

CON9759

Energy Revolution: **Smart IoT Devices** Enable New Business Models for Utilities

Oracle JavaOne 2015, San Francisco

Dirk-Michael Wagner, Christine Mitterbauer, Andreas Gerstmeier

2015, Oct 28, Hilton Continental Ballroom 7/8/9



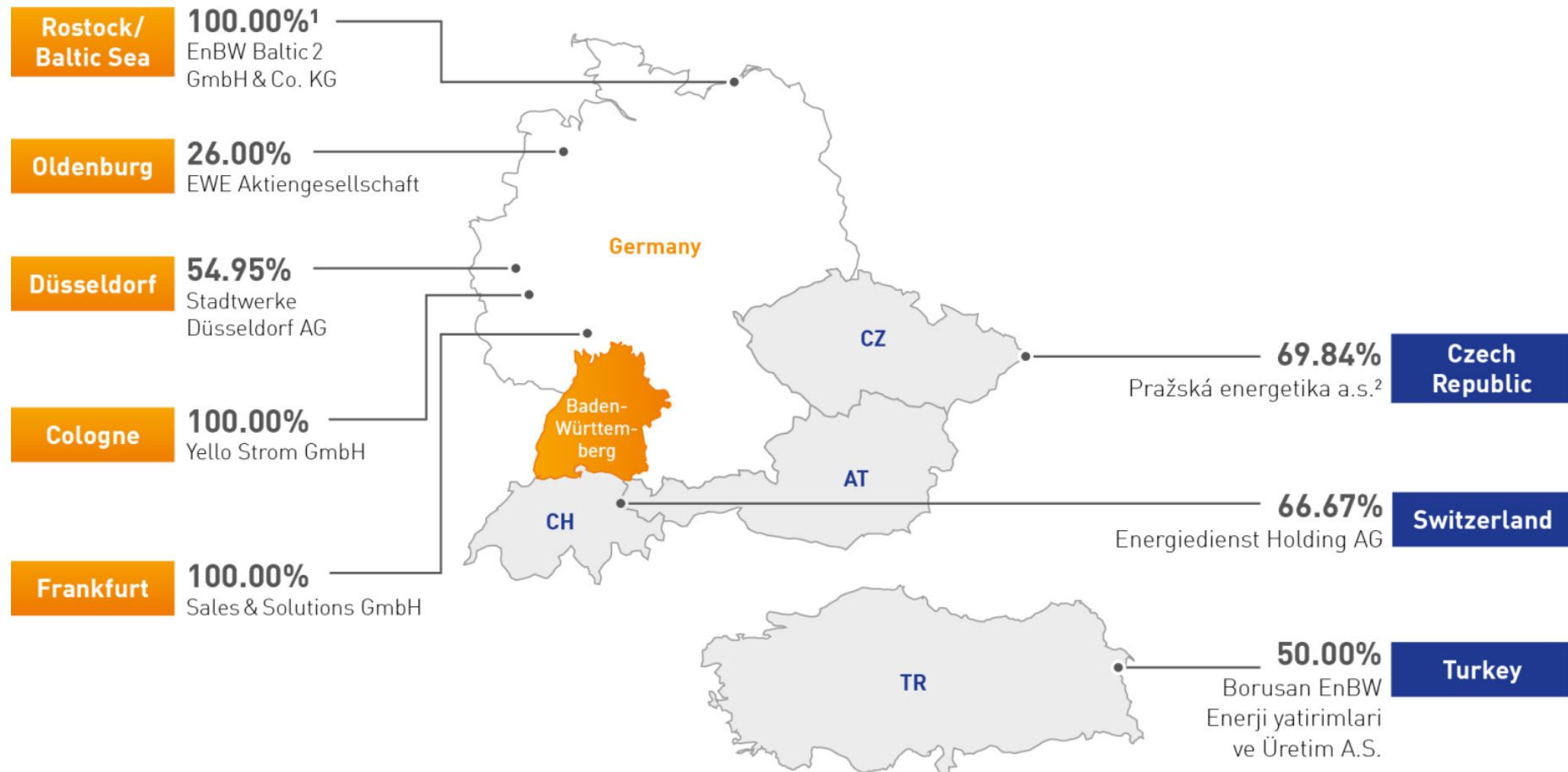
Brief portrait

EnBW Energie Baden-Württemberg AG

- › One of the largest energy companies in Germany and Europe
- › Business segments: Sales, Grids, Renewable Energies, Generation and Trading
- › Revenue 2014: more than €21 billion
- › Customers: some 5.5 million
- › Employees: some 20,000



Business radius and significant investments outside Baden-Württemberg



¹ A contract for sale of 49.89% of the shares to Macquarie Capital was signed. Transfer of these shares is expected in the summer of 2015 following approval under antitrust regulations and the complete commissioning of EnBW Baltic 2.

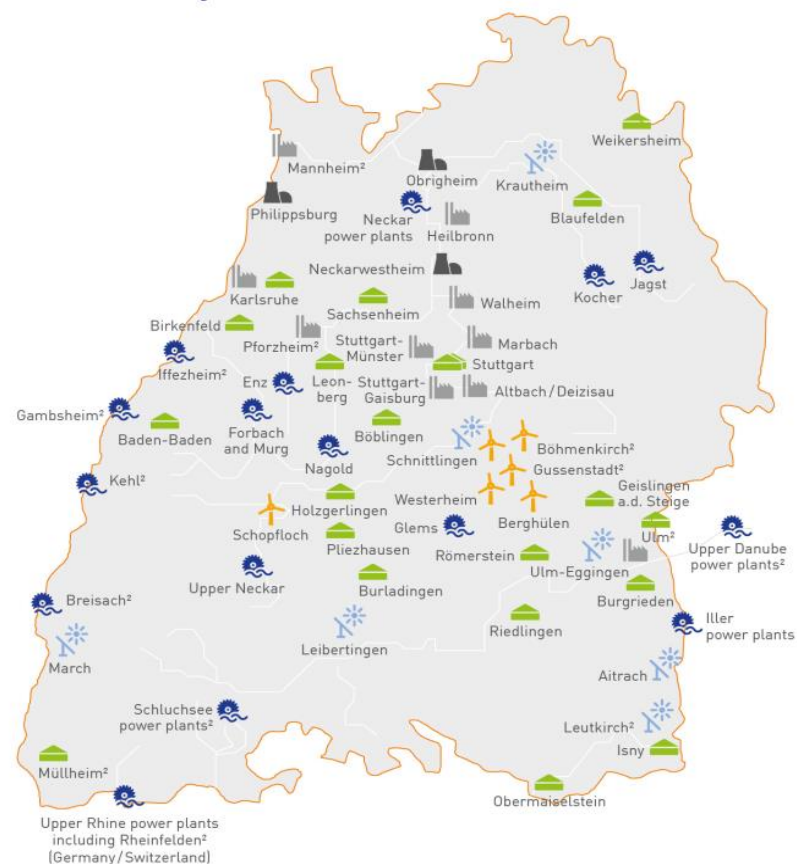
² Directly and indirectly held shares.

Power Generation in Germany

Germany



Baden-Württemberg



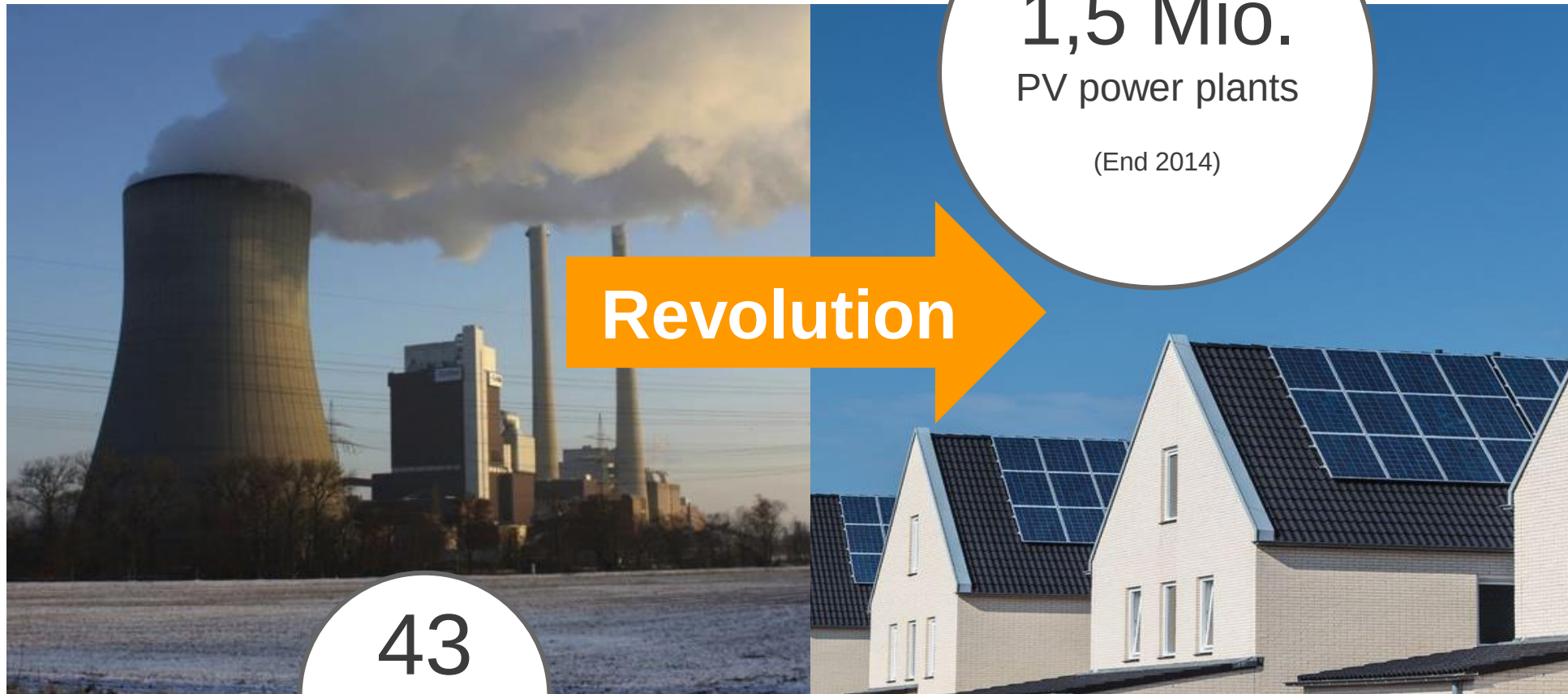
-  Onshore wind farm
-  Offshore wind farm
-  Photovoltaic power plant
-  Hydroelectric power plant
-  Biomass power plant/
bio gas processing
-  Conventional power plant
-  Nuclear power plant

¹ At the planning stage or under construction

² EnBW participation, purchase and supply contracts

EnBW operates around 70 hydroelectric power plants as well as numerous other plants producing power from renewable energies. We have therefore restricted ourselves to a number of major locations.

