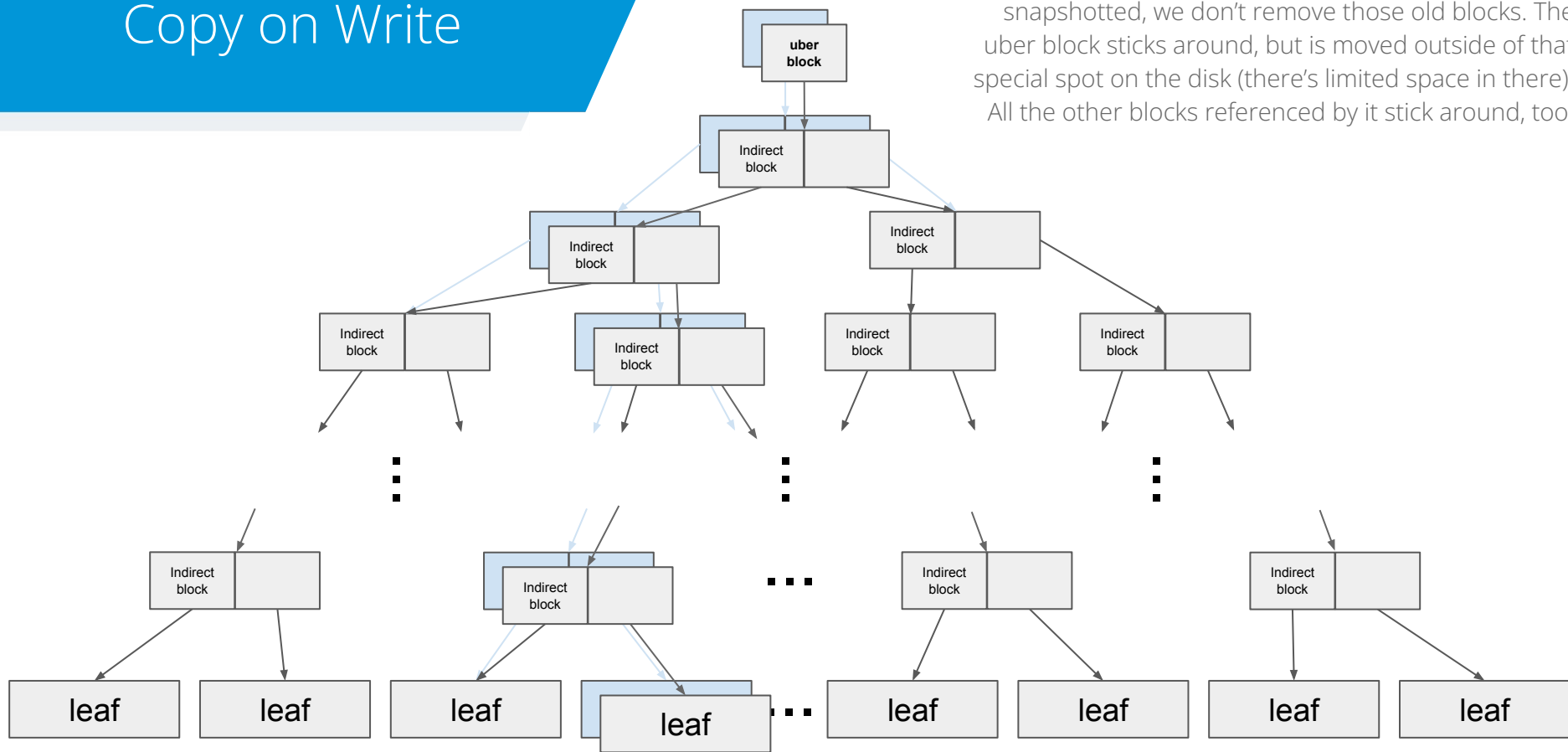
# Copy on Write

After we take the snapshot, we can of course still work on the file system. Here we write an update to a leaf block using the process we just covered.



