

WSO2CON AFRICA 2026 · NAIROBI

SCALING HUMANOID ROBOTICS IN AFRICA

...with open-source middleware.

Nobody wrote this part down. So we did.

Zerobionic Africa





AF- 2.

Ocean plastic. Solar. Signs before it speaks.

WE BUILT IT FOR A QUIET ROOM.

Kigali was not a quiet room.



NOBODY REMEMBERS THE NINETY-NINE TIMES IT WORKED.

Trust is binary. You get one demo.

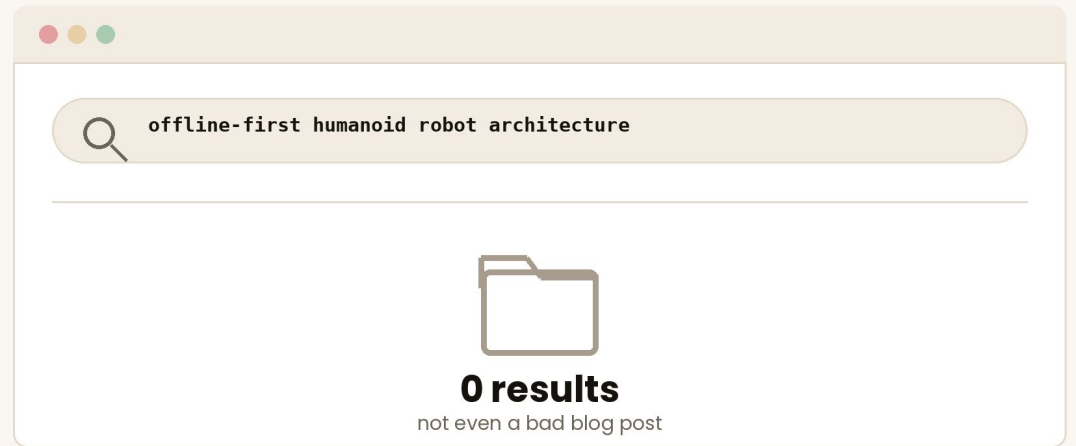


the one they saw

SO WE WENT LOOKING FOR THE MANUAL.

There wasn't one.

ME, LOOKING FOR THE DOCUMENTATION



THE DOCUMENTATION:

“No documented reference architecture exists for applying enterprise open-source middleware to offline-first humanoid robots on the continent.”

**“...fundamentally change
the dynamics of the global
software industry.”**

Sanjiva Weerawarana • WSO2 • OSCON 2005

Twenty years later it runs a classroom robot in Kakuma.



500,000+

deaf learners. Five countries.

None of them care which middleware we chose.

They care that it works with the power out.



THE REFRAME

A BANK AND A ROBOT SAME PROBLEMS.



ENTERPRISE

Partner endpoints

Partner keys

Staff identity

Audit trail

Data sovereignty

ROBOT FLEET

Units across sites

Subsystem APIs

Machine identity

Fleet telemetry

In-country data

We shipped all three mistakes before we knew better.

FOUR REASONS – WSO2

01

Open source

Runs if the vendor
vanishes.

02

No lock-in

Any infrastructure.
Air-gapped too.

03

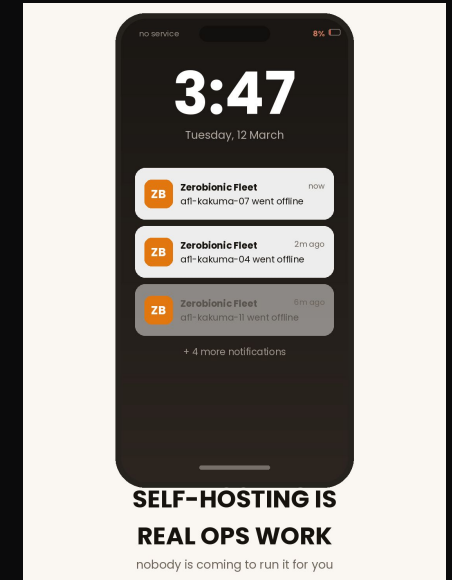
One stack

APIs, integration, identity
— together.

04

Proven where failure is expensive

Banks. Governments. ID
systems.



