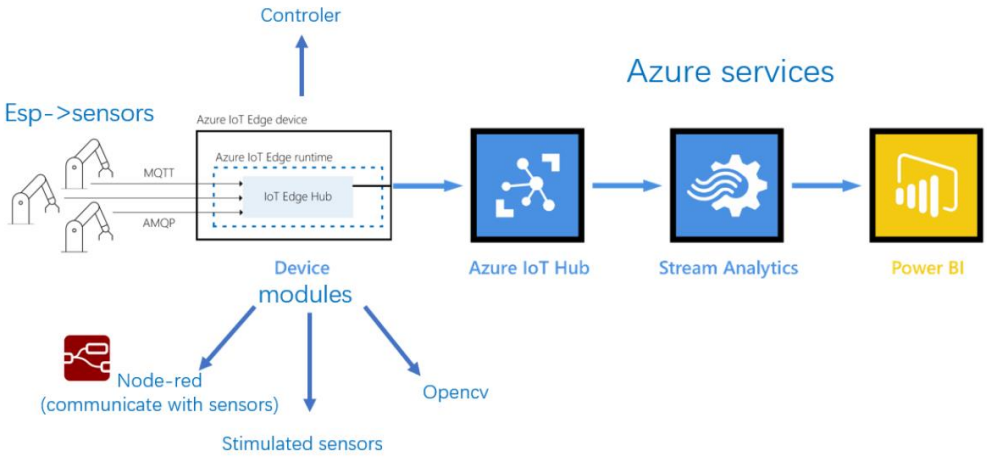
Pervasive Computing Implementation——smart-pi-on-edge

Introduction:

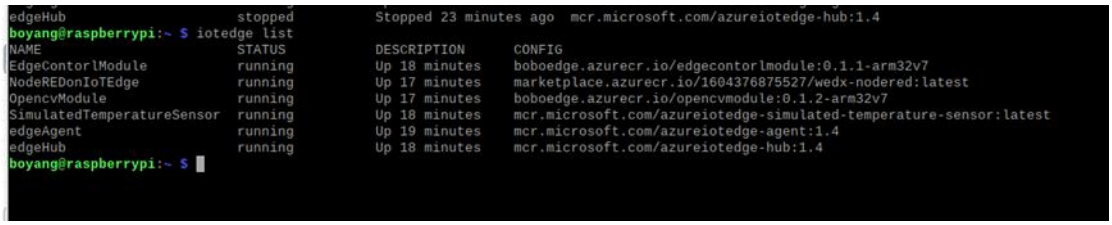
This project aims to explore the implementation of Pervasive Computing in the context of Internet of Things (IoT). Pervasive Computing refers to the integration of smart devices and technologies into our everyday surroundings, enabling seamless connectivity and intelligent interactions. By combining the power of ESP8266 modules, Node-RED, Raspberry Pi, and Azure Cloud services, this project creates a scalable IoT system.

Project Overview:

The project revolves around building a IoT system that utilizes various components to enable pervasive connectivity and intelligent control. The key components of the project include ESP8266 modules, Node-RED, Raspberry Pi, OpenCV, and Azure Cloud services.