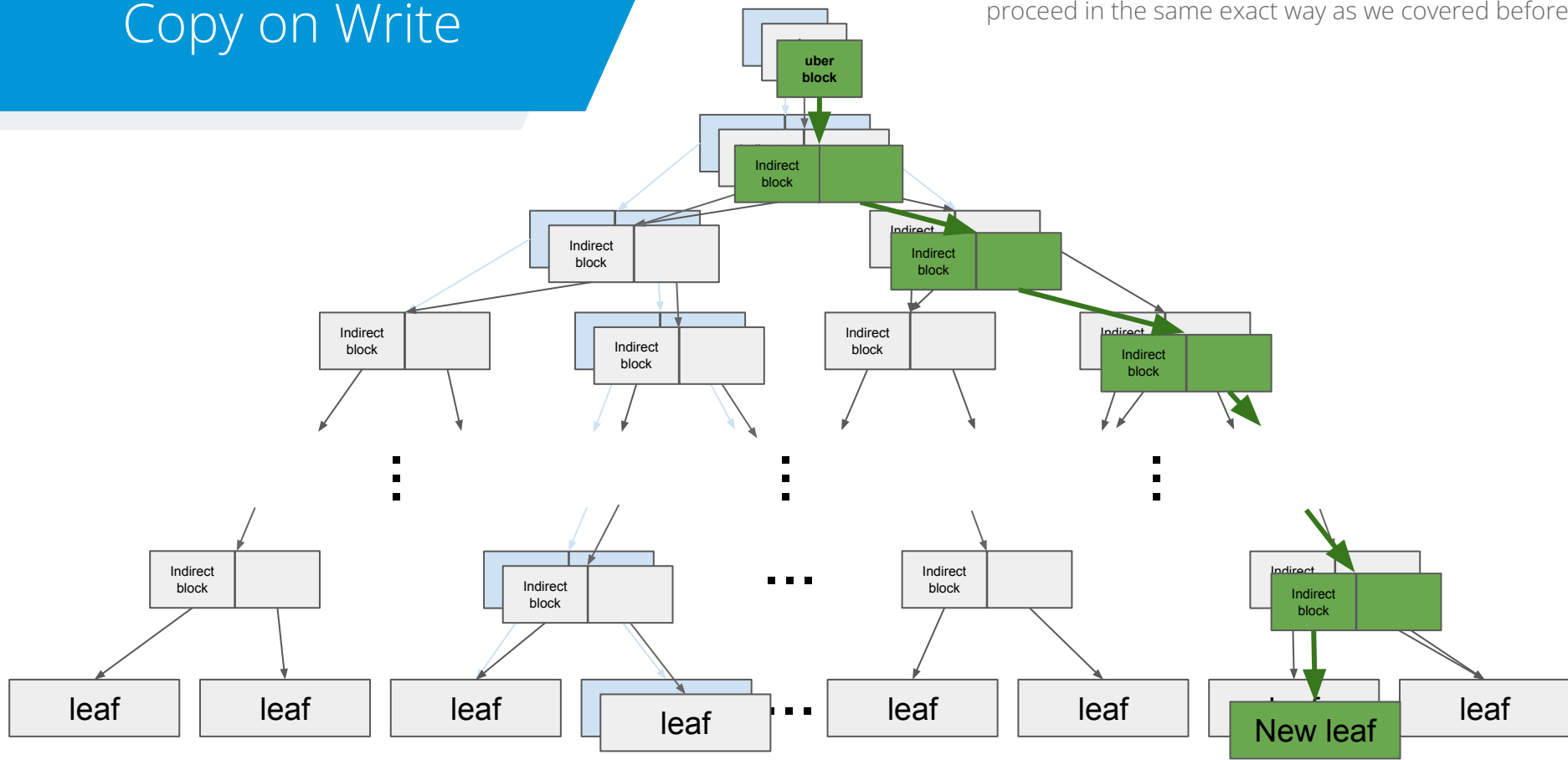
# Copy on Write

...Except since the previous file system state was snapshotted, we don't remove those old blocks. The uber block sticks around, but is moved outside of that special spot on the disk (there's limited space in there). All the other blocks referenced by it stick around, too.