**SELF-HOSTING IS
REAL OPS WORK**

nobody is coming to run it for you

200+

banks

200+

governments

2.5B

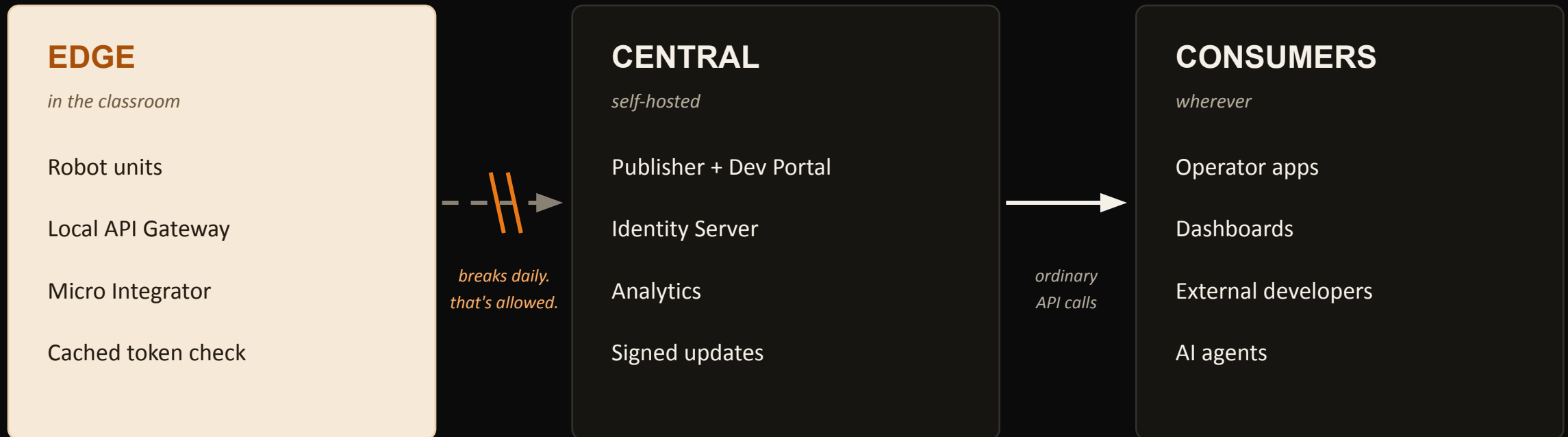
identities

THE CONFESSION

3:47am. Eight per cent battery.

Nobody is coming to run it for you.

THREE LAYERS. ONE RULE.



Sync when connected. Never depend.

THE CLOUD IS FINE. IT'S JUST FAR AWAY.

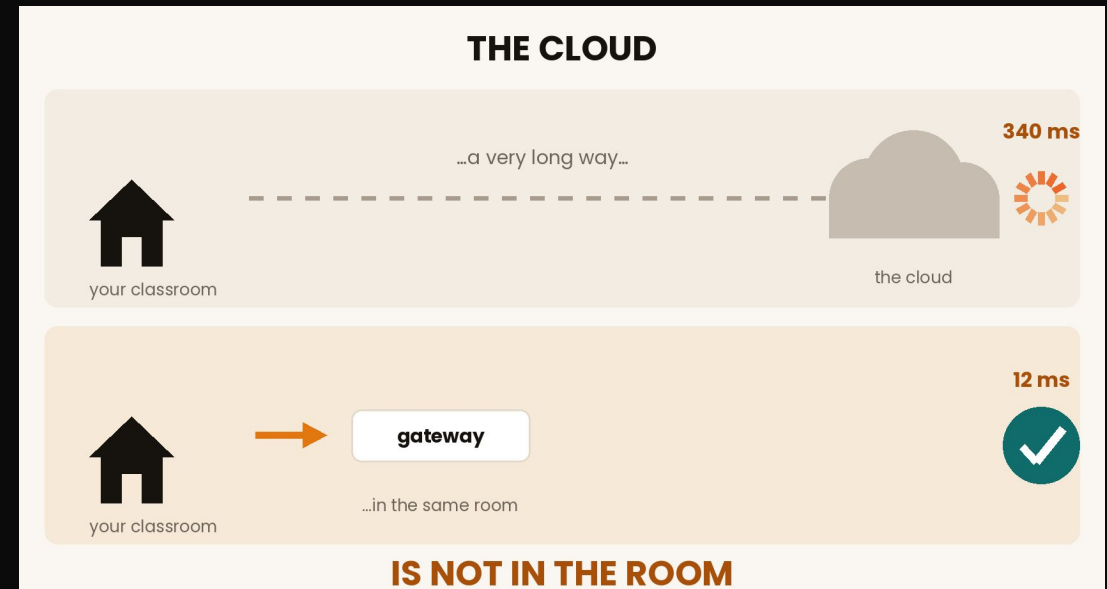
A gateway per classroom, not per continent.

Requests queue. Nothing waits.

