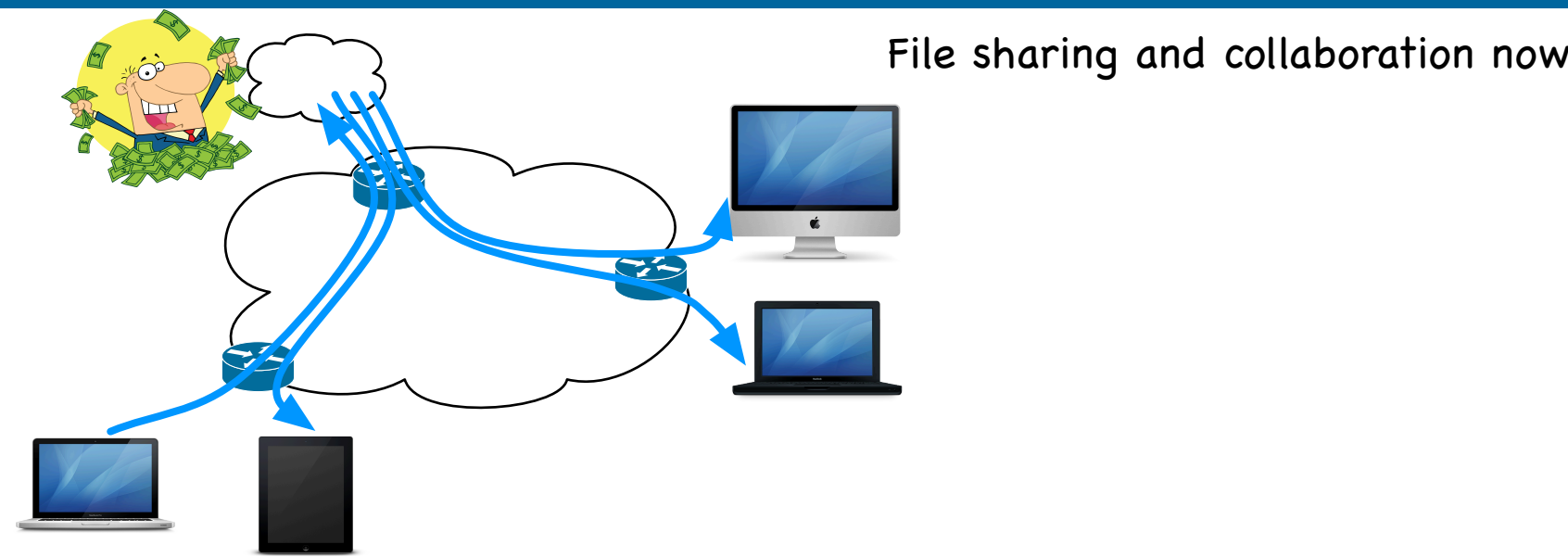
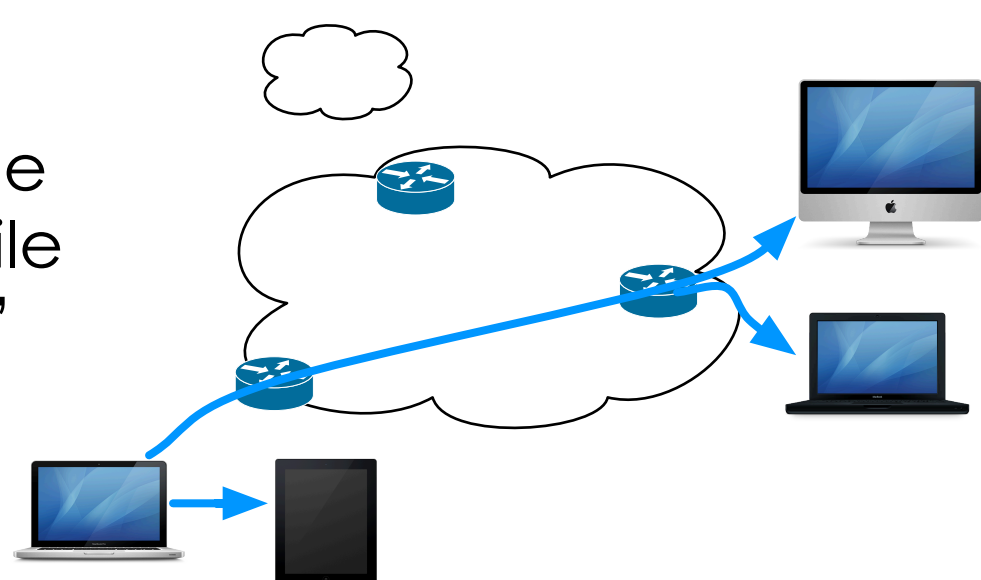


