**Università degli Studi di Trento**  
**Dipartimento di Ingegneria e Scienza dell’Informazione**

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<th>Scholarship reference</th>
<th>B-Adige SPA</th>
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<td><strong>Company (name and address)</strong></td>
<td>ADIGE SPA – via Per Barco, 11 - 38056 - LEVICO TERME (TN)</td>
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| **Type of Scholarship** | • Level 2  
For students enrolled in Computer Science or Artificial Intelligence Systems Master Programs |
| **Title of Scholarship** | Two thematic options are made available:  
B4: Evolution of a client-server architecture for remote diagnosis  
B5: Study and implementation of a 3D machine model |
| **Industrial Tutor (full name + email address)** | Mattia Broilo – mattia.broilo@blmgroup.it |
| **Academic Supervisor (full name + email address)** | To be defined |
Laser cutting machines are complex systems made by several moving units and multiple devices driven by a CNC. Each machine has an HMI PC Panel used to let the operator interact with the system. PC Panel collects information about what is happening from interaction with the operators, from motors, different sensors and devices with which the machine is equipped. On each machine there is also installed a server to let the interaction with the machine from remote, when machine is connected. This server exchange information over the network with several clients for different kind of applications: diagnosis, services operation, machine configuration, software update …

Scope of this thesis is to evolve the actual client - server architecture improving the communication channel and developing new useful features for remote machine and information management.

The Expected Outcomes of this activity are:
- Study of actual architecture of server installed on the laser cutting machines.
- Study of actual situation of the remote connection of the machines
- Analysis and evaluation of the GRPC – dotnet library and the substitution in the actual architecture.
- Development and testing of the GRPC migration both on server and client side - Development of new functionalities in the architecture in order to improve communication with CNC, HMI software and the remote clients.

Required Candidate Skills and Prerequisites:
The candidate should have acquired some theoretical knowledge of:
- Computer science (programming skills)
- Computer Networks
- Telecommunication
- Human Machine Interaction

Our technicians will provide training to reach a basic competence on laser cutting machine, on the hardware and software architecture and related constraints.

The candidate will work in cooperation with our technical department, for the definition and study of the system and its underlying algorithms, in particular with our software engineers for the software implementation and testing.

The proposed topics have been summarized to fit the form provided by UNITN. Interested students will be able to better explore the proposals with the company managers involved, in order to satisfy training needs and expectations.

**B5: Study and implementation of a 3D machine model**

Short Description of Internship and Thesis Activities, and Expected Outcome:
Laser cutting machines are complex systems made by several moving units and multiple devices driven by a CNC. It is important to have a panoramic view of the whole system and the real-time state of all the moving parts. At the moment, our laser cutting machines have a 2D simulation component installed on the HMI PC panel on the machine that have this role. In order to improve the diagnostic process, and to evolve the existing framework for simulation and digitalization of the process, it is more and more necessary to evolve to a 3D solution.

Scope of this thesis is to evaluate the existing framework and toolkit available for developing a WPF component that can import/read simplified 3D model of machines and to use simulated or real time CNC input for moving objects and units.

The Expected Outcomes of this activity are:
- Study of actual architecture of the 2D simulation component installed on the HMI of the machines.
- Analysis and evaluation of 3D framework as Unity or Helix-toolkit.
- The development of component, able to load 3D models and configuration files that define devices and their role.
- Move components ad parts of the machine according to a simulated or CNC real-time input. - Make the component interactive in order to show or hide detailed information about the devices.

Required Candidate Skills and Prerequisites:

The candidate should have acquired some theoretical knowledge of:
- Computer science (programming skills)
- Robotics
- Human machine interaction

Our technicians will provide training to reach a basic competence on laser cutting machine, on the hardware and software architecture and related constraints.

The candidate will work in cooperation with our technical department, for the definition and implementation of the system and its underlying algorithms, and with our mechanical engineers, for the definition of the 3D simplified model.

The proposed topics have been summarized to fit the form provided by UNITN. Interested students will be able to better explore the proposals with the company managers involved, in order to satisfy
training needs and expectations.