**PhD in Electrical, Electronics and Communications Engineering**

**Research Title:** Blockchain technology for certification systems

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<th>Funded by</th>
<th>BeChain S.r.l.s. (<a href="http://www.bechain.it">www.bechain.it</a>)</th>
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| Context of the research activity | Blockchain is a novel, disruptive technology to support distributed databases, which records transactions in a verifiable and permanent way, exploiting a distributed consensus in peer-to-peer network. The most practically relevant example of its application is the bitcoin, a new currency wide spreading in the world. Due the generality of the approach and the possibility of defining “smart contracts” for the validation of the stored information, blockchains have been applied in many application contexts, but many new contexts are expected to be discovered in the near future.  

One promising application scenario for the blockchain is to record the data required by internationally recognized certification bodies (e.g., in the field of ISO certifications). These bodies typically interact with many stakeholders and dictate a precise set of constraints to be satisfied in order to issue a certificate, which naturally map to the development of specific smart contracts for blockchain-based implementations. For this application scenario, the PhD student will interact with the Italian company (BeChain) funding the PhD scholarship and with an internationally recognized European certification body. |
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Other application scenarios are still in study (e.g., to certify the spatial coordinate of a smartphone at some specific time) with expected disruptive implications for the final users.

**Objectives**

Aim of the PhD work is manifold:

1. to investigate the use of blockchain platforms (in particular, permissioned blockchains) in the considered scenarios (certification bodies, spatial certifications, etc.)
2. to develop a proof-of-concept based on permissioned blockchains (e.g., Hyperledger Fabric)
3. to investigate the scalability of the blockchain-based solutions when implemented in a public/private cloud system
4. to define novel promising application scenarios, in terms of economic value and technical sustainability
5. to improve the current platforms in terms of scalability (e.g., modifying the adopted consensus scheme)
6. to contribute to the research in the field of blockchains with contributions to internationally high-reputation conferences and journals

**Skills and competencies for the development of the activity**

- Very good programming skills. Experience with Golang, Java, python, C/C++ is preferred.
- Knowledge of distributed databases and peer-to-peer systems.
- Knowledge of blockchain platforms and experience with permissioned platforms are preferred.
- Knowledge of the principle of cloud computing and computer security.
- Very strong academic background on software development, computer science and computer networks
- Ability to interact in an international English-speaking research environment.