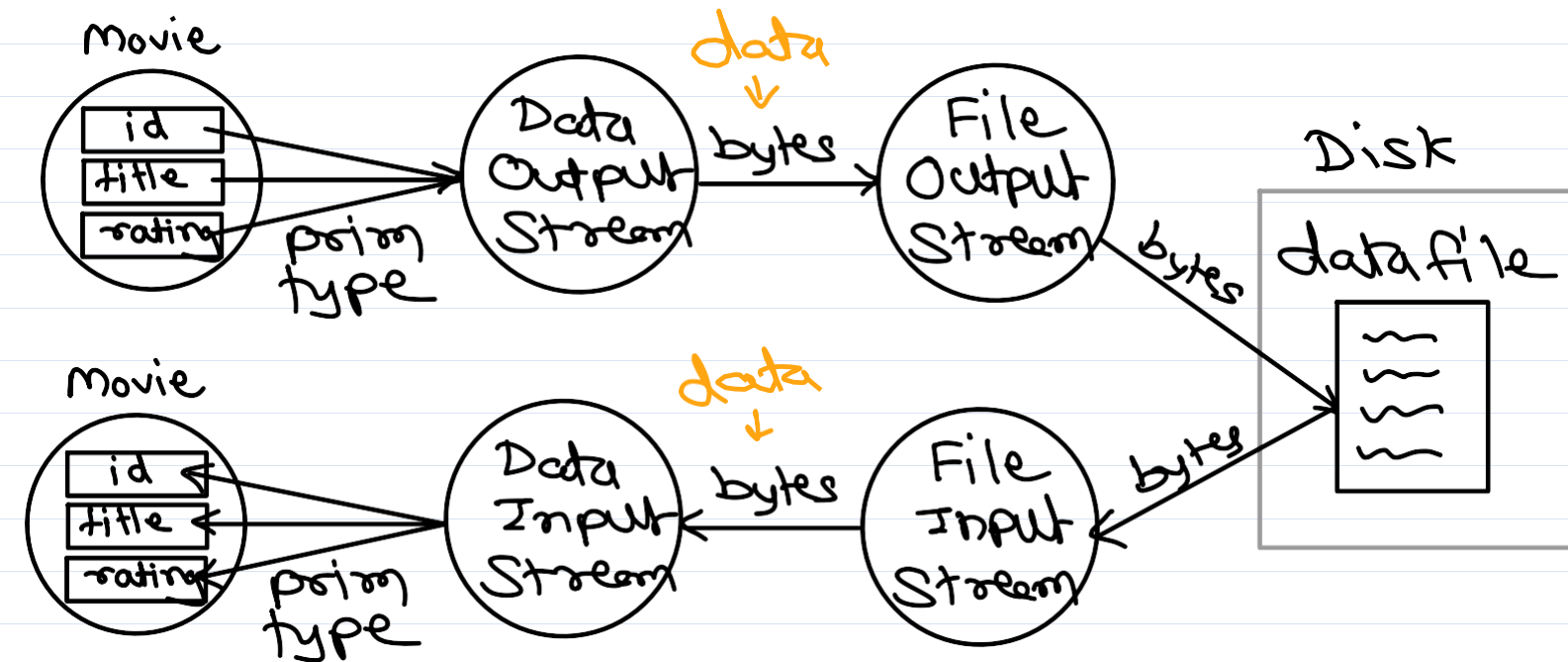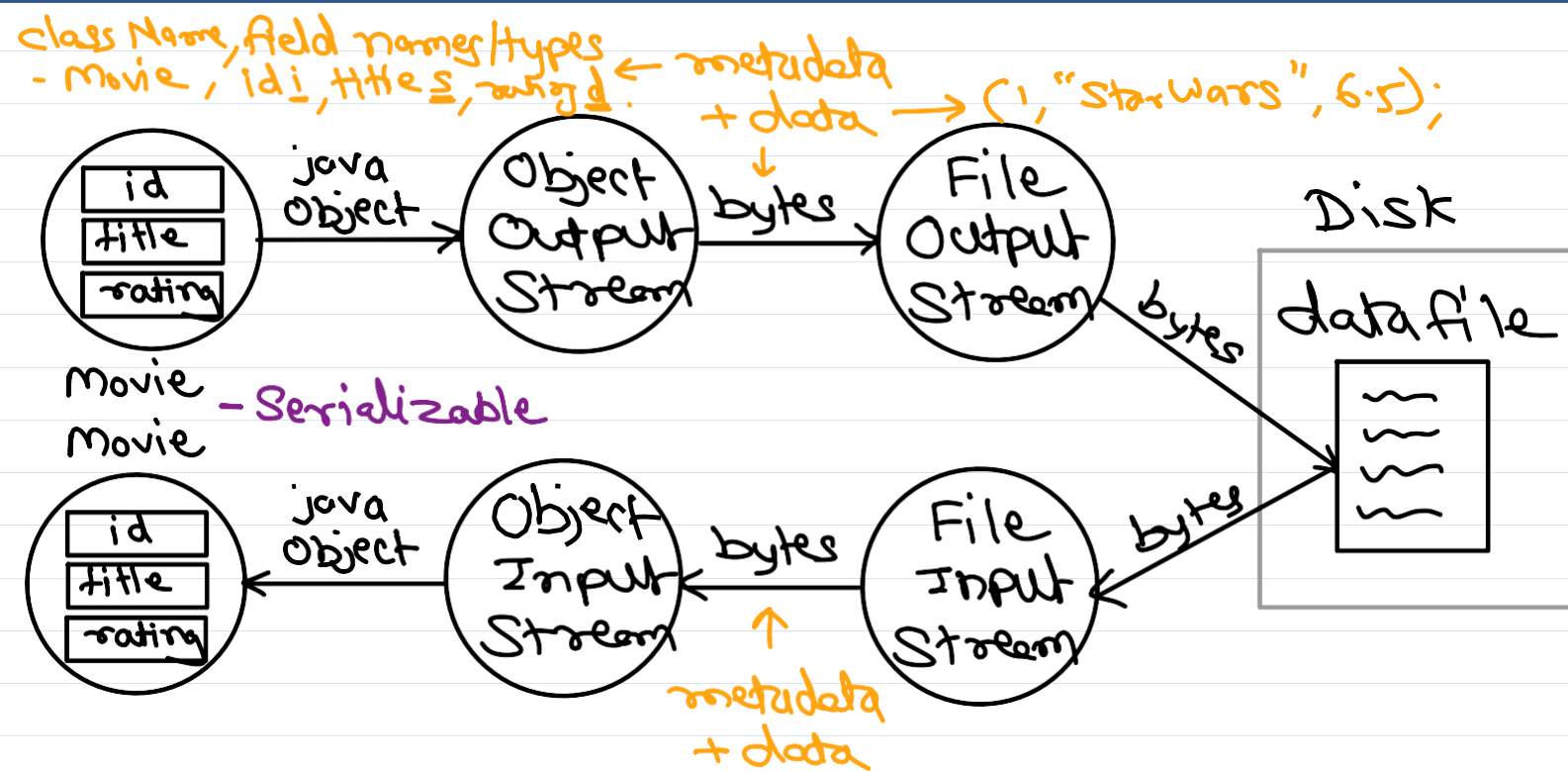# Data Streams


```
Movie m = new Movie(....);
FOS fout = new FOS("path");
DOS dout = new DOS(fout);
dout.writeInt(m.getId());
dout.writeUTF(m.getTitle());
dout.writeDouble(m.getRating());
dout.close();
fout.close();

Movie m = new Movie();
FIS fin = new FIS("path");
DIS din = new DIS(fin);
m.setId(din.readInt());
m.setTitle(din.readUTF());
m.setRating(din.readDouble());
din.close();
fin.close();
```

