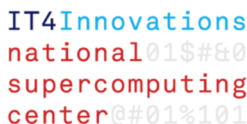



4 Members of the consortium

4.1 Participants (applicants)

4.1.1 VYSOKA SKOLA BANSKA - TECHNICKA UNIVERZITA OSTRAVA / IT4Innovations National Supercomputing Center

	Part N°	Acronym	Country	Type
	1	IT4I	CZ	RO-SCC
Legal Entity Description	<p>   </p> <p>VŠB-Technical University of Ostrava (VSB-TUO) was founded in 1849, it has since grown into a modern institution of higher learning, offering the highest levels of education in technical and economic branches of study. VSB-TUO is the fourth largest university in the Czech Republic with over 19,500 students studying in bachelor's, master's and doctoral degree programs in seven faculties and two all-university study programmes. In November 2011 VSB-TUO was awarded the prestigious ECTS Label.</p> <p>Technical University of Ostrava is a part system of higher education as the highest level of the educational system of the country. Technical University of Ostrava is a high school with technical-economic orientation, whose primary mission is to:</p> <ul style="list-style-type: none"> ● Providing higher education, ● Research and development, ● Cooperation with practice. <p>IT4Innovations national supercomputing center at VSB-TUO (http://www.it4i.eu) is the strategic research infrastructure in the Czech Republic. In the framework of the National supercomputing center, the most powerful supercomputing facilities in the Czech Republic are being built and excellent research in HPC technologies and embedded systems is performed. The mission of the centre is to deliver scientifically excellent and industry relevant research in the fields of high performance computing and embedded systems. The centre is providing state-of-the-art technology and expertise in high performance computing and embedded systems and makes it available for Czech and international research teams from academia and industry. IT4Innovations research activities are distributed into 5 laboratories:</p> <ul style="list-style-type: none"> ● Parallel algorithms research lab ● Advanced data analysis and simulations lab ● Modelling for nanotechnologies lab ● Big data analysis lab ● Infrastructure research lab <p>IT4Innovations is a part of the National Roadmap for Large Infrastructures for Research, Experimental Development and Innovations prepared by the Ministry of Education, Youth and Sports of the Czech Republic, as one of the three large e-infrastructure in the country. IT4Innovations currently operates two supercomputers, Anselm (94TFLOPS, installed in summer 2013) and Salomon (2PFLOPS, installed in summer 2015). Besides operating the infrastructure and offering its resources, IT4Innovations provides regular training for the HPC community and offers MSc and PhD studies in the field of HPC.</p> <p>The team also contributes to the consortium with the strong expertise in HPC technologies and big data processing. IT4Innovations has joined ETP4HPC (European Technology Platform in the area of High-Performance Computing) and represents the Czech Republic in the European research infrastructure PRACE (Partnership for Research and Advanced Computing in Europe) which is the unique institution joining national supercomputing centres in Europe. IT4Innovations participated on 3 implementation projects of this</p>			

	<p>infrastructure PRACE-1IP, PRACE-2IP and PRACE-3IP supported by EU via FP7 programme. IT4Innovations participated on FP7 project HARPA coordinated by POLIMI and exascale computing FP7 project EXA2CT. Currently, IT4Innovations is involved in development of ESA's online Urban Thematic Exploitation Platform and participates on the H2020 projects ExCAPE, ANTAREX and READEX. IT4Innovations is also the only Intel Parallel Computing Center (IPCC) in new member states of the European Union.</p> <p>Participant role in the project IT4Innovations is the Project coordinator (PC) of the project at hand and hence also the leader of WP1 - Management. IT4I will participate in co-design and development of innovative tools and architecture for the federated combined HPC and Cloud technologies with the focus on the Big Data analytics in the technical WPs (WP2- WP4). IT4I will contribute to the infrastructure set-up, roll-outs, validation and benchmarking of the LEXIS in WP2 and together with LRZ will provide test-beds infrastructures and the access to the LEXIS Data System in pilots WPs (WP5-WP7). IT4I will work on design and implementation of the reporting system as well as assisting CYC with correct policy development from a provider perspective in WP8. IT4I will also take an essential role in WP9 by supporting the project in the dissemination and exploitation activities and work towards increasing the LEXIS project impact. IT4I will also provide an infrastructure through Open Access Grant Competition.</p>
<p>Persons involved in research activities</p>	<p>Dr. Jan Martinovič (male) is currently Head of Advanced Data Analysis and Simulation Lab at IT4Innovations. He has extensive experience leading substantial R&D activities, being head of a lab comprising of 32 FTE staff. His research activities are focused on information retrieval, data processing, design and development of information systems and disaster management. His activities also cover a development HPC as a Service Middleware which allows to use HPC infrastructure remotely by specific API. He had previous experience with coordination of the different contracted research activities with international and national companies such as Microsoft Corporation USA or ArcelorMittal Frýdek-Místek a.s. Czech Republic and had responsibility for the technical coordination of the several national projects. He is currently the Leader of IT4I as a partner of the two H2020-FETHPC-2014 projects ANTAREX (AutoTuning and Adaptivity appRoach for Energy efficient eXascale HPC systems) and ExCAPE (Exascale Compound Activity Prediction). He is also responsible for the research and development team of FLOREON+ system (http://floreon.eu) - a system for disaster management support. He has published more than 100 papers in international journals and conferences.</p> <p>Dr. Vít Vondrák (male) is the managing director at IT4Innovations National supercomputing center and associated professor at VŠB-Technical University of Ostrava. His expertise is in numerical linear algebra, optimization methods, high performance computing. He is the member of the PRACE Council (Partnership for Research and Advanced Computing in Europe) representing the Czech Republic. He is/was co-investigator of 4 FP7 projects PRACE-1IP, PRACE-2IP, PRACE-3IP, HARPA and H2020 project PRACE-4IP. Leader of mathematical modelling group in the project FLOREON+ (http://floreon.eu) - system for disaster management support. Principal investigator of the project Intel Parallel Computing Center and project of the Large infrastructures of the Czech republic. Vít Vondrak is author of more than 60 scientific papers, 7 papers in journals with impact factor, h-index 4 on WoS.</p> <p>Dr. Lubomír Říha, (male) is senior researcher in the Parallel Algorithms Research Lab at IT4Innovations, VSB – Technical University of Ostrava. Previously he was a research scientist in High Performance Computing Lab at The George Washington University, ECE Department. He has received his Ph.D. and M.Sc. degrees in Electrical Engineering from Czech Technical University in Prague, Czech Republic in 2011 and Ph.D. degree in Computer Science from Bowie State University, USA. He is/was co-investigator of FP7 EXA2CT and H2020-FET HPC READEX projects and Intel Parallel Computing Center at IT4Innovations. He is also a co-principal developer of the ESPRESO finite element library which includes a parallel sparse solver designed for supercomputers with tens or</p>

	<p>hundreds of thousands of cores with support for both GPU and Intel Xeon Phi accelerators. His research interests are high performance computing, energy efficient computing, acceleration of scientific and engineering applications using multi- and many-core accelerators, development of scalable linear solvers, signal and image processing.</p> <p>Dr. Tomáš Karásek (male) obtained his Ph.D. degree in applied mechanics at VSB-Technical University of Ostrava. He is the Head of Parallel Algorithms Research Lab and has a solid background in computational techniques related to mechanics, structural dynamics, heat transfer analyses, fluid dynamics and fluid-structure interaction. He holds fifteen years of experience in R&D applying numerical methods to solve various industry related problems; nine years of experience with high performance computing (HPC) and code development for numerical simulation of multidisciplinary problems on HPC platforms and over six years of experience of leading a research team. He has been awarded funding for research proposals from government agencies and industry, and initiated and sustained collaborations with researchers in academia, national labs and industry. He has been a chief investigator or co-chief investigator in several projects, and local coordinator of work packages within PRACE 2IP, 3IP and 4IP. He previously worked as scientist and deputy department director at Institute of High Performance Computing in Singapore. Currently he is a deputy head of the research program HPC Libraries and Supercomputing for Industry at IT4Innovations National Supercomputing Center. He also leads team developing tool for image segmentation from bio-medical images. This tool is being developed for Xeon Phi.</p> <p>Dr. Kateřina Slaninová (female) is currently Deputy head of Advanced Data Analysis and Simulations Lab at IT4Innovations and Assistant Professor at Silesian University of Opava, Czech Republic. Her research interests include informational retrieval, traffic analysis, data mining, process mining, and complex networks. She is co-investigator of H2020-FET HPC projects ANTAREX (AutoTuning and Adaptivity appRoach for Energy efficient eXascale HPC systems). She worked within the team of the Center for the Development of Transportation Systems RODOS and participates in long-term cooperation with the navigation company Sygic, Slovakia. She has published more than 50 articles in scientific international journals, book chapters, and conferences focused on the mentioned domains.</p> <p>Anna Němcová (female) is an experienced project and financial manager who is involved in management of academic international projects since 2011. Before she was preparing and administrating national projects for public authorities in the Czech Republic. At VŠB-TUO, respectively IT4Innovations, she has actively participated in management and financial administration of at least 15 FP7 and H2020 projects and also has been involved in co-organizing of international conferences.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Cima, V., Böhm, S., Martinovič, J, Dvorský, J, Ashby, T. J., Chupakhin, V.: HyperLoom Possibilities for Executing Scientific Workflows on the Cloud, CISIS 2017: Complex, Intelligent, and Software Intensive Systems pp. 397-406.</p> <p>Golasowski, M., Bispo, J., Martinovič, J., Slaninová, K., Cardoso, J.M.P. Expressing and applying C++ code transformations for the HDF5 API through a DSL (2017) Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 10244 LNCS, pp. 303-314.</p> <p>Říha L., Brzobohatý T., Markopoulos A., Meca O., Kozubek T.: “Massively Parallel Hybrid Total FETI (HTFETI) Solver”, Platform for Advanced Scientific Computing (PASC), 2016.</p> <p>Silvano, C., Agosta, G., Bartolini, A., Beccari, A.R., Benini, L., Bispo, J., Cmar, R., Cardoso, J.M.P., Cavazzoni, C., Martinovič, J., Palermo, G., Palkovič, M., Pinto, P., Rohou, E., Sanna, N., Slaninová, K.: Autotuning and adaptivity approach for energy efficient Exascale HPC systems: The ANTAREX approach, (2016). In: Proceedings of the 2016 Design, Automation and Test in Europe Conference and Exhibition (DATE 2016), 708-713, (2016)</p>

	<p><i>HEAaaP</i> - HPC as a Service middleware: software that allows users to run complex and performance demanding calculations remotely on a supercomputer. https://code.it4i.cz/ADAS-Private/HEAppE/Middleware/wikis/home</p>
<p>List of up to 5 relevant previous projects or activities</p>	<p>HARPA (Harnessing Performance Variability), http://www.harpa-project.eu/, 2013 - 2016, funded by European Commission (FP7-ICT), The objective is to design and develop methods for the problem solution dealing with load balancing in heterogeneous many core systems to ensure their proper functionality.</p> <p>ExCAPE (Exascale Compound Activity Prediction Engine), 2015-2018, funded by European Commission (H2020-FET HPC). The main goal of the ExCAPE project is to develop Exascale compound activity prediction engine by producing the state of the art scalable algorithms and implementations suitable for running on future Exascale machines. Designed methods will enable processing and analysis of the industry scale complex pharmaceutical analysis workloads.</p> <p>ANTAREX (AutoTuning and Adaptivity appRoach for Energy efficient eXascale HPC systems), http://www.antarex-project.eu, 2015-2018, funded by European Commission (H2020-FET HPC). The main goal of the ANTAREX project is to provide a breakthrough approach to express by a Domain Specific Language the application self-adaptivity and to runtime manage and autotune applications for green and heterogeneous High Performance Computing systems up to the Exascale level.</p> <p>EXA2CT, (EXascale Algorithms and Advanced Computational Techniques), http://www.exa2ct.eu/, 2013 - 2016, funded by European Commission (FP7-ICT), The goal of this project is to develop novel algorithms and programming models to tackle what will otherwise be a series of major obstacles to using a crucial component of many scientific codes at exascale, namely solvers and their constituents.</p> <p>PRACE, http://prace-project.eu/, funded by European Commission FP7-RI more than twenty-five member states are engaged in the initiative, jointly building an all-European supercomputer network that allows access to high-capacity computing resources. PRACE's mission is to support scientific discoveries and the development of applied research across all scientific branches by providing supercomputing capacity.</p>
<p>Description of infrastructure</p>	<p>IT4Innovations operates the biggest supercomputing facility in the Czech Republic. This infrastructure consists of two systems Salomon and Anselm.</p> <p>Salomon is a petaflop class system consisting of 1008 computational nodes. Each node is equipped with 24 cores (two twelve-core Intel Haswell processors). These computing nodes are interconnected by InfiniBand FDR and Ethernet networks. There are two types of compute nodes:</p> <ul style="list-style-type: none"> ● 576 compute nodes without any accelerator, ● 432 compute nodes with MIC accelerators (two Intel Xeon Phi 7120P per node). <p>Each node is equipped with two 2.5GHz processors and 128 GB RAM. Total theoretical peak performance of the Big cluster exceeds 2 PFLOP/s with aggregated LINPACK performance over 1.5 PFLOP/s. All computing nodes share 500TB /home disk storage to store user files. The 1700TB shared storage is available for the scratch and project data. To gain better efficiency all compute nodes without accelerator are cooled by hot water.</p> <p>Anselm consists of 209 computational nodes. Each node is equipped with 16 cores (two eight-core Intel Sandy Bridge processors). These computing nodes are interconnected by InfiniBand (QDR) and Ethernet networks. There are 4 types of compute nodes:</p> <ul style="list-style-type: none"> ● 180 compute nodes without any accelerator, with 2.4GHz CPUs and 64 GB RAM, ● 23 compute nodes with GPU accelerators (NVIDIA Tesla Kepler K20), with 2.3GHz CPUs and 96GB RAM, ● 4 compute nodes with MIC accelerators (Intel Xeon Phi 5110P), with 2.3GHz CPUs and 96 GB RAM, ● 2 fat nodes with larger RAM and faster storage (2.4GHz CPUs, 512GB RAM and two SSD drives).

	<p>Total theoretical peak performance of the whole cluster is 82 TFLOP/s with maximal LINPACK performance 66 TFLOP/s.</p> <p>All computing nodes share 360TB /home disk storage to store user files. The 146TB shared /scratch storage is available for the scratch data. These file systems are provided by Lustre parallel file system. There is local hard drive (500GB) on all compute nodes.</p>
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4.1.2 Bull SAS

	Part N°	Acronym	Country	Type
	2	Bull	FR	PB
Legal Entity Description		<p>Bull is the Atos brand for its technology products and software, which are today distributed in over 72 countries worldwide. With a rich heritage of over 80 years of technological innovation, 2,000 patents and a 700 strong R&D team supported by the Atos Scientific Community, it offers products and value-added software to assist clients in their digital transformation, specifically in the areas of Big Data and cyber security.</p> <p>Bull is the European leader in High Performance Computing (HPC) and its products include the energy-efficient supercomputer that is based on a system patented by the company; bullion, one of the most powerful x86 servers in the world developed to meet the challenges of Big Data. Bull has become an ATOS company since January 2015. ATOS is a leading information technology services company generating annual revenues of EUR 12 billion and employing 100,000 people in 72 countries. Serving a global client base, the Group provides Consulting & Systems Integration services, Managed Services & BPO, Cloud operations, Big Data & Cyber-security solutions, as well as transactional services. With its deep technology expertise and industry knowledge, the Group works with clients across different business sectors: Defense, Financial Services, Health, Manufacturing, Media, Utilities, Public sector, Retail, Telecommunications, and Transportation.</p> <p>In recent years, the Bull R&D labs have developed many major products that are recognized for their originality and quality. These include the Sequana supercomputer which concretes the first results of the “Bull Exascale Program” announced during SuperComputing 2014, bullion servers for the private Clouds and Big Data, the Shadow intelligent jamming system designed to counter RCIEDs, the libertp tool for modernization of legacy applications and hoox, the first European smartphone featuring native security. To explore new areas and develop tomorrow’s solutions, today, Bull R&D is investing heavily in customers – with whom it has forged many successful technological partnerships – as well as in institutional collaborative programs (such as competitiveness clusters and European projects) and in partnerships with industry (Open Source, consortiums). Bull is involved with the strategy towards HPC in Europe with the active leadership of ETP4HPC and contribution to the Strategic Research Agenda.</p> <p>Participant role in the project</p> <p>Bull is the leader of WP2 for the requirements definition and architecture design of this project. Bull will contribute actively in the WP4 as the T4.4 leader for the integration of the overall Cloud/HPC orchestration system.</p> <p>The vision of Bull is to design & build Insight Platforms: from intelligent machines to intelligence of things. Bull focus on analytics & security and their application for the enterprise, the Internet of Things/Industry 4.0/Defense/Cyber security.</p> <p>This project will provide Bull the opportunity to develop new solutions in the HPC, big data analytics and Deep learning markets.</p>		
Persons involved in research activities	<p>Philippe Couvée (male): Senior software architect</p> <p>Philippe Couvée has been working first as an AIX and LINUX kernel and driver developer and then, as Storage architect. He joined the High Performance Computing R&D in 2004 where he was in charge of HPC middleware development (MPI, distributed file systems),</p>			

	<p>then as chief architect of the SuperComputer software products. Since early 2016, he is focusing on Data Management for exascale.</p> <p>Matthieu Pérotin, (male): HPC architect. He has been working for more than 10 years in the HPC field, starting with a Ph.D. about process scheduling (received in 2008) and has joined Bull in 2009 as a software developer. Since joining Bull, he has worked on cluster management tools for petaflop scale clusters and more specifically on on-line event management and processing. He has joined the BXI project in 2011, to define the architecture of the fabric management software suite, which includes fabric monitoring and routing. He also provides expertise on HPC fabric topologies.</p> <p>Etienne Walter (male) is senior project manager in Bull R&D Division, in charge of HPC projects.</p> <p>Etienne worked in Bull Mainframe division, as a software developer, as manager in charge of Change Control process and of a software development team.</p> <p>Is since 5 years involved in HPC and Big Data projects. He has been or is involved in several European projects, such as Seryery (Celtic project), DataScale & ELCI (French Initiative), Fortissimo (FP7), Mont-Blanc2 (FP7) and is now coordinating Mont-Blanc 3 H2020 project.</p> <p>Claire Chen, R&D project manager</p> <p>Claire Chen (female) has obtained her engineer degree in computer science from Telecom Paris in France. She worked as software engineer, software project manager and product manager for data protection offers. Now in Atos/Bull R&D teams, she is a project manager for the funded innovation projects.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>In association with academics organization Bull has participated to some publications, and Bull is present publicly with innovative technologies presentations at HPC major events such as ISC or SuperComputing.</p> <p>Our keywords are digital transformation, innovation and value creation, both for our own company and for our clients. We have cemented our position as the trusted partner for our clients' digital transformation, with the resources, the scale and the know-how that our clients need. With more than 80 years of technology innovation expertise, the brand Bull is the hub of technology development at the heart of the Atos Business Technologist family.</p> <p>Bull has developed a complete open exascale-class supercomputer offer containing Hardware and Software technologies, Bull Sequana. With Bull Sequana, Atos delivers an innovative solution that matches the exascale technological challenges. The Atos R&D designed Bull Sequana around the following guidelines:</p> <ul style="list-style-type: none"> • Open and multi-technology • Ultra-dense and scalable • Ultra-energy efficient • Easy administration <p>With the <u>Bull Sequana X range</u> of supercomputers, Atos confirms its strategic commitment to the development of innovative high performance computing systems – the systems needed to meet the major challenges of the 21st century. Designed by Atos R&D in close cooperation with major customers, Bull Sequana X supercomputer leverages the latest technological advances, so as to guarantee maximum performance for a minimized operation cost. The race to exascale calls for technological breakthroughs.</p> <p><u>Bull Sequana S series</u>: To tackle enterprise IT challenges and enable businesses to take full advantage of Artificial Intelligence (AI), Atos brings to the market a new generation of x86 servers, BullSequana S, optimized for machine-learning, business critical computing applications and in-memory environments. BullSequana S reaches the highest level of quality of service, performance, availability and scalability to meet IT departments' existing and emerging demands. Based on a very flexible architecture, the BullSequana S server range consists of 5 complementary models, based on the Intel® Xeon® Scalable processor. Each model can be smoothly upgraded to another one, preserving investments and</p>

applicative environments. This easy upgrade path is made possible thanks to a very modular design:

- A server scales from 2 to 32 processors, up to 32 GPUs with a maximum memory capacity of 48 TB RAM and 64 TB NV-RAM. All those components within a server are hosted within 1 to 4 Compute boxes;
- The Compute box is the base element of a server, with 3 different form factors (2U/4U/8U) hosting 1 module per 2U;
- The interconnections are performed within a single Compute box by a Connecting box. Above 8 CPUs, a Ubox is added, hosting the new generation of Atos eXternal Node Controller (XNC).

