Engineering Tools and Methods

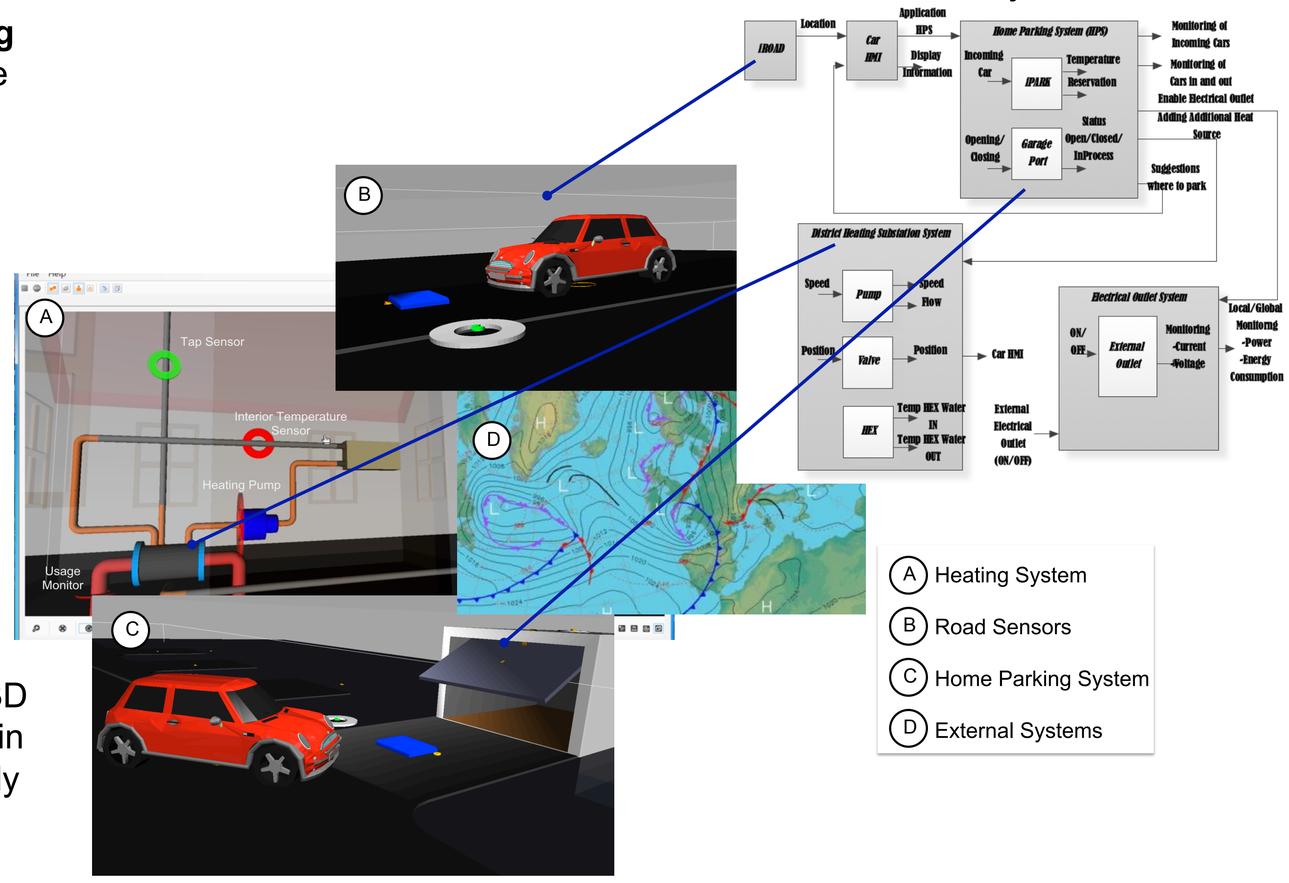
The Process Definition Environment (PDE) toolkit provides **engineering tools** and methods that have been used in the IMC-AESOP to integrate systems using a **component-based approach**. The PDE tools shown here are used to support the design and development of a fully distributed system built from components, sub-systems and systems.

