

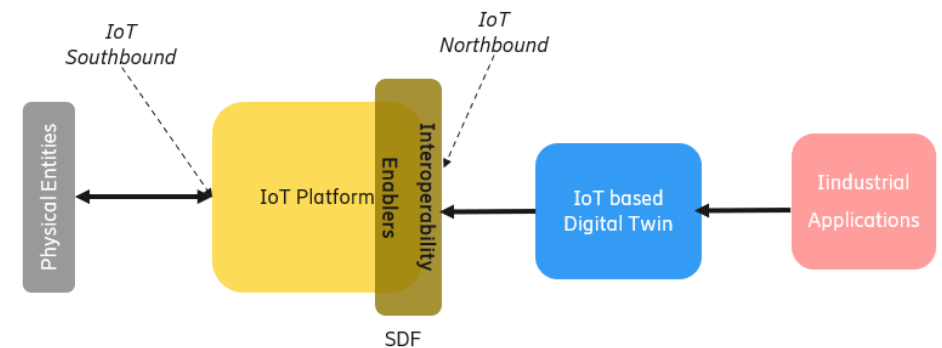
Building Digital Twins on Interoperable IoT Technologies

Interoperability Enabler for Digital Twin

Introduction: Digital Twin based on IoT Platform

- **Digital Twin based on IoT device platform works as enabler for various industrial applications:**
 - An IoT based DT presents and interconnects with the physical devices / operational technologies (OTs) and captures environment status.
 - An IoT based DT is a tool to provide the end-user (industrial applications) with useful insights and automation capabilities to meet end-user needs without the need to deal with low-level data and events.
 - An IoT based DT acts as a layer of abstraction between physical devices and end-user centric interests, providing capability (e.g., automation, emulation, etc.) to various industrial applications.

IoT based Digital Twin: virtual representations of real-world entities (primarily OTs) and processes based on IoT platform, which is synchronized at a specified frequency and fidelity to serve various industrial applications.

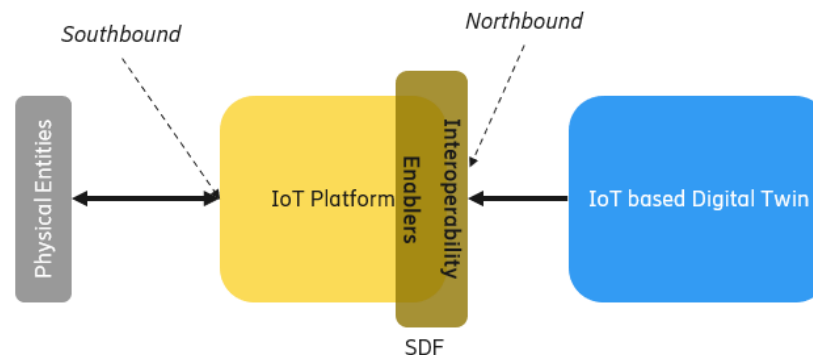


Core features for building DT based on IoT Platform

- Device related information: device descriptions; device related environment context descriptions → **heterogeneity issues to be addressed**
- IoT Device measurements: measurement data collected from IoT devices (various types of sensors) → **light-weight transport mechanism for time series data needed**
- Logic purposes from industrial applications: business related purposes to tell DT about the requirements/needs of industrial applications

Heterogeneity Challenge: Interoperability Enablers Needed for DT

- **DT build up on IoT device platform needs to handle the heterogeneity of data objects from heterogeneous devices:**
 - When the data objects collected from IoT platform are highly heterogeneous, it costs extra resources and time on handling the heterogeneous data objects before feeding them into digital twin;
 - The heterogeneity issue becomes more complicated when the IoT platform scales up. Therefore, the heterogeneity issue should be addressed at early phase.



DT Supported by SDF and SenML

- SDF serves as intermediate data object translator so that heterogeneous data objects from IoT platform can be organized in a uniform format.
- SDF works with IoT device platform before feeding data into digital twin so that data heterogeneity is handled at early phase.
- Besides DT platform intakes device related data objects from the IoT platform using SDF, other DT functionality components for advanced capabilities (e.g., Automation components) can work with **SDF** as well.
- **SenML** as a simplified model for sensor data measurement is used to feed IoT sensor measurement data in light-weight time sequences to the DT.

THANK YOU!

Q&A