The UBox enables to interconnect up to 4 Compute boxes, to form an SMP system (Symmetric Multi-Processor) with up to thirty-two processor sockets in a CC-NUMA architecture. The UBox is a 5U chassis. This VLSI-type (Very Large Scale Integration) integrated circuit is derived from technologies developed for mainframe servers and tuned for High Performance Computing. Up to 8 CPUs, BullSequana S scales in glueless mode; to reach 16 CPUs, a UBox is added to interconnect 2 Compute boxes (2*8 CPUs) and 2 UBoxes are necessary to reach 32 CPUs.

Bull Sequana M series: Atos mainframe servers have always been able to evolve in order to integrate the latest technologies, especially to take into account the processing of very large data volumes, to integrate into the Cloud or to deploy Big Data applications.

BullSequana M is the new range of mainframe class servers with unmatched features. Designed by Atos engineers, based on the latest Intel® Xeon® Scalable processors and a highly flexible and modular architecture, BullSequana M servers benefit from the latest technological features such as virtualization.

BullSequana M servers are available in two series:

- BullSequana M7000 series for GCOS 7, Windows® and Linux® applications,
- BullSequana M9000 series for GCOS 8, Windows and Linux applications.

Both of them propose a virtualized version in addition to a “classical” one.

Bull eXascale Interconnect (BXI): Exascale entails an explosion of performance, of the number of nodes/cores, of data volume and data movement. At such a scale, optimizing the network that is the backbone of the system becomes a major contributor to global performance. The interconnect is very likely going to be a key enabling technology for exascale systems. This is why one of the cornerstones of Bull’s exascale program is the development of our own new-generation interconnect. The Bull eXascale Interconnect or BXI introduces a paradigm shift in terms of performance, scalability, efficiency, reliability and quality of service for extreme workloads. The BXI fabric is highly scalable (up to 64.000 nodes for the first version), it features:

- High-speed links (100 Gb/s/s)
- High message rate (>100 M msg/s)
- Minimal memory footprint and low latency components.

The BXI fabric relies on two types of ASICs as its building blocks, a Network Interface Controller (NIC) and a switch, and comes with its complete software suite. BXI switches are managed through a distributed and out-of-band fabric management suite allowing to scale up to 64K nodes. Out-of-band management eliminates any interference of the management traffic with the applications traffic.

Bull supercomputer suite, or SCS: Bull supercomputer suite introduces a new approach to extreme computing software solutions. Bull SCS is a scalable, open, and robust software suite that meets the requirements of even the most challenging high performance computing (HPC) environments, which also require enhanced security. Bull SCS is the result of Atos’s long experience in deploying large-scale supercomputers, combined to continued efforts in Research & Development.



	<p>Bull supercomputer suite is designed for every HPC need, from small supercomputers with just a few hundred cores to supercomputers with tens of thousands of nodes. It is cut out to reach performance targets of the order of up to 100 PFlops, based on new-generation CPUs and GPUs. The main goal of Bull SCS is to provide a global high performance supercomputing environment. It includes:</p> <ul style="list-style-type: none"> • a standardized and scalable installation process with an enhanced update solution; mechanisms to ease integration of new hardware; • default security with on-time fixes; • and support for several user development and execution environments with top performance. <p>This new generation HPC software suite is a further step towards Exascale computing.</p>
List of up to 5 relevant previous projects or activities, connected to the subject of this proposal	<p><i>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</i></p> <p>Bull is involved with the strategy toward HPC in Europe with the active leadership of ETP4HPC and contribution to the Strategic Research Agenda.</p> <p>Bull participated to the following cooperative projects connected to the subject of this proposal:</p> <ul style="list-style-type: none"> • EU H2020 Mont-Blanc 3 - European scalable and power efficient HPC platform based on low-power embedded technology. • EU H2020 SAGE - Percipient StorAGe for Exascale Data Centric Computing. • EU H2020 VINEYARD - Build a high-level programming framework for allowing end-users to seamlessly utilize accelerators in heterogeneous computing systems by using typical datacentre programming frameworks. • EU H2020 ESCAPE Energy - efficient Scalable Algorithms for Weather Prediction at Exascale. • EU H2020 ESiWACE Centre of Excellence in Simulation of Weather and Climate in Europe.
Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work	<p>Bull makes available for collaborative R&D projects, called Platform NOVA, a cluster architecture hosted in Bull France facilities providing a small datacenter for Cloud/Big Data as well as HPC/Simulation projects. This heterogeneous platform includes a mix of standard x86 servers, large In-Memory Servers (Bullion-S8 et -S16), HPC servers (bullx 515, 520, R423-E4i) with or without accelerators (NVIDIA GPU or INTEL XeonPhi) and also storage systems NetApp-LSI 2800 (240TB) and 2 NetApp 2700 (98TB and 48TB). This platform that can be tuned is providing cloud environments under OpenStack or an HPC environment running an enhanced operating system, lustre file system, development tools and middleware software for executing compute-intensive applications. Within this platform partners can bring their data and then install, test and validate their developments throughout the project whether they are technology providers or applications developers. The platform is located in a DMZ zone so as to allow all projects partners to have access to the platform resources and to their own private dedicated network zone and space. This configuration will be enriched with new generation of Interconnect and new ARM CPU integrated in a SEQUANA platform.</p>

4.1.3 NALLATECH

	Part N°	Acronym	Country	Type
	3	NALL	UK	PB
Legal Entity Description	 <p>Nallatech Ltd is a leading supplier of FPGA accelerated computing solutions. For 20+ years, Nallatech has provided hardware, software and design services to enable customer's success in applications including high performance computing, network processing, and real-time embedded computing.</p>			

	<p>Today Nallatech utilizes latest-generation FPGAs to dramatically increase performance-per-watt over traditional computing architectures, while leveraging high level design tools to reduce time-to-market.</p> <p>Nallatech has long standing corporate partnerships with consortium members: ISR and OEM partner to IBM, and HP 3PO program member.</p> <p>Participant role in the project:</p> <p>Nallatech will be working with other partners on LEXIS architecture definition, by leveraging FPGA accelerators together with kernels optimized for specific functions, such as Neural Network. Nallatech will also be acting as an advisor for OpenCL programming and code optimization on Aeronautic and Tsunami use-cases.</p>
<p>Persons involved in research activities</p>	<p>Richard Chamberlain (Male) – Principal Engineer Based at Nallatech’s UK design office in Bristol, Richard is a principal engineer with over 18 years experience in FPGA computing. With a focus on programmability, Richard developed the first floating point cores for FPGAs, later creating DIME-C, Nallatech’s high level language compiler. More recently he supports customer opportunities involving Intel’s OpenCL FPGA compiler and leads several R&D activities at Nallatech.</p> <p>Gallig Renaud (Male) - Business Development Manager Previously working as a Technology Strategist at HPE for the last 16 years, Gallig is now responsible to develop FPGA solutions and business for Nallatech. With a deep knowledge on datacenter and server technologies, Gallig has been designing disruptive architectures for large customer projects. Latest work is targeting integration of FPGA workflows into an orchestrated cloud infrastructure.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Example products and services can be found here: www.nallatech.com</p> <ul style="list-style-type: none"> • FPGA Accelerated Computing • FPGA Network processing • FPGA Storage solutions • FPGA applied to Convolutional Neural Network, leveraging OpenCL programming: <p>http://www.nallatech.com/wp-content/uploads/Nallatech-Whitepaper-FPGA-Accelerated-CNN-003TR.pdf</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<ul style="list-style-type: none"> • The OPERA project is co-funded by the European Union's HORIZON 2020 Framework Programme for Research and Innovation under grant agreement no 688386, Topic ICT-04-2015 'Customised and low power computing, RIA Research and Innovation action'. Duration: 36 months. • Introduction of world’s first single and double precision floating point IP cores for FPGAs • Launch of DIME-C, a C-to-FPGA compiler and control plane manager that allowed software Engineers to target applications on FPGA hardware • Built the world’s first FPGA-based supercomputer as one of the founding members of the FHPCA (FPGA High Performance Computing Alliance – www.fhpca.org)
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>n/a</p>

4.1.4 ISTITUTO SUPERIORE MARIO BOELLA


	Part N°	Acronym	Country	Type
	4	ISMB	IT	RO
Legal Entity Description	  Istituto Superiore Mario Boella <p>Istituto Superiore Mario Boella (ISMB) is a Research and Innovation Centre operating in the Information and Communication Technologies (ICT) domain. Founded in 2000 by Compagnia di San Paolo and Politecnico di Torino, today ISMB relies on the technological and process competences of around 150 researchers working in close cooperation with companies, academia and public administration. ISMB operates according to the knowledge management model: this means that it plays an active role not only in devising innovative solutions, but also in their implementation and consequent developments. This approach represents a step forward with respect to technology transfer, and in this sense the evolutionary lines of European research are taken into account. ISMB is full member of the:</p> <ul style="list-style-type: none"> • BDVA (Big data Value Association). • HiPEAC community • Heterogeneity Alliance <p>ISMB is currently involved in 38 EU H2020 funded projects and 10 national and regional projects. It is also caring out 25 industrial R&D projects. ISMB has a notable scientific production with an average of 100 publications at year (conferences, journals and books), 960 in total since 2000 and around 130 in 2017. ISMB is organized in Research Areas focused on some core sectors of ICT. For this proposal will be involved the Advanced Computing and Electromagnetics research area (ACE) research area, with the IS4AC (Infrastructures and Systems for Advanced Computing) Research Unit, a team devoted to computing infrastructures based on Cloud computing, machine learning, application acceleration on FPGA and GPU devices. The research topics of the unit regard mainly four aspects:</p> <ul style="list-style-type: none"> • Scalability – development of mechanisms for the automation and optimization of either virtual or physical resources utilization; • HPC – applications acceleration on FPGA technologies, machine learning. • Data Management – data processing optimization, orchestration in different data layer components and data access priority • Orchestration: resources management and allocation for workflow optimization. <p>Participant role in the project:</p> <p>Engineering solutions and co-design as main role will on giving support at technological and scientific level the overall co-design of and architectural solutions for massive data analytics and the convergence between HPC, BigData and cloud services. The profile use will mainly with Senior Researchers on architecture design, data management and cloud orchestration.</p> <p>-Infrastructure layer: involved on HW accelerators programming models mainly with the experience from OPERA project ICT4-2015 on accelerating some application on OpenCL framework.</p> <p>-Data analytics methods: the major involvement will on defining tools and method for extreme scale analytics, deep learning optimization. Senior researcher on Data management will be engaged with experiences on bigdata architecture design for huge datasets management, processing and visualization</p>			

	<p>-Orchestration for efficient sharing in heterogeneous architecture: competences will be mainly on Cloud platforms, orchestration modules (Openstack), workflow management and application/resources profiling, application containerisation</p> <p>-Hw/soft, applications integration layer: ISMB will be involved on layers integration and deployment (infrastructure, orchestration and data).</p>
<p>Persons involved in research activities</p>	<p>Olivier Terzo (Male) PhD in Electronic Engineering and Communications, MSc Degree in Computer Engineering from the Politecnico di Torino (Italy). University degree in Electrical Engineering Technology and Industrial Informatics from University Institute of Nancy (France). Since 2013 he is the Head of Research Area ACE (Advanced Computing & Electromagnetics) dedicated on the study and implementation of computing infrastructure based on technologies of cloud computing, main fields of research are on resources and applications orchestration on distributed infrastructure, machine learning application development on FPGA accelerators, Cloud and IoT convergence on Ultra Low Power devices, Low power computing and Communication. He is the Technical and Scientific coordinator of the OPERA H2020 project (ICT4-2015 call), Technical and Scientific coordinator of the Plastic & Rubber Regional project focused on Industries 4.0 topic. From 2010 to 2013 he was the Head of the Research Unit IS4AC (Infrastructure Systems for Advanced Computing), research activities are related to cloud computing systems infrastructures. From 2004 to 2009 researcher in the e-security laboratory, mainly with a focus on P2P protocols, encryption on embedded devices, security of routing protocols and activities on grid computing infrastructures. Active member of the Hipeac community with the co-organization of the HelpDC workshop (Heterogeneous and Low Power Data Center Technologies) on Hipeac. Workshop organizer on conferences, Associate Editor member of the International Journal of Grid and Utility Computing (IJGUC). IPC member of the International Workshop on Scalable Optimization In Intelligent Networking and peer reviewer in ICNS and CISIS conferences.</p> <p>Alberto Scionti (Male): He holds a MSc degree in computer and control engineering, and a Ph.D. (European Doctorate degree) in computer and control engineering, both received from Politecnico di Torino (Italy). His main research areas comprise hardware design and test of digital circuits (especially embedded memories), design and simulation of modern computer architectures, high-performance computing systems (HPC and HPEC). He matured large experience in designing hardware schedulers for data-flow CMPs, as well as design and simulation of Networks-on-Chip supporting data-flow and fine-grain threading execution models. Past experiences comprise also the application of evolutionary algorithms to industrial problems (e.g., generation of test patterns for digital circuits, drift removal from electronic nose systems). During his research activity, he matured a strong knowledge and experience regarding lightweight virtualization systems (e.g., Docker, LXC, etc.), their applications in the context of distributed infrastructures, as well as exploitation of hardware accelerators for application performance improvement. During his research and investigation activity, he matured expertise and knowledge in using high-level synthesis (e.g., Intel OpenCL) for porting deep learning algorithms on FPGA architectures. He was involved in several EU-funded projects, and he is co-author of more than 35 publications on peer-reviewed international workshops, conferences, and book chapters. Peer reviewer for several international conferences, workshops and journals. Currently, he is involved on the H2020 project OPERA (“customized and low power computing”).</p> <p>Antonio Attanasio Ph.D. (Male) on data mining and Bigdata management. Graduated in Computer Engineering (M.Sc.) at Università del Salento with a thesis entitled “A Wireless Network Based on a Leaky Feeder System”. He conducted this activity at the research center CSP in Turin, supported by a six month research grant. He’s currently PhD student in</p>

	<p>Control and Computer Engineering at Politecnico di Torino, working on database technologies and data mining algorithms on scalable computing infrastructures Since 2012 he's researcher in the Advanced Computing and Electromagnetics (ACE) area at ISMB. He worked for three years on the European FP7 project Snowball and to several other national and regional research projects (CloudCEM, EDEN, CloudXPMI, PIUCultura).</p> <p>His research interests regard the development and deployment of virtual infrastructures for Cloud computing, like OpenStack, and for HPC over geographically distributed clusters; the development of scalable data mining algorithms, using open source big data storage and analysis frameworks like MongoDB and Apache Spark.</p> <p>Klodiana Goga (Female) Master of Science in Electronic Engineering from the Politecnico di Torino(Italy). Since December 2006 she is a researcher at the ISMB, currently, she is a member of Infrastructure and Systems for Advanced Computing (IS4AC) group. Her main research activities are focused on cloud computing infrastructures for e-Science Applications, more in detail process scheduling, resource management and Cloud Computing technologies, including analysis and implementation of architectural solutions based on public, hybrid and private cloud.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Goga, K., Parodi, A., Ruiu, P., Terzo, O.: Performances analysis of WRF simulations in a public cloud and HPC environment. In: Proceedings of the Conference on Complex, Intelligent, and Software Intensive Systems. Springer, Cham (2017)</p> <p>Boschetti, M., Baglio, V., Ruiu, P., Terzo, O., Caragnano, G.: A cloud automation platform for flexibility in applications and resources provisioning. In: Proceedings of the 9th International Conference on Complex, Intelligent, and Software Intensive Systems (CISIS), Blumenau, Brazil (2015)</p> <p>Ruiu, P., Terzo, O., Carlino, G., Prandi, R., Falzone, A., Maggi, P., Torterolo, L., Usai, E., Perego, G.: HPC Cloud Pills: On-demand deployment and execution of HPC application in cloud environments. In: Proceedings of the 9th International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC), Guangzhou, China (2014)</p> <p>Acquaviva, A., Apiletti, D., Attanasio, A., Baralis, E., Bottaccioli, L., Castagnetti, F., Cerquitelli, T., Chiusano, S., Macii, E., Martellacci, D., Patti, E.: Energy signature analysis: Knowledge at Your Fingertips. In: IEEE International Congress on Big Data (BigData Congress), New York, USA, 543-550 (2015)</p> <p>Attanasio, A., Cerquitelli, T., Chiusano, S.: Supporting the analysis of urban data through NOSQL technologies. In: Proceedings of the 7th International Conference on Information, Intelligence, Systems and Applications, 1-6, (2016)</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>OPERA [H2020 ICT4-2015]: OPERA will develop a new generation of Low Power server by integrating heterogeneous architecture (ARM, Intel, X86) to enable energy efficient server-class processors and FPGA accelerator for optimized function on computing performance and energy efficiency, accelerators for achieving significantly better energy efficiency at a cost flexibility. OPERA will propose to deliver a “Scalable Small Form Factor Data Centre” and a Highly parallel embedded ultra-low power architecture system for creating a full low power computing continuum system. The aim is on creating a cooperative, secure, reliable customized and low power computing architecture for the future convergence of Data Center Computing and embedded devices and sensor.</p> <p>SNOWBALL [SEC-2013.4.1-2]: SnowBall is a €5M STREP R&D proposal of 36 months. Its overall objective is to increase preparedness and response capacities of decision-makers, emergency planners and first responders in respect to amplifying hazards in large disasters. SnowBall consists in a deep analysis of cascading effects and development of methods to anticipate them;and in a Decision Support System able to display current crisis monitoring and results of simulated decisions integrating cascading effects, thanks to a data collection system, an Events Log Database, Simulators and a Dashboard. SnowBall innovates in its</p>

	<p>modular approach to crises, its modelling techniques, its agent-supported coupled grid simulations, its generic Events Log Database and tools to follow public behaviour (Emergency Alert, social networks, mobile application).</p> <p>PIUCULTURA [Research and development national call]: The Piucultura project aims to create a new product, that is a software system that can be used on "mobile" devices (smartphones or tablets) that offers an innovative model for the use of knowledge represented by cultural heritage. The definition and design of an effective big data model for the enhancement of knowledge expressed by cultural heritage appears to be an even more relevant problem in light of the recent evolution of cultural demand, which highlights a shift from traditional cultural visit to an experience-based fruition based on forms of "Consumption" of the most experiential cultural heritage, also addressed to the knowledge of intangible cultural aspects, such as the historical identity and the way of life of a community, and oriented to personal development by the users through a multi-sensory involvement and a total immersion in the visit.</p> <p>FREME H2020 [ICT-15-2014] The overall objective of the FREME project is to build an innovative and open commercial framework for providing semantic enrichment services for digital content in a variety of languages. This framework will be based on an open and reusable set of Application Program Interfaces (APIs) and Graphical User Interfaces (GUIs). The solution will be generic, flexible and reconfigurable in order to allow its extension and improvement to ensure its long-term relevance.</p> <p>BIGDATAOCEAN [ICT-14-2016-2017] Recent innovations in sensor, IoT and CPS technologies are building new valuable data streams that if tackled properly and combined based on standardised procedures could deliver new insights and services that could renovate the whole maritime sector. In this context, BigDataOcean aims to capitalise on existing modern technological breakthroughs in the areas of the data driven economy, and roll out a completely new value chain of interrelated data streams coming from diverse sectors and languages and residing on cross technology innovations being delivered in different formats (as well in different states).</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>n/a</p>

