

Otto Friedrich University Bamberg



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# Data Streams and Complex Event Processing

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## Assignment - 03

*Supervisor:*

**Prof. Dr. Daniela Nicklas**  
Mobile Software Systems

*Submitted By :*

**Manasa Reddy Bandari - 1942692**  
**Akshay Sharma - 1943984**  
**Kummari Daniel Raj - 1973448**

Dec 17, 2018

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## 1 Exercise 1 :

Imagine you are working in a software solutions company - specialized in Event-driven architectures - that develops complex event processing systems for its clients. The city's university has different sites, at which lectures and labs are held on a regular basis. Students have to shuttle between the different sites depending on their lectures' schedule. Most of the students use public transportation or dedicated buses to get there in time for their lectures and labs. The dedicated buses are provided by the municipal utilities. The university wants to have a dynamic system that manages the buses dedicated for students' transportation to get the optimal utilization for each day. Some of the issues the system has to address are the frequency of the different lines, the size or number of buses used for every trip, and the rescheduling and cancellation of trips. Initial influence factors to consider could be the lecture schedules of the students, the occupancy of lecture halls or the weather.

### 1.1 To what category of event processing application does this use case belong?

The existing use case belong to Dynamic operational behaviour as there are multiple events which are getting produced and consumed by different entities during the entire life cycle of the product.

### 1.2 Who can be the stakeholders in this scenario?

Three main stakeholders that can take part for this product will be Students, City University and the Municipal utilities each having different roles and responsibilities.

### 1.3 What can be the components of the target system?

Below are the components of the target system.

- > Student's Application
- > Weather Forecast
- > Bus Management System
- > Municipal Bus Management
- > Lectures Management

### 1.4 What is the role of each component in the target system?

- > **Student's Application**
  - Check and Manage schedules
  - Check Weather forecast
  - Check bus availability
  - Set Reminders for trips

**-> Weather Forecast**

- Provide weather information

**-> Bus Management System**

- Interface between services and students

**-> Municipal Bus Management**

- Provide bus information
- Generate Reports
- Display availability

**-> Lectures Management**

- Provide Lectures information
- Provide timetable
- Provide additional information

**1.5 What are the messages exchanged between system components?****-> Student's Application**

- Schedules
- Request to reserve seat in bus
- Enroll to the lectures

**-> Weather Forecast**

- Weather forecast messages

**-> Bus Management System**

- Distance between two endpoints
- Location coordinates of the bus
- Number of seats available

**-> Municipal Bus Management**

- Number of students requests
- Statistical Reports
- Availability of bus information

**-> Lectures Management**

- Time table
- Number of students attending the lecture

Let's take some example processes, which could be performed in our target system; trip scheduling, trip cancellation, and the number of students per trip.

### 1.6 What is the information needed in each of the processes?

#### -> **Trip Scheduling**

- Number of requests from students
- Weather information
- Lectures information
- Bus information
- Availability of seats

#### -> **Trip Cancellation**

- Number of requests getting cancelled
- Lecture information
- Bad Weather Conditions

#### -> **Number of students per trip**

- Weather information
- Number of students attending the lectures.

### 1.7 In terms of data streams, what are the data streams processed by the system?

As per the target systems, there can be 4 possible data streams.

- > Students
- > Weather
- > Lectures
- > Bus

1.8 Draw a simple chart that illustrates the architecture of the system, and the flow of the different data streams between the different components in the system (similar to the Fast Flower Delivery overview)

