SIS Recommender System Component

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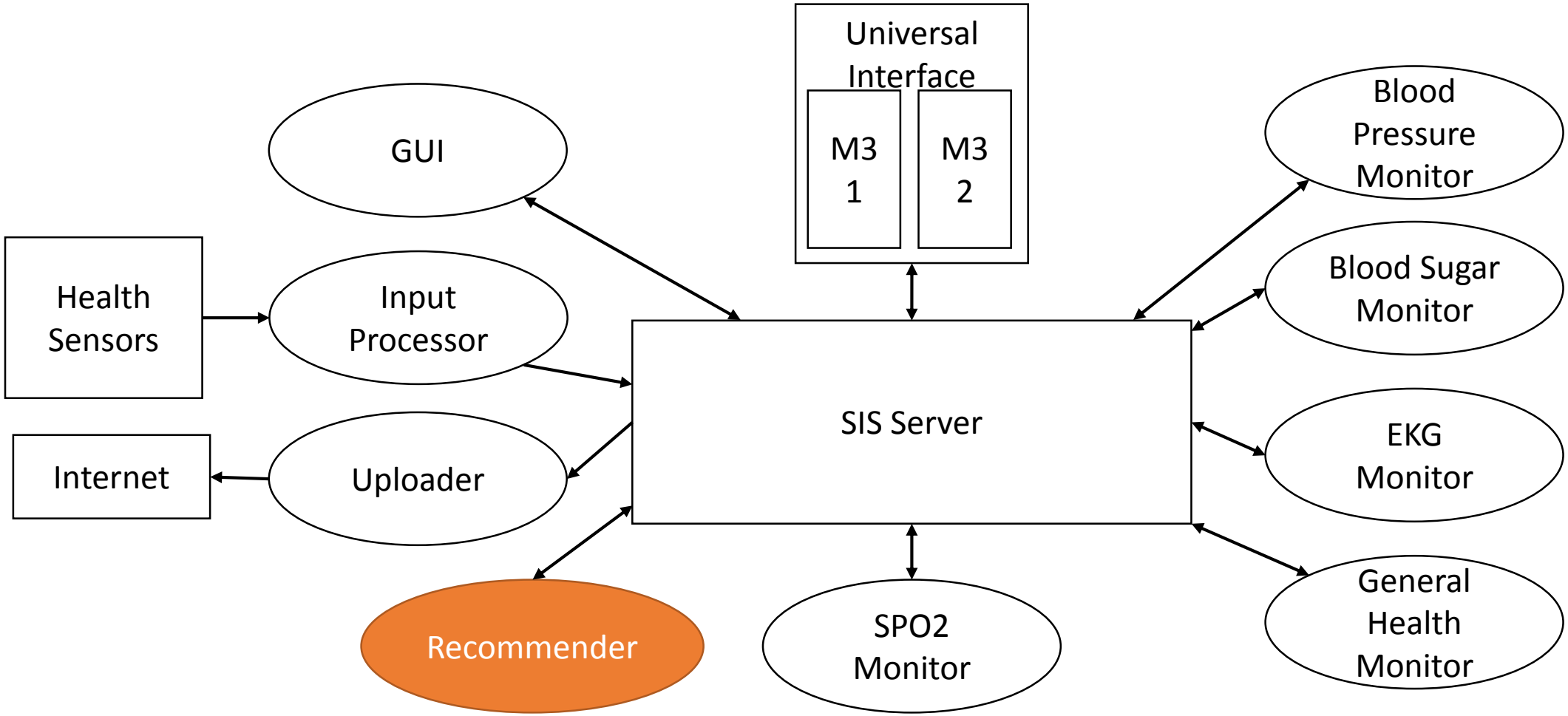
Introduction – SIS Recommender System

- The SIS system is an elaborate system that is capable of triggering events according to readings received from a distributed sensor network.
- Simple decisions can be made on different components by reading scalar values and creating appropriate messages.
- In this document, I am going to present:
  - The design of the SIS Recommender System Component
  - The communication interface (xml messages) of the SIS Recommender System
  - Use-cases and the Motivation behind this component

