Lab 1. Pipe-and-Filter

Group Dnevnik

Alexander Iossa
Artur Badretdinov
Sasha Fazliev
Valerii Volkov

Business context

Organisation builds instrumentation systems

Instrumentation is a signal processing application where streams of data are:

- read
- processed
- displayed
- stored

Can be reconfigured for a variety of applications and platforms

Business goals	Engineering objectives
Expand by entering new markets (aviation, space, ...)	Create flexible system that can be reconfigured for a variety of applications and platforms
	Provide fast data processing capabilities to the instrumentation systems.
Reduce effort required for creating new instrumentation systems	Support creating filters that can be reused in different platforms.

Quality attributes

Engineering objective	**Quality attribute**	**QA scenario**	**Priority**
Create flexible system that can be reconfigured for a variety of applications and platforms	Q1: Modifiability	An engineer is able to add new kind of input sensor to the instrumentation system during development phase in X hours.	H H
Provide fast data processing capabilities to the instrumentation systems.	Q2: Performance	The system receives data from external data source and processes X MB of data in normal operations in Y seconds.	H H
Support creating filters that can be reused in different platforms.	Q3: Reusability.	A developer adds existing filter to a new instrumentation system in development phase in X hours.	H H

Constraints

Category	Factor	Description
Organization	C1: New Market Segments	Limited experience dealing with aviation, space, maritime markets.
Technology	C2: Pipes-filter pattern should be used	Systems must be implemented using pipes-filter pattern.
	C3: Mandated programming language (Java)	There is already existing code written in Java. And systems must be developed using Java.
	C4: Legacy code	System must be implemented using existing legacy code.
Product	C5: Modifiability, reusability and performance	System must be flexible, allow filters to be reused in different managers and, at the same time, provide fast data processing (5 MB in 2 seconds)

Functional responsibilities (system A)

1. Read data stream from a file
2. Convert temperature measurements from Fahrenheit to Celsius
3. Convert altitude from feet to meters
4. Filter out measurements not related to time, altitude and temperature
5. Write output to a text file in accordance with provided format

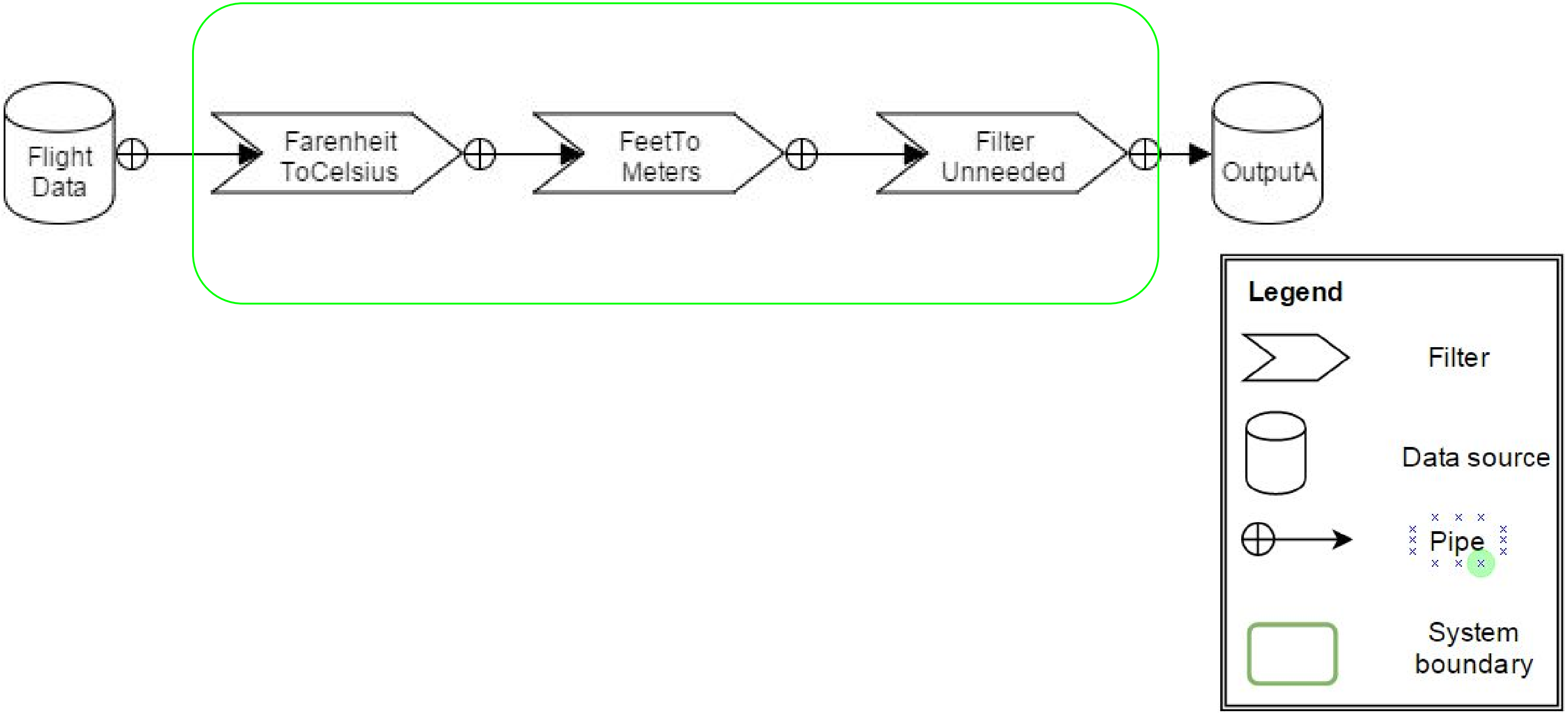
Functional responsibilities (system B)

