z/TPF EE V1.1
z/TPFDF V1.1
TPF Toolkit for WebSphere® Studio V3
TPF Operations Server V1.2

IBM Software Group

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Tape Encryption

Name :John Tarby
Venue : SCP subcommittee

AIM Enterprise Platform Software

IBM z/Transaction Processing Facility Enterprise Edition 1.1.0

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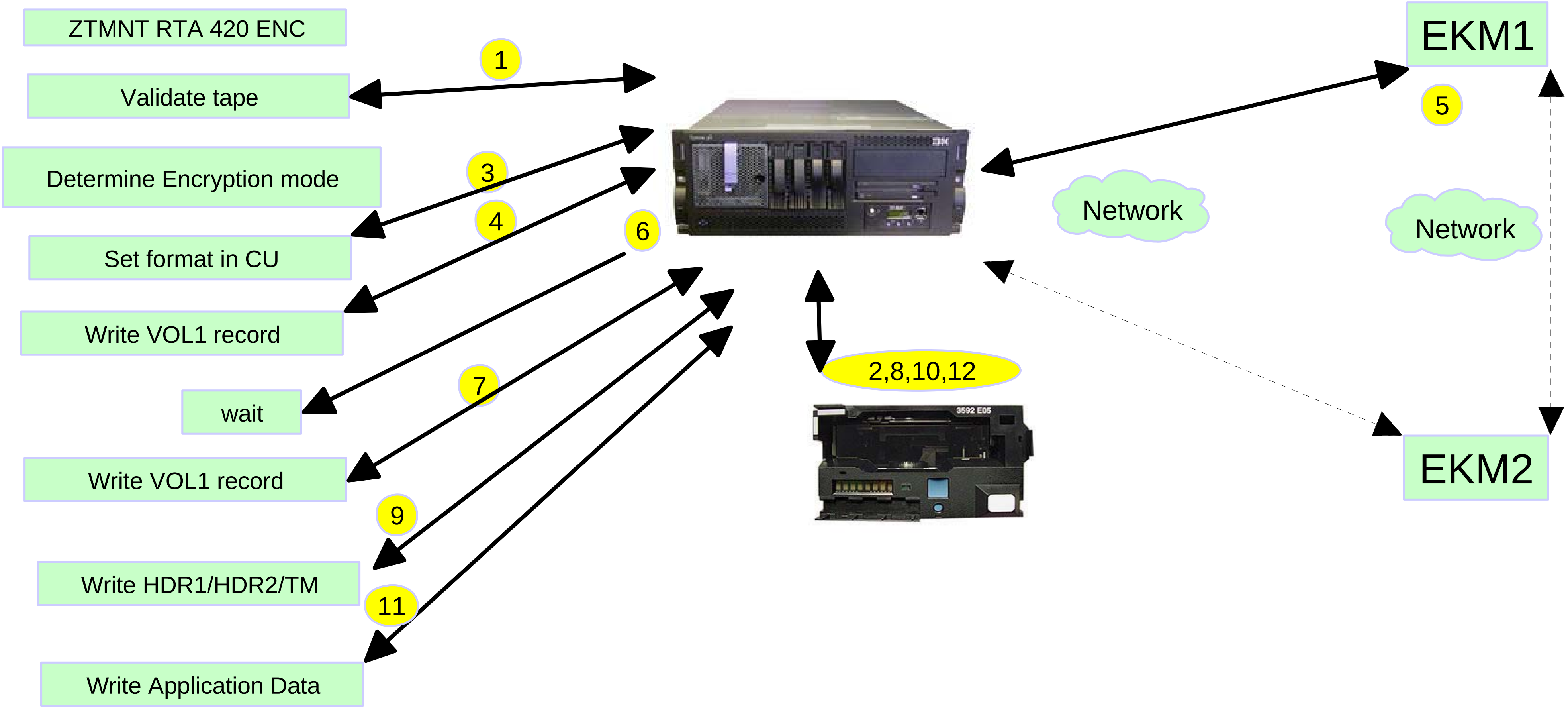
Tape Encryption and TS1120 (3592-E05 emulation) Support

- z/TPF apar PJ31479
- Adds support for TS1120 drives in E05 mode
  - Drives that are Encryption Enabled as well as Encryption Capable
  - 500 gig capacity with standard cartridges
  - 100 gig capacity for short cartridges
  - 700 gig capacity with extended cartridges
- In general
  - New format is F896TRK
  - ENC/NOENC terminology is used throughout z/TPF commands
  - Java based Encryption Key Manager (EKM) is required
  - z/TPF has no knowledge of keys used by the EKM for tape encryption.

