
Model-driven Web3-based Federated-Crosschain for Distributed Smart Manufacturing

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Introduction - Motivation

- Manufacturing industry
 - Due Industry 4.0, manufacturing becomes distributed smart manufacturing (DSM)
- DSM Comprehends,
 - Factory automation systems (FAS), cyber physical systems (CPS), and supply chain management (SCM)
- FAS, CPS, and SCM shows → 27% growth rate of IIoT
 - i.e., IIoT shows 3V (volume, variety, & velocity) → 3VT
 - and, 3VT results in 3V data → 3VT of 3VD

Introduction - Motivation

- Distributed smart manufacturing (DSM) industry
 - Suffers 3VT of 3VD (3V of IIoT result in 3V of big data)
 - 3VT of 3VD result in severe constraints QoS of DSM
 - i.e., Integrity → security + privacy
 - &, Robustness → scalability + interoperability
 - i.e., DSM demands QoS-aware communication platform
- Blockchain 1st + 2nd generations
 - A viable solution to address integrity of DSM
 - However, suffer acute constraints in robustness

Introduction - Background

- Meanwhile, Fukushima Robot Test Field

- Comprehends heterogeneous general and industrial robot R&D use cases.



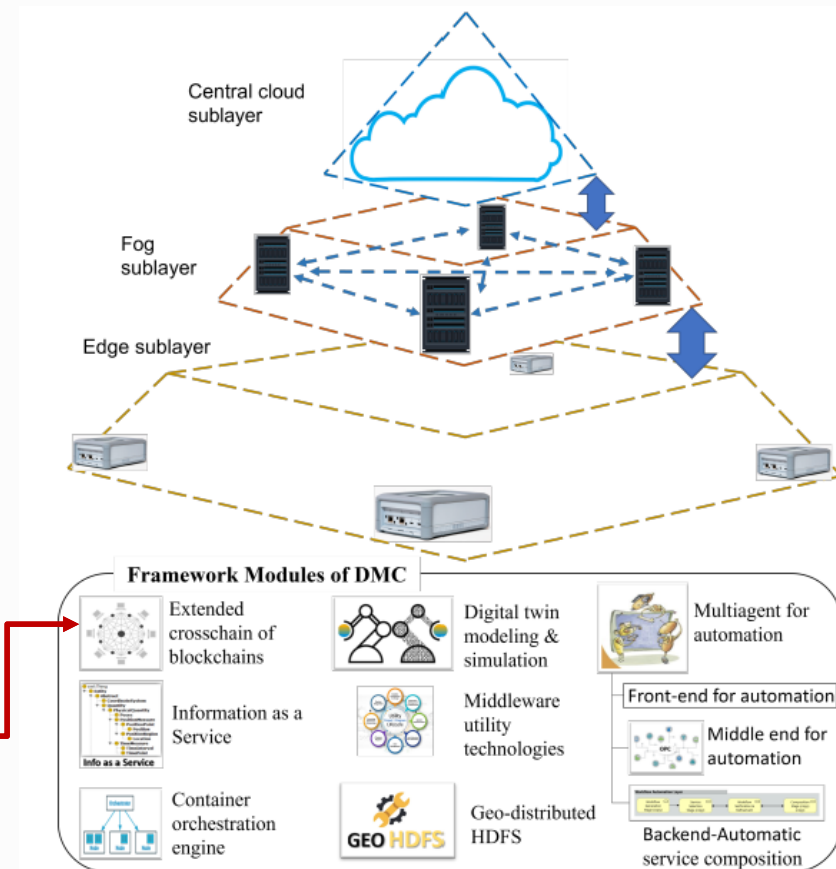
- DSM's (distributed smart manufacturing) are also end users.
- However, RTF does not possess a
 - cloud computing infra and env. + QoS-driven comm. platform

Introduction - Background

- Therefore, we proposed a MNCRP, a.k.a. model-driven next-gen heterogeneous cloud-robot platform [1]

- MNCRP

- Comply with benchmarks of
 - Industry 4.0 & Society 5.0
- Constitute,
 - Decentralized cloud &
 - Comprehend 9 modules,
 - ECB, a module out of 9 mod's.

