

CICS and Recovery

Andy Wright

CICS L3 Change Team

IBM Hursley

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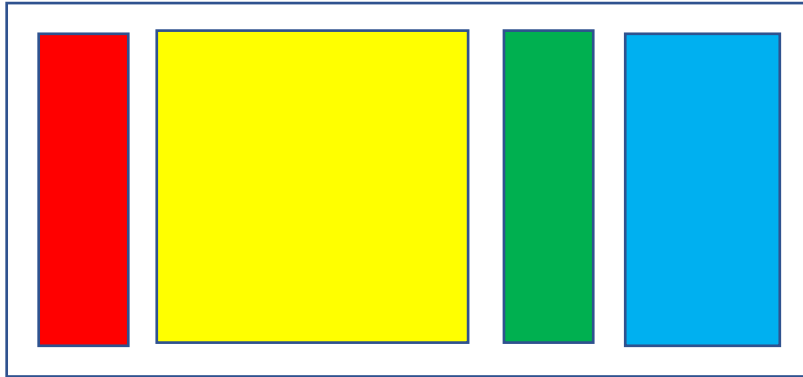
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Some Hursley sights



Log chains

Block n-1



The past

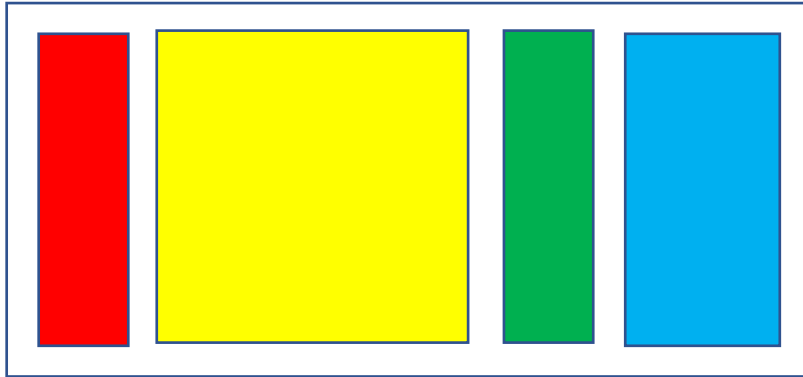
“Now”



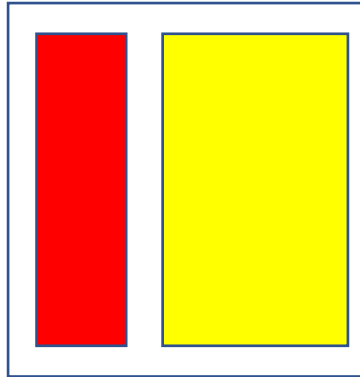
Time

Log chains

Block n-1



Block n



The past

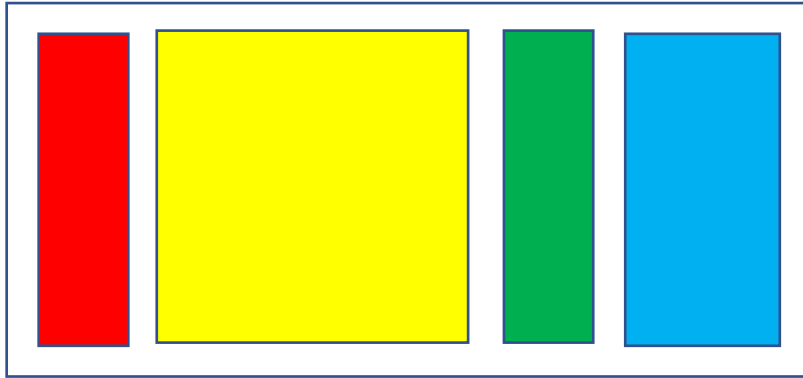
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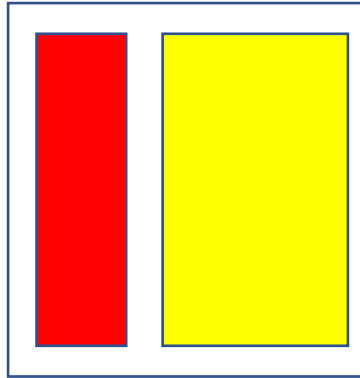
Time