Tape Encryption concepts

- EKM resides outside of z/TPF
  - Key negotiation handled between the tape control unit and the EKM over a TCP/IP connection.
  - Runs on a java machine with TCP connectivity to the CU
  - Control unit supports connectivity to two key managers at different IP addresses for redundancy.
    - Key stores must be kept in sync if two EKMs are used
- The decision to encrypt a tape is made at ZTMNT or automount time, it is not controlled by the application.
  - Entire tape is encrypted (aside from the labels)
- Encryption characteristics must match between active and ALT tape for tape switch
  - Standby tapes are always mounted with the same encryption setting as the active.

The picture that's worth 1000 words



What controls the tapes that are encrypted?

- ZTLBL sets attributes for a given tape name
  - Output only
    - Input tapes inherit the attribute of the volume being mounted
    - Just like compaction
  - Existing tapes are NOENC unless altered
  - New tapes are also NOENC unless specified
- ZTMNT can override what is set in the tape label
  - ZTMNT RTA 420 ENC or
  - ZTMNT RTA 420 NOENC
- TOPNC has no control over tape encryption settings
  - Applications do not need to be updated
- If application data is already encrypted then it can be written to any tape
  - The drive does not have to support encryption
  - Data would need to be decrypted by the application when read

How will I know that a tape is encrypted?

- Tape messages will indicate ENC/NOENC to identify the encryption attribute

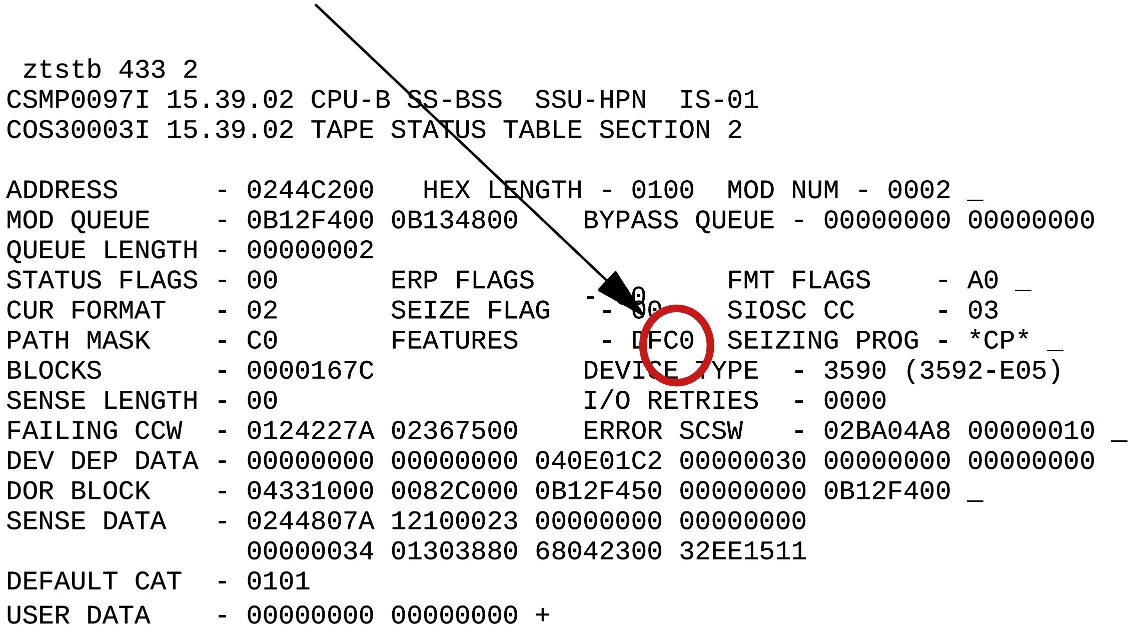
```
COTM0310I 14.50.42 TMNT BSS    TAPE RTL MOUNTED ON DEVICE 0433
          VSN TPF509 G0002 S0001 F896TRK SL B128             2 NOCOMP NOENC
```

- Tape status table section 1, tertiary indicator has a bit that says the current tape is mounted as encrypted
  - Valid for input and output, including ALT
  - bit CT3ENC x'02'

```
COTE0002I 15.39.02 DTAP      - TAPE STATUS

ADDRESS   NAME   SSU    STATUS   TPIND     VOLSER  FORMAT      #BLOCKS LDR

0420      RTA    BSS      AO    00 01 20   A00186   38K2             6 YES
0433      RTL    BSS      AO    22 01 22   TPF509  896TRK         5756 LIB

END OF DISPLAY+
```

How can I tell that a tape drive supports encryption?

