

OPPORTUNITY OPEN SOURCE – IIT KANPUR 2024

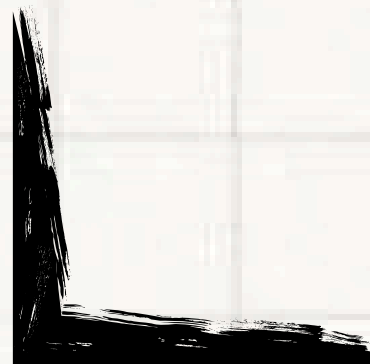
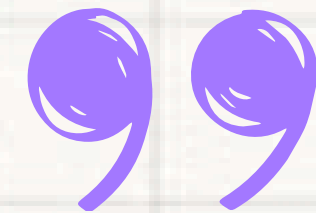
The Quest for Supply Chain Resilience

Akarshan Kapoor

What's That?

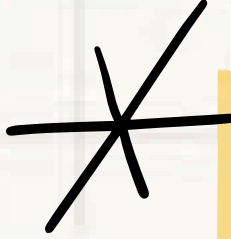


The journey of a product from raw material to your hands. Ensures that the right product reaches the right customer at the right time and cost.





IoT Protocols



MQTT

- Publish/Subscribe
- Typically uses TCP
- Relies on TLS over TCP for security
- Limited to basic messaging, lacks advanced management features



LWM2M

- Client/Server
- Typically uses UDP/CoAP
- Built-in security features over CoAP/UDP, providing encryption and authentication
- Offers full device management, including remote configuration, firmware updates, and monitoring

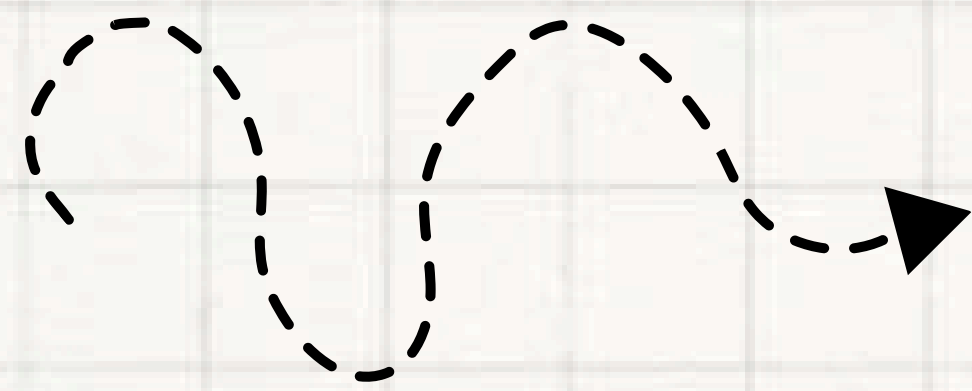
Leshan

- An open-source project by Eclipse Foundation.
- Implements the LwM2M protocol for IoT device management.
- Supports DTLS for secure communication.
- Flexible, secure, and suitable for scalable IoT ecosystems.

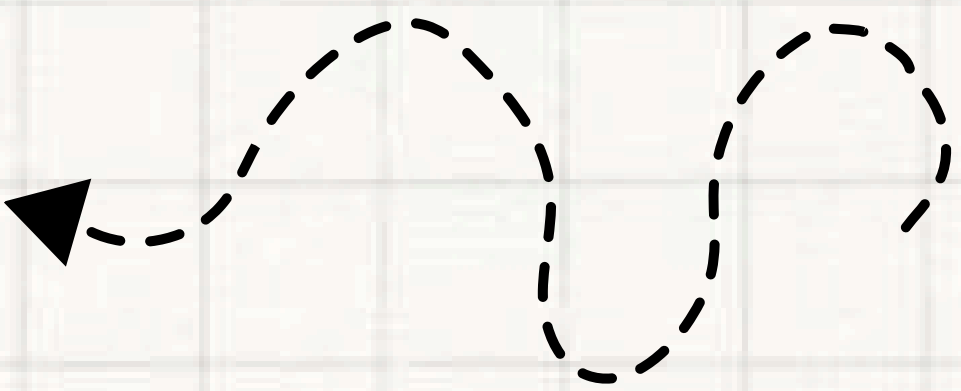


LESHAN

OMA Lightweight M2M server and client in Java




Zephyr RTOS



Zephyr[®]

