



Edge Cloud Continuum for Production: Efficiency through AI-supported data monitoring

In view of increasing demands on efficiency, resources and production reliability, industrial manufacturing faces major challenges: it must minimise quality fluctuations, reduce scrap and optimise machine utilisation. Production facilities already provide valuable measurement data for this purpose, but its collection, secure processing and utilisation require powerful infrastructures.

Fraunhofer AISEC, as the spokesperson institute for Fraunhofer CCIT, contributes its expertise in automated security testing of ECC4P. This enables Edge and Cloud infrastructures to be continuously and automatically analysed in order to identify vulnerabilities and comply with current security standards.

Modular infrastructure for the production of the future

ECC4P is designed as a modular system and can be flexibly integrated into existing production environments. Core components include:

- **Smart sensors** for specific manufacturing processes: smartGRIND (grinding), smartTOOL (milling, drilling), smartNOTCH (metal forming)
- **Edge software infrastructure** for real-time acquisition and synchronisation of high-frequency measurement signals
- **LinkedFactory**: flexible data architecture for managing product, process and machine-related information
- **Application-specific AI algorithms** for process-parallel data evaluation
- **Eclipse Dataspace Connectors (EDC)** for simple, secure and sovereign data transfer
- **MLOps Pipeline** for continuous optimisation of application-specific AI models
- **Automated testing of security compliance rules** for Edge and Cloud

With Edge Cloud Continuum for Production (ECC4P), the Fraunhofer Cluster of Excellence Cognitive Internet Technologies CCIT is developing a solution that addresses precisely this issue: production processes such as milling, drilling or roller grinding are optimised through continuous monitoring and intelligent data processing – from the sensor to the cloud. ECC4P combines the expertise of the Fraunhofer Institutes IWU, IIS, ISST, IAIS and AISEC in sensor technology, AI-supported data analysis, secure data rooms and Edge Cloud Architectures.

From the sensor to the cloud and back

ECC4P combines the advantages of local data processing on the machine (Edge Computing) with the scalable computing power of the cloud. The Edge immediately detects critical deviations such as vibration or temperature increases, and machines react automatically. At the same time, the cloud uses AI to analyse large amounts of data from different machine locations to identify wear patterns and optimise maintenance intervals. This helps to avoid unplanned downtime and extend the service life of tools.

‘ECC4P offers the manufacturing industry in mechanical engineering a scientifically sound, practical solution for more efficient, flexible and secure production. The intelligent combination of Edge and Cloud technologies creates new opportunities for optimisation, automation and quality assurance,’ explains Michael Fritz, Head of the Fraunhofer CCIT office.

Fraunhofer CCIT: Research for the Edge-Cloud-Continuum

In the Fraunhofer Cluster of Excellence Cognitive Internet Technologies CCIT, the Fraunhofer Institute is working on cognitive Internet technologies along the entire data processing chain. To this end, Fraunhofer CCIT is pooling the expertise of various Fraunhofer Institutes from the fields of microelectronics, information and communication technology, and production. The joint research and development work focuses on technology solutions in the Edge-Cloud-Continuum.



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