- Second features byte in ZTSTB cuu 2 will give encryption capability status
  - This does not mean that the volume currently mounted is encrypted, just that the device is capable of encryption
  - CTS2ENC - X'40'



```
 ztstb 433 2
CSMP0097I 15.39.02 CPU-B SS-BSS  SSU-HPN  IS-01
COS30003I 15.39.02 TAPE STATUS TABLE SECTION 2

ADDRESS       - 0244C200   HEX LENGTH - 0100  MOD NUM - 0002 _
MOD QUEUE     - 0B12F400 0B134800    BYPASS QUEUE - 00000000 00000000
QUEUE LENGTH  - 00000002
STATUS FLAGS  - 00       ERP FLAGS     - 0      FMT FLAGS    - A0 _
CUR FORMAT    - 02       SEIZE FLAG     - 00    SIOSC CC     - 03
PATH MASK     - C0       FEATURES       - DFC0  SEIZING PROG - *CP* _
BLOCKS        - 0000167C            DEVICE TYPE   - 3590 (3592-E05)
SENSE LENGTH  - 00                  I/O RETRIES   - 0000
FAILING CCW   - 0124227A 02367500    ERROR SCSW    - 02BA04A8 00000010 _
DEV DEP DATA  - 00000000 00000000 040E01C2 00000030 00000000 00000000
DOR BLOCK     - 04331000 0082C000 0B12F450 00000000 0B12F400 _
SENSE DATA    - 0244807A 12100023 00000000 00000000
                00000034 01303880 68042300 32EE1511
DEFAULT CAT   - 0101
USER DATA     - 00000000 00000000 +
```

Are encrypted tapes slower?

- Short answer... NO
  - "At all transaction sizes and compression ratios, the TS1120 write data rates with encryption-enabled matches the high write data rates of the TS1120 (non-encrypting) tape drive."
  - ~80 meg/sec with 128K blocksize*
- Long answer... mounts take longer.
  - z/TPF must wait for key exchange between the CU and the EKM
  - z/TPF also must wait for the tape format information to be re-written when a new key is used.
  - Both delays occur when VOL1 is being written
- No delays at tape switch time.
  - This is why ALT tapes are mounted as encrypted or unencrypted

*z/TPF guest under VM... for example purposes only, your mileage may vary

Aside from PJ31479, what else do I need?

- IBM Encryption Key Manager component for the Java platform (EKM)
  - http://www-1.ibm.com/support/docview.wss?&uid=ssg1S4000504
  - The EKM is supported on z/OS, i5/OS, AIX, Linux, HP-UX, Sun Solaris & Windows.
- TCP/IP connectivity from the tape control unit to the EKM above
- TS1120 Encryption Enabled tape drive
- TS1120 model C06 tape controller or 3590-J70 tape controller

Other tape encryption options

- TS7700 (VTS)
  - Encryption support included with the R1.2 code level
    - GA 3/9/07
  - Tape data is written as encrypted when it is moved from cache to tape
  - Requires TS1120 encryption enabled drives as the back end storage for the VTS.
  - Translucent to TPF
    - User exit CORU allows Advanced Policy Managment (APM) attributes to be set when a tape is loaded.
    - TPF 4.1 APAR PJ31643
    - z/TPF APAR PJ31934

- Application encrypted data
  - No specific hardware requirements
  - Application encrypts and decrypts data on its own.

Additional Resources

- IBM System Storage TS1120 Tape Encryption Planning, Implementation, and Usage Guide
  - http://www.redbooks.ibm.com/abstracts/sg247320.html
- TS7700 Encryption Support White Paper
  - ftp://ftp.software.ibm.com/storage/Encryption/TS7700_Encryption_Support_V10.pdf

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