



# HP LTO4 versus IBM LTO4 Competitive Differentiation

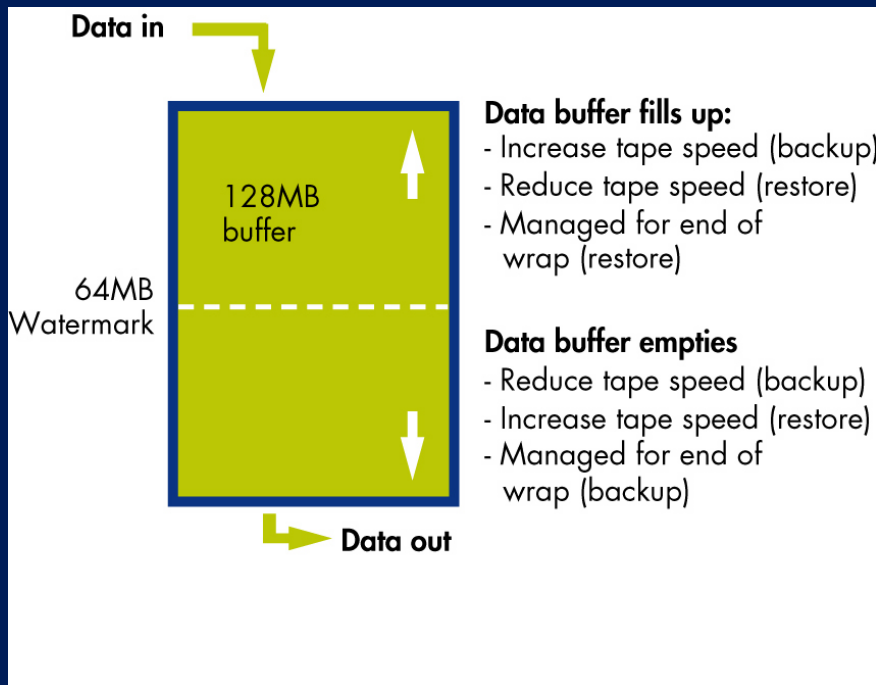
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# Key HP Differentiation Areas – Better performance, higher reliability



Feature	HP LTO Ultrium 4	IBM LTO Ultrium 4	Business benefit
Real Time Data Rate Matching	Yes	No	Higher performance with slow host servers - improved reliability with less wear and tear on heads and media
Tape Lifter	Yes	No	Used to protect the Head Elements for better reliability
Active Head Cleaner	Yes	No	Higher reliability due to Intelligent head cleaner that can be activated at any time
Load/Unload Mechanism	Yes	No	Higher reliability for 100% duty cycle automation environments
Radiused Rollers	Yes	No	Higher performance and reliability due to less stress on tape
Reverse Winding T-Reel	Yes	No	Higher performance due to improved tape packing

# Real Time Data Rate Matching – Optimized performance and reliability



## Data Rate Matching

- HP LTO2; 10 - 32MB/sec
- HP LTO3: 27 – 80 MB/sec
- HP LRO4: 40 – 120 MB/sec
- Intelligence enables dynamic, real time speed adjustments every 1 ms
- Real time speed adjustments are better – they significantly reduce the number of repositions/shoe shine events (**IBM drive must wait for an event to happen before changing speeds ie end of tape**)
- Drive & host operate at optimum level
- Drive adapts to host performance & improves reliability – **less shoe shine events mean less wear and tear on head and media**
- Below DRM Range the data buffer is large enough to allow repositions without affecting host performance or drive reliability

# Real Time Data Rate Matching – Optimized performance and reliability



- Only HP LTO drives have **real time** data rate matching (DRM)
  - DRM allows the HP LTO-4 drive to stream write or read at any host transfer rate from 40 to 120 MB/s. Infinitely variable and adjusted every 1ms.
  - DRM increases overall system performance.
  - DRM reduces wear and tear on the drive and media. Heads are the single biggest wear item in a tape drive.
  - By reducing head and media wear DRM extends the life of the drive and the media, reducing costs and therefore improving customer satisfaction
- IBM LTO 4 drives have a rudimentary stepped function with only a few discreet speeds available, and selectable only at certain times during the tape motion.

