Automatic Weather Stations at DWD

Jochen Dibbern
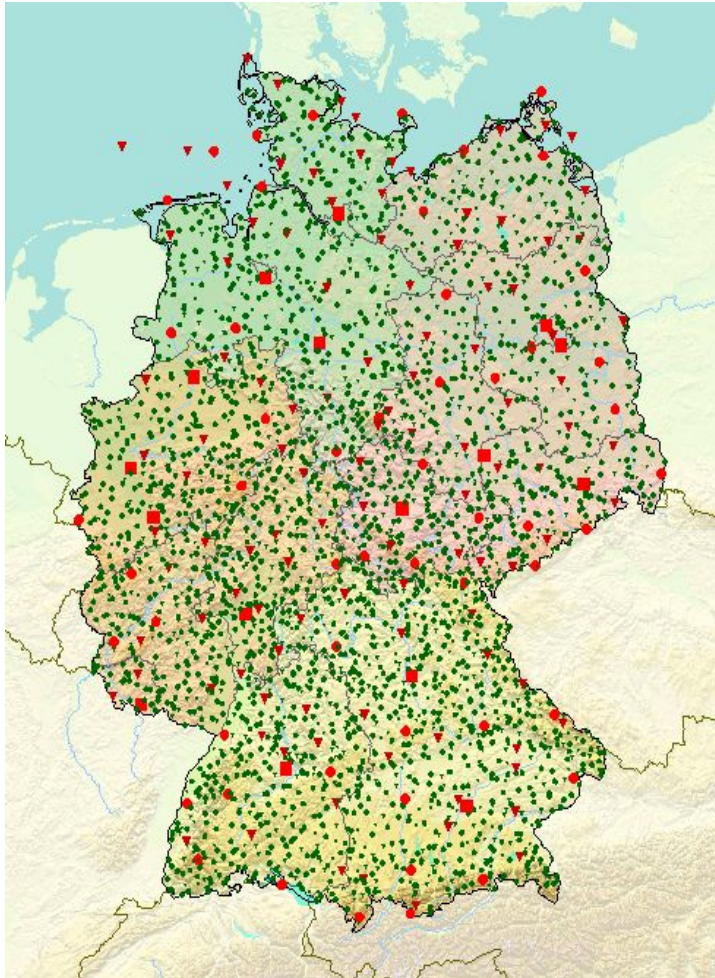
The WMO International Conference on Automatic Weather Stations

Offenbach am Main, Germany
24-26 October 2017

Content

→ Introduction

→ Primary and Secondary AWS at DWD

→ Maintenance Process

→ Calibration Labs

→ Data Management

→ Quality Monitoring

Surface observing network

- **primary observing stations:**
  183 stations:
    - 30 stations with observers
        - 25 with 24-hours visual observations
        - 5 with partly visual observations
        - 48 stations measuring radioactivity in the air
    - 153 automatic weather stations

- **secondary observing stations:**
  1782 stations with voluntary observers
    - 845 automatic weather stations
    - 683 stations with daily messages from observer

