

Digital Twin for Plan and Make From MIMAC to Semantic Web based Digital Reference

Explanation of the Idea

- > The JESSI/SEMATECH joint project MIMAC (Measurement and Improvement of Manufacturing Capacity) data sets serve as reliable simulation reference model for planning long-since.
- > Shorter product lifecycles, high demand uncertainty and fluctuation, changing manufacturing processes and an increasing quantity of globally distributed fabs are involved in the production of a single product. Hence, it leads to a increasing degree of complexity.
- > The scope of the MIMAC data set is expanded by transferring supply chain simulation related data into a **Semantic Web based** model that depicts the planning process for semiconductors and engineering integration, hence making it relevant in today's conditions. It facilitates **Plan** and **Make** (according to the SCOR model) processes within the semiconductor supply chain.

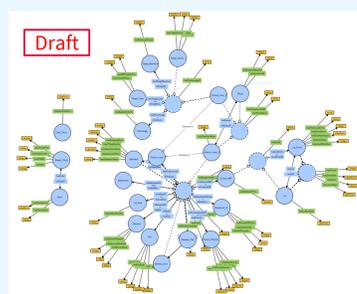


Figure 1: Semiconductor Operations third level ontology: the internal supply chain (draft).

Key Benefits

- > Transferred into a Semantic Web description, machine and human interpretability is ensured, moreover reducing complexity and eliminating redundancy.

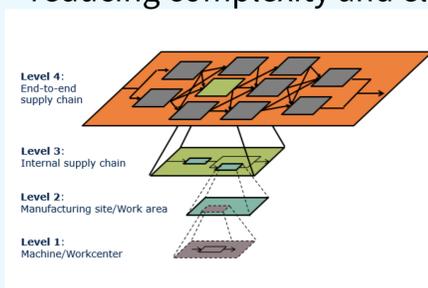


Figure 2: The four levels of semiconductor operations.

- > By splitting the model up, domain specific and relevant data is given. This ensures broad-scale extensibility, maintaining very detailed description.
- > Real-time access and data processing is ensured.

Challenges at current situation

- > Enhanced connection of physical and digital entities requires real-time accessibility of a high volume of data along the entire product lifecycle and options for automated communication.

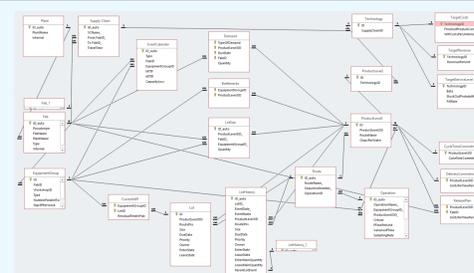


Figure 3: Semiconductor Supply Chain Planning Model based on MIMAC data set.

- > Not feasible with existing MIMAC data set integration and representation features.

Additional Information

- > The four simulation levels of semiconductor operations can each be transferred into an ontology and can be merged to form the holistic top-level **Digital Reference**.
- > The Semantic Web is an extension of the World Wide Web (WWW) framework that now connects data instead of hyperlinked documents. Linked and openly available data sets are hence readable and interpretable by both machines and humans, which enables improved collaboration between computers and humans.
- > The Semantic Web toolset enables the definition and maintenance of a controlled vocabulary of entities, including roles, processes and objects.
- > **The semiconductor industry with its strong connection to digitalization approaches has the capacity to lead this change towards a data driven smart development and manufacturing environment.**

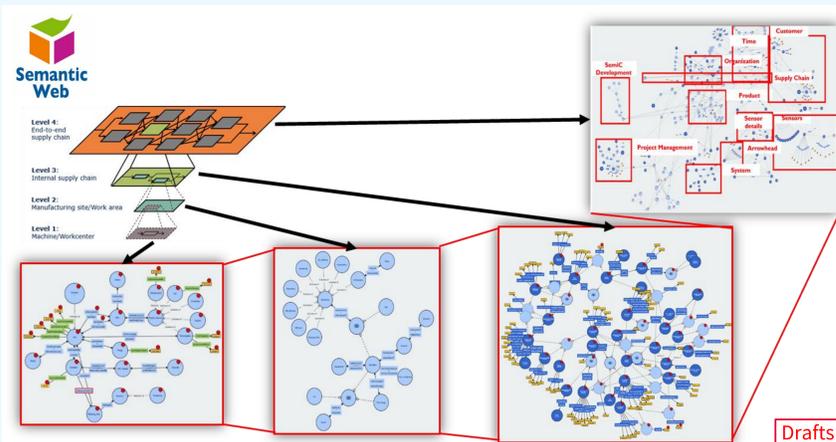


Figure 4: Splitting the four levels of Semiconductor operations up into domain or problem specific ontologies, that can be reintegrated, accordingly (drafts).

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