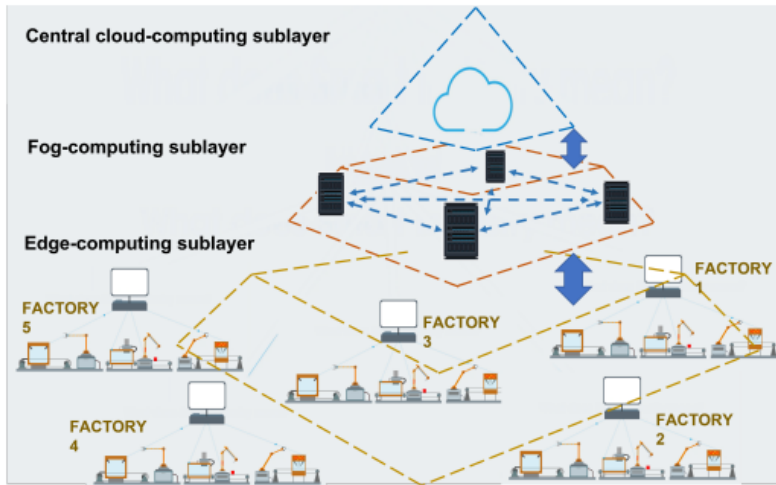


Introduction - Background

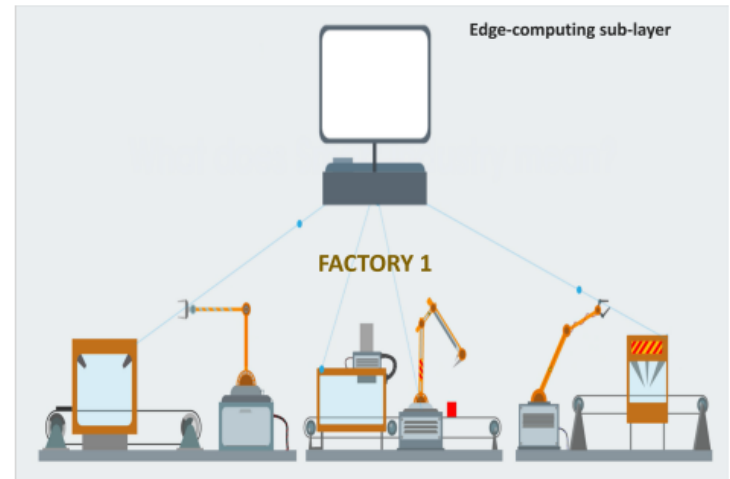
- ECB : a.k.a. Extended Crosschain of Blockchains
 - Is a 3rd gen Blockchain a.k.a. Web 3.0
 - Web 3.0 means → read + write + own web
- ECB can address
 - Integrity + robustness concerns of decentralized systems
 - However, most of the existing DSM solutions are ad-hoc software architectures,
 - result in → homogeneous solutions + lack adaptability
- Therefore, we proposed a model-driven Web3-based communication Platform for DSM

Use case

- Composition of DSM



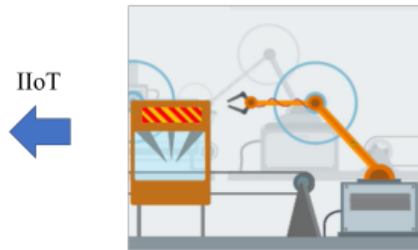
(1) Geo-distributed Factory-network



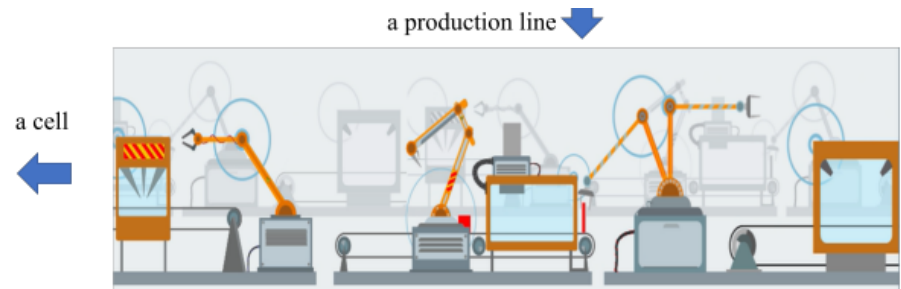
(2) A factory with multiple production lines



