

A stylized, flat-design illustration of a mountain landscape. In the background, a large yellow sun is in the top left corner against an orange sky. Below the sky are blue mountains, with the highest peak covered in yellow snow. In the middle ground, a silhouette of a hiker wearing a cap and carrying a large backpack is walking on a winding brown path towards the right. To the left of the hiker, a small brown Sasquatch is walking away. Behind the Sasquatch and hiker, a city skyline with several colorful buildings (orange, green, and blue) is visible. The foreground consists of dark blue and green rolling hills. The text 'ODTUG' is in white, bold, sans-serif font, positioned above 'KSCOPE' which is also in white, bold, sans-serif font. The number '26' is in a colorful, multi-colored geometric pattern. Below the main title, the text 'DENVER · JUNE 14 - 18' is in white, bold, sans-serif font.

ODTUG KSCOPE 26

DENVER · JUNE 14 - 18

● KSCOPE 26 · DENVER

Awakening JARVIS.

A 5-year odyssey to wise, conscious buildings.

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THE QUESTION

What if your
building
could *think*?

Not just react. Not just automate. Actually understand you.

2019

It started with a dream.

- Fully data-driven from day one.
- Smart building, connected to a smart city.
- A place where ideas come to live.
- Built with love. God is in the detail.



THE PLACE

Leuven, Belgium.

A real home. A real office. A real test bed.

5 min

to the university

4 min

to the forest

14 min

to the city center

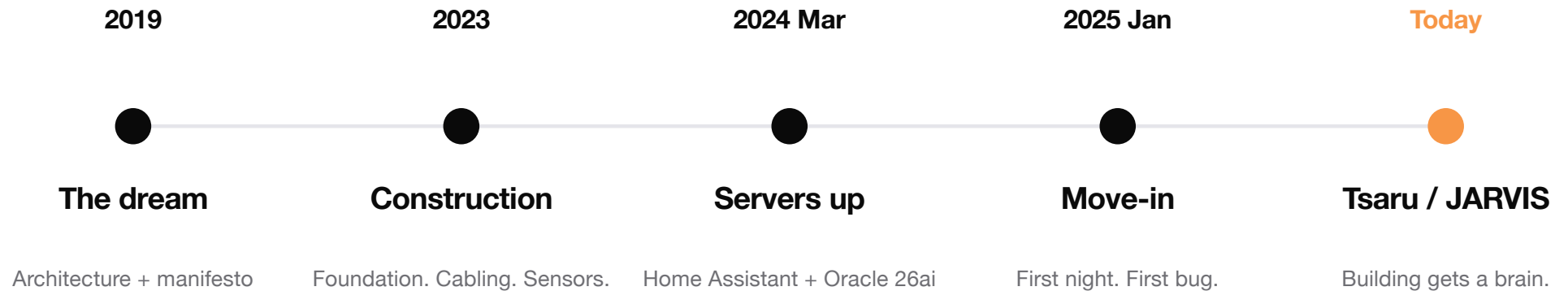
20 min

to the airport

Combo house + office. Residential by design. Smart by intent.

FIVE YEARS

From blueprint to consciousness.





AND THEN WE BUILT IT

Real walls. Real wires. Real sensors.

Five years of decisions you only see when something breaks.



BEFORE THE WALLS

We made a digital twin first.

A full 3D scan of every room — the house existed in data before it existed in concrete.

THE HARDWARE REALITY

“Smart” has a **machine room.**



Sensing

Air quality, temperature, occupancy, water, light



Vision

Cameras, fire detection, access control



Energy

Solar, battery, HVAC, appliances



Audio

Microphones, audio, TVs, touch screens



Compute

AI · Home Assistant · Oracle 26ai



BY THE NUMBERS

The instrumented home.