- **27 observing stations of German military**

- **1079 phenological stations**

Surface observing network

473 stations with temperature
and humidity measurement

182 stations with pressure
measurement

Example of a primary observing station

1897 stations with precipitation
measurement

277 stations with wind
measurement

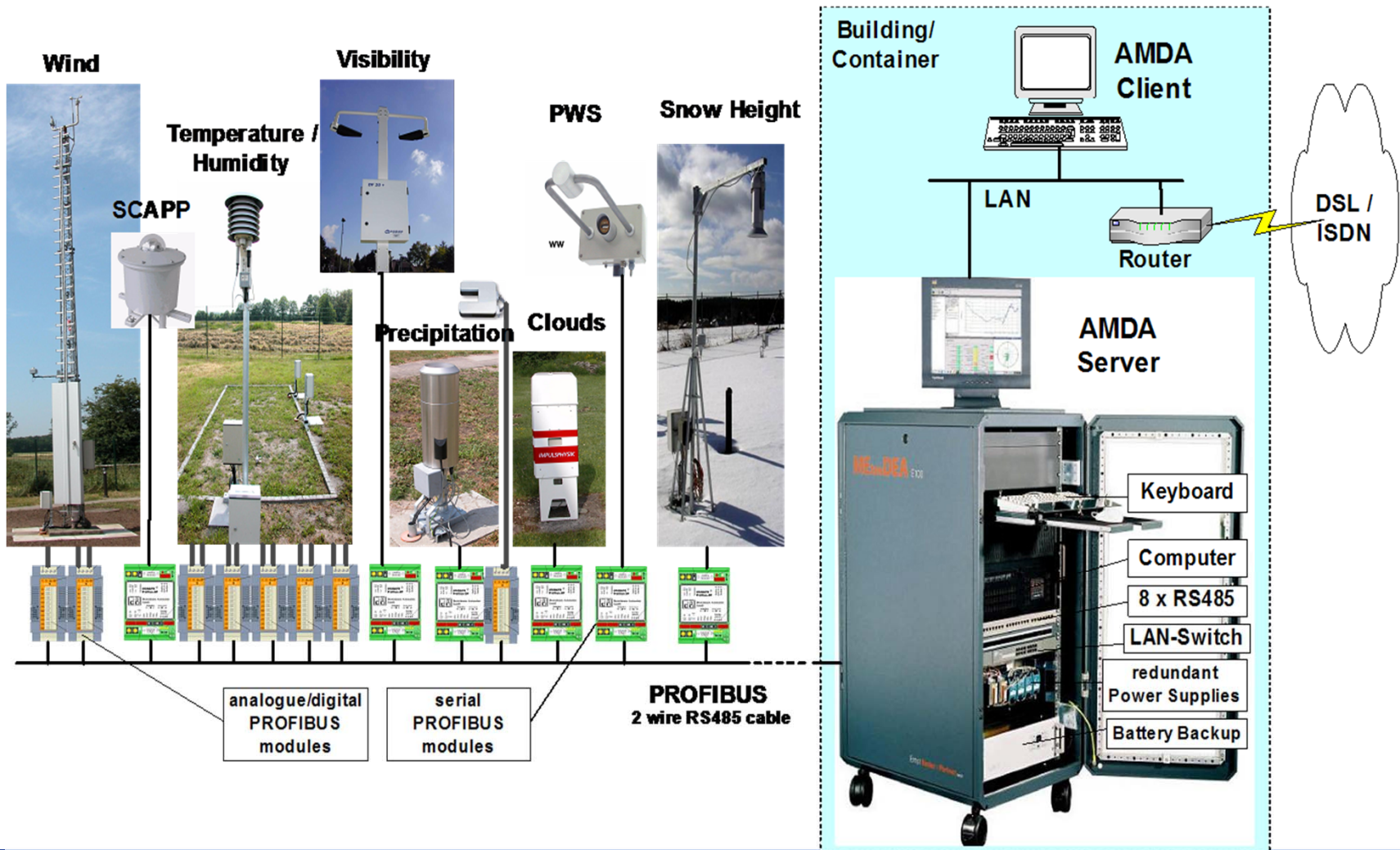Example of a secondary observing station

(status 01.05.2016)

full equipped primary observing station

example

wind (speed & direction)
Thies WR & WG

tiltable mast
CFK & GFK

visual range
DF20

temperature, humidity
PT100, HMP45

snow hight
SR50

precipitation monitor
Thies LNM

cloud hight
LD40

precipitation quantity
Pluvio - Ott

precipitation detector
Thies

AMDA I/II   (SYNOP)

DWD
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Wind

Temperature / Humidity

SCAPP

Visibility

PWS

Snow Height

Precipitation

Clouds

Building/ Container

AMDA Client

LAN

DSL / ISDN

Router

AMDA Server

Keyboard

Computer

8 x RS485

LAN-Switch

redundant Power Supplies

Battery Backup

analogue/digital PROFIBUS modules

serial PROFIBUS modules

PROFIBUS 2 wire RS485 cable

![DWD - Deutscher Wetterdienst - Wetter und Klima aus einer Hand]

partly equipped stations (system MODES/AMDA III)

