

## Dynamic Service Compositions in Sensor Networks using Real Options

*Service-oriented Architecture* (SOA) for sensor networks aims at abstracting the sensor network into components (services) which provide functionality within the specific application domain. These services can be combined together to achieve more complex goals, which are sometimes not possible on a single sensor node due to various limitations like battery lifetime, limited memory or processing power etc. In such a scenario a sensor node will try to use services offered by other sensor nodes. We can think of it as a component based system in which one sensor node uses services offered by other nodes as input to its services.

The theory of real options comes from financial stock markets. It is also termed as Real options valuation which is an option valuation technique for budgeting decision. Real option strategy is effective in making decisions in highly uncertain environments. For example buying shares in some stock market that is very volatile or buying shares of a company which has high uncertainty in valuation (e.g. an oil company where oil prices are always fluctuating). Similarly if a software company wants to invest in a new research project but the outcome is uncertain the Real options theory provides a valuation technique that will enable the investor to make wise decisions. The commonly used real options are options to defer, time to build option, option to alter, option to abandon, option to switch, growth option and multiple investing option.

The theme of this project is to use real options theory in dynamically composing services in sensor networks. As mentioned earlier in a service oriented sensor network one node say Node-A uses other nodes' output as its input then there may be various nodes offering the same services. In such a case Node-A has to choose the best service in terms of cost. Node-A will like to choose service of such a node that incurs the lowest cost. The focus of this project will be to use real switch options as a selection process. In an ideal situation Node-A will have various switch options in hand and it will activate only one service at a time which has the lowest cost. After certain time it will re-evaluate its options and will switch to another service provider. This has to be done dynamically and at regular bases because of the nature of sensor networks which is changing continuously one service from one node which is the best option at time 't' may not be a good option at time 't+Δt' which is why we would like to switch to other options. As we can see that Real options provide a good decision mechanism for uncertain environment I think it would be interesting to apply Real options in sensor networks which are uncertain by nature.

The final outcomes of this project when fully implemented will be a simulator and simulation based results that would conclude the study whether it is a good idea to use Real Options as a service selection mechanism in service networks or not.