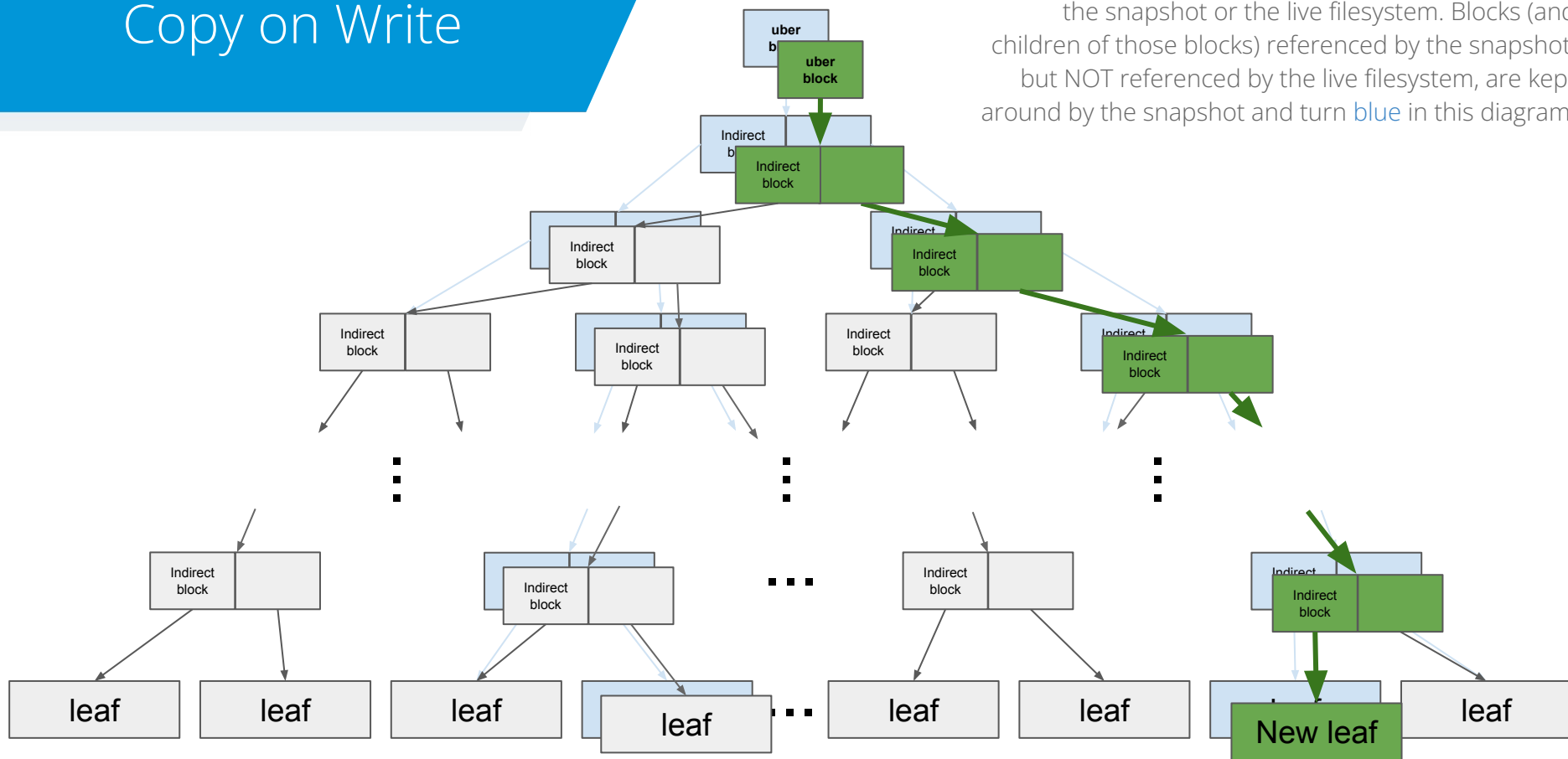
# Copy on Write

Now we updated another block in our tree. We proceed in the same exact way as we covered before.



