CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

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TIMEPAC

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SmartLivingEPC: Advanced Energy Performance Assessment towards Smart Living in Building and District Level

Framework Architecture

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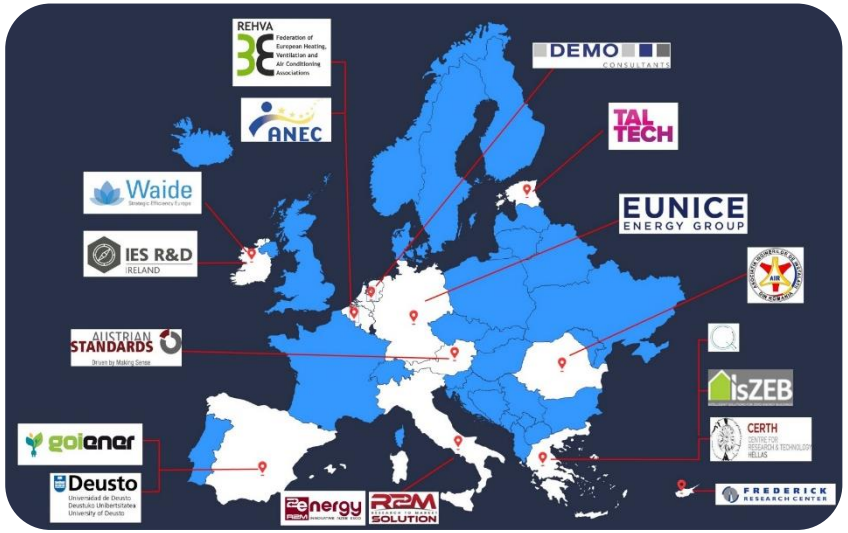
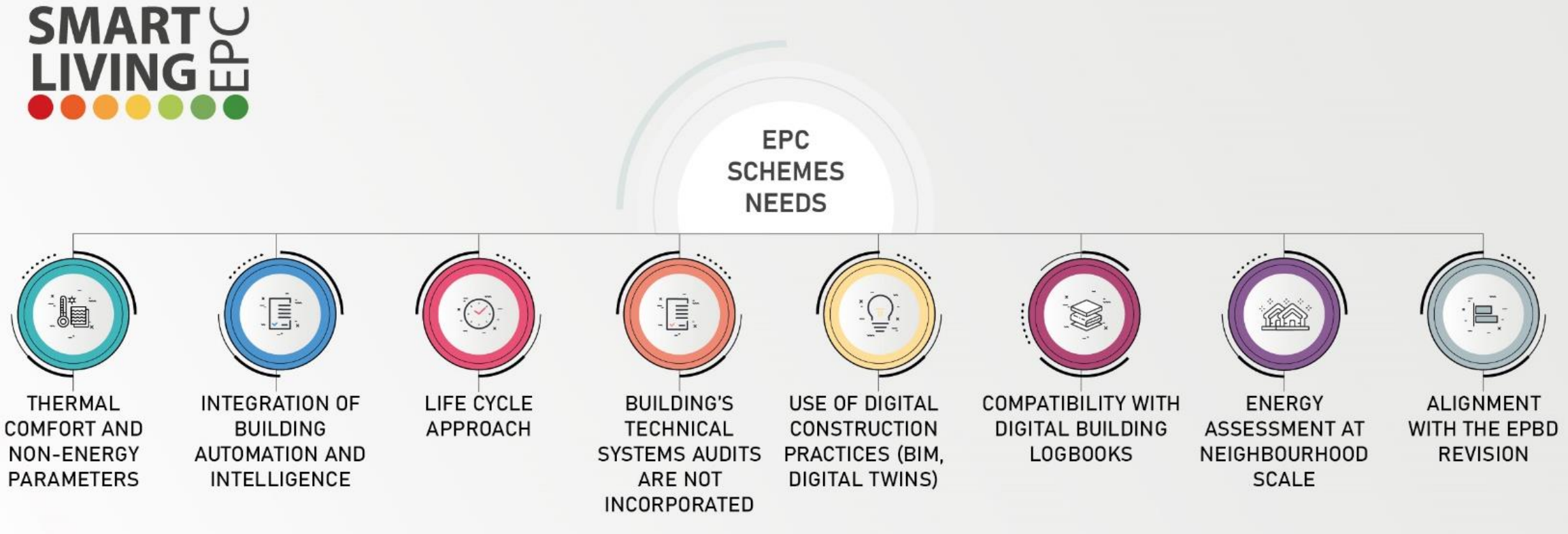
The SmartLivingEPC project