Log chains

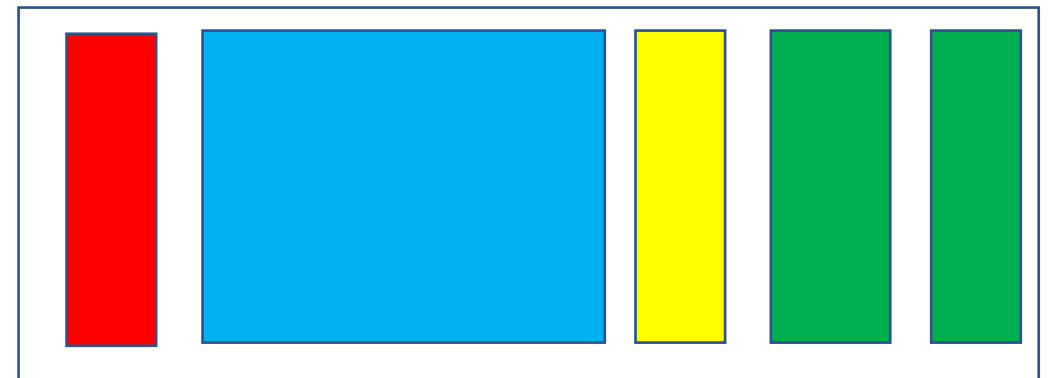
Block n-1



Block n



Block n+1



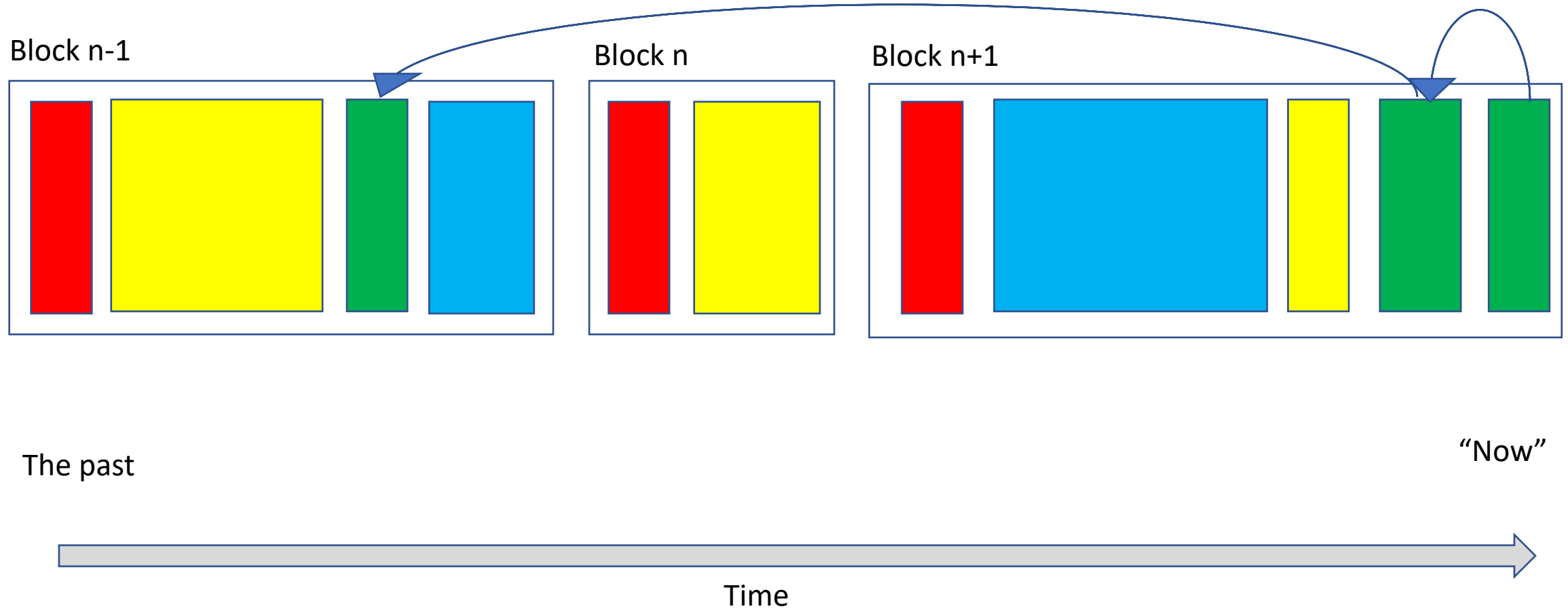
The past

“Now”

