UNIVERSITAS SCIENTIARUM SZEGEDIENSIS

UNIVERSITY OF SZEGED

Department of Software Engineering

MESTERSÉGES INTELLIGENCIA

Nemzeti Laboratórium

Simulation solutions for IoT-Fog-Cloud systems

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MILAB Webinar in Sensors, IoT and Telecommunications

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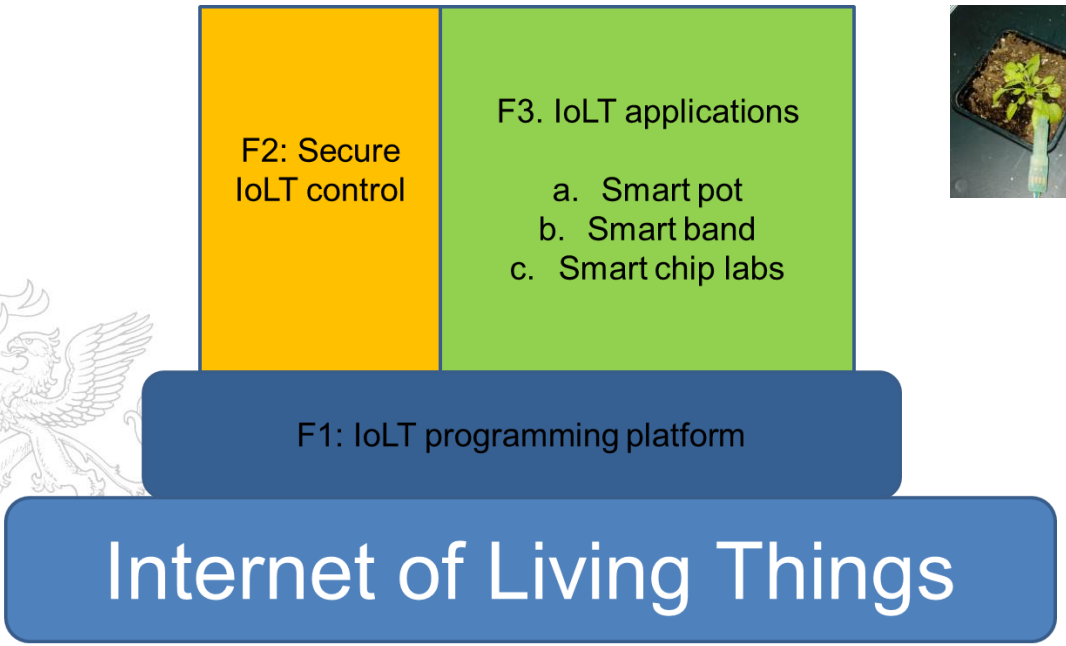
GINOP Internet of Living Things – IoLT Project

INTERNET OF LIVING THINGS

- Duration: February 2017 – October 2021
- Consortium partners: SZTE and SZBK (BRC)
- Scientific coordinator: Prof. Tibor Gyimóthy
- Involved research groups: 6 from SZTE, 4 from SZBK



GINOP Internet of Living Things Project

- Goal:
  - To integrate research in IoT basic technologies and biological and medical application areas
  - To create an open source IoLT software platform that suports ultra-low-resource and ultra-cheap IoT devices

- SED involvement:
  - F1: JavaScript interpreter developed for heavily constrained IoT devices (JerryScript)
  - F2: Tools for software quality assurance including source code quality and vulnerability checks
  - *F2: IoT, fog and cloud infrastructure and simulators*
  - F3: Smart Band, Pot and Microscope development

Smart Microscope (Lab-on-a-chip - SZBK)

- ArduCam control with JerryScript 2

Hardware assembly of the Smart Pot (SZBK)

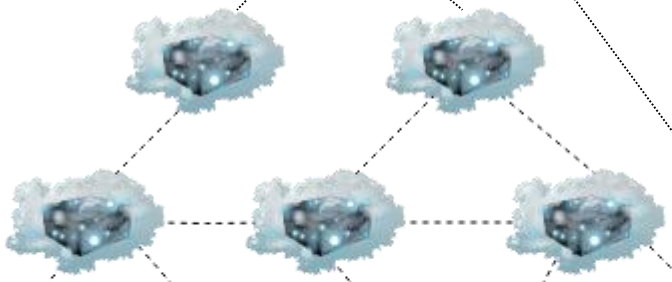
- 12 pots in a cluster
- Raspberry Pi3 with camera
- Sensors for monitoring:
  - Air temperature
  - Air humidity
  - Light intensity
  - Soil humidity
  - Leaf temperature

IoT-Fog-Cloud systems

IoT layer

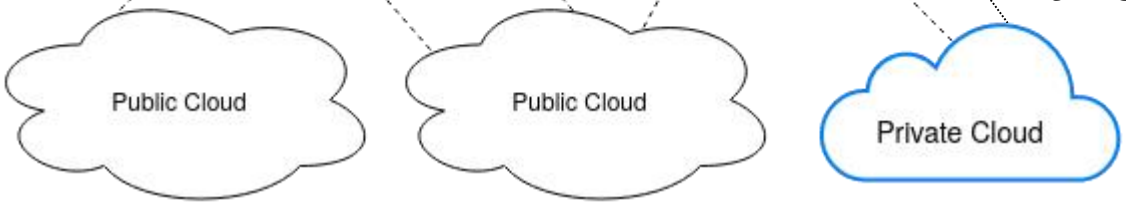
Sensor data
format, size,
frequency

Fog layer



Computation/Storage
time, bandwidth,
latency, cost
privacy

Cloud layer



Computation/Storage
time, bandwidth,
latency, cost

Research questions

- How to examine and experiment with complex, large-scale systems composed of IoT devices, and Fog and Cloud nodes?