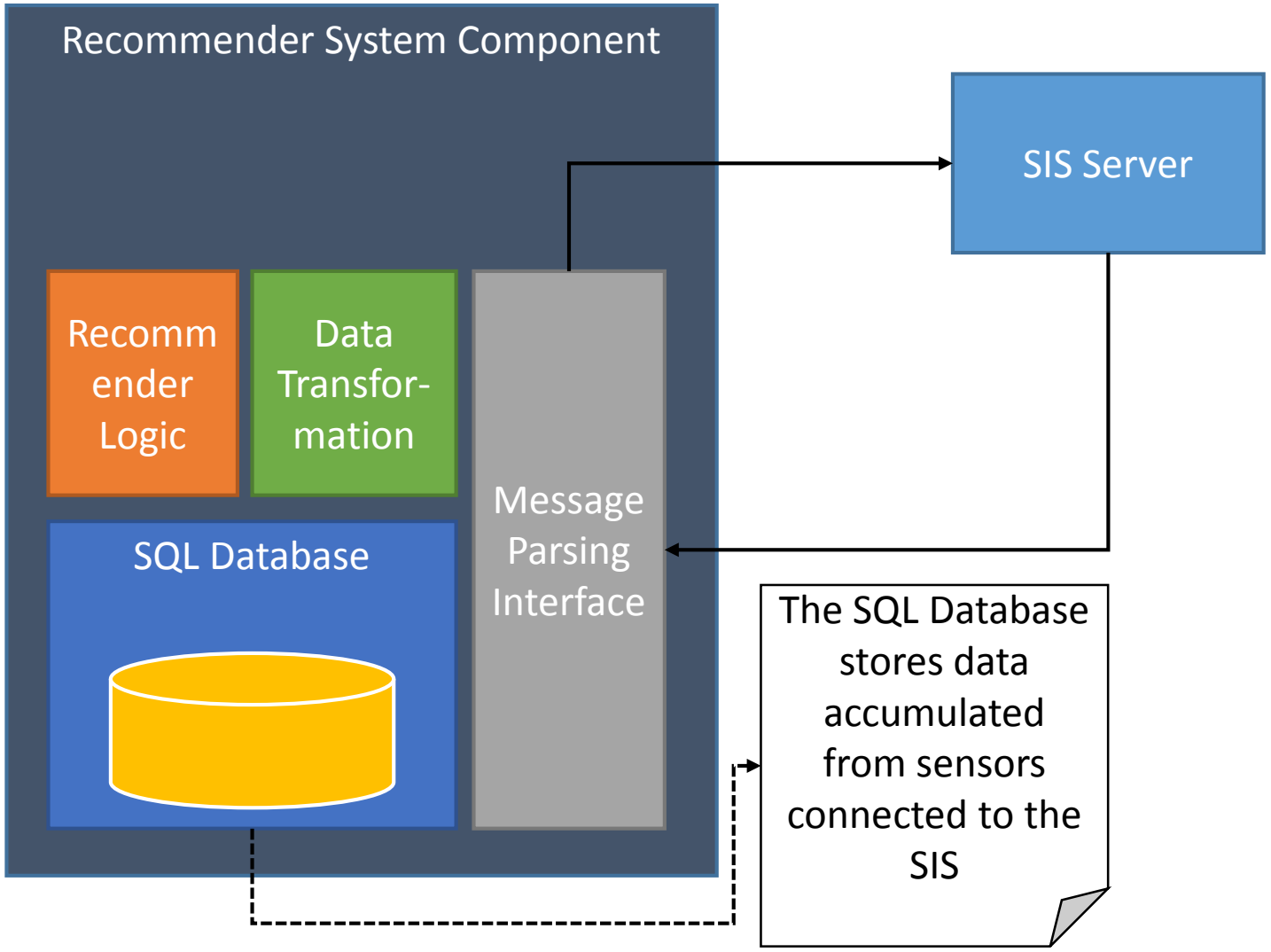
System Diagram – Recommender System



Recommender System - Motivation

- The SIS system is a component based expandable system.
- Many sources of input data like:
  - Motion sensors
  - Blood pressure
  - Temperature data
  - Sound monitors
  - Etc.
- Current SIS components do not allow us to combine information from different sensors. For instance:
  - Is a person in danger when his temperature is high, his blood pressure has risen and his heart beats have increased?
- The motivation behind the Recommender System component is to prevent unwanted patient situations by predicting imminent health problems.
- In order to take complex decision, which involve different metrics, a recommender system needs to take action.

