

Next-Generation Internet (of Things)

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NGINO, Trondheim Set. 2020

Ongoing NGINO activities

- Evaluator of NGI Atlantic
 - <https://ngiatlantic.eu/>
- Proposal submitted to ICT-41-2020
 - COSMOS
- 3h session at EVU course IT6205 (NTNU)
 - Enabling Technologies for Digitalization: Next Generation Internet of Things
- Ongoing survey paper
 - Human-centric IoT

NGI Atlantic

- *Through a set of 5 Open Calls, the H2020 project [NGIatlantic.eu](https://ngiatlantic.eu) supports the **collaboration between EU and US** with a total funding budget of 2.8 Million euro dedicated to research. The intercontinental teams can carry out their research through very innovative [experimental platforms](#) existing both in EU and US.*

Accepted projects

- **Self-Certifying Names for Named Data Networking**
- [Athens University of Economics and Business](#) with [The University of Memphis](#)
- "The proposed solution builds on the emerging paradigm of Decentralized Identifiers (DIDs), a new form of self-sovereign identification under standardization by W3C. Our solution proposes the use of DIDs as content names in Name Data Networking (NDN). DIDs are associated to a DID document that contains cryptographic material that can be used for verifying DID ownership, as well as auxiliary information about the DID. This auxiliary information is used in our approach for verifying the "metadata" of an item, its ownership status, its "representations," and it defines basic roles that can be used for access control."

Accepted projects

- **Experimental Study of Context Based Routing Using Deep Reinforcement Learning**
- [Rheinisch-Westfälische Technische Hochschule Aachen](#) with [Rutgers, the State University of New Jersey](#)
- "Through the proposed experimental campaign we intend to instigate research on the following issues: Can artificial intelligence (AI)—and in particular deep reinforcement learning (RL)—with the help of contextual information achieve real-time or near-real time packet routing and under which conditions? Can deep RL achieve that in a distributed manner? Is deep RL sufficiently resilient and adaptive in solving the super complex NGI routing problems?"

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Accepted projects

- **Food Data Marketplace - Privacy and Trust Enabling Data Marketplace for Sustainable Supply Chains**
- [Trace Labs](#) with [Kakaxi Inc.](#)
- "Food Data Market (FDM) is an inclusive marketplace fostering new economic models for sustainable food supply chains based on data. It leverages key benefits of DLT (trust, neutrality, inclusiveness) while keeping the key advantages of participants intact by employing privacy-by-design approach thus enabling farmers and cooperatives to regain control of their data, give it a price tag, and sell it to interested partners in the supply chain. This contributes to greater visibility and trust in food supply chains, more equitable sharing of gains from data exchanges (value moving upstream supply chains - farmers) and to more sustainable environmental practices by making trusted information about food production available to consumers. "

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Accepted projects

- **Fairteam** ←
- [Fairkom Gesellschaft](#) with [Rocket.Chat Technologies Corp.](#)
- "Cloud based workspaces and communication services should be able to map teams. fairkom offers a portfolio of open source-based web services. To make them as easy usable as possible we firstly apply a common brand strategy (faircloud, fairchat, fairmeeting, ...), secondly we do a horizontal integration with single-sign-on (fairlogin as ID provider) and thirdly we try a vertical integration between the services. One of the challenges is to map teams across cloud-based services."

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Accepted projects

- **Measuring Multi-Carrier Cellular Access International Roaming Performance**
- [Universidad Carlos III de Madrid](#) and [Telefónica Research](#) with [Northwestern University](#).
- "Multi-Carrier Cellular Access (MCCA) allows cellular users to dynamically connect to different cellular networks without switching their SIM card. There are a number of advantages that can be realized through MCCA. MCCA users can improve coverage and performance, combining measurement-based dynamic carrier selection and predefined preferences on radio access technology (RAT) use (3G, 4G, 5G, wifi), irrespectively of which carrier is offering it a particular location."

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Accepted projects

- **CacheCash Experiment**
- [Sorbonne Université](#) with [NYU Tandon School](#) and [US Ignite](#).
- "CacheCash, the Content Delivery Network (CDN) technology that we will test, has the potential to change the nature of CDNs by involving the end users themselves directly in serving content through machines that are under their control. Putting users in charge can lead to a wider range of content benefitting from CDNs. CacheCash provides a service in which interested users run caches, and they are incentivised to participate by receiving a crypto-currency (Cachecoin) in exchange for serving content to other users. Both cryptographic and economic analyses demonstrate that the incentives lead CacheCash users to honestly serve content. Analysis has also shown that CacheCash can scale to meet the workload of even the most popular services used today. Our experiment will put these ideas to the test."

COSMOS (IA ICT-41-2020)

- Multi-aCtor PrOviSioning of Third-Party Multisensory COntent over 5G for Disruptive Service Innovation in an Immersive, Interconnected and Data-rich world
 - Relational Romania, Brunel University London, ..., Vodafone Innovus, ..., **NTNU** (total of 15 partners)
 - 11 use cases covering 3 thematic areas
 - News and advertisement
 - Entertainment and Social Media
 - Tourism and Training
 - Focus on 5G VNFs for next generation multisensory applications

IT6205 Next Generation IoT

- This independent 3h module
- Discussion of the currently existing NGIoT technologies
- Potential and applicability in improving:
 - UN's SDGs
 - businesses
 - personal life
 - society in general
- 16 students from different companies in Norway

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Human-centric Internet (ongoing survey)

- "...vision of a Next Generation Internet, which is more human-centric in terms of identity, data protection and privacy, **control and opportunity**..."
- "...emergence of tactile interface based on **human-centric sensing and actuating**, augmented and virtual reality combined with new IoT end-point capabilities capturing contextual environment."
- "...move towards the integration of intelligent objects with social capabilities that need to address the **interactions between autonomous systems and humans in a seamless way**."
- "...**human-robot symbiosis** with the purpose of inventing new jobs humans can hardly imagine..."
- "Contribution to human-centered IoT evolution improving **usability and user acceptance**."

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Economic and Policy Challenges

- Support for SMEs and start-ups
- Accurate economic parameters estimates
- Data and information as critical assets
- Increase of digital skills and competencies
- Build trust
- Identification of key regulatory and legal issues
- Interoperability and replicability
- Security and reliability by design
- Innovation procurements
- Sustainability
- Cohesion
- Sovereignty

Drivers for NGIoT

- Data-centric and secure architectures
- 5G/6G Network Infrastructures
- Multi-access Edge Computing
- Distributed AI and Analytics
- Digital Twins
- Distributed Ledgers
- Augmented Reality and Tactile Internet

Foundational and Emerging Challenges

- Reliable, low-cost, sustainable and scalable IoT networks
- NGIoT data processing architectures
- Futureproof security and **trust**
- Interoperability
- **Privacy-by-design and Ethics**
- Real-time IoT decision-making
- Autonomous IoT solutions
- **Human** and sustainable development **in the loop** IoT
- IoT data sharing and monetisation enabling models and technologies

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THANK YOU