4.1.5 TESEO SpA


	Part N°	Acronym	Country	Type
	5	TESEO	ITA	PB
<p>Legal Entity Description</p>	 <p>TESEO S.p.A. is the Italian subsidiary of CLEMESSY, which a business unit of EIFFAGE Group listed at Paris Stock Exchange under the ticker FGR.</p> <p>The group has about 15 billion euros revenues and 65.000 employees across the world, TESEO belongs EIFFAGE ENERGIE SYSTEME CLEMESSY which represents about 665 million euros revenues and 5.000 employees in 12 countries.</p> <p>TESEO, aside bringing CLEMESSY solutions into the Italian market, is the center of expertise and R&D in electronics, radiofrequency and fiber optics. Founded in 1978 as a spinoff of Telecom Italia Labs, today TESEO is a well-recognized integrator and designer of</p>			

	<p>business-to-business instrumentation and test equipment, which include low power instrumentation/products and highly resilient and flexible test benches that natively enable LEAN manufacturing and deliver Industry 4.0 benefits.</p> <p>In order to maintain competitive advantage and support business growth TESEO dedicates on a yearly basis significant investment in technology R&D, some of which funded by EU programs such as regional POR, FP7 Clean Sky and by the European Defense Agency. To support its efforts TESEO has an established and effective network with key R&D institutions, including ISMB, and from case to case leveraged on technology transfer. An R&D laboratory is set jointly with Politecnico di Torino and CSP and based in Politecnico di Torino premises. A typical side effect of such R&D investments is the growth of the engineering resources, especially among the one that contribute to successful R&D projects. TESEO has been involved in several regional and EU FP7 funded projects and in 1 EDA project. The company also carries out independent industrial R&D projects driven by the medium terms roadmap agreed with the group. Based 100% on internal funding such projects encompass high technology products for Space applications or innovative Industry 4.0 products such as MATC (Mechatronic Actuator Test & Calibration unit).</p> <p>For this project TESEO R&D and Engineering department will be highly involved together with the metrology specialists and the EMC Laboratory. Nonetheless specialist from management accounting, business development and marketing will be involved to support Impact maximization. A convergent team focused to develop innovative low power architectures and platforms.</p> <p>The research topics of the unit focus on mainly three streams of low power architectures and platforms:</p> <ul style="list-style-type: none"> • Flexible –platforms that could build the technology bricks for the integration into HPC/AI future solutions designed around customer’s needs; • Smart – intelligent and resilient technology bricks characterized by low power requirements; • Scalable and Portable – easiness to use and to deploy with a modular approach which facilitates tailoring around the user’s requirements <p>Participant role in the project:</p> <p>The Innovation Manager will be responsible for exploiting the activities in the WP9 – Expected impact in targeted sectors and the results achieved in the technical work packages of LEXIS; continuously consider the evolution of products and markets demand, the business strategies of the large, small and medium companies of the consortium; be in charge of the project vision and the scientific results achieved in LEXIS with the aim to promptly adjust project objectives and requirements, specify the innovation aspects to focus on and identify exploitation potentials; support the Project Coordinator and Steering Committee in coordination with other EU-funded or other international projects; speak on a regular basis, in many different type of events; drive the dissemination and exploitation of LEXIS’s innovations.</p>
<p>Persons involved in research activities</p>	<p>Stefano SERRA (Male)</p> <p>MSc Degree in Economics from University of Florence, Specialisation in Finance at Victoria University (Melbourne-Australia). General Manager of TESEO since 2007 and CEO of TESEO since 2013, Stefano mixed his previous experiences into his daily duties balancing the day to day operations with the industrial plan objectives of growth set for the EIFFAGE subsidiary. He is part of CLEMESSY AST Committees and has significant role within Confindustria at both local and national level. He is member of the Scientific Committee of CSP R&D center and of Affidabilità e Tecnologia. Considered that vocational learning and training for future employees is fundamental to industry success, Stefano is also President of two education institutions and member of ITS Steering Committee at the Ministry of Education.</p> <p>Completing the background experience, from 1998 to 2007, Stefano worked in PricewaterhouseCoopers in London, Milan and Turin office focusing on Mergers &</p>

	<p>Acquisition and Initial Public Offering, Post-Merger Integration, Business Re-Engineering and Restructuring, Business Development, Corporate Governance. Prior to that Stefano has been Group Treasurer of GIG Toys Group, Chartered Accountant dedicated to Chapter 11 companies and scholar as Business Analyst at City of Florence for the participated companies.</p> <p>Roberto PEVERI (Male) Roberto is TESEO Operations Manager. Degree in Electronic Engineering from Politecnico di Torino, with specialization in Electronics for Telecommunications. Roberto, since 2007 is part of TESEO R&D and Engineering department. Most of his experience is connected to hardware and software development. During his period in TESEO he seasoned the competence for complex systems design. Since 2015 he is Operations Manager, with the direct responsibility of full operations including Engineering Department, EMC and Calibration Laboratory, and manufacturing. Over the last 2 years he has been the technical focal point for OPERA European Research Project. From 2012 to 2017, Roberto had the overall responsibility for R&D of innovative Industry 4.0 products as well as the deploying at Honeywell plants worldwide one of the innovative products designed and industrialized by the company.</p> <p>Andrea BUCZKOWSKY (Male) Andrea is the RF/EMC Leader in TESEO. With a degree in Electronic Engineering from Politecnico di Torino, Andrea has over 20 years of experience in new product qualification and is member of CEI committees 210/77A, 210/77B, 2010A, 106A and 106B since 1997. He provides RF/EMC advisory to a large portfolio of projects and customers with a speciality on embedded electronics and hybrid propulsion. Working on innovation and in the validation of innovative products for the major industrial groups in Italy, he is the core of his expertise and interacts on a regular basis with customer's Research & Development.</p> <p>Daniele PAOLINI (Male) Daniele has Master Degree in Electronics Engineering from Università degli Studi di Roma and has 3 years of experience as Microwave Engineer in Thales Alenia Space Italy. He works as R&D Engineer and since he joined Teseo is occupying of research projects in Radio Frequencies field. During he's experience in Teseo, he acquired also skills related to software development for "System on Chip" boards, with special focus to gateways device for distribute acquirement low power system.</p> <p>Florin Ionut APOPEI (Male) Florin has a Master Degree in Business Administration from Università di Torino and joined TESEO as Management Accounting and Business Planning resource reporting directly to the CEO. He had been trained directly by group senior resources in France and gained a significant hands-on experience working closely with CEO on key business development projects which encompass R&D and innovation, such as OPERA. Prior to join TESEO, Florin had an experience in PricewaterhouseCoopers Management Consulting.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>TESY2001: internally developed low power platform for Environmental Pollution Monitoring which includes RF sensors designed by TESEO. OBE898: internally developed low power fiber optic link for automotive bus. MATC (Mechatronic Actuator Test & Calibration unit) TCU: a smart and flexible testing platform for mechatronic actuators for Transportation industry powertrain. MATC (Mechatronic Actuator Test & Calibration unit) ASIU: a smart and flexible testing platform for mechatronic actuators for Transportation industry autonomous vehicles.</p>

	<p>SMAX prototype, a highly flexible and rugged datalogger technology conceived for upgrading the current test laboratories in the Transportation industry that is migrating towards mechatronic products.</p> <p>MCDL – <i>A fiber optic multi-configurable data link for Flight Test applications</i>, Cammarata, S. Symposium Proceedings of 21th SFTE EC Annual - Symposium, Italy (2010)</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>[H2020 – OPERA PROJECT] – lead by ST Microelectronics the project objective was to research and develop low power and ultra-low power technologies in three use cases and exploit the results in Europe. The project is still underway, the consortium has achieved the first implementation phase while the second implementation on the use cases is in due course.</p> <p>[FP7 CleanSky] HIGHPMAAC – Lead by CLEMESSEY and under the supervision of ISPANOSUIZA the project objective was to research and develop the most advanced technology for the integration rig dedicated to the more electric aircraft. The project is completed, the expected results achieved, integration rig installed and working in ISPANOSUIZA premises.</p> <p>[FESR] SMAX – Lead by ARVIN MERITOR the project had a twofold objective: researching on the mechatronic technologies for smart-axales and on the technologies required for upgrading current testing laboratories (signal and data acquisition) according to the more electric vehicle development streams. The project is completed and the expected TRL achieved.</p> <p>[FESR] STEPS 1 and 2- Lead by THALES ALENIA SPACE the project had a quite significant number of concurrent objectives linked to Space Exploration. TESEO worked in the research for the RF guided system for Rendezvous & Docking in space with a target of deploying on low power space platforms. The project is completed and the expected TRL achieved.</p> <p>[FESR] HFCS - Lead by MECAER the project has the objectives to research technologies in the stream of the more electric aircraft, in particular for flight control actuation leveraging on fiber optic links and sensors. The project is completed and the expected TRL achieved.</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>TESEO in its own premises is provided with a fully equipped R&D and Engineering department. All relevant engineering and simulation tools, prototype development and integration laboratories, The R&D department has then access to special integration areas where developments are validated and integrated. Nonetheless TESEO has two key accredited laboratories: one RF and EMC facility for product validation and an Accredited Calibration laboratory with all relevant electronic and RF references for metrology measurements and operations.</p>

4.1.6 Commissariat à l'Energie Atomique et aux Energies Alternatives


	Part N°	Acronym	Country	Type
	6	CEA	FR	RO
<p>Legal Entity Description</p>		<p>CEA is the French Atomic Energy and Alternative Energies Commission (Commissariat à l’Energie Atomique et aux Energies Alternatives). It is a public body established in October 1945. The CEA is active in three main fields: energy, information and health technologies, and defence and national security. In each of these fields, the CEA maintains a cross-disciplinary culture of engineers and researchers, building on the synergies between fundamental</p>		

	<p>and technological research. CEA has a workforce of around 16000 employees. Within CEA Technological Research Division, institutes lead research in order to increase the industrial competitiveness through technological innovation and transfers, as with CEA Tech initiative, http://www.cea.fr/english-portal/cea-tech. The List, CEA Tech institute, is a key player in Information and Communication Technologies. Its research activities are focused on Digital Systems with major societal and economic stakes: Embedded Systems, Ambient Intelligence and Information Processing. With its 700 researchers, engineers and technicians, the List performs innovative research in partnership with major industrial players in the fields of ICT, Energy, Transport, Security & Defence, Medical and Industrial Process.</p> <p>Participant role in the project CEA will lead WP6 on the Earthquake and Tsunami Pilot and will work on real-time orchestration and workflow arbitration, study and evolution of the codes of the use case, study of hardware acceleration possibilities (hybrid computation runtime). CEA will support the requirements and architecture definition workpackage (WP2), the data layer workpackage (WP3) and the orchestration workpackage (WP4) with its expertise on the management of heterogeneous hardware and accelerators, general HPC constraints and finally applicative constraints coming from the pilot it leads. It will also participate to WP7 and WP8 by helping the qualification and quantification of the impacts related to the Earthquake and Tsunami Pilot.</p>
<p>Persons involved in research activities</p>	<p>Dr. Thierry Goubier (male) is a senior expert at CEA, technical lead of the heterogeneous high performance embedded computing thematic in the LCE laboratory. He is a telecommunication engineer with a PhD in graphical user interface software architectures and has been involved (sometimes as a WP leader) in numerous activities and european projects, starting in 1998, and more recently the Kalray MPPA technology transfert from CEA, the COBRA, MACH, M2DC, PROBANT, EMC2, PRODUCTIVE 4.0, and the upcoming European Processor Initiative. He is involved in the Software Engineering group of the ETP4HPC organisation.</p> <p>Dr. Stéphane Louise (male) joined the CEA in 1999 as part of his PhD thesis on Worst-Case Execution Time (WCET) for critical real-time systems where he applied methods inspired by his formation of physicist to an original approach of the problem, after a few years as a physicist in Laboratoire de Physique des Particules in Clermont-Ferrand/Aubière where he worked on theoretical models of strong interactions. After his PhD defense, in 2002, he joined the CEA DRT to work on the OASIS model for safety critical systems, and after 2006 moved to work around Models of Computation and Communication for massively parallel and distributed systems, in particular as part of the MPPA project in cooperation with Kalray that issued the first European manycore processor with 256 independently programmable cores. Since then, he continued the work on this theme, especially models of computations for distributed and heterogeneous systems and with a recent interest in quantum computing. He is a former alumni of Ecole Normale Supérieure de Cachan (now Ecole Normale Supérieure de Paris-Saclay) and obtained his French Habilitation as Research Advisor (HDR) from Université Paris- Sud in 2015.</p> <p>Dr. Loïc Cudennec (male) joined the CEA LIST in 2009 with a focus on compilation tools for many-core processors, data sharing and heterogeneous resources management after a PhD in CS addressing the deployment of distributed applications onto large scale computing grids. He is/was involved in H2020 projects such as M2DC (heterogeneous micro-servers), Exanode (Parallel processor for exascale computing), EIT Digital HII CPS (Industrie 4.0), Kalray joint laboratory (256-core processor), Grid'5000 (Computing grid). He co-organises since 2013, with Stéphane Louise (CEA), a A-rank "Alchemy" special session, held in conjunction with the ICCS Conference, to present recent works on the use and design of many-core architectures.</p> <p>Paul Dubrulle (male) graduated with a master degree in computer science from the University of Maine (France) in 2008. He has been a research engineer at CEA List since</p>

	then, working on methodologies based on formal modelization to improve the reliability and performance of critical embedded and distributed systems.
List of up to 5 relevant publications, and/or products, services	<p>Louise, S., Dubrulle, P., Goubier, G.: A model of computation for real-time applications on embedded manycores. In: Proceedings of the Embedded Multicore/Manycore SoCs (MCSoc), 2014 IEEE 8th International Symposium on., (2014)</p> <p>Ducrot, V., Goubier, T., Juilly, K., Mota Da B., Courchamps Des Bayle G., Monot, S.: From R to heterogeneous accelerators: the MACH project, Poster, CGO (2016)</p> <p>Oleksiak, A., Kierzynka, M., Piatek, W., Agosta, G., Barenghi, A., Brandolese, C., Fornaciari, W., Pelosi, G., Cecowski, M., Plestenjak, R., Cinkelj, J., Pormann, M., Hagemeyer, J., Griessl, R., Lachmair, J., Peykanu, M., Tigges, L., Berge dem vor M., Christmann, W., Krupop, S., Carbon, A., Cudennec, L., Goubier, T., Philippe, J.-M., Rosinger, S., Schlitt, D., Pieper, C., Adeniyi-Jones, C., Setoain, J., Ceva, L., Janssen, U.: M2DC - Modular Microserver DataCentre with heterogeneous hardware. Microprocessors and Microsystems, 52(C), 117-130 (2017)</p> <p>Benoit, N., Louise, S.: Using an intermediate representation to Map Workloads on Heterogeneous Parallel Systems. In: Proceedings of the 24th Euromicro International Conference on Parallel, Distributed, and Network-Based Processing (PDP), Greece, (2016)</p> <p>Cudennec, L.: Software-distributed shared memory over heterogeneous micro-server architecture. In: Proceedings of the Parallel Processing Workshops, Spain (2017)</p>
List of up to 5 relevant previous projects or activities, connected to the subject of this proposal	<ul style="list-style-type: none"> • FiPS (https://www.fips-project.eu/): the FiPS FP7 project aimed at building the basic components of future HPC systems where the hardware would be defined by the applications it will have to run. For this purpose, FiPS consortium heavily relied on computing resources heterogeneity by providing a server hardware architecture able to seamlessly integrate all types of computing architectures (CPU, embedded CPUs, GPUs, FPGAs and manycore) and a methodology with related analysis and simulation tools to select the right architectures and use and to size the server architecture. In this project, the CEA N2D2 framework was used to generate the source codes and run implementations of the well-known AlexNet neural network on x86 CPUs (OpenCL/OpenMP), ARM CPUs (OpenMP), Nvidia K80 GPU (Cuda, OpenCL) and the Mali GPU of the ARM platform (OpenCL). • M2DC (http://m2dc.eu): the goal of this H2020 project is to develop a new class of low-power TCO (Total Cost of Ownership)-optimised appliances with built-in efficiency and dependability enhancements, easy to integrate with a broad ecosystem of management software and fully software-defined to enable optimisation for a variety of future demanding applications in a cost-effective way. In this project CEA introduced the SEE (System Efficiency Enhancement) concept enabling to improve the global behaviour of a complex computing system using proper accelerators implemented on FPGAs. • Productive 4.0 (https://productive40.eu/): Productive 4.0 is an ECSEL innovation project meant to open the doors to the potentials of Digital Industry and to maintain a leadership position of the industries in Europe. Among other things, CEA is working on the use of real time, mix-critical dataflow models of computation for optimisation of the production process of microelectronics factories with industrial partners. • PROBANT: PROBANT is a french national project (FUI – Fonds Inter-Ministériel) whose goal is to optimise the quality of microelectronics products with advanced data analytics technics and predictive models, with a focus on the scalability of the data analytics methods implementation on high performance computers. • MACH: MACH was an ITEA 2 project which aimed to introduce domain specific embedded languages (DSeL) to separate the specifics of the underlying hardware layers from the formulation of the general algorithms within an application domain. CEA worked on building a compiler toolchain for heterogeneous targets (GPUs, Manycores, CPUs) for the ubiquitous R data analytics language, applied to a metagenomics use case.
Description of any significant	n/a

infrastructure and/or any major items of technical equipment, relevant to the proposed work	
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4.1.7 Leibniz Supercomputing Centre (LRZ) of the Bavaraian Academy of Sciences and Humanities (BADW)


	Part N°	Acronym	Country	Type
	7	LRZ	DE	RO-SCC
Legal Entity Description	 <p>The Leibniz Supercomputing Centre (Leibniz-Rechenzentrum, LRZ), an institute of the Bavarian Academy of Sciences and Humanities (Bayerische Akademie der Wissenschaften, BADW), is the IT service provider for Munich’s universities and scientific institutions in the state of Bavaria. The LRZ was founded in 1962 in Munich and is now located on the Research Campus in Garching. The Centre is a front-runner in High-Performance Computing (HPC), both nationally and internationally. It supports outstanding research and education in various scientific domains by providing stable, professional, reliable, secure, and energy-efficient IT services based on the latest IT technologies.</p> <p>LRZ's contribution to LEXIS will be backed by ample experience from the participation of LRZ in European and national HPC/e-Infrastructure projects. LRZ’s current involvement in building the “Experimental Execution Environment” of the HPC project COMPAT (H-2020), and in building a data-exchange infrastructure for German HPC centres in the InHPC-DE project for the GCS (Gauss Centre for Supercomputing, with JSC Jülich and HLRS Stuttgart) continues a long history of collaborations since FP6. EGI, PRACE and GEANT have seen considerable contributions from LRZ. In all these contexts, LRZ has contributed and built expertise in diverse fields, such as middleware (IGE, COMPAT, InHPC-DE), hardware design and operation (Mont-Blanc, DEEP, PRACE), applications (DEEP-ER), software design (AutoTune, GN3) and development (VERCE), training (PRACE), education (DRIHM), communication and dissemination (DEEP, COMPAT) as well as project management and coordination (IGE). As for data management and HPDA connectivity, LRZ plays an essential role not only in the infrastructure-oriented InHPC-DE effort, but also in the GerDI project on a Generic Research Data Infrastructure. GerDI provides a meta-layer connecting research data repositories, in order to support findability, accessibility, interoperability and reusability (FAIR) in Research Data Management. Currently, LRZ is establishing the “Bavarian Big Data Competence Centre”, which focuses - besides pure data management - on massively parallelised applications such as Machine Learning workflows. A thematic overlap of LEXIS with this regional effort as well as the national GerDI and InHPC-DE efforts is an ideal ground for accelerated development and synergetic innovation. The traditional focus of LRZ is on operating performance-optimised and energy-efficient supercomputers. Currently the top-level cluster of LRZ is SuperMUC, a 241,000-core machine with a peak performance of over 6 PFlop/s. SuperMUC is used on the national level (GCS) as well as on the European level (PRACE). In addition, LRZ offers smaller clusters such as an IaaS HPC Compute Cloud (being extended to ~2,000 cores), for tasks requiring maximum flexibility, such as Big Data pre- and post-processing or workflow control. The energy efficient operation of these resources has become a central topic in LRZ research in the last decade. LRZ was one of the first HPC centres to install supercomputing clusters with</p>			

