

## Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Ignasi Lluch I Cruz

**PhD Program:** Engineering Systems

**Title of Thesis:** A Framework for Architecting Federations of Engineering Systems


**Supervisor:** Professor Alessandro Golkar

**Chair of PhD Defense Jury:** Professor Clement Fortin

**Email:** [c.fortin@skoltech.ru](mailto:c.fortin@skoltech.ru)

**Date of Thesis Defense:** September 21, 2017

**Name of Reviewer:**

<p>I confirm the absence of any conflict of interest</p> <p>(Alternatively, Reviewer can formulate a possible conflict)</p>	<p><b>Signature:</b></p>  <p><b>Date: 08-09-2017</b></p>
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*The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to forward a completed copy of this report to the Chair of the Jury at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.*

*If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.*

### Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevancy of the topic of dissertation work to its actual content
- The relevancy of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications
- The summary of issues to be addressed before/during the thesis defense

The thesis of Ignasi Lluch covers a broad scientific subject within the field of Engineering systems with a focus on Federation of Satellites Systems (FSS). Two well-defined research questions are presented with two sub-questions each that the candidate is proposing to answer with a number of associated hypotheses, which corresponds very well to the title and subject of the thesis.

The thesis covers a very complex subject focusing on the architecting of complex federated systems and it also analyses and compares a number of systems including taxi ride sharing and shared wireless communication networks. This research work provides an excellent literature review of the specific field and proposes the innovative concept of Synergy for federated systems, which represents a specific kind of emergent behaviour for Systems of Systems. The thesis thus provides an excellent synthesis in this specific field.

The methodology is based on an innovative combination of Markov Decision Processes, Utility theory and Pareto Front analyses to study the evolutive architecture development of Systems of systems. This is definitely an excellent contribution to the state of the art in this specific field at the international level. Ignasi Lluch has published a significant number of papers in reputable journals and conferences on the topic also.

The author can be complimented for including a section on the limitations of his work; this is a good sign of a researcher's maturity and it certainly does not diminish the impact of the current thesis.

The thesis comprises nine chapters including the conclusion plus another chapter for references. The document it is very well written and I only found a number of small typographical errors, which should be corrected through a final revision.

This certainly one of the best theses that I have evaluated throughout my career.

#### **Provisional Recommendation**

☒ *I recommend that the candidate should defend the thesis by means of a formal thesis defense*

☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

☐ *The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*