Architecture for a Multi-Energy Forecasting Strategy

A Domain-Driven Design Approach

Overview

This presentation is based on the research paper

“A Multi-Energy Meta-Model Strategy for Multi-Step Ahead Energy Load Forecasting”

published in Electrical Engineering (Springer, 2025) by Aristeidis Mystakidis et al.

The study proposes a novel, unified approach to forecasting the heating, cooling, and electricity consumption of a smart building using Machine Learning and Deep Learning models.

A Domain-Driven Design Approach to Architecture

Applying the principles of Domain-Driven Design (DDD) by identifying the core domain, defining bounded contexts, and modeling aggregates and interactions, allows to structure a forecasting system that handles multi-step price prediction for energy commodities such as electricity, natural gas, and oil. The result is a modular system that maps naturally to cloud-native services and can evolve with business and technical needs.

Core Domain

Multi-Step Forecasting for Energy Loads

The following is the heart of the system

- Forecast energy (or price) values over multiple future steps.
- Handle different energy types (heating, cooling, electricity) or adapted to other specific cases, different commodities (natural gas, oil, electricity prices).

Bounded Contexts

Feature Engineering Context

- Handles the preparation of historical datasets, feature construction, lag calculations, transformations.

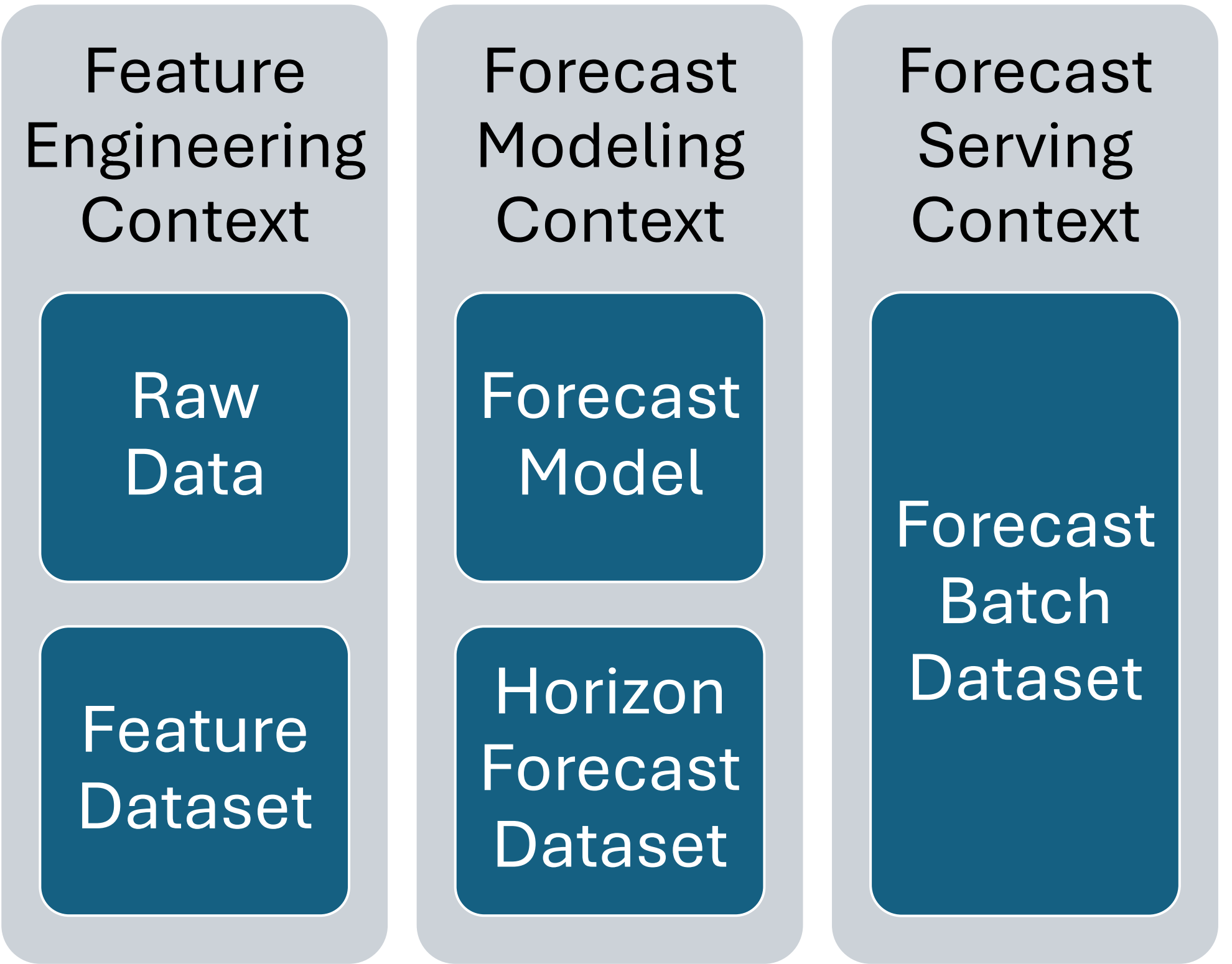
Forecast Modeling Context

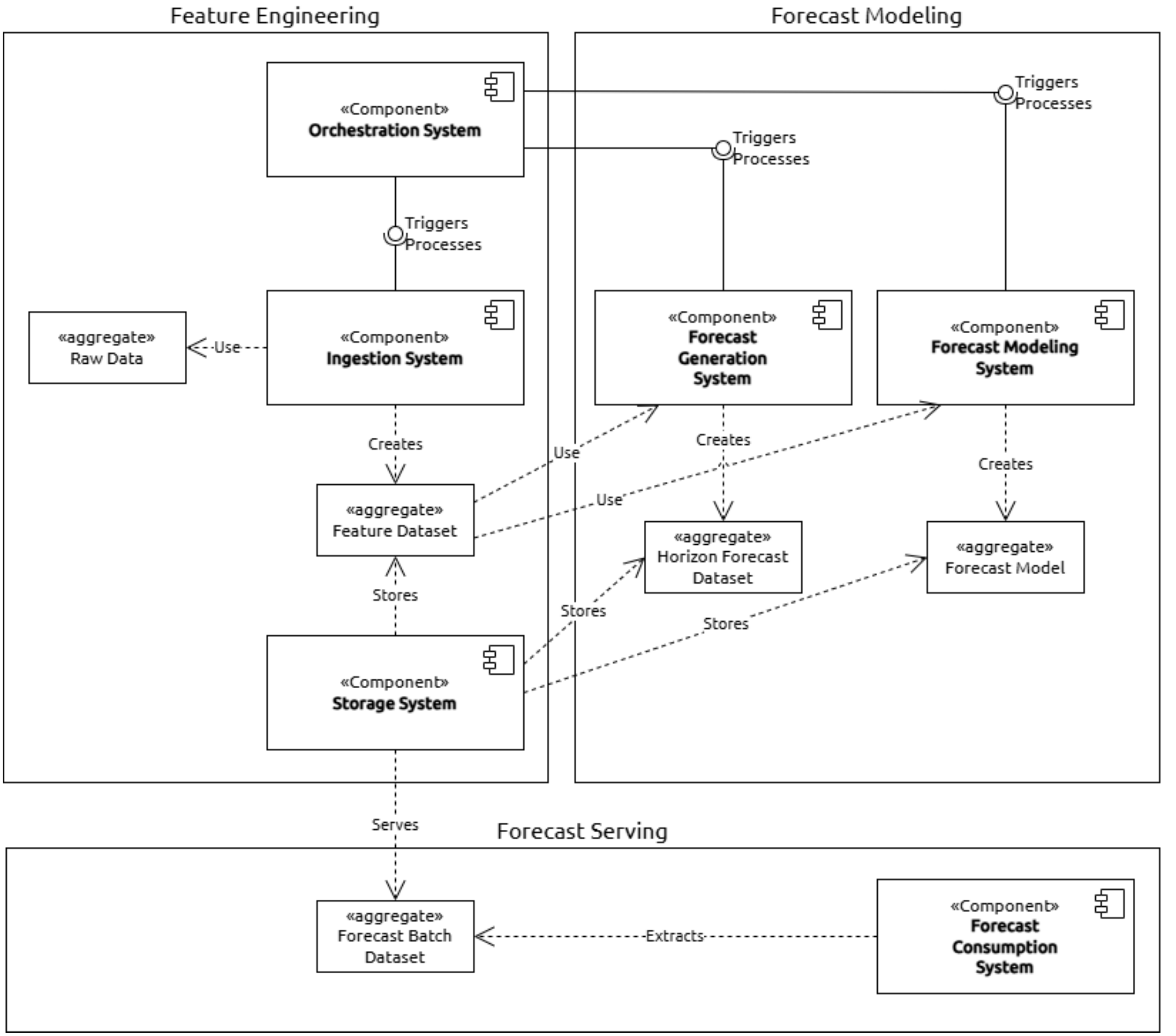
- Encapsulates model training, model selection, and multi-horizon prediction generation.

Forecast Serving Context

- Manages how trained models are exposed, how batch scoring is triggered, how results are stored and consumed.

Main Aggregates





Components Diagram Contexts and Aggregates