example
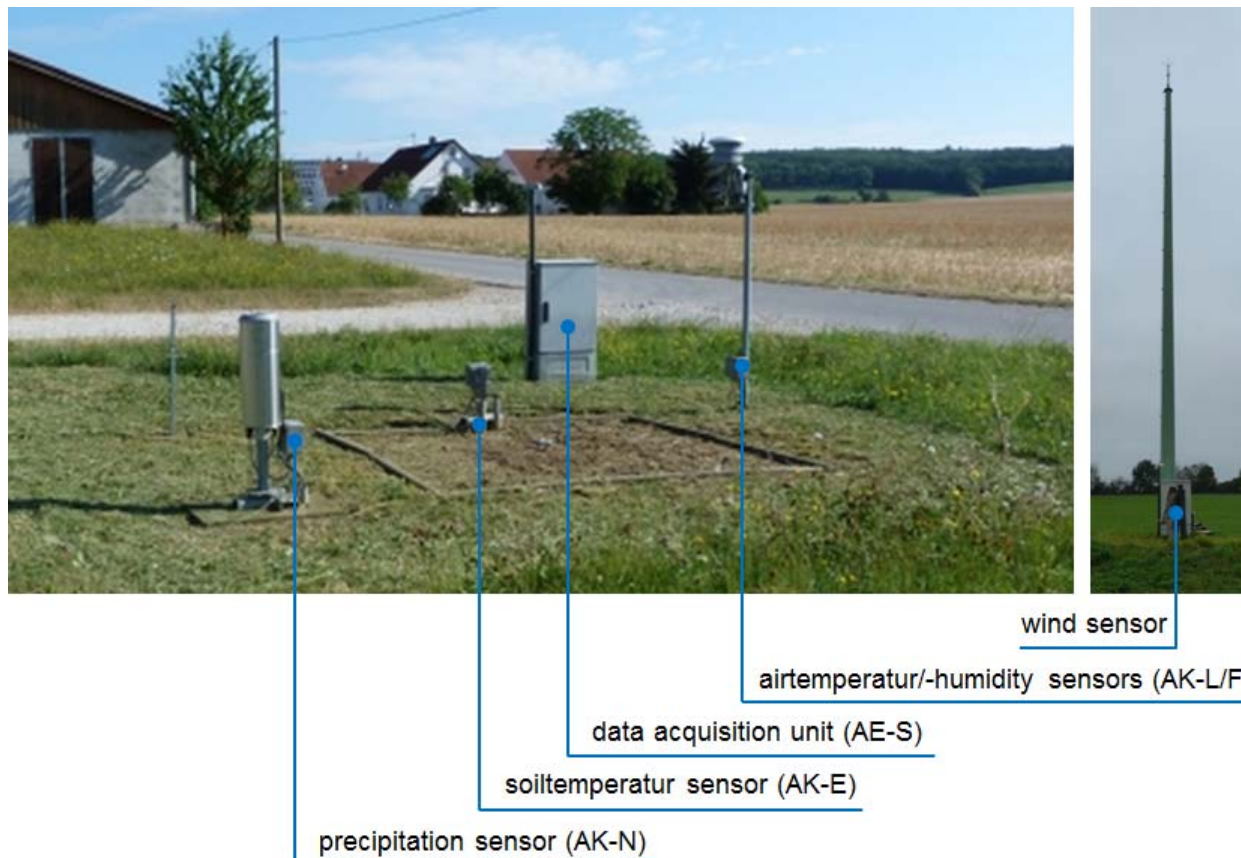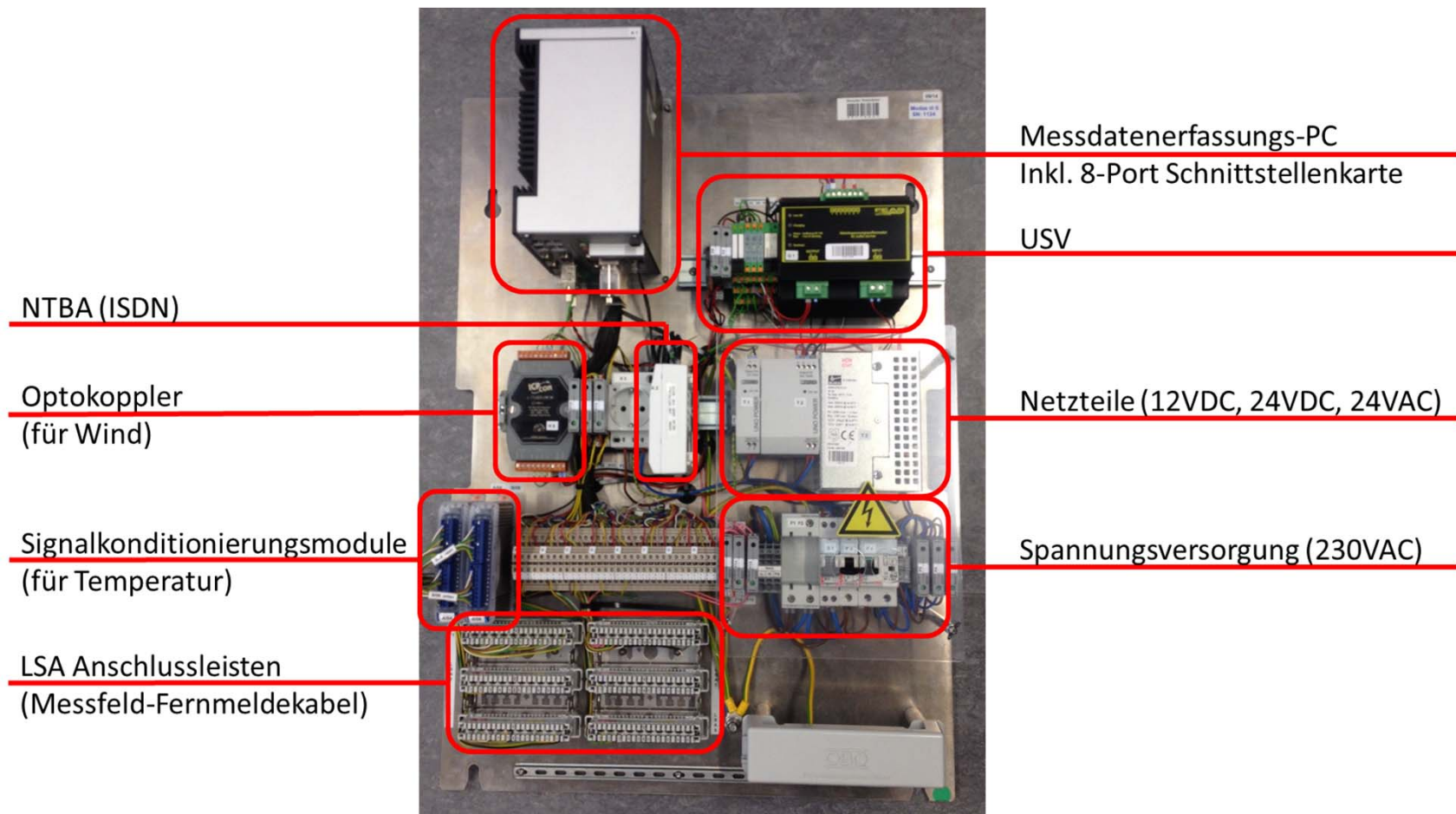
wind sensor

airtemperatur/-humidity sensors (AK-L/F)

data acquisition unit (AE-S)

soiltemperatur sensor (AK-E)

precipitation sensor (AK-N)

