

**Research area:** Next Generation Internet of Things

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**Institution:** Systems Research Institute Polish Academy of Sciences  
**Discipline:** Technical Computer Science and Telecommunication  
**Form of recruitment:** talk with the candidate  
**Number of candidates:** 1

**Description:** In the Internet of Things (IoT), substantial research has been devoted to architectural aspects of the infrastructure, i.e. edge, fog, cloud. The key assumptions were: (A) the closer to the edge (of the network), the less powerful devices become, with the fog consisting of more powerful “nodes”, and the cloud offering unlimited resources; and (B) communication at the edge is slower than networks, connecting fog nodes to the cloud.

These assumptions are no longer valid and a new approach is needed for the edge-fog-cloud continuum. Proposed research will focus on post-cloud computing infrastructures. Here, the assumptions are: (1) ecosystems consist of heterogeneous nodes; (2) nodes can produce and consume (process) data; (3) nodes can initiate tasks (workflows); (4) nodes may “want to” collaborate with some nodes (to complete tasks), and “not want to” work with other nodes (depending on the task/context); (5) nodes can join/leave the ecosystem; (6) semantic technologies are used whenever beneficial; (7) nodes are connected by heterogeneous networks; (8) semantically demarcated services are orchestrated to realize workflows; (9) ecosystems may join (temporarily or semi-permanently) forming larger ecosystems; (10) ecosystems have self-\* characteristics (follow concepts of autonomous computing).

The proposed work will address selected aspects of the research agenda outlined, by the European Commission in the H2020 ICT-56 and ICT-40 calls. The SRIPAS team will be the Technical Coordinator of an upcoming project (ASSIST-IoT), realized within the scope of ICT-56. Research in ASSIST-IoT, will be centered around distributed IoT architectures supporting dynamic, intelligent and software-defined networks of devices, capable of dynamically adjusting by the means of virtualized services, capabilities and roles. It will also include aspects of augmented and virtual reality. PhD student(s) will have access to the resources (hardware, software) available within the project, and will have an opportunity to interact with members of the consortium (from Spain, Greece, Germany, Malta, France, Finland, France, and The Netherlands).

Proposed research can focus on selected aspects of post-cloud ecosystems and will draw from experiences gathered during last 20 years in the areas such as (this list is non-exhaustive): Grid Computing, Cloud Computing, Software Agents and Agent Systems, Semantic Technologies. In each case, best practices from the past will be selected and modified, in particular, to address the most recent developments in the area of Internet of Things.

#### Literature:

##### 1. EU context:

<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/ict-40-20201>

<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/ict-56-20201>

##### 2. Pertinent research of the research team:

<http://www.ibspan.waw.pl/~paprzyck/mp/cvr/research/IoT.html>

[http://www.ibspan.waw.pl/~paprzyck/mp/cvr/research/agents\\_GRID.html](http://www.ibspan.waw.pl/~paprzyck/mp/cvr/research/agents_GRID.html)

[http://www.ibspan.waw.pl/~paprzyck/mp/cvr/research/IoT\\_papers/IDC\\_EXTENSION.pdf](http://www.ibspan.waw.pl/~paprzyck/mp/cvr/research/IoT_papers/IDC_EXTENSION.pdf)