Object-Oriented Design and Programming Tutorial

Consider a security system for protecting residential properties:

- Several *security guards* may be assigned to protect a *property*.

- *Motion detectors* can be installed to monitor particular areas within a property. Each motion detector is associated with a *location description* that describes the area monitored by that motion detector.

- A motion detector *activates* when it detects movement. When this happens, an alert message including the location description of the motion detector is sent to all security guards assigned to protect the corresponding property.

You may assume the availability of the following template class:

```
template <class T>
class List {
  ...
public:
  void append(const T &item); // append item to list
  void remove(const T &item); // delete item from list
  int size(); // number of list items
  T *front(); // pointer to first list item
  T *next();  // pointer to subsequent list item(s)
};
```

a   Draw a UML class diagram to describe the above.

b   Write C++ class declarations (i.e. no function bodies) to support the above.

c   Write a test function as follows:
  - Kensington Palace is a property fitted with three motion detectors having location descriptions "Hallway East", "Hallway West" and "Crown Jewels Display Case" respectively.
  - Imperial College is a property fitted with a single motion detector having location description "Rector's Office".
  - Alice and Bob are security guards who are assigned to protect Kensington Palace.
  - The "Hallway East" motion detector activates.
  - Alice is assigned to protect Imperial College.
  - The "Crown Jewels Display Case" motion detector activates.

d   Write the bodies of the functions from part (b).