1. Read data stream from a file
2. Convert temperature measurements from Fahrenheit to Celsius
3. Convert altitude from feet to meters
4. Process pressure data
5. Filter wild points
6. Extrapolate values for wild points
7. Extrapolate values for early wild points
8. Extrapolate values for late wild points
9. Filter out measurements not related to time, altitude temperature, pressure
10. Write output to a text file in accordance with provided format
11. Write rejected wild points to another file

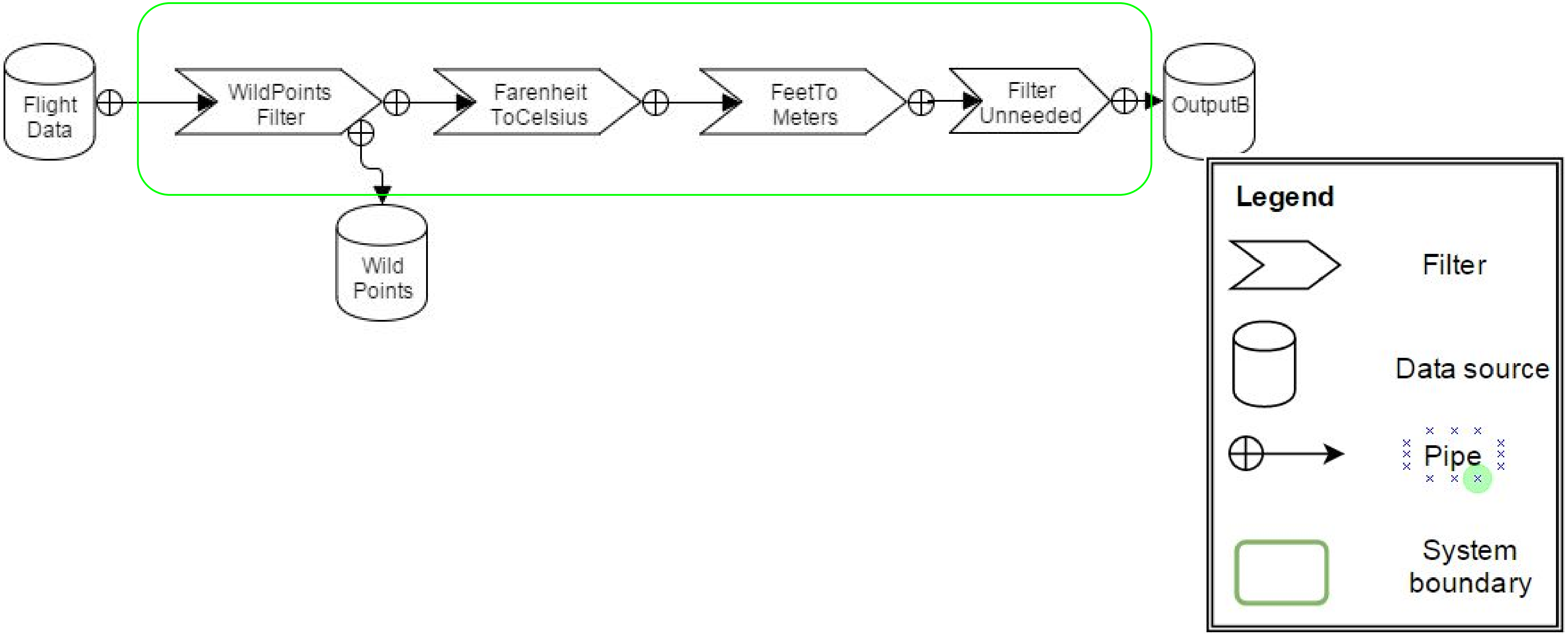
Functional responsibilities (system C)