- A RTOS Ecosystem, By Developers, For Developers.
- Small Footprint Kernel for resource constrained and embedded systems
- Supports a variety of different architectures like Intel x86, ARM v6/7, MIPS, RISC-V etc.
- Provides Direct Support for LWM2M Server setup and testing

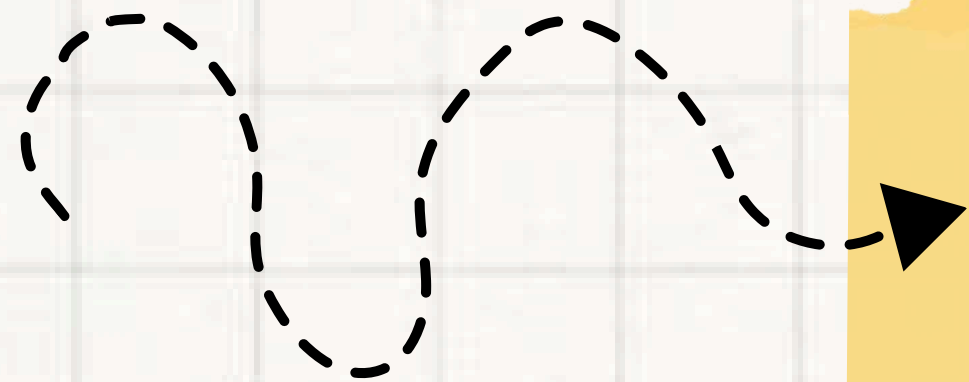


Getting Started

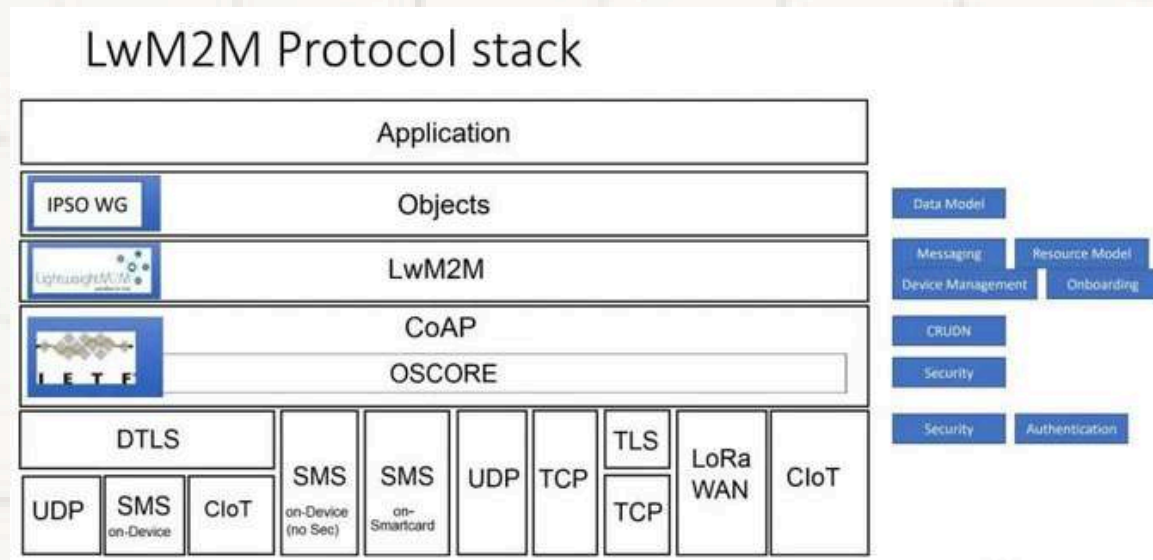


Zephyr[®]