19,000+

Home Assistant entities

every switch, sensor, lamp, device

5

years of continuous data

longitudinal, real, lived

100+

physical sensors

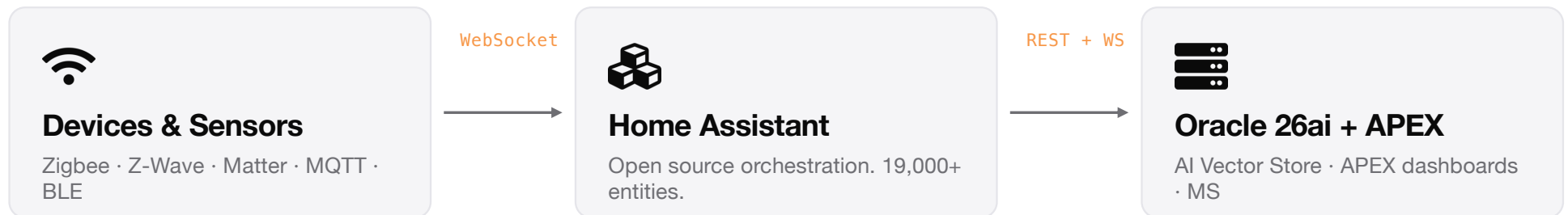
across 3 floors and outside

1

house, no cloud lock-in

your data stays in your walls

From sensors to APEX, in one breath.

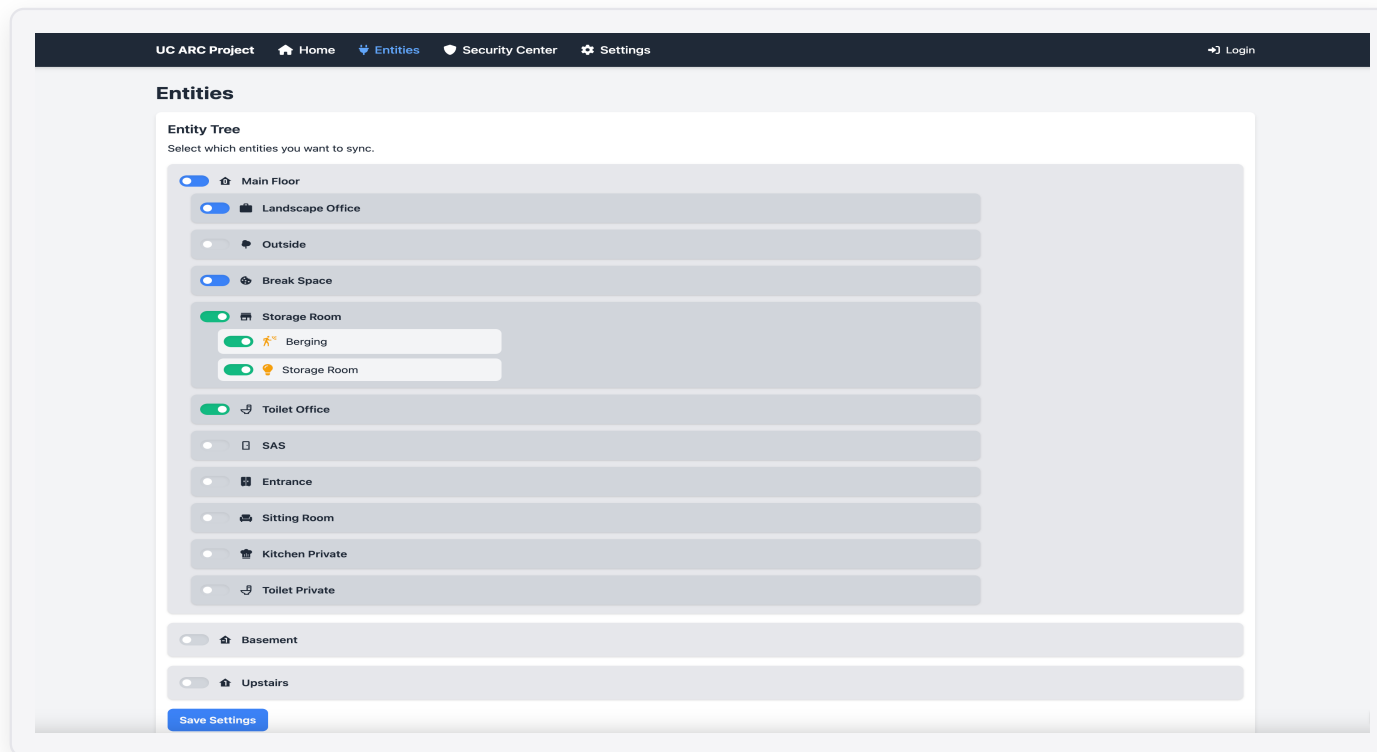


UC ARC Addon · the bridge we wrote

DEMO

UC ARC, in APEX.