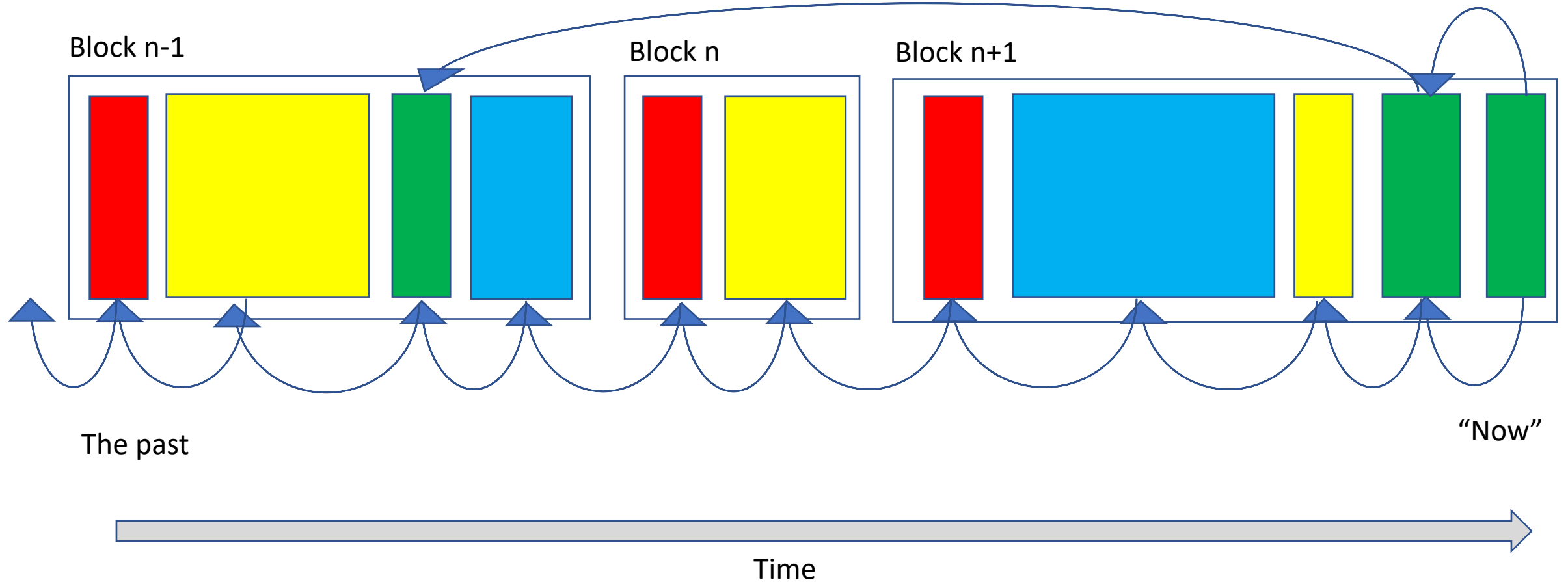


Time

Log chains



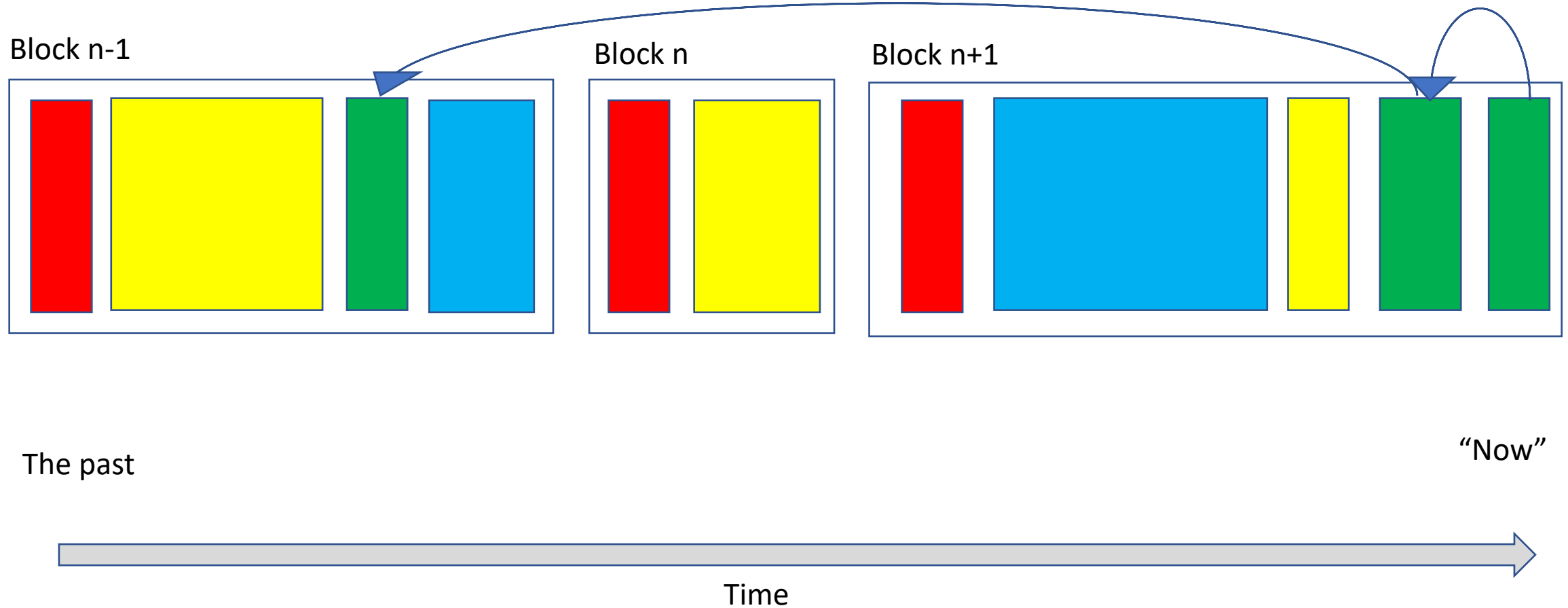
Log chains



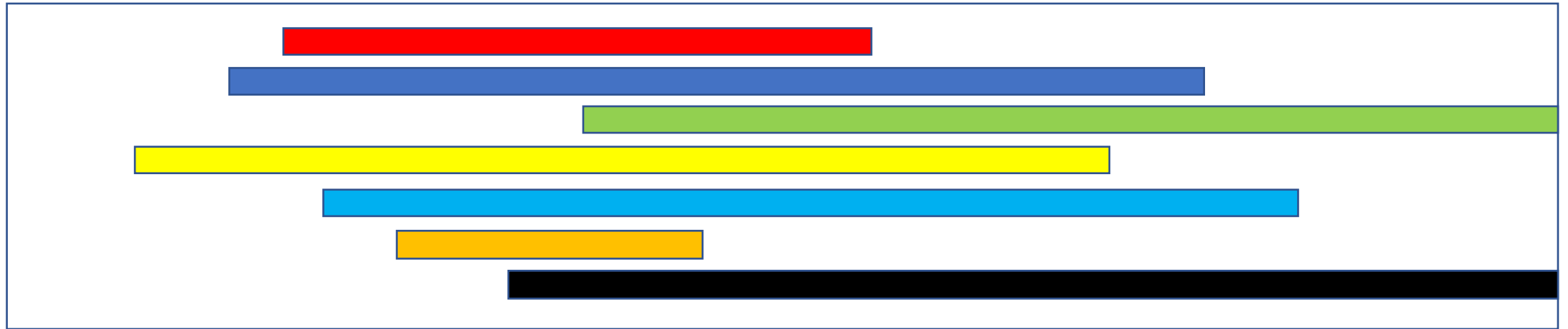
DTB – reading one log chain

- Driven as the result of
 - An abend
 - An EXEC CICS SYNCPOINT ROLLBACK
- Recovery Manager calls Log Manager to read back the UOW log chain
- Records are presented to the appropriate client to back out changes