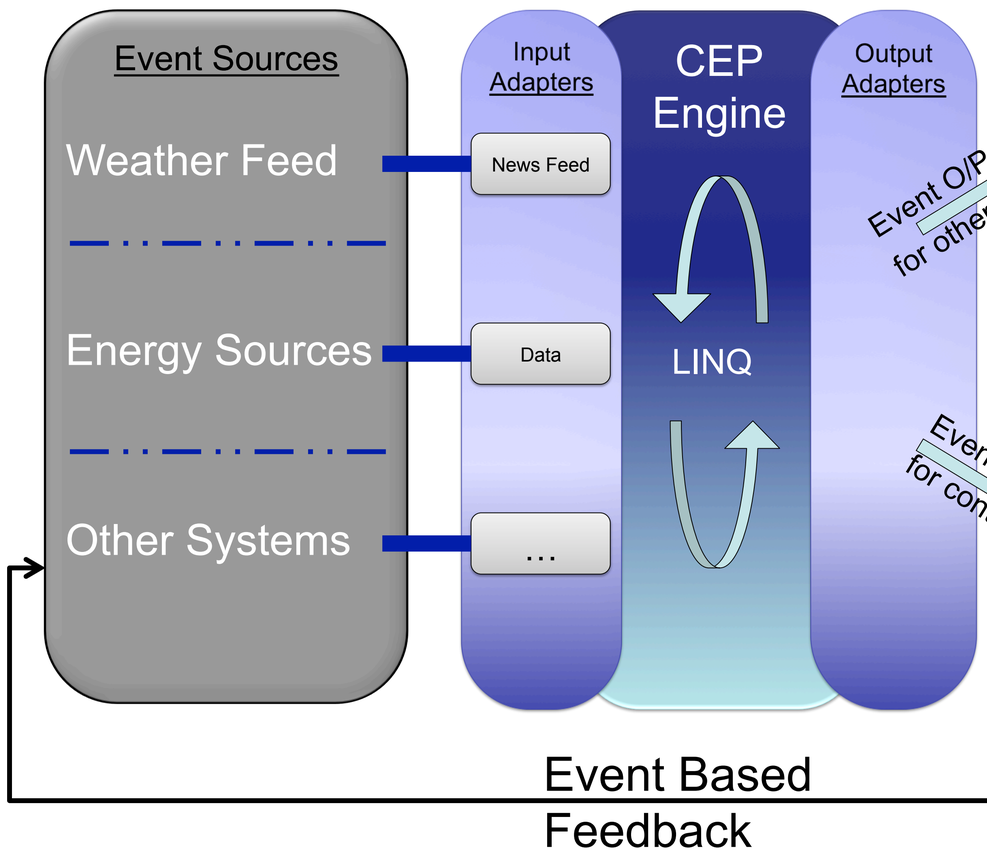
Utilising **SOA** based components operating in independent sub-systems (heating, road and home parking systems) that are integrated with **external systems** (e.g. weather forecasting system) cooperating systems can be developed. Here short range weather forecasts and the home parking system status direct the driver to the most appropriate parking location.

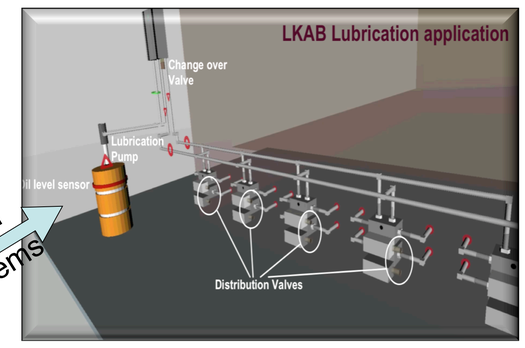
The PDE toolkit is used to build components from **geometric data** (lightweight CAD, kinematic data, and assembly points (link points)), **behaviour** (using Finite State Machines) and **error/ maintenance/ configuration data** that are specific to each component. Lightweight 3D models of the systems are assembled using the component link points in a similar fashion to 'Lego'; as such, effective simulations may be quickly built.

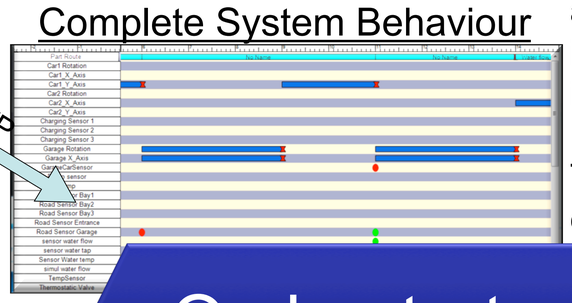
The behaviour of the system is created by interlocking the component state machines. This behaviour can be used to validate system behaviour and implement control software, such that there is a 1-1 mapping between the simulated and real control definition.

Use Case 4: System Definition









The **Complex Event Processing** (CEP) engine, implemented using Microsoft StreamInsight, provides an efficient mechanism to integrate asynchronous events from external systems. The event streams are processed using LINQ queries in order that time-based decisions can be used to influence the behaviour of the orchestrated system.