LIVE, RIGHT NOW

zerobionicafrica.com/developers

OpenAPI 3.1 · key in 30 seconds



Order of magnitude, from our own sites.

THREE SENSES, ONE SENTENCE.

Three sensors arrive separately. The child signs once.

```
<aggregate id="fusion" correlateOn="studentSessionId">
  <onComplete>
    <call><endpoint key="lessonContentService"/></call>
  </onComplete>
</aggregate>
```

Correlate on the child, not the clock.

No outbound call. The internet is optional.

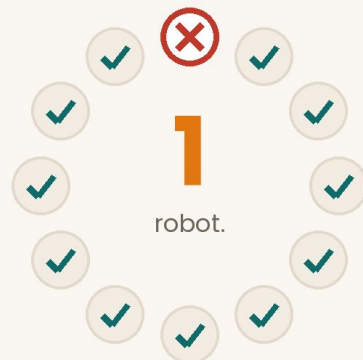


ONE ROBOT. ONE IDENTITY.

One OAuth2 client per unit.

SCIM revokes it on the next sync.

SOMEBODY STEALS A ROBOT'S KEYS

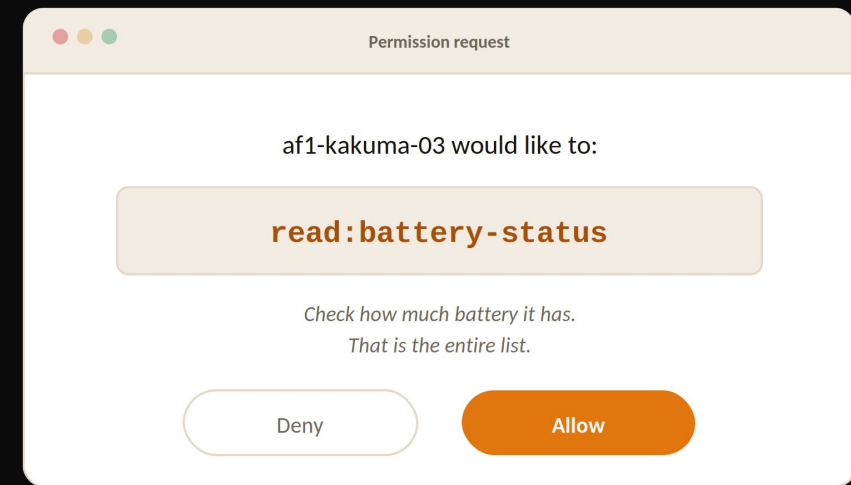


THE OTHER ELEVEN NEVER KNEW

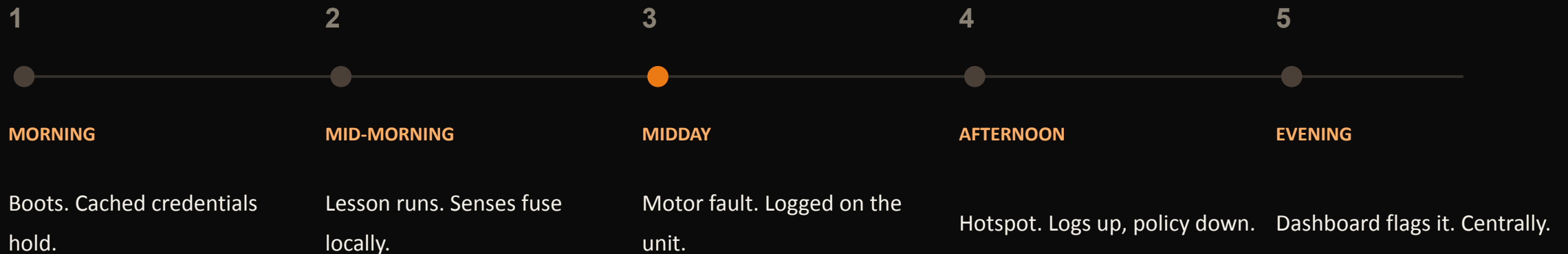
LIVE PROOF · ZB-SSH

```
$ zb-ssh af1-kakuma-03  
  
# scoped tunnel, no VPN, no firewall holes
```

One command. cloudflared underneath.



ONE SCHOOL DAY. NO INTERNET. NOBODY NOTICED.



Nothing in that day waited for the cloud.

TWO YEARS AGO.

- 01 Design for the noise, not the demo.
- 02 Break it yourself, before an audience does.
- 03 Teachers in the room on day one.

Designed in a vacuum is how good tech dies.