The German „Energiewende“...



1,5 Mio.
PV power plants

(End 2014)

Revolution

43

Power
plants
> 500 MW

Impact on our business segments...

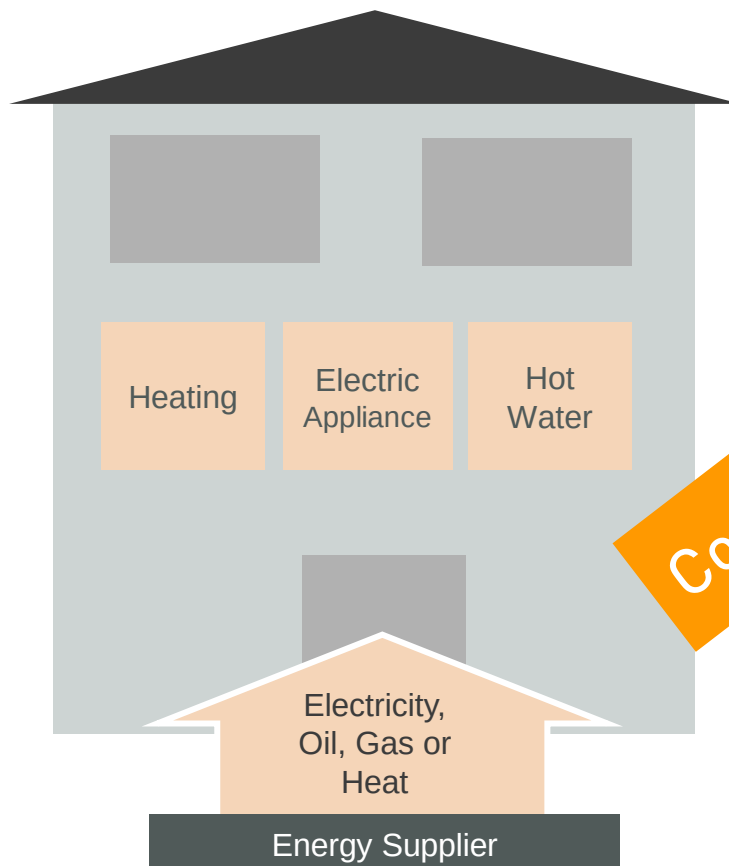


Adjusted EBITDA

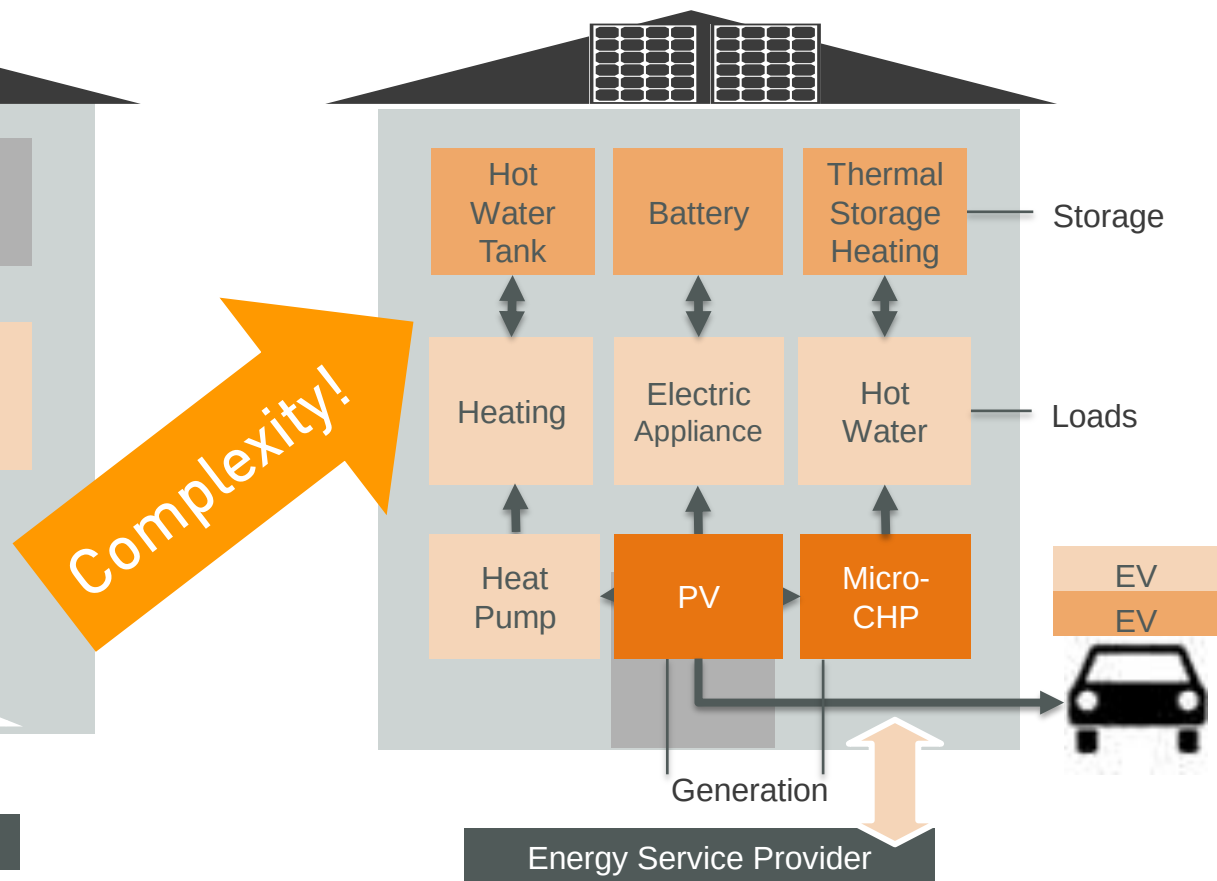


... a challenge for the "Prosumer"

Old World: Simply use energy!



Today: Generation, usage and storage of energy in a local system → "Micro-Utility"



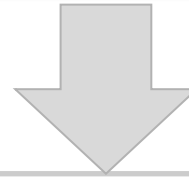
Source: Apricum (lightly modified)

Market Potential



Market Potential in Germany

15.6 Mio. 1-2 family houses

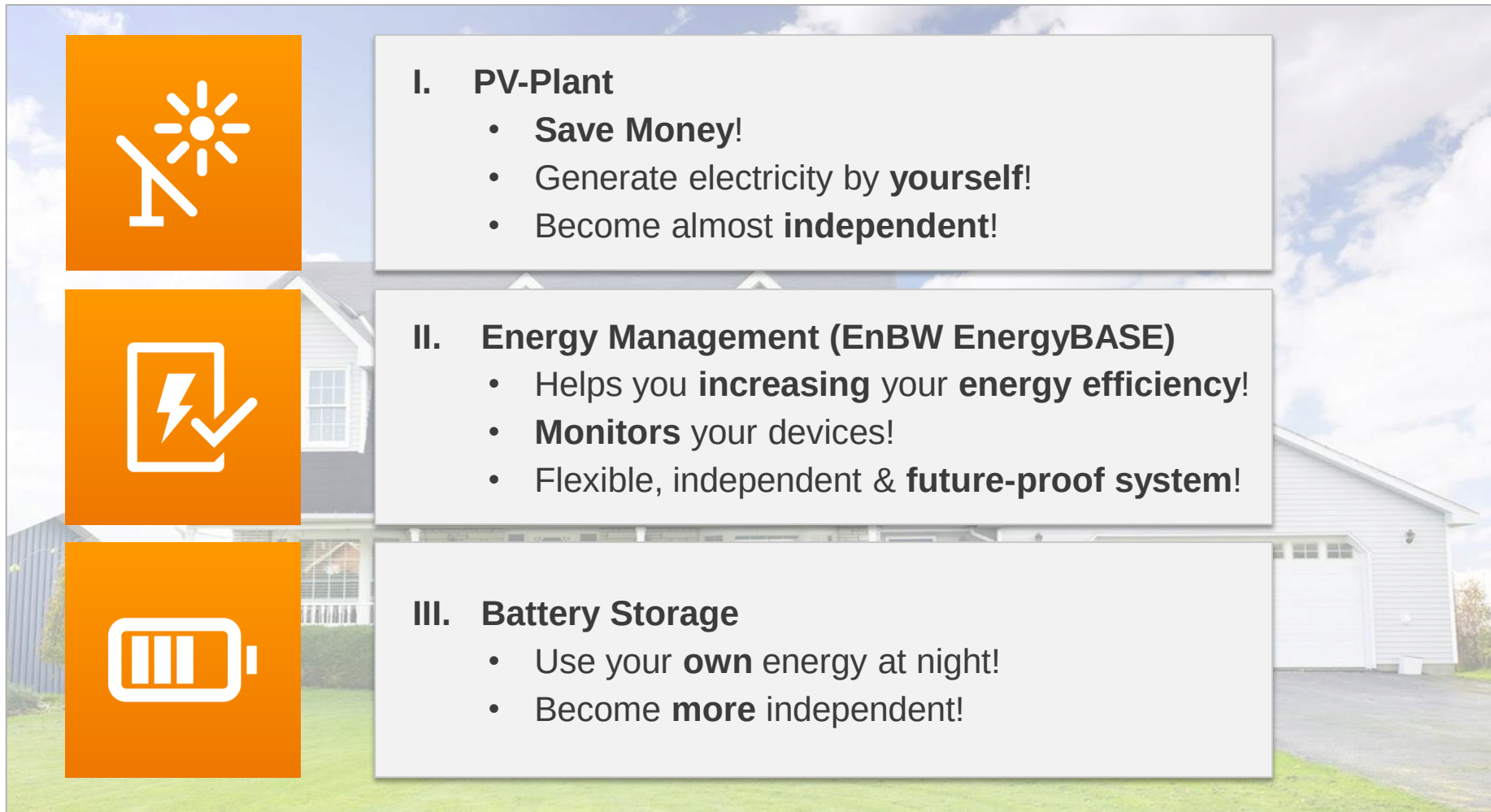


Target Market

4.7 Mio. households in the target market:

- Health- and Environmentally aware behavior
- Sustainable Lifestyle

A smart & simple solution for the customer





I. PV-Plant

- **Save Money!**
- Generate electricity by **yourself!**
- Become almost **independent!**