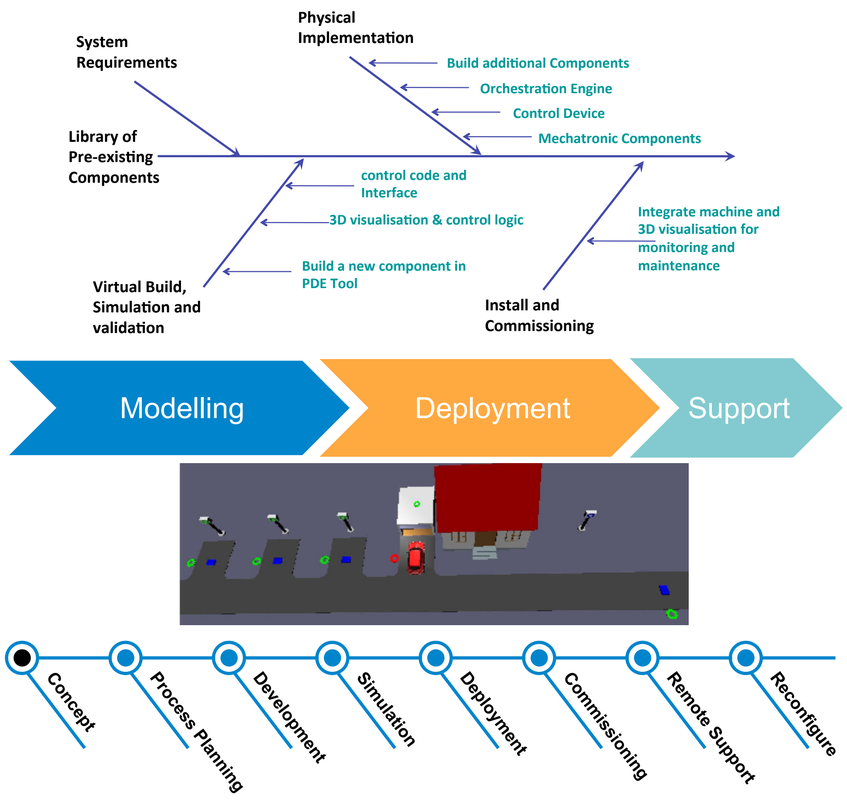
Output from the orchestrated system may be used as an input event stream to provide feedback, and integrated with external event streams to further influence system behaviour.

The advantage of CEP is that the queries may be enhanced and extended dynamically, creating an agile system capable of reacting to changing external factors; or used to integrate events from large scale systems to provide a method for building scalable systems.

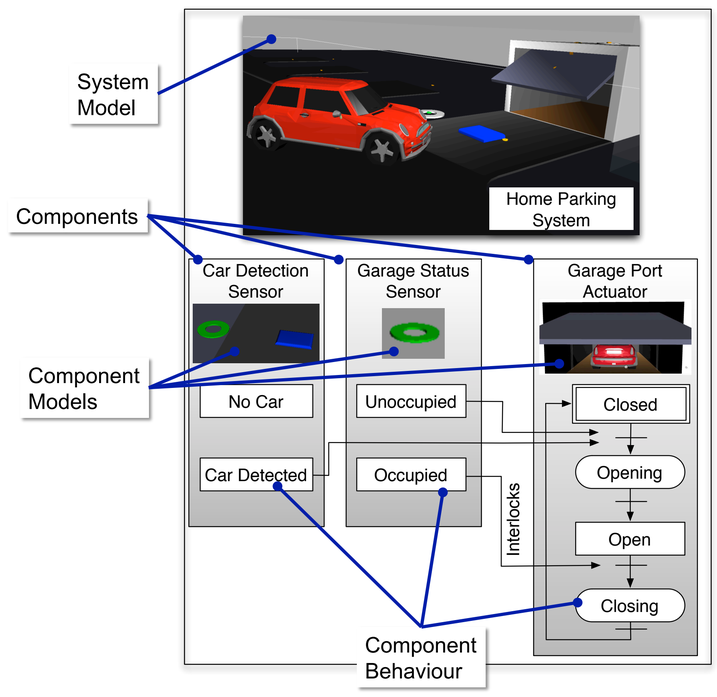
Complete Lifecycle Support

A high level of reuse can be achieved using component based systems with mechatronic devices. More robust systems may be created from libraries of validated components with additional components being created as required. These systems may be commissioned virtually, reducing the risk associated with deployment.

Virtual 3D models can be driven directly from the "real" components, as it is the same control system driving both the simulated and real components. These models may be used as a maintenance tool, as part of the PDE toolkit. This will result in any reconfiguration of the physical control system being directly reflected in the simulation.



Example System



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