DTB – reading one log chain



Chain and Stream history points



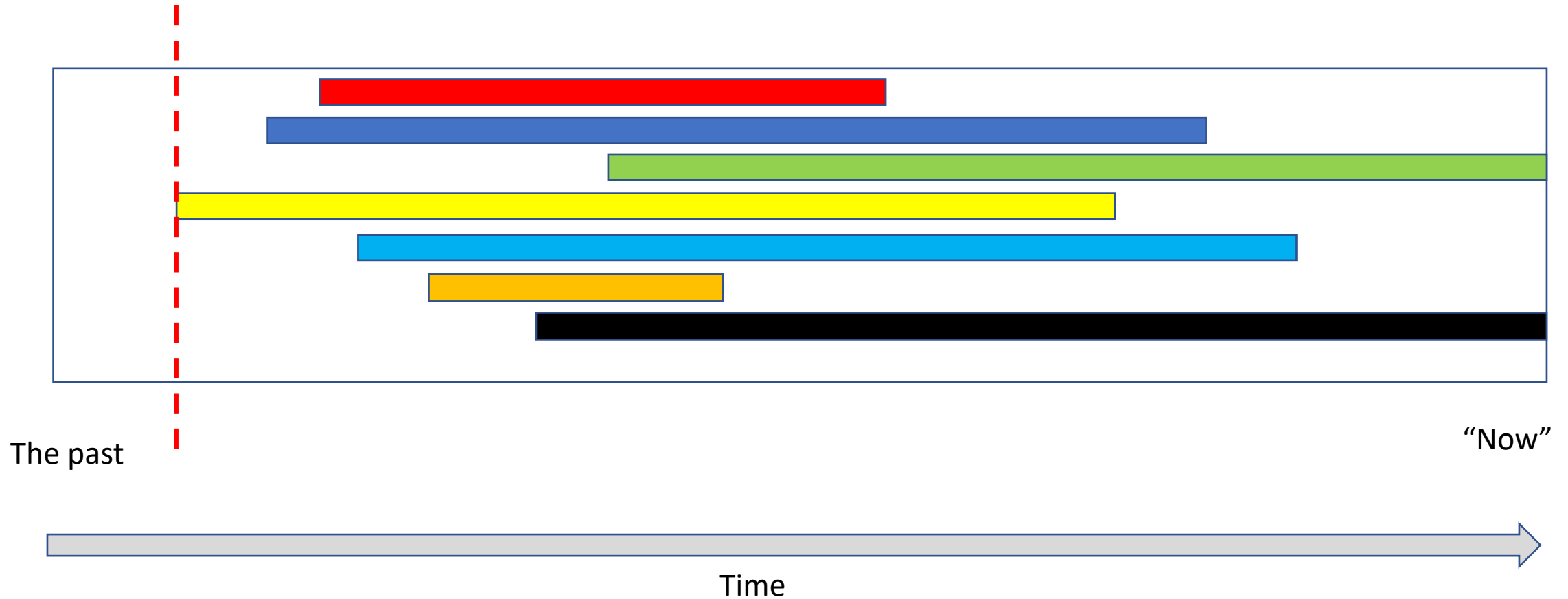
The past

“Now”