II. Energy Management (EnBW EnergyBASE)

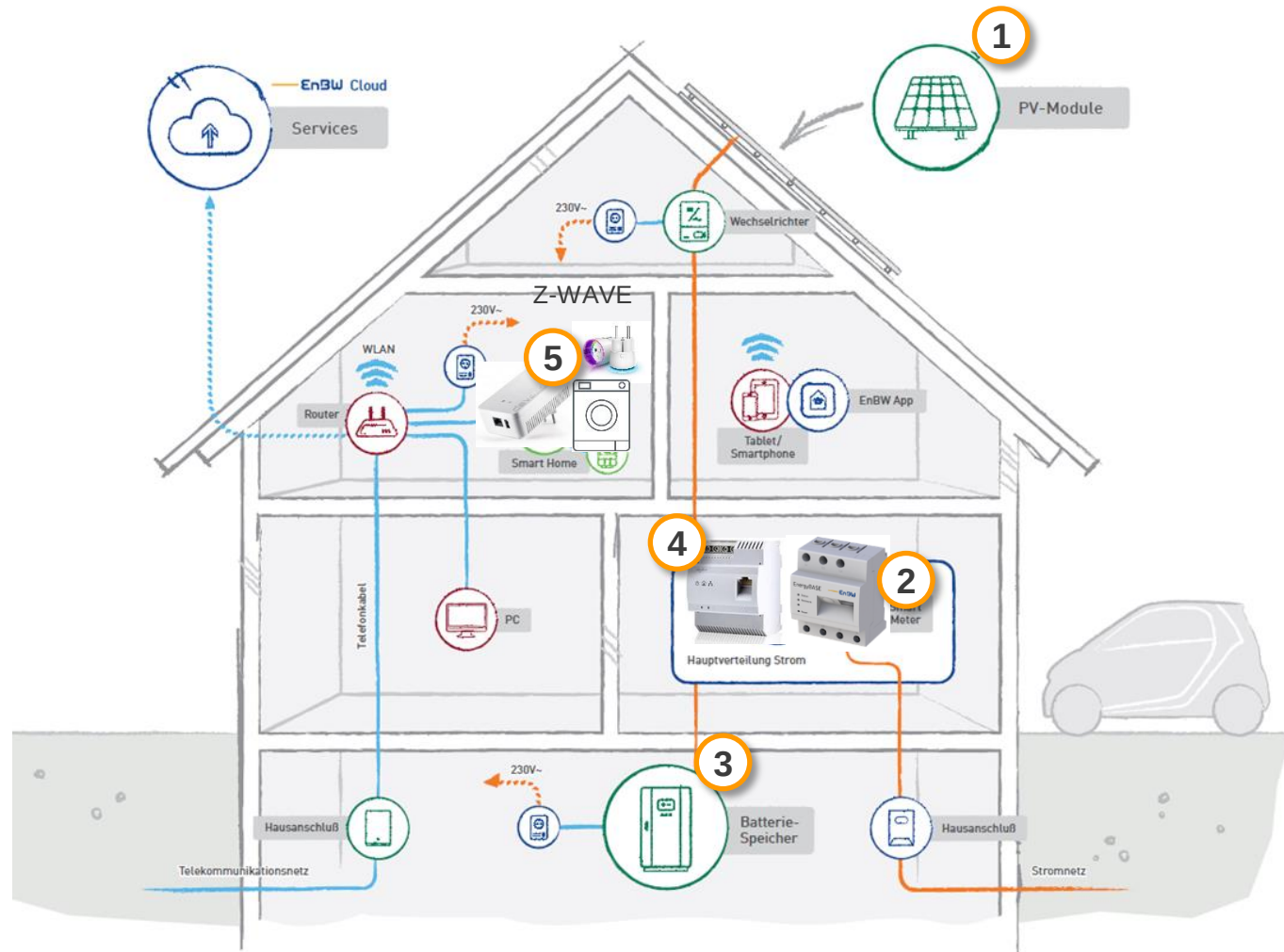
- Helps you **increasing** your **energy efficiency!**
- **Monitors** your devices!
- Flexible, independent & **future-proof system!**



III. Battery Storage

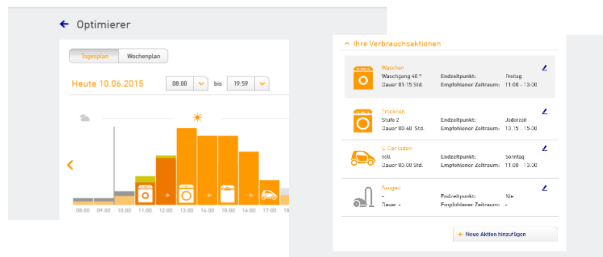
- Use your **own** energy at night!
- Become **more** independent!

How does a typical installation looks like today?



- 1** PV (rooftop) & Invert.
- 2** EnBW EnergyBASE (distribution cabinet)
- 3** Battery Storage
- 4** Communication-Module (Option)
- 5** Power-Plugs (Z-Wave)

The EnergyBASE Services



I. Transparency, Security & Privacy

- Mini SCADA-System: Performance Monitoring, Device Monitoring & Control
- Security and Privacy
→ **Local** data storage and processing!

Basic-Service

II. Energy Efficiency

- Self-learning intelligent algorithms, forecasts
- Optimization suggestions (user configurable)
- Updates, Backup, Remote access

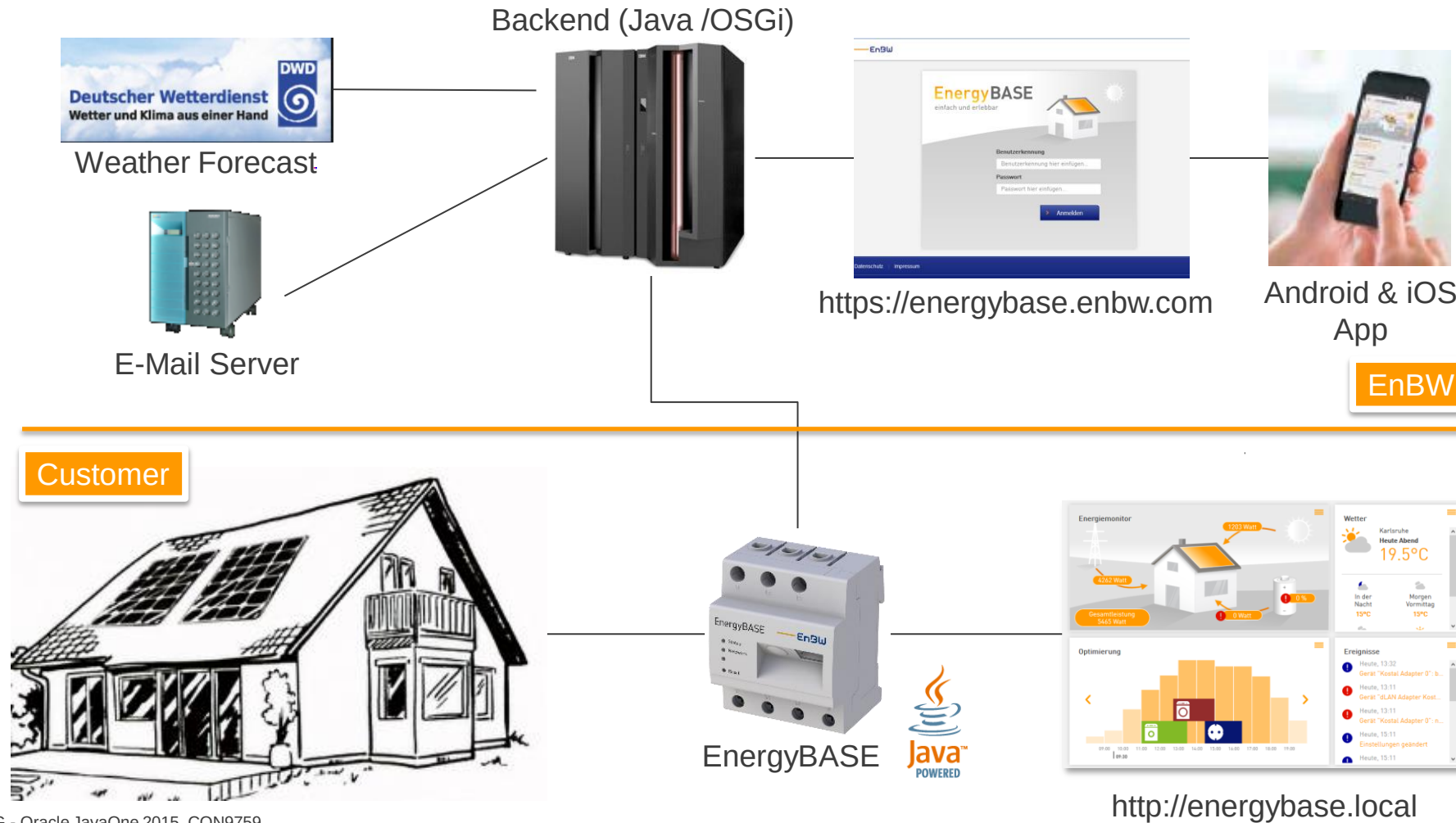
Optimizer-Service

... additional Services...

