Raspberry Pi Single-Board Computers for Testing: How Berry Traces have Changed our Lives

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Background

- Product
  - Software for in-vehicle Infotainment Systems
    - navigation, audio, video, online services, speech dialog system
  - Premium systems (asia market)

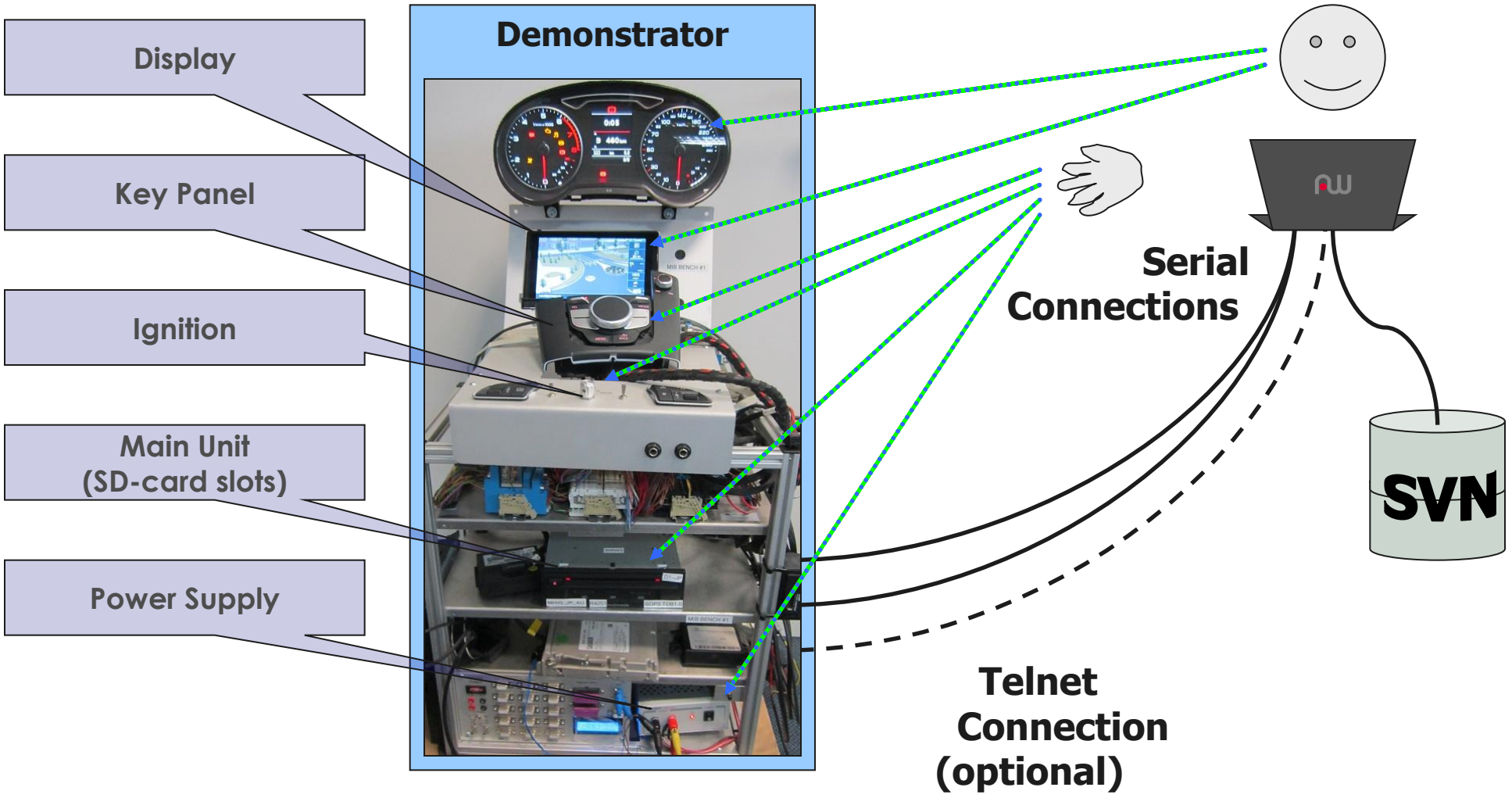
- Tasks
  - Software integration and smoke testing
  - Recording of traces (baseline for later analysis)

- Sponsor
  - AW Technical Center Europe (Munich)
  - Subsidiary of Aisin AW (Japanese automotive supplier)