# Copy on Write

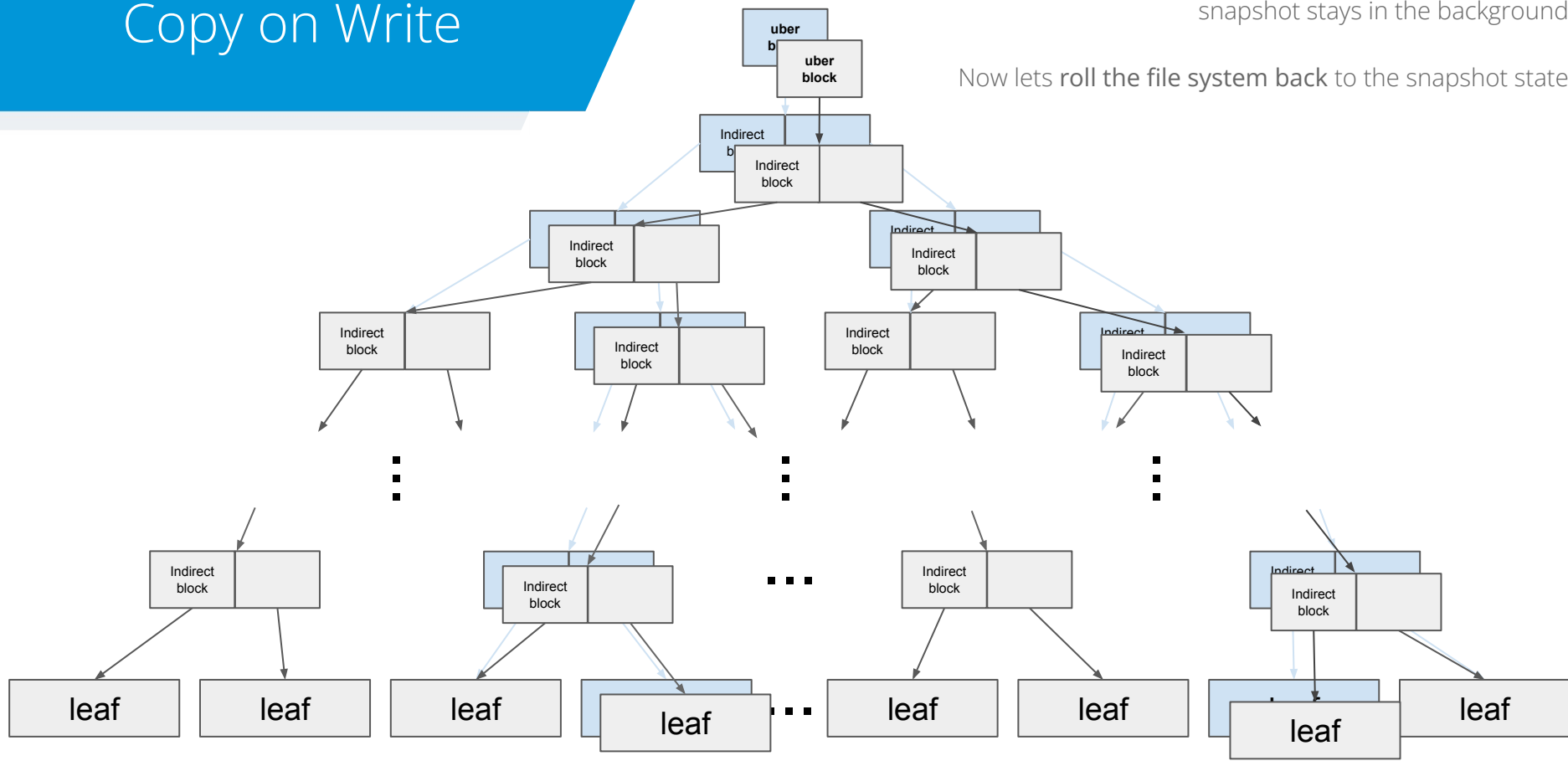
We can now “remove” blocks not referenced by either the snapshot or the live filesystem. Blocks (and children of those blocks) referenced by the snapshot, but NOT referenced by the live filesystem, are kept around by the snapshot and turn **blue** in this diagram.