Data acquisition unit

Messdatenerfassungs-PC
Inkl. 8-Port Schnittstellenkarte

USV

NTBA (ISDN)

Optokoppler
(für Wind)

Netzteile (12VDC, 24VDC, 24VAC)

Signalkonditionierungsmodule
(für Temperatur)

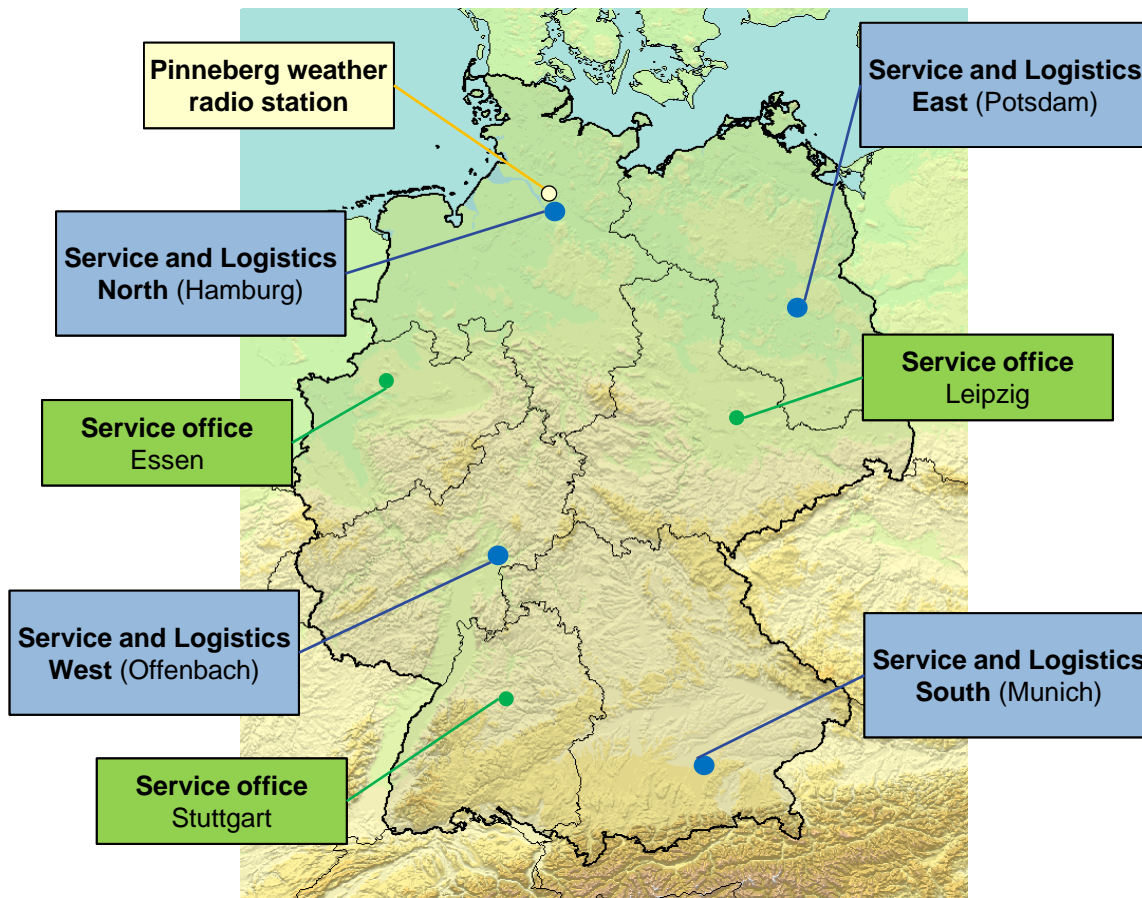Spannungsversorgung (230VAC)

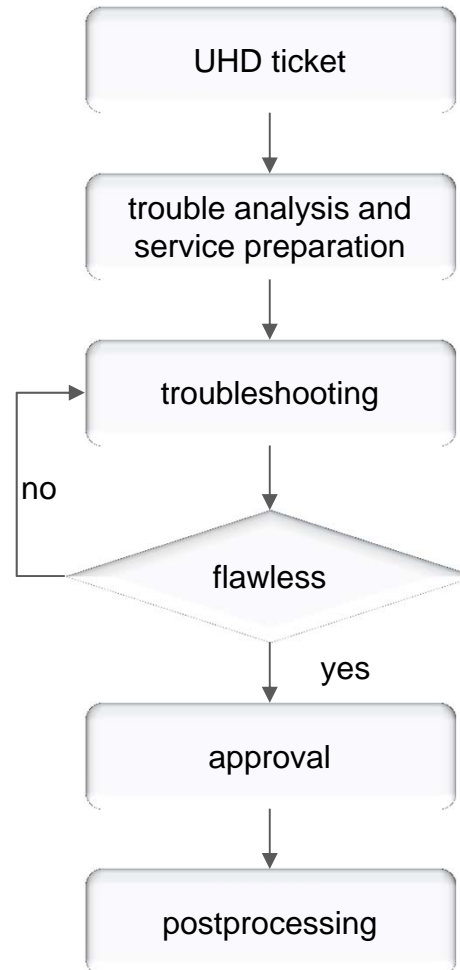LSA Anschlussleisten
(Messfeld-Fernmeldekabel)

