Exploring z/OS SMF 14 / 15 Records for Tape and DASD File Activity

Peter Enrico

Email: Peter.Enrico@EPStrategies.com

Enterprise Performance Strategies, Inc.
3457-53rd Avenue North, #145
Bradenton, FL 34210
http://www.epstrategies.com
http://www.pivotor.com

Voice: 813-435-2297
Mobile: 941-685-6789

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Abstract

Exploring z/OS SMF 14 / 15 Records for Tape and DASD File Activity

The SMF 14 and 15 records are some of the very first SMF records that IBM introduced way back during the dawn of SMF records recording on the MVS platform. Many installations still process and examine these records. Some installations process these records because their data set I/O activity reporting programs are ancient, while others use these measurements because in these records, we find certain measurements not found in any other SMF records.

In this webinar, Peter Enrico will explore these SMF record types, their history, their measurements, and why you may or may not want to use these records to better understand the file I/O activity of your z/OS environments.

Like what you see?

- Free z/OS Performance Educational webinars!
  - The titles for our Winter/Spring/Summer 2022 webinars are as follows:
    - ✓ *SMF Recording Options to Improve Your Performance Analysis*
    - ✓ *SMF 98 and 99: Pinpointing Transient Performance Problems*
    - ✓ *Exploring z/OS Processor Storage Measurements*
    - ✓ *Exploring PR/SM Physical and Logical CPU Utilization Measurements*
    - ✓ *Exploring Locking and Locking Measurements on z/OS (with Bob Rogers)*
    - ✓ *Exploring z/OS SMF 30 Address Space CPU Measurements*
    - ✓ *More Details - Exploring z/OS SMF 30 Address Space CPU Measurements*
    - ✓ *Exploring z/OS WLM CPU Measurements: SUs vs CPU Secs vs APPL% vs Workload%*
    - ✓ *Exploring the Coupling Facility Lock Structure Measurements*
    - ○ *Exploring z/OS SMF 14 / 15 Records for Tape and DASD File Activity*

  - Dozens of past webinars are available at our website.

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SMF 14/15 Records

- The SMF 14/15 records measure file activity
  - SMF 14
    - Written for non-VSAM direct access data sets, tape data sets, or VIO data sets. that are defined by DD statements or dynamic allocation and opened for RDBACK or INPUT processing
    - Written when a data set is closed or processed by EOV

  - SMF 15
    - Written for non-VSAM direct access, or VIO tape data sets that are defined by DD statements or dynamic allocation and opened for OUTPUT, UPDAT, INOUT, or OUTIN processing
    - Written when a data set is closed or processed by the end-of-volume (EOV)

  - The SMF 14/15 records:
    - Have the same mapping as each other
    - Not written for VSAM
    - Not written for a data set defined by a DD* or DD DATA statement.
    - Not written for BPAM if only z/OS UNIX directories are allocated
    - Not written for data sets defined as SYSOUT data sets on DD statements

SMF 14 / 15 Records
Historical Background

Interesting fact:

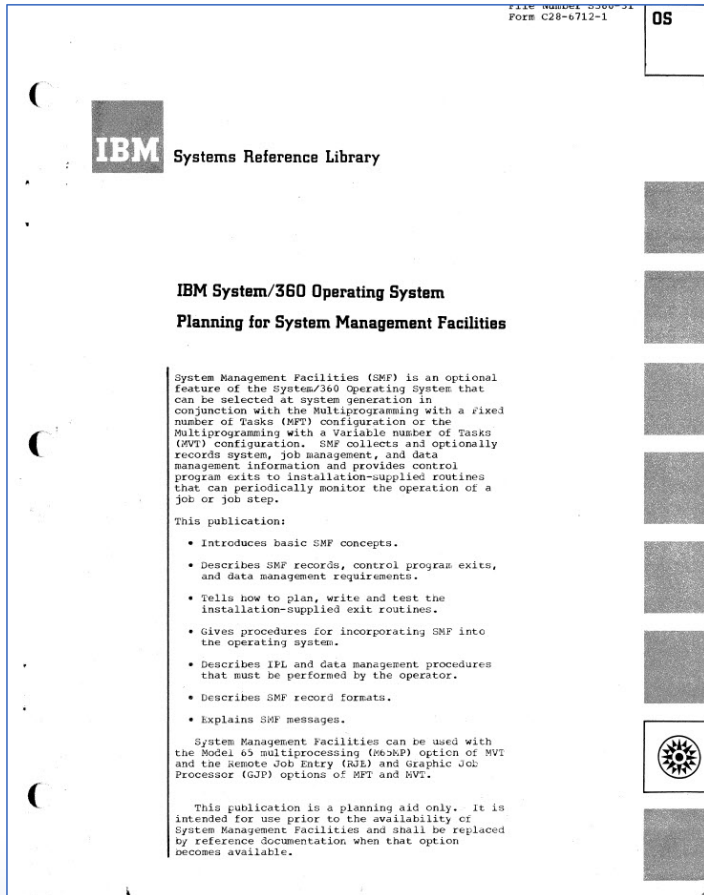The SMF 14 and SMF 15 records were two of the very first SMF record types created.