# Head Lifter



- Used during loading to keep the tape leader off the head.
- Helps protect the head elements
- Ensure only the data media contacts the head
- Can be deployed at other times to help with recovery

# Active Head Cleaner – Longer Head and Media Life



- Only HP LTO-4 drives have an active head cleaner that can be deployed at any time during drive operation.
  - Head cleaner fully integrated into the tape path
  - Head cleaner brushes can be activated **at any time**, especially when drive firmware detects a rise in the error rate
  - Allows the use of the head cleaner to be incorporated in the error recovery algorithms.
  - Virtually eliminates need for manual cleaning (i.e. use of a cleaning tape)
- IBM LTO-4 drives have a “non intelligent” mechanical head cleaner that can only operate during load/unload.
  - Cannot operate during read/write activity

# Load/Unload Mechanism – optimized for 100% automation duty cycles

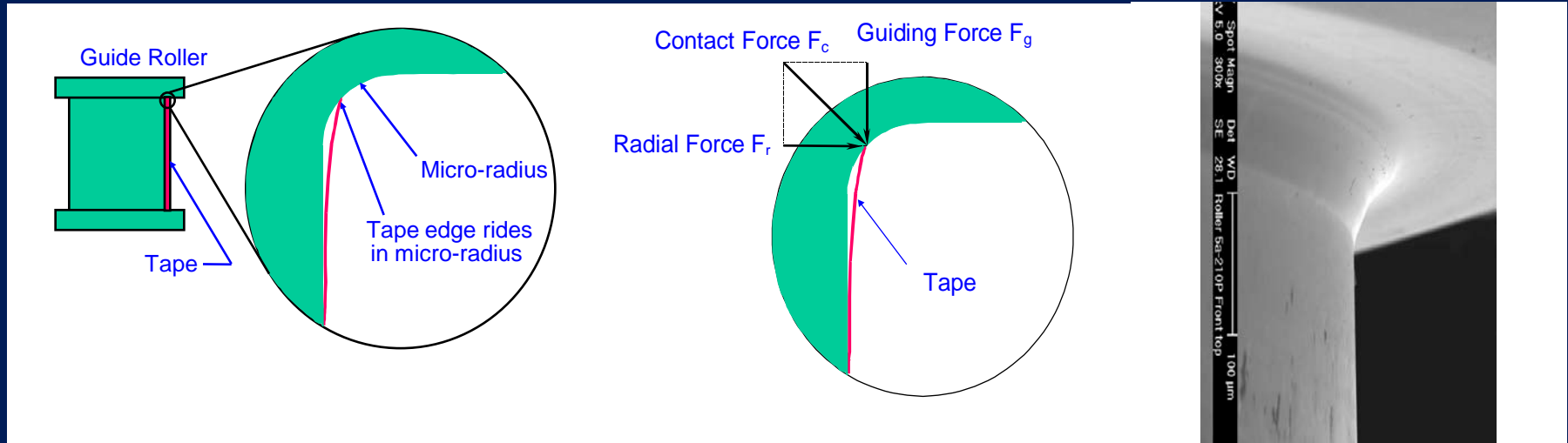


- HP LTO Ultrium has a highly reliable load/unload design
  - Soft Load, rigid parts, positive snap feature, mechanical interlock, redundant sensors – **NO SWALLOWED LEADERS**
- Only HP LTO Ultrium drives use multiple redundant sensors to ensure that the leader pin capture is totally secure/failsafe. If sensors detect pin is not seated, drive will not thread tape and will start the pin engagement process over. If repeated attempts to secure leader pin fail, drive will notify library and cartridge will return to the dismount position
- Automatic softload feature (just like a home video) make loading tapes completely intuitive and ensures proper cartridge alignment and seating.
- IBM has no cartridge sensor (unlike HP) so no way for library robotics controllers to detect if a picker has or has not removed a cartridge from the drive
- “Pull power” on IBM LTO drive during threading can cause lost leader block

# Tape Rollers – simple tape path for higher reliability and performance



- Only HP LTO Ultrium drives uses patented and award-winning “Radius Roller” design to ensure maximum tape guidance without any edge damage.
- IBM LTO Ultrium uses old fashioned edge guidance and more (4) rollers which can lead to tape edge damage.



## HP's Radiused Roller Design

# Reverse Winding T-Reel – higher performance with less stress on tape



- HP LTO-4 drives use a unique reverse T-Reel design. Wraps tape around T-Reel in the same way as on the S-Reel. (used in HP LTO2 and HP LTO3)
  - Tape is wound magnetic side out, same as cartridge reel. More consistent tape packing. – This is a good thing, improves tape tension, less stress on tape.
  - Less lateral disturbance during tape motion – this helps tape tracking, reduces potential for edge damage and improves the bit error rate
  - More margin for the servo system allowing higher density tracks. The head uses a servo system to follow the data tracks – less lateral disturbances in the tape path allows for more margin in the system, better error rate and reduces the potential of data or capacity loss.
- IBM and all other drives use old-fashioned winding direction.

# Reverse Winding T-Reel – higher performance with less stress on tape

