Headphones production 4.0

A cloud based Industry lot solution for quality improvement
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The customer

Beyerdynamic GmbH

1. Produces headphones, microphones and conference technology since 1924
2. 350 employees ~ small firm sector
3. Headquarters in Heilbronn, Subsidiaries in USA, India, Singapore
4. www.beyerdynamic.de
The customers setup – smart factory

- New innovative production lines
- Customer programs robots and invents specialized production technique
- Many parameters as input (>1000 per device)
- Automized quality checks to meet highest quality standards
IT department was asked

Could you help us to

• identify problems in manufacturing processes in realtime? („this should also look fancy“)
• find out which parameters settings drive which product quality properties for optimization? („you could use this machine learning thing“)
• store any data of the production process? („at moderate costs of course“)
They answered

Hmm, this sounds crazy! We would need new data centers and 100+ tech guys with know-how about this rocket science stuff!

But...wait, there is this public cloud thing, lets have a look!
Why using public cloud for analytics?

What Platform-as-a-service offers

- Scalability to infinity
- Cutting edge technology
- Agile Setup
- Relaxed IT staff
- Fast innovation circles
- Cost Optimization
- Global scenarios
- Increased reliability
- Flexibility for test-environments
One of the challenges – data format

Data Format is semi-structured in Json by field gateways

```
0Z", "machineid": 0, "structid": 0, "co1001": 23, "co1002": "Shuffle", "co1003": 0.898, "co1004": 0
0Z", "machineid": 0, "structid": 1, "co1001": 25, "co1002": "Error 332"
0Z", "machineid": 1, "structid": 0, "co1001": 24, "co1002": "Rotation", "co1003": 0.701, "co1004": 228
0Z", "machineid": 0, "structid": 0, "co1001": 23, "co1002": "Shuffle", "co1003": 0.898, "co1004": 0
0Z", "machineid": 0, "structid": 0, "co1001": 24, "co1002": "Rotation", "co1003": 0.701, "co1004": 228
```

Schema-on-read pattern – log anything, use only needed

Enrichment with master data for visualization

```
"time frame": "2017-12-01T05-06", "machine_name": "installation cable", "medium precision": 0.898
"time frame": "2017-12-01T05-06", "machine_name": "installation cable", "medium precision": 0.701
```
Overview of the chosen architecture

On premises at beyerdynamic

Azure cloud

- Azure Functions & IoT Hub
  - Feedback for use in optimisation

- Azure IoT Hub
  - Data reception & asynchronous storage of different formats

- Azure Stream Analytics
  - Combination of data from stream, aggregation, distribution to various services

- Azure Machine Learning
  - Optimisation of system parameters for stations

- Azure Data Lake Store & Analytics
  - Archiving Temporalisation

- Power BI
  - Real-time monitoring, display optimisation, development of timeline-based reports

Real-time data

Archive data for training

Archive data for analysis
Demo Realtime Monitoring
Conclusion

What has been achieved?

1. Customer uses real time monitoring next to the assembly line (and anywhere else they want)
2. Ongoing data exploration with diverse technologies leads to increased productivity
3. Tons of data is stored continuously and ready for analysis
4. The IT department of the customer is still alive 😊
Customer statement:

The inovex team and the Microsoft Cloud allow us, as an SME, to use highly innovative, leading-edge technology to optimise our business processes. The inovex team aren't just experts, they're also thoroughly nice people – truly "good geeks".

Peter Härtel, Head of Strategic Operations, beyerdynamic
Beyerdynamic GmbH

Case study

See online: https://www.inovex.de/en/references/case-studies/beyerdynamic-headphone-production-40/
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