Introduction

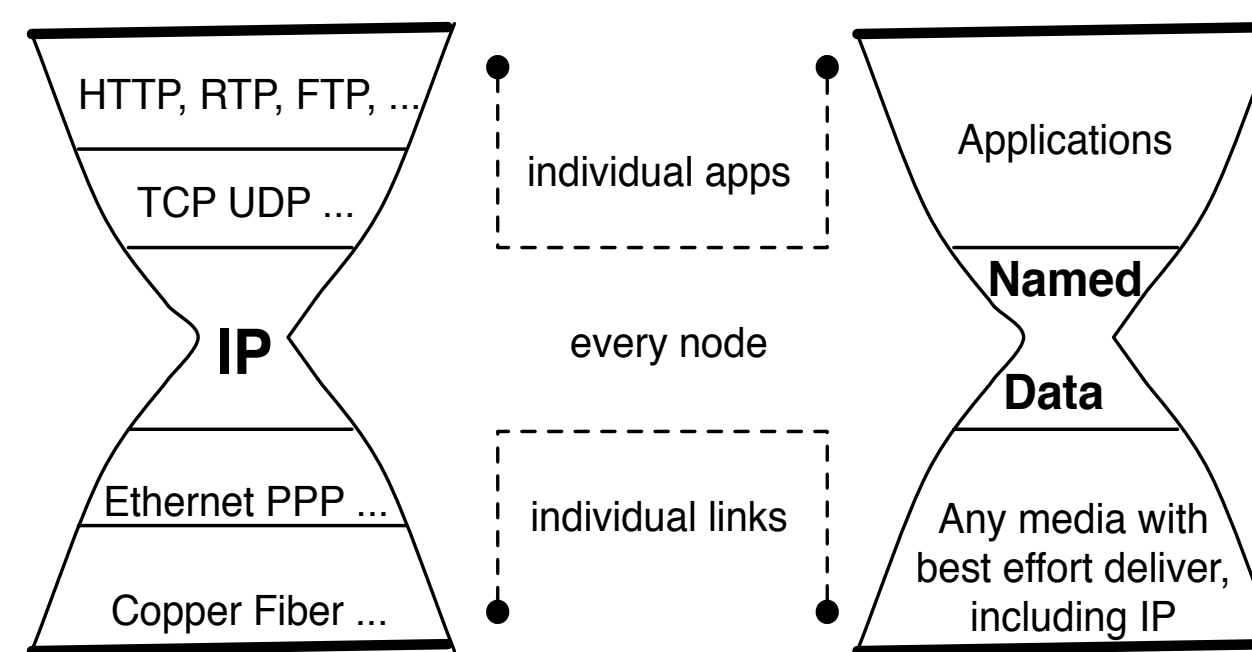


How it should have been done

- With NDN, come the opportunities for "file sharing done right"