Object Streams

class Name, field names/types ← metadata
- Movie, id i, title s, rating d.

+ data → (1, "StarWars", 6.5);

id
title
rating

java Object

Object Output Stream

bytes

File Output Stream

bytes

Disk

data file

Movie
Movie — Serializable

id
title
rating

java Object

Object Input Stream

bytes

File Input Stream

bytes

↑
metadata
+ data

Movie m = new Movie(....);
FOS fout = new FOS("path");
OOS oout = new OOS(fout);
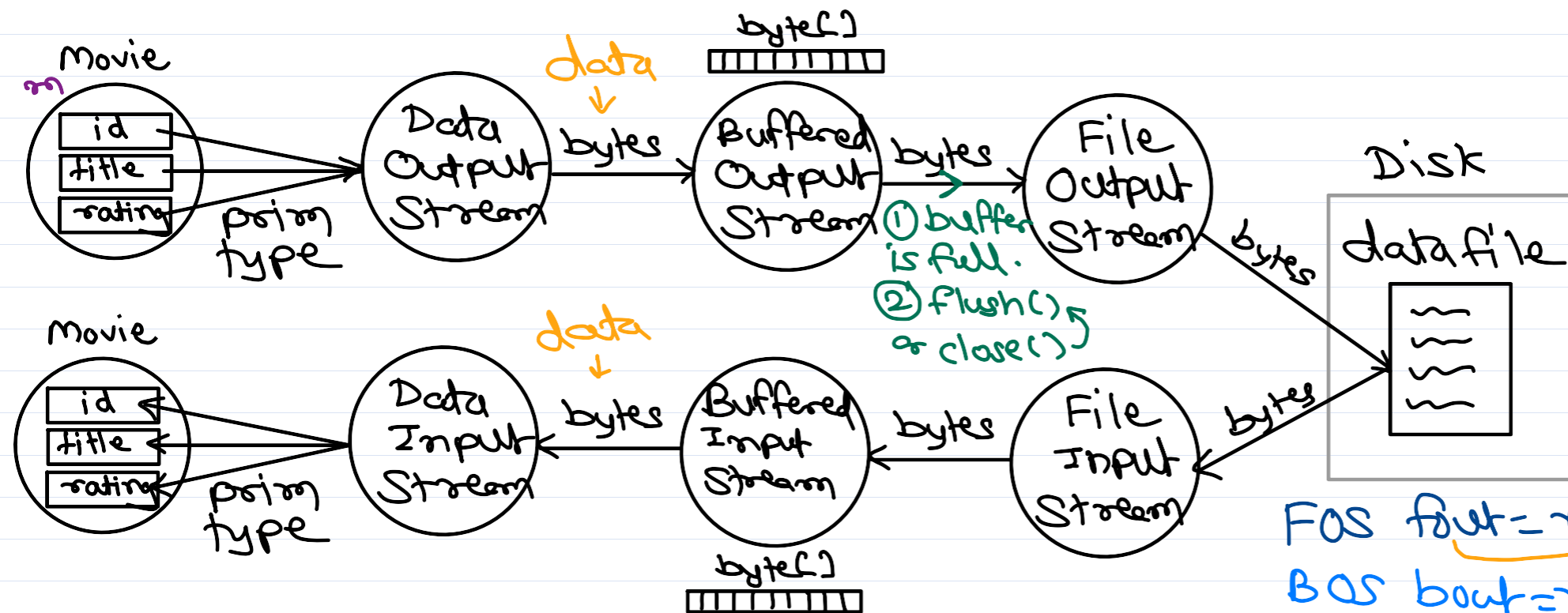
oout.writeObject(m);

oout.close();
fout.close();

FIS fin = new FIS("path");
OIS oin = new OIS(fin);

Movie m = (Movie)oin.readObject();

oin.close();
fin.close();

Buffered Streams

Movie

byte[]

data ↓

Data Output Stream → bytes → Buffered Output Stream → bytes → File Output Stream → bytes → Disk

datafile

① buffer is full.
② flush() or close()

Movie

data ↓

Data Input Stream ← bytes ← Buffered Input Stream ← bytes ← File Input Stream ← bytes ← Disk
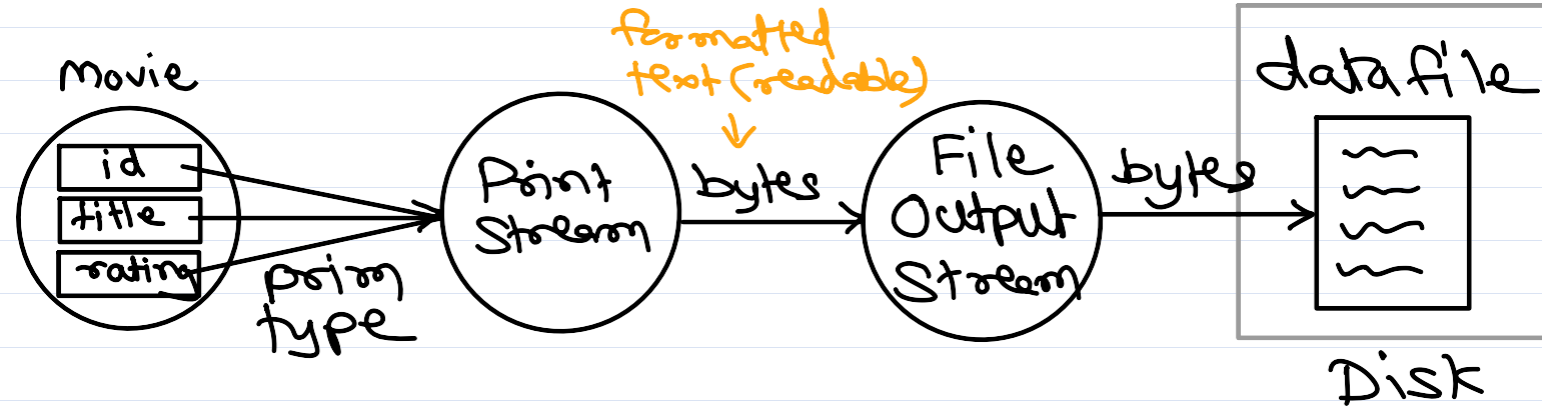
byte[]

```
FOS fout = new FOS("path");
BOS bout = new BOS(fout);
DOS dout = new DOS(bout);
dout.writeInt(m.getId()); ...

dout.close();
bout.close();
fout.close();
```

PrintStream

movie

formatted
text (readable)

Print
Stream → bytes → File
Output
Stream → bytes →

data file

Disk

prim
type

```
Movie m = new Movie(...);
FOS fout = new FOS("path");
PS out = new PS(fout);
fout.printf("%d,%s,%.f \n"
    m.getId(), m.getTitle(), m.getRating());
out.close();
fout.close();
```