Design methods: JSP and JSD†

- Stands for: *Jackson Structured Programming* and *Jackson System Development.*
- Primary applicable notations:
  - *System specification diagrams* (SSDs), correspond roughly to DFDs.
  - *Entity-structure diagrams* (ESDs), process interpretation of structure diagrams.
  - Pseudo-code.
- Overall objective: *Derive complete detailed design from requirements specification in the case of JSD; derive pseudo-code for an individual process in an SSD, in the case of JSP.*

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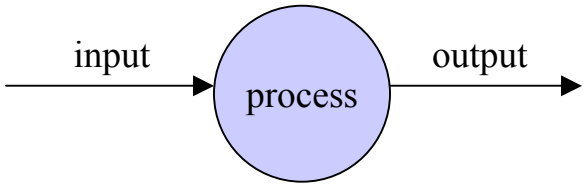
† Material from text by Budgen and from "Software Engineering Concepts", by Richard Fairley.

JSP: Overall process

Starting with

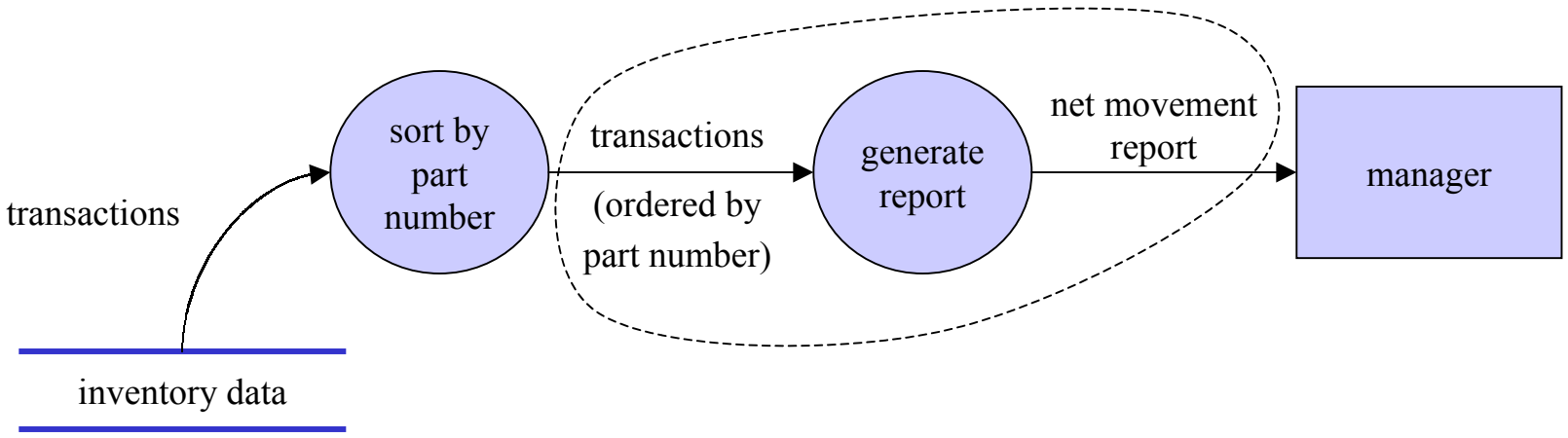


proceed as follows:

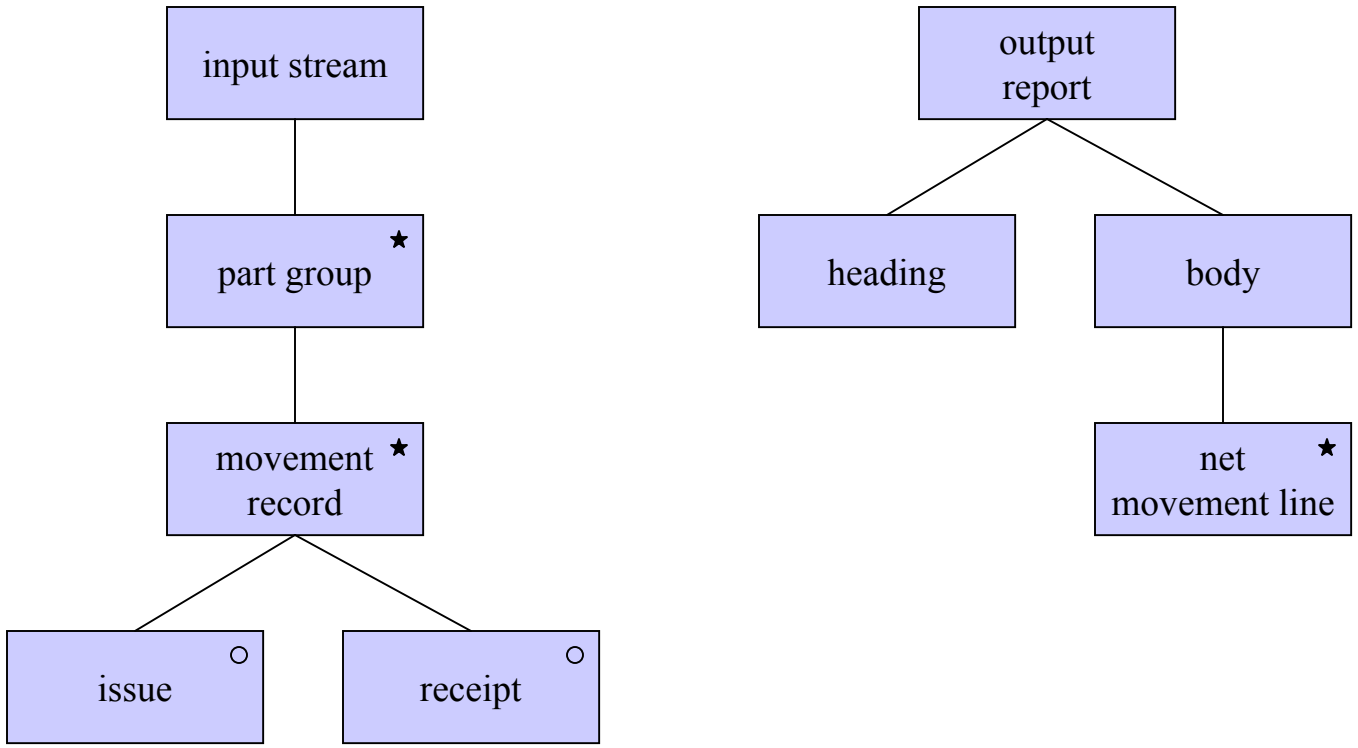
1. Derive the structure diagrams for the input and output streams.
2. The input-output structure diagrams are converted to a sequential processing diagram by identifying points of correspondence between nodes in the input and output structure diagrams.
3. The sequential processing diagram is expanded into a detailed design model with pseudo-code that contains the operations needed to solve the problem.