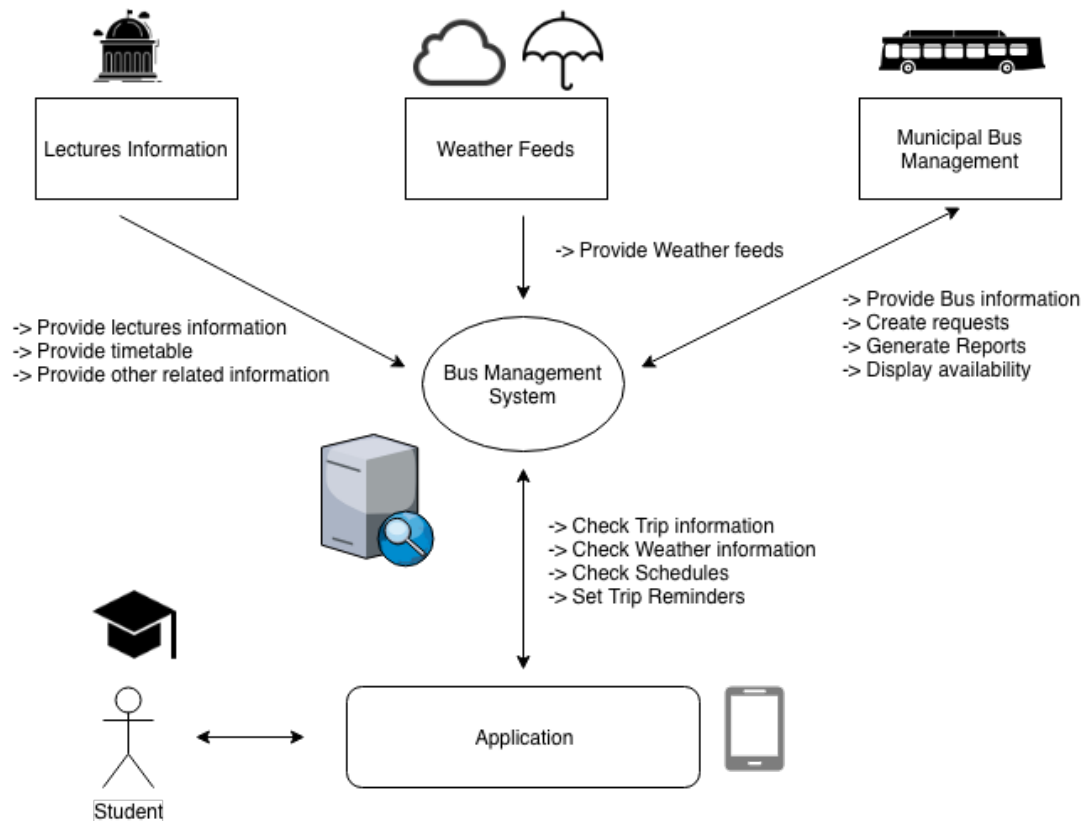


Figure 1: Architecture Diagram

1.9 In the application, which components act as event producers, consumers, or both? Draw a simplified event processing network for the application.

#### Producers

- > Weather Forecast
- > Lectures Management

#### Producers and Consumers

- > Student's Application
- > Bus Management System
- > Municipal Bus Management

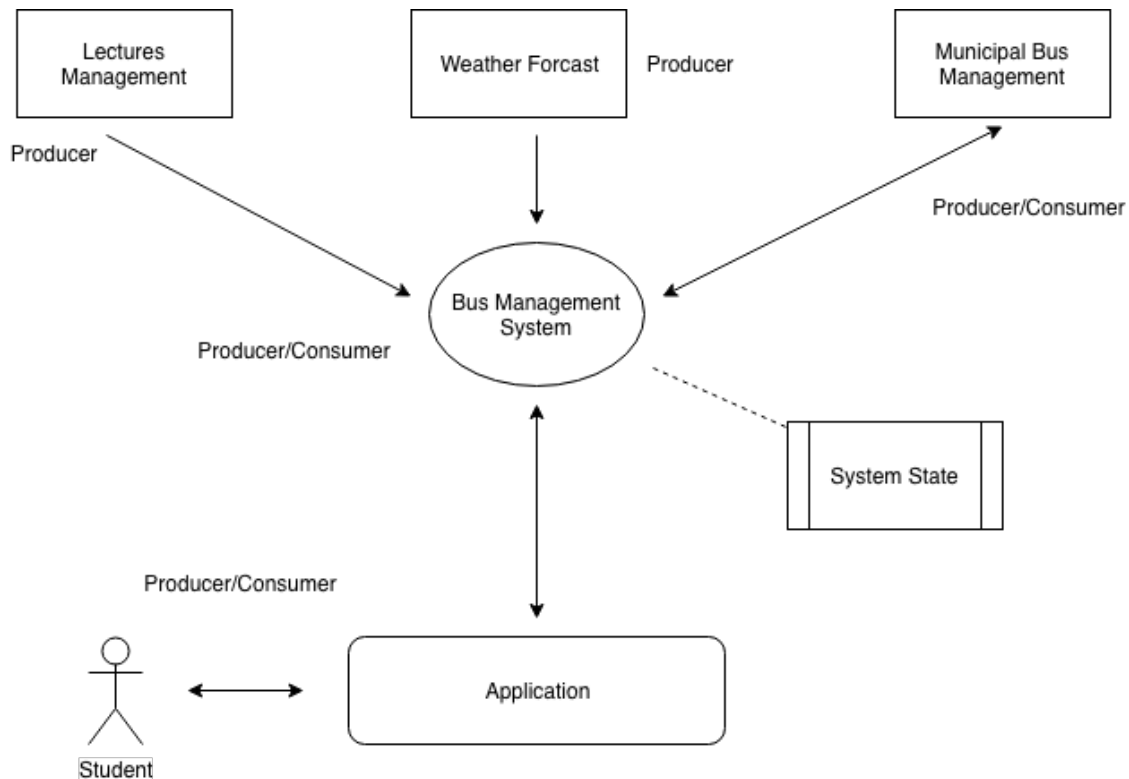


Figure 2: Event Diagram

As one of the recurrent patterns in the system, a trip is assigned an articulated bus instead of a simple one. This pattern is a count pattern, in the context of vehicle selection for the trip. The relevant types here are the students' requests for a certain trip that suits their lecture schedule, and the parameter here "if the requests > 60". The cardinality policy of the pattern is single, and the evaluation is immediate.

#### 1.10 Find one or two patterns in the system, and put them in a table like the one in the Event Pattern

##### Bad Weather Condition

Pattern Types	Context	Relevant Types	Parameters	Policies
Sometimes	Evaluation	Bad Weather	Weather.status = bad	evaluation=deferred

##### Alternative Bus

Pattern Types	Context	Relevant Types	Parameters	Policies
Always	Request	Municipal Bus	students > 50	evaluation=immediate