1. Read data stream from two files
2. Merge two streams together and time-align the data
3. Single output stream’s time data should be monotonically increasing
4. Filter data collected below 10 000 feet
5. Write low altitude data to another file
6. Extrapolate values for wild points
7. Extrapolate values for early wild points
8. Extrapolate values for late wild points
9. Write the filtered pressure values to a file
10. Write output to a file

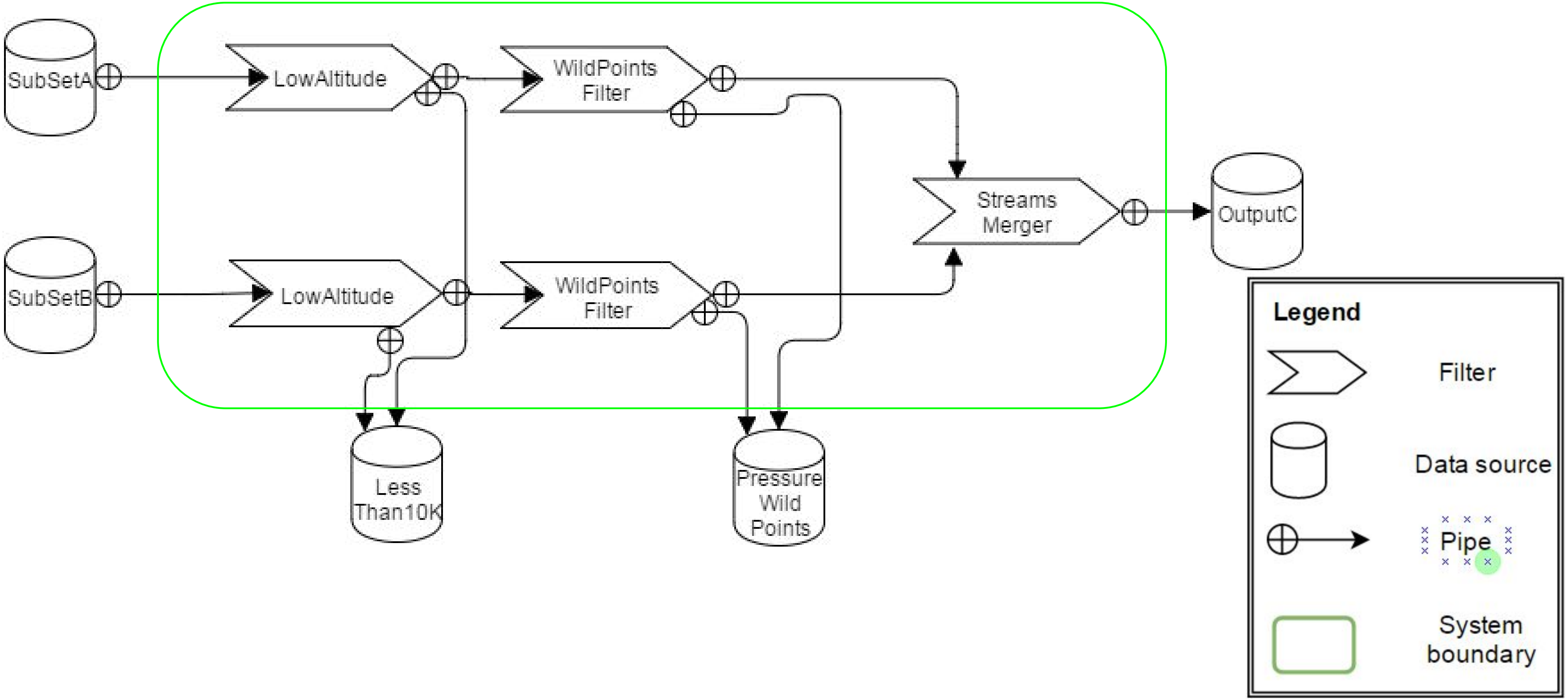
System A


Flight Data
Farenheit ToCelsius
FeetTo Meters
Filter Unneeded
OutputA
Legend
Filter
Data source
Pipe
System boundary