Example: an inventory reporting application

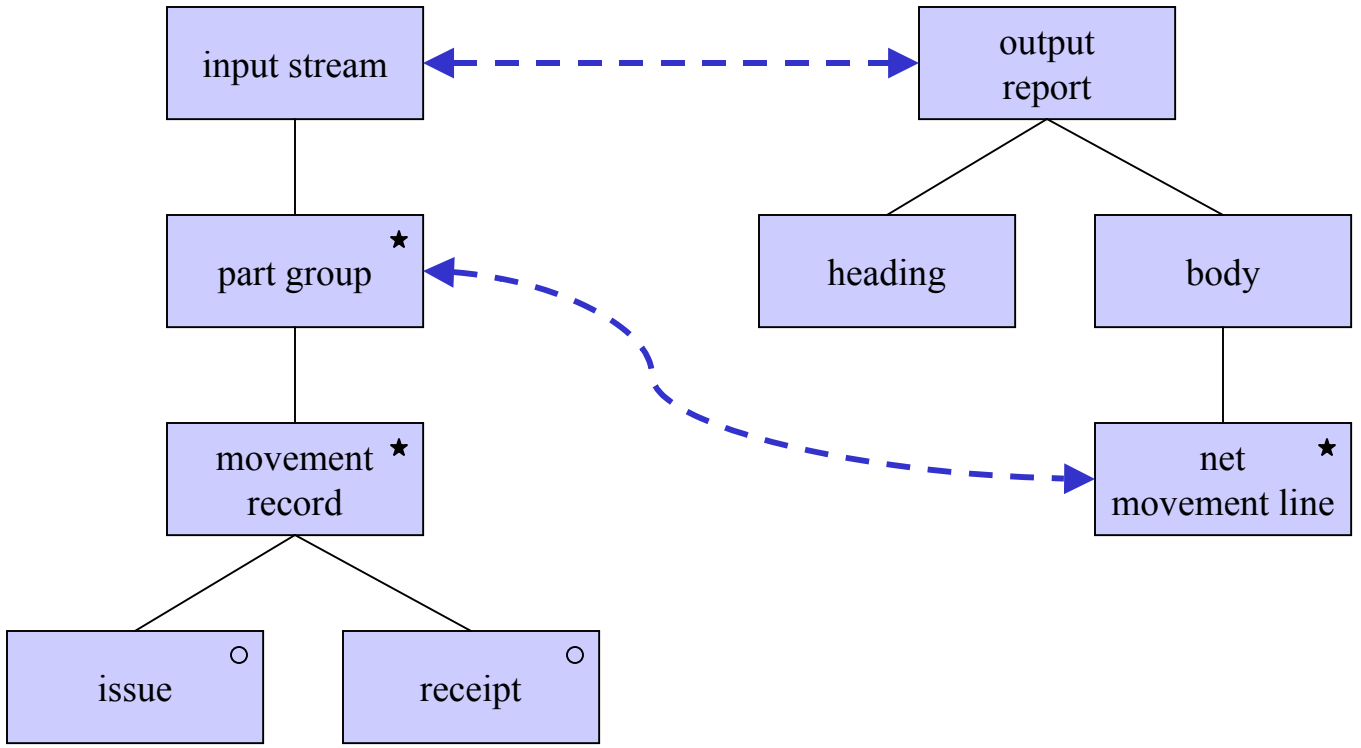
Inventory data contains a collection of transactions, each of which has a part number and number of units of that item issued or received in the transaction. An output report is to be produced that contains a heading and a net movement line for each part number that occurs in the collection.