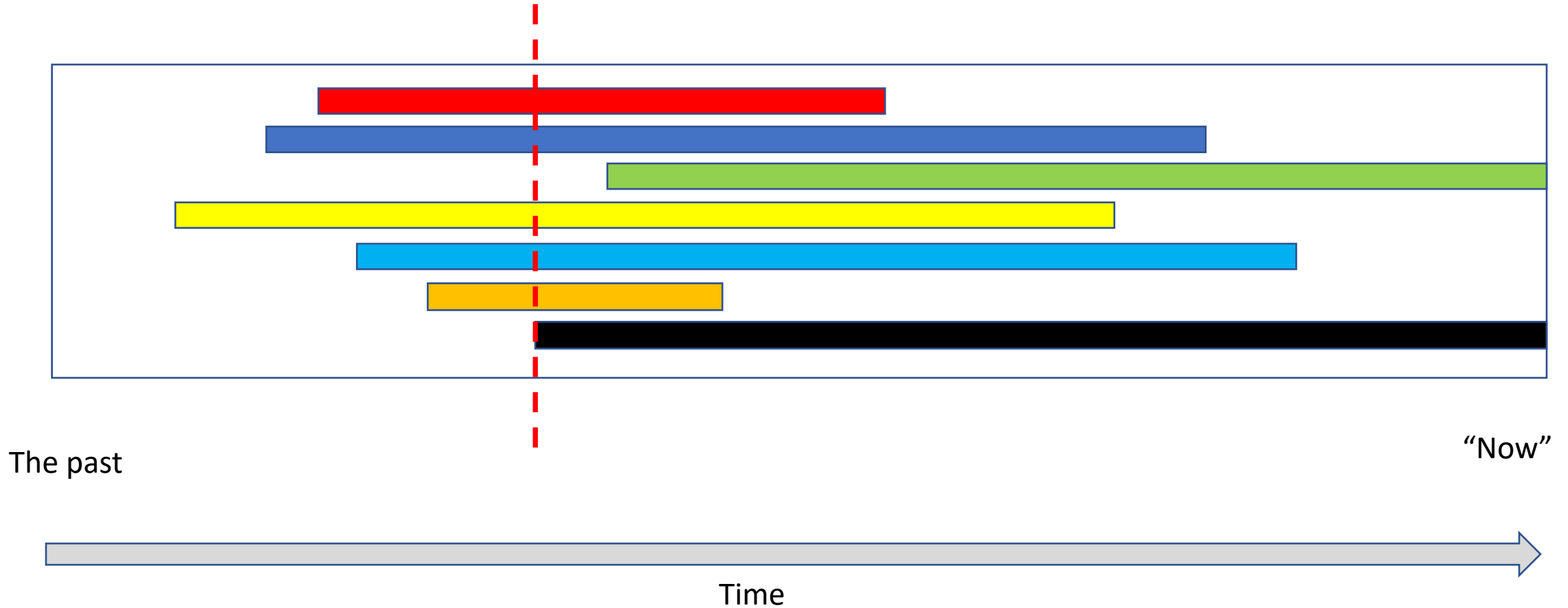


Time

Chain and Stream history points



Chain and Stream history points



Two phase commit sequence

- Driven by EXEC CICS SYNCPOINT, EXEC DLI TERM, etc
- Recovery Manager drives 2PC processing for remote coordination
- **Phase 1 is Prepare**
 - The local resources are polled to vote
 - The remote systems are polled to vote
 - If clients vote yes they must be prepared to commit forwards if told to later
 - Remote systems enter an **Indoubt** phase until told which way to commit
- CICS logs the fact the UOW is committing forwards
- **Phase 2 is Commit**
 - The remote systems are called to commit
 - The local resources are called to commit