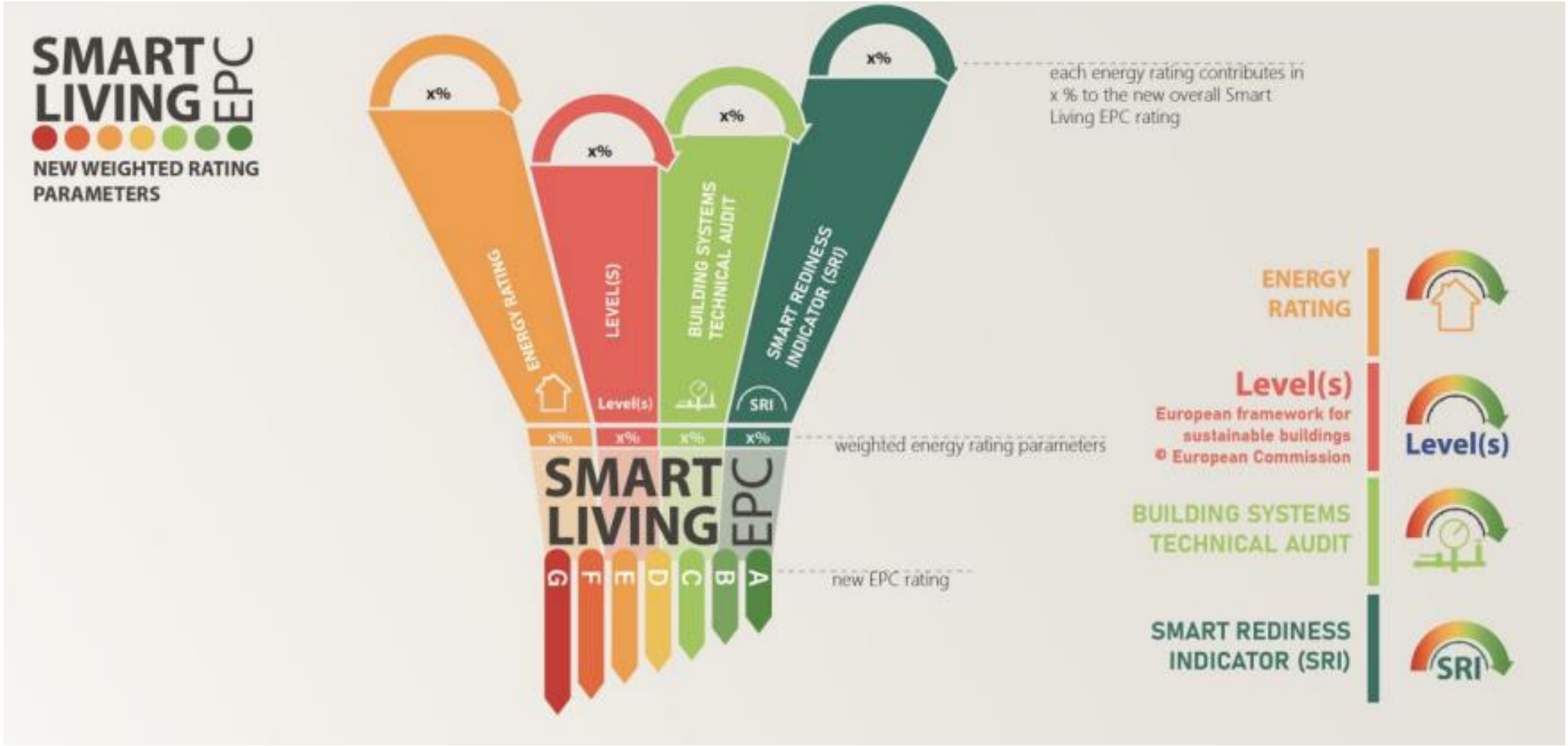
Grant Number	101069639
H2020 Call	HORIZON-CL5-2021-D4-01-01
Type of action	Advanced Energy Performance Assessment & Certification HORIZON Innovation Actions
Duration	36 months
Starting date	1 July 2022
Consortium	