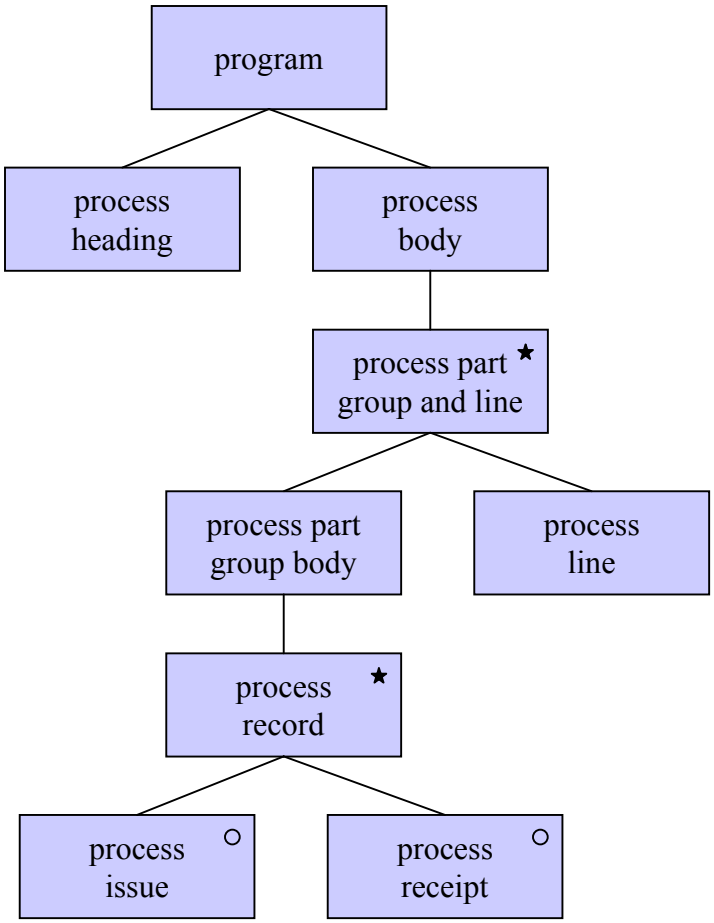
The input and output structure diagrams



Identifying points of correspondence



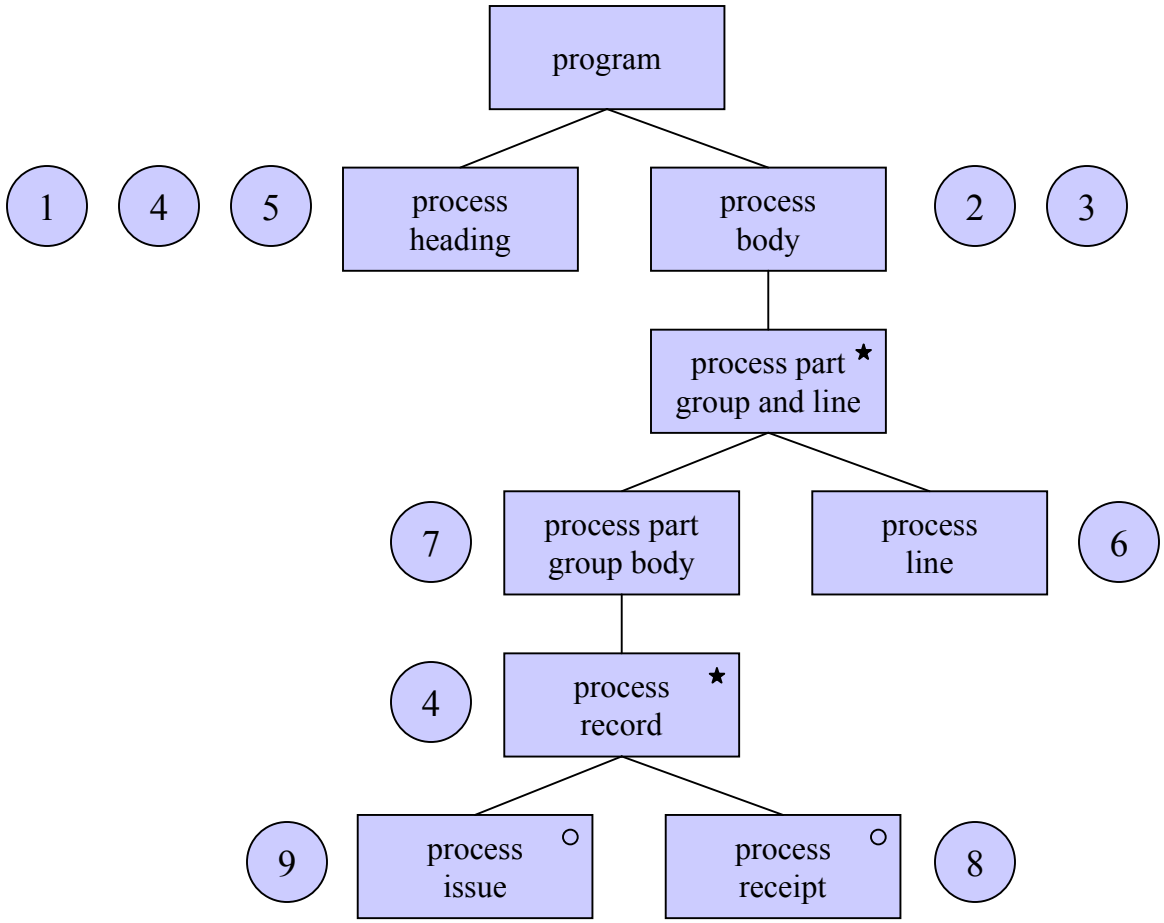
Derive sequential processing diagram



Derive additional operations

1. Open sort stream.
2. Close sort stream.
3. Terminate program.
4. Read a [`PartNumber`, `CreditDebit`, `Amount`] transaction.
5. Write report heading.
6. Write a net movement line.
7. Set `NetMovement` to zero.
8. Add `Amount` to `NetMovement`.
9. Subtract `Amount` from `NetMovement`

Add operations to sequential processing diagram



Derivation of pseudo-code

```
begin
    open sort stream;
    read a [PartNumber, CreditDebit, Amount] transaction;
    write heading;
    loop while not end-of-sort-stream
        set NetMovement to zero;
        loop while same-part-number
            if (CreditDebit = 'debit') then
                Subtract Amount from NetMovement
            else
                Add Amount to NetMovemen;
            read a [PartNumber, CreditDebit, Amount] transaction;
        end loop;
        write a net movement line;
    end loop;
    close sort stream;
    terminate program;
end
```