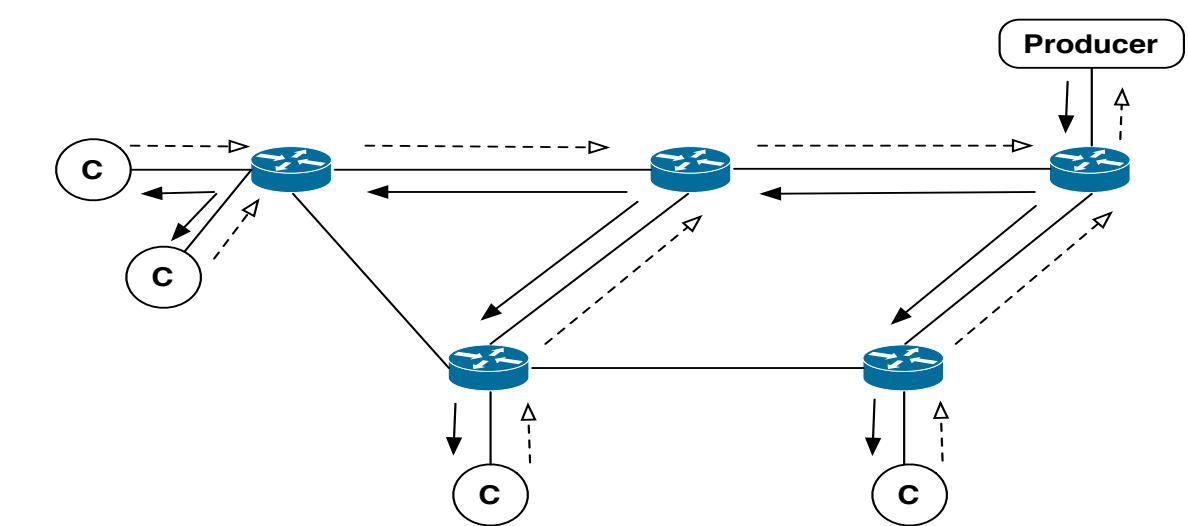
NDN: a new Internet architecture



- Two packet types
 - Every piece of data has a name
 - Security is built into data

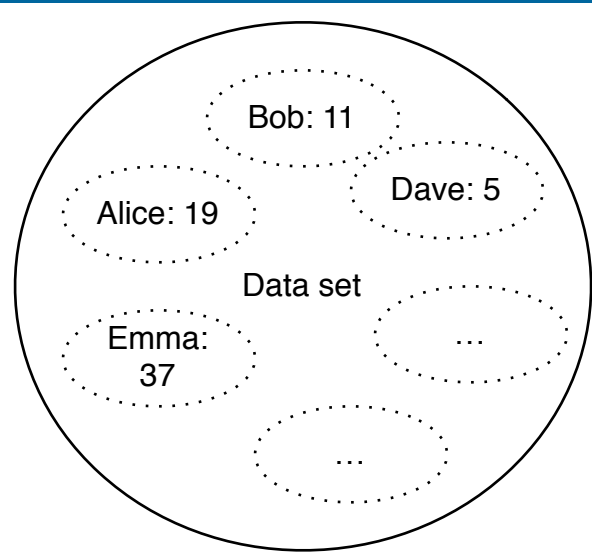
Interest	Data
Name	Name
Selectors	Content
Nonce	Signed Info
	Signature

- Receiver-driven communications
 - Send Interest to retrieve Data
 - One Interest brings at most one Data packet
- Intelligent data plane
 - Router maintain "Pending Interest Table"
 - Aggregation of Interests by routers
 - Natural support for data multicast



