



# **LEIT ICT WP 2018-20**

## **ICT-16: Software Technologies**

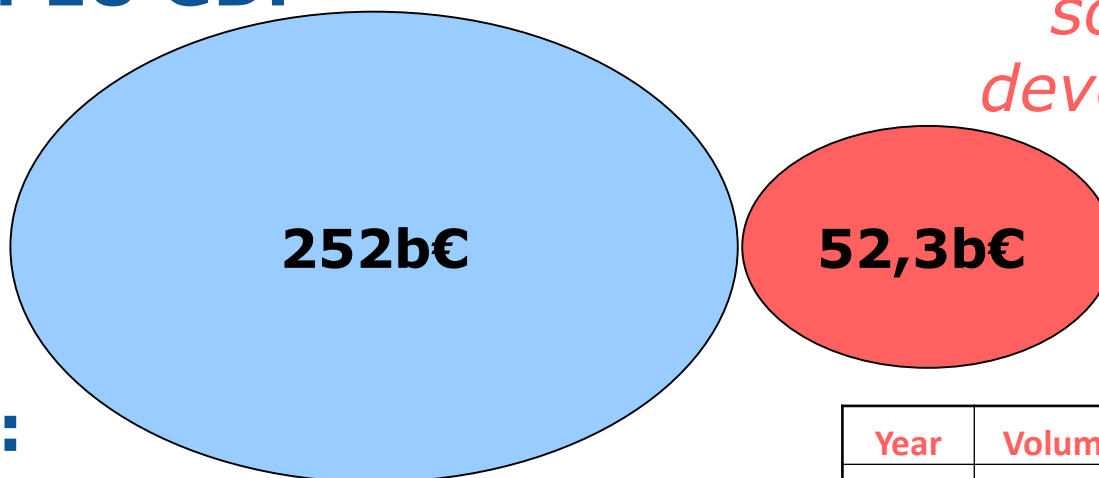
**Brussels, 25 October 2017**



# Software impact in the EU economy

*Software and Software-based services market (SSBS)*

- **1,8% of EU GDP**



- **Market Growth:**

2009-2015 → 1,5%

Expected 2015-2020 →  
2,9%(290b EUR in 2020)

Year	Volume (b€)	SBSS share
2015	52,3	20,80%
2020	57,2	19,70%



### Key findings of the “2016 Global Innovation 1000 Study”

- *Companies allocating 25% or more of their R&D budgets to software offerings report that their revenues are growing faster than those of key competitors that are allocating a smaller portion.*
- *Regionally, companies in North America are making the strongest shift to software offerings—from 15% of total R&D spending in 2010 to 24% in 2020.*
- *By 2020, companies will have shifted the majority of their R&D from product offerings to software and services.*
- *The top reason companies are shifting R&D budgets toward software and services is the “need to stay competitive”*



# FP7/H2020 project portfolio in Software

FP7 - Call 1

FP7 - Call 8

FP7 - Call 10

WP2016-17 Call 2

**Service/Software Engineering**  
(complexity, dependability):

**DEPLOY**, Protest, COMPAS, ALIVE, MOST, MANCOOSI, DIVA, Q-Impress

**Advanced Software Engineering**

MODAClouds	<b>ARTIST</b>
PROWESS	MIDAS
MARKOS	OSSMETER
RISCOSS	U-QASAR

**Innovative software & tools for services**

Agile Software Prototyping	Model Driven Engineering
<i>S-Case</i>	<i>Mondo</i>

**Software Technologies**

CROSSMINER  
DECIDE  
ELATEST  
OPENREQ  
Q-RAPIDS  
STAMP  
COEMS

35,6 M €\*

31,1 M €

5,1 M €

30 M €



FP7 - Call 5

23,3 M €

27 M €

WP2014-15 Call 1

**Advanced Software Engineering**

Service coordination <b>CHOReOS</b> , ACSI	Testing FITTEST	Maintenance FastFix	Migration to clouds REMICS	Open source development ALERT
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**Tools & Methods for Software Development**

DICE	ARCADIA
HyVar	CHOReVOLUTION
ALIGNED	RePhrase
SWITCH	SUPERSEDE

39 Projects - 152.1 M €

\*EC Contribution

# Acceptance ratio and participation in Software Technologies related topics

WP	Topic	EC Funding (M€)	Projects Funded	Requested Funding (M€)	# proposals	Acceptance ratio	EC funding ratio
WP2014-15	<i>Tools and Methods for Software Development</i>	27	8	244,40	74	10,8%	11,0%
Overall in ICT-LEIT (2014)		660,6	209	5.461,00	1639	12,8%	12,1%
WP2016-17	<i>Software Technologies</i>	31	7	356,80	90	7,8%	8,7%
Overall in ICT-LEIT (2016)		456,8	134	3.696,00	1071	12,5%	12,4%