# Copy on Write

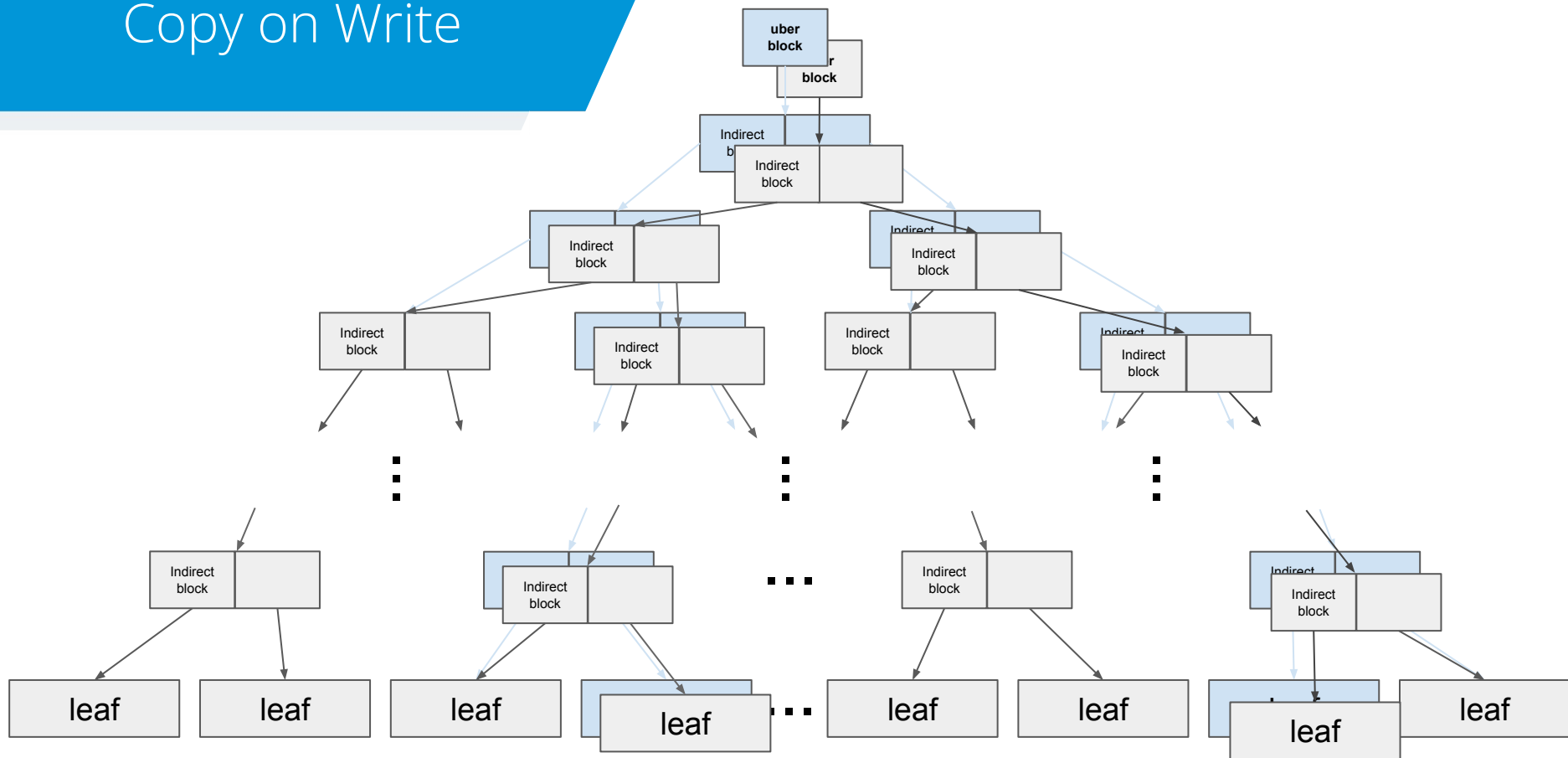
The updated blocks become the live filesystem and the snapshot stays in the background.

Now lets roll the file system back to the snapshot state!



