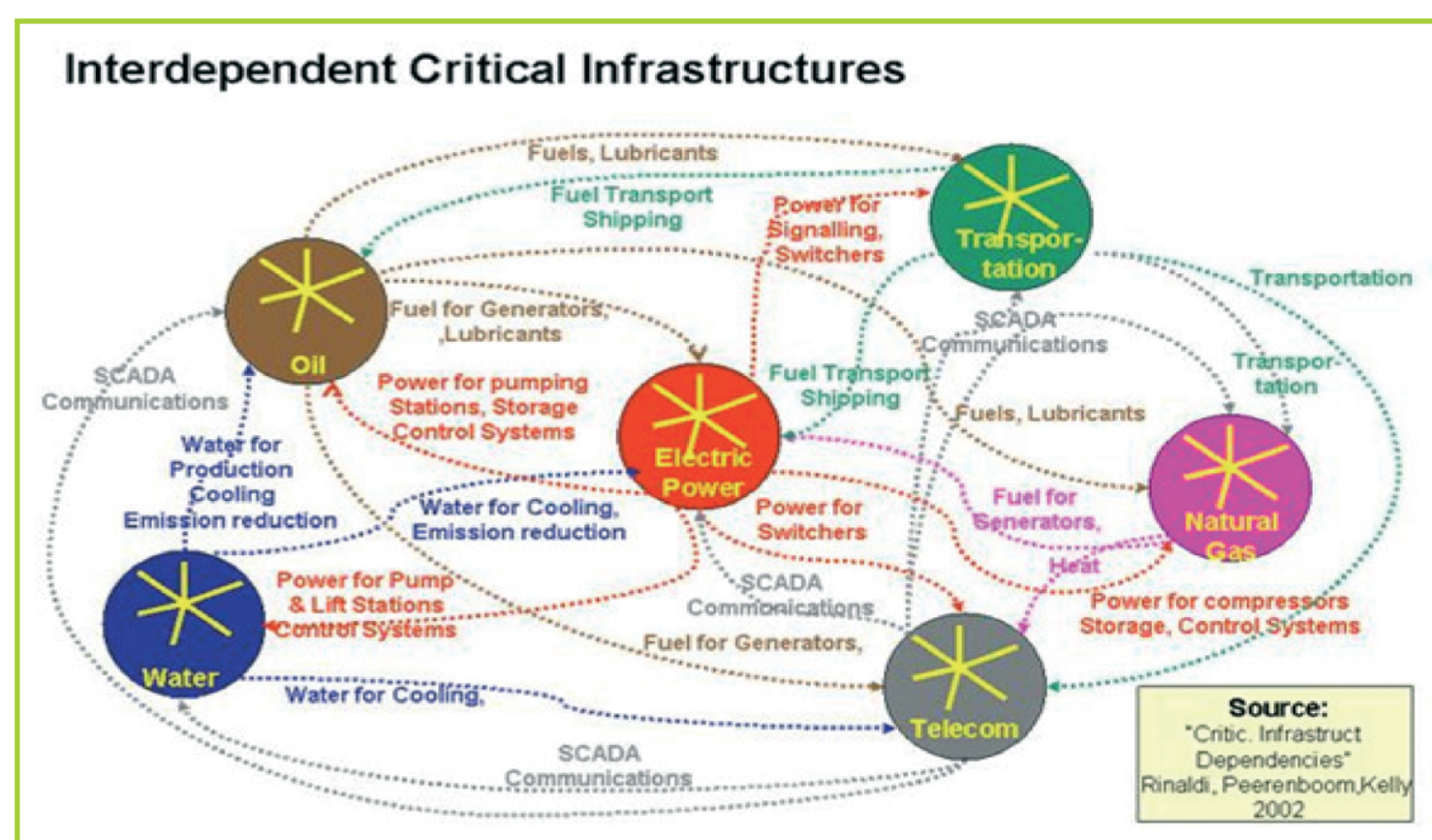


Interdependences among complex networks

The main goal of the project is to study the phenomena of the interdependences among different infrastructures with the approach of "What if", giving a result visualization as close to the reality, using also simulation technologies of virtual reality. For this purpose we have an higher level of difficulty for modeling a set of infrastructures rather than a single model network, because we intend to build all possible interactions among different infrastructures. This activity must answer the following questions:

- How is made up of the model for a set of different interdependent complex networks
- What is the burden of spatial and economical parameters of the interdependences, that is how is it possible to design stand-alone networks
- What is the contribute of the cyber layer for the networks interdependences and how to evaluate joined risks

The research goal is to create the integration of different simulation codes studying interdependences among infrastructures and giving information about it to accountable people of critical situations. So, we can note that a probable Simulation Center takes care of only the analysis of the interdependences among all the infrastructures considered in a particular scenario with the approach of "What if"



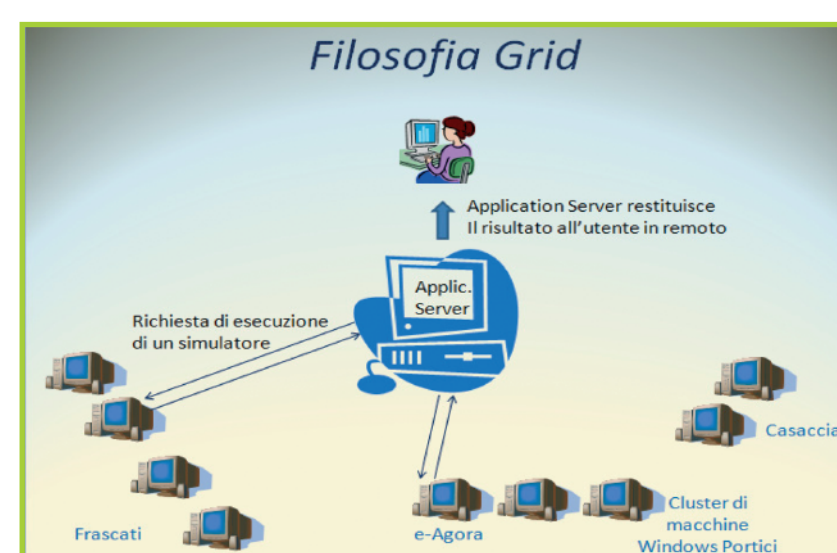
Considering the complexity of the problem, we think about a distributed solution in which all operators can run their own codes offering the provided results coming from them. However, it is not possible a software and operating system normalization because a lot of the available codes are developed in different times (power grid codes, transportation and communication network codes, ...). For this reason we make a solution that leaves every operator offer their own results and simulation codes to high calculus capacity nodes. The Simulation Center should realize an Application Server, which should be in the same center and provide different services to final users. All provided services should be given by using both the capacity calculus center and the codes provided by different operators.

The middleware between the Application Sever and the simulation codes should be made by "wrapper" which interact with the simulation codes in a traditional way and with the Application Server using the Web Service technology with XML for data representation, and HTTP/SOAP for information transport.

In this situation the Application Server can require a node, where a simulation code runs, both for simple data and for the execution of the code with a particular input. This request could be either synchronous or asynchronous: in the first case the requested protocol sends its request and waits for the results before continuing the elaboration; in the second case it does not attend for the ultimate execution, it goes on its elaboration, and finally asks for the results of the simulation code.

The situation should be the following: final users coming from different organizations should enter the services provided by the Simulation Center by Internet, and after creating an own account, they should set by middleware their own simulation request and send all of them to the Simulation Center, and wait for the final results.

Our purpose is to set up a simulation platform where it should be possible performing failure and attack scenarios in an automatic way, in order to emphasize problems connected to "interdependences" among different complex networks.

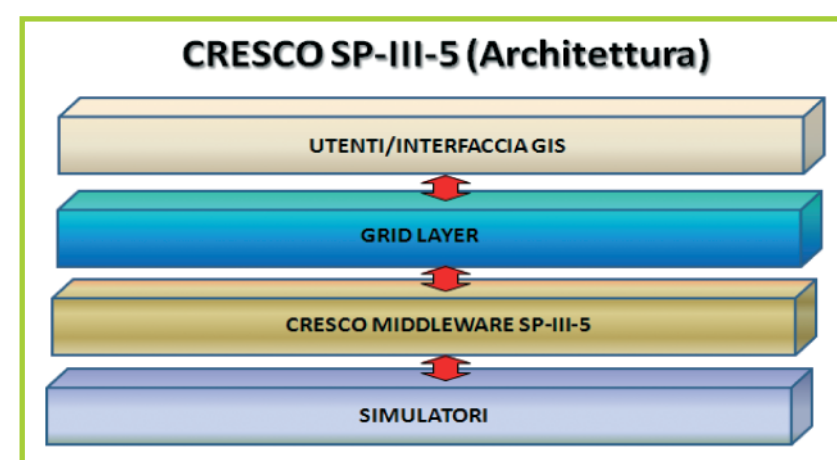


The computational platform should provide simulation services to users who log on from Internet