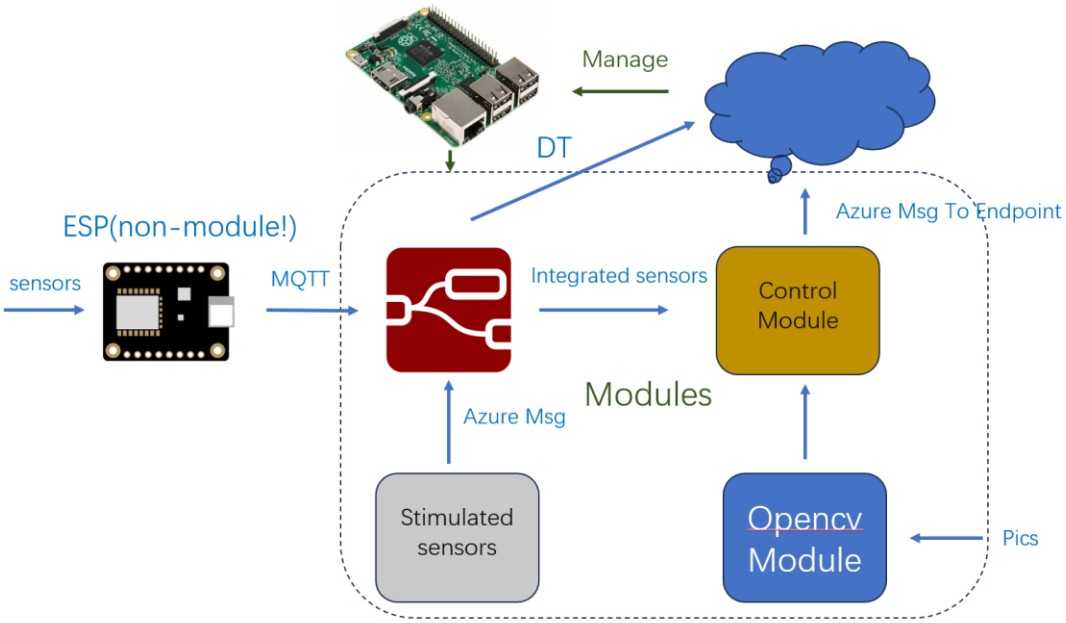


Project structure

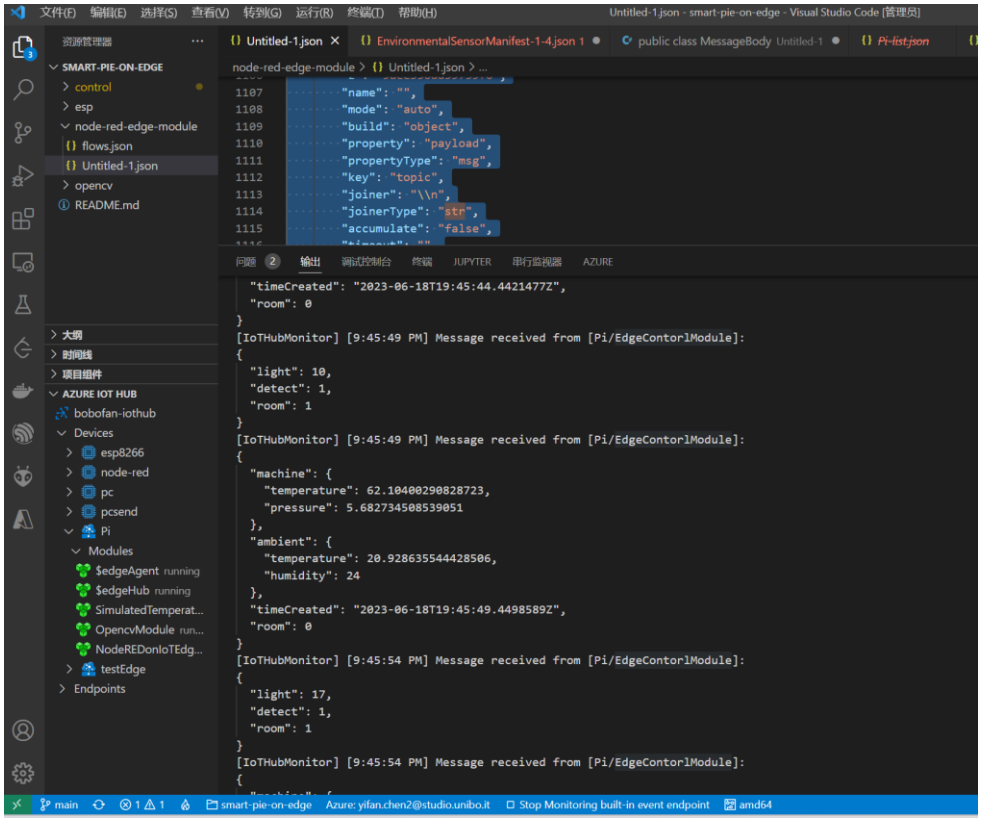


Modules on edge

Msg routing



Edge



Interesting aspects:

- The use of Node-RED as a **gateway** and the scalability for **expanding downstream devices** (Reference: Scaling Node-RED Horizontally for High Availability). https://www.narendranaidu.com/2016/07/scaling-node-red-horizontally-for-high.html

Different topic/ Shared Subscription/ Other modules and expands

- Edge computing with direct integration of sensors, enabling real-time data processing and decision-making at the edge.