Deployment Diagram – Internal Architecture



The Recommender System Component consists of the following:

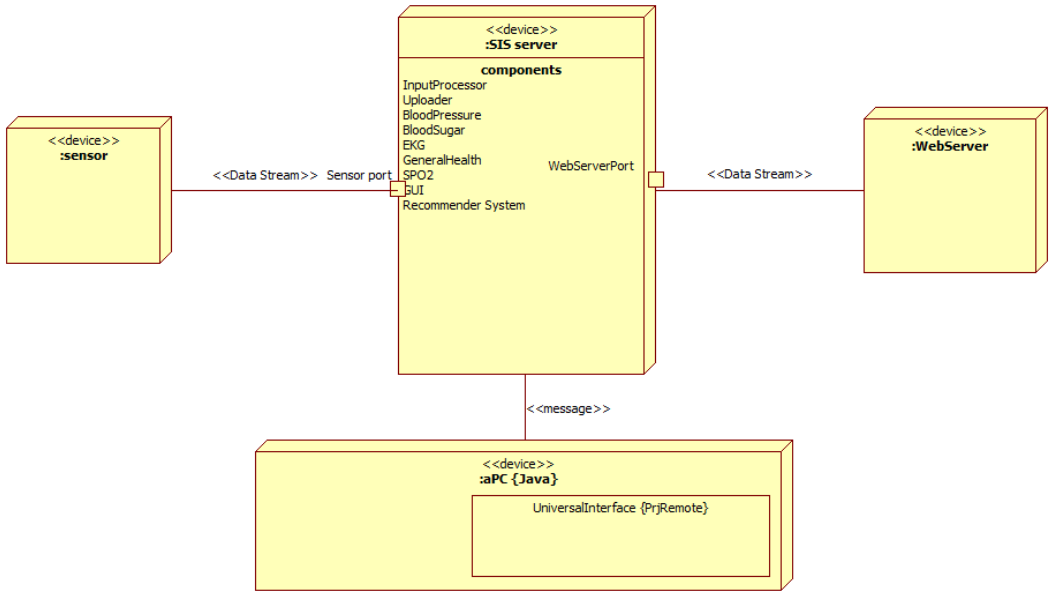
- **Recommender Logic:** Main memory structure that executes Collaborative Filtering Algorithms
- **Data Transformation Logic:** Main memory library for transforming incoming sensor data.
- **SQL Database:** Local Database with information accumulated from sensors and from Health center.
- **Message Parsing Interface:** Module responsible for handling messages