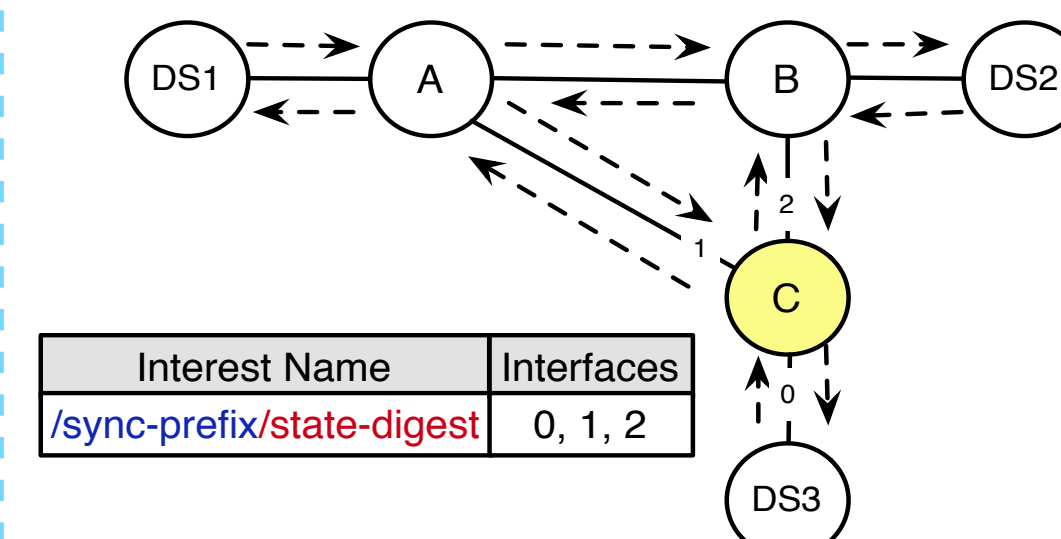
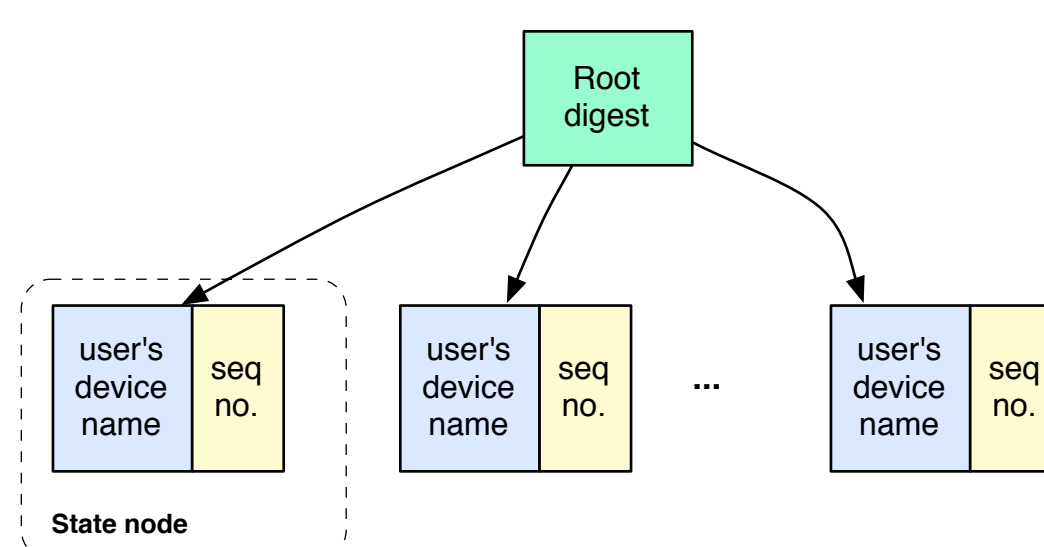
State of a data set

- A data set is the union of all subsets produced by users
 - By naming data sequentially, a user's data subset can be represented as {name prefix, max(SeqNo)} pair
- The state, or knowledge, of the data set consists of all such pairs