Created to report on data set and magnetic tape activity.
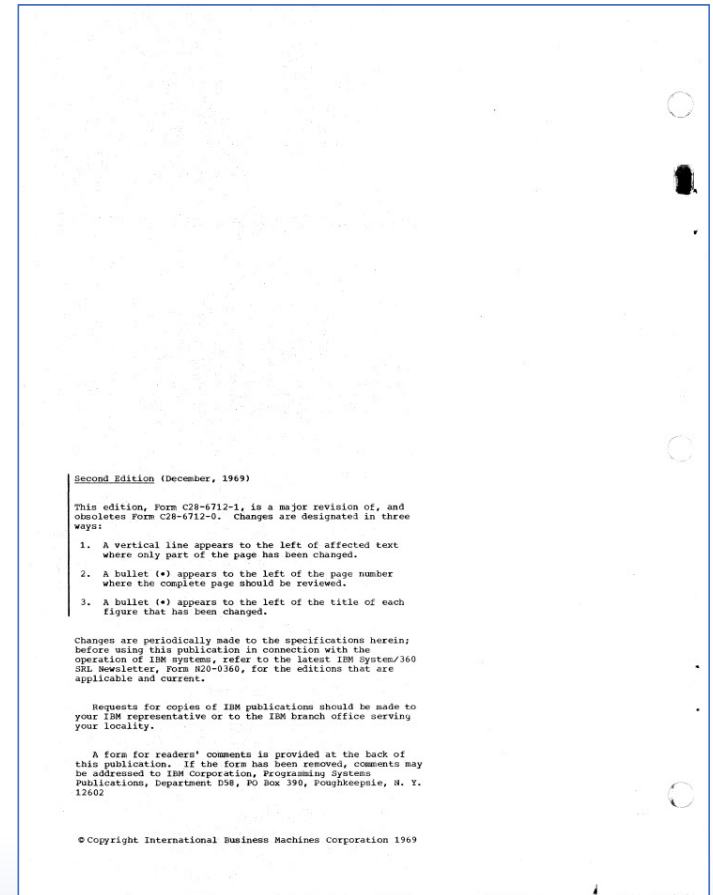
SMF 14/15 Records

- SMF 14/15 records originally contained _partial_ control block dumps of measurements helpful to audit file and hardware usage
    - TIOT - Task Input/Output Table
        - Contextual information for JFCBs and allocated devices
        - Each DD statement has a TIOT
    - JFCB - Job File Control Block
        - Constructed for each dd in a job step
    - DCB/DEB - Data Control Block, and Data Extent Block
        - Data pertinent to the current use of a data set is stored.
        - DEB is extension of the DCB
    - UCB – Unit Control Block
        - Describes the characteristics of a device to the operating system
        - One UCB per device
- Also contained contextual information
    - Dates, times, jobnames, etc.

1969 Second Edition SMF Manual

File Number S360-31
Form C28-6712-1 **OS**

IBM Systems Reference Library

IBM System/360 Operating System

Planning for System Management Facilities

System Management Facilities (SMF) is an optional feature of the System/360 Operating System that can be selected at system generation in conjunction with the Multiprogramming with a Fixed number of Tasks (MFT) configuration or the Multiprogramming with a Variable number of Tasks (MVT) configuration. SMF collects and optionally records system, job management, and data management information and provides control program exits to installation-supplied routines that can periodically monitor the operation of a job or job step.

This publication:

• Introduces basic SMF concepts.

• Describes SMF records, control program exits, and data management requirements.

• Tells how to plan, write and test the installation-supplied exit routines.

• Gives procedures for incorporating SMF into the operating system.

• Describes IPL and data management procedures that must be performed by the operator.

• Describes SMF record formats.

• Explains SMF messages.

System Management Facilities can be used with the Model 65 multiprocessing (M65MP) option of MVT and the Remote Job Entry (RJE) and Graphic Job Processor (GJP) options of MFT and MVT.

This publication is a planning aid only. It is intended for use prior to the availability of System Management Facilities and shall be replaced by reference documentation when that option becomes available.