Deployment Diagram - UML

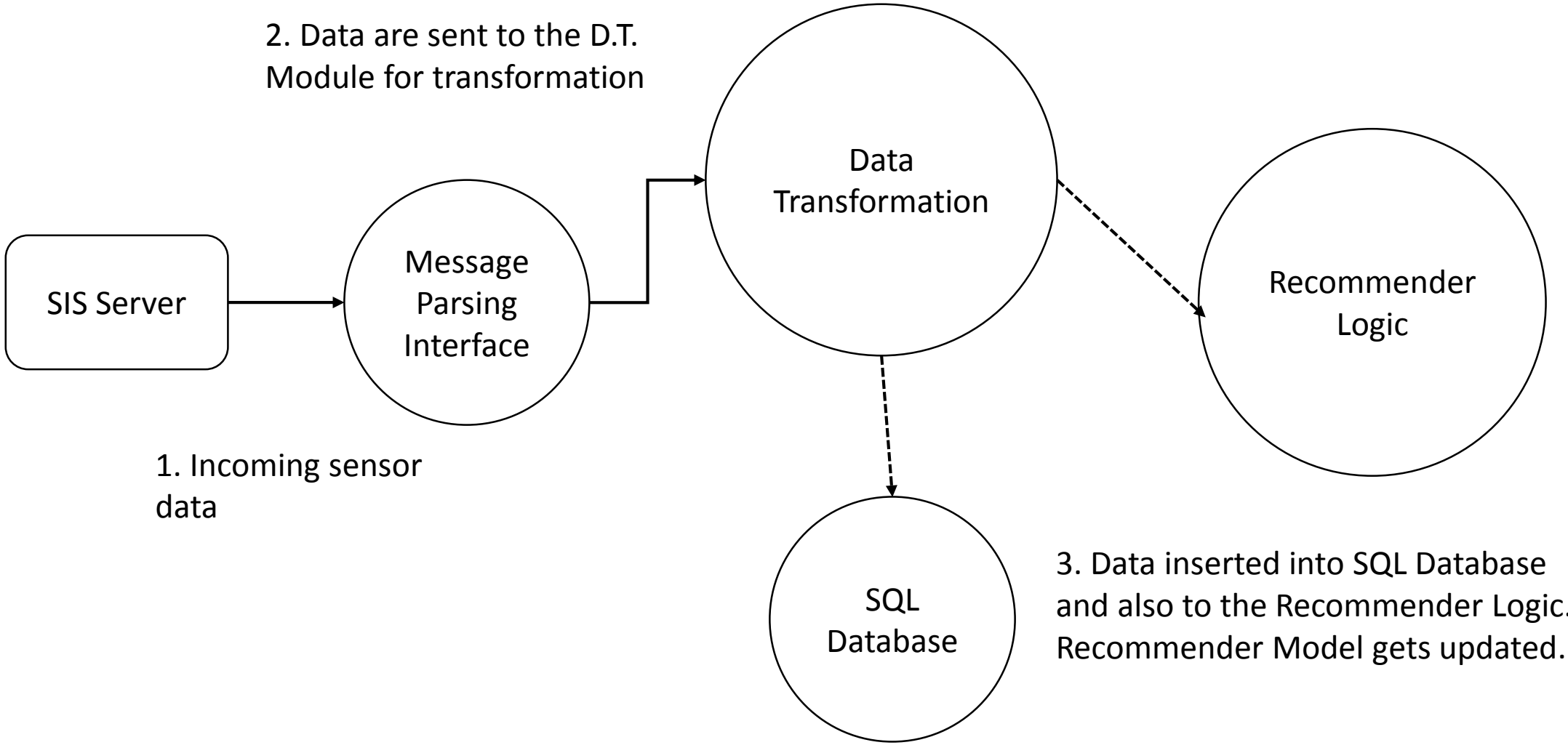
The Recommender is designed to be an additional component to the SIS Server. Its internal SQL Database is going to be accessible only by the Recommender System and not exposed to other components.

Sensor data are streamed to the Recommender System through the SIS Server. For instance, a new temperature measure is important for the recommendation system, so, the SIS should forward this message to it. Every time a “warn” condition is recognized, the Recommender System produces the appropriate message and sends it to the SIS Server. Then, the SIS Server forwards the message to the Uploader and the Web Server.