Content

➔ Introduction

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➔ Maintenance Process

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➔ Data Management

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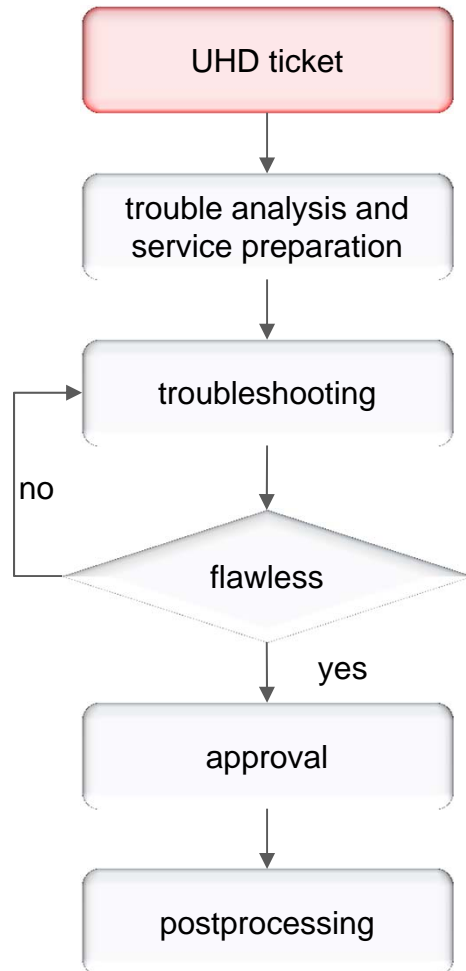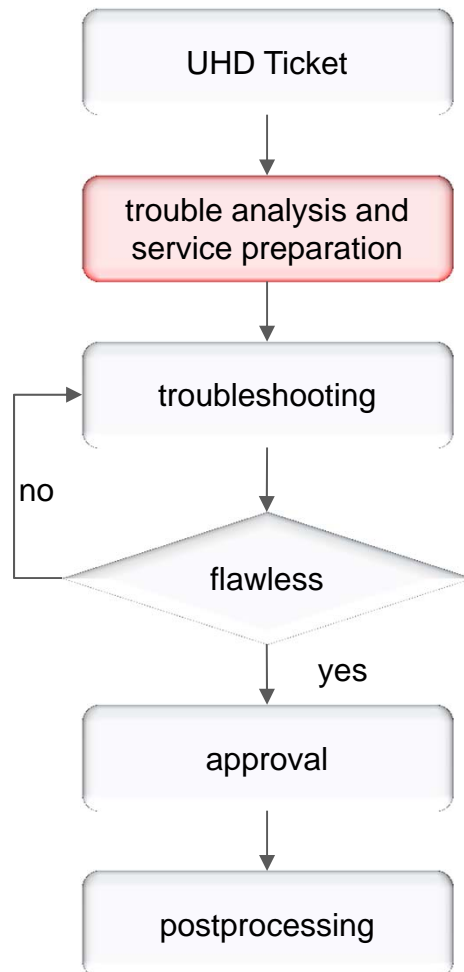# Maintenance by Department Service and Logistics

Pinneberg weather radio station

Service and Logistics East (Potsdam)

Service and Logistics North (Hamburg)

Service office Leipzig

Service office Essen

Service and Logistics West (Offenbach)

Service and Logistics South (Munich)

Service office Stuttgart

Observing system	Priority (reaction time)
airport AWOS	1 (4h)
radioactivity stations	2 (24h), (1* event)
centennial stations	2 (24h)
primary observing stations	3 (48h)
secondary observing stations	4 (48h)
marine AWS on ships	3 (48h)
weather radar network	1 (4h)
radar windprofiler	2 (24h)
radiosonde network	2 (24h)

process maintenance

```
┌─────────────────┐
│   UHD ticket    │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ trouble analysis and │
│ service preparation  │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  troubleshooting │ ◄───┐
└─────────────────┘     │
         │          no  │
         ▼              │
      ◇ flawless ◇──────┘
         │
        yes
         ▼
┌─────────────────┐
│    approval     │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│  postprocessing │
└─────────────────┘
```

- customer generates an <u>U</u>ser <u>H</u>elp <u>D</u>esk ticket
- UHD disposes an ticket (via AIXBOMS) to the local service unit

UHD Ticket

↓

trouble analysis and service preparation

↓

troubleshooting

↓

flawless

no → (loop back to troubleshooting)