# Copy on Write

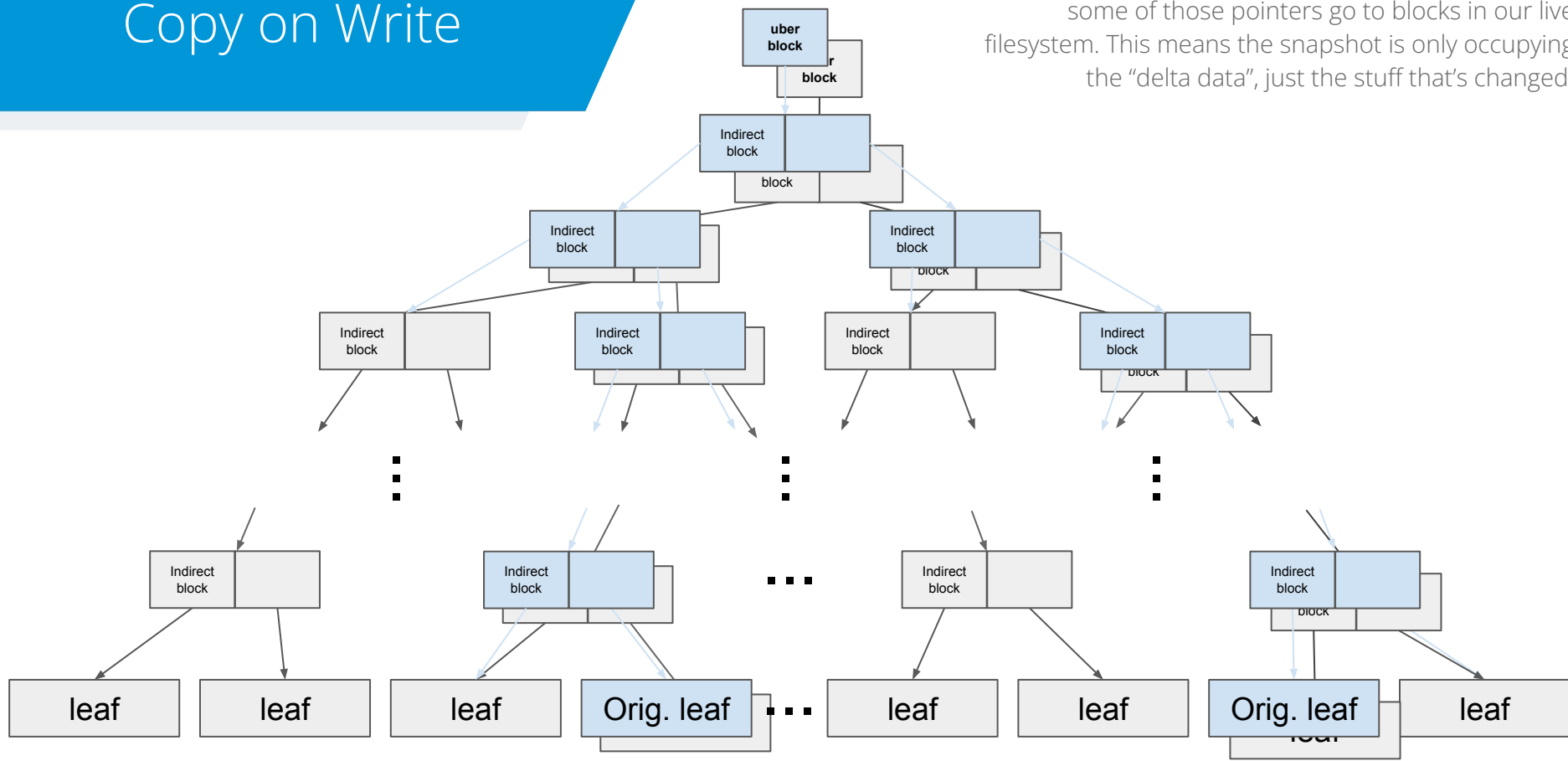
ZFS finds the snapshot's uberblock...