(5) IIoT's of cell



(4) A cell of a production line



(3) A production line of given factory

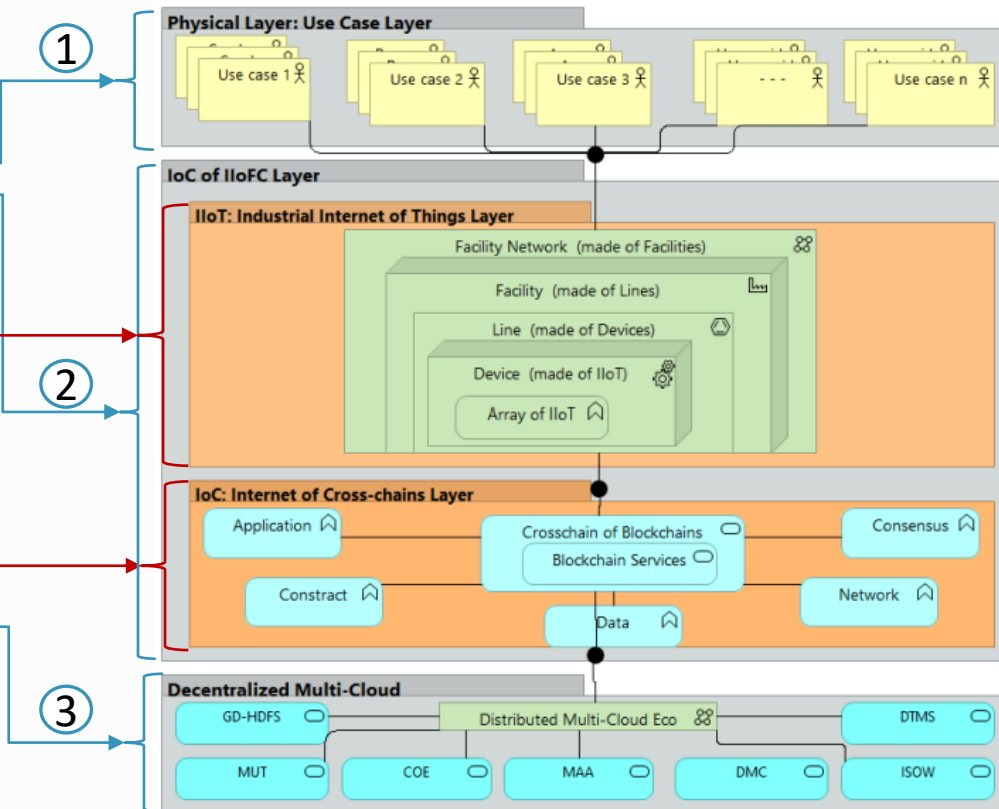
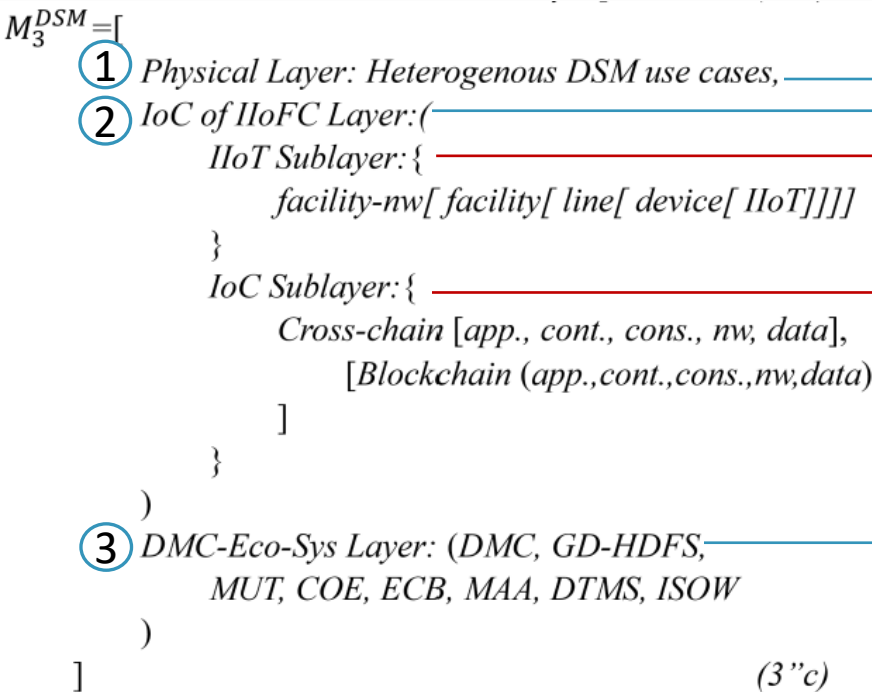
Proposed Solution