- PaaS, SaaS (providing developers with a managed platform and software services, supporting the concept of WoT), and FaaS (allowing quick deployment, serverless architecture, and distributed computing).

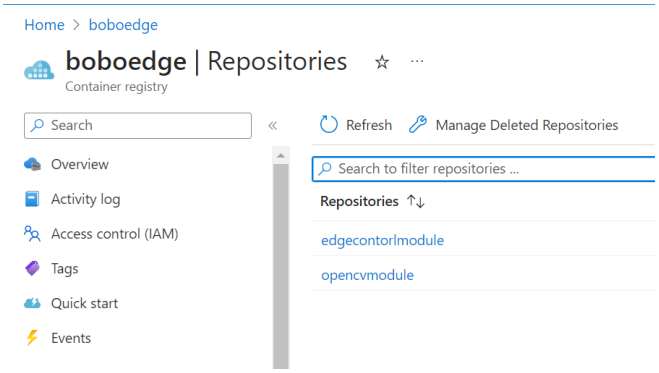
- Development and integration of multiple modules, leveraging Azure IoT Edge Modules for enhanced portability and scalability.

Challenges:

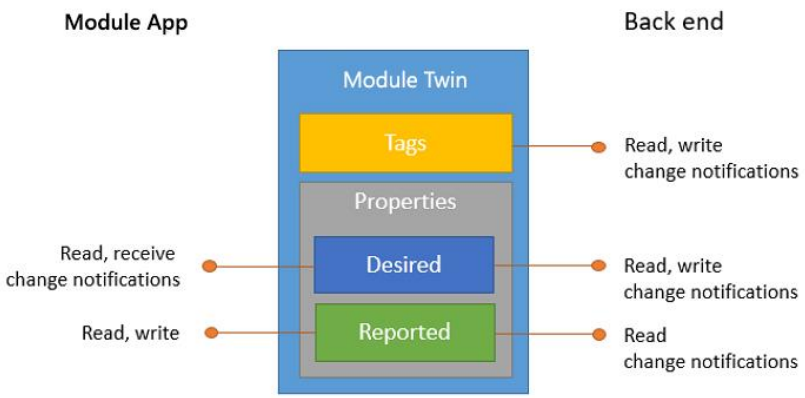
-Development of modules using Azure IoT SDK and deployment using Docker.

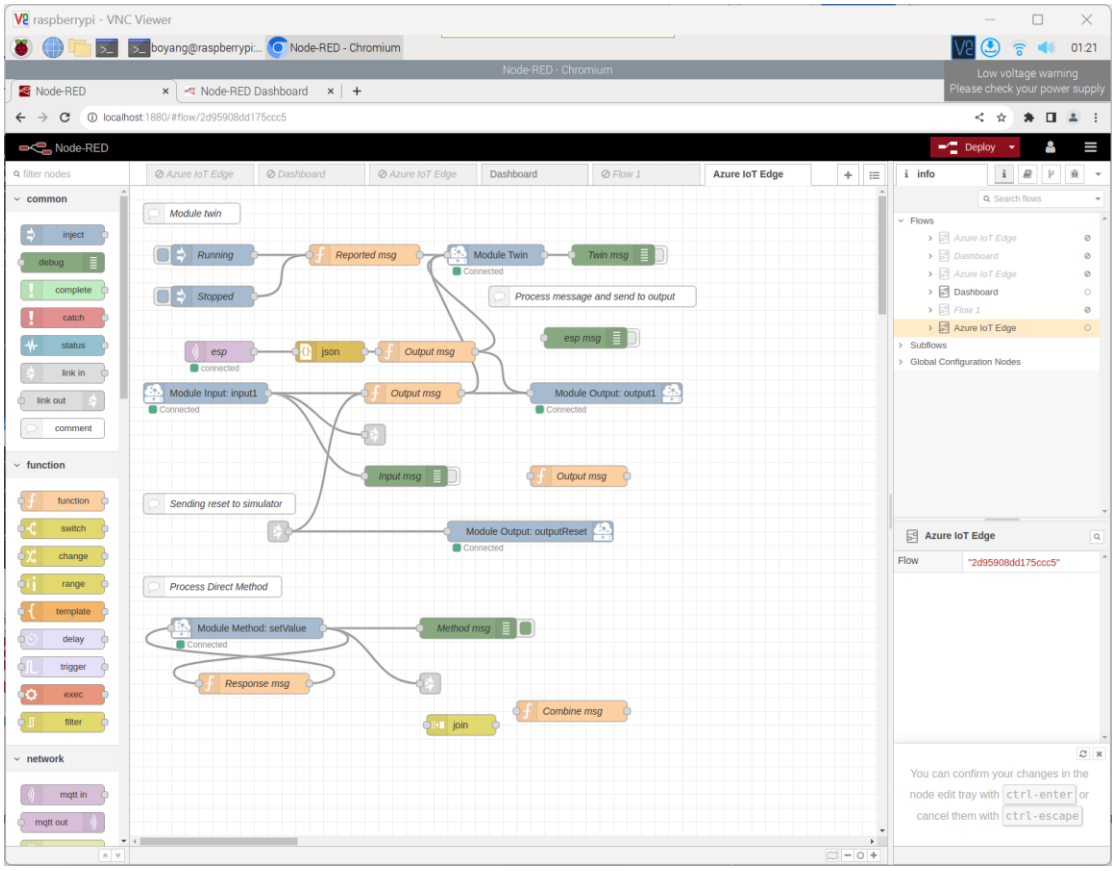
-Effective utilization of the Azure platform, including **Azure Central, Power BI**, Azure Functions, and other services to achieve desired functionality.