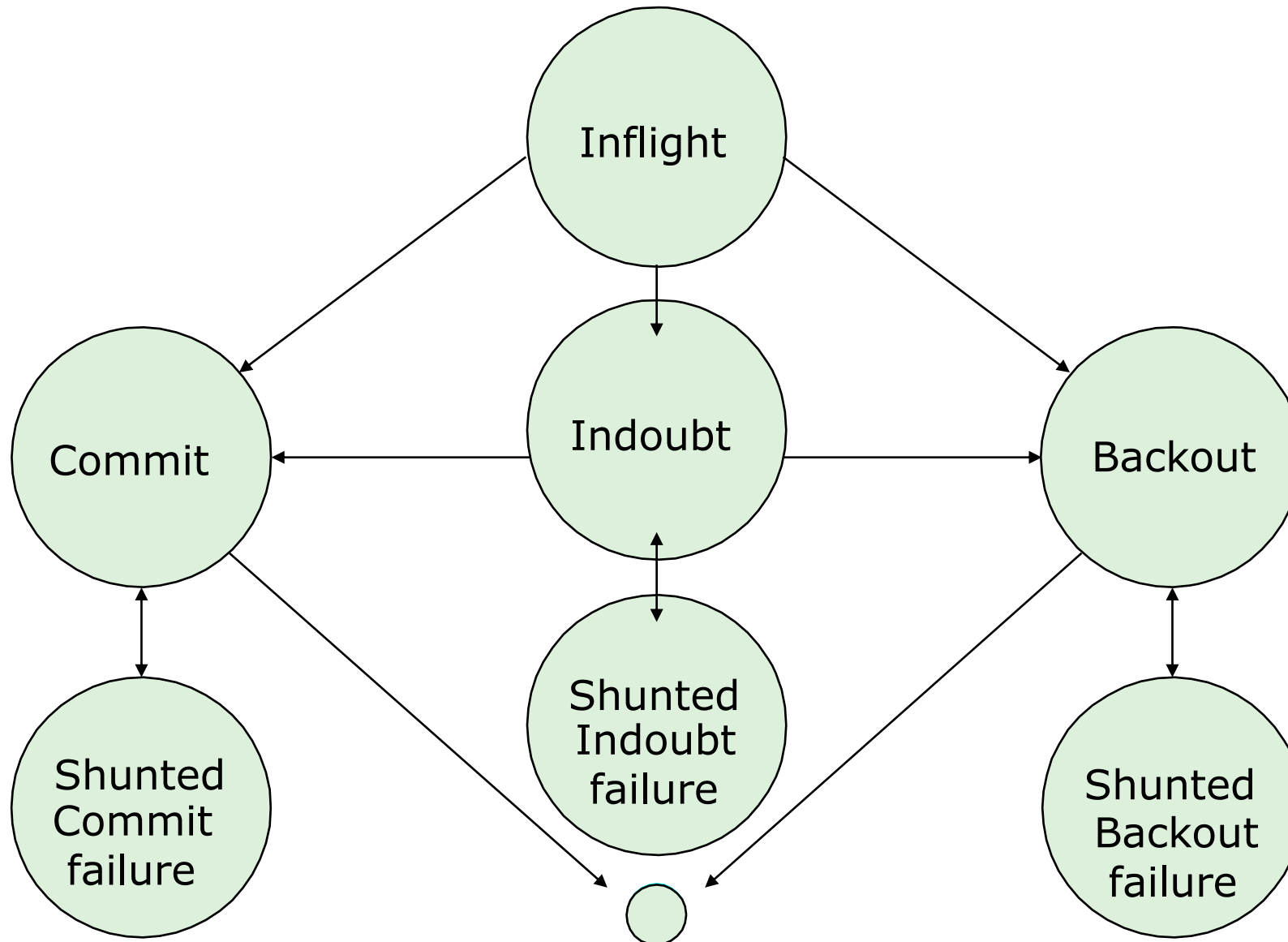
Backout (commit backwards) sequence

- Driven by EXEC CICS SYNCPOINT ROLLBACK, an ABEND, etc
- Backout is a single phase process to commit backwards
 - The remote systems are called to commit backwards
 - The local resources are called to commit backwards
- Resource managers do not need to prepare to backout
 - **Note** - “Any resource manager worth its salt should default to backout”
- CICS logs the fact the UOW has committed backwards

Shunting and unshunting

- CICS can shunt UOWs that fail at key moments during a syncpoint
- A shunted UOW awaits resolution of an indoubt failure, a commit failure or a backout failure
 - Recovery manager attempts to complete a shunted UOW when the failure that caused it to be shunted has been resolved
- Shunting releases resources such as terminals, user programs, working storage, etc, normally by abending the transaction
 - CICS retains locks on recoverable data until it can attempt an unshunt
- Shunted UOW log data tends to persist for longer durations, so is moved from DFHLOG to DFHSHUNT
 - **Note** - DFHSHUNT is not just for shunted UOW's log records

Shunted Unit of Work state



Last Agent

- Recovery Manager invokes every participating system to prepare
- The final one can be called **directly** to commit
- CICS passes the coordination role to this system
 - **Note** – the old coordinating system is now Indoubt
- The new coordinator will then either commit forwards or backwards (backout)
- This response is returned to the old coordinator which does the same
- It then instructs its own participants to do likewise
- **Note** – Last Agents may be daisy-chained

Single Updater

- An optimized form of Last Agent
- When the coordinator passes the role to a Last Agent, and no local logging has occurred up to this point
- This means the old coordinator is not indoubt
 - It doesn't care which way it commits

Implicit Forget

- The coordinator could wait for a response to each commit
 - This would delay processing
- Implicit Forget avoids this
- Recovery Manager retains the UOW and its state information
 - Decouples from the communication layer object (e.g. session)
 - The session can be reused by another task
 - When data is sent down the session, the code notifies CICS of this
 - CICS can now forget the remote system (and potentially the old UOW)

