



FRI3D
CAMP

How does a digital-voice-
assistant actually work?

| Jürgen Pabel

About me

- I am a hacker/maker
- I work as an IT-Security manager
- I have way too much stuff from dead projects
 - Free HW: Camping field 2 (near the end)



Digital voice-assistants: Intro

- Act upon (presumably natural) voice commands
- Hardware and/or Software
- Capabilities
 - General knowledge (=> internet)
 - User context actions (=> smartphone & -home)
- Why?

Digital voice-assistants: History

- 2011 Siri (Apple), Watson (IBM)
- 2012 Google Now (Google)
- 2014 Alexa & Echo (Amazon)
- 2015 Cortana (Microsoft)

Digital voice-assistants: Ingredients

- Wake-word-detector
- Speech-to-text (SST)
- Intent-parser
- Skills
- Text-to-speech (TTS)

Usually „in the cloud“

Digital voice-assistants: History

- 2011 Siri (Apple), Watson (IBM)
- 2012 Google Now (Google)
- 2014 Alexa & Echo (Amazon)
- 2015 Cortana (Microsoft)
- 2022 HAL9000 (me)

HAL9000: Project goals

- A digital voice-assistant that...
 - is actually usable (response time, error rates, ...)
 - performs everything on-device („look ma, no cloud“)
 - is entirely Free/Libre Open-Source-Software
 - is as-easy-as-possible to build (make/buy & assemble)
- Not specifically a goal: price (although somewhat reasonable at 120-200€, depending on selection of components)

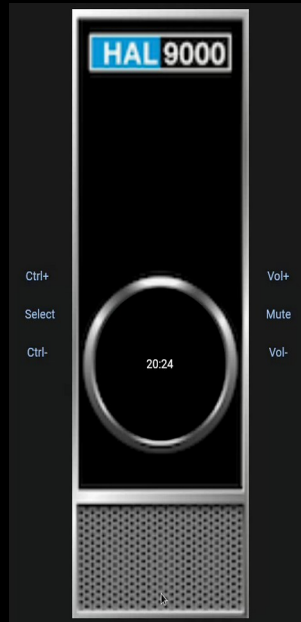
Demo-Time



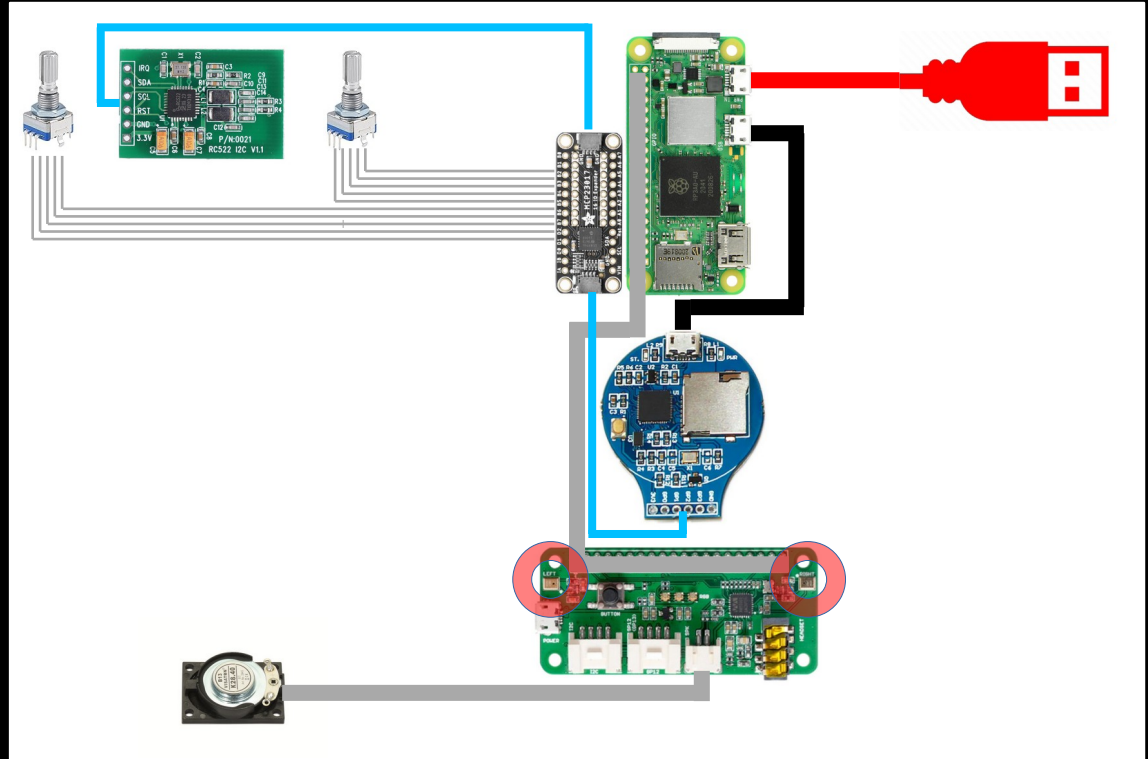
Artwork: <https://github.com/armel/HAL9000/>
<https://www.jcheudin.fr/playground/playground/ha19000/>