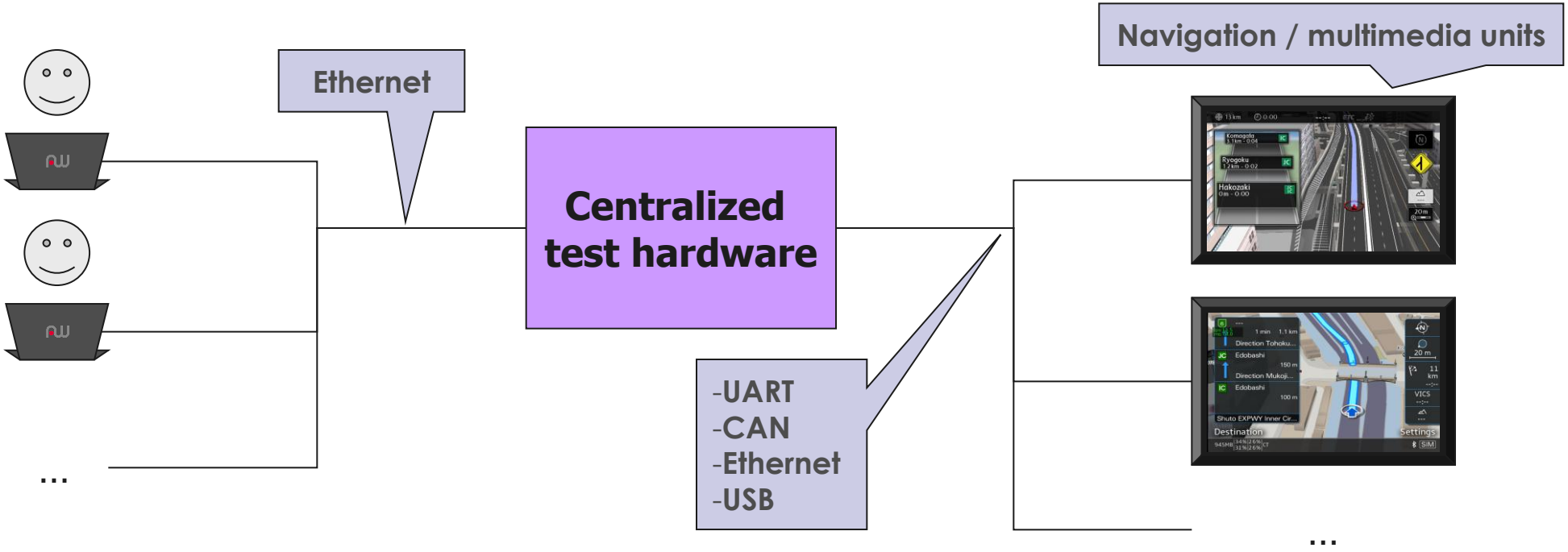
Introduction

- Quantity of releases
  - 4 regions, 5 car manufacturers, different models, overlapping SOPs
  - up to 45 Software releases per week
- Automation of software build and assembly
  - manual integration 8 hours -> 2 hours (human effort)
  - difficult to reduce further
- Automation of testing
  - manual testing takes about 1 hour
    - can be reduced by factor 4
    - functionality can be extended (more traces, more self tests)

