



## BROADCAST PROBING SYSTEM

### Contact

Dr. Stefan Arbanowski  
Business Unit FAME  
Phone +49 30 3463-7197  
stefan.arbanowski@fokus.fraunhofer.de

Martin Lasak  
Business Unit FAME  
Phone +49 30 3463-7294  
martin.lasak@fokus.fraunhofer.de

Fraunhofer FOKUS  
Kaiserin-Augusta-Allee 31  
10589 Berlin  
Germany

<http://s.fhg.de/bps>

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### Broadcast Probing System for DVB networks

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The Broadcast Probing System offers cloud-based continuous monitoring of broadcast networks by utilising low-cost devices equipped with receiving capabilities, so-called probes. Controlled either individually or in groups, the probes are securely instructed to execute scheduled jobs like scanning through frequency ranges, tuning to desired channels or fine-grained inspection of transport streams. The collected spatiotemporal data links radio frequency characteristics (e.g. signal-to-noise ratio) and stream quality (e.g. bit error rate), multiplexed service information tables (e.g. AIT/HbbTV, EIT/EPG) and audio/video bitstreams to allow for live analysis and subsequent evaluation covering many locations of the broadcasting area simultaneously.

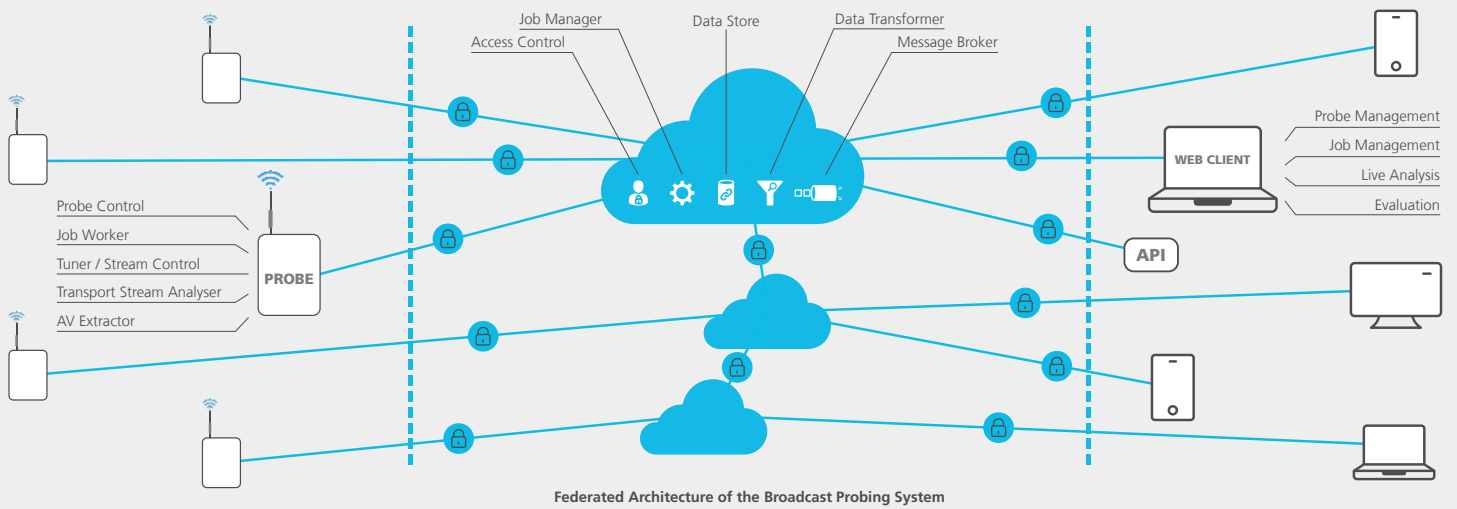
Beyond the real-time access to the tracked broadcast status information, the data is processed and condensed by the cloud portion of the system. Deviations from the target state are identified and can trigger well-defined actions supporting the optimisation of the overall service operation.

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### How does it work?

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Any probing activity starts with the definition of a probing job. A job specifies general information like location, time and recurrence together with a list of specific actions to be performed by the probes. The submitted jobs are dispatched to applicable probes by the cloud service. An exemplary job would be: For each channel out of a given list tune to its transponder frequency for sixty seconds (e.g. DVB-T2), measure reception quality and extract continuously all service information (SI data) as well as sample video bitstreams (e.g. HEVC) and snip out single frames. Each action is acknowledged by submission of the interim results back to the cloud service and available for live preview.



The presentation of the probing job results is versatile and available anywhere, anytime on a wide range of Web enabled devices. It covers exploration and visualisation of historical data as well as live data feedback via video frame mosaic streams or map-based notifications.

## Benefits and areas of application

The reference design and implementation of the system offers a remote monitoring of signals and metadata in DVB networks by tackling two main challenges:

- Manageability: From data acquisition, secure transfer to storage and controlled access
- Visualisation: From easy job definition, result processing to meaningful presentation

The main purpose is the cost-effective and near real-time service monitoring at lots of locations to support the detection of faulty conditions. Beside this, the system can support evaluations with queries like "What was the avg. packet error rate for Channel C at location X with radius R yesterday". Moreover, the tracked probing data can be used for inter-regional comparisons, traceability or linkage with other data sources, e.g. to support derivation of correlations.



## At a glance

The Broadcast Probing System offers cloud-based monitoring of digital service networks. It utilises small, spatially distributed cost-effective computing units (probes) to run monitoring jobs, like tuning to TV channels and tracking data of interest including detailed status information from the receiving end. This feedback is used to detect potential misconfigurations and service degradation and helps to optimise the broadcast operations.

- Near real-time monitoring of digital service broadcasts (RF level, TS level, AV level after ETSI TR 101 290) including DVB-T2 with HEVC
- Remote control of individual and groups of low-cost probes (Android, Raspberry Pi)
- Execution of scheduled probing jobs and secure instant access (PKI, TLS)
- Analysis and evaluation on live and historical linked data, extensible and linkable with other sources (JSON-LD)
- Integrates with existing monitoring systems and offers a comprehensive API (SNMP, MQTT, REST/HTTPS)