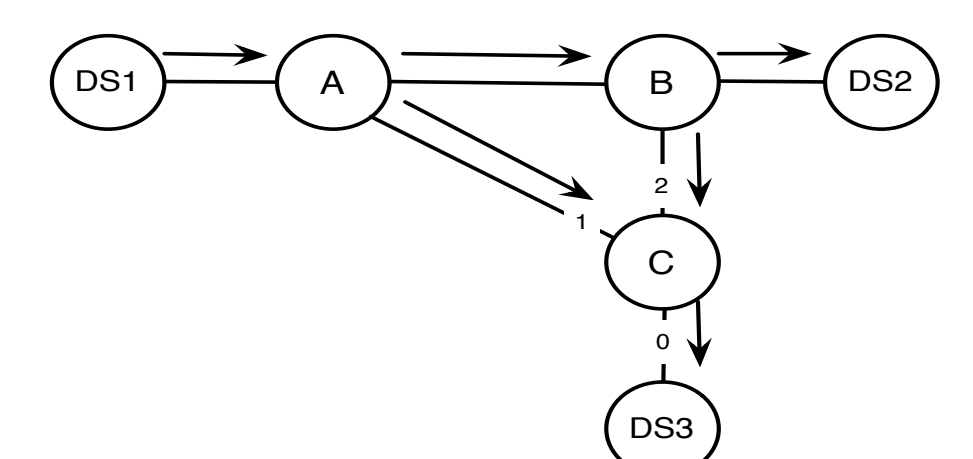
ChronoSync: efficient state synchronization

- Represent state as a digest tree
 - The root digest summarizes the state of the whole set
 - Each child node corresponds to a user's data subset



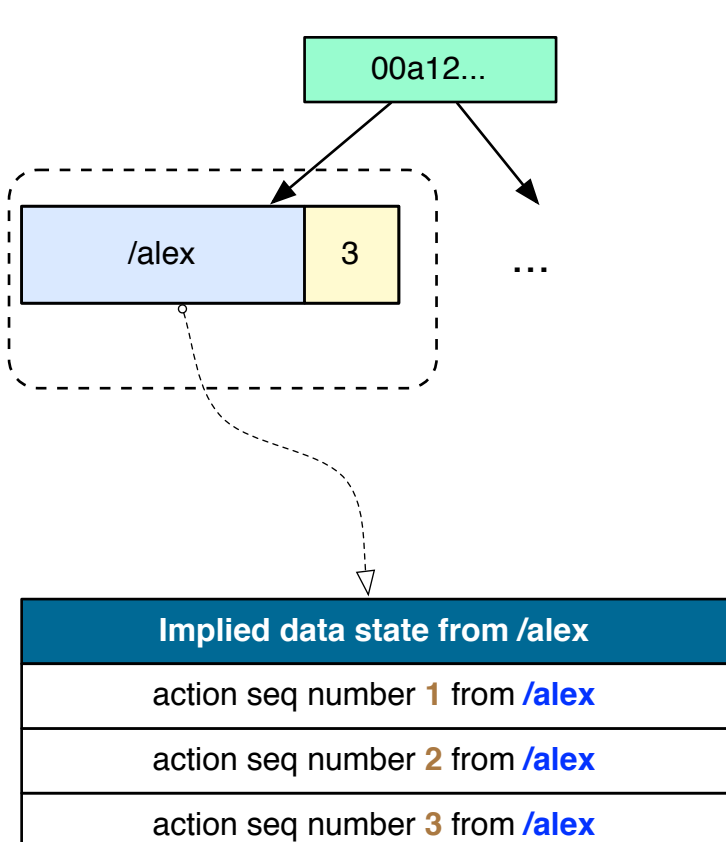
- Users exchange root digests with broadcast Interests
 - All Interests are identical in steady state

- Whoever produces new data can reply the Interest
 - With his new {name prefix, SeqNo.} pair
 - Receivers update their hash tree and send out Interests with new root hash