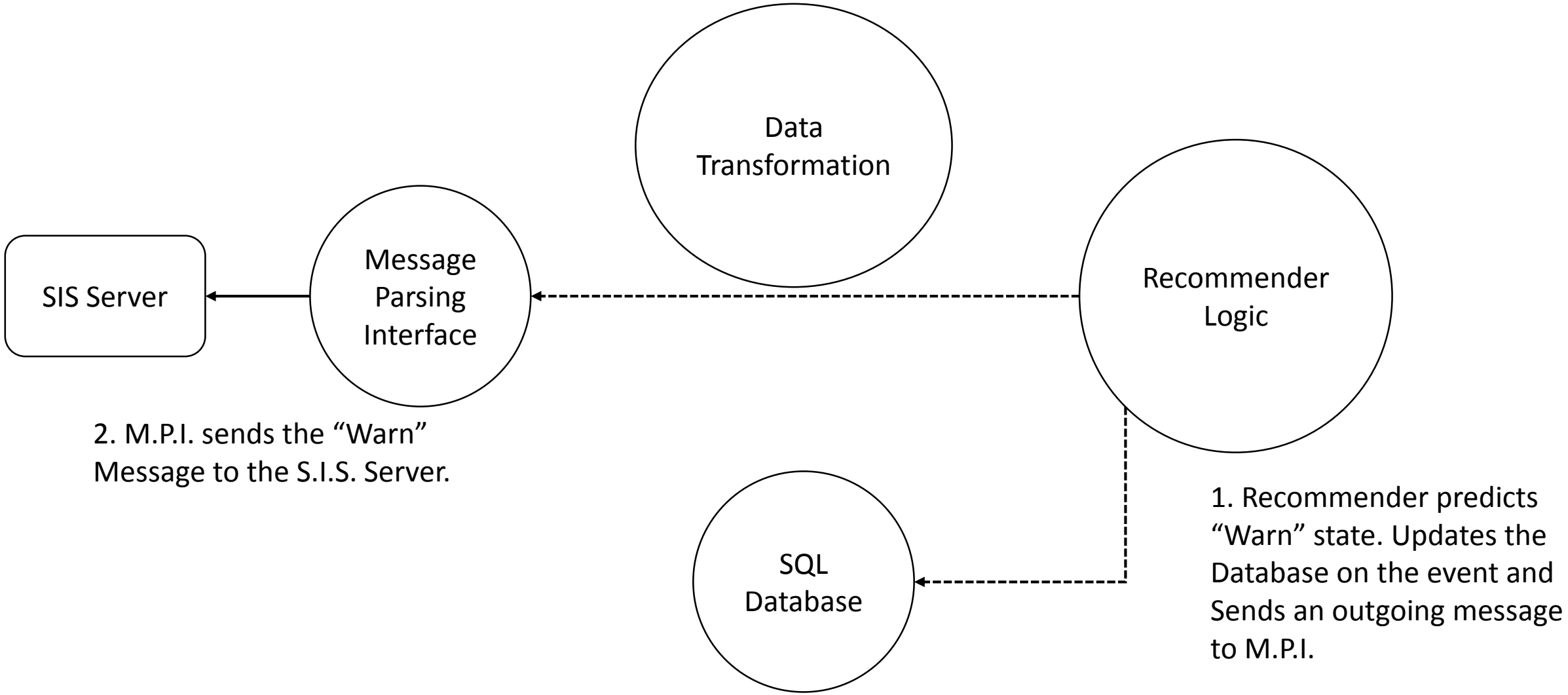
On the left, we can see the Deployment Diagram for the final system, with the Recommender System component.



Workflow Diagram (1) – Incoming sensor data



Workflow Diagram (2) – Recommender identifies Warn State



Messages Specification – Creation Message

Field Name	Field Value
MsgID	20
Description	Create Recommender System Component
Passcode	****
SecurityLevel	3
Name	RecommenderSystem (Name of created Component)
SourceCode	RecommenderSystem.jar (Source code file name of created Component)
InputMsgID 1	30 (Sensor data reading)
InputMsgID 2	31 (Blood pressure reading)
InputMsgID 3	41 (Blood sugar reading)
InputMsgID 4	35 (EKG Reading)
InputMsgID 5	33 (SPO2 Reading)
OutputMsgID 1	64 (warn alert)
Component Description	Recommender System parses current readings and based on its database information and its prediction model, produces alert messages

XML Message Specification – Msg 64

Name	Value
MsgID	64
Description	Recommender System Alert
AlertType	Recommender Alert
DateTime	Current Date (i.e. “2014-10-30 15:05:10”)

XML Message examples

- Recommender System creation file (xml): RecommenderSystem.xml
- Output 64 message (xml): msg64.xml

Use-Case Scenario

1. Blood Pressure Reading sends Msg 31 to InputProcessor, which parses the data and extracts vital signals (produce Msg 31).
2. Recommender System receives Msg 31 and calculates the possibility that the patient is in danger. The possibility is low, so no output messages are produced.
3. Blood Sugar Monitor sends Msg 41 to InputProcessor, which parses the data and extracts vital signals (produce Msg 41).
4. Recommender System receives Msg 41 and calculates the possibility that the patient is in danger. The possibility is high now, so it produces an Output Msg 64 indicating high possibility of alert.