# From H2020 WP2016-17 to WP2018-20

## Preparation process

### Internal consultation

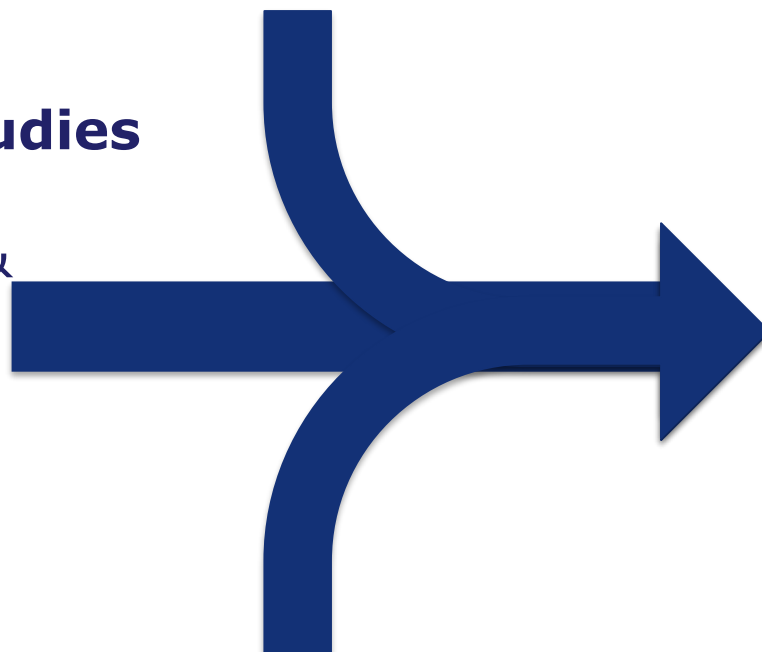
### Independent studies

(SMART 2015/15  
prof. M. Hinchey &  
prof. D. Spinellis)

**Workshop**  
(6/10/16)

### Other sources

(e.g. HolaCloud CSA, NESSI position paper, SW4SA project cluster)



H2020  
WP2018-2020



## Several sources of input

**The Economic and Social Impact of Software & Services on Competitiveness and Innovation (SMART 2015/0015)**

FINAL REPORT  
A study prepared for the European Commission DG Communications Networks, Content & Technology by:

DPC  
CXP  
Fraunhofer

Digital Europe  
Project

**Research Priorities in the area of Software Technologies**

Prepared by Diomidis Spinellis

European Commission

**NESSI**  
Networked European Software and Services Initiative

**SOFTWARE CONTINUUM**  
Recommendations for ICT Work Programme 2018+

11 May 2016 (Release 2)

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)  
**ScienceDirect**  
Elsevier

Procedia  
Computer Science

CLOUD FORWARD: From Distributed to Complete Computing, CF2016, 18-20 October 2016, Madrid, Spain

**Current and Future Challenges of Software Engineering for Services and Applications**

Giuliano Casale<sup>a</sup>, Cristina Cuesta<sup>a</sup>, Peter Deussen<sup>a</sup>, Elisabetta Di Nitto<sup>a,\*</sup>, Panagiotis Gouvas<sup>a</sup>, Sotiris Koussouris<sup>a</sup>, Vlado Stankovski<sup>a</sup>, Andreas Symeonidis<sup>a</sup>, Vlassis Vlassiou<sup>a</sup>, Anastasios Zafeiropoulos<sup>a</sup>, Zhiming Zhao<sup>a</sup>

*\*Chair of European Projects on Software Engineering for Services and Applications  
<http://www.usb.cit.uzh.ch/research/sem4services-and-applications/>*

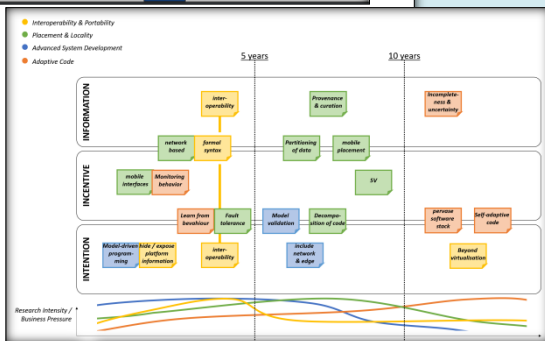
**Abstract**  
ICT (Information and Communication Technology) and, in particular, software is more and more pervasive and it cannot be considered anymore as a minor element of a complex system. In domains like cloud, big data, IoT (Internet of Things), CPS (Cyber-Physical Systems) it is the core element. We need to consolidate the software engineering discipline which, despite the impressive achievements in the area of software technology, is probably one of the youngest scientific and technological disciplines with almost 60 years of history. This paper summarizes the challenges that the Software Engineering for Services and Applications is considering as relevant.  
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Stability of organizing committee of the international conference on cloud forward: Cloud Computing  
Keywords: Research Challenges; Collaborative; Software Development

ular, software is more and more pervasive. It is affecting our lives, the services we can exploit, mining, agriculture, health, and other fields in a way that could have never been even imagined a  
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Stability of organizing committee of the international conference on cloud forward: Cloud Computing  
Keywords: Research Challenges; Collaborative; Software Development