WHAT WILL BITE YOU

The central gateway as a single point of failure

Tokens scoped too wide, too early

The sync burst when a fleet reconnects

Credential rotation nobody owns

A smaller ecosystem than Kong or Apigee

OBSERVABLE. MANAGEABLE. AGENTIC.

Emerging, not battle-tested. Pilot agents where being wrong is cheap.



AF-1

NO REPLY OK 11601 / FAIL 62925 RSSI -48 dBm UP 29879s

COMBOS SPELL GLOVES HOME RELAX STOP

LIVE KINEMATIC FEED - URDF af1_description

REST

T-POSE

ARMS FWD

FIST

DIAGS

ROKOKO GLOVES

UDP 14043 no packets frames 0
Run glove_forward.py on the PC and point Rokoko Studio at it. This board cannot take Studio's own packet: it is ~14 KB and anything over 1472 B arrives fragmented and is dropped. The forwarder sends 74 B. No Isaac Sim in the path.

LEFT

thw --

ind --

mid --

rin --

pin --

RIGHT

thw --

ind --

mid --

rin --

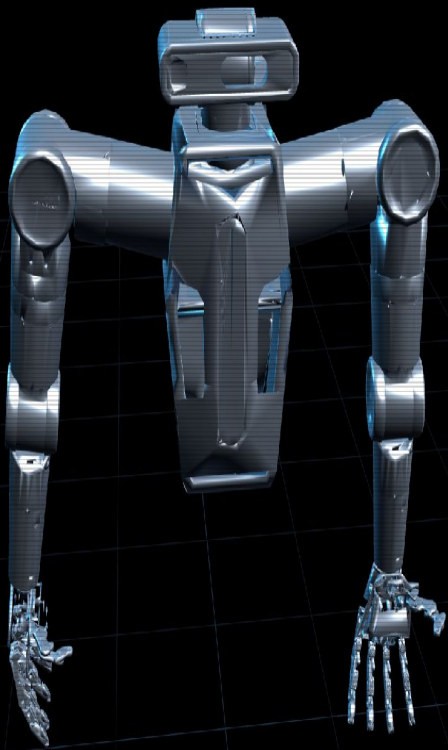
pin --

CAPTURE OPEN

CAPTURE FIST

FOLLOW: OFF

clear cal



DRAG ORBIT - WHEEL ZOOM

AF-1

NO REPLY OK 11601 / FAIL 62799 RSSI -50 dBm UP 29829s

COMBOS SPELL GLOVES HOME RELAX STOP

LIVE KINEMATIC FEED - URDF af1_description

REST

T-POSE

ARMS FWD

FIST

HEAD // STEPPER

head_yaw

691026/26

0°

0 360

-10 -1 +1 +10

SET ZERO

head_pitch

691030/32

0°

0 360

-10 -1 +1 +10

SET ZERO

LEFT ARM // STEPPER

left_shoulder_pitch

012/013

3°

0 360

-10 -1 +1 +10

SET ZERO

left_shoulder_roll

010/011

2°

0 360

-10 -1 +1 +10

SET ZERO

left_shoulder_yaw

02/03

4°

0 360

-10 -1 +1 +10

SET ZERO

left_elbow

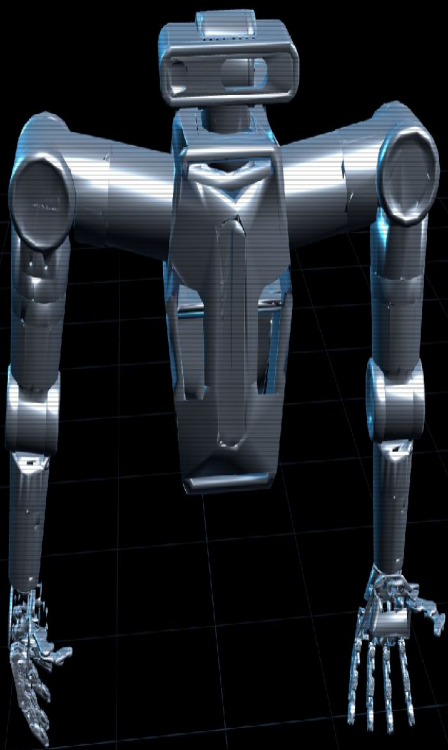
00/04

7°

0 360

-10 -1 +1 +10

SET ZERO



DRAG ORBIT - WHEEL ZOOM



**“MY DREAM OF BECOMING
A DEAF PILOT CAN FINALLY
COME TO FRUITION.”**

— A LEARNER, DURING PILOT TESTING · ZEROBIONIC AFRICA

*Everything else in this talk exists to make that
sentence possible, with the power out.*

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