- Monolithic v/s MicroKernels
- Scheduling, management, threading, memory
- Device-tree data structure
- RTIO and Z-bus.
- Understanding the west

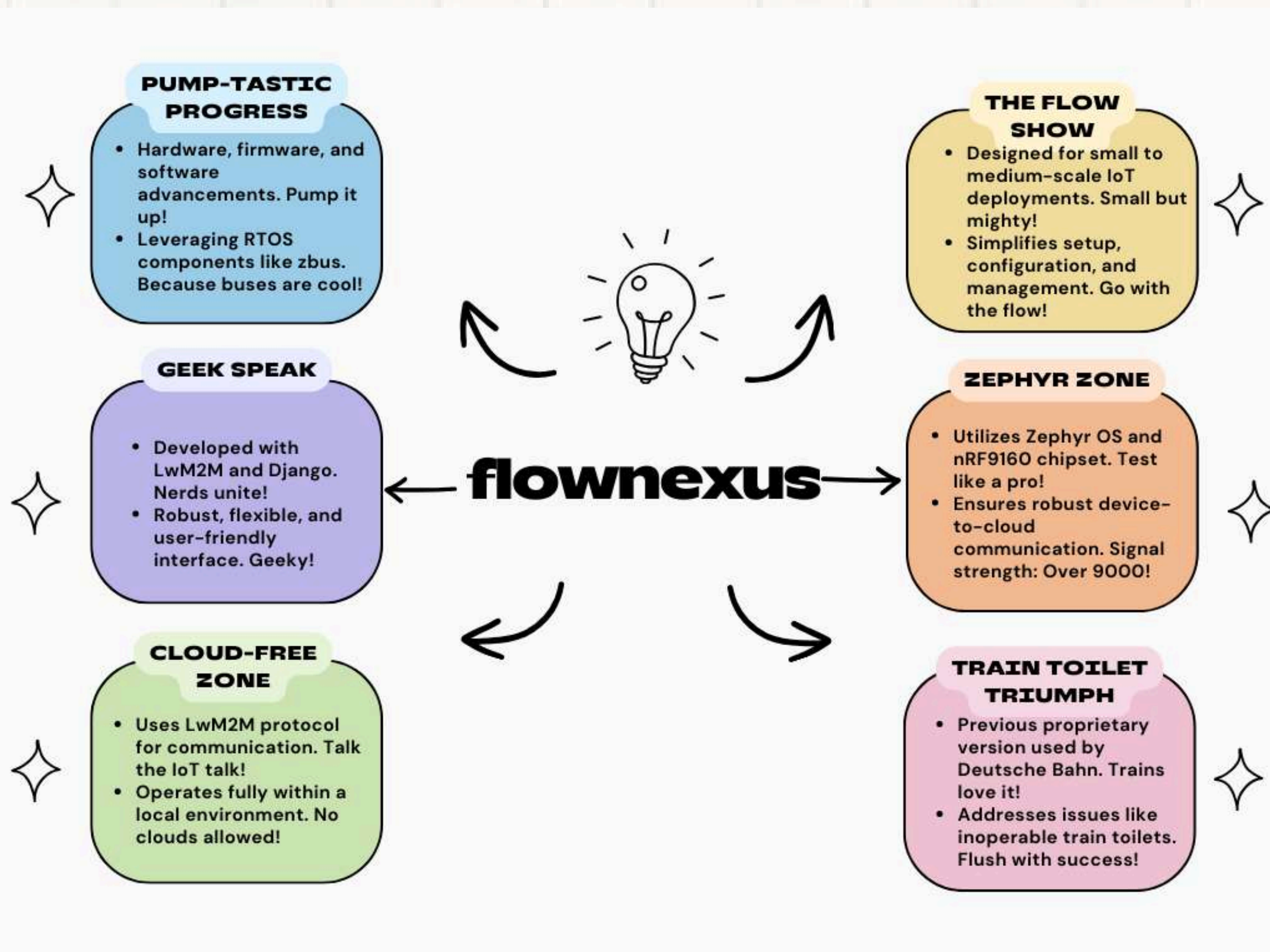


Assembly



Zephyr®





- Solution for small to medium scale IoT deployments
- Minimal and standalone Open Source IoT platform
- Simplify the complexities of IoT deployments, making them accessible and manageable for businesses of all sizes.
- On the go setup!!

Single Resource Format (3303/0/5700)

```
{
  "ep": "qemu_x86",
  "obj_id": 3303,
  "val": {
    "kind": "singleResource",
    "id": 5700,
    "type": "FLOAT",
    "value": "24.899181214836236"