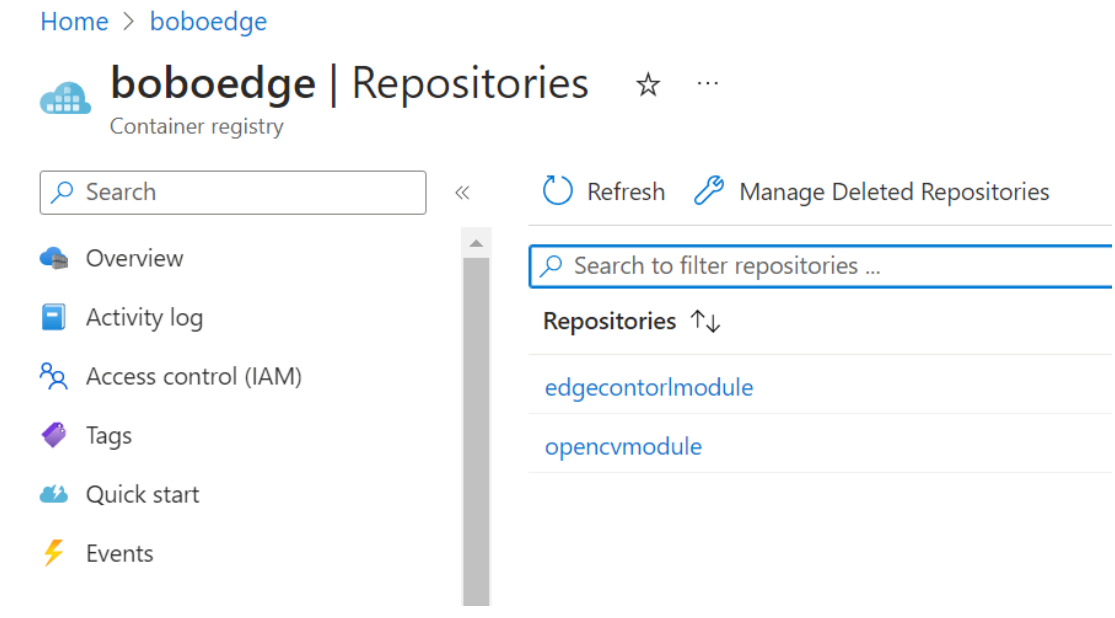
-System integration, leveraging modular design principles and containerization techniques to simplify the overall system architecture and improve interoperability.