The figures on this slide are as follows:

• Cover of SMF Manual for IBM System/360

• The copyright stating Second Edition (December 1969)

Second Edition (December, 1969)

This edition, Form C28-6712-1, is a major revision of, and obsoletes Form C28-6712-0. Changes are designated in three ways:

1. A vertical line appears to the left of affected text where only part of the page has been changed.

2. A bullet (•) appears to the left of the page number where the complete page should be reviewed.

3. A bullet (•) appears to the left of the title of each figure that has been changed.

Changes are periodically made to the specifications herein; before using this publication in connection with the operation of IBM systems, refer to the latest IBM System/360 SRL Newsletter, Form N20-0360, for the editions that are applicable and current.

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1969 SMF Manual Table of Contents

**Contents**

The figures on this slide are as follows:

- The complete Table of Contents for the 1969 SMF Manual

- SMF 14 and SMF 15 records were two of the original records

- This does explain why they are 'odd' set of records
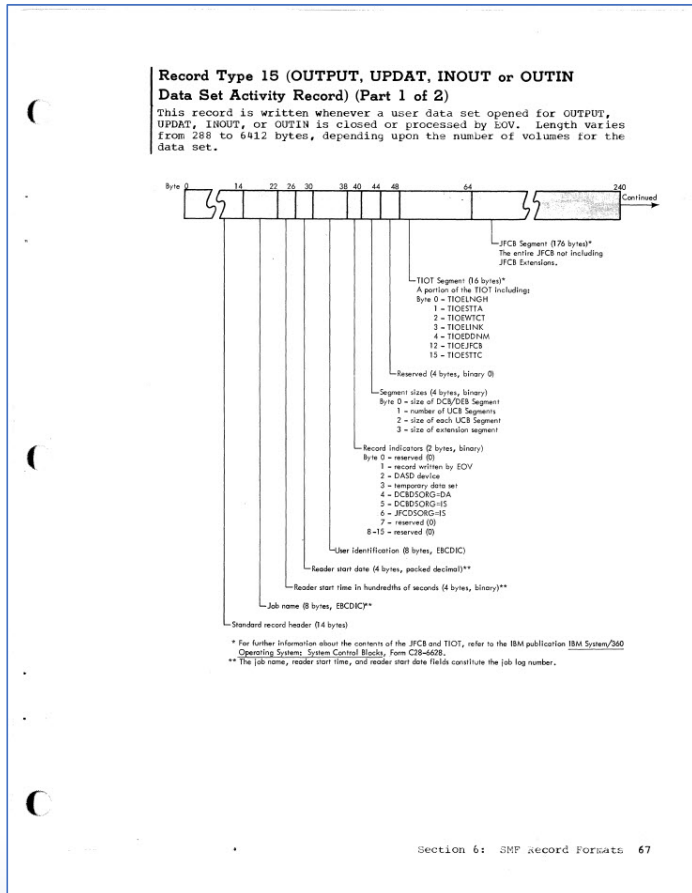
1969 SMF Manual – SMF 14 Documentation
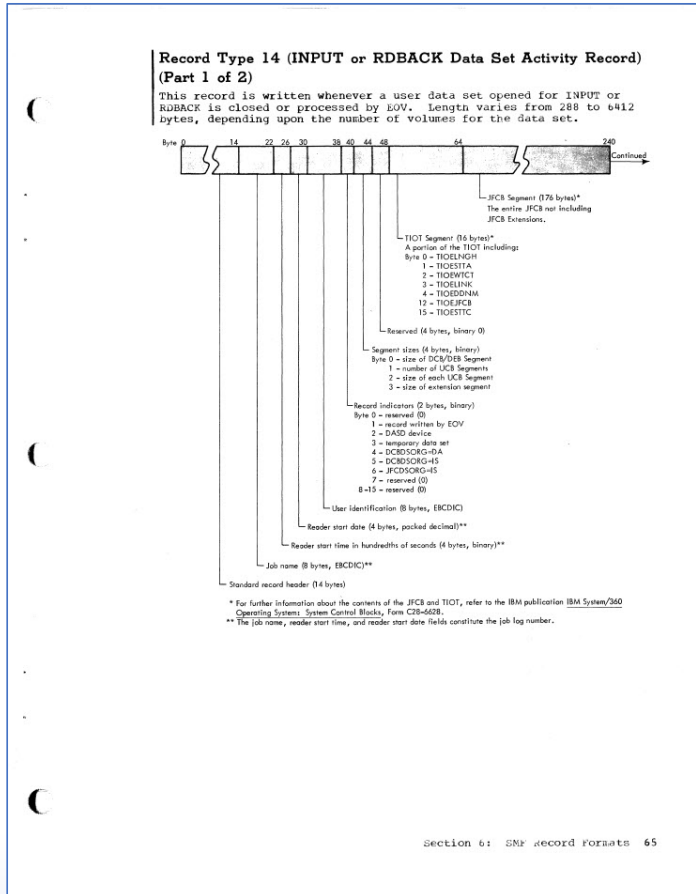
The figures on this slide are as follows:

- The complete documentation of the SMF 14 record.