  }
}
```

Composite Resource Format (3/0/0..17)

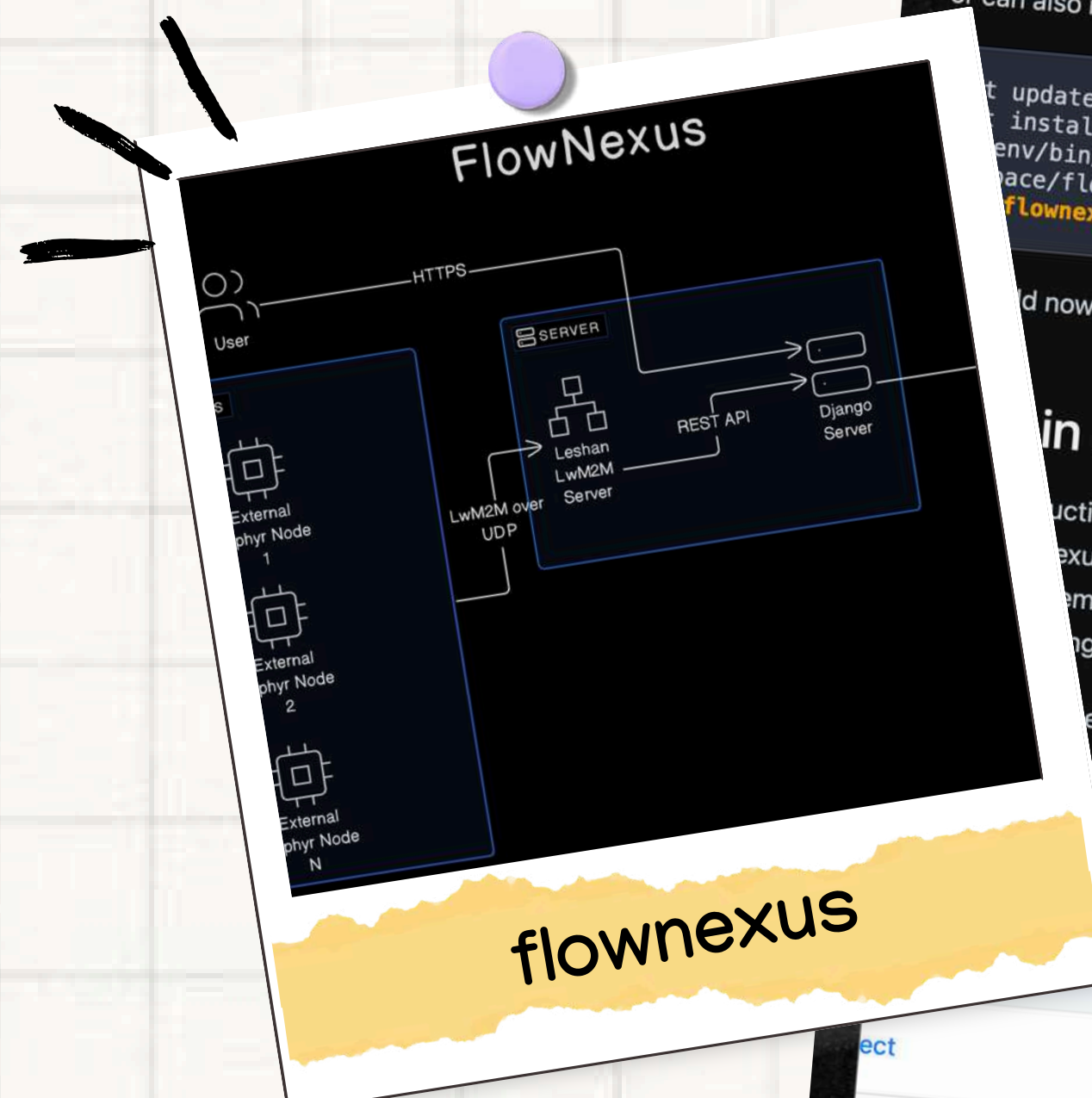
```
{
  "ep" : "qemu_x86",
  "val" : {
    "instances" : [ {
      "kind" : "instance",
      "resources" : [ {
        "kind" : "singleResource",
        "id" : 0,
        "type" : "STRING",
        "value" : "Zephyr"
      }, {
        "kind" : "multiResource",
        "values" : {
          "0" : "1",
          "1" : "5"
        }
      },
      {
        "kind" : "singleResource",
        "id" : 17,
        "type" : "STRING",
        "value" : "qemu_x86"
      }
    ]
  },
  "id" : 0
},
"kind" : "obj",
"id" : 3
}
```