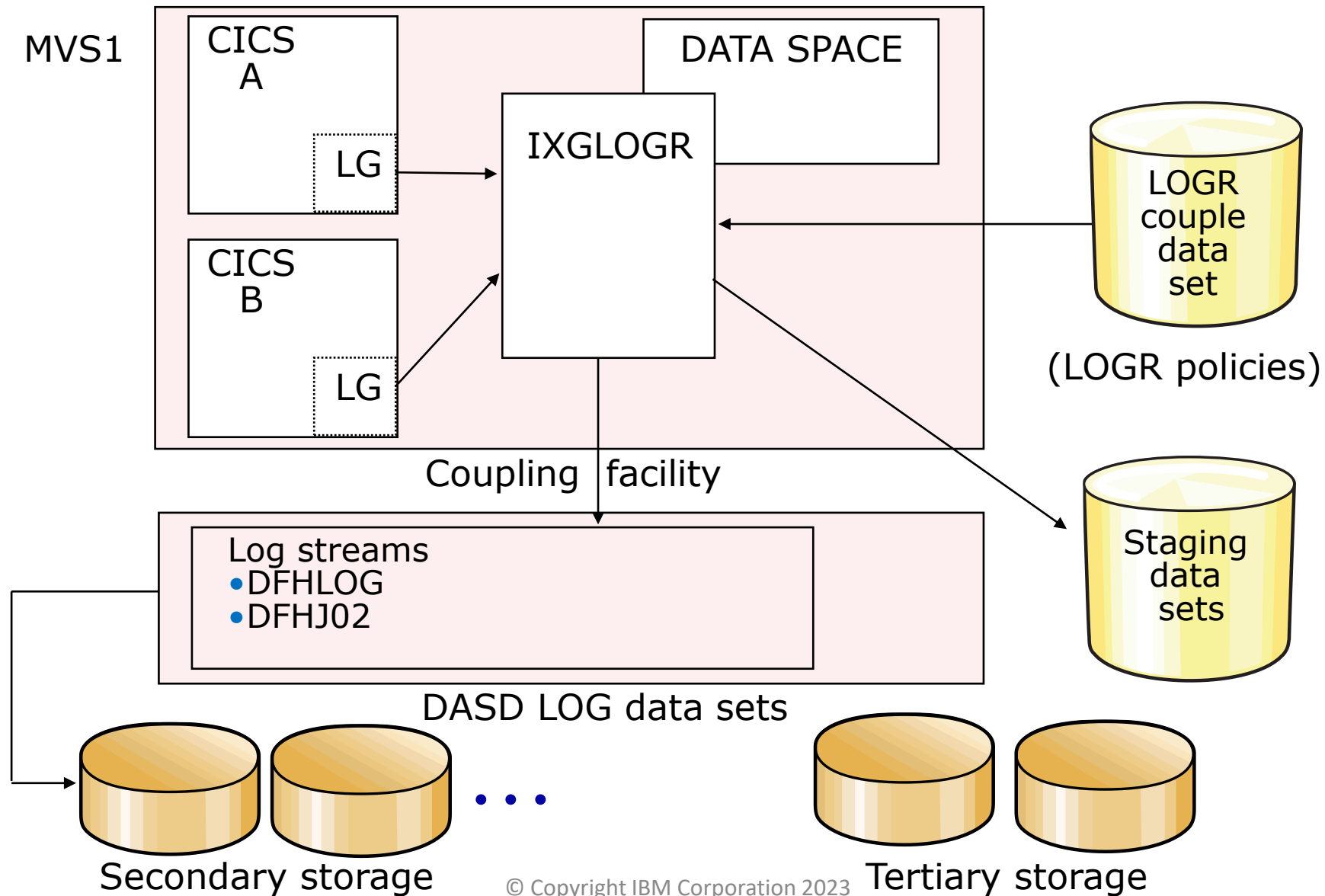
Keypointing

- Driven by AKPFREQ being reached
- Causes a CSKP system transaction to be attached
 - **Note** - You cannot attach CSKP by entering it at a terminal
- Keypointing will write state data to DFHLOG
- It also will trim DFHLOG and DFHSHUNT
- Important messages:
 - **DFHRM0205** *date time applid* An activity keypoint has been successfully taken.
 - **DFHLG0743** *date time applid* Tail of log stream *lsn* deleted at block id *X'blockid'*.
 - **DFHLG0760** *date time applid* Log stream *lsn* not trimmed by keypoint processing. Number of keypoints since last trim occurred: *trimnum*. History point held by transaction: *transid*, task number: *trannum*.

