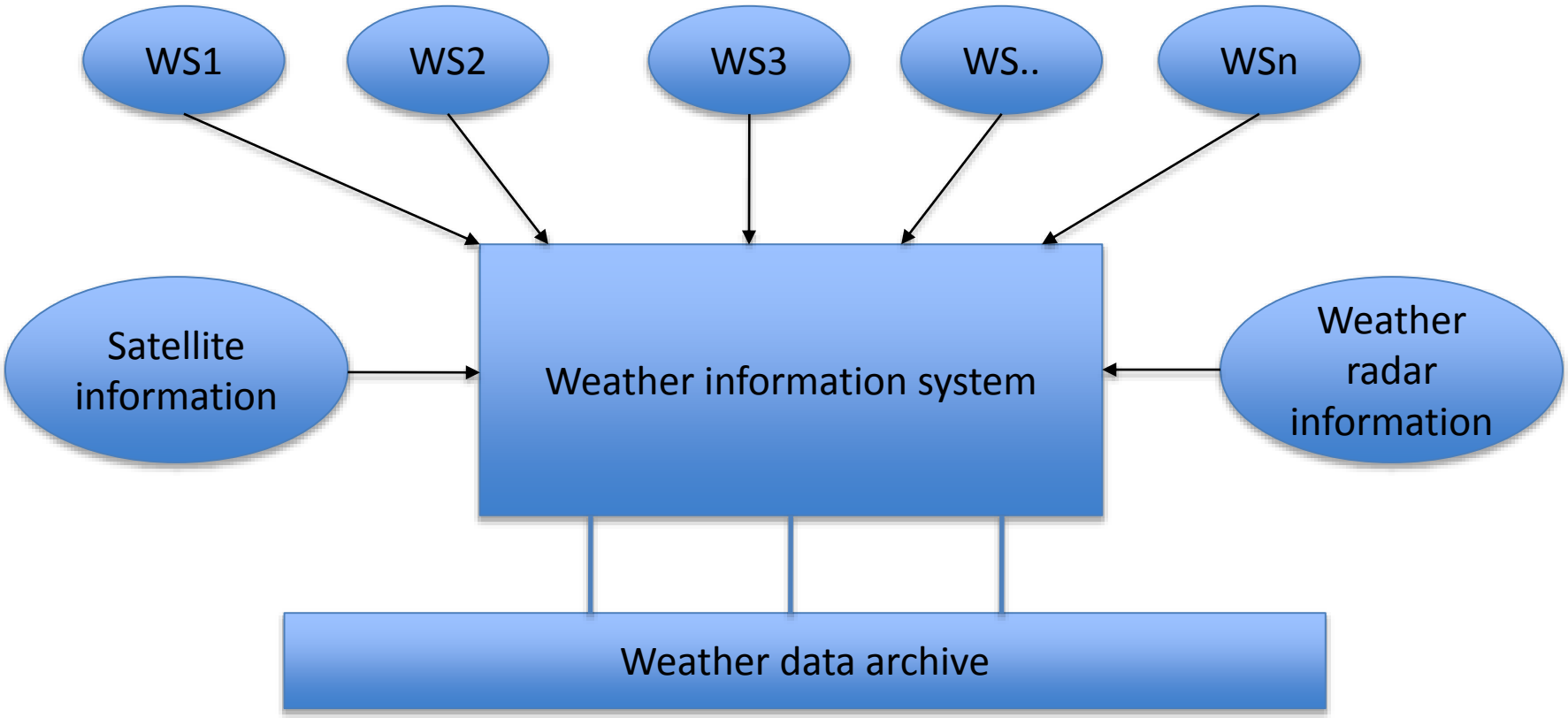
The wilderness weather system

Case study

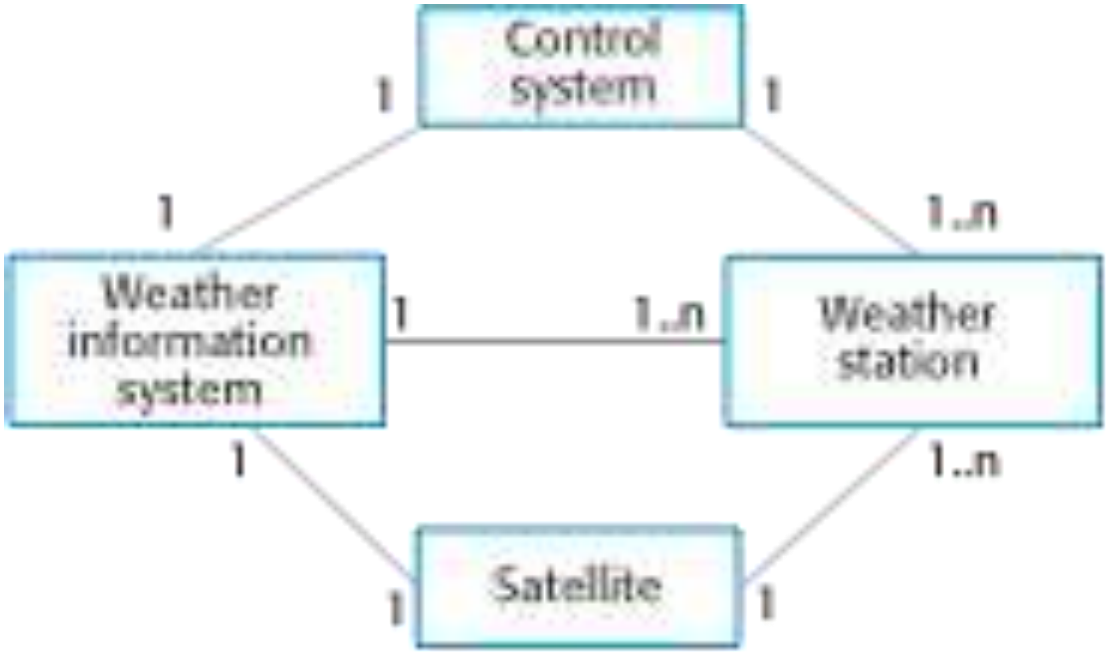
Weather information

- A national weather service wishes to collect weather information from remote areas to help with weather forecasting, forecast accuracy assessment and climate change modeling.
- Currently, limited collections are made manually by people visiting remote stations every day.
  - This is expensive and time consuming
  - Some areas have no coverage because of difficulties of access (no road, heavy snowfall, etc.)
- The intention therefore is to develop remote automatic collection systems that are connected to a broader weather information system.

Overall system organization



System context for the weather station



Weather station characteristics

- ✧ Must be self-contained and completely autonomous
  - Integral power supplies and power generation
  - Satellite communications
  - Ruggedized to tolerate extreme weather
  - Self-testing
- ✧ May exist in several version for different types of deployment
    - Highland areas based on wind power
    - Desert areas based on solar power
- ✧ Remote control to support autonomous operation
