



Introduction to the new mainframe

Chapter 7: Batch processing and the Job Entry Subsystem (JES)



Chapter 7 objectives

Be able to:

- Give an overview of batch processing and how work is initiated and managed in the system.
- Explain how the job entry subsystem (JES) governs the flow of work through a z/OS system.



■ Key terms in this chapter

- batch processing
- execution
- initiator
- job
- job entry subsystem (JES)
- output
- procedure
- purge
- queue
- spool
- symbolic reference
- workload manager (WLM)

What is batch processing?

Much of the work running on z/OS consists of programs called *batch jobs*.

***Batch processing* is used for programs that can be executed:**

- With minimal human interaction
- At a scheduled time or on an as-needed basis.

After a batch job is submitted to the system for execution, there is normally no further human interaction with the job until it is complete.

What is JES?

In the z/OS operating system, *JES* manages the input and output job queues and data.

JES handles the following aspects of batch processing for z/OS:

- Receives jobs into the operating system
- Schedules them for processing by z/OS
- Controls their output processing

What is JES? (continued)

z/OS offers two types: JES2 and JES3

Some important differences, but both JES2 and JES3:

- Accept and queue jobs submitted for *execution*
- Queue jobs for an *initiator* -- a JES program that requests the next job in the queue
- Accept *output* from a job while it is running and queue the output
- Can print the output, or save it on *spool* for an output manager to retrieve.

What is JES? (continued)

```

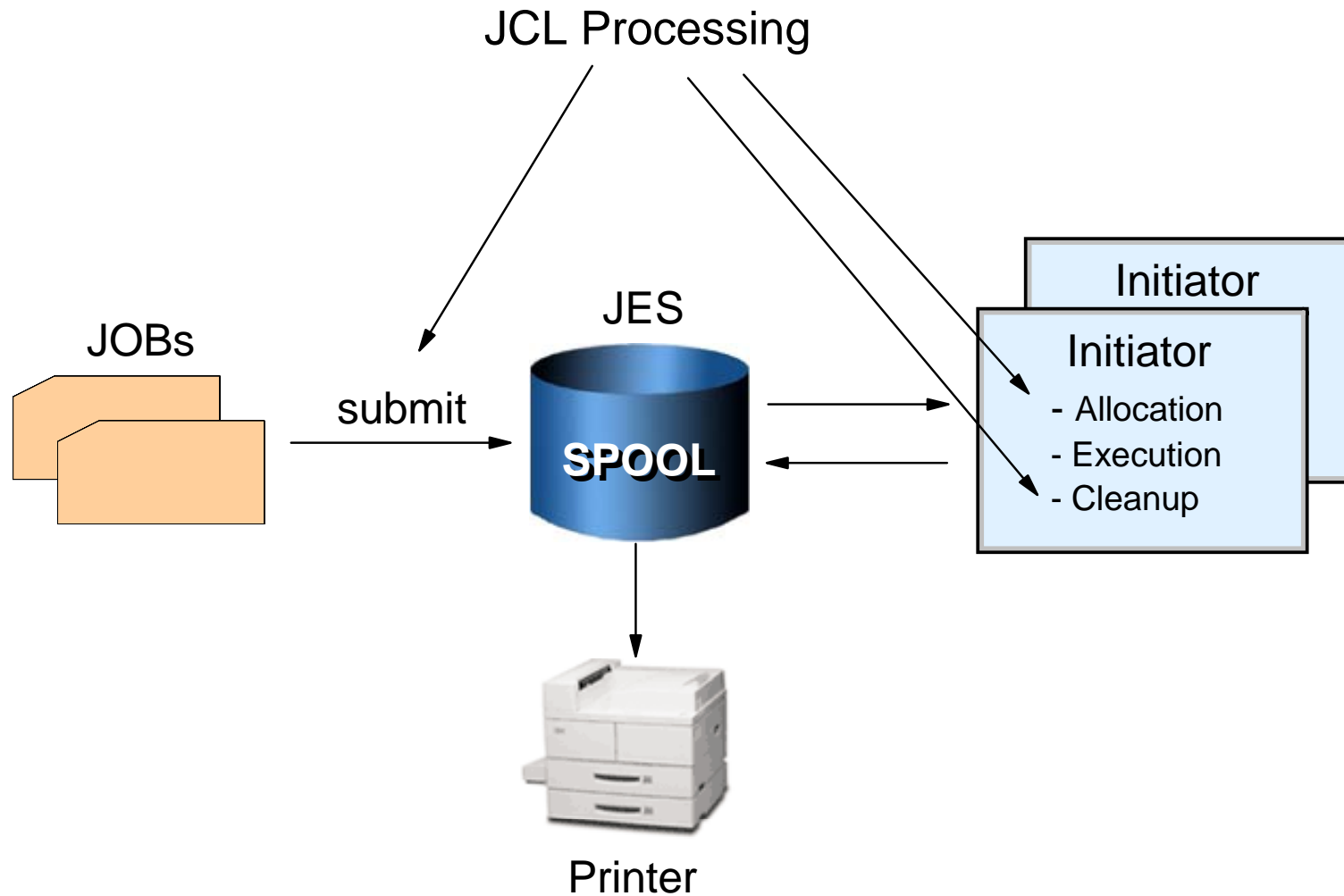
  _Display  _Filter  _View  _Print  _Options  _Search  _Help
-----
SDSF INITIATOR DISPLAY  SC80                LINE 1-17 (100)
COMMAND INPUT ==>          SCROLL ==> PAGE
NP      ID Status      Classes  JobName  Stepname ProcStep JobID    C ASID ASID
   1    1 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 29 001D
   2    2 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 39 0027
   3    3 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 40 0028
   4    4 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 54 0036
   5    5 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 55 0037
   6    6 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 56 0038
   7    7 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 57 0039
   8    8 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 58 003A
   9    9 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 59 003B
  10   10 INACTIVE     ABC      ABC      ABC      ABC      ABC      C 60 003C
      F INACTIVE     F        F        F        F        F        F 61 003D
      F INACTIVE     F        F        F        F        F        F 62 003E
      F INACTIVE     F        F        F        F        F        F 63 003F
      F INACTIVE     F        F        F        F        F        F 64 0040
      F INACTIVE     F        F        F        F        F        F 65 0041
      F INACTIVE     F        F        F        F        F        F 66 0042
      F INACTIVE     F        F        F        F        F        F 67 0043

F1=HELP      F2=SPLIT      F3=END      F4=RETURN    F5=IFIND    F6=BOOK
F7=UP        F8=DOWN       F9=SWAP     F10=LEFT     F11=RIGHT   F12=RETRIEVE

MA  A                                               04/021

```

Batch flow (simplified)



■ What is spooling?

