

DRUID-NET

eDge computing ResoUrce allocatlon for Dynamic NETworks

National Technical University of Athens (NTUA),
Greece



Scientific Background

- IoT-based applications and Cyber-Physical Systems
 - Interplay between end-devices, sensors and actuators
 - Limited energy and computing capacity of local nodes
 - Time and mission constraints
- Edge Computing
 - Low network latency
 - Augmented computing resources
 - Virtualization
 - Dynamic Resource Allocation



Key Challenges

- Workload Estimation
 - Devise Profiling
 - Application Profiling
 - Mobility Profiling
- Performance Modeling
 - Hybrid Dynamic Models
 - Queueing Models
- Resource Allocation
 - Admission Control
 - Resource Scheduling
 - Task Offloading
 - Control co-design



Potential Impact of the Project

- Accurate context-aware estimation for IoT applications
- Accurate MIMO dynamic models
- Smart Allocation Strategies with guaranteed properties (Stability, Robustness)
- Novel Controllers for CPS
- Actual Implementation with well-known cloud and IoT orchestration platforms
- Open reproducible data sets.



Scientific Results

- Design of DRUID-NET architecture to facilitate dynamic resource scaling mechanism on cloud/IoT orchestrators.
- Workload Modeling:
 - Accurate Classifier for device profiling.
 - Application Profiling
 - Creation of real data sets for 6 IoT applications in smart-building environment
 - 5 tested regression-based machine learning algorithms for predicting QoS metrics per application
- Performance Modeling
 - event-driven discrete model using queueing modelling
- Resource Allocation
 - Design of a stable AIMD-like (additive increase multiplicative decrease) admission control policy



Dissemination

- Scientific Publications
 - Published/ Accepted: 4 conference papers, 1 journal papers
 - Under Submission: 2 conference papers, 2 journal papers
- Tutorials
 - ECC 2020 - “Control co-design and resource allocation in edge computing and dynamic networks”



Sustainability/Exploitation

- Synergies with industrial and academic partners
 - Cisco Systems (Canada)
 - Rakuten (Japan)
- Open reproducible data sets for three use-cases
 - Collaborative Robotics
 - Rapid Resource Deployment
 - Mobility-aware Edge Computing



DRUID-NET Consortium

National Technical University of Athens, Greece (Prof. S. Papavassiliou)

- Modeling and Optimization of heterogeneous networks
- Cloud/Edge Computing
- Wireless Communications
- Social Networks
- Internet of Things

Queen's University Belfast, Northern Ireland, UK (Lect. N. Athanasopoulos)

- Systems and Control Theory
- Industry 4.0
- Cyber-Physical Systems
- Collaborative Robotics



DRUID-NET Consortium

**Institut national de recherche en informatique et en automatique (Inria) ,
France (Dr. N. Mitton)**

- Wireless Communications
- Sensors Networks
- Robot Networks

**Université catholique de Louvain, Belgium
(Prof. R. Jungers)**

- Theoretical Computer Science
- Systems and Control Theory
- Cyber-Physical Systems



DRUID-NET Consortium

- École de technologie supérieure (ETS), Montreal, Canada (Prof. A. Leivadeas)
 - Resource Management and Optimization
 - Cloud/Edge Computing
 - Virtualization



Stay tuned on DRUID-NET website

<https://druidnet.netmode.ntua.gr/>



Questions