Manual testing

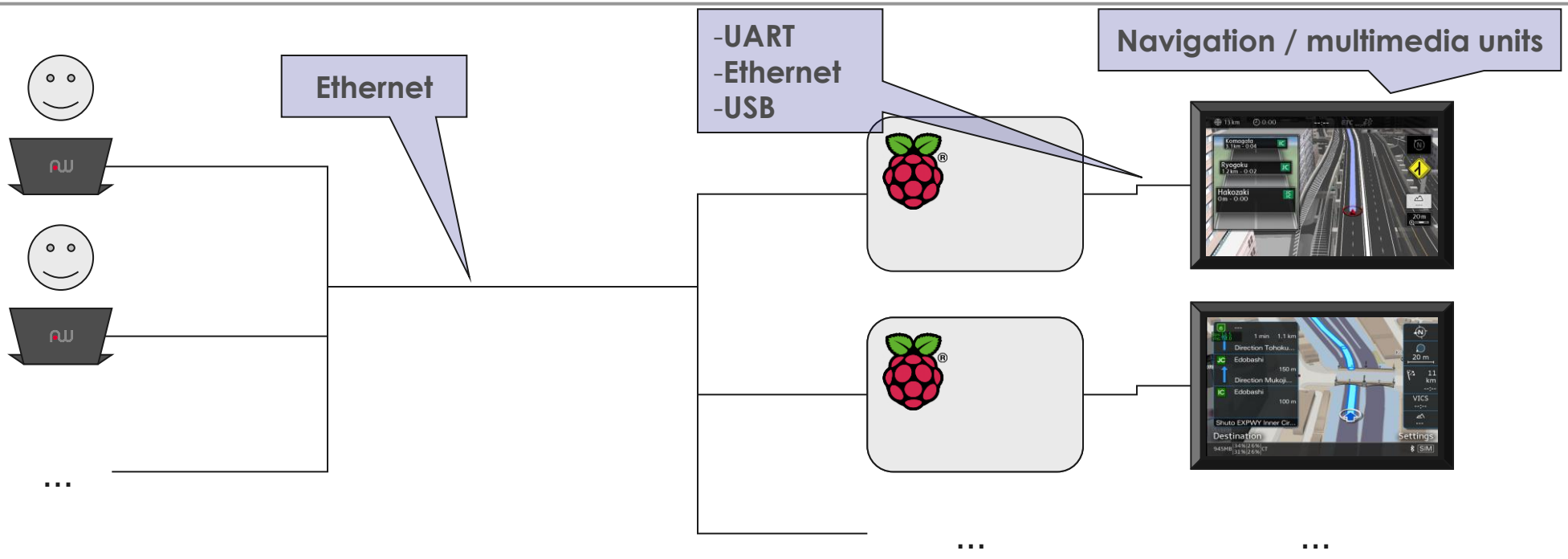


Approach A



- Advantages
  - Already in use
  - Full range of features (frame-grabbing, key-panel-simulation)
- Disadvantages
  - PXI-Hardware: > 20,000 EUR
  - Still requires adaptation effort
  - Outage risk

Approach B



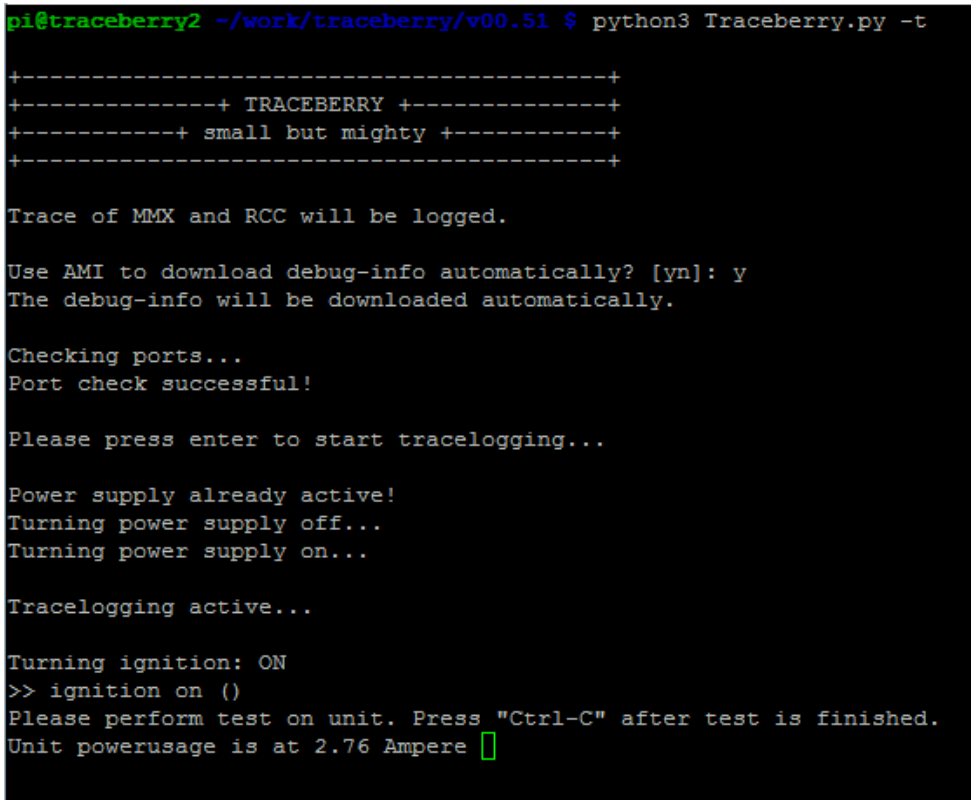
- Advantages
  - Hardware: ~ 350 EUR per demonstrator
  - Distributed system
  - Scalability
- Disadvantages
  - Development: ~ 5,000 EUR
  - Limited features

Implementation 1

- Python
  - pyserial
  - pysvn
  - blends into existing system (mostly in Python)
    - in-house logging modules
    - in-house SVN modules
- Configuration
  - Stores settings for various demonstrators
    - Serial-USB adapters
    - Preferences of the developers
  - SVN structure

Implementation 2

- Classes for logical/physical structures
  - Ignition
  - Power Supply
  - Main Unit
  - SVN
- Main test sequence
  - Connection tests
  - On/Off cycle (Main Unit)
  - Traces / several logs / SVN / …
- Multithreaded tracing and logging



Feature summary

- Low power consumption
  - ~ 30 kWh / year
- Distributed system
  - No single point of failure
- Allows permanent logging
  - E.g. during updates, non-testing activities
- Link to SVN
  - Get SW update from SVN and install update
  - Do test (semi-manually)
  - Put test results and traces to SVN

Outlook

- Additional capabilities
  - CAN/LIN/UART
    - Simulate key panel / touch pad inputs
    - speed signals
  - Image recognition
    - LVDS screen grabber
    - internal screenshots
  - Audio I/O

- New applications
  - automated updates (e.g. new map data)
  - software development
  - main unit configuration utilities