***Spooling* is a method for queuing and holding data for input or output.**

JES uses one or more disk data sets for spooling.

Input jobs and printed output from many jobs are stored in the single (conceptual) spool data set.

What an initiator does

To run multiple jobs asynchronously, z/OS uses initiators to:

- **Ensure that jobs do not conflict in data set usage**
- **Ensure that single-user devices (tape drives) are allocated correctly**
- **Find executable programs requested by jobs**
- **Clean up after the job ends and request the next job**

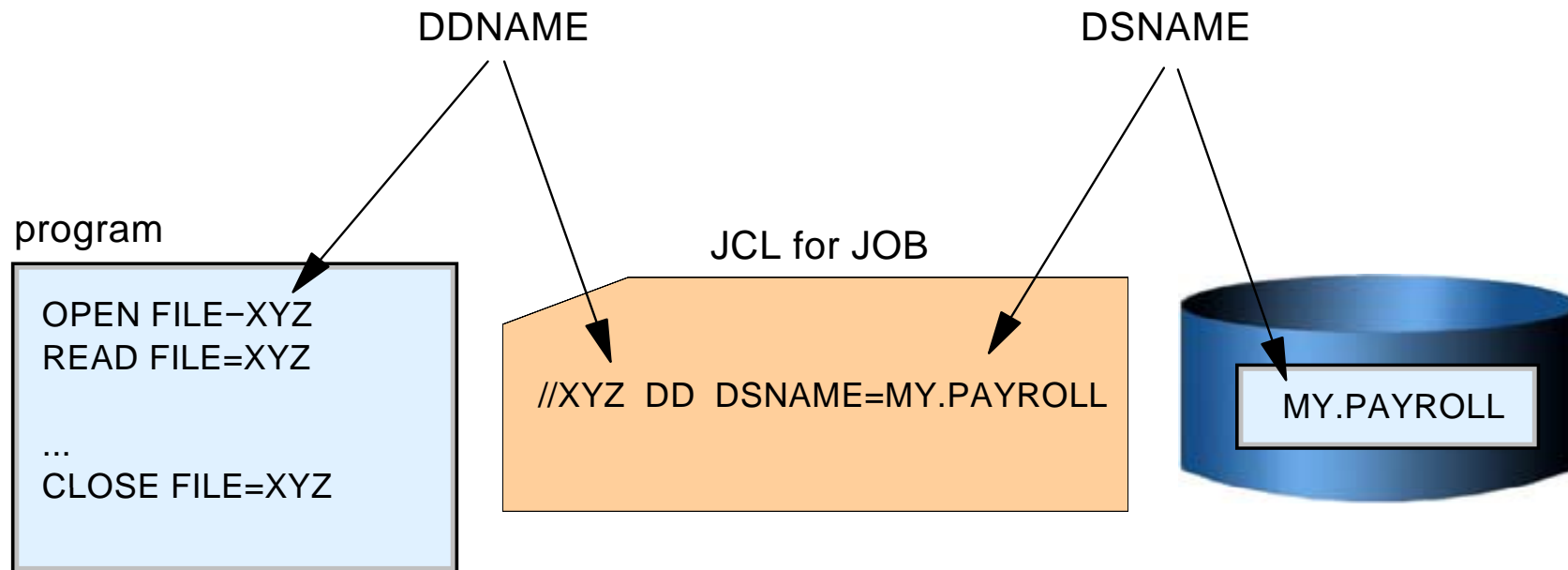
Preventing two users from accessing the same data at the same time is critical to z/OS and the ability to do this is one of the defining characteristics of the operating system.

■ Symbolic references to files

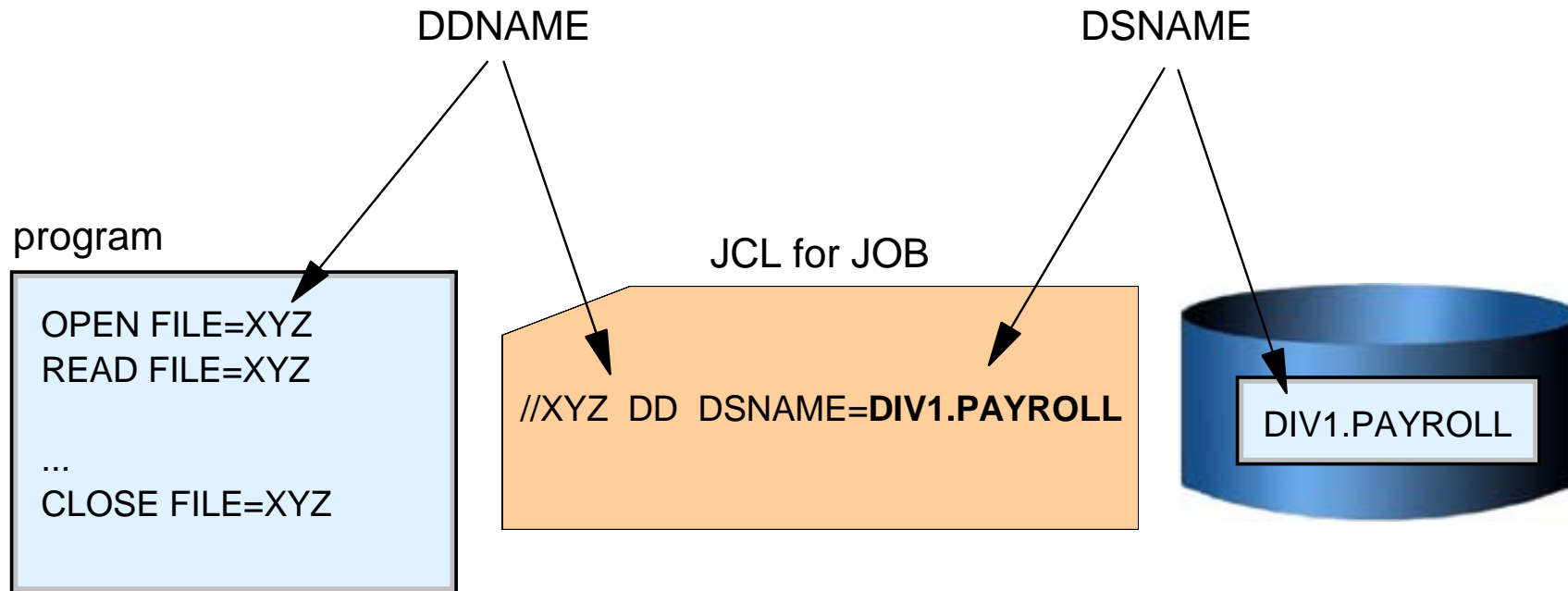
z/OS normally uses *symbolic references* to files (data sets) rather than actual file names.