- EV-Integration, Virtual Power Plant (VPP), CHP-Integration, Assisted Living (AL), ...

NEW Service

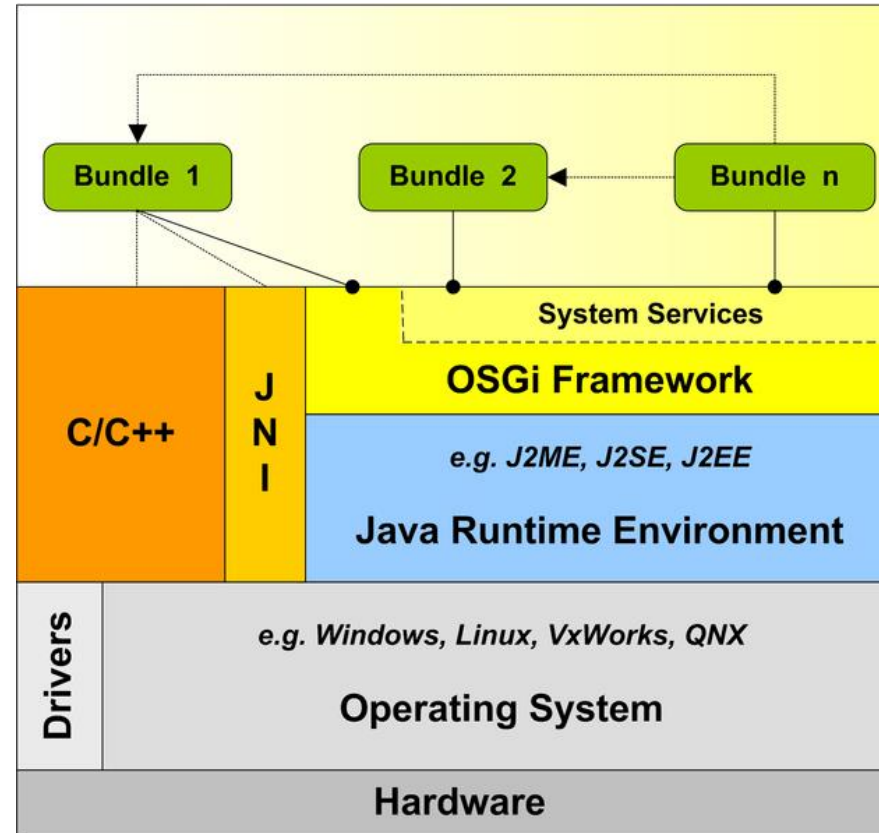
EnergyBASE System Architecture



Chosen approach for this challenge

Our Requirements were...

- 1) Manufacturer independence
 - Hardware & OS
- 2) Proven & highly scalable!
 - Maintenance
 - Provisioning
- 3) Strong partners
- 4) Highly flexible
- 5) Many standard services
- 6) Many software developers
- 7) Large community



Source: wikipedia.de

- Independent Software Vendor and Solution Provider
 - Located in Munich/Stuttgart/Berlin, Germany
- Over 15 years experience in the embedded area
- International customer base
- Experience in multiple application domains
 - Telematics, Automotive, Smart Grid, Smart Metering...
- Oracle OJPI partner since 2014
 - Talk today 11:30 a.m. Hilton Continental Ballroom 6 (CON5106)

Enabling Your Device to Be Part of the IoT



- Java™ Technology Provider
- Experience with large Java/OSGi customer projects in the embedded area
 - Project management
 - Quality assurance
 - Development resources



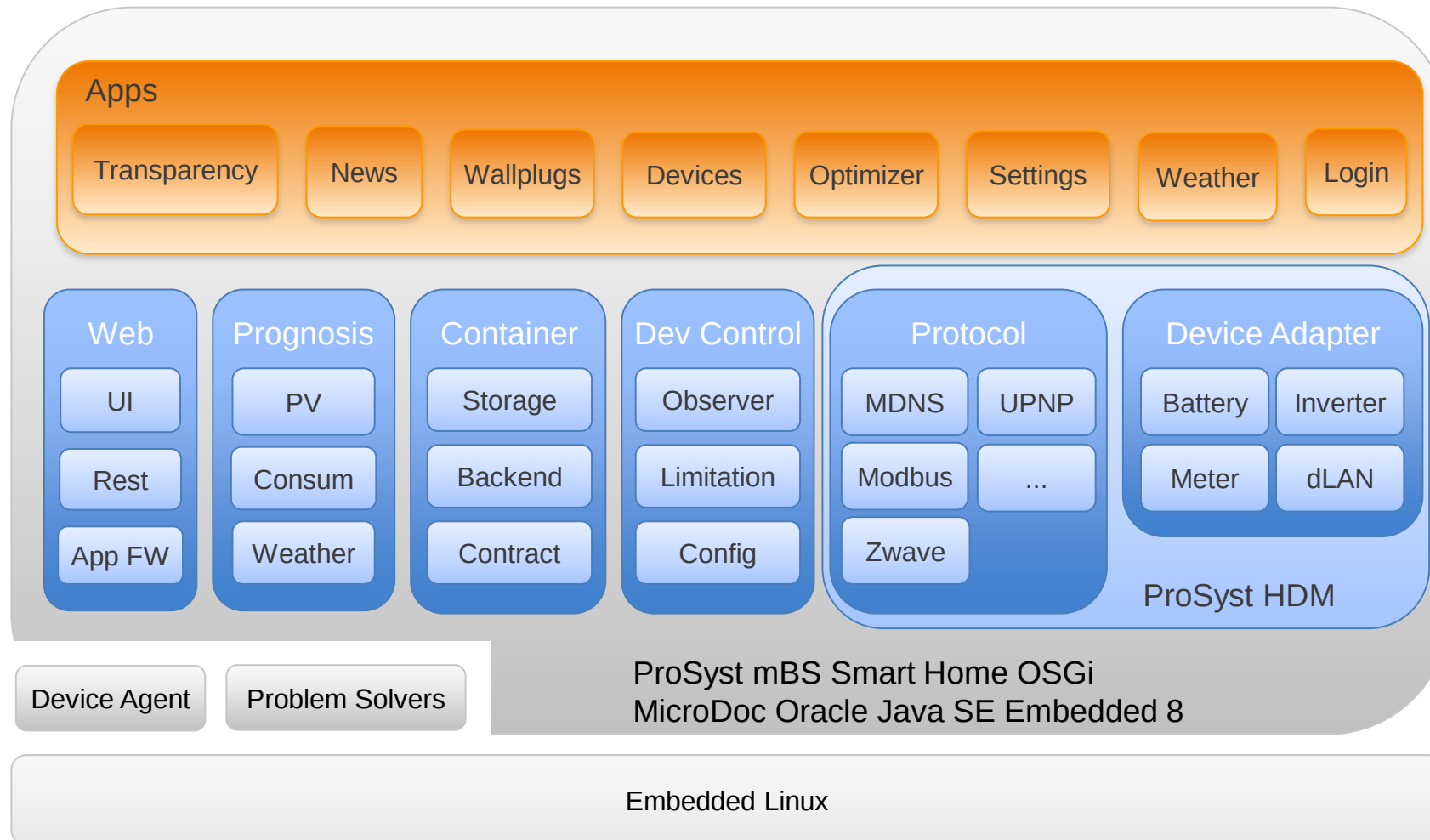
Hardware

- 450 MHz ARM9 processor
- 128 MB RAM / 4GB Flash
- Ethernet & Serial RS485 Interfaces
- Polyphase electric meter