yes ↓

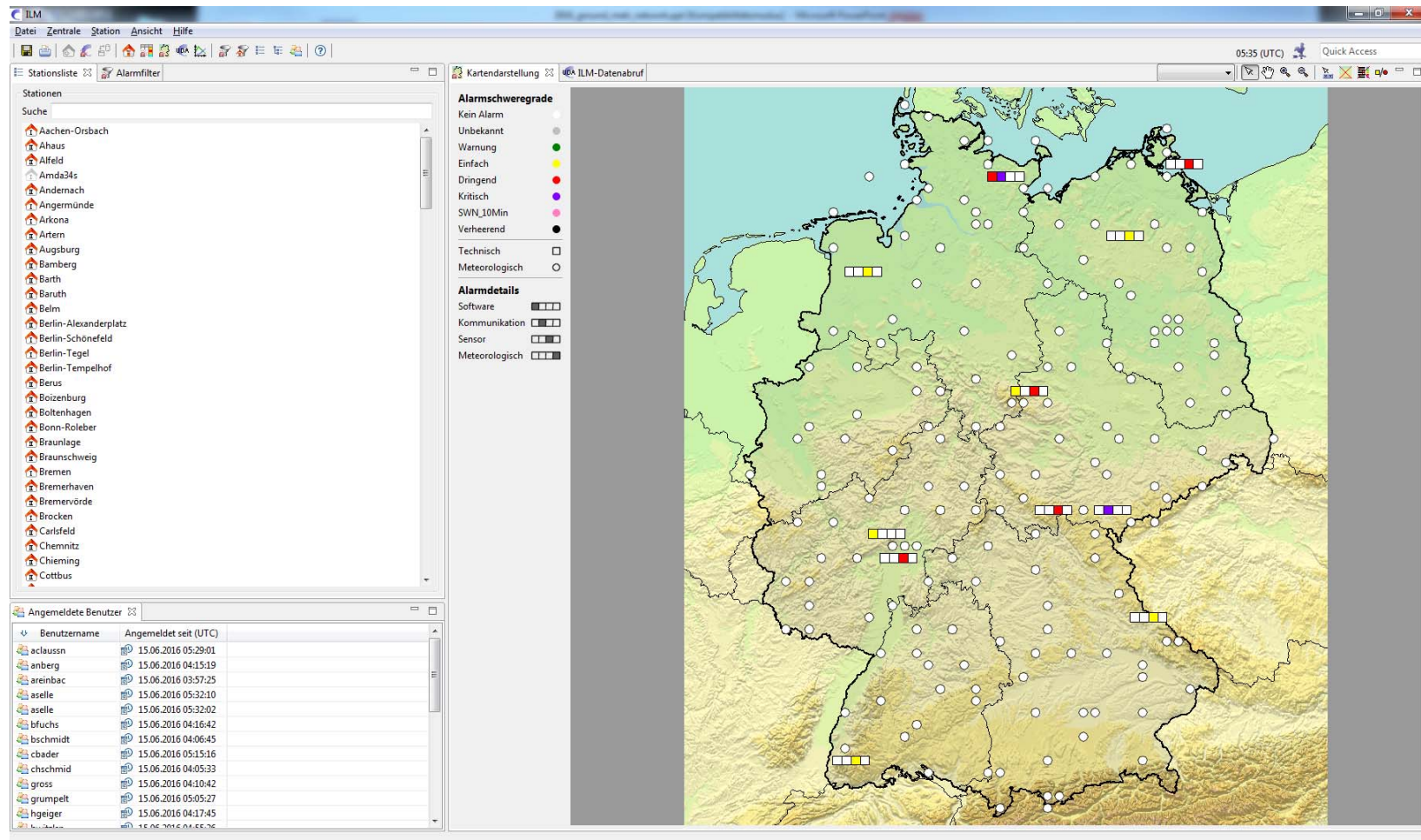approval

↓

postprocessing

- trouble analysis via

  - Information Logistic Metrological network (ILM) client

  - remote access to system / sensors

  - phone call to local advisor

- service preparation

  - combination with other troubleshooting / maintenance jobs

  - booking of

    ✓ spare parts

    ✓ car

    ✓ hotel

ILM client

```
┌─────────────────┐
│   UHD ticket    │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ trouble analysis and │
│ service preparation  │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ troubleshooting │
└─────────────────┘
         │
         ▼
      ◇ flawless ◇ ── no
         │
        yes
         ▼
┌─────────────────┐
│    approval     │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│ postprocessing  │
└─────────────────┘
```