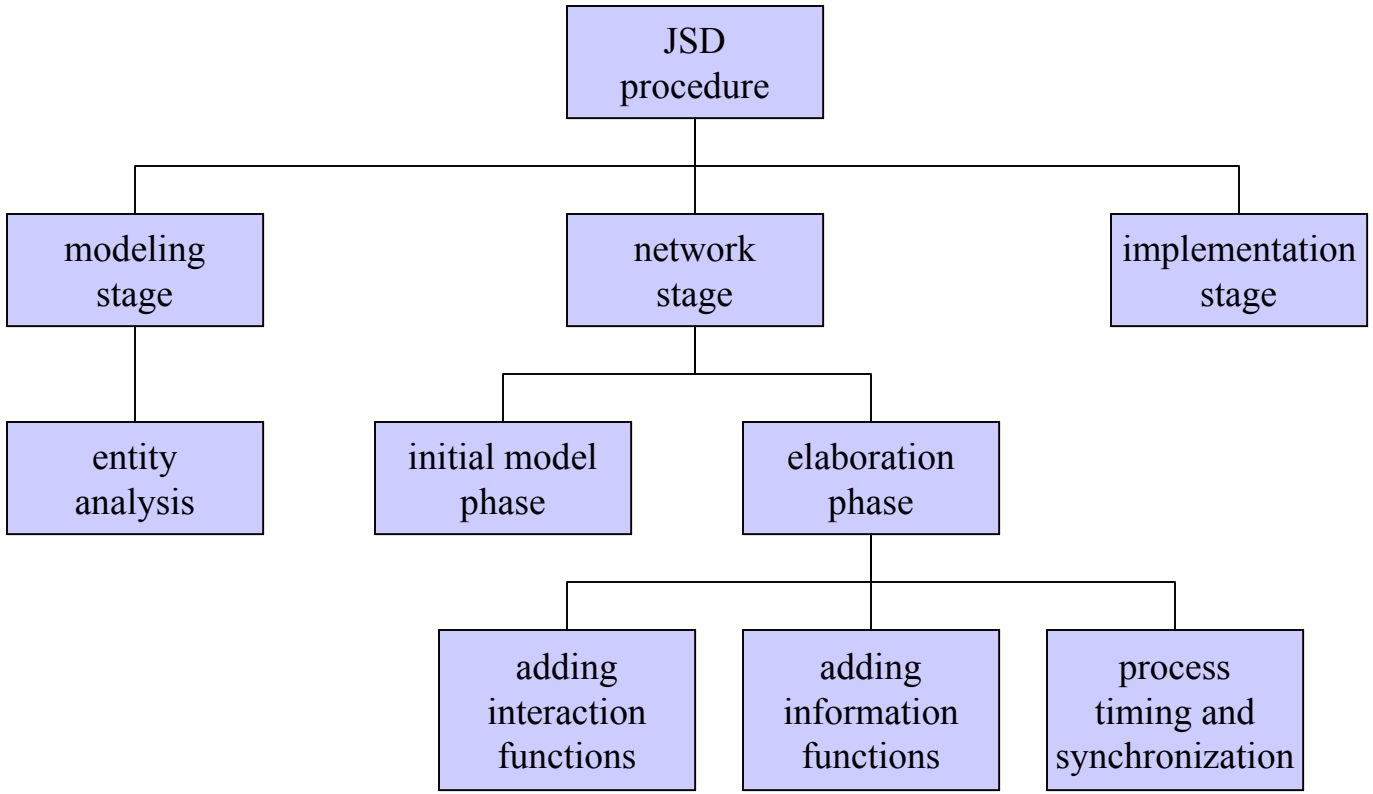
Complications

- Structure clashes: occur when points of commonality between input and output structure diagrams cannot be determined. A suggested solution is termed *program inversion*, and is essentially the decomposition of the process into two processes.

- The need for lookahead. E.g., processing any element of a sequence of items depends on all items being error free. Solution is to employ *backtracking*.

JSD: Overall process

A process model for both *analysis* and *design*. Overall process can be described by an ESD (i.e., entity structure diagram).



JSD: Overall process (cont'd)

Results of each stage and phase:

Entity analysis: a collection of ESDs.

Initial model phase: an SSD and additional ESDs.