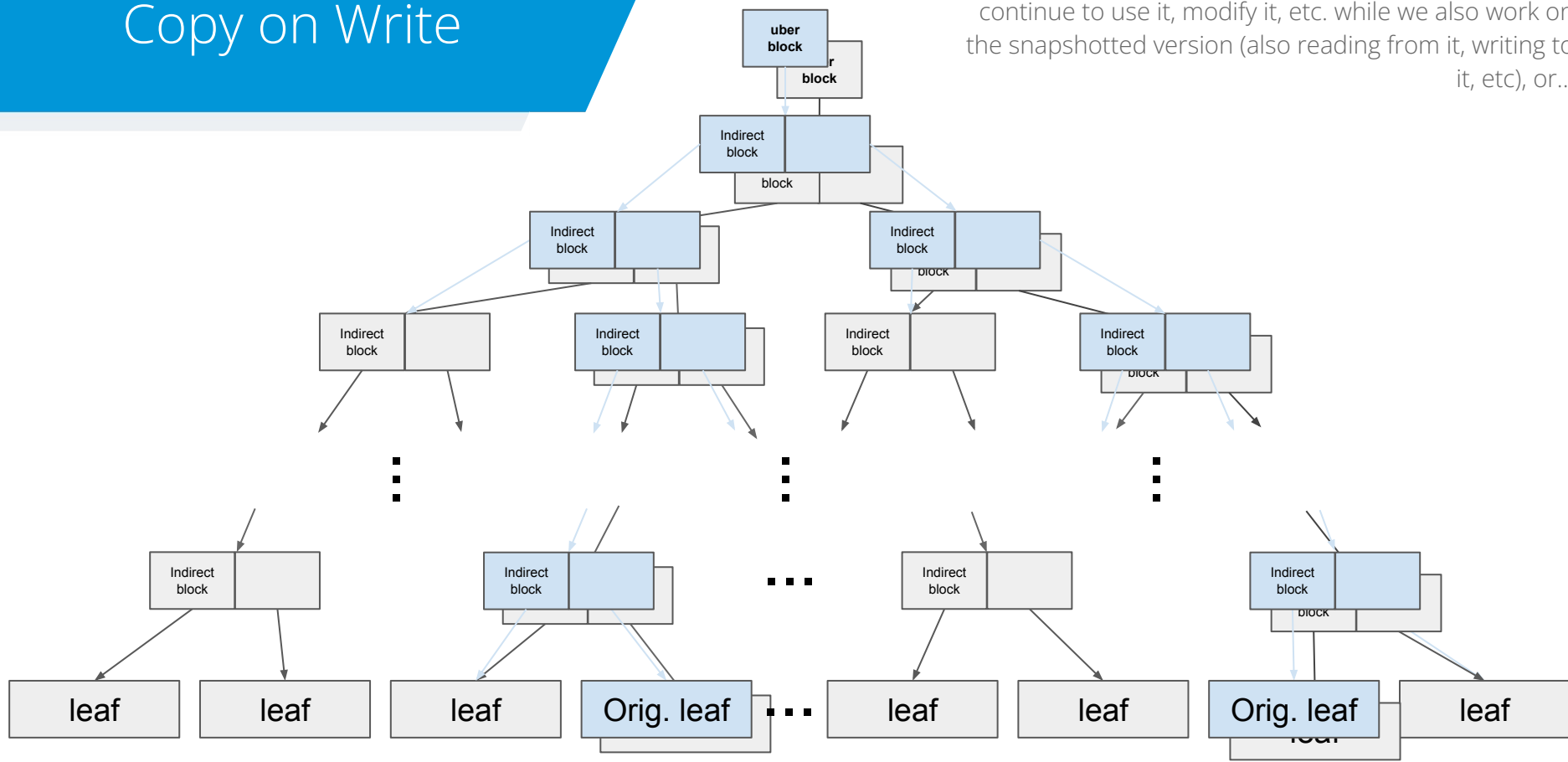
# Copy on Write

And can trace all its pointers down the tree. Note that some of those pointers go to blocks in our live filesystem. This means the snapshot is only occupying the “delta data”, just the stuff that’s changed!