- What does it cost for a customer to operate an IoT application in the cloud/fog?

- How to enable secure and privacy-aware data management in IoT-Fog-Cloud systems?

IoTCloud group and solutions

- Small, focused group of a leader, 1 post-doc, 2 PhD students, ~6 MSc and BSc students

MobIoTSim
SUMMON
IoTGateway

IoT Device/Sensor simulation with real cloud gateways and trace archive

DISSECT-CF-IoT
DISSECT-CF-Fog

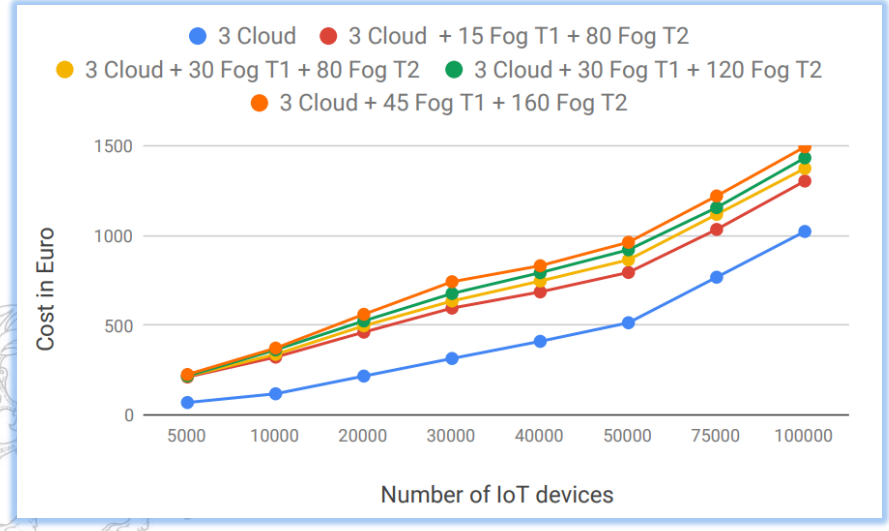
IoT Device, fog and cloud simulation with time, cost, energy predictions

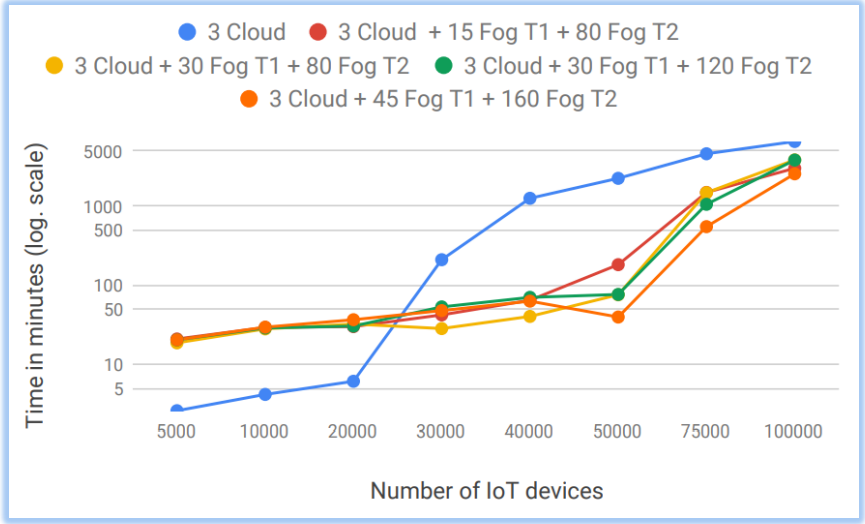
FoBSim
Simulator

Blockchain and fog simulation with privacy-aware methods

Simulating an IoT application with DISSEC-CF-Fog

- Here we analyzed the tradeoff between using a purely cloud infrastructure, and partly fog-based ones
- The IoT application is a large-scale weather-forecasting scenario (~idokep.hu: stations are IoT devices having 5 weather sensors, generating 100 bytes of data every minute)





*Markus, A.; Gacsi, P. and Kertesz, A. (2020). Develop or Dissipate Fogs? Evaluating an IoT Application in Fog and Cloud Simulations. In Proc. of CLOSER'20, pages 193-203. DOI: 10.5220/0009590401930203

Related publications

- H. Baniata, A. Anaqreh, A. Kertesz, *PF-BTS: A Privacy-Aware Fog-enhanced Blockchain-assisted task scheduling*. Information Processing & Management, 58 : 1. DOI: 10.1016/j.ipm.2020.102393 (2021)

- Sz. Varadi, G. Gultekin-Varkonyi, A. Kertesz, *Legal Issues of Social IoT Services: The Effects of Using Clouds, Fogs and AI*. In book: Toward Social Internet of Things (SIoT): Enabling Technologies, Architectures and Applications, Springer, DOI: 10.1007/978-3-030-24513-9_7 (2020)

- A. Markus and A. Kertesz. *A Survey and Taxonomy of Simulation Environments Modelling Fog Computing*. Simulation Modelling Practice and Theory. DOI: 10.1016/j.simpat.2019.102042 (2019)

- A. Kertesz, T. Pflanzner, T. Gyimothy, *A Mobile IoT Device Simulator for IoT-Fog-Cloud Systems*. J Grid Computing 17, 529–551. DOI: 10.1007/s10723-018-9468-9 (2019)