	<p>direct warm-water cooling, co-developing this energy-saving forefront technology together with the manufacturers. Waste heat from the clusters is re-used as a energy source for heating offices and running adsorption cooling machines. LRZ leads the Energy Efficiency Working Group of the European Technology Platform for High-Performance Computing (ETP4HPC). Various performance and energy-usage monitoring tools have been developed in the LRZ research groups.</p> <p>Participant role in the project: In LEXIS, LRZ will lead the Work Package 3 on the LEXIS Data System. LRZ will orchestrate the efforts on this data layer, and contribute its experience in creating such infrastructures within the projects AlpEnDAC, GeRDI, ComPat and others, in particular when leading Task 3.3 on the completion of the LEXIS Data System Core. LRZ will, in addition, make substantial contributions to Tasks in other work packages closely connecting to the Data System. In particular it will lead the evaluation of the infrastructure-related user needs (WP2 Task 2.1) and the implementation of LEXIS Portal functionality related to the user-friendly access of data (WP8 Task 8.1).</p>
<p>Persons involved in research activities</p>	<p>Univ.-Prof. Dr. Dieter Kranzlmüller (male) is full professor at the Department of Computer Science of the Ludwig-Maximilians-Universität München (LMU) and Chairman of the Board of Directors of the Leibniz Supercomputing Centre of the Bavarian Academy of Sciences and Humanities (LRZ). He has worked in parallel computing and computer graphics since 1993, with a special focus on parallel programming and debugging, cluster and especially grid computing. He has participated in several national and international research projects, has been acting as a reviewer and international expert for several countries and research programmes, and has co-authored more than 150 scientific papers in journals, and conference proceedings. At present, he serves as Strategic Director for EGI_DS, the European Grid Initiative Design Study and as Area Director Applications of the Open Grid Forum (OGF). Before his move to Munich, he has been the deputy head of GUP, the Institute of Graphics and Parallel Processing at the Johannes Kepler University Linz, Project Director of EGI_DS, the national representative of Austria in the EU e-Infrastructures Reflection Group (e-IRG), and a member of the Austrian Grid Executive Board.</p> <p>Dr. Jens Weismüller (male) holds a PhD in Geophysics from Ludwig-Maximilians-Universität München. He is a senior researcher of the Environmental Computing Team at LRZ. His research interests include algorithms and HPC implementations for hydrometeorologic as well as deep Earth applications. Currently, he is involved as senior researcher in several nationally and internationally funded projects. Since obtaining his PhD, he is also contributing in local management roles for collaborations with universities and public authorities, and as local manager of the joint environmental computing activities of LRZ and LMU.</p> <p>Dr. Stephan Hachinger (male) works as a senior research associate at Leibniz Supercomputing Centre. He holds a Ph.D. degree in theoretical astrophysics (2011, Max-Planck-Institute for Astrophysics / TU Munich), where he gained experience in parallel programming of radiative-transfer simulations. In 2014, he joined LRZ, and has since then been working on grid-computing and IT-Infrastructure projects for science, with one focus being the Research Data Management and simulation platform AlpEnDAC (“Alpine Environmental Data Analysis Centre”). Another major part of his work has been devoted to European e-Infrastructures for HPC, such as VERCE (Virtual Earthquake and seismology Research Community e-science environment in Europe) and the “Experimental Execution Environment” of COMPAT (Computing Patterns for High Performance Multiscale Computing).</p> <p>Hai Nguyen (male) is a research associate at the LRZ and holds a master’s degree in electrical and computer engineering. As a research assistant at the Technical University of Munich, he was responsible for the management and analysis of atmospheric measurement data as well as maintaining the data and server infrastructure. In 2017, he joined the LRZ to work within the national data infrastructure project GeRDI in which he is leading the work package “Requirements and Communities”. In this work package, interviews and meetings with</p>

	<p>scientific communities are conducted to gather the requirements for the development of GeRDI's service architecture. Since 2018, he is also responsible for the data management and GIS service architecture in the project HiOS.</p> <p>Dr. Megi Sharikadze (female) holds a PhD degree in biology and Masters in chemistry. Since graduation, Dr. Sharikadze was active in the biomedical research (as a senior research scientist at Beritashvili Institute of Physiology, also as a visiting scientist at e.g., University of Bremen, Ludwig-Maximilians University of Munich, the University of Federal Armed Forces in Munich (Germany), EFPL (Switzerland), Purdue University (USA), RIKEN (Japan). In parallel to her research-related activities in human neuroscience, she has been actively involved in grant-writing, fundraising and consulting activities. Since 2009, she is fully engaged in the academic project management. E.g., working at the University Hospital Regensburg as a project manager, Dr. Sharikadze successfully managed LipidomicNet (GA: 202272) - a large-scale FP7 project uniting of 26 partners from academia and industry. Since August 2014, Megi Sharikadze is appointed at LRZ and is engaged in research coordination and management of externally-funded research projects.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Sousa, T.N., Hasselbring, W., Weber, T., Kranzelmüller, D.: Designing a generic research data infrastructure architecture with continuous software engineering. In: CSE 2018 – 3rd workshop on Continuous Software Engineering (2018) (accepted)</p> <p>Hachinger, S., Harsch, C., Meyer-Arneck, J.: On-demand simulation of atmospheric transport processes on the AlpEnDAC cloud. In: American Geophysical Union, Fall General Assembly (2016)</p> <p>Atkinson, M., Carpena, M., Casarotti, E., Claus, S., Filgueira, R., Frank, A., Galea, M., Garth, T., Gemünd, A., Igel, H., Klampanos, I., Krause, A., Krischer, L., Leong, S.H., Magnoni, F., Matser, J., Michelini, A., Rietbrock, A., Schwichtenberg, H., Spinuso, A., Vilotte, J.-P.: VERCE delivers a productive e-Science environment for seismology research. In: Proceedings of the IEEE 11th International Conference on e-Science, 224-236 (2015)</p> <p>Huber, H., Brehm, M., et al.: Extreme Scaling of Real World Applications to >130,000 Cores on SuperMUC. In: Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC13), Denver U.S. (2013)</p> <p>Frank, A., Jamitzky, F., Satzger, H., Kranzelmüller, D.: In need of partnerships - an essay about the collaboration between computational sciences and IT services. ICCS, 1816-1824 (2014)</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>PRACE Partnership for Advanced Computing - 5IP (H-2020 Project ID 730913; continuation of PRACE-1IP/-2IP/-3IP/-4IP): Pan-European HPC infrastructure. LRZ has been / is leading the tasks on HPC prototyping.</p> <p>GeRDI (DFG Project Grant-No. BO818/16-1 and HA2038/6-1): Generic Research Data Infrastructure: national initiative on creating an interoperable, "FAIR" Research Data Management (RDM) layer, including REST-API-based functionality on cross-site data staging and workflows.</p> <p>ComPat (H-2020 Project ID 671564): Optimisation of Multiscale computing algorithms recognising their "patterns". The focus is on efficient coupling of the single-scale building blocks, fault tolerance, and energy consumption. LRZ is managing the e-Infrastructure of ComPat (WP6 / Experimental Execution Environment).</p> <p>AlpEnDAC (VAO-II Subproject, Bavarian State Ministry of the Environment and Consumer Protection): Design/operation of the "Alpine Environmental Data Analysis Centre" - a distributed RDM and simulation platform for high-altitude research facilities such as the "Schneefernerhaus" (Mt. Zugspitze, D). LRZ has been leading the tasks on simulations and on the iRODS distributed-data infrastructure.</p> <p>VERCE (FP7 Project ID 283543): Virtual Earthquake and Seismology Research Community E-science Environment in Europe. LRZ played a leading role in building and maintaining the grid-based e-infrastructure for the project.</p>
<p>Description of any significant</p>	<p>LRZ operates one of the top supercomputers on European level, SuperMUC with 241,000 x86 cores and a peak performance of over 6 PFlop/s, as well as a number of general purpose and specialized clusters, such as the Intel MIC (KNL) cluster CoolMUC-3 and Nvidia DGX-</p>

infrastructure and/or any major items of technical equipment, relevant to the proposed work	<p>1 machines for machine learning. The most recent addition to LRZ’s HPC ecosystem is a Compute Cloud (IaaS, OpenNebula/ OpenStack-based) being extended to ~2,000 x86 CPU Cores. This offers ultimate flexibility with users fully defining their environment, including the guest operating system. Besides running its own systems, LRZ – with its excellent building infrastructure and efficient cooling solutions – offers housing for production systems (e.g. the 2048-core C2PAP compute cluster, www.universe-cluster.de/c2pap/) as well as technology prototypes (e.g. the DEEP Energy Efficiency Evaluator system, http://www.deep-project.eu).</p> <p>SuperMUC-NG, to be installed in 2018, will be LRZ’s “Next Generation” supercomputer with a focus on energy-efficiency and flexibility with high performance at the same time. It will be equipped with more than 6.400 Lenovo ThinkSystem SD650 DWC compute nodes based on the Intel Xeon Scalable processor and with more than 300,000 compute cores will provide an impressive computational power of 26.7 PFlop/s to a wide-ranging scientific community.</p> <p>Interconnectivity with European e-Infrastructures and other project participants is ensured by the highly performant connection of the Munich Scientific Network (MWN, operated by LRZ) to the German X-WIN research network, which maintains excellent (highly performant and resilient) connectivity to the Internet and international research institutions (https://www.dfn.de/en/xwin/ip-platform).</p>
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4.1.8 European Centre for Medium-Range Weather Forecasts


	Part N°	Acronym	Country	Type
	8	ECMWF	UK	RO-SCC
Legal Entity Description	 <p>The European Centre for Medium-Range Weather Forecasts (ECMWF) is an independent international organisation supported by 34 Member and Cooperating States, recognised as a world-leading centre for global numerical weather prediction (NWP). ECMWF is both a research institute and a 24/7 operational centre, producing and disseminating medium- and extended-range weather forecasts to its member states, worldwide commercial customers and international organisations (including the UN/WFP and IAEA). Moreover, ECMWF's objectives also include the development of scientific and technical research directed to the improvement of these forecasts, and the collection and storage of appropriate meteorological data. To that effect, ECMWF operates a supercomputer facility that is one of the largest of its type, with the currently deployed 2 Cray XC-40 clusters ranked 25th and 26th in the June 2017 Top500 list, and an associated perpetual archive of meteorological data featuring more than 200 PiB. Furthermore, ECMWF pursues scientific and technical collaborations with satellite agencies, the European meteorological community and the world climate and weather prediction communities, as well as providing services for the European Commission.</p> <p>ECMWF is the entrusted entity for the European Union’s Copernicus Climate Change Service and the Copernicus Atmosphere Monitoring Service. The Copernicus Climate Change Service responds to environmental and societal challenges associated with human-induced climate change. The service will give access to information for monitoring and predicting climate change and will, therefore, help to support adaptation and mitigation. The Copernicus Atmosphere Monitoring Service provides continuous data and information on atmospheric composition. The service consists of daily global forecasts of atmospheric composition, daily forecasts of European air quality, global and regional reanalyses, as well as services on solar radiation, greenhouse gases and emissions.</p> <p>In 2014, ECMWF initiated a 10-year “scalability programme” with the aim of modernising its forecast models and product chain for the era of exascale computing. Within this programme, ECMWF is exploring different computational models and I/O paradigms, as well as building collaborations with various hardware vendors, research centres and universities. ECMWF has dedicated many internal resources to this programme, to develop a full Exascale NWP system, and is now an integral part of ECMWF’s 2016-2025 strategy.</p>			

	<p>ECMWF will participate by:</p> <ul style="list-style-type: none"> (a) contributing with requirements for the software infrastructure, ensuring its correct application to the weather and climate test-bed. (b) providing the global weather forecasts that feed the local regional models. (c) designing and developing the Weather & Climate Data API (WCDA) that will connect the multiple layers of the weather & climate test-bed. (d) explore, develop and deploy existing technologies for handling large-scale analysis of in-situ unstructured and unconventional weather observations (e.g. mobile phones, smart cities, etc). (e) explore, develop and deploy existing technologies for serving large-scale NWP data output for end-user data analysis and post-processing in Cloud systems.
<p>Persons involved in research activities</p>	<p>Dr. Tiago Quintino (male) is the Team Leader for Scalability within the Forecast Department at ECMWF and is ECMWF’s project manager for the H2020 project NEXTGenIO. He and his team develop software to meet the HPC scalability challenges in pre- and post-processing of meteorological products, storage and perpetual archival of weather observations and forecast data. Tiago develops the meteorological archival software (MARS) and the high performance I/O middleware (FDB). His career spans many years researching numerical algorithms and developing high performance scientific software in the areas of Aerospace and Numerical Weather Prediction. Lately he is focusing on scalable data handling algorithms for generation of meteorological forecast products, optimising their workloads and I/O of massive data sets. He is also the author of 25 journal publications and book chapters on high performance scientific computing and has managed and contributed to multiple EU funded projects.</p> <p>Dr. Peter Bauer (male) joined ECWMF in January 2000 and is the Deputy Director of the Research Department. Before joining ECMWF, he led a DLR research team on satellite meteorology in Cologne, Germany. His background covers physical modelling, data assimilation and satellite remote sensing. He obtained his masters and PhD degrees in meteorology from the universities in Cologne and Hamburg, respectively. During his career, he has been awarded research fellowships by NOAA and NASA, and a science award by DLR, and is an author on over 100 peer-reviewed scientific journal papers. He is a member of several international scientific advisory committees (WMO, ESA, EUMETSAT) and has extensive experience with coordinating international research projects. At ECMWF he manages the Scalability Programme, and the coordination of ESCAPE and ESiWACE, amongst other duties.</p> <p>Mr. Baudouin Raoult (male) is ECMWF’s Principal Software Architect. He joined the ECMWF in 1989. Since then, he has been responsible for the architecture and the development of ECMWF meteorological archive system (MARS), a multi-petabyte repository of meteorological data. He has also led key ECMWF projects such as the development of a tool for workflow supervision and monitoring that controls the ECMWF operational production system, the design of a data manipulation language, the implementation of a web-based catalogue browsing and data retrieval system and the development of an OGC compliant system for delivering on-demand graphical products. He is currently involved in several projects, ranging efficient handling of NWP model output on high-performance computers, to a cloud-based distributed climate data repository that also provides users with big data analytics tools. He is member of several WMO expert teams.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Bauer, P., Thorpe, A., Brunet, G.: The quiet revolution of numerical weather prediction. <i>NATURE</i>, 525 (7567), 47–55 (2015)</p> <p>Deconinck, W., Bauer, P., Diamantakis, M., Hamrud, M., Kuehnlein, C., Maciel, P., Mengaldo, Gi., Quintino, T., Raoult, B., Smolarkiewicz, P., Wedi, N.: Atlas, a library for numerical weather prediction and climate modelling. In: Press, <i>Computer Physics Communications</i>, 220, 188-204 (2017)</p>

	<p>Smart, S., Quintino, T., Raoult, B.: A scalable object store for meteorological and climate data. In: Proceedings of the Platform for Advanced Scientific Computing Conference, Switzerland (2017)</p> <p>Raoult, B.: The architecture of the new MARS server. In: Sixth Workshop on Meteorological Operational Systems (1997)</p> <p>Mozdzyński, G., Hamrud, M., Wedi, N., Doleschal, J., Richardson, H.: A PGAS implementation by Co-design of the ECMWF Integrated Forecasting System (IFS). High Performance Computing, Networking, Storage and Analysis, SC Companion, 652-661 (2012)</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>Operational forecasting is the primary purpose of ECMWF. Atmospheric and ocean forecasts, both deterministic and as part of a stochastically perturbed ensemble, are provided twice daily. As of September 2017, daily operations produce on average 32 million output fields taking 60 TiB, which are post-processed into 90 million products, totaling 12 TiB, all produced and processed in one-hour time-critical windows and distributed to 1,150 different world-wide destinations.</p> <p>Copernicus is the EU’s flagship programme for monitoring the Earth. Copernicus delivers operational data and information services on a range of topical areas. ECMWF manages both the <i>atmosphere monitoring service (CAMS)</i> and the <i>climate change service (C3S)</i>. ECMWF is also involved in the marine and emergency services, particularly by running the computational centre and hosting the information system for the European Flood Awareness System (EFAS).</p> <p>ECMWF curates and serves the world’s largest meteorological archive (MARS), which holds observations and output of numerical simulations, which is built on top of its extreme-scale Data Handling System (DHS). It contains data from operational model runs, research experiments and EU-funded projects (ERA-CLIM, MAAC, EFAS) amongst other datasets. The data represents a valuable asset, providing a detailed record of worldwide weather observations and forecasts over the past 30 years, and climatic evolution over the whole 20th century. As of September 2017, the archive holds 190 PiB of primary data, and is growing at a rate of 150 TiB per day.</p> <p>ESCAPE: “Energy-efficient Scalable Algorithms for Weather Prediction at Exascale”.EU H2020 project, 1stOctober 2015 - 30thSeptember 2018. www.hpc-escape.eu. Developing world-class extreme-scale computing capabilities for European operational numerical weather prediction and future climate models. Coordinated by ECMWF.</p> <p>ESiWACE: “Centre of Excellence in Simulation of Weather and Climate in Europe” EU H2020 project, 1st September 2015 - 31stAugust 2019. www.esiwace.eu. <u>Improving efficiency and productivity of numerical weather and climate simulation on high-performance computing platforms by supporting the end-to-end workflow of global Earth system modelling in HPC environments. Co-coordinated by ECMWF.</u></p> <p>NEXTGenIO: “Next Generation I/O for the Exascale”EU H2020 project, 1stOctober 2015 - 30thSeptember 2018. www.nextgenio.eu. Addressing the I/O bottleneck of HPC workloads through exploitation of Intel’s ground-breaking 3D XPoint™ non-volatile memory technologies.</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the</p>	<p>ECMWF operates a world-class HPC facility (HPCF) in a production environment for weather forecasting. The HPCF is amongst the most powerful supercomputers in Europe, featuring two Cray XC-40 systems (Anemos and Ventus), in a resilient dual-cluster configuration with a 21 PiByte Cray Sonexion storage system. Each subsystem consists of around 3600 dual-socket compute nodes (Intel “Broadwell” Xeon), providing 140,000 cores. ECMWF has recently taken delivery of a cluster containing 32 nodes with Intel Xeon Phi (Knights Landing) processors, and a 34-node cluster with two NVIDIA K80 GPUs per node for the purpose of experimenting with different programming models on a range of new architectures.</p> <p>https://www.ecmwf.int/en/computing/our-facilities/supercomputer</p>

proposed work	<p>ECMWF has an entire infrastructure to accept, process and move weather observational data from its arrival through to the dissemination of weather forecast products to its member states and customers. This infrastructure includes satellite dishes and a dedicated computing cluster for real-time acquisition and assimilation of observations (SAPP), the above mentioned HPCF for forecast production, and the dissemination system (ECPDS) over dedicated network lines to worldwide customers (RMDCN).</p> <p>https://www.ecmwf.int/en/computing/our-facilities/data-handling-system https://www.ecmwf.int/en/computing/our-facilities/rmdcn</p> <p>ECMWF has a software stack built over several decades that includes not just the scientific codes used to make the forecasts, but the application software that runs in the hardware infrastructure mentioned above. This contains the libraries for (de)compression of meteorological data to/from the internationally recognised formats, data manipulation and transformations, a post-processing infrastructure, and all the required data-management functionality including an effective domain-specific storage solution, handling hundreds of terabytes daily.</p>
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4.1.9 INFORMATION TECHNOLOGY FOR HUMANITARIAN ASSISTANCE, COOPERATION AND ACTION

	Part N°	Acronym	Country	Type
	9	ITHACA	IT	RO
Legal Entity Description	<div style="display: flex; align-items: flex-start;">  <div> <p>The non-profit association ITHACA, based in Torino, Italy, is a center of applied research devoted to support humanitarian activities in response to natural disasters by means of remote sensing techniques. ITHACA has built strong competences in the field of acquisition, management and elaboration of geographic and cartographic data for emergency response purposes, delivering methodologies, analytical services and technical tools to improve the capacity of the international humanitarian community in early warning, early impact assessment and other risk management related areas.</p> <p>The association was founded in November 2006 by Politecnico di Torino, with the financial support of Compagnia di San Paolo and in cooperation with the WFP (World Food Programme) - the food aid arm of the United Nations and the world's largest operational humanitarian agency.</p> <p>The assigned UKAS international certification ensures the compliance of the services offered by ITHACA to the UNI EN ISO 9001:2008.</p> <p>Concerning the role of ITHACA, given its long-lasting experience in the framework of emergency management within the EU Copernicus programme, in particular in processing and analyzing remote sensing imagery in order to extract value added information, ITHACA will be mainly involved in the use cases Weather&Climate and Earthquake and Tsunami, exploiting outputs from the models to generate Emergency Mapping products</p> <p>Participant role in the project:</p> <p>Concerning the role of ITHACA, given its long-lasting experience in the framework of emergency management within the EU Copernicus programme, in particular in processing and analyzing remote sensing imagery in order to extract value added information, ITHACA will be mainly involved in the use cases Weather&Climate and Earthquake and Tsunami, exploiting outputs from the models to generate Emergency Mapping products</p> </div> </div>			
Persons involved in research activities	<p>Fabio GIULIO TONOLO (Male)</p> <p>Fabio Giulio Tonolo has a master degree in Environmental Engineering (Politecnico di Torino, Italy, 2001) and holds a Ph.D. in Geodesy and Geomatics (Politecnico di Milano, Italy, 2005). He is currently senior researcher and geographic information specialist at</p>			

ITHACA, where he is in charge of the emergency mapping activities and covers the role of Project Manager for several international project. His main interest is on research and operational activities focused on the use of geomatics techniques to provide spatial data services (especially in the emergency preparedness/response domain), including acquisition, management and processing of geo-spatial data.