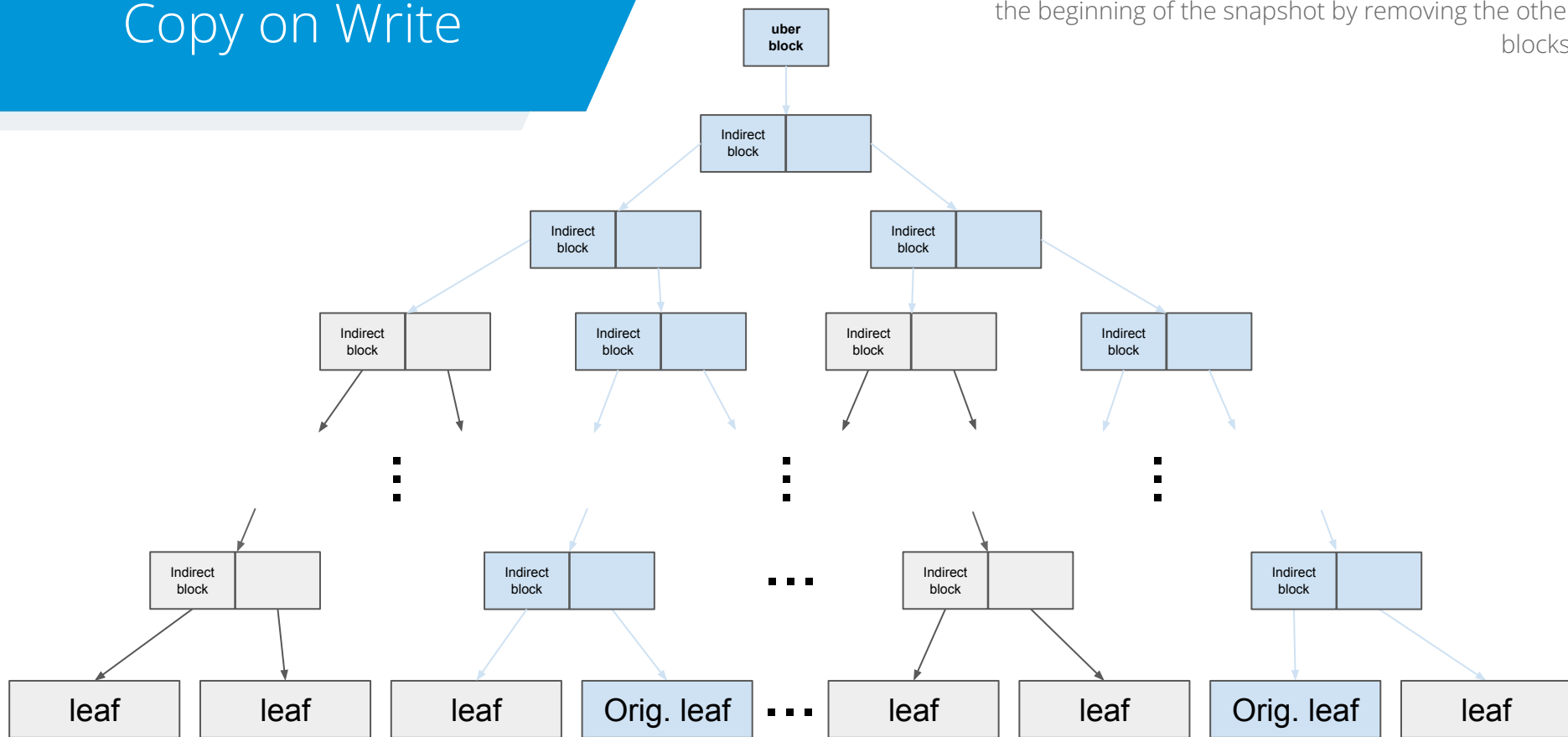
# Copy on Write

We can leave the updated (grey) file system in place and continue to use it, modify it, etc. while we also work on the snapshotted version (also reading from it, writing to it, etc), or...



# Copy on Write

We can restore the filesystem state to where it was at the beginning of the snapshot by removing the other blocks.



# Copy on Write

