



EUCloudEdgeIoT.eu

Digital Platforms for the Cloud-Edge-IoT, Innovation through Open Source & Software

Unifying execution environments for the Cloud- Edge-IoT continuum

Cloudkernels: Cloud-native Unikernels

Anastassios Nanos

NUBIS PC



Funded by
the European Union

☁ NUBIS PC:

- ☁ Young SME (inc. 2020) doing research in virtualization systems
- ☁ Distributed team (10), based in Greece, UK & Germany
- ☁ involved in H2020 & HE projects

☁ Involved in:

- ☁ low-level (OS/hypervisor) systems development
- ☁ container runtimes/orchestration
- ☁ systems software for hardware acceleration

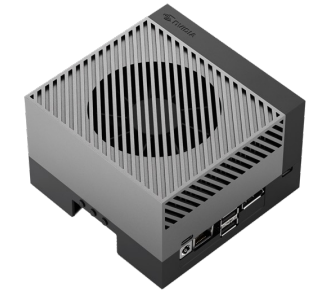
☁ Anastassios Nanos:



- ☁ Systems Researcher, PhD
- ☁ low-level systems software, Hypervisors, Unikernels, Container runtimes



Cloud-Edge-IoT continuum



Diverse requirements at each stage of execution:

- ☁ Cloud: Vast resources, homogeneous
 - ☁ Challenges: data security & privacy, multi-cloud management, interoperability
- ☁ Edge: Lots of different devices available for the Edge
 - ☁ Challenges: How to deliver applications? How to manage multi-tenancy? How to use & expose hardware accelerators?
- ☁ IoT: Even more types of devices available
 - ☁ Challenges: All with their own proprietary SDK, No OS – deploy application OTA requires manual steps
- ☁ Target: HORIZON-CL4-2024-DIGITAL-EMERGING-01-21
- ☁ Containers have dominated the cloud -> **Craft a unified build & execution framework for efficient cloud-native deployments across the whole continuum (Cloud, Edge & IoT).**
- ☁ Provide unified deployment experience to end-users with CloudKernels, by building, packaging and deploying applications as unikernels on a wide range of processor architectures, using OCI standards (image & runtime specifications).
- ☁ Provide seamless scaling of applications requiring increased compute power, using vAccel as the generic API to enable partial or full hardware acceleration.

Impact and next steps

- ☁ Cloud-native integration of embedded devices and their software components is crucial to the wider adoption and unification of device management and software supply verification & validation.
- ☁ We design & develop software that facilitates the cloud-native integration of embedded devices and their software components:
 - ☁ urunc: a unified container runtime deploying unikernels & IoT blobs across the continuum
 - ☁ Bunny: a unified builder & packager for unikernels & IoT blobs as container images / OCI artifacts
 - ☁ vAccel: a hardware acceleration framework decoupling the application code from its hardware-specific implementation.
- ☁ All components are (a) bootstrapped and enhanced in H2020 and HE projects* and under active development, (b) licensed with Apache-2.0

*5G-COMPLETE, SERRANO, MLSYSOPS, DESIRE6G



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Thanks!

<https://blog.cloudkernels.net>

<https://nubis-pc.eu>

<https://docs.vaccl.org>