Dr. Giulio Tonolo has been lecturer in several training courses (also in developing countries) for both universities, NGOs and private companies and is co-author of more than 70 national and international publications, among which an article on the prestigious journal SCIENCE. He has the national scientific qualification to function as associate professor in Italian Universities for the period 2015-2020.

He is member of the Steering Committee of the Italian Association of Remote Sensing since 2014 (member since 2003). He is actively involved in the International Working Group on Satellite Emergency Mapping (IWG-SEM) that he chaired from April 2013 to May 2014. He was co-chair of the ISPRS (International Society for Photogrammetry and Remote Sensing) WG VIII/1 - Disaster and Risk Reduction for the period 2012-2016

Andrea AJMAR (Male)

Andrea Ajmar has more than 20 years of experience in analyzing environmental phenomena, with all the support provided by Geographic Information Systems: from geostatistical approaches for soil classification, to global soil cartography and databases, to flood risk reduction analysis and modelling, to interferometric DEM derivation, to geodatabases and SDIs development. Since joining ITHACA in 2007, he has covered the role of Project Manager in several international projects focusing on i) SDIs mainly dedicated to emergency response, ii) E-R model for geographic data storage, iii) multiuser geodatabase management, iv) software procedures in support of early-warning and early impact analysis. He is currently senior staff at Ithaca, member of the Rapid Mapping team since 2012. He has been involved as trainer in GIS for international organizations, NGO's and local authorities, mainly in developing countries. He has been Member of the scientific committee of ASITA (Federation of the Italian Scientific Associations devoted to Geomatics and Environmental applications) in the period 2008-2012 and Secretary of the ISPRS (International Society for Photogrammetry and Remote Sensing) ICWG IV/VIII - Updating and Maintenance of Core Spatial Databases in the period 2008-2012.

Simone BALBO (Male)

Simone Balbo holds a Master's degree in Environmental Engineering (Politecnico di Torino, 2008) and a Ph.D. in Environmental Protection and Management (Politecnico di Torino, 2012). He specializes in GIS, GPS surveys, Mobile Mapping Systems surveys, Spatial Data Infrastructure management, GIS data processing. He was short term consultant at the Global Facility for Disaster Recovery and Reduction of the World Bank - Washington, DC (US) on the implementation of a Web platform for geospatial data sharing in 2011. In 2012-13 he was consultant for the WFP for the development of their Spatial Data Infrastructure. He is currently senior staff at Ithaca, member of the Rapid Mapping team since 2012.


Franca DISABATO (Female)

Franca Disabato holds a master degree in Engineering of the environment and territory (Politecnico di Torino, Italy, 2006) and a Ph.D. in Environmental Engineering (Politecnico di Torino, Italy, 2009). She has been working at Ithaca since 2009 on remote sensing applications for natural disasters, analyzing and elaborating satellite data for flood and drought early warning systems. Furthermore, she has been involved in the development of applications to automatically process and perform statistical analysis on large geospatial datasets, in the development of graphic interfaces in IDL, and in GIS analysis for the production of thematic maps. In 2012-13 she was short-term consultant at WFP HQ in the field of hazard definition for flood risk analysis, satellite data processing for emergency management purposes and emergency mapping. Since 2014 she is quality manager and since 2015 she is supporting landcover validation activities. She is participating to the following ITHACA projects: TRIBUTE Project (TRigger Buffer zones for inundaTion Events), Prevention Project for EU Civil Protection, DG-ECHO 2017-2018, Copernicus Emergency Mapping Service in RUSH mode - IPSC/2011/02/04/OC SC/2011 – 2012-2015 and in the

	<p>Copernicus emergency management service rapid mapping - 2015-2019, "Global Land High Resolution Hot Spot Monitoring within the Global Land Component of the Copernicus Land Service (C-GL-HRM) – Lot 1" - 2015-2019</p> <p>Francesca PEREZ (Female)</p> <p>Francesca Perez has a master degree in Environmental Engineering (Politecnico di Torino, Italy, 2003) and a Ph.D. in Environmental Engineering (Politecnico di Torino, Italy, 2008). She specializes in remote sensing multispectral data processing in support to environmental analysis, developing and implementing specific algorithms for their elaboration as well. She has been practice assistant for Remote sensing and Analysis of observation data-Topography courses at the Politecnico di Torino. At present, her main research field concerns the elaboration of satellite-derived vegetation indexes time-series, their proper statistical analysis and integration with climatic data, for vegetation stress conditions and land cover changes identification. She is currently environmental researcher at ITHACA, where she is in charge of the “Detection and monitoring of drought events” project. She is currently senior staff at Ithaca, member of the Rapid Mapping team since 2012.</p> <p>Luciana Dequal (Female)</p> <p>Luciana Dequal holds a Master’s Degree in Foreign Languages (Torino University, Italy, 1998). She has 20 years of experience in international projects, external relations and international bids. Before joining ITHACA in 2008, she worked for 2 years as Export Dept. Manager in an Italian SME operating in the electro-medical sector and for 8 years in the business promotion area at the Foreign Trade Office - Piemonte Chambers of Commerce, where she was in charge of the organization of collective participation to international exhibitions, partner searches, reception of foreign delegations, organization of outgoing trade missions.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Services</p> <ul style="list-style-type: none"> • ITHACA is member of the service provider consortium of the Copernicus Emergency Management Service (© European Union, 2012-2018) since 2012 <p>Publications</p> <ul style="list-style-type: none"> • Voigt, S., Giulio-Tonolo, F., Lyons, J., Kučera, J., Jones, B., Schneiderhan, T., Platzeck, G., Kaku, K., Hazarika, K.M., Czaran, L., Li, S., Pedersen, W., James, G.K., Proy, C., Muthike, M.D., Bequignon, J., Guha-Sapir, D.: Global trends in satellite-based emergency mapping, <i>Science</i>, 353(6296), 247-252 (2016) • Ajmar, A., Boccardo, P., Disabato, F., Giulio Tonolo F.: Rapid Mapping: geomatics role and research opportunities. <i>Rendiconti Lincei</i>: 26(1), 63-73, Springer, Milan (2015) <p>Products</p> <ul style="list-style-type: none"> • Extreme Rainfall Detection System (ERDS). WebSite: http://erds.ithacaweb.org/ More details: http://www.ithacaweb.org/projects/erds/ • Drought Monitoring System. WebSite: http://drought.ithacaweb.org/ More details: http://www.ithacaweb.org/projects/drought-monitoring/
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>TRIBUTE (TRigger BUffer zones for inundaTion Events) European Commission DG ECHO 01/2017-12/2018</p> <p>Managing inundation risk requires prevention measures in close cooperation with Civil Protection Authorities. An evacuation trigger buffer is a pre-established boundary that circumscribes an area in such a way that when floodwaters (incl. waters, sediment, contaminated waters and pollution) coming from any direction cross the buffer, an evacuation is recommended. TRIBUTE software tool that will be delivered as a web service and as a mobile application, will provide the trigger buffers zones for a threatened site taking into consideration the current estimates of downpour hazards from satellites as well as its vulnerability and coping capacity. The service will have pan-European coverage and will be tested extensively in three pilot areas with different characteristics, including cross-border and multi-threat.</p>


	<p>ELF (European Location Framework) European Commission – DG COMM Competitive and Innovation Framework Programme (CIP) 03/2013 - 10/2016</p> <p>The goal of this project is to deliver the European Location Framework (ELF) required to provide up-to-date, authoritative, interoperable, cross-border, reference geo-information for use by the European public and private sectors. This versatile cloud-based and cascade-supporting architecture provides a platform of INSPIRE compliant geo-information, harmonized at a cross-border and pan-European level. The three-year project is supported by a consortium of 30 partners across Europe and it will foster the wider use of geo-information and enable the creation of innovative value-added services. The project's proactive stimulation of content markets involves the creation of sample applications using thematic communities to make user-led developments by SMEs (both inside and outside the consortium). ITHACA is involved in the Emergency Mapping use case, whose main purpose is to demonstrate the impact the ELF platform has on operational services focused on emergency mapping. More specifically, the availability of the ELF platform is expected to eliminate the current time-consuming digitising operations based on the visual interpretation of suitable satellite images, thus drastically reducing the delivery time for data. Furthermore, the geometric and thematic accuracy of standard (official and authoritative) digital maps and raster topographic maps available at local level is generally higher than that achievable through digitising ortho-corrected satellite imagery.</p> <p>GIO-EMS in non-rush mode. European Commission – Joint Research Centre 04/2012 - 03/2015</p> <p>The GMES initial operations — emergency management service was intended as an operational service offered to the authorized users active in the field of crisis management in the EU Member States, the European Civil Protection Mechanism, the Commission's Directorates-General (DGs) and the participating executive agencies and international humanitarian aid. The core character of the GIO-EMS service lies in the provision upon activation by the authorized user of timely and accurate information derived from satellite imaging sensor data in all phases of the emergency management cycle. The information generated by the service can be used as supplied by the contractor (e.g. as digital or printed map outputs) or further combined with other data sources (e.g. as digital feature sets in a geographic information system) to support analysis and decision-making processes of emergency managers. The mapping in non-rush mode service concerns the on-demand provision of geospatial information in support to emergency management activities during the phases of the emergency management cycle which are not related to the immediate response, i.e. not requiring rush mode delivery. In particular, information provision relates to the prevention, preparedness and reconstruction phases. Client: European Commission, Joint Research Centre. Years: 2012-2015</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>N/A</p>

4.1.10 CIMA Research Foundation (CIMA)

	Part N°	Acronym	Country	Type
	10	CIMA	IT	RO
Legal Entity Description		<p>The Foundation, named Centro Internazionale In Monitoraggio Ambientale (International Centre On Environmental Monitoring), is a not for profit organization under the Italian Legal Regulations. The Founding Institutions were the Civil Protection Department of the Italian Prime Minister's Cabinet Office, the University of Genova, the Government of the Region of Liguria, and the Administration of the Province of Savona. A framework agreement between CIMA and University of Genoa is active for regulating joint activities in research programs.</p> <p>CIMA Research Foundation controls ACROTEC Foundation. Since last five years, ACROTEC Foundation has developed, in cooperation with CIMA, an innovative model of design, distribution and installation on “field-ready” professional environmental monitoring systems based on recent concepts of Open Hardware and Internet of Things (IoT). This idea corresponds to ACRONET Open Hardware stations-</p> <p>CIMA research deals with the study of uncertainty propagation in hydro-meteorological forecasting chains, the study of rainfall processes with the development of rainfall downscaling and hydrological models. CIMA has participated to several national and international DRR projects, and it coordinated a number of FP7 projects.</p> <p>Participant role in the project: CIMA is leading the Weather & Climate pilot. CIMA has participated to several national and international DRR projects, and it coordinated a number of FP7 projects. CIMA has a long-standing experience in research and operational activities dealing with in situ observational data and their integration with EO data in support of hydro-meteorological modelling from the weather scenario down to its socio-economic impacts.</p>		
Persons involved in research activities	<p>Antonio Parodi (male), PhD, Program Director at CIMA Research Foundation. Master Degree in Environmental Engineering, University of Genova, Italy (1998). Research Scholar at MIT - EAPS, (2002). Member of Radar Science Group at JPL-NASA (2009). His research interests are related to the development of simplified models of dry and moist convection and to the study of the main sources of uncertainty in the high-resolution numerical modelling of deep moist convective processes. He is author and co-author of 50 publications on international peer-reviewed journals. Project director of the FP7 projects DRIHMS (www.drihms.eu), DRIHM (www.drihm.eu), DRIHM2US (www.drihm2us.eu), ESA STEAM project.</p> <p>Elisabetta Fiori (female), PhD, researcher at CIMA Research Foundation. Master Degree in Environmental Engineering, University of Genova, Italy (2005). Research activities in hydro-meteorology, in high resolution numerical modelling of intense convective events, in the study of its main sources of uncertainty and in the analysis of thermodynamics and kinematics properties of atmospheric processes due to deep moist convection. She is author and co-author of 9 publications on international peer-reviewed journals.</p> <p>Martina Lagasio (female), PhD student at CIMA Research Foundation. She graduated in Environmental Engineering, University of Genova, Italy (2013) and Master graduation in Environmental and Energy Engineering (2015) with a master thesis on “Lightning flash activity indices as forecasting tool of high impact weather events over complex topography”. Currently PhD student in Systems Engineering working on data assimilation in WRF-ARW meteorological model. Her research interests are the use of data assimilation in high resolution Numerical Weather Prediction to improve forecast skill of extreme hydrometeorological events as well as the investigation of lightning forecast performances in multimicrophysical cloud resolving simulations. She is author and co-author of 1 publication on international peer-reviewed journal and 3 conference papers presented at international conferences.</p>			

	<p>Emanuele Danovaro (male), PhD, research fellow at CIMA Research Foundation. MD in computer science, University of Genova, Italy (2000). His research interests are in the field of high-performance and distributed computing, with a focus on systems for hydro-meteorological predictions. He is author and co-author of more than 40 publications on journal and international conferences.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>D'Agostino, D., Clematis, A., Galizia, A., Quarati, A., Danovaro, E., Roverelli, L., Parodi, A.: The DRIHM project: a flexible approach to integrate HPC, grid and cloud resources for hydro-meteorological research. In: Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis, IEEE Press., 536-546 (2014)</p> <p>Fiori, E., Comellas, A., Molini, L., Rebora, N., Siccardi, F., Gochis, D. J., Parodi, A.: Analysis and hindcast simulations of an extreme rainfall event in the Mediterranean area: The Genoa 2011 case. Atmospheric Research, 138, 13-29 (2014)</p> <p>Hally, A., Caumont, O., Garrote, L., Richard, E., Weerts, A., Delogu, F., Clematis, A.: Hydro-meteorological multi-model ensemble simulations of the 4 November 2011 flash-flood event in Genoa, Italy, in the framework of the DRIHM project. Natural Hazards and Earth System Sciences Discussions, 2(11), 6653-6701 (2014)</p> <p>Parodi, A., Boni, G., Ferraris, L., Siccardi, F., Pagliara, P., Trovatore, E., Kranzlmüller, D.: The “perfect storm”: From across the Atlantic to the hills of Genoa. Eos, Transactions American Geophysical Union, 93(24), 225-226 (2012)</p> <p>Quarati, A., Danovaro, E., Galizia, A., Clematis, A., D'Agostino, D., Parodi, A.: Scheduling strategies for enabling meteorological simulation on hybrid clouds. Journal of Computational and Applied Mathematics (2014)</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>DRIHM, short for Distributed Research Infrastructure for Hydro-Meteorology, is a project (www.drihm.eu, 2011-2015) co-funded under the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement no. 283568.</p> <p>DRIHM2US, short for Distributed Research Infrastructure for Hydro-Meteorology to US, is a project (www.drihm2us.eu, 2012-2015) co-funded under the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement no. 313122.</p> <p>EXPRESS-Hydro, short for EXtreme PREcipitation and Hydrological climate Scenario Simulations, Gauss Large Scale project, undertaking its activities in cooperation with the DRIHM project, to produce very high-resolution regional dynamical downscaling of historical climate scenarios produced by the ERA-Interim reanalysis and of climate change scenarios produced by a global climate model (the EC-Earth model), using the state-of-the-art non-hydrostatic Weather Research and Forecasting (WRF) regional climate model.</p> <p>RASOR, short for Rapid Analysis and Spatialisation Of Risk, is a project (www.rasor-project.eu, 2013-2016) co-funded under the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement no. 606888.</p> <p>GEO-CRADLE, short for Coordinating and integrating state-of-the-art Earth Observation Activities in the regions of North Africa, Middle East, and Balkans and Developing Links with GEO related initiatives towards GEOSS, is a project (http://geocradle.eu/en/) co-funded from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690133.</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>CIMA was the coordinator of the DRIHM and DRIHM2US project, which developed an e-Infrastructure for Hydro-Meteorology research. Furthermore CIMA has access for research and operation purposes to the natural hazards modelling and observational data of the Italian Civil Protection Department, available through the DEWETRA platform.</p>