The use of symbolic references provides a naming redirection between a data set-related name used in a program and the actual data set used during execution of that program.

How a symbolic file system is used



How a symbolic file system is used (continued)



JES, job management, and JCL

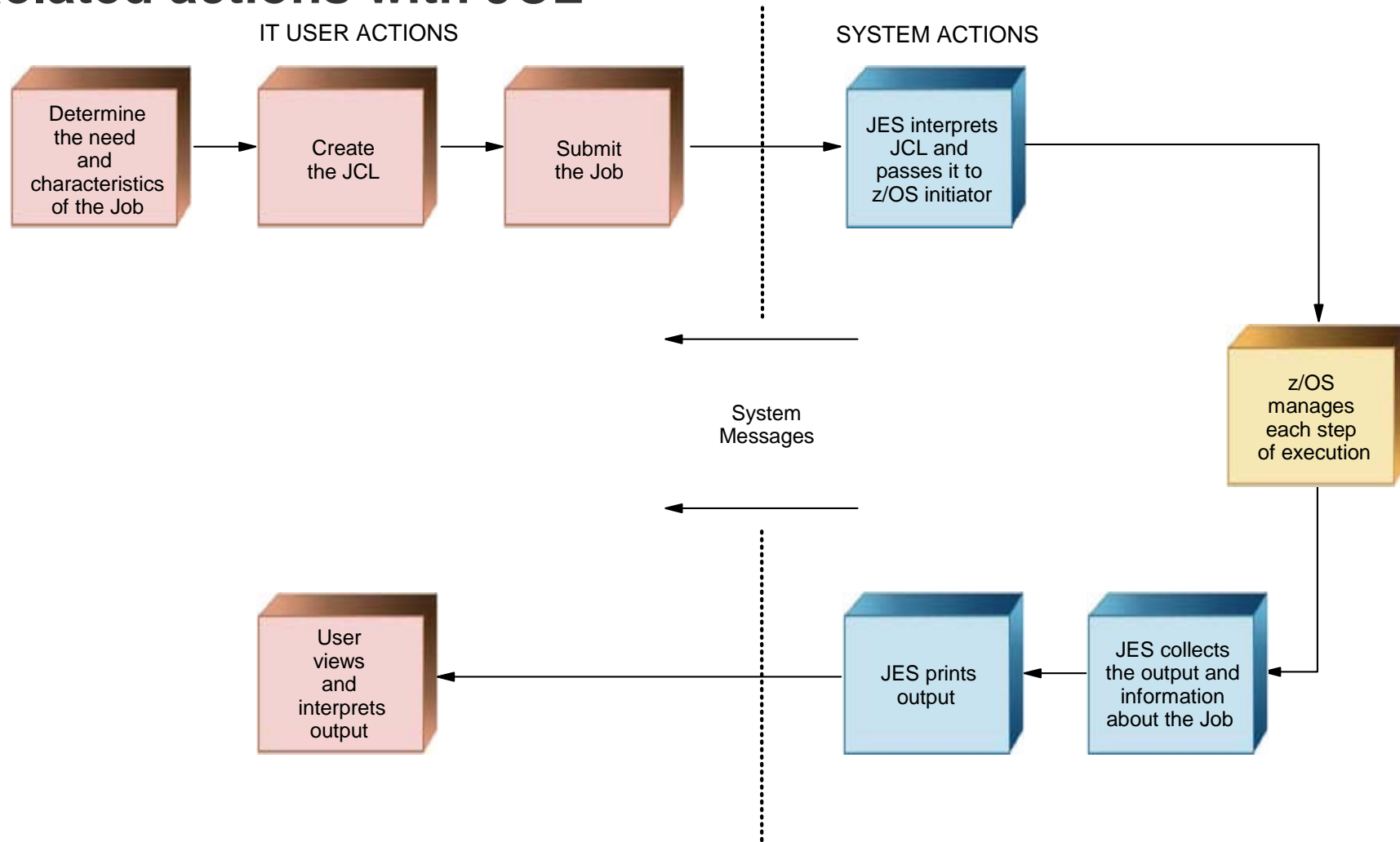
Job control language (JCL) is the language used by a batch job to request resources and services from the operating system.

Through JCL, you specify:

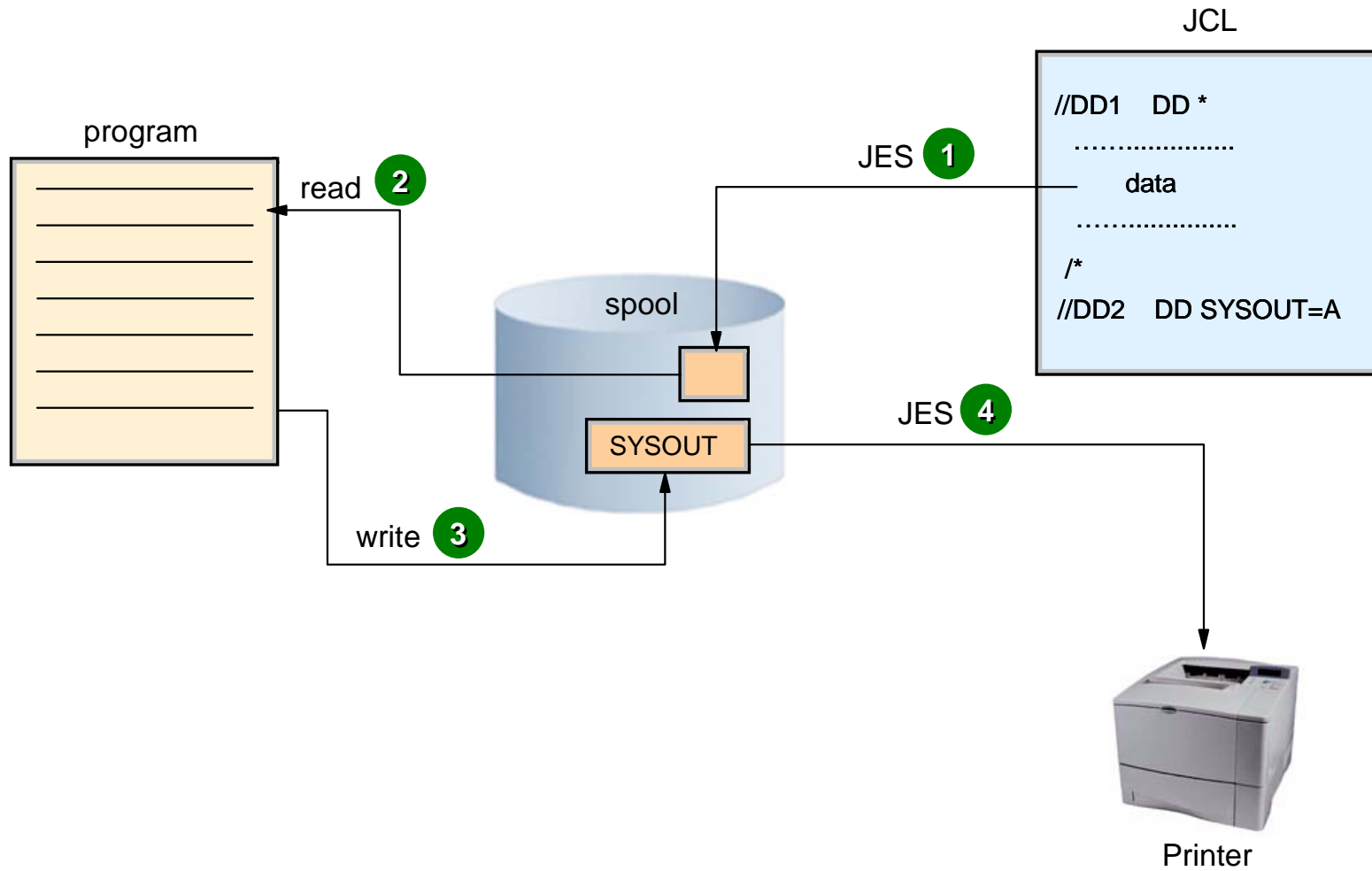
- **Who you are (important for security reasons).**
- **Which resources (programs, files, memory) and services are needed from the system to process your program.**

The use of JCL is covered in detail in the next module.