- Digital twins(Twin Graphs & their visualization (Explorer))




raspberrypi - VNC Viewer
Node-RED - Chromium
Node-RED
Node-RED Dashboard
localhost:1880/#flow/2d95908dd175ccc5
Deploy
Module twin
Running
Reported msg
Module Twin
Twin msg
Stopped
Process message and send to output
esp
json
Output msg
esp msg
Module Input: input1
Module Output: output1
Input msg
Sending reset to simulator
Module Output: outputReset
Process Direct Method
Module Method: setValue
Method msg
Response msg
Combine msg
join
Azure IoT Edge
Dashboard
Flow 1
info
common
function
network


Home > boboedge
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Container registry
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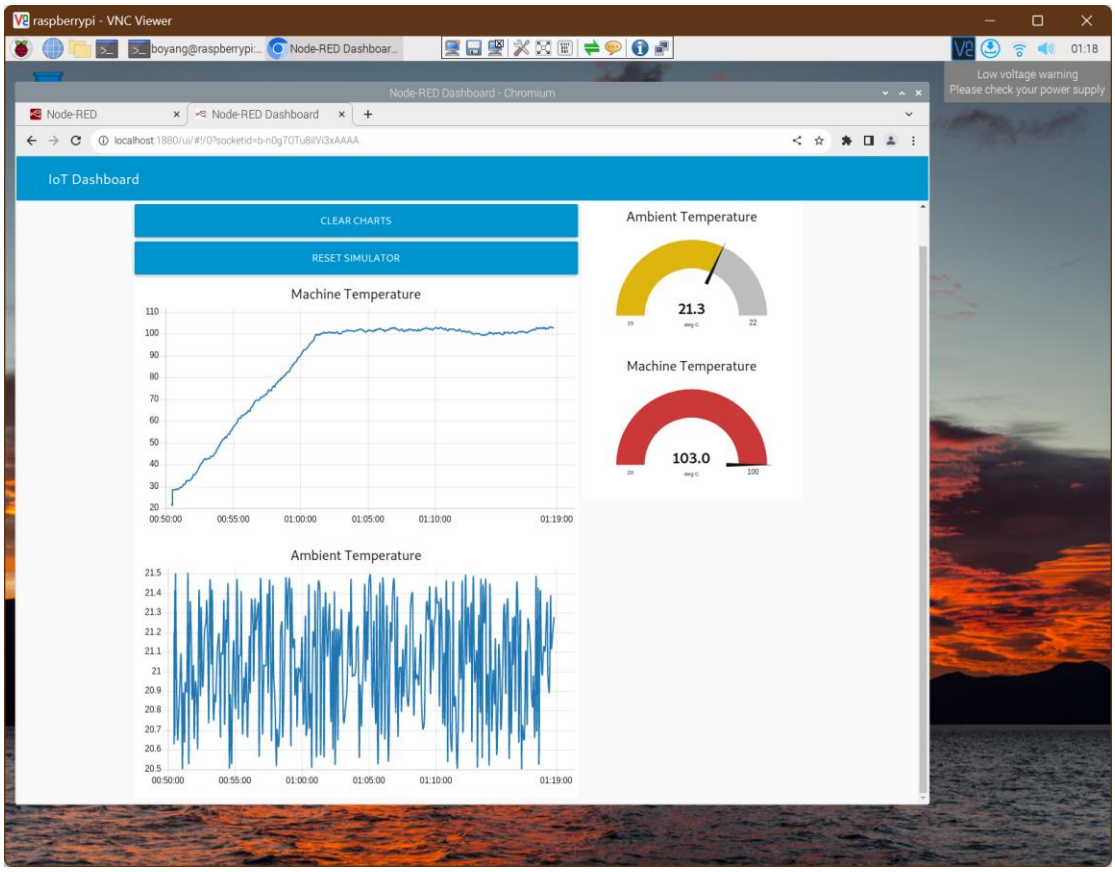
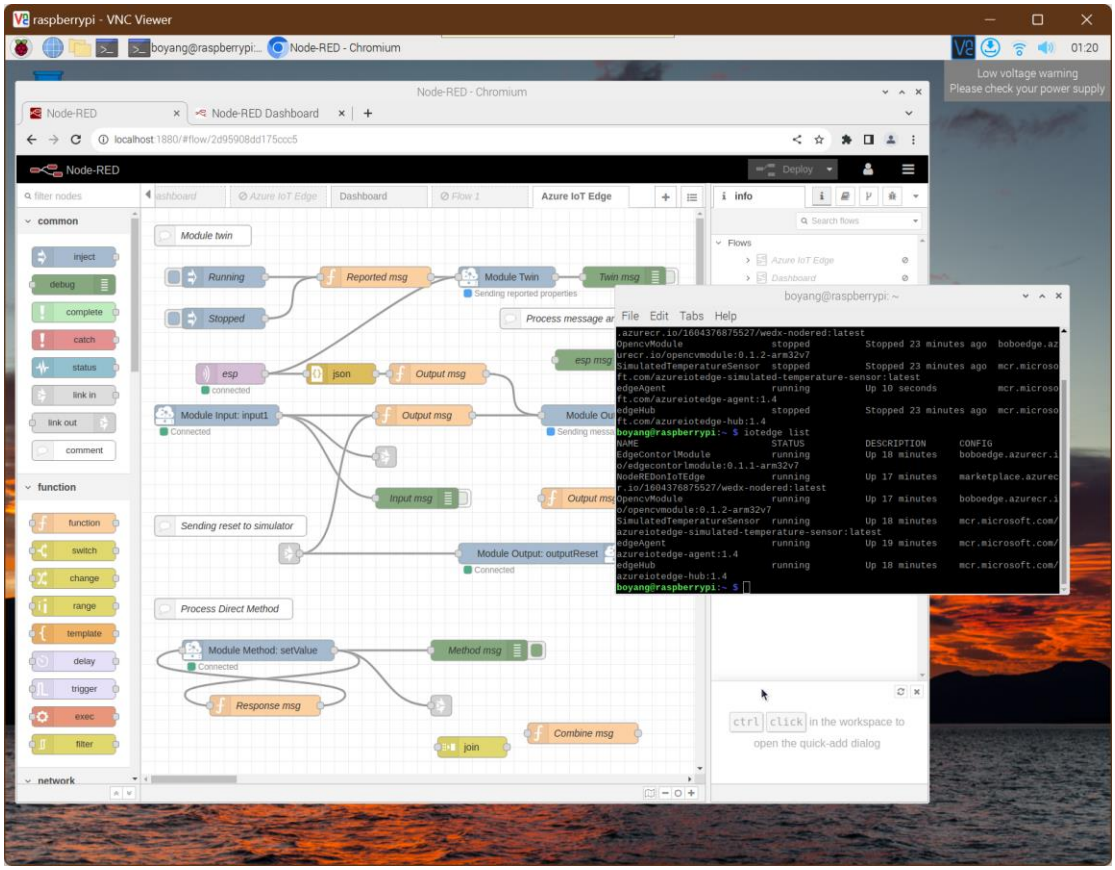
Overview
Activity log
Access control (IAM)
Tags
Quick start
Events
Search to filter repositories ...
Repositories
edgecontorlmodule
opencvmodule