Pick what to sync. Per room, per entity, per house.



AND THEN ...

Nothing happened.

19,000 entities. Beautiful dashboards. Endless data.

And nobody used it after week two.

THE REALIZATION

Connectivity $\neq$ Intelligence

What we built

- Devices that talk to each other
- Rules that fire on triggers
- Dashboards that we ignored

What we needed

- **A system that understood context**
- **Intelligence that anticipated needs**
- **A companion, not a control panel**

THE NEW MISSION

From

smart
buildings



To

wise
buildings with consciousness

They don't just respond. They understand. They remember. They care.

INTRODUCING

• Tsaru.

The human companion for smart living.

Local

your data, your walls

Multi-agent

one brain, many specialists

Open

built on Home Assistant

THE ONE BELIEF

Trust is the product.

Not engagement. Not attention. Presence.

What we refuse

- Exploiting loneliness
- Maximising attachment
- Engineering addiction
- Treating people as data

What we protect

- Autonomy and growth
- Privacy by architecture
- Presence over interaction
- The user always in control

Three intelligence layers.

Coordinated by one orchestrator. Running locally.



ENVIRONMENT

Environment Agent

Reads sensors. Optimizes the room.
Light, air, occupancy, comfort.



ORGANIZATION

Schedule Agent

Plans your day. Anticipates needs.
Calendar, routines, suggestions.



INTERACTION

Presence Agent

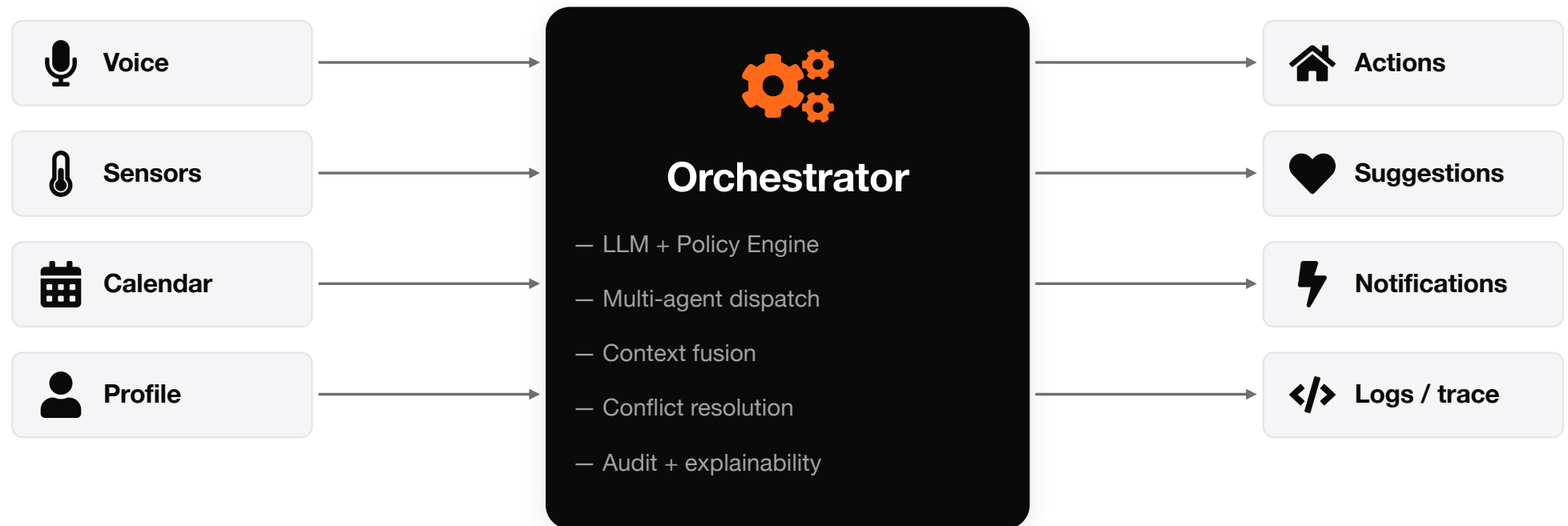
Talks to you. Learns who you are.
Voice, emotion, presence.

ORCHESTRATOR

THE BRAIN

The Orchestrator.