Legal disclaimer: Some audio material used in the demo is not part of the project due to copyright/legal issues.

Demo-Backup: HTML Frontend



Electronics: Overview

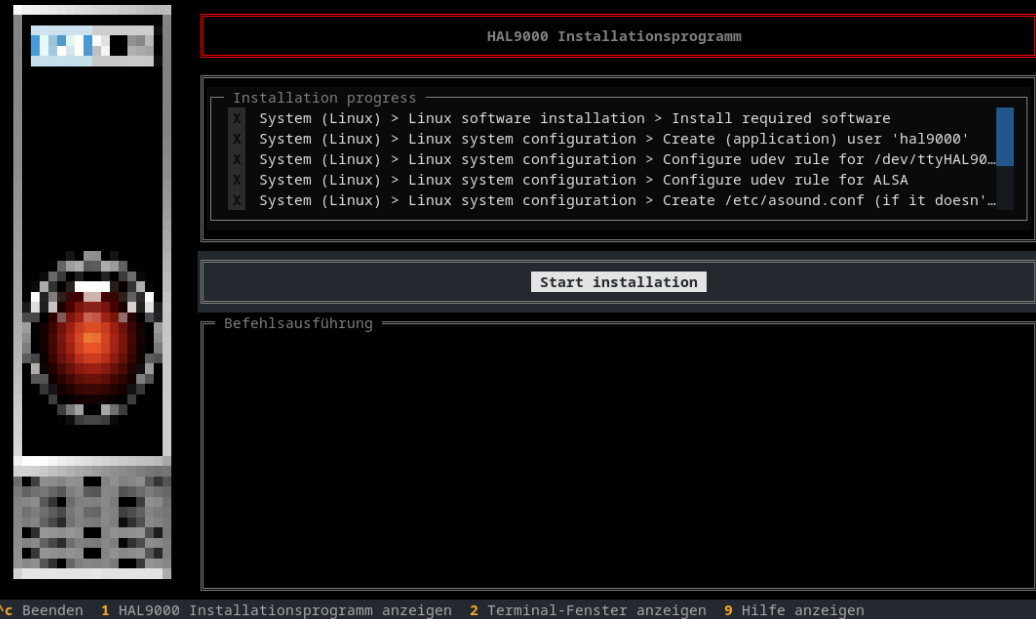


Software: Overview

- Linux
 - kalliope (remember the „ingredients“? this is it)
 - frontend (browser: flet, arduino: /dev/ttyHAL9000)
 - brain (coordinates kalliope with UI appearance)
 - console (admin/mgmt interface)
- Arduino
 - UI & inputs
 - C++ with ETL and ~100% statically allocated memory
 - Minimal set of lib_deps (~10, all from pio registry)

Software: Installer

- Click...click....done-installer
- English and german demo configurations
- Terminal UI



Project-Goals: Review

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Workshop

- Today 13:00-15:00
Camping field 2



- Play with HAL
- Tear HAL apart (...and put him back together)
- Ask me questions...

Questions?

Have a go at it!

- What are you waiting for?
 - <https://github.com/juergenpabel/HAL9000/blob/master/resources/hardware/BOM.md>
 - <https://www.printables.com/model/218766-hal-9000>
 - <https://github.com/juergenpabel/HAL9000-installer/>



That's all folks!

Thank you!