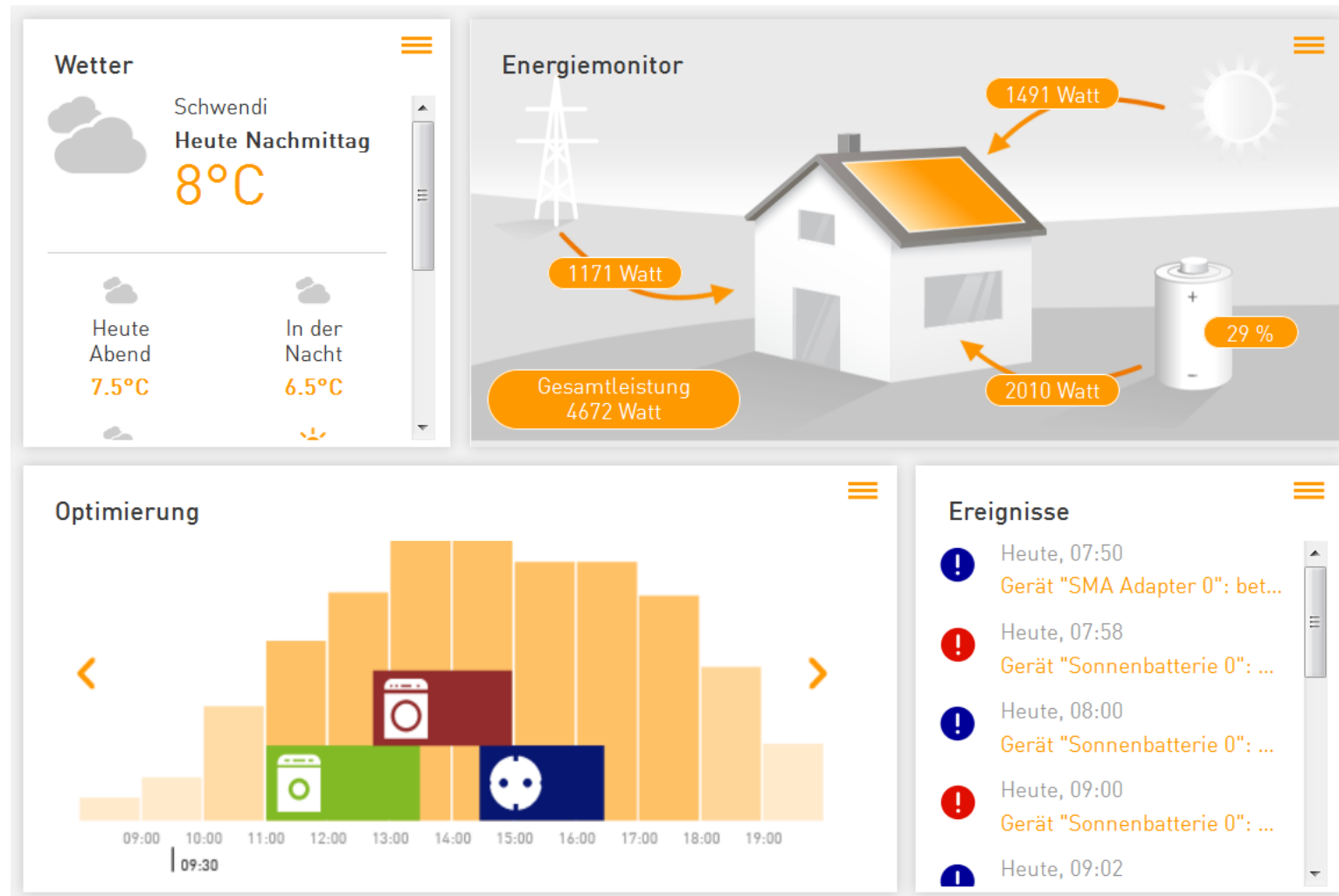
Software

- Embedded Linux
- **MicroDoc Oracle Java SE Embedded 8**

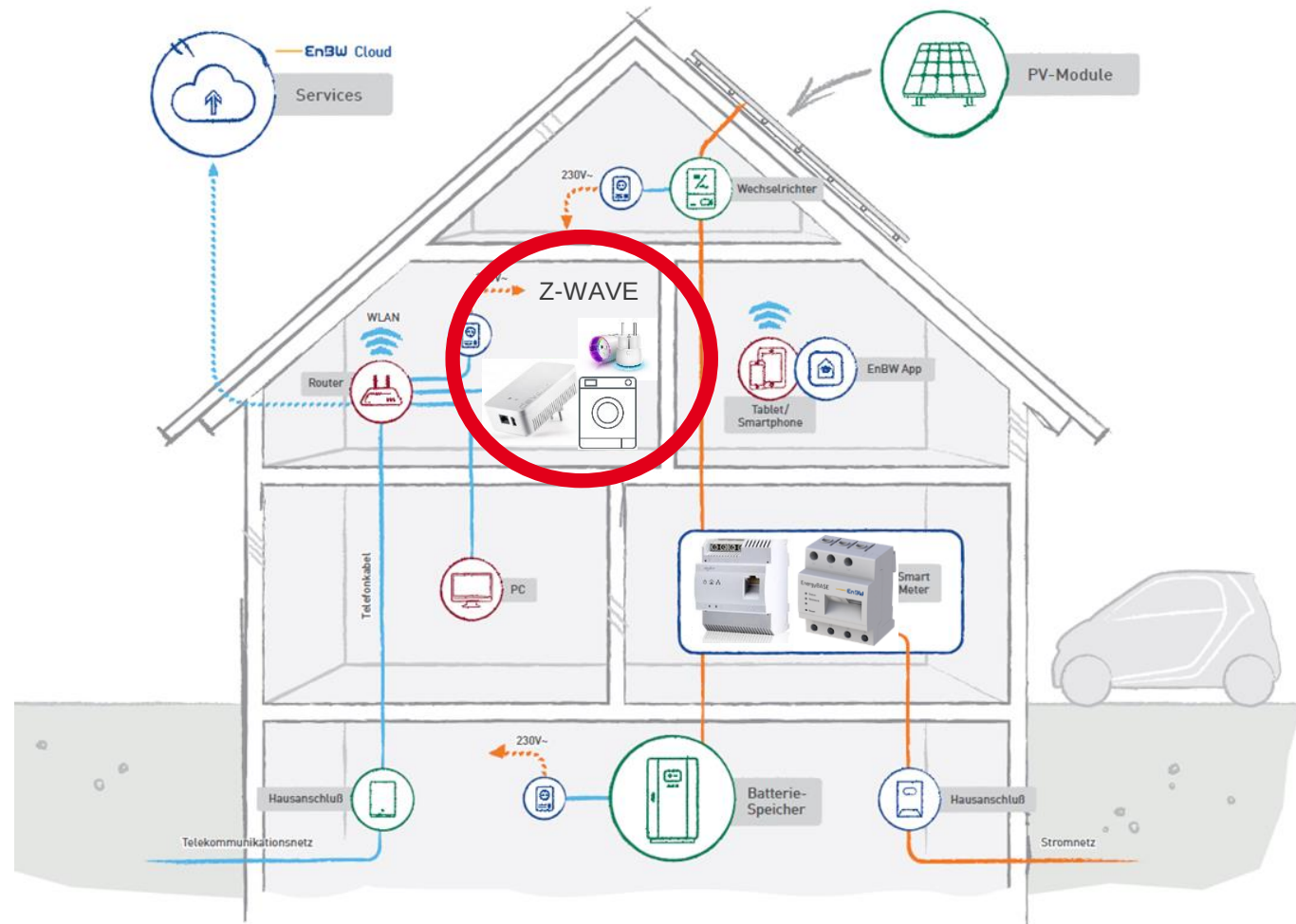
EnergyBASE - Software Architecture



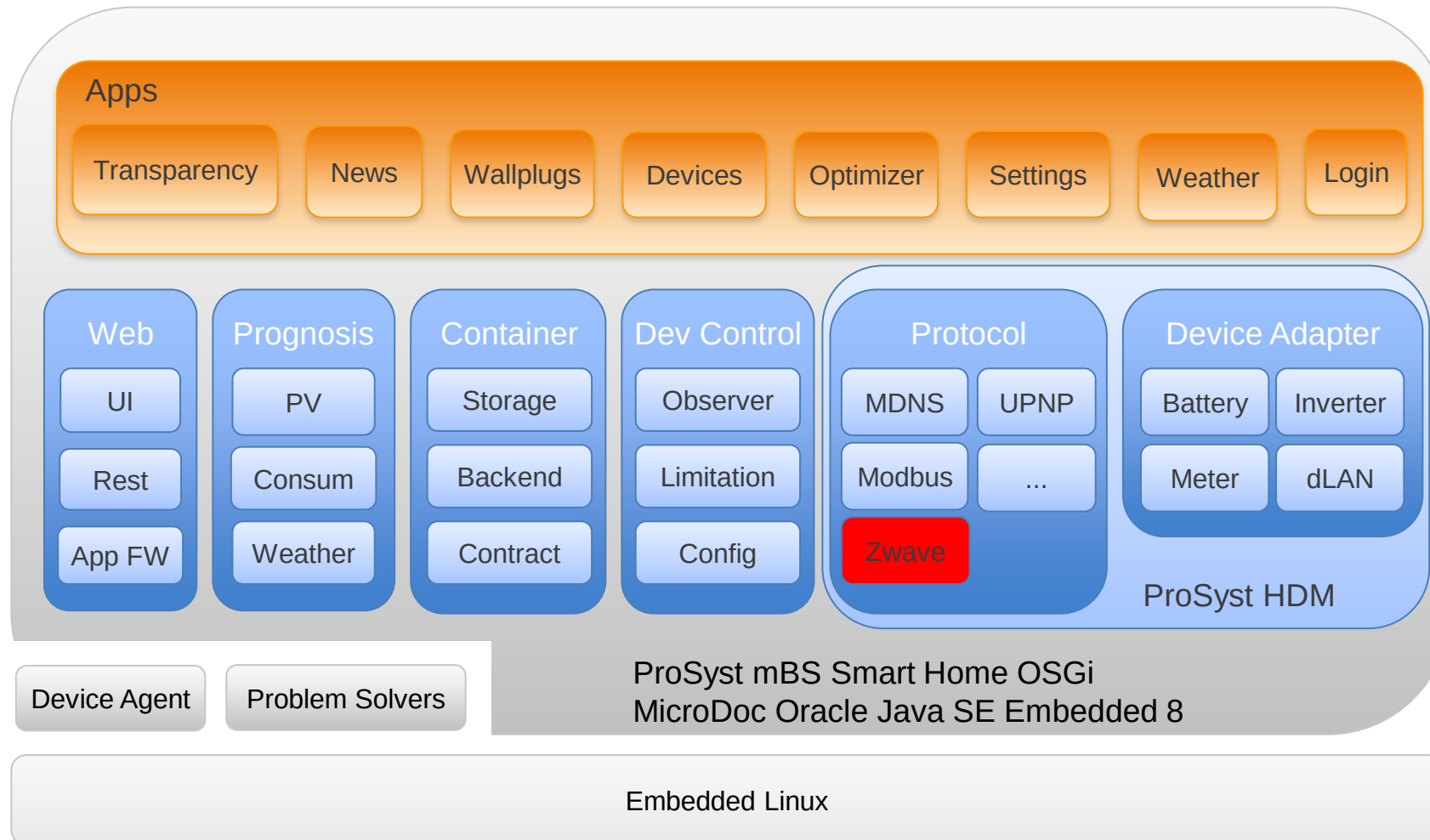
Service- / Apps-based model



Installation in a typical household



EnergyBASE - Software Architecture



IoT – Software Deployment Scenario I

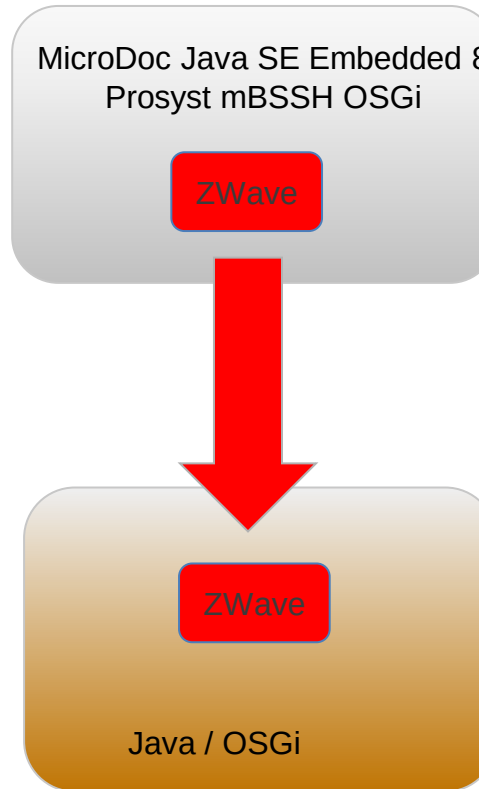
Bundles moved between OSGi-enabled Devices



