CELTIC-NEXT Proposers Day

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Pitch of the Project Proposal

Intelligent Edge of Things (I-EoT)

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• Considering decentralized & virtualized three-tier Edge IoT architecture, in this proposal we focus on…
• How AI / machine learning can be used in:
  • Finding optimal placement of services and resources in the correct architectural tier?
  • Optimizing the resource utilization & management in the edge infrastructure?
• …to achieve:
  • Improved cost- & resource-efficiency
  • Higher QoE
  • Higher level of security & privacy

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Intelligent Edge of Things (I-EoT) - Erkki Harjula, University of Oulu, erkki.harjula@oulu.fi
Organization Profile

University of Oulu
- One of the largest universities in Finland: ~16 000 students, ~3 000 staff
- Focus research areas:
  - Information Technology
  - Biosciences and Health
  - Cultural Identity and Interaction
  - Environment, Natural Resources and Materials

Faculty of Information Technology and Electrical Engineering (ITEE)
- ~2 000 students, ~500 staff
- Strengths & success factors:
  - High-quality teaching and research
  - Multi- and interdisciplinary collaboration
  - Strong external funding
  - Close collaboration with industry & research organizations

CWC
- One of the leading research institutes globally in the area of wireless communications
- Focus areas include e.g.: 5G, 6G, IoT, Edge, Security, …

Ubicomp
- The largest cluster of ubiquitous computing & HCI researchers in Finland, and one of the largest in Europe
- Focus areas include e.g.: IoT + Edge, machine learning, Big data, UX, …

Available research infrastructures
- World’s first 5G test network: 5GTN
- Smart campus environment
- MEC development environment
- 6Genesis research program

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Introduction

• **Some of today’s most relevant technology trends:**
  • **Artificial Intelligence (AI)**
    • The most active field of AI is **Machine Learning (ML) with a new trend distributed ML methods**
  • **Virtualization**
    • One of the most active fields is **decentralized virtual microservice architectures**
  • **Lightweight container technologies**
  • **Edge computing**
    • Lot of buzz around **Mobile Edge Computing (MEC)**
    • The newest trend is Local edge computing, e.g. **IoT Edge**
Our proposal: I-EoT (1)

This proposal: How can AI/ML be used in this context?
- Goal: to research & develop methods to address the challenges,
- Bidirectional approach: AI=>Edge, Edge=>AI

Where to deploy computing tasks?
Considering e.g.:
- latency,
- availability,
- needed comp. Capacity?
- Where is data?
- User mobility?

How to optimize capacity/resource placement?
Considering e.g.:
- performance
- resource-efficiency,
- user mobility,
- manageability & maintenance?

How to limit propagation of sensitive data?
Considering e.g.:
- who needs what kind of data?
- can raw data be kept local, while only analysis results are sent to public cloud?
- is there enough local computing capacity for local processing?
- which organization controls the infra and can it be trusted?

Computing task

Cloud

Global service

Global service

Edge service

Edge service

Edge service

Local service

Local service

Mist

Data Center

Low

Limited (local)

High

Global

Low (high latency)

Responsiveness

High

Global

Low

Context-awareness

High

Energy-criticality

Low

Low
Our proposal: I-EoT (2)

- **Benefits / Business potential of AI-assisted Edge computing**
  - **Subscribers/users** will benefit from:
    - Faster low latency content delivery and increased privacy, interactivity and reliability
  - **3rd party developers** will benefit from:
    - Cost-effective deployment of applications and advanced data-analytic capabilities for resource utilization
  - **Network / system / edge platform Operators** will benefit from:
    - Optimized utilization and intelligent management and maintenance of their resources
  - **Overall business value based on reductions in operational costs and improved QoE**
Potential partners:

• **We are looking for project collaboration within the scope of the proposal**
  • For initiating a new project proposal (or alternatively joining in a related existing proposal)

• **The potential partners include:**
  • Cloud infrastructure providers
  • Big data / data analytics providers
  • Edge/ Fog infrastructure providers
  • Telecom infrastructure providers and operators
  • IoT device manufacturers
  • Potential customer organizations on application areas such as industry/office/home automation/surveillance, e-health, smart traffic, logistics, city infrastructure, etc.
  • Cybersecurity specialists
  • Research partners focusing on e.g. Edge, AI/ML, Security, Distributed systems
For more information and for interest to participate please contact:

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Join the follow-up Telco
13 Feb. 9-10 CET

Join Webex meeting
Meeting number (access code): 959 805 643
Meeting password: KtmB3pMf

Join by phone
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Global call-in numbers

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