- local analysis and troubleshooting

  - sensors

  - interfaces

  - data processor

  - wiring

  - power supply

AMDA I/II Server

Unigate

Profibus   RS 422

Sensor

```
┌─────────────────────┐
│     UHD ticket      │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│ trouble analysis and│
│ service preparation │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   troubleshooting   │◄──┐
└─────────────────────┘   │
           │              │ no
           ▼              │
        ◇ flawless ◇──────┘
           │
           │ yes
           ▼
┌─────────────────────┐
│      approval       │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   postprocessing    │
└─────────────────────┘
```
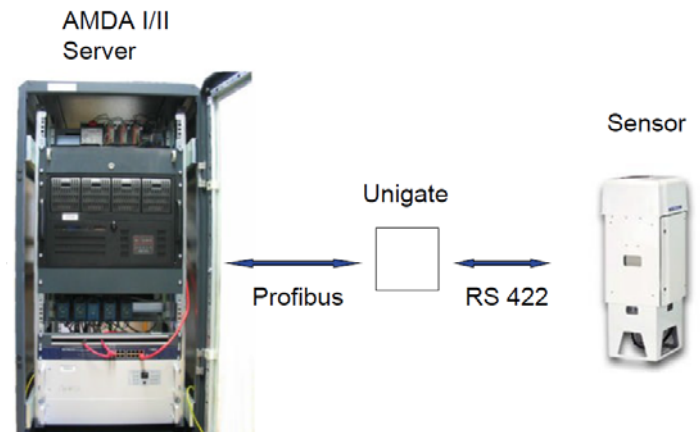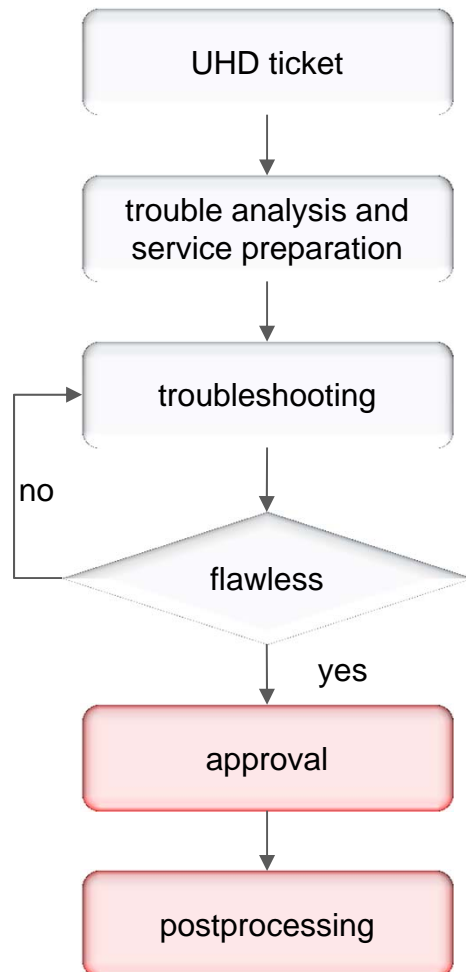
- approval
  - additional check via remote access

- postprocessing
  - creation of maintenance / troubleshooting protocol
  - delivery of changed components
  - resolve of AIXBOMS-ticket
  - exchange of experience > local to colleagues and in general to system manager
  - car care

Content

→ Introduction

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DWD calibration laboratories in Hamburg and Munich

➜ accredited in accordance to ISO 17025:2005 (status: test laboratory)

- wind speed and wind direction sensors
- sensors for relative humidity
- resistance temperature detectors
- absolute air pressure gauges
- weighing rain gauges

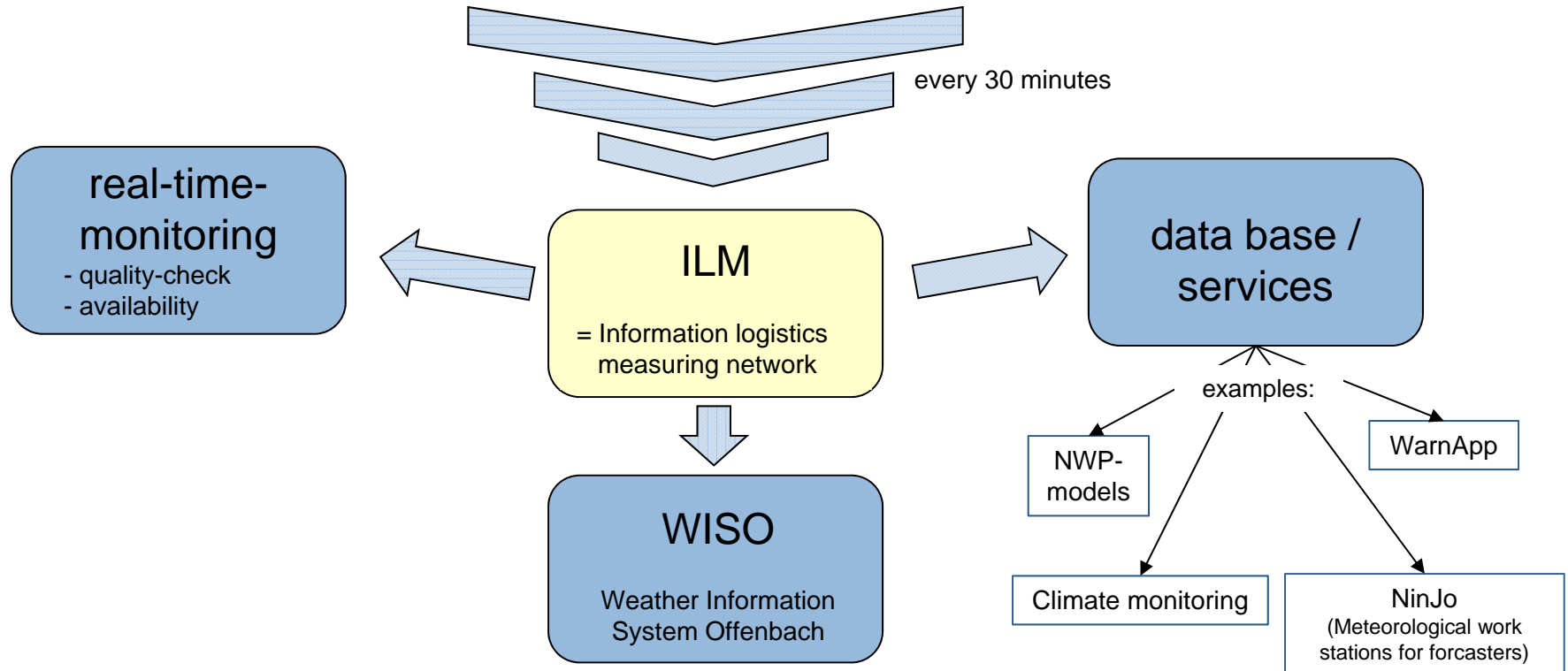➜ accredited as calibration laboratory in 2017