API & Data flow

- RESTful API needs proper resource management
- Construct formats for single or composite instances
- Structure the flow from the endpoint to the backend.
- Configuring backend to endpoint configuration for bidirectional update.

- No external dependencies (e.g., AWS, MQTT brokers); must run locally.
- Focus on LwM2M protocol communication between Zephyr and server.
- Web application supports secure login and basic user management.
- Demonstrate adding data to a database and visualizing it in a web application.
- Supports OTA updates.

Advantages



```
Run
er can also run locally, without the need of a docker container.
t update
install openjdk-17-jdk maven
env/bin/activate
pace/flownexus/server/leshan
flownexus/server/leshan$ ./leshan_build_run.sh
```

and now be up and running under the following URL: <http://localhost>

in flownexus

function ready LwM2M server and is used in many commercial
exus. It is responsible for registering and managing [endpoint](#)
emented in Leshan related Java code within flownexus. The
ngo application.

between the LwM2M endpoints Django. There is no direc

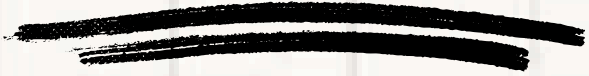
ses

ect

the ongoing development of the Pump Monitor project, introduced at the Zep
ence in software components. This approach reduces reliance on specific cl

and firmware enhancements for the Pump Monitor, leveraging recent Zeph
pping an Open Source IoT LwM2M and Django server with a user-friendly inte
gn contribute to ensuring operational stability and adaptability.

I hope you learned something new. Any questions ?



'flownexus'
Documentation


Looking forward
to connect!!



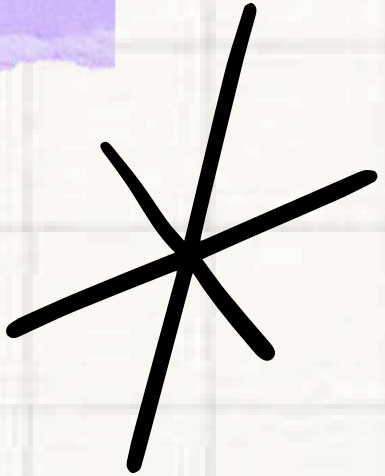


∞OSC

OPPORTUNITY OPEN
SOURCE CONFERENCE



Thank You!



A huge shoutout to Till, Aveek and the
organising team at IIT Kanpur.