4.1.11 AVIO AERO

	Part N°	Acronym	Country	Type
	11	AVIO AERO	IT	PB
Legal Entity Description	 <p>Avio Aero is a GE Aviation business which operates in the design, manufacture and maintenance of civil and military aeronautics components and systems. Today, the company offers innovative technological solutions which allow customers to respond faster to the market's on-going changes: additive manufacturing, rapid prototyping as well as technologies dedicated to the production of transmissions, turbines and combustors.</p> <p>The headquarters is located in Rivalta di Torino, which is also the largest production plant, while strategic facilities are located also in Brindisi and Pomigliano d'Arco (Naples), for a total amount of 4,200 employees in Italy. Abroad, it has a production plant in Poland.</p> <p>Through ongoing investments in research and development, and thanks to a consolidated network of contacts and relations with major international universities and research centres, Avio Aero has attained an internationally recognized level of excellence in technology and manufacturing: an achievement borne out by its partnerships with the leading global actors in the aeronautical sector.</p> <p>Avio Aero's challenge is to develop new technologies and applications in order to cut energy consumption, produce lighter aircraft and deliver better performance.</p> <p>Avio Aero: our digital journey</p> <p>To increase the productivity and competitiveness of the industry, it is necessary to exploit the opportunities offered by digitization. In Avio Aero, the fourth industrial revolution has already begun, through what has been called 'Brilliant Factory', the 'Fabbrica Intelligente', a production site that can continually self-improve its products and processes by collecting, connecting and analyzing data in real time. Avio Aero's Brilliant Factory is characterized by a faster product development cycle and improved production efficiency.</p> <p>In this context, advanced manufacturing and, more specifically, additive manufacturing plays a key role seeing the company involved in the forefront thanks to its Cameri plant, one of the largest in the world entirely dedicated to additive production.</p> <p>In Apulia, Avio Aero and the Polytechnic of Bari created a new laboratory, the Apulia Development Center for Additive Repair, to develop repair procedures for aeronautical engine components using innovative technologies based on laser systems. Together with the Polytechnic of Turin, Avio Aero has signed a partnership agreement to create the Turin Additive LAB, a new joint laboratory that sets the foundation for collaboration on strategic research topics for the aeronautics industry.</p> <p>Participant role in the project:</p> <p>(a) contributing to requirements definition for the newly designed HPC/BD/Cloud infrastructure, ensuring its correct application to the proposed aeronautics use cases related to aero engines' turbomachinery and rotating parts simulation;</p> <p>(b) helping to integrate SW and HW equipment in order to achieve the best performance to be applied to aero engines' numerical analyses and design opportunities investigation, and to assure reliable service operations and secure data access on the platform in all the conditions;</p> <p>(c) hence validating the developments and improvements carried out in the present research project for the newly designed HPC/BD/Cloud infrastructure. Proper KPIs will fix the challenges.</p>			
Persons involved in	<p>Ennio Spano (Male) has about 27 years of experience in turbomachinery. Passing thru a short experience in transonic gas turbine and compressor design and as a lecturer in the Polytechnic of Turin dealing with advanced design of aeronautical turbines, he has been manager of aero</p>			

research activities	<p>& acoustics team, responsible for aeronautical turbines design and development. Nowadays he is leading the Advanced Design Tools program in Avio Aero.</p> <p>Davide Torzo (Male) has more than 10 years of experience in turbine aero and acoustics, including several research activities on numerical prediction methodologies and experimental investigations. He is currently leading the LPT acoustics-related activities at Avio Aero.</p> <p>Ivano Di Conca (Male) has 11 years of experience in Architecture and infrastructure solution. After degree in Energetic Engineering at Polytechnic of Turin, in 2000 he started like consultant in IBM/Global Value Company like System Engineering Microsoft and Network. In 2004 he joined in Avio Aero following Military Application about Eurofighter project from IT prospective. In 2007 he changed role, he became Solution Architect. Now he is accountable of architecture and infrastructure solutions for Avio Aero, he keeps aligned Avio Aero with GE technology standard and CoreTech strategy</p> <p>Donato Magarielli (Male) got Master degree in Electronic Engineering and a postgraduate degree in methodologies and technologies supporting collaborative design in the new product development process within aerospace value network. He has been working in Avio Aero Digital Technology organization since 2012, initially acting as software application owner for computer-aided experimental testing tools and test data management application. Since 2014 he has been acting also as software application owner for computer-aided engineering tools and as HPC software architect.</p> <p>Roberto Merotto (Male) After 10 years in engineering department and Six Sigma Black Belt certification, started current path introducing new technologies, analyzing and innovating processes looking beyond the habits. He is a project and program manager leading from several years IT Research activities with different, increasing responsibility roles.</p> <p>Davis Quirico (Male) has 22 years of experience in IT as developer and architect. His experience started at the University of Torino in Computer Science and then involved in different Businesses: Energy, Telco, Finance and Manufacturing. Joining Avio in 2008 has covered different technical roles and now act as Principal Architect for Innovative solutions as Cloud, IoT and Big Data.</p>
List of up to 5 relevant publications, and/or products, services	<p>Giovannini, M., Marconcini, M., Arnone, A., Bertini, F.: Evaluation of unsteady computational fluid dynamics models applied to the analysis of a transonic high-pressure turbine stage. In: Proceedings of the Institution of Mechanical Engineers, Part A: Journal of Power and Energy, (2014)</p> <p>Pacciani, R., Marconcini, M., Arnone, A., Bertini, F.: Predicting high-lift LP turbine cascades flows using transition-sensitive turbulence closures. In: Proceedings of the Turbine Technical Conference and Exposition, (2014)</p> <p>Pacciani, R., Marconcini, M., Arnone, A., Bertini, F.: URANS Prediction of the effects of upstream wakes on high-lift LP turbine cascades using transition-sensitive turbulence closures". Energy Procedia, 45, 1097-1106 (2014)</p> <p>Andreini, A., De Sogha, R., Facchini, B., Coutandin, D., Maiuolo, F., Tarchi, L.: Experimental and numerical analysis of multiple impingement jet arrays for an active clearance control system, Journal of Turbomachinery (ASME), 135(3), (2012)</p> <p>Andreini, A., Bianchini, C., Facchini, B., Giusti, A., Turrini, F.: A multi- [Cloud HABITAT] 2 coupled Eulerian-Lagrangian solver for airblast injectors including liquid film evolution and primary breakup – Numerical model. In: Proceedings of the ILASS (2013)</p>
List of up to 5 relevant previous projects or activities, connected to the subject of this proposal	<p>Avio Aero boasts participation in the most important EU research projects, including VITAL, FACTOR, ENOVAL, CLEAN SKY 1 & 2.</p>

<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>Avio Aero will provide sophisticated and advanced computer-aided engineering (CAE) software applications, whose goal is to model and simulate large-scale engineering problems aimed to analyze the complex fluid dynamic behaviour in aeronautical engines' components. The strict integration between these software requisites and the hardware ones, both needed to run on the newly designed HPC/Big data/Cloud platform the simulations of aeronautical use cases proposed, will be exploited in this research project to handle and optimize the specific features of computing and processing very large data sets in aeronautical engineering sector.</p> <p>A significant impact in terms of reduced execution time for simulation data computing and post-processing is expected: this is a fundamental step to improve engineering productivity in NTI (New Technology Introduction)/NPI (New Product Introduction) Aeronautical processes and to guarantee that Avio Aero products be innovative, competitive and market appealing, with less environmental impacts for worldwide communities too.</p> <p>Moreover, based on the expected technological improvements, the newly developed HPC/Cloud/Big Data service, combined with the CAE software applications sustaining large-scale aeronautical use cases, may be extended to other computer-aided problems in the framework of aeronautical engineering, and also be exploited and adopted by other big aeronautical companies.</p>
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4.1.12 Helmholtz-Zentrum Potsdam – Deutsches Geoforschungszentrum GFZ

	Part N°	Acronym	Country	Type
<p>Legal Entity Description</p>	<p>12</p> 	<p>GFZ</p>	<p>DE</p>	<p>RO</p> <p>The GFZ was founded in 1992 as the national research institution for geosciences in Germany and is member of the Helmholtz Association of National Research Centres. The GFZ is Germany's premier institute for the geosciences, with strong links to leading institutes across Europe. Research in 37 sections of the GFZ ranges across the full breadth of the Earth Sciences from the dynamics of Earth's deep interior to the remote observation of its active surface. The GFZ employs almost 1300 people and operates the global seismological network GEOFON. The GFZ is the responsible institution for the assessment of seismic hazard in Germany and, as member of the Global Earthquake Model (GEM) project, a key participant in many seismic hazard assessments worldwide. A key product in of the GFZ in this domain is the European Macroseismic Scale EMS-98.</p> <p>Participant role in the project</p> <p>The section "Seismic hazard and risk dynamics" of the GFZ will participate in LEXIS. This section employs a group of more than 20 scientists working in the field of seismic hazard and risk, from earthquake forecasting and rupture simulation, via ground-motion predictions, to exposure and risk modeling. The historical earthquake catalogs provided for multiple seismic hazard models form the basis for assessments of future earthquake locations and sizes. The ground-shaking prediction models developed at GFZ are used in modern seismic hazard assessments and the full chain of computation is implemented in OpenQuake, a Python program provided by GEM to compute seismic hazard (partly developed by people from GFZ). GFZ is also developing the first purely open and dynamic global exposure model on the building scale (OpenBuildingMap) to be used in LEXIS. GFZ provides the infrastructure for hosting large-scale OpenQuake computations as well as the OpenBuildingMap.</p> <p>GFZ is pioneering the testing and validation of seismic hazard and risk models and their components, i.e. earthquake forecast models, earthquake ground-motion predictions, and</p>

	<p>exposure models. Testing experiments at GFZ have reduced epistemic uncertainties in seismic hazard assessments and provide necessary data for decision making. As a consequence, GFZ is developing a first purely data-driven seismic hazard and risk model, comprising the constantly growing open and transparent big data in the earthquake domain. GFZ will provide earthquake simulations and ground shaking predictions for earthquake scenarios to be used in earthquake risk (damage) assessments and as input for tsunami simulations. GFZ will also contribute the engine for building classification and damage assessment for different natural hazards (here earthquakes and tsunamis).</p>
<p>Persons involved in research activities</p>	<p>Prof. Dr. Fabrice Cotton (male) is the head of the “seismic hazard and risk dynamics” section and holds a professorship at the University of Potsdam. He holds a Ph.D. in Seismology from the University Joseph Fourier, Grenoble, France. He is working in the fields of earthquake-source analysis and probabilistic seismic hazard assessment, focusing on critical facilities. He also chairs the Global Earthquake Model Science Board.</p> <p>Dr. Danijel Schorlemmer (male) is leading the earthquake statistics and testing group within the “seismic hazard and risk dynamics” section. He holds a Ph.D. in Seismology from ETH Zurich, Switzerland. He is working in testing seismic hazard models and improving forecasting of seismic events. He is also introducing big-data and crowd-sourcing to seismic risk assessment and pioneering big data and crowd-sourcing for seismic hazard and risk.</p> <p>M. Eng. Karsten Prehn (male) is starting his Ph.D. in seismic hazard and risk and particularly in exposure modeling based on open data. He worked as software developer for many years and is now developing the building classification and damage assessment modules of the OpenBuildingMap.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Grünthal, G., Stromeyer, D., Bosse, C., Cotton, F., Bindi, D.: The probabilistic seismic hazard assessment of Germany—version 2016, considering the range of epistemic uncertainties and aleatory variability. In: Bulletin of Earthquake Engineering (2018)</p> <p>Kotha, S., Bindi, D., Cotton, F.: Partially non-ergodic region specific GMPE for Europe and Middle-East. In: Bulletin of Earthquake Engineering, 14 (4), 1245-1263 (2016)</p> <p>Mak, S., Schorlemmer, D.: A comparison between the Forecast by the United States National Seismic Hazard Maps with Recent Ground-Motion Records. In: Bulletin of the Seismological Society of America, 106(4), 1817-1831 (2016)</p> <p>Schorlemmer, D., Werner, M., Marzocchi, W., Jordan, T., Ogata, Y., Jackson, D., Mak, S., Rhoades, D., Gerstenberger, M., Hirata, N., Liukis, M., Maechling, P., Strader, A., Taroni, M., Wiemer, S., Zechar, J., Zhuang, J. (accepted): The collaboratory for the study of Earthquake Predictability: Achievements and Priorities. Seismological Research Letters.</p> <p>Global Dynamic Exposure Model (OpenBuildingMap): (2D) URL: http://obm.gfz-potsdam.de, (3D) URL: http://obm3d.gfz-potsdam.de.</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>SERA (2017-2020), GFZ is participating in this EU-funded project for Research Infrastructures for Earthquake Hazard. GFZ is characterizing seismicity rates and developing tools for improving and testing ground-motion models.</p> <p>Dynamic Risk Quantification (2015-2018), GFZ developed the prototype of the full chain for transparent and data-driven dynamic hazard and risk computations. This project involved a strong collaboration with the funding institution, KAUST in Saudi Arabia, in the field of dynamic rupture modeling.</p> <p>Global Earthquake Model (2012-2018), as the national representative of Germany, GFZ is leading the testing and evaluation of probabilistic seismic hazard models and working together with many partners of GEM globally on testing experiments.</p> <p>EPOS-IP (2015-2019) The EU-funded European Plate Observing System for a pan-European infrastructure for solid Earth science. GFZ is developing a new service for ground-shaking models for use in European seismic hazard assessment.</p>
<p>Description of any significant</p>	<p>GFZ will provide the infrastructure for the operation of OpenQuake (earthquake scenario computations) and the OpenBuildingMap (building classifications and damage assessment).</p>

infrastructure and/or any major items of technical equipment, relevant to the proposed work	
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4.1.13 Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research

	Part N°	Acronym	Country	Type
	13	AWI	DE	RO
Legal Entity Description	 <p>The Alfred Wegener Institute is a foundation under public law and member of the Helmholtz Association. It was founded in 1980 in Bremerhaven and also operates facilities in Potsdam, Helgoland, and List (Sylt) with in total more than 1000 employees. As an internationally respected centre of expertise on polar and marine research, the Alfred Wegener Institute coordinates German polar research efforts, while also conducting research in the North Sea and adjacent coastal regions.</p> <p>The Project LEXIS will be conducted by the scientific computing group at the computing centre at AWI. The group of 13 scientists provides the high performance computing (HPC) servers at AWI – currently a Cray CS400 and a NEC SX-ACE - and supports the scientists at AWI in high performance computing in house and on national and European HPC centres. Another field of scientific support are workflows for data handling. Furthermore, the group is embedded in the joint Helmholtz research program of the Helmholtz Centre Geesthacht and AWI and takes a leading role in the topic 4 "Bridging research and society - products, tools and climate services" by developing tools and data services with relevance for the stakeholders in society and politics.</p> <p>In 2005, the tsunami modelling group was established as part of the scientific computing group in the framework of the BMBF funded project "German Indonesian Tsunami Early Warning System" (GITEWS). The tsunami simulation code TsunAWI was developed and a database of tsunami scenarios was calculated and integrated into the warning system. Since GITEWS and the succeeding "project for training, education and consulting for tsunami early warning systems" ended in 2014, the group as a contractor of gempa GmbH offers support, maintenance, and training for the Indonesian Tsunami Early Warning System InaTEWS, located at the Agency for Meteorology, Climatology, and Geophysics (BMKG).</p> <p>Participant role in the project AWI will bring in the tsunami simulation code TsunAWI and the expertise in the operational use of the code in tsunami early warning.</p>			
Persons involved in research activities	<p>Prof. Dr. Frickenhaus (male) is the designated head of the AWI computing centre and professor for scientific computing at the University in Bremen. He holds a PhD in theoretical biophysics (Humboldt University Berlin, 1999), and currently works as Professor for Algorithmics in Molecular Biology at the Hochschule Bremerhaven since 2004. He has worked in parallel code optimizations since he joined the scientific computing group in 1999. He is engaged in data workflows and developed the concept of data scientists for the sustainable handling of scientific data at AWI.</p> <p>Dr. Natalja Rakowsky (female) is head of the group for "tsunami modelling and numerical development" within the scientific computing group. She obtained her PhD in mathematics (1999, University of Bremen and AWI) on parallel linear solvers in ocean</p>			

	<p>modelling and extended this expertise as a PostDoc at AWI. In 2004, she took a position at the computing center of the Technical University Hamburg-Harburg, where she was responsible for the HPC user support and the acquisition of HPC servers. Here, she gained knowledge on HPC in different application fields in engineering, e.g., fluid dynamics, electro dynamics, statics, bio mechanics, and chemistry. In 2010, she returned to AWI to her current position. Besides the tsunami modelling component, her tasks are HPC user support and code optimization, in particular for the ocean model FESOM developed at AWI.</p> <p>Dr. Sven Harig (male) is member of the group for "tsunami modelling and numerical development" as part of the scientific computing group at AWI. After studies of mathematics he obtained his PhD in physics in 2004 (University of Bremen and AWI). After a short stay at the University of Alberta in Edmonton, Canada he joined the scientific computing group in 2005. He is mostly working in applications of finite element methods in the field of numerical ocean modelling, especially in tsunami propagation. Further expertise lies in triangular grid generation and HPC user support. He conducted several TsunAWI trainings in Indonesia and Chile.</p> <p>Dipl.-Inf. Antonia Immerz (female) Diploma in Applied Computer Science (University of Augsburg, 2007) and Bachelor in Biology (University of Bremen, 2016) is member of the group for "tsunami modelling and numerical development" as part of the scientific computing group at AWI since 2010. After a study trip to South America until 2008, she worked for mgm technology partners in Munich developing web forms until 2010, followed by a short stay at the Cooperation Systems Center Munich at the University of the Bundeswehr Munich in a European project to develop a social media device for seniors. As part of her tasks within the tsunami modelling group, she designed and implemented the interface from the TsunAWI database to InaTEWS and held multiple trainings in Indonesia. Her expertise further includes the development of GIS applications.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Greenslade, D., Babeyko, A., Burbidge, D., Ellguth, E., Horspool, N., Kumar, T. S., Kumar, C. P. Moore, C., Rakowsky, N., Riedlinger, T., Ruangrassamee, A., Srivihok, P., Titov, V. V.: An assessment of the diversity in scenario-based tsunami forecasts for the Indian Ocean. <i>Continental Shelf Research</i>, 79, 36-45 (2013)</p> <p>Griffin, J., Latief, H., Kongko, W., Harig, S., Horspool, N., Hanung, R., Rojali, A., Maher, N., Fuchs, A., Hossen, J., Upi, S., Dewanto, S.E., Rakowsky, N., Cummins, P.: An evaluation of onshore digital elevation models for modeling tsunami inundation zones. <i>Frontieres in Earth Science</i>, 3 (32) (2015)</p> <p>Immerz, A., Rakowsky, N., Harig, S.: Indonesian tsunami early warning system - InaTEWS. <i>SpringerBriefs in Earth System Sciences, Building Bridges at the Science-Stakeholder Interface - Towards Knowledge Exchange in Earth System Science</i>, ed. Krause, G., (2018)</p> <p>Rakowsky, N., Androsof, A., Fuchs, A., Harig, S., Immerz, A., Danilov, S., Hiller, W. and Schröter, J.: Operational tsunami modelling with TsunAWI – recent developments and applications, <i>Nat. Hazards Earth Syst. Sci.</i>, 13, 1629-1642 (2013)</p> <p>TsunAWI-GIS, visualizing tsunami scenarios used in InaTEWS, URL: http://maps.awi.de/map/map.html?cu=tsunami_simulations_in_indonesia</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>GITEWS (2005-2011) and PROTECTS (2011-2014), BMBF-funded projects which resulted in the operational Indonesian Tsunami Early Warning System InaTEWS. Lead by GFZ, tsunami modelling component developed and integrated by AWI. Transfer of ownership to Indonesia in 2011, focus on capacity building during PROTECTS.</p> <p>Contract research (since 2014): yearly maintenance and support contract for tsunami modelling component of InaTEWS with AWI as contractor of gempa GmbH.</p> <p>Contract research (2015-2017): "Strengthening the Decision Support System of the Indonesian Tsunami Early Warning System" (DFAT Agreement Number 70984), supported by the Australian Government through DMInnovation. In total 8 workshops at</p>


	InaTEWS to support the Indonesian staff to extend the TsunAWI scenario database and integrate the new scenarios into the decision support system. RIESGOS (2017-2020): BMBF project "Multi-Risc Analysis and Information System Components for the Andes Region", lead by DLR. AWI contributes with a web service for tsunami simulation data products and model studies for the project regions Valparaíso (Chile) and Lima (Peru).
Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work	AWI will provide the relevant IT infrastructure. LEXIS will use compute time and disk space on the Cray CS400 Linux cluster with in total 11,500 Intel Xeon Broadwell cores, OmniPath interconnect, 1PB BeeGFS work file system. Furthermore, disk space on a global file server, virtual machines, and eventually archive space to sustain good scientific practice will be provided for LEXIS.