- Followed RA modeling for DSM & deduced model and RA

Deduced parameterized model

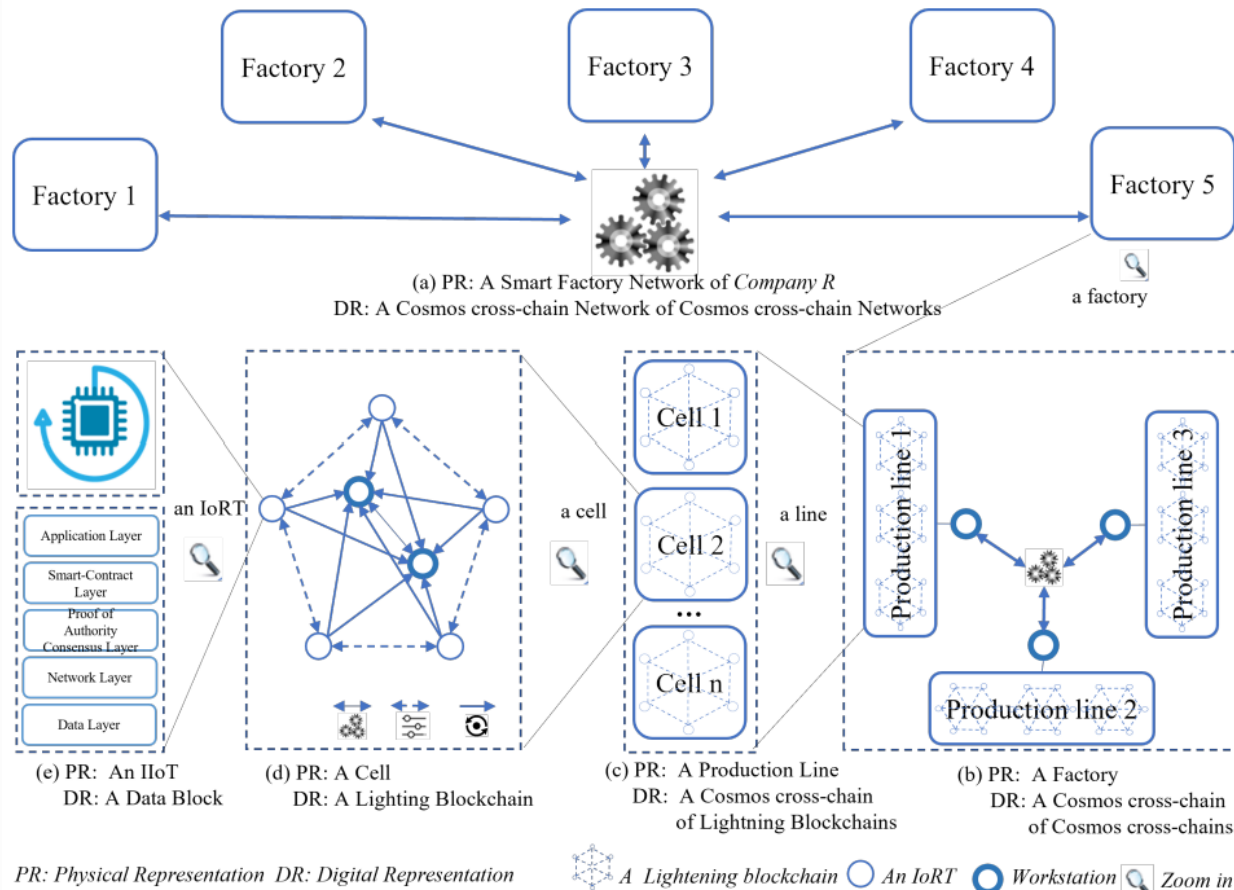


Modeled reference architecture (generic solution)



Proposed Solution

- Derived system architecture for the use case based on the generic solution



Thank you