**Innovation Potential of Software Technologies in the context of Horizon 2020**

Lero THE IRISH SOFTWARE RESEARCH CENTRE





## The specific Challenge

20 MEuros

50 WEPILO2

- *The impact of software defined and virtualized infrastructures in the software development & management processes*
- *Transition from traditional development processes towards new paradigm which treats software, data and compute resources as abstract elements.*
  - Enable data to flow freely over heterogeneous infrastructures in a **scalable, distributed** and **human-understandable** fashion.
- *Increased need for reusable code and software components*





## An overview of Actions

*Research & Innovation Actions (RIA)*

10 MEuros

**Integrated programming models & techniques for exploiting the potential of virtualised and software defined infrastructures.**

*Innovation Actions (IA)*

9 MEuros

**Software ecosystems exploiting the potential of existing code bases.**

*Coordination & Support Actions (CSA)*

1 MEuro

- a. Stakeholders coordination, projects results dissemination, R&I road mapping.**
- b. Help projects establish software ecosystems and transform their results into exploitable and viable solutions.**



## Research & Innovation Actions (RIA) Scope

- **Code and resources (data, computing and networking) abstractions.** Code and data abstractions that are expressive, machine-readable and carrying out additional information about execution requirements, network topologies, data sources.
- **Advanced software systems development.** Enable flexible (de)composition and interoperability of software and data at run-time, thereby adhering to relevant operational constraints and business requirements. Programming models easier and more abstract, following the principles of human thinking, rather than standard algorithms

**Demonstrate the applicability and viability of the proposed solutions across multiple application domains**

Mid-sized actions: 3-5 MEuros



## Innovation Actions (IA) Scope

***Software ecosystems exploiting the potential of existing code bases.*** Development platforms and mechanisms for code re-usability:

- Ensuring software quality (development, verification, validation and/or qualification tools)
- Supporting software reusability (storing, tracking, searching and analysing software artefacts)

Attention on:

- handling cross-platform dependencies
- quality management of diverse software components

Mid-sized actions: 3-5 MEuros



## Coordination & Support Actions (CSA) Scope

- **Support actions for establishing software ecosystems** (especially in the context of H2020). From initial software development results to **commercially viable solutions, best practices of code reusability, community building and code reuse** by new initiatives.
- **Coordinate stakeholders in Software Technologies and support to R&D programmes/activities:**
  - disseminate project results, organise scientific and policy events, develop research and innovation roadmaps, address pre-standardisation initiatives.

Small actions: 400 - 600 KEuros



## Expected Impact

- *Research & Innovation Actions (RIA)*
  - Increase the capacity of the European software industry to **exploit the capabilities of virtualised infrastructures through software.**
  - Overcome fragmentation in the European supply base, optimizing investments and use of resources **to yield multi-domain software-based products and related software services through R&I.**
- *Innovation Actions (RIA)*
  - Overcome fragmentation in the European supply base, optimizing investments and use of resources **to yield reusable software-based products and related software services.**
- *Coordination & Support Actions (CSA)*
  - **Creation of a sustainable European forum of stakeholders** representing the Software research, industry and end users.

***Provide appropriate metrics for claimed impacts***



## Further Information (1/2)

*The Economic and Social Impact of Software and Services on Competitiveness and Innovation (SMART 2015/15) study*

<https://ec.europa.eu/digital-single-market/en/news/economic-and-social-impact-software-and-services-competitiveness-and-innovation>

*Future trends and research priorities in the area of Software Technologies*

<https://ec.europa.eu/digital-single-market/en/news/future-trends-and-research-priorities-area-software-technologies>

*The innovation potential of software technologies*

<https://ec.europa.eu/digital-single-market/en/news/innovation-potential-software-technologies>

*Expert Workshop on the Challenges & Opportunities for the European Software Industry (6 October 2016)*

<https://www.pac-online.com/expert-workshop-challenges-opportunities-european-software-industry>



## Further Information (2/2)

*NESSI Strategic Research and Innovation Agenda 2017*

[http://www.nessi-europe.com/files/NESSI\\_SRIA\\_2017\\_issue\\_1.pdf](http://www.nessi-europe.com/files/NESSI_SRIA_2017_issue_1.pdf)

*HolaCloud Roadmap*

<http://www.holacloud.eu/roadmap/>

*Current and Future Challenges of Software Engineering for Services and Applications, White Paper, SE4SA project cluster*

<http://www.sciencedirect.com/science/article/pii/S1877050916320944>

*2016 Global Innovation 1000 Study, PwC*

<https://www.strategyand.pwc.com/innovation1000>

*Software Technologies R&I Project portfolio :*

<https://ec.europa.eu/digital-single-market/news/software-services-cloud-computing-h2020-project-portfolio>