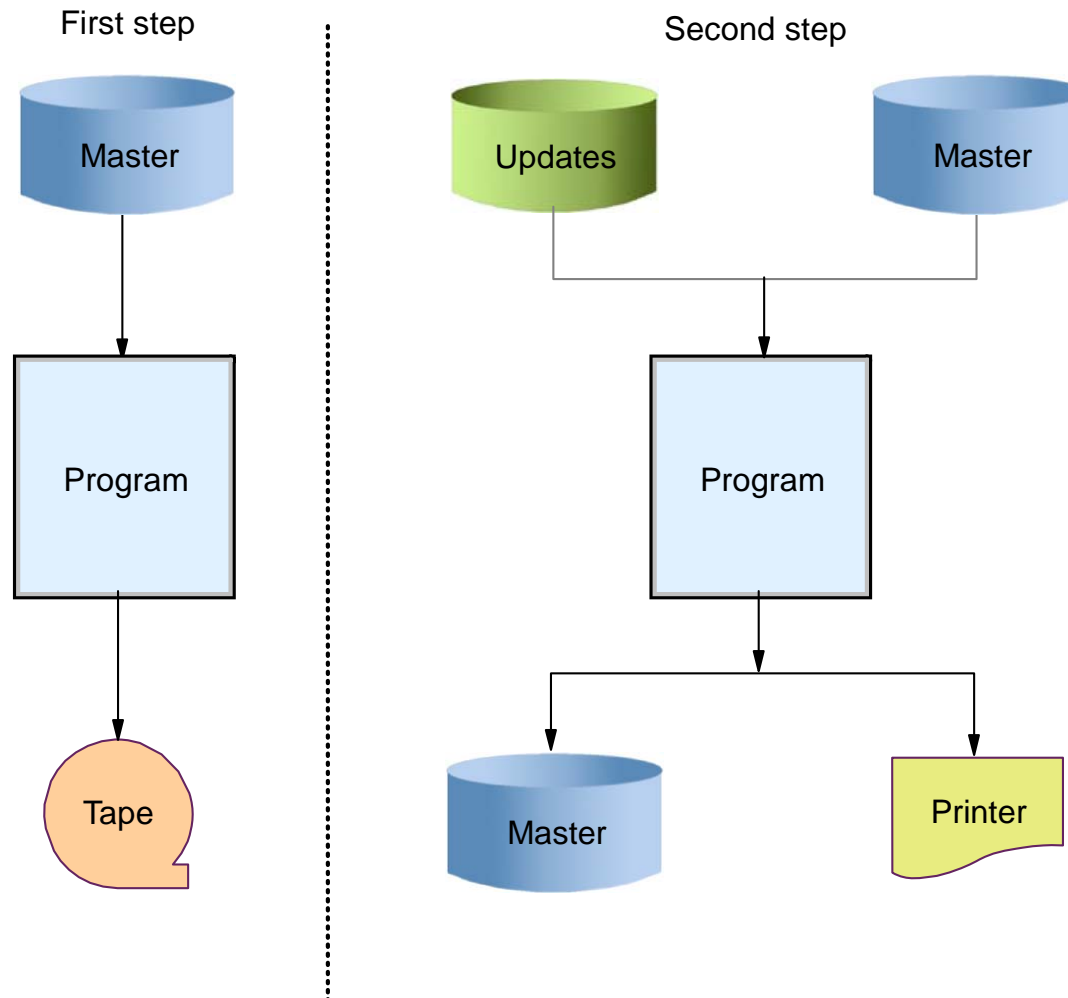
Related actions with JCL



Spooling



Two-step job

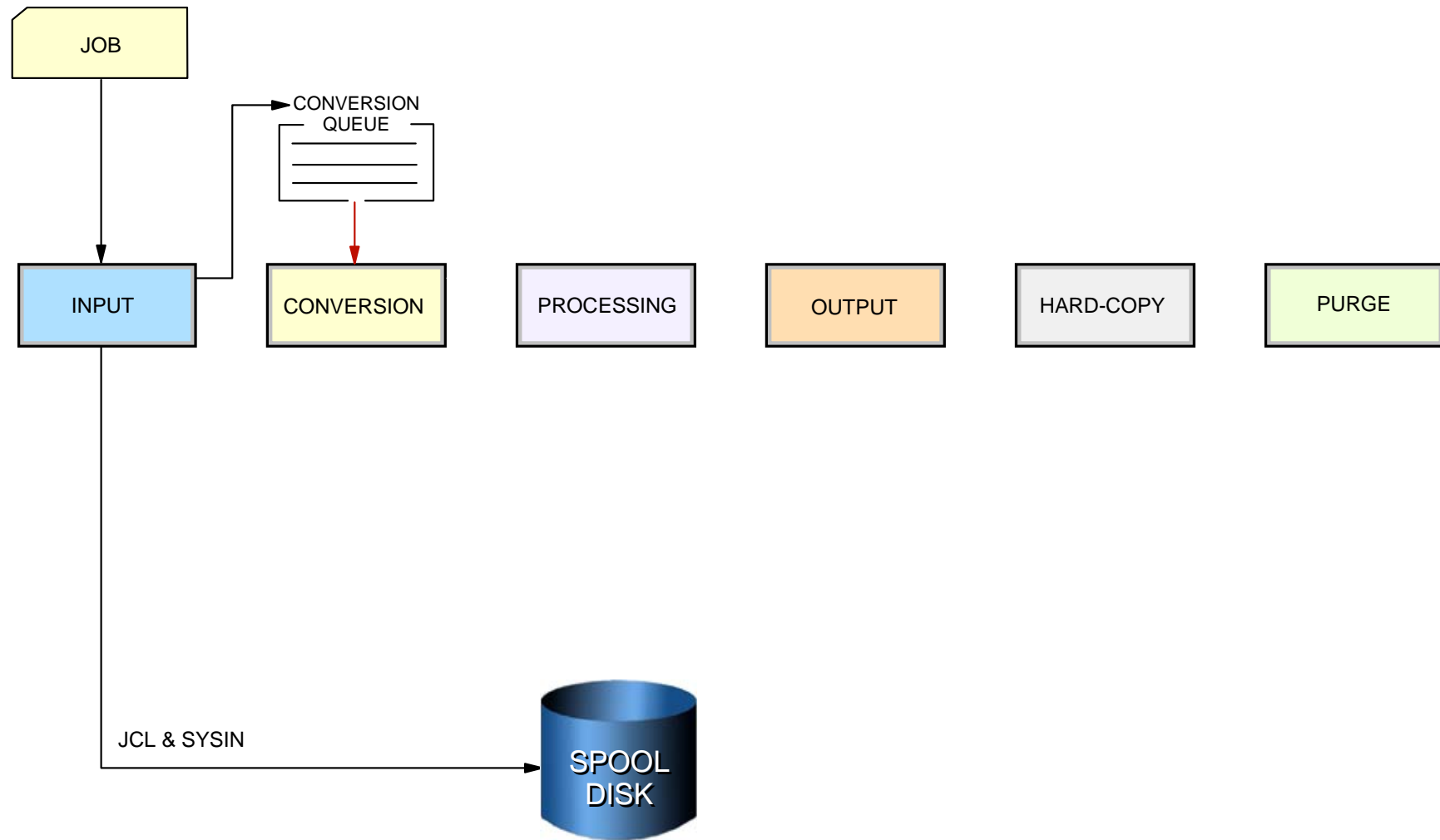