Where probabilistic AI meets deterministic decisions.



IT GETS BETTER

It learns. Quietly. Locally.

Observe

Sensors, voice, routines, time of day.

→ Infer

Patterns, preferences, rhythm — per person.

→ Act

A suggestion, an adjustment, or silence.

→ Adapt

Your response tunes the next decision.

The loop runs on the Brain. Your patterns never leave the house — no two homes converge to the same model.

THE SENSES

Hearing, speaking, seeing.

Speech-to-text

Wake word → on-device STT → intent.
The Orchestrator turns words into actions, never a cloud round-trip.

Audio streaming

Mic arrays across the house. Sound levels, events, even BirdNet in the garden — streamed locally.

Video streaming

Camera feeds and low-light vision for presence. Frames are processed on-device and never uploaded.

Capture local. Process local. *Stream only inside your own walls.*

RAG: answers from its own knowledge.

Ingest

Manuals, docs, device PDFs, history.

→ Embed + store

Vectors in Oracle 26ai — vector, JSON, relational, one DB.

→ Retrieve

Pull only the passages that matter, per question.

→ Generate

Local LLM answers, grounded in your house.

“How do I maintain the Sage coffee machine?” — answered from the building’s own manuals. That’s the ‘Ask Philip’ demo.

WHY LOCAL

Your home shouldn't phone home.

0%

cloud dependency

Voice. Vision. Context. All on-device.

100%

yours

Ownership-first. Ask “what do you know about me?”

<1.5s

voice → action

P95 latency, end-to-end. No round-trip.

GDPR

by design

DPIA, EU AI Act, NIS2-compliance baked in.

Make probabilistic AI behave deterministically.

THE PROBLEM

Same input. Different output.

- “Turn on the light” works at 9am
- “Turn on the light” fails at 9pm
- Hallucinates a non-existent device
- Skips the safety check entirely

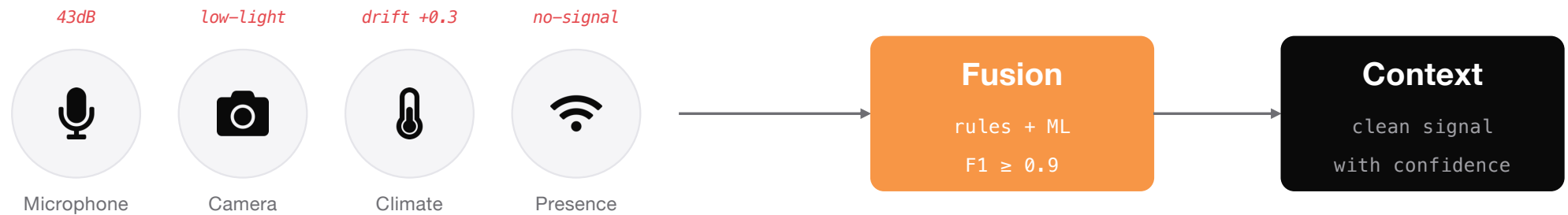
OUR ANSWER

LLM proposes. Policy decides.

- 30+ explicit policy rules
- Forced JSON schema on every intent
- Deterministic conflict priority
- >80% reproducibility across 3 runs

Sensors lie. All of them.

Noise. Drift. Conflict. Each sensor sees a fragment.



Three time windows (1m, 10m, 1h). One unified context object. Per room, per moment.

Specialists who talk past each other.

Three agents. One decision. Sometimes they disagree.

SCENARIO

It's 22:47. Living room is dim. Voice says "put on something to relax".

Three agents fire at once. Each has a different opinion.

Environment Agent

"Dim lights to 20%. Warm 2700K."

Schedule Agent

"Calendar: 7am meeting. Suggest sleep."

Presence Agent

"Voice tone: tired. Skip the music."

Orchestrator resolves: dim lights · play soft ambient · skip notifications.

Priority: user state > schedule > preference. Trace logged.

WE HOLD OURSELVES TO THIS

The numbers, on edge hardware.

<1.5s

voice → action (P95)

<60%

CPU sustained

<70%

RAM of 4 GB

<10W

energy / 24h

≥0.9

presence F1-score

>80%

decision reproducibility

100%

decisions traced

0%

diagnostic LLM output

THE STACK

Built on what already works.