- This was before field descriptions were documented in the SMF manual

- Field descriptions were from the control block documentation
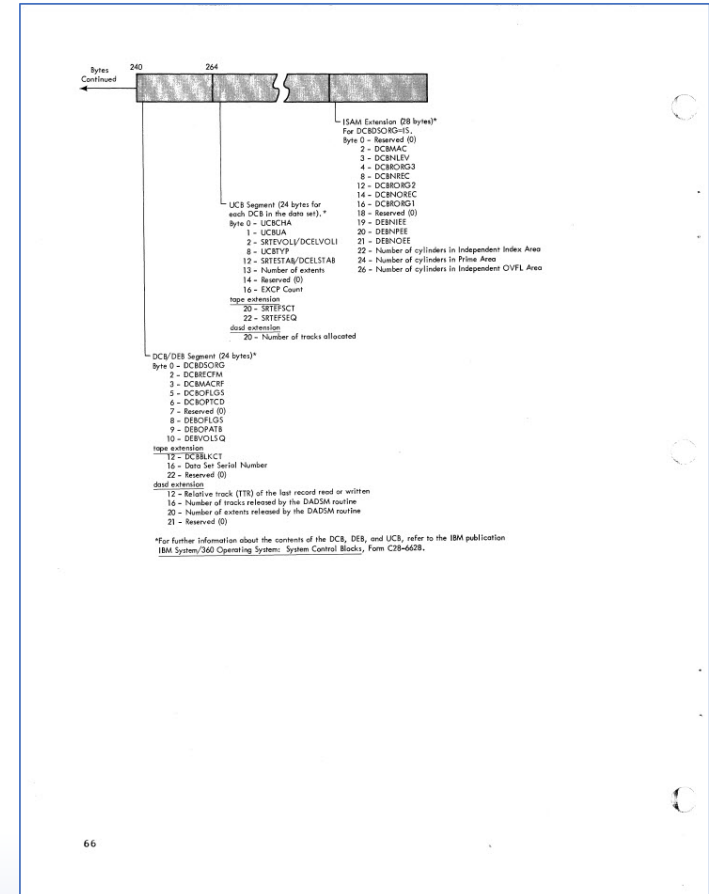
1969 SMF Manual – SMF 15 Documentation

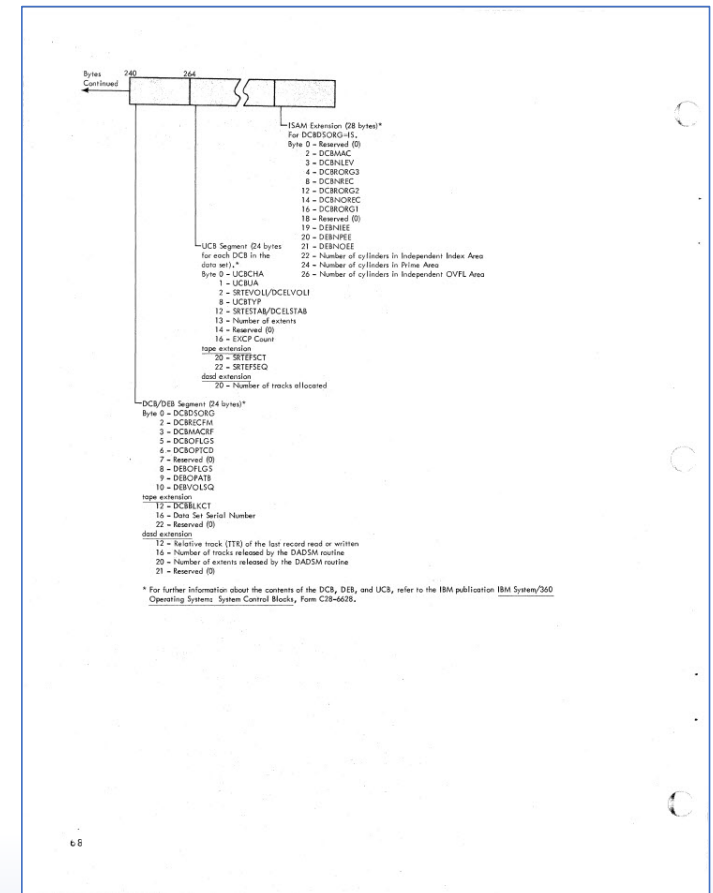The figures on this slide are as follows:

- The complete documentation of the SMF 15 record.

