

## 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:

I confirm the absence of any conflict of interest  (Alternatively, Reviewer can formulate a possible conflict)	<b>Signature:</b>   <b>Date: 16.08.2017</b>
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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

This thesis addresses a complex systems issue in attempting to characterize federation of functions in complex system environments. It is based upon a multitude of assumptions and simulations which represent a theoretical construct and background for the application examples. The generic architecture framework for federating system elements can, under certain circumstances, provide value for better understanding and describing complex system of systems relationships.

The thesis anticipates that the “sharing economy” would be a centerpiece of the work. This is exemplified in only one of the case studies. The introduction could hence be put into a better context with the rest of the thesis.

The thesis rightfully acknowledges that the developed framework is applicable to exploratory research trade-off phases. It goes too far though when it states that this framework can also be applied to concept phases aimed at demonstrating system feasibility and more. The number of parameters and the level of depth in such phases most of the time goes substantially beyond the possibilities and methods developed in this PhD thesis.

The example used to explain trade-offs for Earth remote sensing satellites in Fig 4 on page 38 is not representative and could be misleading. Typical Earth (surface) Observation satellites have a spatial ground resolution range from less than 1 to 20 meters and occasionally to some 100 meters. There are already a number of R&D and operational remote sensing satellite constellations in Earth orbit, e.g. Copernicus, SSTL, SAR Lupe, Prisma, etc, and several new proposed constellations, e.g. OneWebb, Boeing, SpaceX, Telesat et al. Should they not be mentioned in this thesis, in particular since e.g. the 5 satellite constellation SAR Lupe already uses inter-satellite links?

It is generally not clear where the cost estimates of this thesis come from and how substantiated they are. Please elaborate and clearly differentiate between cost assumptions and cost which originate from real values; provide the sources for both.

The thesis features an elaborate international literature research in the fields of systems science and engineering systems.

Altogether the quality of the thesis is acceptable, some adjustments as noted are nonetheless recommended.

Some very specific comments follow:

The thesis could benefit from a list of abbreviations

Page 22 refers to a “proposal”; this is not explained and probably refers to the thesis?

Several small typing errors identified: pages 24,29,34,38,65,91,138,156,163,180

#### **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*