raspberrypi - VNC Viewer
boyang@raspberrypi:...
Node-RED Dashboar...
01:18
Low voltage warning
Please check your power supply
Node-RED Dashboard - Chromium
Node-RED
Node-RED Dashboard
localhost:1880/ui/#!/0?socketid=b-n0g7OTu8ilVi3xAAAA
IoT Dashboard
CLEAR CHARTS
RESET SIMULATOR
Machine Temperature
Ambient Temperature
21.3
Machine Temperature
103.0
Ambient Temperature


raspberrypi - VNC Viewer
boyang@raspberrypi:...
Node-RED - Chromium
01:20
Low voltage warning
Please check your power supply
Node-RED - Chromium
Node-RED
Node-RED Dashboard
localhost:1880/#flow/2d95908dd175ccc5
Deploy
Azure IoT Edge
Dashboard
Flow 1
common
function
network
Module twin
Running
Reported msg
Module Twin
Twin msg
Stopped
esp
json
Output msg
Module Input: input1
Connected
Sending reset to simulator
Module Output: outputReset
Process Direct Method
Module Method: setValue
Method msg
Response msg
Combine msg
join
info
Flows
boyang@raspberrypi: ~
File Edit Tabs Help
ctrl click in the workspace to open the quick-add dialog

edgecontorlmodule

Repository

Refresh | Manage deleted artifacts | Delete repository

Essentials

Repository	: edgecontorlmodule	Tag count	: 10
Last updated date	: 6/19/2023, 12:34 AM GMT+2	Manifest count	: 12

Search to filter tags ...

Tags	Digest	Last modified
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