- ✧ Dynamic software re-configuration

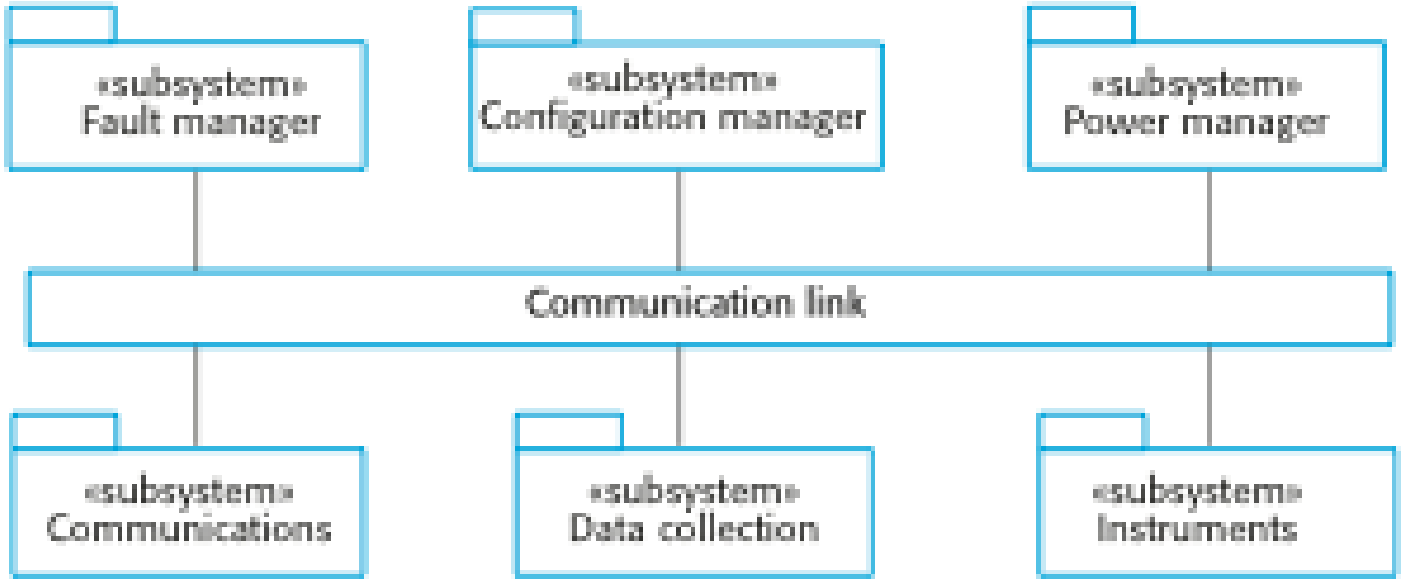
Installed instruments

- ✧ Anemometer – wind speed measurement
- ✧ Barometer – air pressure measurement
- ✧ Ground and air thermometers
- ✧ Rain/precipitation gauge
- ✧ Sunshine gauge
- ✧ Visibility gauge

Essential system functionality

- Collect weather information from instruments at regular intervals
- Transmit this information, on request, to the weather information system over the satellite link
- Store information if communications are not available
- Monitor external conditions and shut down power generation/instruments if threat of damage from extreme weather
- Run regular diagnostic tests to assess overall health of system

Software architecture



System software

- Embedded software but not real-time in the sense that rapid reaction to events is required.
- Developed using an object-oriented approach
- OO approach associates objects with the physical entities in the system e.g.
  - Weather data collection instruments
  - Power supply and generation
  - Communications
- Data may be stored as objects
- No requirement for large-scale database