PhD Student Vacancy for the Lowcomote Project

Cloud-Based Low-Code Model Transformations Composition and Execution

University of L’Aquila is hiring a PhD Student for its Lowcomote Project in L’Aquila.

The Lowcomote project

The MSCA ITN 2018 project Lowcomote will train a generation of experts that will upgrade the current trend of Low-code development platforms (LCPDs) to a new paradigm, Lowcode Engineering Platforms (LCEPs). LCEPs will be open, allowing to integrate heterogeneous engineering tools, interoperable, allowing for cross-platform engineering, scalable, supporting very large engineering models and social networks of developers, smart, simplifying the development for citizen developers by machine learning and recommendation techniques. This will be achieved by injecting in LCDPs the theoretical and technical framework defined by recent research in Model Driven Engineering (MDE), augmented with Cloud Computing and Machine Learning techniques.

The Lowcomote project will train the first European generation of skilled professionals in LCEPs. The 15 future Early Stage Researchers (ESRs) will benefit from an original training and research program merging competencies and knowledge from 5 highly recognised academic institutions and 8 large and small industries of several domains. Co-supervision from both sectors is a promising process to facilitate agility of our future professionals between the academic and industrial world.

Partners

IMT Atlantique (FR), University of York (UK), Universidad Autónoma de Madrid (ES), University of L’Aquila (IT), JK University of Linz (AT), British Telecom (UK), Intecs (IT), Uground (ES), CLMS (UK), IncqueryLabs (HU), SparxSystems (AT), Metadev (ES), The Open Group (UK)

Training activities

The training program of Lowcomote aims at enabling the recruited ESRs to develop a broad range of scientific, technical and transferable skills that will prepare them for fruitful careers in academia and industry, namely thanks to training led by world experts in the field and timely and high-quality feedback by all co-supervisors.

In particular, the network will provide training for the three main competences needed for developing future LCEPs:

- MDE, for domain analysis, language construction and code generation;
- Cloud computing, for an efficient use of the Cloud infrastructure to manage a large number of users and artefacts;
- Machine learning, for building smart assistants for citizen developers.

Other training activities will include communication, career development and plan, and entrepreneurship.
Phd. research topic: Cloud-Based Low-Code Model Transformations Composition and Execution

Within the context of the Lowcomote project, the Phd candidate will work to the following specific research subject.

Objectives: The development of complex and large transformations can benefit from the reuse of smaller ones that can be composed according to user requirements. Composing transformations is a complex problem: typically smaller transformations are discovered and selected by developers from different and heterogeneous sources. Then the identified transformations are chained by means of manual and error-prone composition processes. In order to chain transformations it is necessary to ensure the pre- and post-conditions of the considered transformations and to verify the metamodels compatibility condition, i.e., that the output metamodel of the first transformation is immersed in the input metamodel of the second one. In case of similar output and input metamodels, the metamodels compatibility condition can be too strong and would discard transformations that could potentially be chained. Moreover, existing approaches are based only on structural aspects of transformations and metamodels. The objective of this project is to develop an approach to compose and execute model transformations that will enable the development of complex transformations by reusing and composing simpler and smaller ones. Transformation compositions and properties will be specified by means of a dedicated Model Transformation Composition Language (MTCL) that will be developed in the project. The specified properties can refer to both syntactical characteristics of the composed transformations (i.e., the source, and the target metamodels), and semantic aspects that that will drive the selection of the intermediate transformations that have to be retrieved from a repository of existing model transformations. In this respect a challenging open problem is assessing the semantics preservation of chained model transformations. An engine will be also developed to support the execution of the composed transformations. All tools developed in this project will be implemented as software-as-a-service, enabling their remote adoption and easy integration with external tools.

Expected results: The first objective of the project is to develop a theory of model transformation composition. The properties to be maintained during and after the execution of model transformations will be also investigated. Then a domain specific language (MTCL) will be defined for specifying model transformation compositions, i.e., the properties and the constraints that composed transformations have to satisfy. Algorithms to automatically compose model transformations according to MTCL specifications will be also defined. By considering each single transformation as a service, the outcome of the composition will be a composition model that will be consumed by a model transformation orchestration engine able to execute the composed transformation as specified in the composition model previously produced. Based on our preliminary results in we expect a significant reduction of the time required to compose transformations (from minutes to seconds or even hours depending on the repository population and on the complexity of the chain).
Requirements

Degree: Master degree in Computer Science or equivalent providing access to PhD programs.

Language: English proficiency must be attested either through a previous English language diploma, or an internationally recognized proficiency test (at least C1 level of the Common European Framework of Reference for Languages i.e. IELTS, IBT, TOEFL or Cambridge).

Career: When starting their contract (September 2019), selected researchers should be within the first four years of their careers. This means being both within a four years window following their most recent graduation and not having been awarded a prior doctoral degree so far.

Mobility: At the time of recruitment, the researcher must not have resided, or carried out his/her activity in Italy for more than 12 months in the 3 years prior to recruitment date.

Employment conditions

Full-time Equivalent Position

Duration: 36 months, including 2 secondments of 3 months each at other consortium members’ premises (see Hosting institution section)

Starting date: 1st September 2019

Remuneration:
The gross remuneration will amount €3,200 (approx) with an extra family allowance, if applicable.

Research, Training and Networking costs:
All relevant expenses linked to the research and training activities (travel, accommodation, etc.) will be paid by the project budget.

Hosting institution

The University of L’Aquila (UDA) has 7 departments and the work carried out in this project will be based at the Department of Information Engineering Computer Science and Mathematics. UDA has developed a solid research and development experience in software engineering by mainly focusing on software architectures, model-driven development, evolution of open source software, component-based programming, internet-based programming, security and verification issues.

The ESR will be hosted at the MDE group at the DISIM (http://www.disim.univaq.it) department of the University of L’Aquila:

University of L’Aquila
Department of Information Engineering Computer Science and Mathematics (DISIM)
Via Vetoio
67100 L’Aquila (Italy)
The ESR will spend 2 secondments of 3 months at the premises of 2 project’s members as detailed in the following table.

<table>
<thead>
<tr>
<th>Planned Secondments</th>
<th>Hosting Partner</th>
<th>Start – End Date</th>
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<tbody>
<tr>
<td>2. Integration of the transformation language developed by ESR13 with the orchestration engine.</td>
<td>IncQuery Labs (Hungary)</td>
<td>M31-M33 (July – September 2021)</td>
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**Supervisors**

Alfonso Pierantonio, [alfonso.pierantonio@univaq.it](mailto:alfonso.pierantonio@univaq.it)
Davide Di Ruscio, [davide.diruscio@univaq.it](mailto:davide.diruscio@univaq.it)

**Application process**

All applications shall be sent before 15th April 2019 by filling in the form on the Lowcomote [https://www.lowcomote.eu/call/](https://www.lowcomote.eu/call/).

Applications are composed of the following documents in English (and when necessary a certified translation of official documents):

1. a complete CV with references to past research and training experiences;
2. a motivation letter highlighting the consistency between the candidate’s profile and the chosen ESR position for which they are applying;
3. at least 2 reference contacts (could be substituted by a reference letter, which should be in English or in certified translation)
4. scan of the degree qualification.
5. scanned copy of valid identification document (identity card or passport)
6. proof of proficiency in English (either through a previous English language diploma, or an internationally recognized proficiency test - at least C1 level of the Common European Framework of Reference for Languages i.e. IELTS, IBT, TOEFL or Cambridge).