Job flow through the system

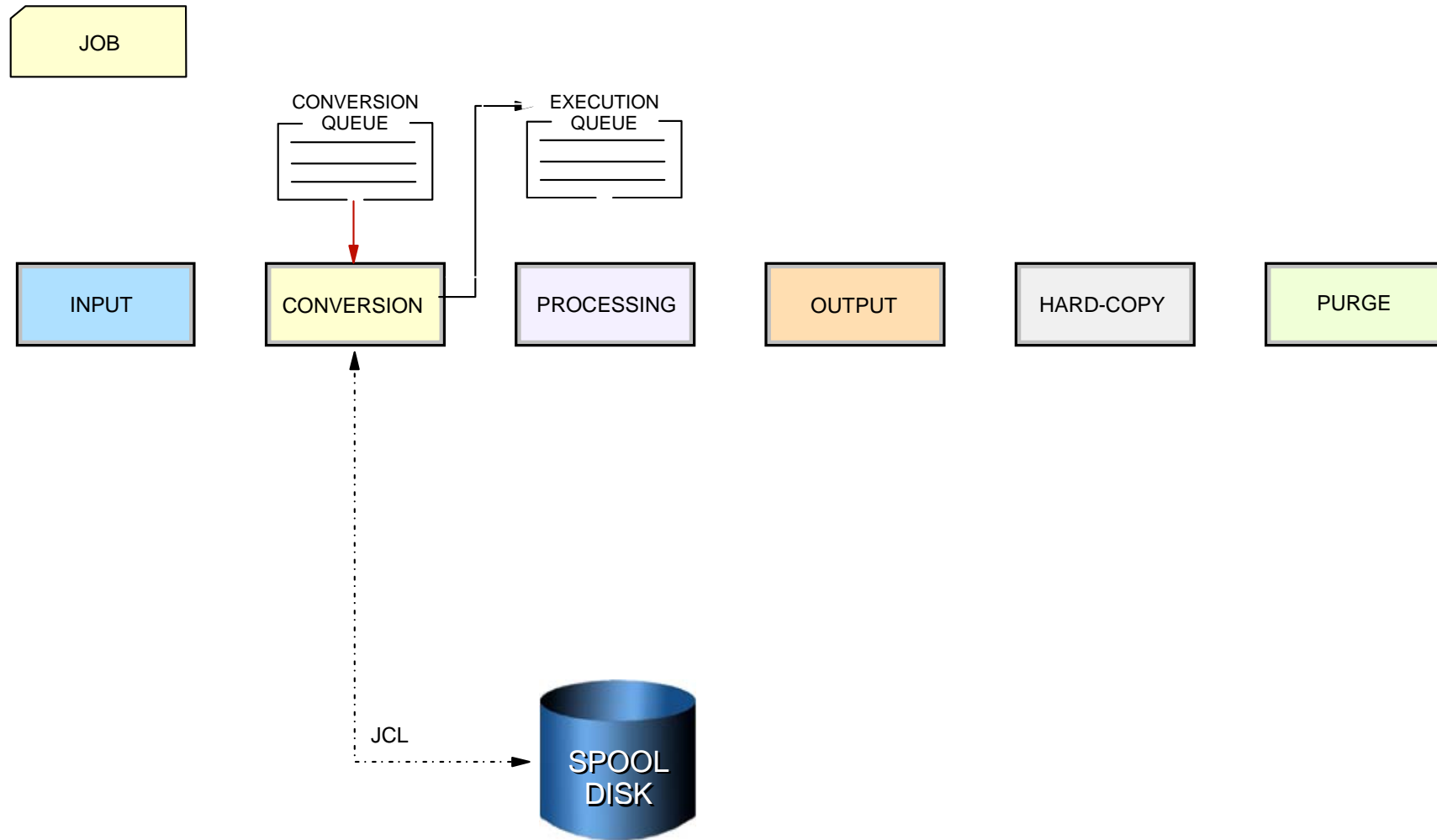
During execution, a job goes through the following phases:

- **Input**
- **Conversion**
- **Processing**
- **Output**
- **Print (to hardcopy or a console display)**
- **Purge**

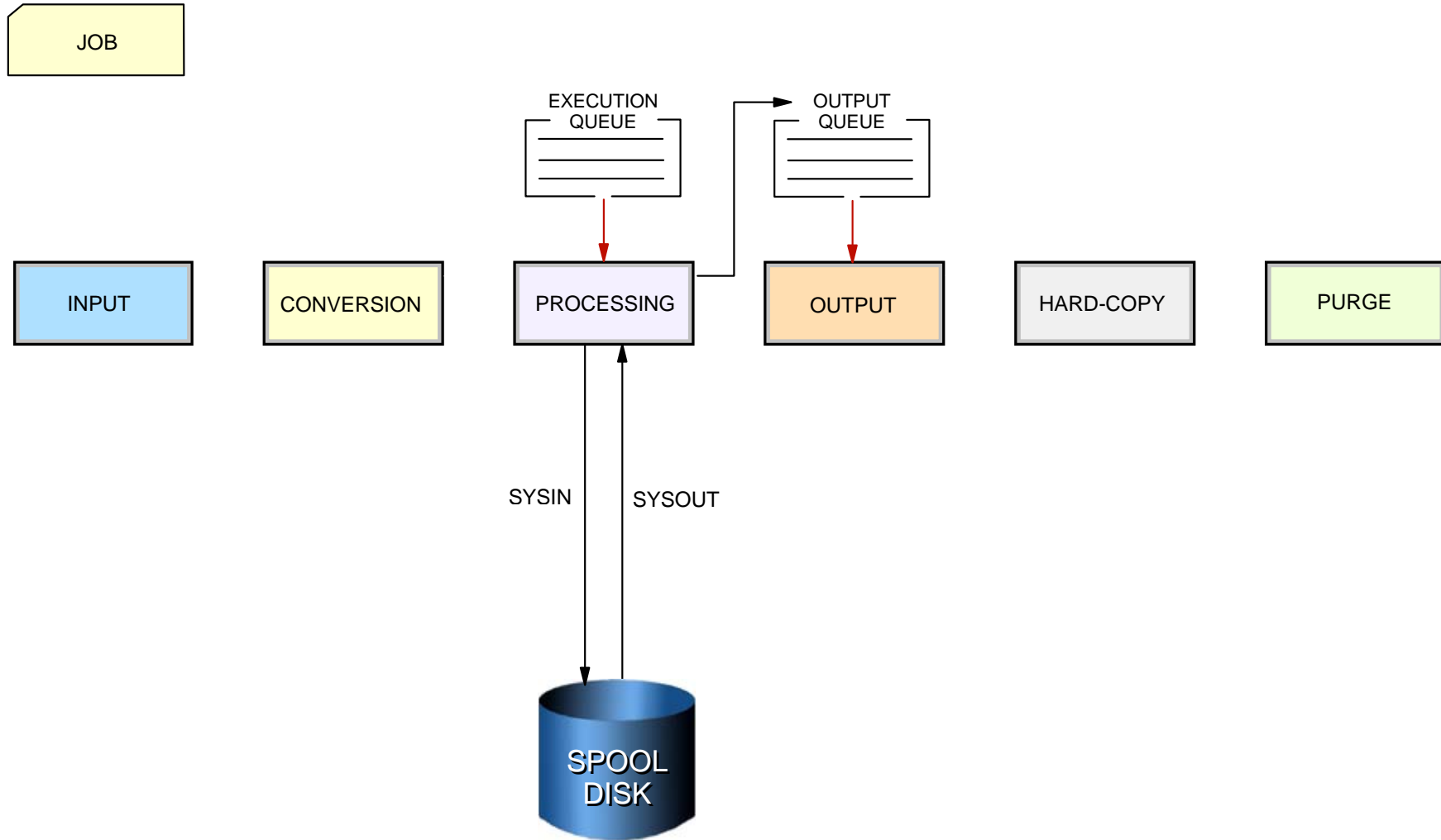
Phases of job flow: input



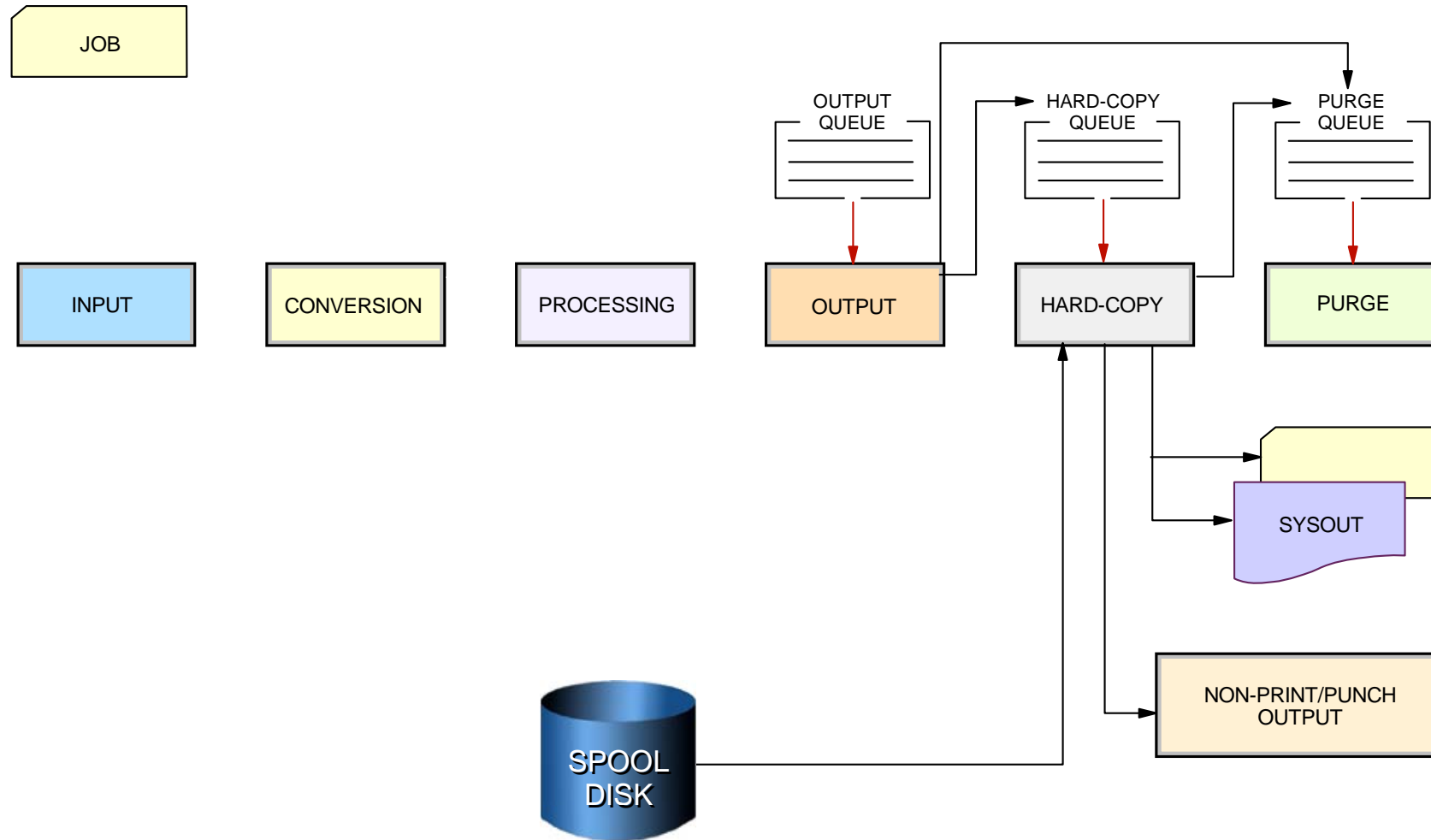
Phases of job flow: conversion



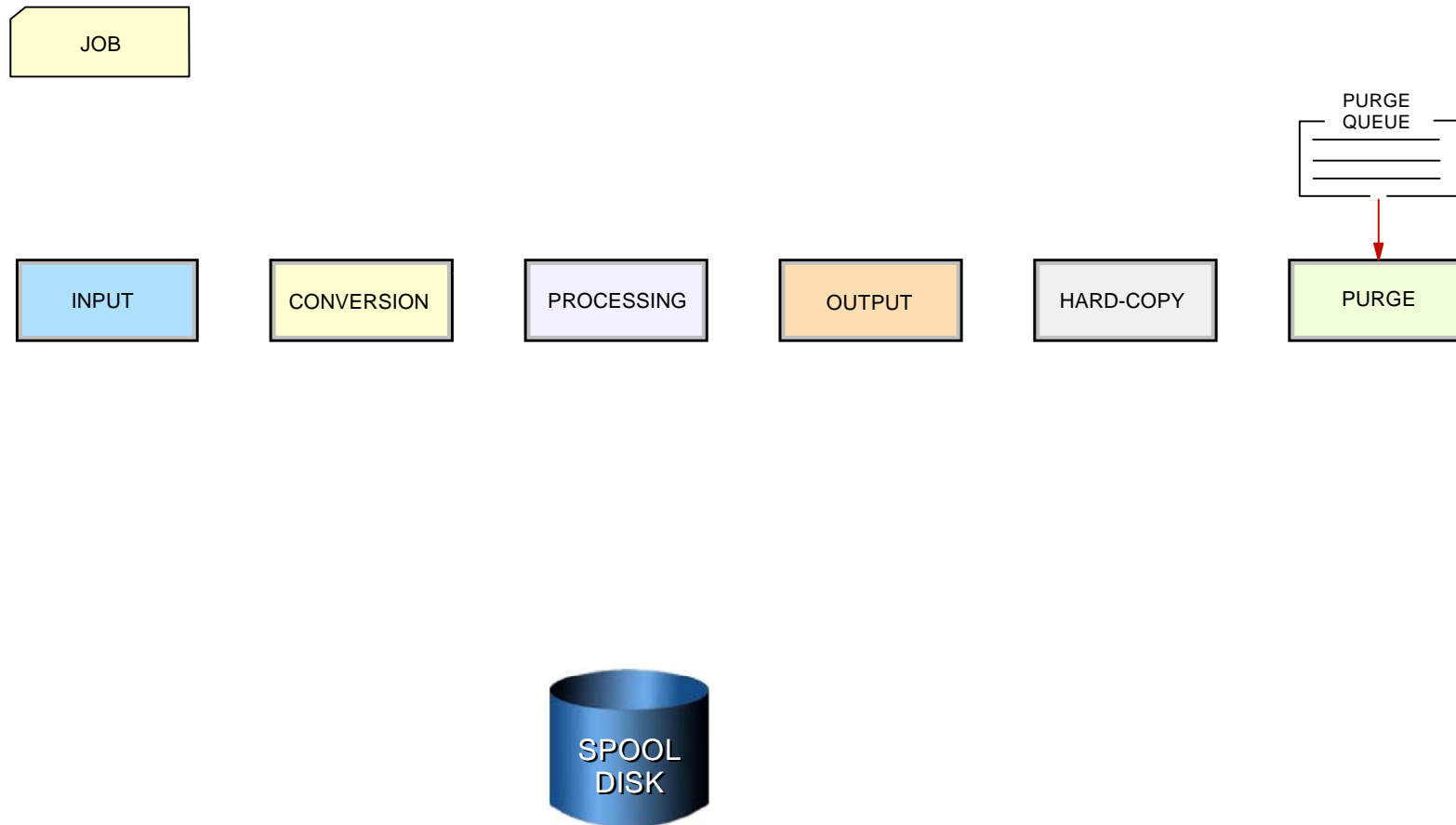
Phases of job flow: execution



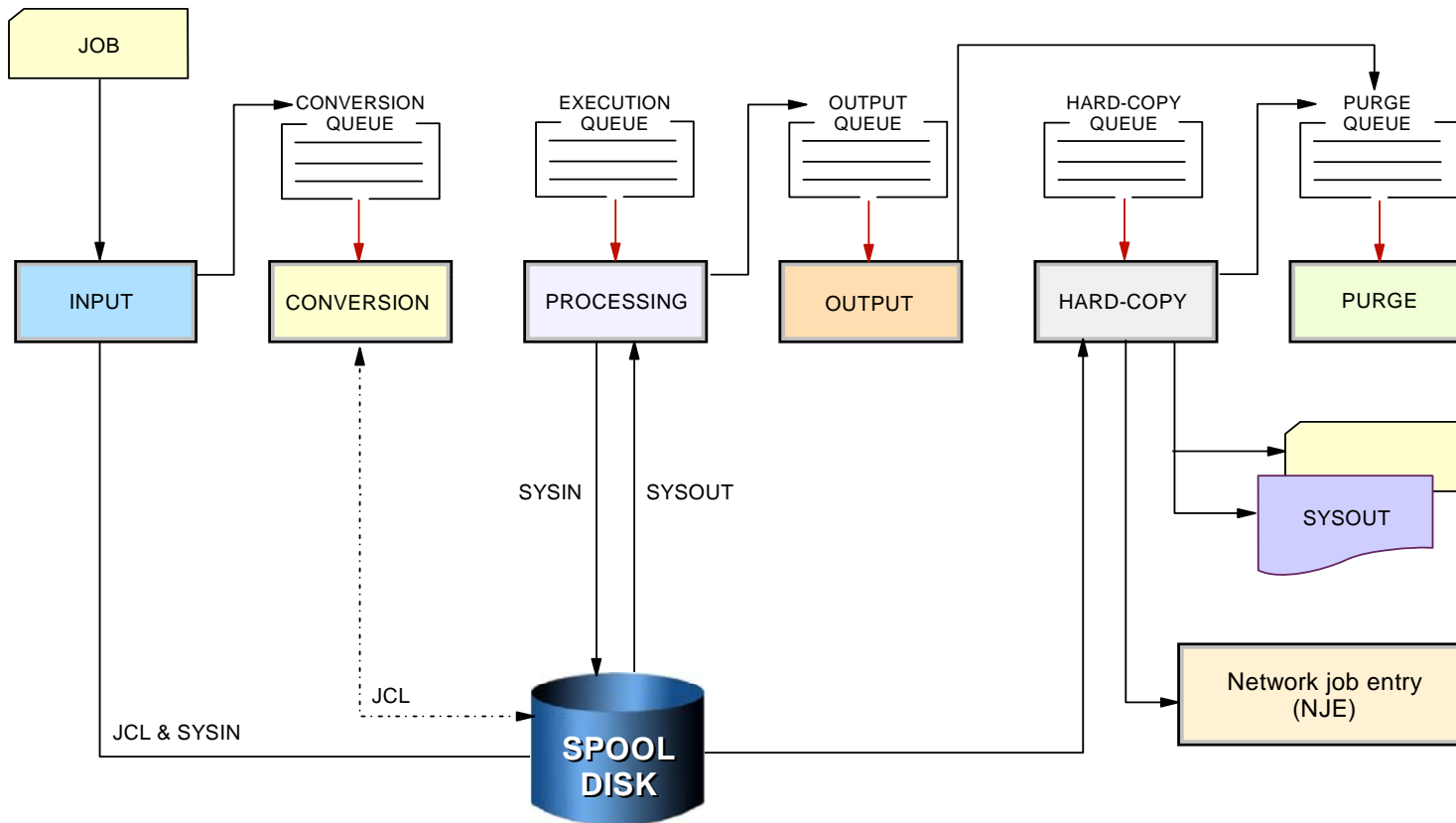
Phases of job flow: output and hardcopy



Phases of job flow: purge



Job flow through the system



JES2 compared to JES3

In a multi-processor configuration:

JES2:

- Each JES2 processor controls its own job input, job scheduling, and job output processing.
- It is possible to configure JES2 to share spool and checkpoint data sets with other JES2 systems (multi-access spool or MAS).

JES3:

- Centralized control over processing through a single global JES3 processor, which does job selection, scheduling, and device allocation the other JES3 systems.
- The centralized control of JES3 provides increased job scheduling control, deadline scheduling capabilities, and increased control by providing its own device allocation.

Most installations use JES2, as do the examples in this text.

■ What is workload manager?

Workload manager (WLM):

- **The component of z/OS that manages the processing of workload in the system according to the company's business goals, such as response time.**
- **Also manages the use of system resources, such as processors and storage, to accomplish these goals.**

Summary

- **Batch processing is a fundamental function of z/OS.**
- **z/OS shares with JES the management of jobs and resources.**
- **JES receives jobs into the system, schedules them for processing, and controls their output.**
- **JES manages jobs in queues.**
- **An initiator sets up the necessary environment for running a batch job. Multiple initiators permit the parallel execution of batch jobs.**
- **During the life of a job, both JES and the z/OS base control program control different phases of the overall processing.**