Hardware	Mini-PC (ARM/x86) · NPU · Mic array · Camera (opt.)
Runtime	Linux · Docker · Redis Streams · gRPC
Integration	Home Assistant · Matter · Zigbee · Z-Wave · MQTT
AI / ML	Local LLM · STT · Vision · Time-series · Vector DB
Orchestration	Policy engine · Multi-agent dispatch · Audit trail
Data	Oracle 26ai (Vector / JSON / Relational)

Code, in case you were wondering.

```
orchestrator.py

# Voice arrives. Orchestrator builds context, asks LLM, validates.
async def decide(utterance, context):
    intent = await llm.extract(
        utterance, schema=IntentSchema, profile=context.user
    )

    # Hybrid: probabilistic proposal, deterministic guard.
    plan = planner.compose(intent, context.fused_signals)
    guard = await policy.evaluate(plan, context)

    if not guard.allowed:
        return guard.fallback(reason=guard.why)

    audit.log(intent, plan, guard, trace_id=context.id)
    return executor.dispatch(plan) # < 1.5s budget
```

LIVE

Three demos. All live.



Everything you just saw as architecture — now actually running.

LIVE · DEMO 1

Ask JARVIS something hard.



The 22:47 scenario, live: watch the proposal hit the policy guard — and land in under 1.5s.

Walk the house, end to end.



19,000 entities, the UC ARC dashboard, and an AR walkthrough — all running locally.

Ask the building anything.



RAG over its own manuals and docs: “How do I maintain the Sage coffee machine?” — answered locally.

PHASE TWO

Then: from one building to many.

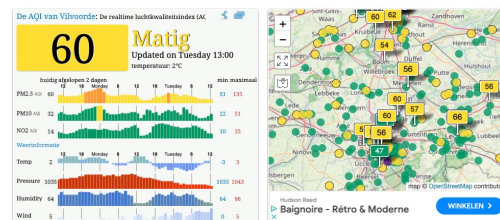
Same architecture, aggregated and anonymized. Privacy never leaves the home.



Sound

Where is the city loud, when, and why?

Luchtvervuiling van Leuven: realtime luchtkwaliteitsindex (AQI)



VOORSPELLING VAN DE LUCHTKWALITEIT



Air quality

Real-time AQI, neighborhood by neighborhood.



Wellbeing

Saying hello makes people happier. Measured.

FOR THE APEX CROWD

Why Oracle 26ai + APEX.



One database, every shape.

Vector + JSON + Relational + Graph. AI Vector Store native.



Runs on-prem & in the cloud.

Same engine in the house, in the rack, on OCI.



APEX = dashboards in hours.

Domain-specific UI, fast. The control panel writes itself.



Same platform, home → city.

From one house to a fleet without changing the data layer.



Mature, scalable, boring.

Boring is a feature when the lights need to come on.



Long-term ergonomics.

Schema evolution, backups, observability — built-in, not bolted.

BUILD IT YOURSELF

Where to start.

The open foundation

- Home Assistant (open source)
- Oracle 26ai + APEX (free tier)
- Matter, Zigbee, Z-Wave, MQTT

What we built on top

- UC ARC — the HA ↔ APEX bridge
- Tsaru Core — the Orchestrator
- A policy engine + audit trail

Your first steps

- Instrument one room
- Sync only what you need
- Put a policy guard before the LLM
- Log every decision

Start with one room and a policy engine. *Grow from there.*

What we learned the hard way.

- 01** **Connectivity is not intelligence.**
Wiring everything together is the easy 80%.

- 02** **Probabilistic AI needs a deterministic guard.**
Ship a policy engine. Always.

- 03** **Local AI is finally good enough.**
And it earns trust the cloud never could.

- 04** **Multi-agent $\neq$ multiple agents.**
It's the orchestrator that's the product.

- 05** **Build for the 10-year mode, not the demo.**
Boring infra wins. APEX, Oracle, Home Assistant.

PHASE THREE

One day, on Mars.

*If JARVIS can run a home in Leuven,
it can run a habitat anywhere.*

(Not joking. Mostly.)

THE NAME, FINALLY

“Tsaru” means **hello**.

Hello, World.

The first thing every system says when it wakes up.

QUESTIONS, PLEASE

Thank you.

Now — what would you ask JARVIS first?

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