

WP6 Communication Framework

WP6T61-01-02: Fractal orchestration to Nuttx (PULP)

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Low-end node orchestration architecture

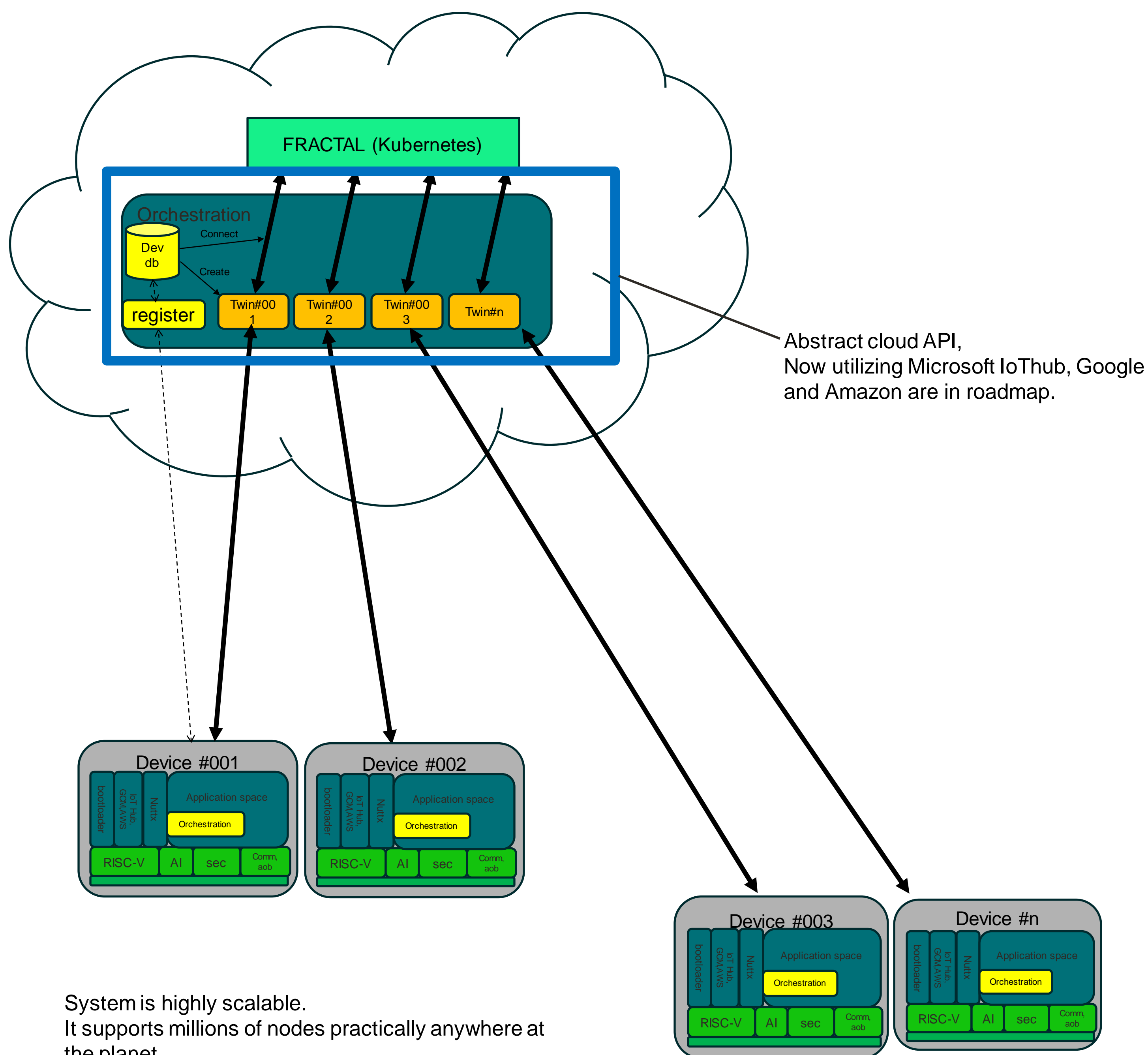


Component location

- Objective of the component:
 - Realize a solution to orchestrate the Fractal low end nodes from Fractal cloud.
- Fractal Features associated:
 - ADAPTABILITY -->
- Inputs/Outputs:
 - INPUT: Device security on node and cloud
 - OUTPUT: Connection request from Node to Fractal
- Integration:
 - Works on Nuttx based system RISC-V, PULP(*)



System overview



System is highly scalable. It supports millions of nodes practically anywhere at the planet



FRACTAL technology demo case

Nodes have individual secrets installed at manufacturing
Secrets saved to device database

During installation/commissioning the device context is transported to device database. (serial number, location, owner, service, purposes, ...)

At second stage commissioning the Devices connects to orchestration cloud. If device database confirms that device exists, and it has been commissioned;

- Device twin is created
- Device twin is connected to FRACTAL (kubernetes)
- Device may begin to communicate with its twin

At FRACTAL level the communication is terminated to the application space

Possible functions

- Uploading (sensor) information
 - Downloading (AI model) information
 - Updates and functional changes
- (Note, Only minimal demonstrated here)

Orchestration layer may handle the internet security issues
When cloud provider (MS, Google, Amazon) informs an issue:

- New fw can be build
- All affected twins on Orch cloud are notified for upgrade
- When Device connects to twin it will be updated
- Eventually whole fleet will be updated

Technology: IoT Hub, GCM or AWS



Get started

Pulp/NuttX based systems have limited resources. Installing any of existing orchestration tools is not trivial. Challenges are typically the lack of memory/disk resources but also binary compatibility in commercial solutions.

On this solution, the IoT Hub is ported to Nuttx (pulp) system and Azure cloud handles the authentication and the securing of the communication. A Cloud agnostic API is introduced for Fractal integration to Kubernetes.

EU2020 Horizon



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(*) PULP FPGA implementation is bit limited due limited connectivity and clock speed of 10MHz