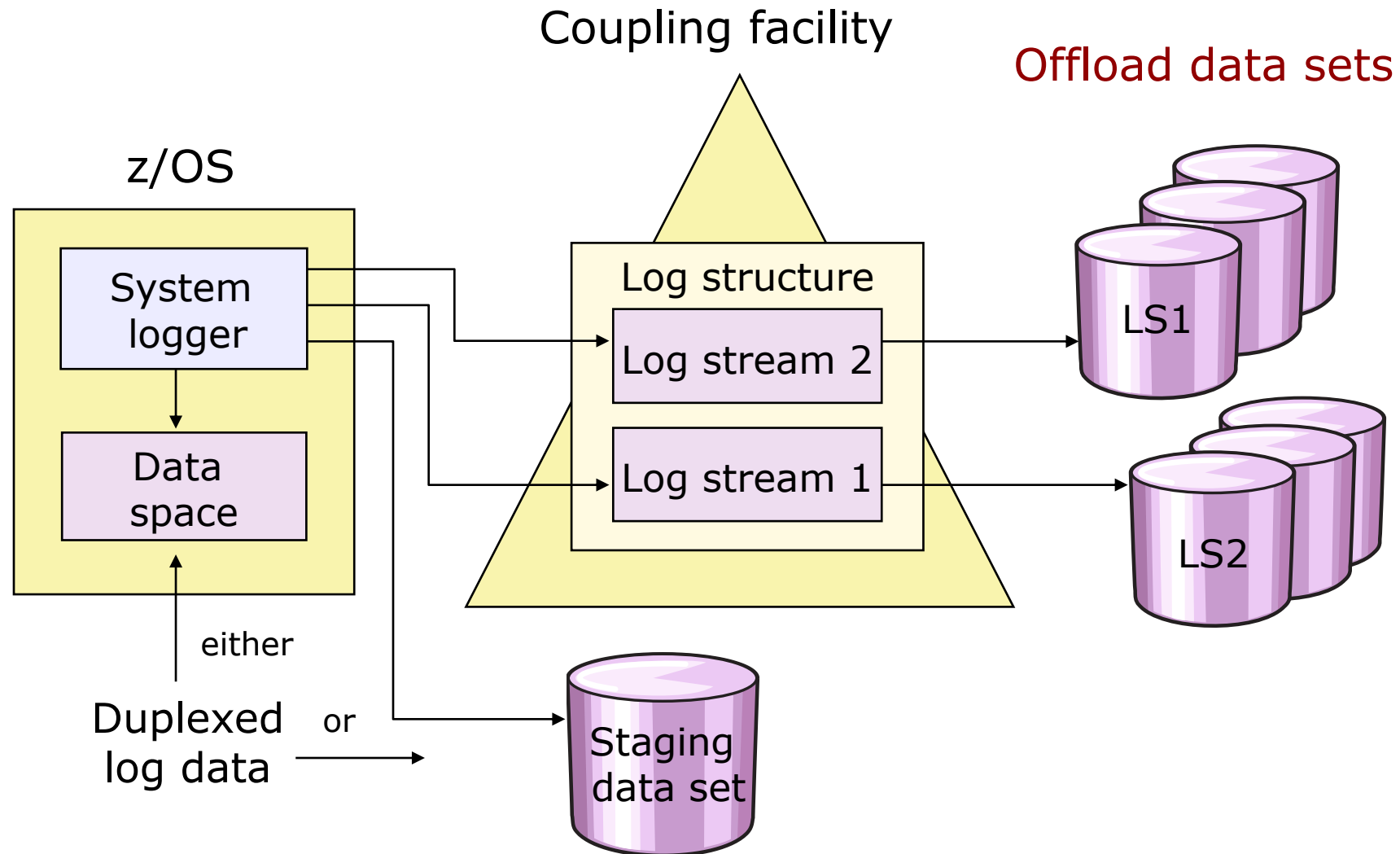
Log trimming

- Keypoints are an opportunity for CICS to delete unwanted log data
- Log Manager issues delete calls to the z/OS Logger
 - These logically delete ranges of the DFHLOG and DFHSHUNT logstreams
- When the logstream reaches its **HIGHOFFLOAD** percentage, the z/OS Logger will perform offload housekeeping work
 - Logically deleted log blocks are physically deleted
 - If necessary, remaining log data is moved to secondary storage (offload datasets)
- This continues until the **LOWOFFLOAD** percentage is reached
- Offload housekeeping is a good thing
 - Offload I/O to DASD is not so good
- **Note** – check for **DFHLG0760** messages (or no **DFHRM0205** messages)
 - Evidence that log trimming is not taking place

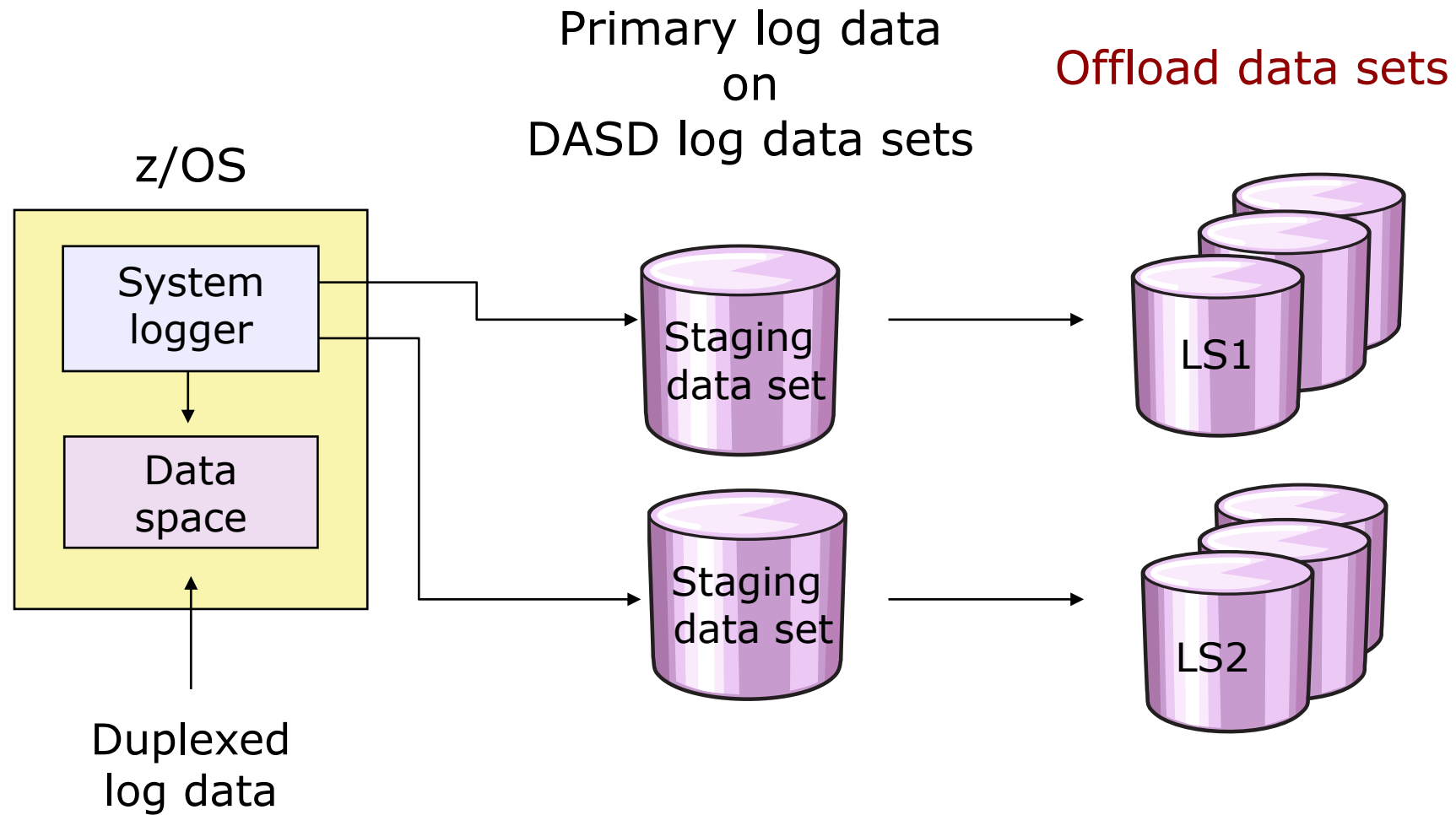
z/OS System Logger overview



Log stream storage for CF logging



Log stream storage for DASD-only logging



Log analysis

- CICS system logs are written to and read back by CICS
- CICS general logs are only written to by CICS
- **DFHJUP** is provided to read back logstreams for offline purposes
 - You can PRINT or COPY log data
- **DFHJUP** provides **COMPAT41** to return log data in “old-style format”
 - Some batch utilities still exist that work with such old-style CICS log data