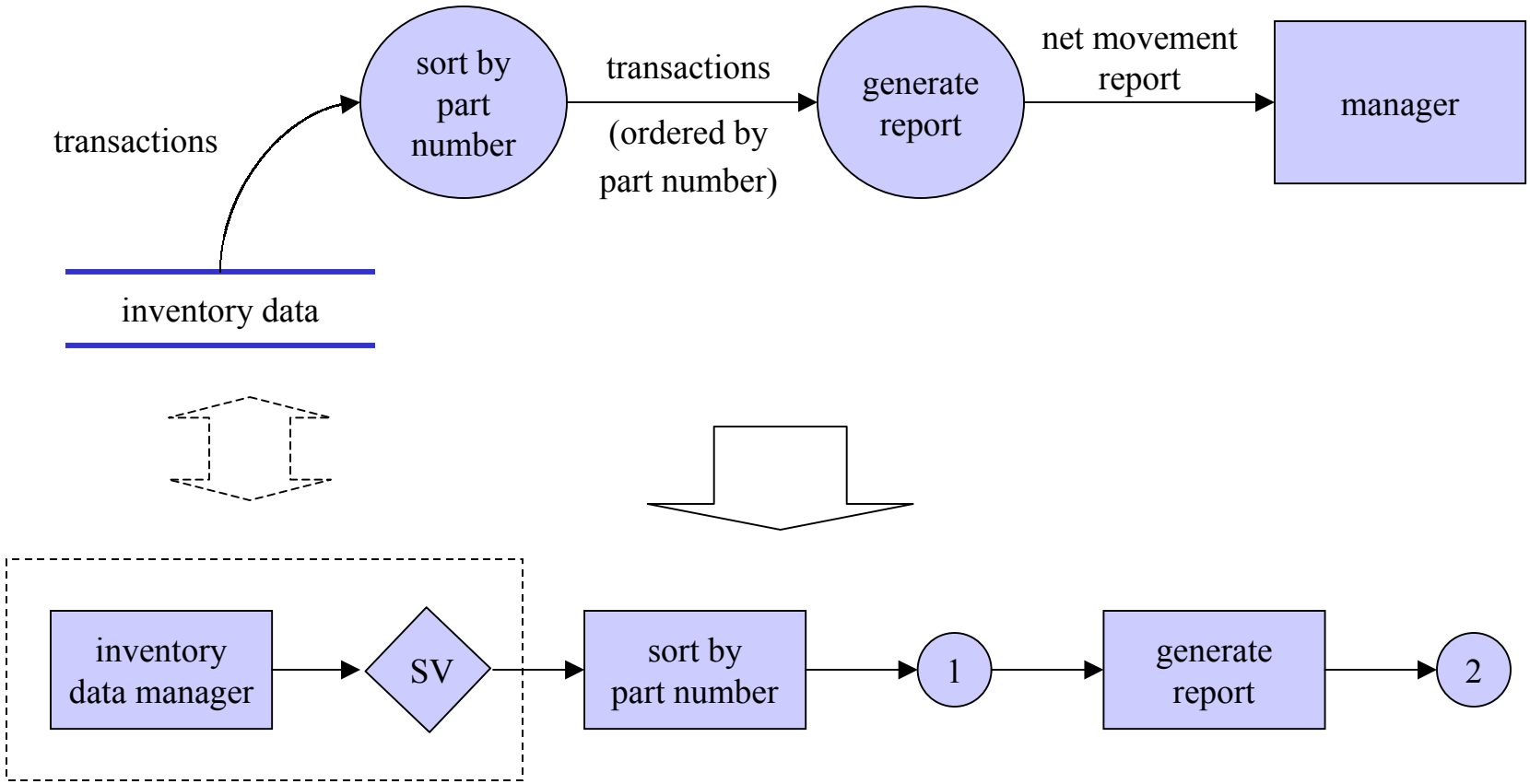
Adding interactive functions: a modified SSD and additional ESDs.

Adding information functions: a modified SSD and additional ESDs.

Process timing and synchronization: a modified SSD, additional ESDs and timing constraints.

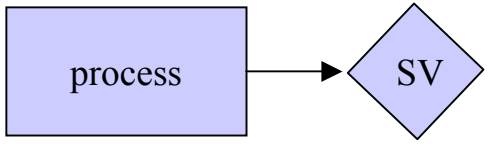
Implementation stage: pseudo-code for ESDs, process packaging, etc.

JSD: SSDs versus DFDs



JSD: SSDs versus DFDs (cont'd)

- State vectors are "owned" by a single process.



- A "rough merge" can be specified for input streams.