- This was before field descriptions were documented in the SMF manual

- Field descriptions were from the control block documentation

SMF 14/15 Today

- Today, the SMF 14/15 still contain the traditional partial measurements
  - TIOT, JFCB, DCB/DEB,UCB

- But also contain additional sections for more 'modern day' data set usage
  - Type 1 - Compressed format data set section
  - Type 2 - SMS Class Section
  - Type 3 - Step Information Section
  - Type 4 - ISO/ANSI Version 4 CCSID Information Section (tape)
  - Type 5 - Additional data set characteristics section
  - Type 6 - PDSE Statistics Section
  - Type 7 - Tape Encryption Data Section
  - Type 8 - RAS Section (basically failure condition flags)
  - Type 9 - DASD Data Set Encryption Information

Usages for SMF 14 / 15 Records

Presenter Note:

- Admittedly, I do not look at the SMF 14/15s much
  - Nearly never for DASD data sets
  - Tape data sets for tape demographics

- Instead
  - DASD data set activity
    - SMF 42.6 records for DASD data set I/O statistics
    - Created in the late 1980s to address the limitations and complexities of the SMF 14/15 records
    - Many other SMF records for all file types and usage for modern day data sets

  - Tape activity
    - Tape subsystems now are virtual, and for this people analyze
      - TMC data – tape management catalogs
      - BVIR data – Bulk Volume Information Retrieval
        - Information about the logical volumes managed by a virtual tape server (VTS)
      - And various tools to analyze tape data

Primary SMF 14/15 Recommendation

- For a variety of reasons, many users use the SMF 14/15 records
  - Ancient SAS, MXG, MICS programs
  - Older internal tools and older programs
  - 'Seasoned' data analysts that are just comfortable with the SMF 14/15 records

- Much traditional SMF 14/15 analysis can be done with modern SMF records
  - Example:
    - SMF 42.6 – DASD data set activity
    - SMF 60-64 – Various VSAM, VSAM catalog activities
    - SMF 92 – File system activity
    - DCOLLECT
    - Various other records for auditing and batch analysis
    - Vendor tools
    - Various VTS analysis tools and programs

- My recommendation: Explore the more modern records
  - DASD and tape data set usage today has been modernized, and this means the data analysis programs to analyze this usage should also be modernized

Why Use the SMF 14/15 Record

- To better understand
  - Data set usage profiles
    - What is modifying, allocating, deleting files
  - Demographics of data set media, location, etc.
  - To help determine if a file is on the right medium

  - Admittedly, with the advent of Solid State Devices (SSDs), PAVs, Virtual Tape(VTS), and other technologies, the criticality of placement is less today than it was, say, 20+ years ago
    - But still critical and important to know

Typical Traditional SMF 14/15 Questions

- Who / what is accessing certain data sets?
- Who / what is allocating, modifying, deleting data sets?
  - Example: What is putting files into a storage pool, and pool is running out of space.
    - Who did this?
- What files are used, and when, during a batch application cycle
  - Some batch optimization tools use the SMF 14/15 records
- UCB usage for Tape
  - IBM VTSes came with 256 virtual addresses, so that's quite a lot of tape jobs you could theoretically be running at once.
- Help identify bad JCL
  - Example: unnecessary DISP=OLD
- Understanding tape mount demount activity
- Data set placement for performance
- Excessive Opens and Closes

Typical Traditional SMF 14/15 Questions

- Are files on the right medium
  - Data sets on DASD that should be on DASD
  - Data sets on Tape that should be on Tape
  - Datasets on DASD that should be on Tape
  - Datasets on Tape that should be on DASD

- Example: Identify data sets on DASD that should be on Tape
  - Write once, read seldom
  - If open only for reads, then maybe leave on Tape, otherwise DASD

- Example: Identify data sets on Tape that should be on DASD
  - If data set is written once, read often
  - If data set is written and read often
  - If batch jobs / cycles with lots of simultaneous reads
  - If a file has excessive opens and closes
  - If writing many small files one at a time during a batch cycle
  - If a tape data set has many mounts, then may want to put on DASD
  - If there is a shortage of tape addresses / UCBs
    - Example: Job step uses 10 'tape drives' (so 10 UCBs), and one file has lots of data and I/O and takes a long time to process. The smaller files could still be held.

Report Examples

None of these example too interesting since they are for Tape

We use other records for DASD data set analysis

Questions?