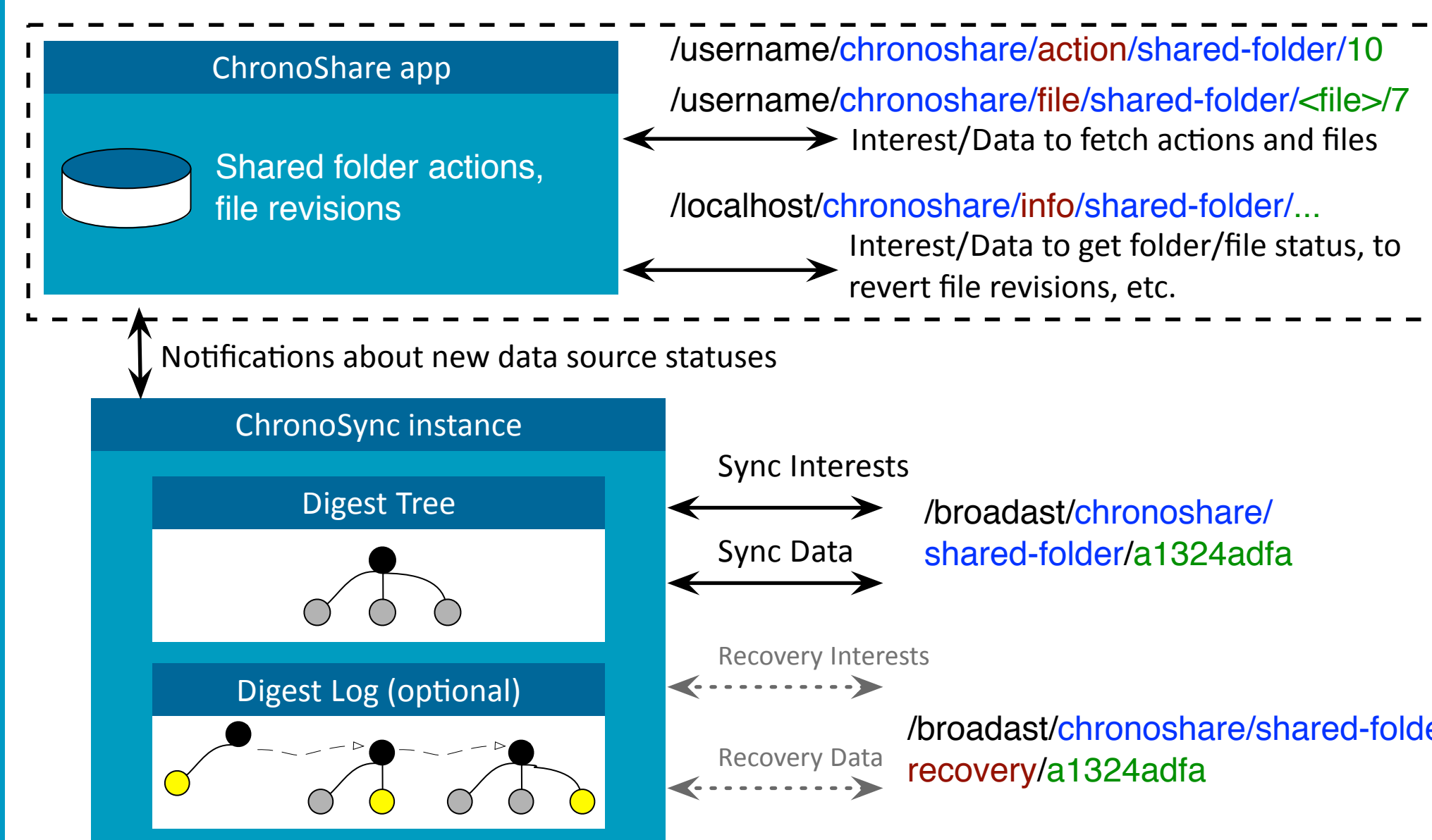
From ChronoSync to ChronoShare

- The state of the shared folder can be determined by the actions applied to the files
 - Actions can be delete, create, update
- ChronoSync tracks the actions of each user
 - The SeqNo is the number of actions from the user