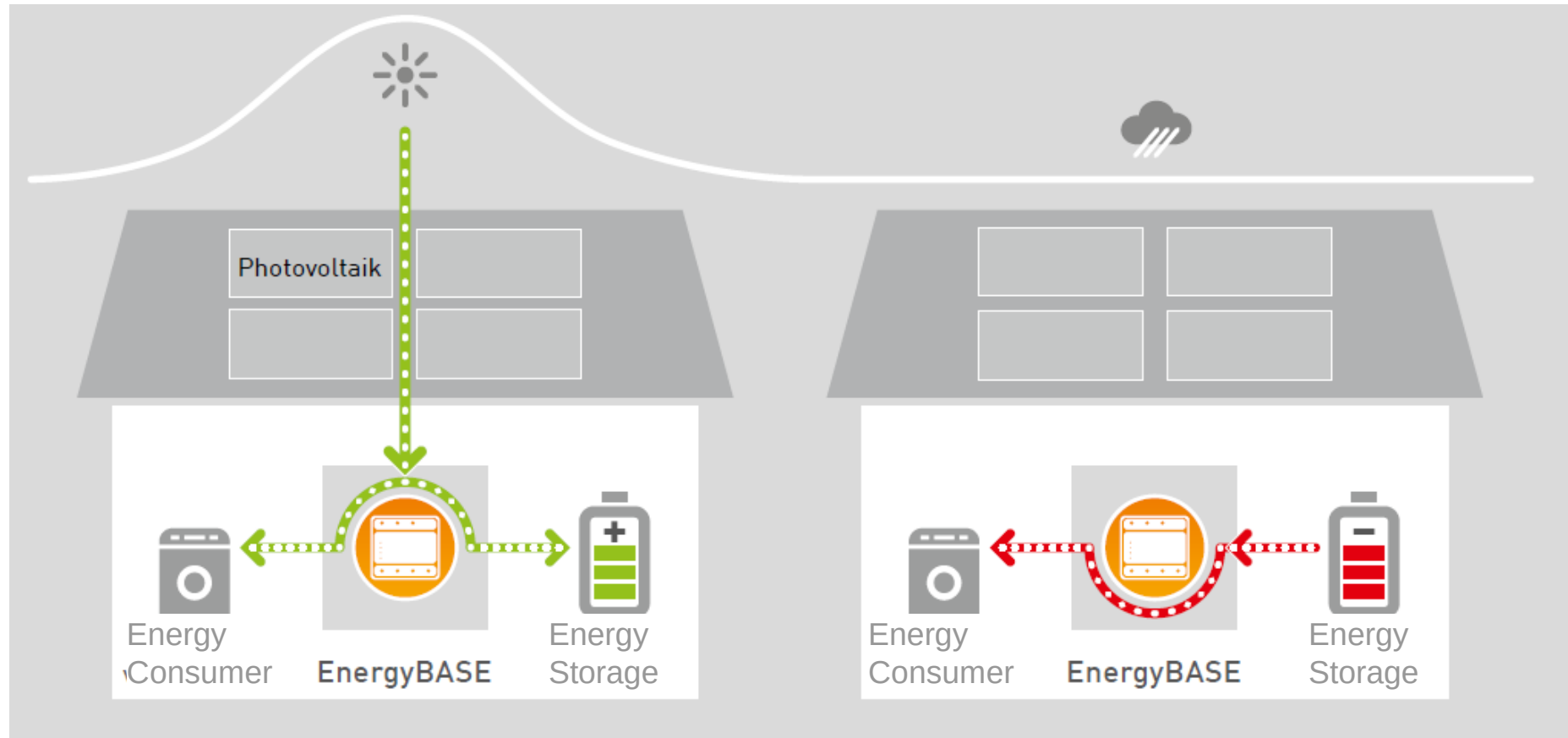
EnBW EnergyBASE



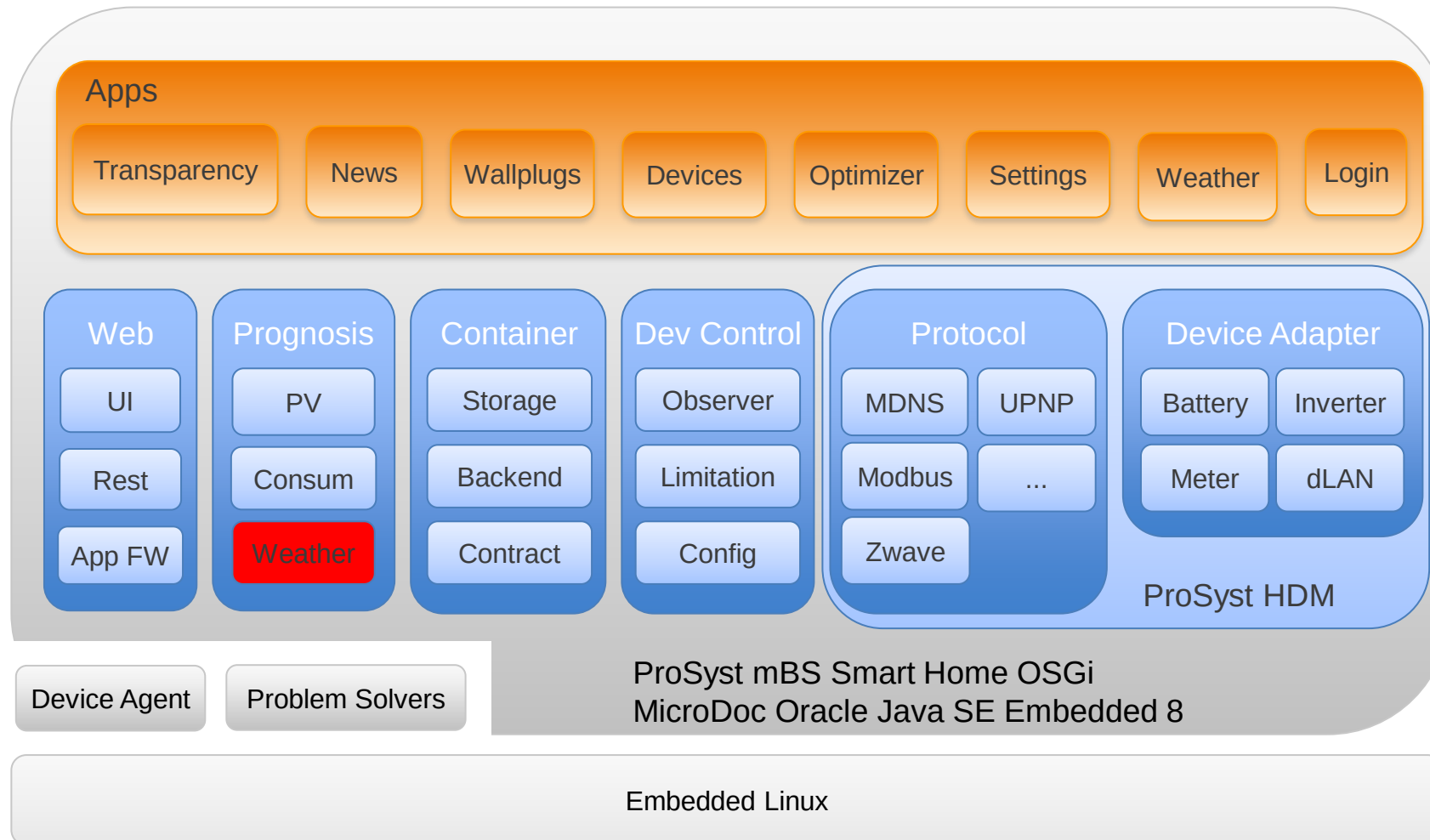
Devolo PLC Adapter



Functions of the EnergyBASE

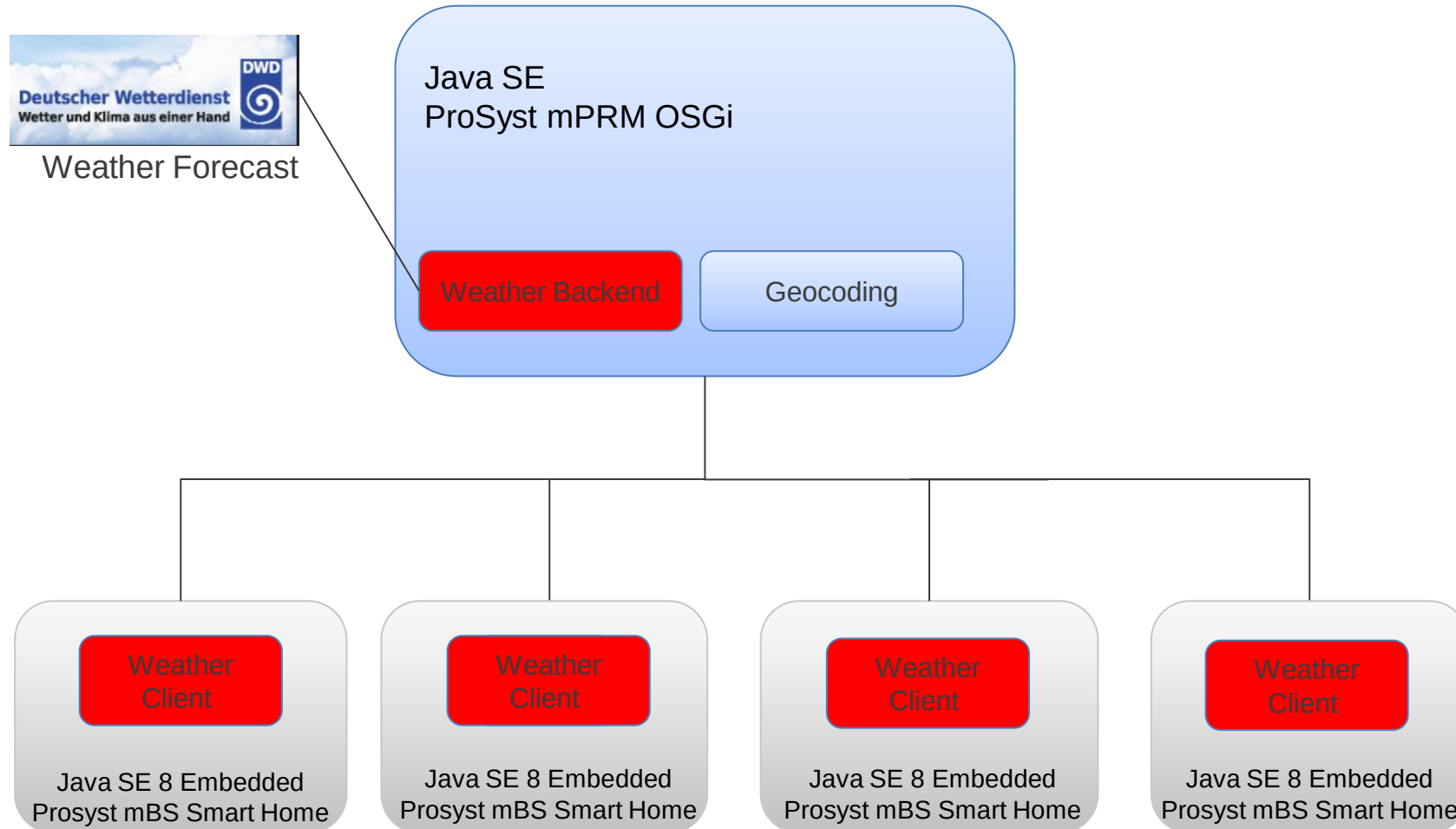


EnergyBASE - Software Architecture



IoT – Software Deployment Scenario II

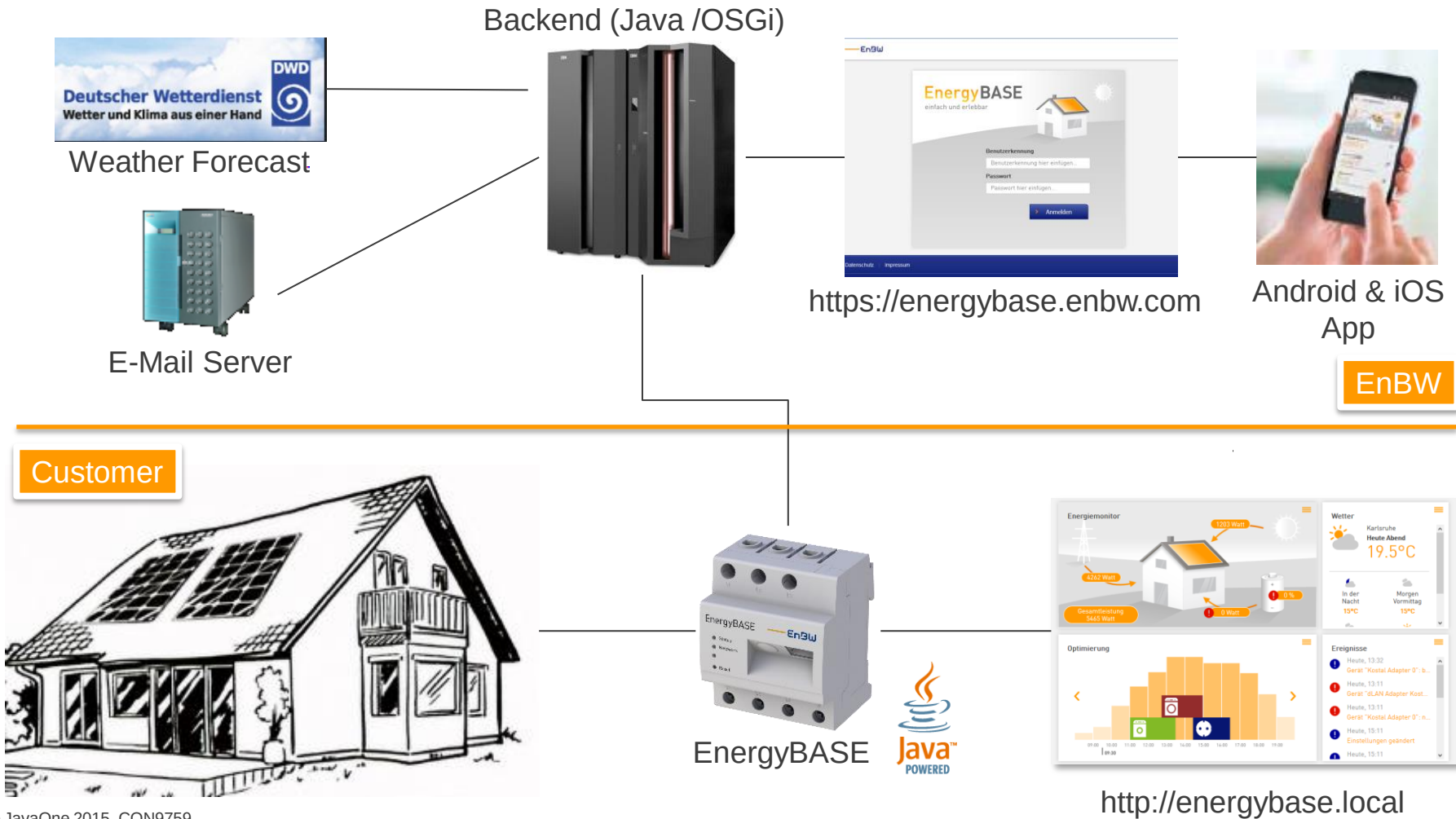
Distributed OSGi Services



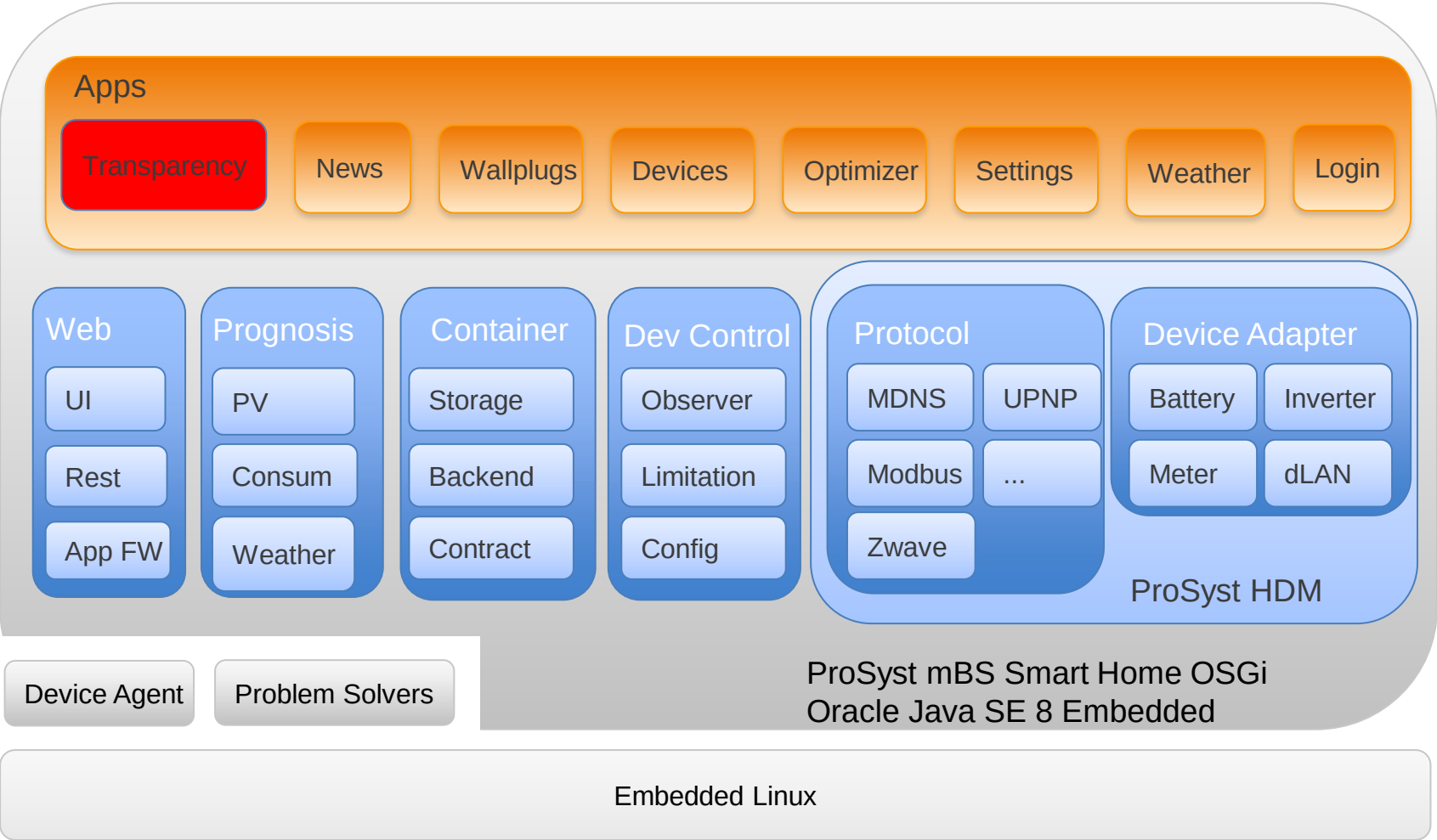
EnergyBASE Backend Server

EnergyBASE Devices

