**UML-B Refinement Exercise - Ambulance Dispatch System**

The exercise involves developing a formal specification of an ambulance dispatch system using the UML-B language. The dispatch system is responsible for allocating ambulances to emergency incidents and monitoring the progress of the response to each incident.

The dispatch system is required to process each incident in the following way:

1. When an emergency call is received, the control assistant logs the details of the incident including the location, the emergency level (on a scale of 1 to 5) and the medical capabilities required.
2. After the incident is logged, an ambulance is allocated to the incident. The ambulance allocated to an incident should have sufficient medical capabilities to deal with the incident.
3. When allocating ambulances, an incident with a higher emergency level gets priority over an incident with a lower emergency level.
4. The ambulance is selected from a pool of available ambulances. Ambulances are distributed across several base stations. The ambulance allocated to an incident should be as close as possible to the location of the incident.
5. While the ambulance is on its way to the incident, the control assistant allocates a hospital to the incident. It should try to allocate a hospital that is close to the incident.
6. So that the dispatch system may track the progress of an incident, an ambulance informs the system when it has arrived at the incident. After that it informs the dispatch system that it has arrived at a hospital. Finally an ambulance will return to its base so that it is available for allocation to another incident.

**Tasks**

1. Model the ambulance dispatch system using UML-B. Start with a simple model that just deals with incidents and allocates ambulances from the pool
2. Start by drawing a context diagram for the static parts of the model then add a class diagram for the behaviour. Use state machines as needed to describe sequences of events.
3. Use refinement to layer in details of the specification.
4. Analyse your UML-B models at each refinement level using the Rodin tools including the ProB plug-in.

**Hints:**

To assist with animation, it is useful to define the instances of your class types explicitly as enumerated sets. (e.g. AMBULANCES = {a1,a2,a3}.

To model closeness of locations you could introduce a constant function *distance* of the following type:

*distance* ∈ (LOCATION × LOCATION) → ℕ

where *distance*(*l1*↦*l2*) represents the distance between locations *l1* and *l2*.