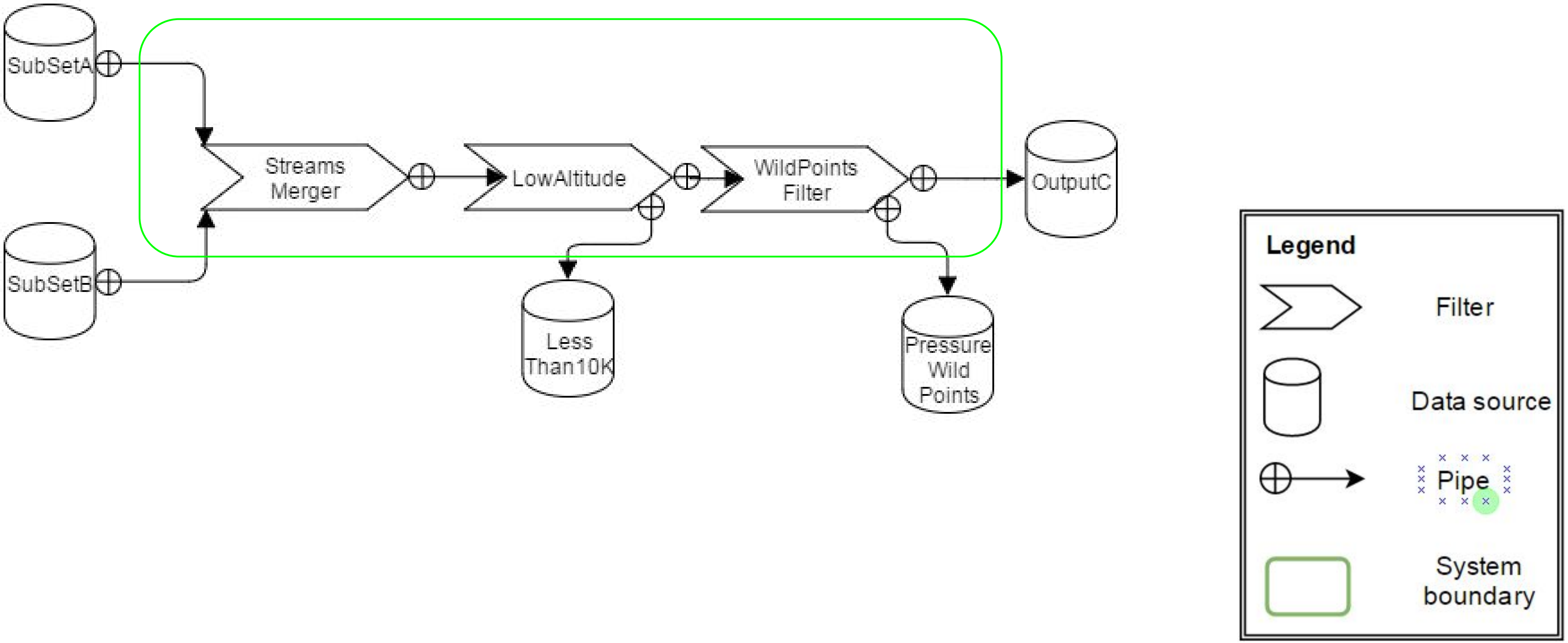
System B


Flight Data
WildPoints Filter
Farenheit ToCelsius
FeetTo Meters
Filter Unneeded
OutputB
Wild Points
Legend
Filter
Data source
Pipe
System boundary

System C


SubSetA
LowAltitude
WildPoints Filter
Streams Merger
OutputC
SubSetB
LowAltitude
WildPoints Filter
Less Than10K
Pressure Wild Points
Legend
Filter
Data source
Pipe
System boundary

System C


SubSetA
SubSetB
Streams Merger
LowAltitude
WildPoints Filter
OutputC
Less Than10K
Pressure Wild Points
Legend
Filter
Data source
Pipe
System boundary

QA

Thank you for attention!