EnergyBASE System Architecture

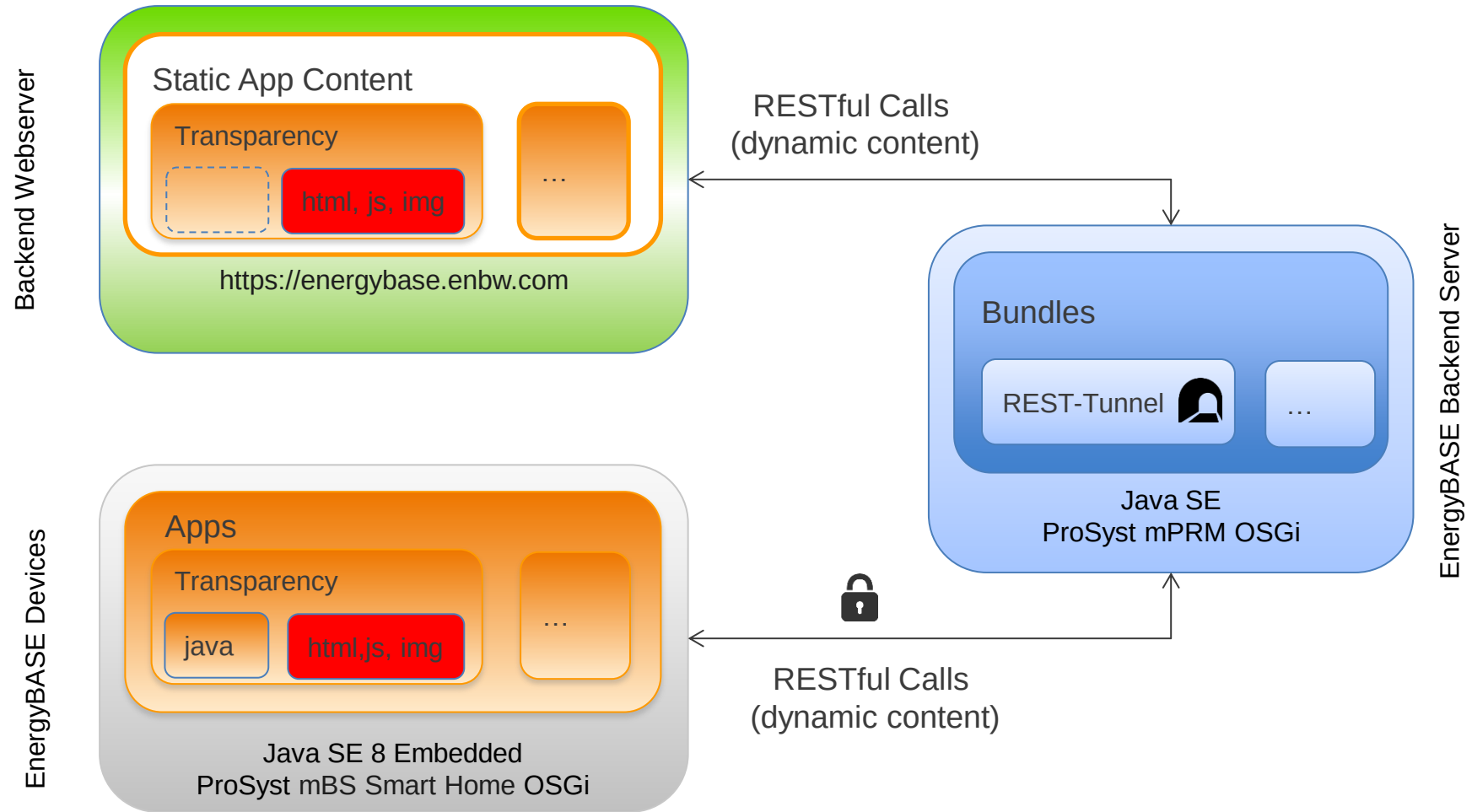


EnergyBASE - Apps



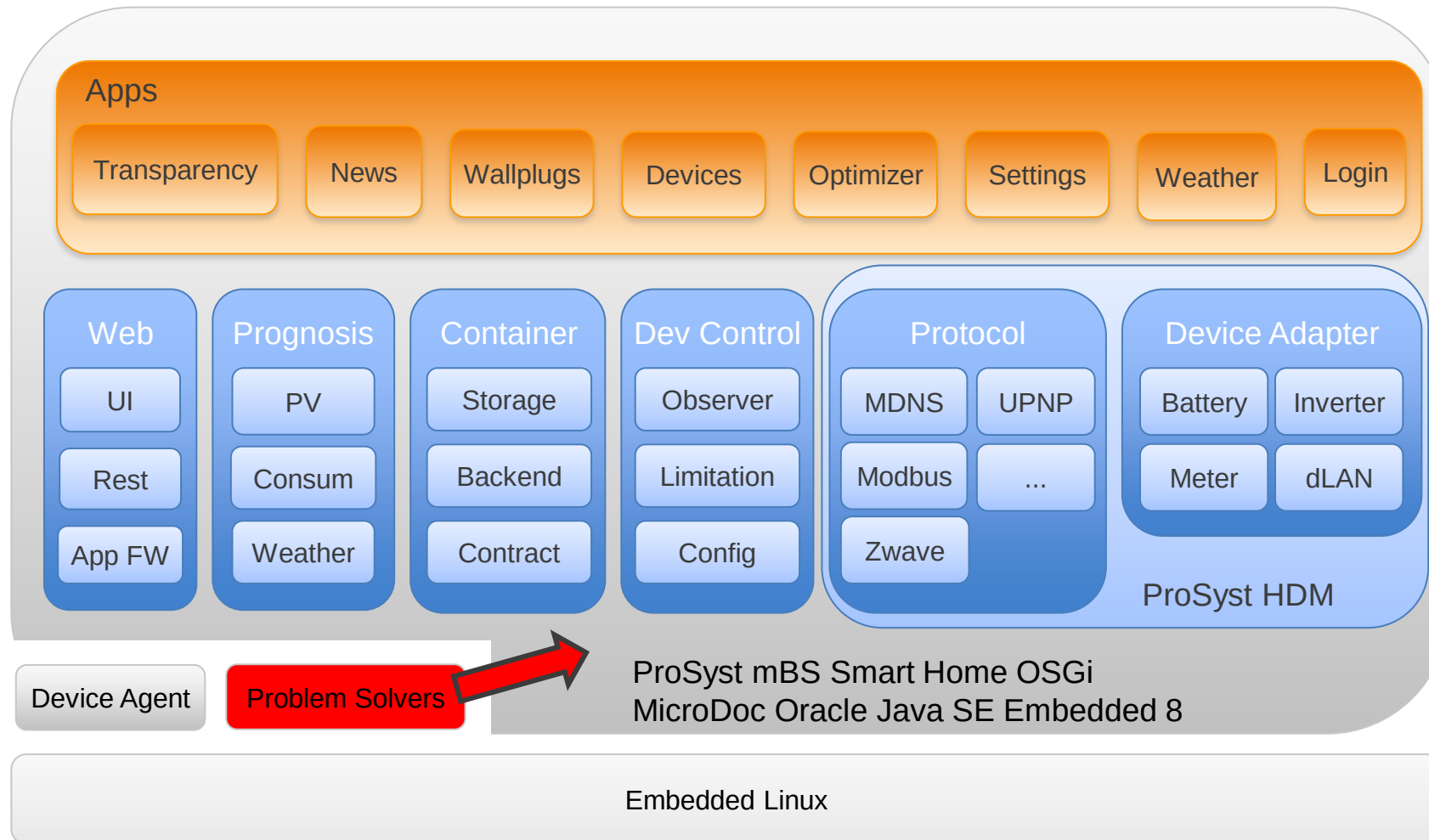
- Apps implemented as OSGi-Services
- OSGi-Services exported as RESTful-Webservices transparently
- REST-Services used by Mobile-Apps AND Web-App
- Web-App contained in APP
- API open for Third-Party-Systems
- New functions easy to integrate
- Apps can be booked as a service

IoT – Distributed Apps