- set up new temperature chambers for calibration of temperature sensors including electronic boxes
- internal audits in 2015 and assessments by DAkkS in 2016

Content

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Observational network

Surface weather observations:

every 30 minutes

real-time-monitoring
- quality-check
- availability

ILM

= Information logistics measuring network

data base / services

examples:

NWP-models

WarnApp

Climate monitoring

NinJo
(Meteorological work stations for forcasters)

WISO

Weather Information System Offenbach

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➔ Introduction

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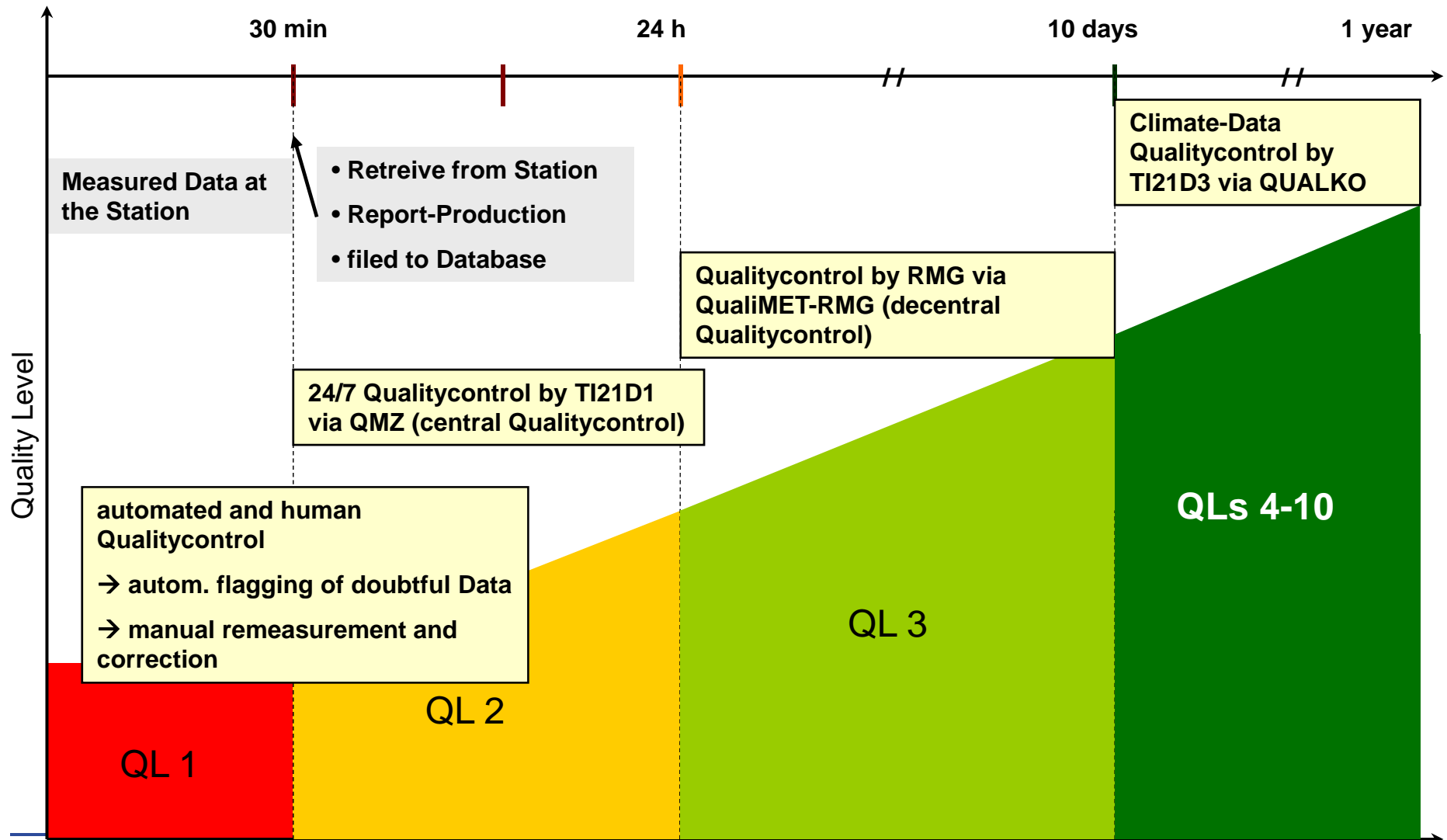➔ Calibration Labs

➔ Data Management

➔ Quality Monitoring

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

30 min   24 h   10 days   1 year

Quality Level

Measured Data at the Station

- **Retreive from Station**
- **Report-Production**
- **filed to Database**

Climate-Data Qualitycontrol by TI21D3 via QUALKO

Qualitycontrol by RMG via QualiMET-RMG (decentral Qualitycontrol)

24/7 Qualitycontrol by TI21D1 via QMZ (central Qualitycontrol)

automated and human Qualitycontrol

→ **autom. flagging of doubtful Data**

→ **manual remeasurement and correction**

QLs 4-10

QL 3

QL 2

QL 1

Thank you very much for your attention!