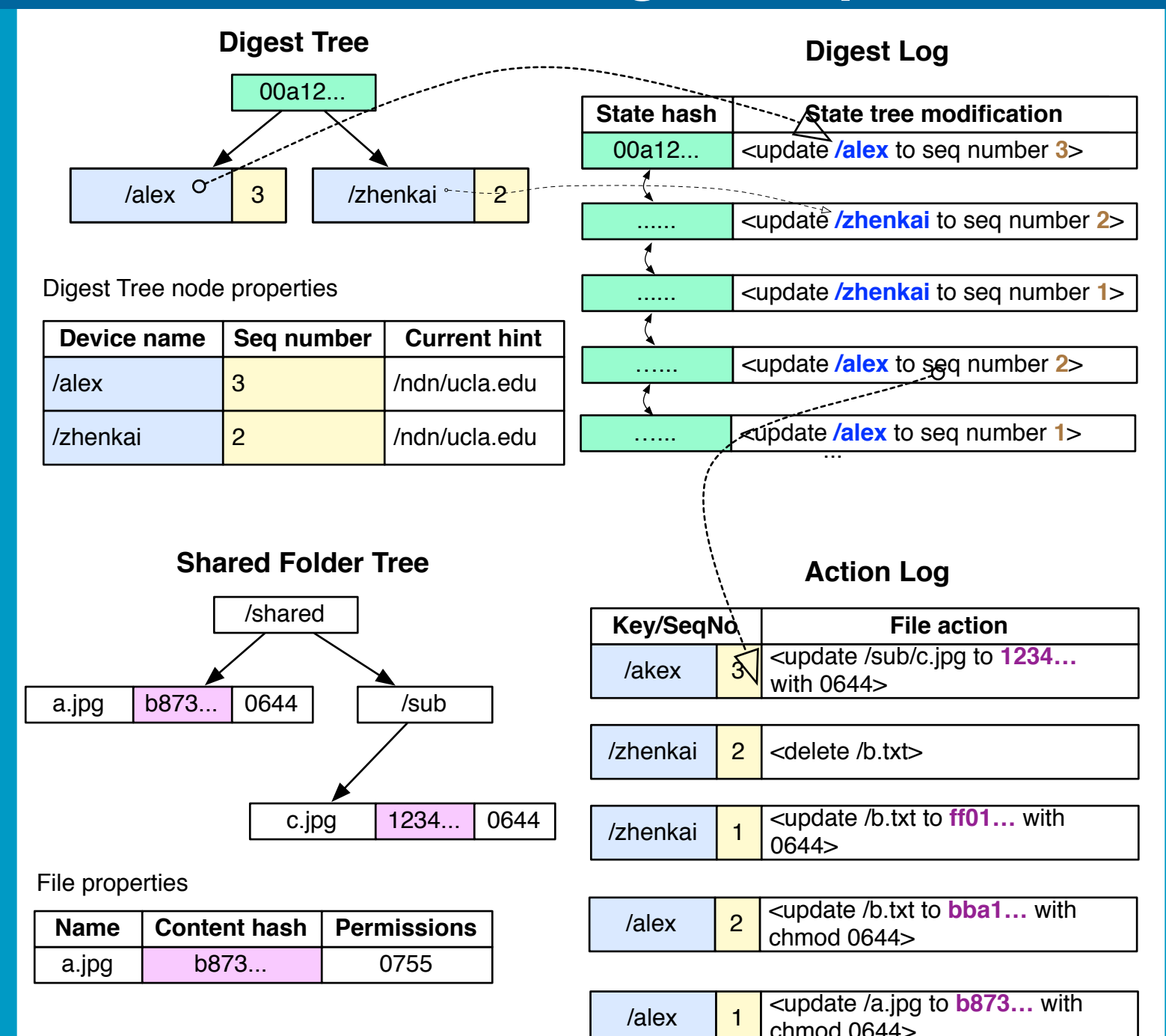


- Users request for missing actions once ChronoSync detects state change
- Actions are applied in the same order by all users
 - Each action result in a new version of a file
 - The same set of actions results in the same shared folder
- Users may decide whether to fetch the new version of a file or not

ChronoShare design overview



ChronoShare design components



Features

- Efficient multicast data distributed
- Local communication is truly local
- Device mobility is supported
- Files are available even if the producer is offline
- Version control is supported
- Encryption based access control
- Data Provenance guaranteed

Implementations