4.1.14 OUTPOST24 FRANCE (EX SECLUDIT)

	Part N°	Acronym	Country	Type
	14	SEC	FR	SME
Legal Entity Description	 <p>SecludIT SAS is a French private company based in Sophia Antipolis and founded by infrastructure & data security experts together with EURECOM Research Institute, a key player in European research programs in telecom & network security. Founded to address vulnerability and data security issues in the Cloud, the company has become a recognized industry player:</p> <ul style="list-style-type: none"> • Founding member of the Cloud Security Alliance in 2009, • AWS, VMware, HP Cloud, Eucalyptus, technology partner • “Secured Virtual Cloud” consortium member in charge of security • Recognized in several major publications or events such as Forbes or ACM/SAC conference “A Security Analysis of Amazon’s Elastic Compute Cloud Service” <p>Participant role in the project Within LEXIS project, SECLUDIT will be in charge of security, authentication and authorization for user access to HPC resources and available data sets, with a special focus on interoperability among federated HPC infrastructures. SECLUDIT will guarantee continuous monitoring among different types of infrastructure, providing security checks related to the overall deployment on the different federated HPC infrastructures.</p>			
Persons involved in research activities	<p>Frédéric Donnat, CTO and Co-founder started his career more than 10 years ago in an innovative startup on cryptographic acceleration working on SSL and TLS protocols. After focusing on cryptography and becoming project manager of crypto accelerator, he contributed to security software products tackling web security, email security and secure remote access. Then, he was in charge of Linux based security appliances and he was the main architect of the high availability solution and worked on the virtualization of those appliances. Frédéric holds a Bachelor degree in Mathematics and a Master in Computer Science from Blaise-Pascal University of Clermont-Ferrand (France).</p>			
List of up to 5 relevant publications, and/or products, services	<p>Puzio, P., Loureiro, S.: Detecting Attacks and Threats in Elastic Cloud Infrastructures: Case of. Side-channel Attacks. (2014)</p> <p>Puzio, P., Lourerio, S.: Elastic SIEM: Elastic Detector integrated with OSSIM. RaSIEM Workshop (ARES), (2013)</p> <p>Puzio, P., Molva, R., Melek Onen, M., Sergio Loureiro, S.: ClouDedup: Secure Deduplication with Encrypted Data for Cloud Storage. IEEE CloudCom, (2013)</p>			

	<p>Balduzzi, M., Zaddach, J., Balzarotti, D., Kirda, E., Loureiro, S.: A security analysis of amazon's elastic compute cloud service. In: Proceedings of the 27th Annual ACM Symposium on Applied Computing, USA, 1427-1434 (2012)</p> <p>Loureiro, S., Molva, R.: Mobile code protection with Smartcards. In: Proceedings of the ECOOP. France (2000^[1]_{SEP})</p> <p>Loureiro, S., Molva, R., Pannetrat, A.: Secure data collection with update, In: Agents in Electronic Commerce of Electronic Commerce Research Journal, 1(2), 119-130 (2001)</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>Tclouds - Trustworthy Clouds Privacy and Resilience for Internet-scale Critical Infrastructure http://www.tclouds-project.eu/</p> <p>A4Cloud - Accountability For Cloud and Other Future Internet Services http://www.a4cloud.eu/</p> <p>SecludIT is participating on the french collaborative research project SVC (Secure Virtual Cloud), funded by the french government. The goal of SVC is to provide a comprehensive security stack for delivering high security SaaS services to SME in France and Europe. SecludIT is a founding member of the Cloud Security Alliance (CSA) and Sergio Loureiro is one of the co-authors of the Security Guidance for Cloud Computing done by the CSA in December 2009 (V2.1). The CSA is working with the ISO towards standards on the cloud security domain.</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>n/a</p>


4.1.15 Cyclops Labs GmbH

	Part N°	Acronym	Country	Type
	15	CYC	CH	SME
<p>Legal Entity Description</p>	 <p>Cyclops Labs was founded in August 2017 to commercialize Cloud Accounting and Billing activities which took place within a research lab in Zurich University of Applied Sciences (ZHAW); Cyclops Labs is a spinout of ZHAW. Cyclops Labs offers customization, integration and support services around the Cyclops Accounting and Billing Open Source codebase.</p> <p>Cyclops has had a strong focus on usage based billing, arising from needs identified within other EU projects, primarily with a cloud and telecoms focus. Usage based billing is very suited to workload patterns arising in a large scale analytics context and as such the design of the Cyclops solution can address problems which naturally arise within the LEXIS project.</p> <p>Participant role in the project</p> <p>Cyclops will lead will lead WP8 as well as tasks T8.3 and T9.2. Cyclops brings a unique perspective to the project, having a profound understanding of cloud computing platforms and how their ease of use decrease friction in getting user engagement. Further, Cyclops Labs' experience identifying customer needs and requirements through direct customer engagement is good background for identifying key user requirements for the LEXIS portal to be developed in WP8. Task 8.3 will leverage the experience of</p>			

	<p>Cyclops Labs in developing usage based accounting and billing solutions employing monitoring data generated by WP3 and WP4: Cyclops Labs will work with partners to ensure appropriate monitoring data is available as input to the billing models. Cyclops Labs will also lead task T9.3 focusing on positioning LEXIS in the converging HPC/Cloud/Big Data context: this will leverage the market research done by Cyclops identifying customers for its usage based account solution which provides a good understanding of Cloud and Big Data markets from an enterprise perspective; this will be augmented with the strong HPC perspective of the other partners to support delivery of a clear positioning of the LEXIS solution in this context. Cyclops Labs will also contribute to WP1, WP2 and WP3.</p>
<p>Persons involved in research activities</p>	<p>Dr. Piyush Harsh (CEO) (male): Piyush has considerable experience with complex, distributed compute environments generally and cloud computing technologies in particular – arising from his work in EU collaborative project such as Conrail, MCN and T-Nova – as well as technology transfer to local industry from bilateral projects with Swiss partners. As primary architect of the Cyclops Accounting and Billing solution, Piyush will contribute to the Accounting and Billing aspects of the LEXIS architecture including determining how system monitoring information can be mapped to raw accounting and billing data and how and billing rules can be generated based on this data to result in appropriate billing solutions for LEXIS. Further as a hands on CEO, Piyush will be involved in the further development of Cyclops to meet the needs arising in LEXIS.</p> <p>Dr. Seán Murphy (Business Development) (male): Seán has been working in applied R&D projects for over a decade. Before coming to Switzerland, he was working on R&D projects in University College Dublin – a mix of commercially focused projects with local industrial partners and some for commercially relevant academic work (funded by Enterprise Ireland) – as well as FP7 projects with consortia comprising of commercial partners. As Cyclops is a small company the business development role involves deeply understanding the customer requirements and customizing the Open Source codebase to meet the customer requirements. As such, Seán will work on the modifications and enhancements of the Cyclops Open Source solution to meet the needs of LEXIS.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Harsh, P., Patanjali, S.: CYCLOPS : Rating, charging and billing framework (slides). In: OpenStack Central & Eastern Europe Day 2015, Budapest (2015)</p> <p>Harsh, P., Highly, A.: Available generic billing architecture for Heterogeneous Mobile Cloud Services (slides). In: 2014 World Congress in Computer Science, USA (2014)</p> <p>Patanjali, S., Truninger, B., Harsh, P., Bohnert, T.: Cyclops: Rating, charging and billing framework for cloud. In: Proceedings of the 13th international conference on Telecommunications, Graz, Austria (2015)</p> <p>Harsh, P., Bohnert, T.: DISCO: Unified provisioning of distributed computing platforms in the cloud. In: Proceedings of the 21st International In: Proceedings of the Conference on Parallel and Distributed Processing Techniques and Applications, Las Vegas, USA (2015)</p> <p>Meszaros, B., Harsh, P., Bohnert, T.: Lightning Sparks all around: A comprehensive analysis of popular distributed computing frameworks. International Conference on Advances in Big Data Analytics (ABDA), Las Vegas, USA (2015)</p> <p><i>Note: the above publications were written based on the Cyclops platform prior to the incorporation of Cyclops Labs GmbH.</i></p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>Mobile Cloud Network (MCN): The MCN FP7 project focused on enabling the telecommunications sector to leverage the flexibility that are the essential characteristic of cloud computing technologies, thus enabling them to be more dynamic, flexible and responsive to customer needs. Specifically, this project focused on making it easier to deploy complex telecommunications services comprised of multiple constituent components on an Openstack infrastructure. A key activity within this project was to develop a billing solution for these flexible services: this work was the initial work which</p>

	<p>was to become the Cyclops accounting and billing solution. Link: https://www.mobile-cloud-networking.eu/</p> <p>T-Nova: The FP7 T-Nova project focused on a similar problem, however it leveraged more advanced networking primitives based on the Network Function Virtualization (NFV) paradigm. As with the MCN project, there was a need to support accounting and billing for new services. An important differentiator from the MCN work is that in this case, the reseller model had much more prominence and this was reflected in the enhanced capabilities required of the accounting and billing solution – these features were integrated into Cyclops within this project. Link: http://www.t-nova.eu/</p> <p>Flexible Billing and Cyber Intelligence in Virtual Data Centres: This was a project in conjunction with a Swiss industry partner - funded under a Swiss national funding scheme - which focused on adapting the Cyclops accounting and billing framework to a different cloud computing stack – Cloudstack. From an R&D perspective, the goal within this project was to determine how flexible the Cyclops framework really is and to test this by applying it to a different cloud computing framework. The result of this project was a modified solution with increased flexibility.</p> <p>Scale-UP: This project focuses on the delivery of cloud services to the higher education sector in Switzerland – this includes compute services but also storage services as well as other types of applications. In this project, Cyclops is being adapted to the set of scenarios envisaged by SWITCH – the provider of the network between educational institutions in Switzerland.</p> <p>Note the above projects were executed prior to the formation of Cyclops Labs GmbH but are project in which the core development of the Cyclops Open Source framework took place.</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>Cyclops Labs will not bring any significant infrastructure to the LEXIS project.</p>


4.1.16 BAYNCORE LABS Limited

	Part N°	Acronym	Country	Type
	16	BAY	IE	SME
<p>Legal Entity Description</p>	<p> Bayncore Labs Limited is a Consulting and IT Services with offices in Dublin (Ireland), Cambridge (UK) and London (UK). Bayncore provide advanced training and consultancy for the HPC community both in Industry and Academia. Specializations include code-modernization, High Performance Computing (HPC)., Artificial Intelligence (AI) and Big Data Analytics.</p> <p>Participant role in the project: Bayncore Labs will participate on the technical integration work in the technological work packages of LEXIS project. In relation to this role will be participation of Bayncore Labs in the pilot work packages where will be providing support with the testing and test reports. The last important role will be in WP9 where will provided feedback on the features from a point of view of a training and consultancy expert and will lead exploitation and</p>			

	<p>sustainability activities and will address potential interested parties. Bayncotre Labs will also participate on creation of the Open Calls and the industrial partners training.</p>
<p>Persons involved in research activities</p>	<p>Stephen Blair-Chappell (male) (local coordinator, supervisor of FEA3, commitment 15%) is Technical Consulting Engineer and Team leader at Bayncore. He has many years of experience providing code modernisation for Intel-based HPC systems. He also was for more than 10 years in charge in delivering technical support, training and consulting to major Supercomputing Centers in Europe and abroad in the framework of the IPCC program from Intel Corporation for Academic Research laboratories and supercomputing facilities. Stephen is also a prominent member since its foundation of the IXPUG.</p> <p>Francois Fayard (male) (commitment 5%) is a Technical Consulting Engineer and works on commercial research for oil/gas exploration in topics such as uncertainty quantification, floating point arithmetics and parameter-free stopping criteria.</p> <p>Dr. Roger Philp (male) (commitment 5%) is a Technical Consulting Engineer and has a long experience in Computational Science, HPC and electric fields.</p> <p>Participant role in the project BAYNCORE LABS participate in the activities spread across all of the projects Work Packages, using its consultig and training experience to enhance the project deliverables. In particular, Bayncore will lead the Task 4.2 Orchestration policies in federated Cloud/HPC environments for BDaaS, Task 9.2 - Exploitation and sustainability, HPC and Big Data Technologies investments stimulation, Private and Public partnership, and Task 9.5 – Open Call stimulating Project Framework Adoption and Stakeholders engagement on targeted Large-Scale Pilot</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Seaton, M., Mason, L., Matveev Z.A., Blair-Chappell, S.: Vectorization advice, Chapter 23, 441–462 in J. Reinders and J. Jeffers (ed.): High Performance Parallelism Pearls: Multicore and Many-core Programming Approaches, 2, Elsevier, Amsterdam (2015)</p> <p>Blair-Chappell, S., Stokes, A.: Parallel Programming with Intel Parallel Studio XE. Wiley, Canada (2012).</p> <p>Sivalertporn, K., Mouchliadis, L., Ivanov, A.L., Philp, R., Muljarov E.A.: Direct and indirect excitons in semiconductor coupled quantum wells in an applied electric field. Physical Review B, 85(4), (2012)</p> <p>Bennett, D. P., Cuss, R.J., Vardon, J.F., Harrington, J.F., Philp, R.N., Thomas, H.R.: Data analysis toolkit for long-term, large-scale experiments. Mineralogical Magazine 76(8), (2012)</p> <p>Vardon, P.J., Cleall, P.J., Thomas, H.R., Philp, R.: Coupled thermo-hydro-mechanical modelling: A new parallel approach. Int. Symposium on Parallel & Distributed Processing, (2009)</p>
<p>List of up to 5 relevant previous projects or activities</p>	<p>Bayncore Labs is founding member of the MaRIONet project (Manycore Research: Interactions and Opportunity Network) in collaboration with University of Cambridge, University of Edinburgh, University of Glasgow, Imperial College London, University of Manchester, Queen’s University Belfast, Codeplay, Edinburgh Parallel Computing Centre, Imagination Technologies, Maxeler Technologies, Microsoft Research, and RedHat.</p> <p>They are the main deliverer of training in EMEA and Scandinavia for Intel customers, teaching how to modernize legacy code to run on the latest generation of CPUs. This includes delivery at most of the large research data centres within the EMEA. Bayncore Labs is a key contributor in the Intel Nervana AI Academy, which focusses on development and delivery of training for startups and scientists exploring the use of Artificial Intelligence.</p> <p>In addition Bayncore Labs is currently working on the development of Dynamic Performance Analysis for HPC and Predictive Performance Analysis tools and methodologies, using complex algorithms in Artificial Intelligence. This work being</p>

	applied within the HPC centres in various industries including the Financial Services Industry, Oil & Gas, Defence, and Life Sciences.
Description of infrastructure	Bayncore owns their own small Intel Xeon Phi cluster, as well as several 'latest generation' development PCs and lab machines, which are regularly upgraded to the latest state-of-the-art hardware. Because of Bayncore's special relationship with Intel, we also have direct access to pre-release silicon prior to its general availability. Additionally Bayncore has direct access to the TACC Stampede cluster, which contains the latest generation of Intel Xeon processors. Bayncore has its own training facilities in Dublin and Cambridge.

4.1.17 NUMTECH

	Part N°	Acronym	Country	Type
	17	NUM	FR	SME
Legal Entity Description	 <p>Founded in 2000, NUMTECH is a French SME specialised in the field of air quality and meteorological simulations. NUMTECH became leader in France on the weather and atmospheric dispersion modelling. Its customers are mainly large groups (TOTAL, EDF, Suez Environment, Rhodia-Solvay, Michelin, ...), local and regional authorities (cities, regions) and organizations / research institutes (CEA, INERIS, InVS, DGA).</p> <p>NUMTECH has many references in the following areas:</p> <ul style="list-style-type: none"> • The modelling and evaluation of the impact of air emissions (industrial site, traffic, ...), whether chronic or accidental. • The modelling of air quality of the urban scale to regional scale. • Health impact assessment of the air quality. • The analysis of weather and the weather forecasting. • In the development of software tools specific in the field of meteorological and atmospheric dispersion. <p>For this purpose, NUMTECH has developed and use effective and innovative digital tools. These tools integrate different software modules for specific requirements: impact of industrial activities on the environment, monitoring air quality, industrial risk management, modelling weather patterns. The company also has important computing means (dedicated servers and large clusters) and is working to propose SaaS solutions based on HPC cloud.</p> <p>Participant role in the project: NUMTECH will be mainly involved in the use cases Weather&Climate, exploiting outputs from the weather models to apply it on the urban health impact, agricultural yield production and sustainable management of atmospheric release of industrial sites.</p>			
Persons involved in research activities	<p>Fabien Brocheton (Male) has 21 years of experience on meteorological and air pollution modelling. He is the General Manager of NUMTECH and act as its Technical Director. He will involve as the main contact (administrative and technical ones) for NUMTECH, as internal project manager, and as expert of different topic. He was involved in more than 20 collaborative research projects (French or European) as project manager and expert for NUMTECH. He has a PhD in atmospheric chemistry modelling.</p> <p>Julien Galineau (Male) has 14 years of expertise on urban air pollution and its management. He is in charge of the development of deployment of the Urban'air systems at NUMTECH, and was involved in different R&D projects on this topic.</p> <p>David Poulet (Male) has 21 years of experience on meteorological and air pollution modelling. He has a PhD in atmospheric physic. He is the R&D expert in terms of</p>			

	<p>meteorological and air dispersion modelling at NUMTECH. He was involved in all the NUMTECH R&D projects since its creation.</p> <p>Adrien Marchais (Male) has 11 years of experience on evaluation of health impact due to atmospheric pollution. After to obtain an Engineer's degree in Process Engineering, he follow and obtain an Engineer's degree in Sanitary Engineering (IGS) from the National School of Public Health of Rennes. He participates in different national working groups on the health effects of atmospheric compounds.</p> <p>Benjamin Chabanon (Male) is in charge from 2002 to manage the informatics development at NUMTECH. The last yers, he was involved in the deployment of SaaS and cloud solutions for different NUMTECH's applications.</p>
<p>List of up to 5 relevant publications, and/or products, services</p>	<p>Mallet, V., Tilloy, A., Brocheton, F., Poulet, D.: Reduction and emulation of ADMS Urban, In: Journal of Geophysical Research, (2016)</p> <p>Brocheton, F.: From the city to the street: modeling at a finer grain... yes but how?" session: Digital sciences and technologies for smart cities: From the networking infrastructure to public engagement. In: 6th annual workshop with California partners, Paris (2016)</p> <p>Brocheton,, F., Chabanon, B., Galineau, J., Mira Just, V., Pesin, C., Poulet, D.: Urban Air: An operational air quality management tool at high resolution for cities. In: Proceedings of the 21st International Transport and Air Pollution Conference (TAP), France (2016)</p> <p>Yahia, J., Brocheton, F.: An integrated tool to survey and forecast impact of an industrial plant on its atmospheric environment. Présentation Orale, Symphos 2015, Marrakech, 18-20 (2015)</p> <p>Duclaux, O., Donnat, L., Puel, C., Cocagne, G., Andre, D.-F., Caro, D., Poulet, D., Buisson, E.: An integrated tool to forecast and reduce refinery contribution on SO2 pollution peaks in complex estuary atmospheric circulation - Application on Normandy refinery, (AWMA), Next Generation models, Raleigh (2009)</p>
<p>List of up to 5 relevant previous projects or activities, connected to the subject of this proposal</p>	<p>NUMTECH has participated to the following European projects : FORTISSIMO, ACCENT, ENV&YOU; and has been involved in lot of French collaborative projects and transnational projects ("Atmo-Idee" Interreg project between France and Germany, "AIRQ" ANR blanche project between France and Romania, ...)</p>
<p>Description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work</p>	<p>N/A</p>

4.2 Third parties involved in the project

Participant 11 – Avio Aero

Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	Y
<p><i>If yes, please describe and justify the tasks to be subcontracted</i></p> <p>Avio Aero plan to subcontract to University of Florence part of tasks “5.1: HW/SW integration requirements” and “5.2: Turbomachinery use case set-up and run”.</p> <p>Objectives will be to understand how the state-of-art of HPC/BD technological platform meets the software pre-requisites of turbomachinery use cases’ simulations, and how this platform and the used CAE solver TRAF (owned by University of Florence) may (separately or both) evolve and be integrated in order to cope with planned research targets that are:</p> <ul style="list-style-type: none"> • validate improvements introduced in High Performance Computing platform, • speed up the execution time of complex aero engines’ turbulent flow simulations. 	
Does the participant envisage that part of its work is performed by linked third parties ^[1]	N
<p><i>If yes, please describe the third party, the link of the participant to the third party, and describe and justify the foreseen tasks to be performed by the third party</i></p>	
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	N
<p><i>If yes, please describe the third party and their contributions</i></p>	
Does the participant envisage that part of the work is performed by International Partners ^[2] (Article 14a of the General Model Grant Agreement)?	N
<p><i>If yes, please describe the International Partner(s) and their contributions</i></p>	

5. Ethics and security

5.1 Ethics

No ethical issues have been identified in the proposal.