- Remote Device monitoring
- Software Repository
- Remote Software Updates
- Email and Push notifications
- Address geocoding
- DWD-Weather forecasts
- Support
- ...

EnergyBASE - Software Architecture



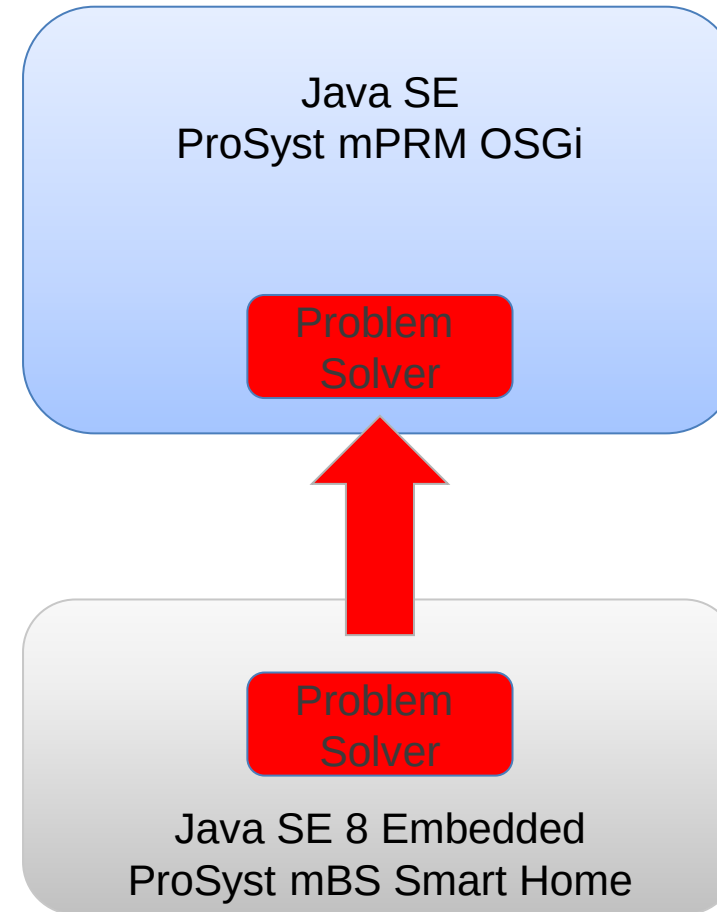
Possible Software Deployment Option: Move Bundles to Backend



EnergyBASE Backend



EnBW EnergyBASE



Demo EnergyBASE IoT



DEMO

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