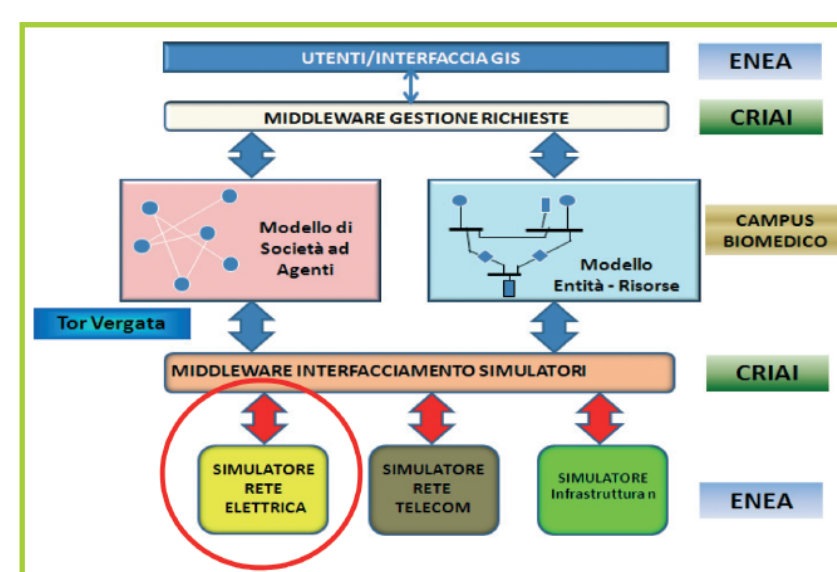
The objective of this activity is to describe in a formal way the working of a scenario in which different and complex networks work, such as power grid, communication network, transportation network, and so on., which interact by data information

exchange and interdependences.

The final results coming from simulations should predict networks behavior which are accident-prone by external fault or working state. It could be very important to have a constant analysis of every infrastructures belong to the scenario in order to have a working trend of all the services provided



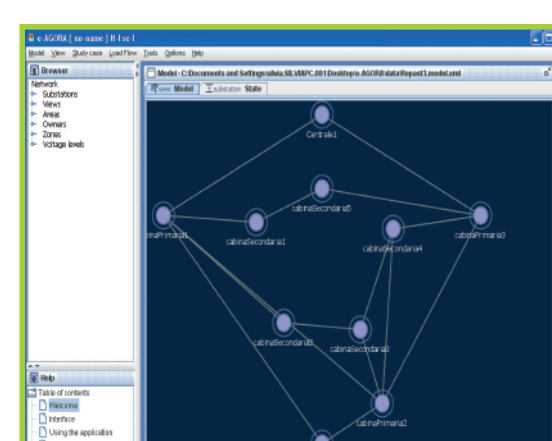
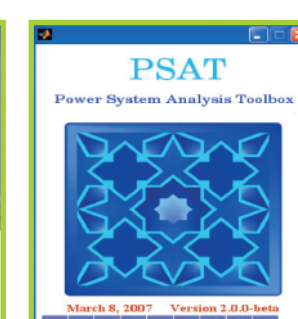
CRESCO SP-III-5 structure is built by a middleware between simulators (simulation codes/software) and Agent Based Model - Resources Entity Model, and another one which manages all users requests



The scheme shows the way in which the structure is built by all project partners



Power Grid Simulators prospected for the integration with the Agent Based Model and the Resources Entity Model



We focus on the integration of Power Grid Simulators with the platform architecture

We are building a power grid topology with e-AGORA Simulator which feeds both the scenario included in the Agent Based

Power Grid topology for Agent Based Model scenario built with e-AGORA