5.2 Security

No security issues apply to the LEXIS project proposal

The LEXIS project does not involve activities or results raising security issues.

The LEXIS project does not involve 'EU-classified information' as background or results

^[1] A third party that is an affiliated entity or has a legal link to a participant implying a collaboration not limited to the action. (Article 14 of the [Model Grant Agreement](#)).

^[2] 'International Partner' is any legal entity established in a non-associated third country which is not eligible for funding under Article 10 of the Rules for Participation Regulation No 1290/2013.



To: Jan Martinovič - Project Coordinator
IT4Innovations National Supercomputing Centre
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708 33 Ostrava-Poruba
Czech Republic

Barcelona, 12 April 2018

Letter of Support: Participation in the External Advisory Board

This letter confirms my support of the project “**Large-scale EXecution for Industry & Society**” (**LEXIS**) that will be submitted to the call H2020-ICT-2018-2, topic ICT-11-2018-2019 under the proposal No. SEP-210510476.

I, **Fatos Xhafa**, employee of **Universitat Politècnica de Catalunya, Barcelona, Spain**, hereby confirm that I am interested in and will support the above-mentioned project coordinated by VYSOKA SKOLA BANSKA – TECHNICKA UNIVERZITA OSTRAVA/ IT4Innovations National Supercomputing Center represented by Dr. Jan Martinovič.

I, in my role as member of the External Advisory Board (“EAB”) of the project LEXIS, might receive certain proprietary or confidential information of the project or the partners of the LEXIS Consortium Agreement (“Partners”).

According to my availabilities and adequate resources, I will provide experiences and knowledge and will contribute to the project as follows:

- Give an independent view on the LEXIS project with respect to the high-level objectives,
- Recognize challenges and opportunities for innovation to maximize the impact of the LEXIS project and the future exploitation of the project results,
- Discuss with other members of the EAB and/or with Partners the (intermediate) results of the LEXIS project,
- Provide comments and recommendations regarding objectives, development, and progress as well as exploitation and dissemination activities to be discussed and processed at General Assembly meetings.
- Support user uptake of project results, where possible,
- Participate in the EAB meetings that will be organized face-to-face or by means of telephone conferences or co-located to some major international events to minimize travel expenses.

By signing this letter, I confirm that:

1. I will use Confidential Information disclosed to me only for the purpose. "Confidential Information" shall mean all information in whatever form or mode of communication, which is disclosed by a Party of the LEXIS consortium to any other Party (the “Recipient”) or another EAB member to me in participation in the EAB during implementation.
2. I will not disclose Confidential Information to any third parties other than the Partners of LEXIS or the EAB members.



3. The obligations as per Articles 1 and 2 shall not apply, however, to any information which:
 - a. is already in the public domain or becomes publicly available by means other than my breach of confidentiality obligations;
 - b. was rightfully in my possession without confidentiality obligation prior to receipt from the disclosing party;
 - c. I have rightfully received from a third party who is in lawful possession thereof without confidentiality obligation;
 - d. is approved for release by the disclosing party;
 - e. I am required to disclose by any ruling of a governmental or regulatory authority or court or by mandatory law.
4. I shall have the right to refuse to accept any information under the LEXIS project prior to disclosure.
5. This Letter of Support shall automatically terminate upon termination or expiration of the LEXIS project or the termination of my role as member of the EAB at the LEXIS project. We are free to withdraw from discussions or negotiations without any liability at any time. The rights and obligations accruing prior to termination shall, however, survive the termination of this Letter of Support for a period of 5 years.
6. This Letter of Support shall be governed by Belgium Law without giving effect to principles of conflict of laws.

My contact details:

Fatos Xhafa

Professor Titular d'Universitat

Departament de Ciències de Computació

Universitat Politècnica de Catalunya

Campus Nord, Ed. Omega, C/Jordi Girona 1-3

08034 Barcelona, SPAIN

Voice: +34 93-413-7880

Email: fatos@cs.upc.edu

Web: <http://www.cs.upc.edu/~fatos/>

Signature: _____

Date: Barcelona, 12 April 2018

To: Jan Martinovič - Project Coordinator
IT4Innovations National Supercomputing Centre
VŠB – Technical University of Ostrava
17. listopadu 15/2172
708 33 Ostrava-Poruba
Czech Republic

Fukuoka, 16 April 2018

Letter of Support: Participation in the External Advisory Board

This letter confirms my support of the project “**Large-scale EXecution for Industry & Society**” (**LEXIS**) that will be submitted to the call H2020-ICT-2018-2, topic ICT-11-2018-2019 under the proposal No. SEP-210510476.

I, [Leonard Barolli], employee of [Fukuoka Institute of Technology, Japan], hereby confirm that I am interested in and will support the above-mentioned project co-ordinated by VYSOKA SKOLA BANSKA – TECHNICKA UNIVERZITA OSTRAVA/ IT4Innovations National Supercomputing Center represented by Dr. Jan Martinovič.

I, in my role as member of the External Advisory Board (“EAB”) of the project LEXIS, might receive certain proprietary or confidential information of the project or the partners of the LEXIS Consortium Agreement (“Partners”).

According to my availabilities and adequate resources, I will provide experiences and knowledge and will contribute to the project as follows:

- Give an independent view on the LEXIS project with respect to the high-level objectives,
- Recognize challenges and opportunities for innovation to maximize the impact of the LEXIS project and the future exploitation of the project results,
- Discuss with other members of the EAB and/or with Partners the (intermediate) results of the LEXIS project,
- Provide comments and recommendations regarding objectives, development, and progress as well as exploitation and dissemination activities to be discussed and processed at General Assembly meetings.
- Support user uptake of project results, where possible,
- Participate in the EAB meetings that will be organized face-to-face or by means of telephone conferences or co-located to some major international events to minimize travel expenses.

By signing this letter, I confirm that:

1. I will use Confidential Information disclosed to me only for the purpose. "Confidential Information" shall mean all information in whatever form or mode of communication, which is disclosed by a Party of the LEXIS consortium to any other Party (the “Recipient”) or another EAB member to me in participation in the EAB during implementation.
2. I will not disclose Confidential Information to any third parties other than the Partners of LEXIS or the EAB members.

3. The obligations as per Articles 1 and 2 shall not apply, however, to any information which:
 - a. is already in the public domain or becomes publicly available by means other than my breach of confidentiality obligations;
 - b. was rightfully in my possession without confidentiality obligation prior to receipt from the disclosing party;
 - c. I have rightfully received from a third party who is in lawful possession thereof without confidentiality obligation;
 - d. is approved for release by the disclosing party;
 - e. I am required to disclose by any ruling of a governmental or regulatory authority or court or by mandatory law.
4. I shall have the right to refuse to accept any information under the LEXIS project prior to disclosure.
5. This Letter of Support shall automatically terminate upon termination or expiration of the LEXIS project or the termination of my role as member of the EAB at the LEXIS project. We are free to withdraw from discussions or negotiations without any liability at any time. The rights and obligations accruing prior to termination shall, however, survive the termination of this Letter of Support for a period of 5 years.
6. This Letter of Support shall be governed by Belgium Law without giving effect to principles of conflict of laws.

My contact details:

Leonard Barolli

Full Professor

Department of Information and Communication Engineering

Faculty of Information Engineering

Fukuoka Institute of Technology (FIT)

3-30-1 Wajiro-Higashi, Higashi-ku, Fukuoka 811-0295

Japan

Tel: +81-92-606-4970

Fax: +81-92-606-4970

E-mail: barolli@fit.ac.jp

Signature:



Date: ___April 16, 2018_____

Jan Martinovič - Project Coordinator
IT4Innovations (National Supercomputing Centre)
VŠB – Technical University of Ostrava
17. listopadu 15/2172
708 33 Ostrava-Poruba
Czech Republic

Druento, 29th March 2018

Dear Sir

This letter confirms that TESEO SpA obtained support from Eng. Giovanni SEMBENINI to the project “Large-scale EXecution for Industry & Society” (LEXIS) that will be submitted to the call H2020-ICT-2018-2, topic ICT-11-2018-2019 under the proposal No. SEP-210510476.

Eng Giovanni SEMBENINI holds a PhD in Aerospace Engineering, is board member of The Aerospace Testing Seminar, member of the Scientific Advisor Committee of the von Karman Institute for Fluid Dynamics, and has an extensive R&D projects experience being "Head of Section for NATO and non-European countries Research & Technology programs" in the Italian Ministry of Defense Secretariat General of Defense; he also is the NATO Science and Technology Organisation Systems, Concepts and Integration (SCI) Panel Principal Member as well as Italian NATO Science and Technological Organisation National Coordinator.

He confirmed the interest in and will support the above-mentioned project co-ordinated by VYSOKA SKOLA BANSKA – TECHNICKA UNIVERZITA OSTRAVA/ IT4Innovations National Supercomputing Center represented by Dr. Jan Martinovič.

In his role as member of the External Advisory Board (“EAB”) of the project LEXIS, he might receive certain proprietary or confidential information of the project or the partners of the LEXIS Consortium Agreement (“Partners”).

According to his availabilities and adequate resources, he agrees to provide experiences and knowledge and will contribute to the project as follows:

- Give an independent view on the LEXIS project with respect to the high-level objectives,
- Recognize challenges and opportunities for innovation to maximize the impact of the LEXIS project and the future exploitation of the project results,
- Discuss with other members of the EAB and/or with Partners the (intermediate) results of the LEXIS project,

- Provide comments and recommendations regarding objectives, development, and progress as well as exploitation and dissemination activities to be discussed and processed at General Assembly meetings.
- Support user uptake of project results, where possible,
- Participate in the EAB meetings that will be organized face-to-face or by means of telephone conferences or co-located to some major international events to minimize travel expenses.

In case project is awarded he will sign an engagement letter to confirm that:

- (1) He will use Confidential Information disclosed to me only for the purpose. "Confidential Information" shall mean all information in whatever form or mode of communication, which is disclosed by a Party of the LEXIS consortium to any other Party (the "Recipient") or another EAB member to me in participation in the EAB during implementation.
- (2) He will not disclose Confidential Information to any third parties other than the Partners of LEXIS or the EAB members.
- (3) The obligations as per Articles 1 and 2 shall not apply, however, to any information which:
 - a) is already in the public domain or becomes publicly available by means other than my breach of confidentiality obligations;
 - b) was rightfully in my possession without confidentiality obligation prior to receipt from the disclosing party;
 - c) I have rightfully received from a third party who is in lawful possession thereof without confidentiality obligation;
 - d) is approved for release by the disclosing party;
 - e) I am required to disclose by any ruling of a governmental or regulatory authority or court or by mandatory law.
- (4) He shall have the right to refuse to accept any information under the LEXIS project prior to disclosure.

This Letter of Support shall automatically terminate upon termination or expiration of the LEXIS project or the termination of my role as member of the EAB at the LEXIS project. We are free to withdraw from discussions or negotiations without any liability at any time. The rights and obligations accruing prior to termination shall, however, survive the termination of this Letter of Support for a period of 5 years. This Letter of Support shall be governed by Belgium Law without giving effect to principles of conflict of laws.

Signature:

Name of the signatory: Stefano SERRA
Position: Chief Executive Officer
Date: 29th March 2018

TESEO S.p.A.
Amministratore Delegato
STEFANO SERRA



To: Jan Martinovič - Project Coordinator
IT4Innovations National Supercomputing Centre
VŠB – Technical University of Ostrava
17. listopadu 15/2172
708 33 Ostrava-Poruba
Czech Republic

Lubbock, TX USA, 13 April 2018

Letter of Support: Participation in the External Advisory Board

This letter confirms my support of the project “**Large-scale EXecution for Industry & Society**” (**LEXIS**) that will be submitted to the call H2020-ICT-2018-2, topic ICT-11-2018-2019 under the proposal No. SEP-210510476.

I, Alan Sill, employee of Texas Tech University, hereby confirm that I am interested in and will support the above-mentioned project co-ordinated by VYSOKA SKOLA BANSKA – TECHNICKA UNIVERZITA OSTRAVA/ IT4Innovations National Supercomputing Center represented by Dr. Jan Martinovič.

I, in my role as member of the External Advisory Board (“EAB”) of the project LEXIS, might receive certain proprietary or confidential information of the project or the partners of the LEXIS Consortium Agreement (“Partners”).

According to my availabilities and adequate resources, I will provide experiences and knowledge and will contribute to the project as follows:

- Give an independent view on the LEXIS project with respect to the high-level objectives,
- Recognize challenges and opportunities for innovation to maximize the impact of the LEXIS project and the future exploitation of the project results,
- Discuss with other members of the EAB and/or with Partners the (intermediate) results of the LEXIS project,
- Provide comments and recommendations regarding objectives, development, and progress as well as exploitation and dissemination activities to be discussed and processed at General Assembly meetings.
- Support user uptake of project results, where possible,
- Participate in the EAB meetings that will be organized face-to-face or by means of telephone conferences or co-located to some major international events to minimize travel expenses.

By signing this letter, I confirm that:

1. I will use Confidential Information disclosed to me only for the purpose. "Confidential Information" shall mean all information in whatever form or mode of communication, which is disclosed by a Party of the LEXIS consortium to any other Party (the “Recipient”) or another EAB member to me in participation in the EAB during implementation.
2. I will not disclose Confidential Information to any third parties other than the Partners of LEXIS or the EAB members.
3. The obligations as per Articles 1 and 2 shall not apply, however, to any information which:



TEXAS TECH UNIVERSITY

Information Technology Division

- a. is already in the public domain or becomes publicly available by means other than my breach of confidentiality obligations;
 - b. was rightfully in my possession without confidentiality obligation prior to receipt from the disclosing party;
 - c. I have rightfully received from a third party who is in lawful possession thereof without confidentiality obligation;
 - d. is approved for release by the disclosing party;
 - e. I am required to disclose by any ruling of a governmental or regulatory authority or court or by mandatory law.
4. I shall have the right to refuse to accept any information under the LEXIS project prior to disclosure.
 5. This Letter of Support shall automatically terminate upon termination or expiration of the LEXIS project or the termination of my role as member of the EAB at the LEXIS project. We are free to withdraw from discussions or negotiations without any liability at any time. The rights and obligations accruing prior to termination shall, however, survive the termination of this Letter of Support for a period of 5 years.
 6. This Letter of Support shall be governed by Belgium Law without giving effect to principles of conflict of laws.

My contact details:

Prof. Dr. Alan Sill

Function: Senior Director, High Performance Computing Center

Mail address: MS 1167, Drane 159, Texas Tech University, 2500 Broadway, Lubbock TX 79409 USA

Telephone: +1 806 834 5940

Email: Alan.Sill@ttu.edu

Signature and Date: _____

Jan Martinovič - Project Coordinator
IT4Innovations National Supercomputing Centre
VŠB – Technical University of Ostrava
17. listopadu 15/2172
708 33 Ostrava-Poruba
Czech Republic

Monday, April 16, 2018

SUBJECT: Letter of Support for LEXIS H2020 proposal from Pacific Disaster Center

Aloha LEXIS project team,

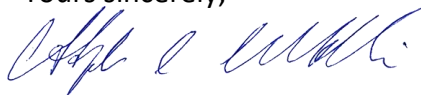
Pacific Disaster Center (PDC; www.pdc.org) is pleased to offer its support to the proposed “Large-scale EXecution for Industry & Society” (LEXIS) project that will be submitted to the call H2020-ICT-2018-2, topic ICT-11-2018-2019 under the proposal No. SEP-210510476.

The goal of the project—to build an advanced, geographically-distributed, HPC infrastructure for Big Data analytics—is very consistent with our mission of applying information, science and technology to advance disaster risk reduction. The weather and climate (drought and wildfire hazards) and earthquake and tsunami applications are of great interest to our Center and those that we serve. Your proposed methods—innovative technologies and exploiting data available from test-bed partners—could yield high-importance inputs to PDC’s DisasterAWARE platform

If your team is successful in its proposal, Pacific Disaster Center will be happy to participate in the project through the following possible actions:

- Assist your team with the identification of suitable hazard and consequence data;
- Provide inputs related to the operational requirements for decision-making information products;
- Evaluate the feasibility of incorporating project output, including dynamically-generated information, within PDC’s DisasterAWARE platform; and
- If implemented, provide access to the widely-used, PDC-hosted version of DisasterAWARE called EMOPS for use by project beneficiaries, including disaster managers and decision makers.

Yours sincerely,



Chris Chiesa
Deputy Executive Director

Lili Ding

Director of Meteorology
Beijing Moji Fengyun Technology CO.,LTD
A215 Area No1 Gate3 Jiuxianqiao Road No14, Chaoyang District, Beijing
T:+86 185 1838 8924,FAX:+86 10 84897832
E: lili.ding@moji.com

17th Apr 2018

Erik Andersson (Dr.)
Deputy Director of Forecasts
ECMWF, Shinfield Park, Reading , RG2 9AX, UK
T: +44 118 949 9060, Fax: +44 118 986 9450
E: erik.andersson@ecmwf.int

Dear Erik Andersson :

Beijing Moji Fengyun Technology CO.,LTD(abbr. Moji) is a Weather company based on mobile Internet from China.Moji have over 500 million users.Every day, Moji can get more than 60 million phone barometer data at least.

It is very pleasure for Moji to participate the project: HPC and Big Data enabled Large-scale Test-beds and Applications.

As a stakeholder:

1. Moji will share the mobile barometer data to the members within the research work under this project , and only for this purpose.
2. Moji will keep ensure the quality of the data and the access permission by the members within this project.
3. The scientific reports and peer-reviewed papers of this project will be shared to Moji.
4. That publications involving Moji data will always acknowledge "Moji Weather" for the provision and support.
5. Moji is welcome to attend project dissemination meetings to discuss face to face with the other members.
6. ECMWF and the other members of this project will help Moji to use these phone barometer data into the model of assimilation.

Finally, we wish the project a successful declaration under the help of Moji.

Sincerely

Lili Ding

Saint-Beauzire, April 17, 2018

Letter of support

Project "Large-scale EXecution for Industry & Society", "call ICT11: HPC and Big Data enabled Large-scale, Test-beds and Applications"

Dear Sirs,

On behalf of Vilmorin & Cie, I hereby confirm our intention to participate in the project "LEXIS (Large-scale EXecution for Industry & Society)".

Our participation will be effective through the company Numtech with whom we agree to work in collaboration.

In particular, Numtech will bring some of the stakes that we consider of importance to the attention of the consortium, in the domain crop models and weather data applied to breeding and seed business. To do so, we will implement internally a "mirror" working group in charge of managing the partnership with Numtech.

Sincerely yours,



Valérie MAZZA
Head of Scientific Affairs and Innovation

.....
Vilmorin & Cie

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Adresse géographique : Biopôle Clermont-Limagne - Rue Henri Mondor - 63360 Saint-Beauzire - France
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