Smart living EPC

EPC Schemes Requirements



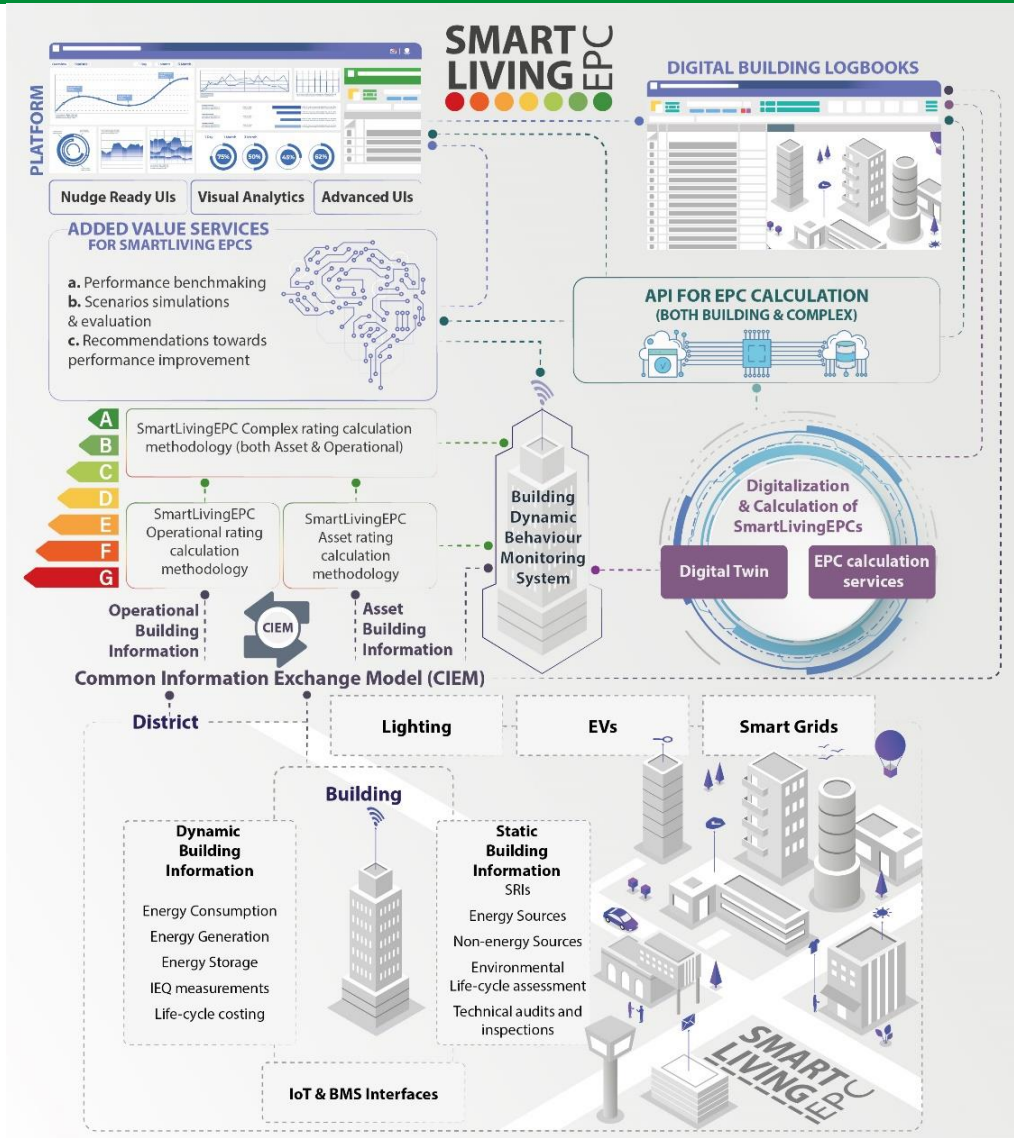
SmartLivingEPC methodological approach



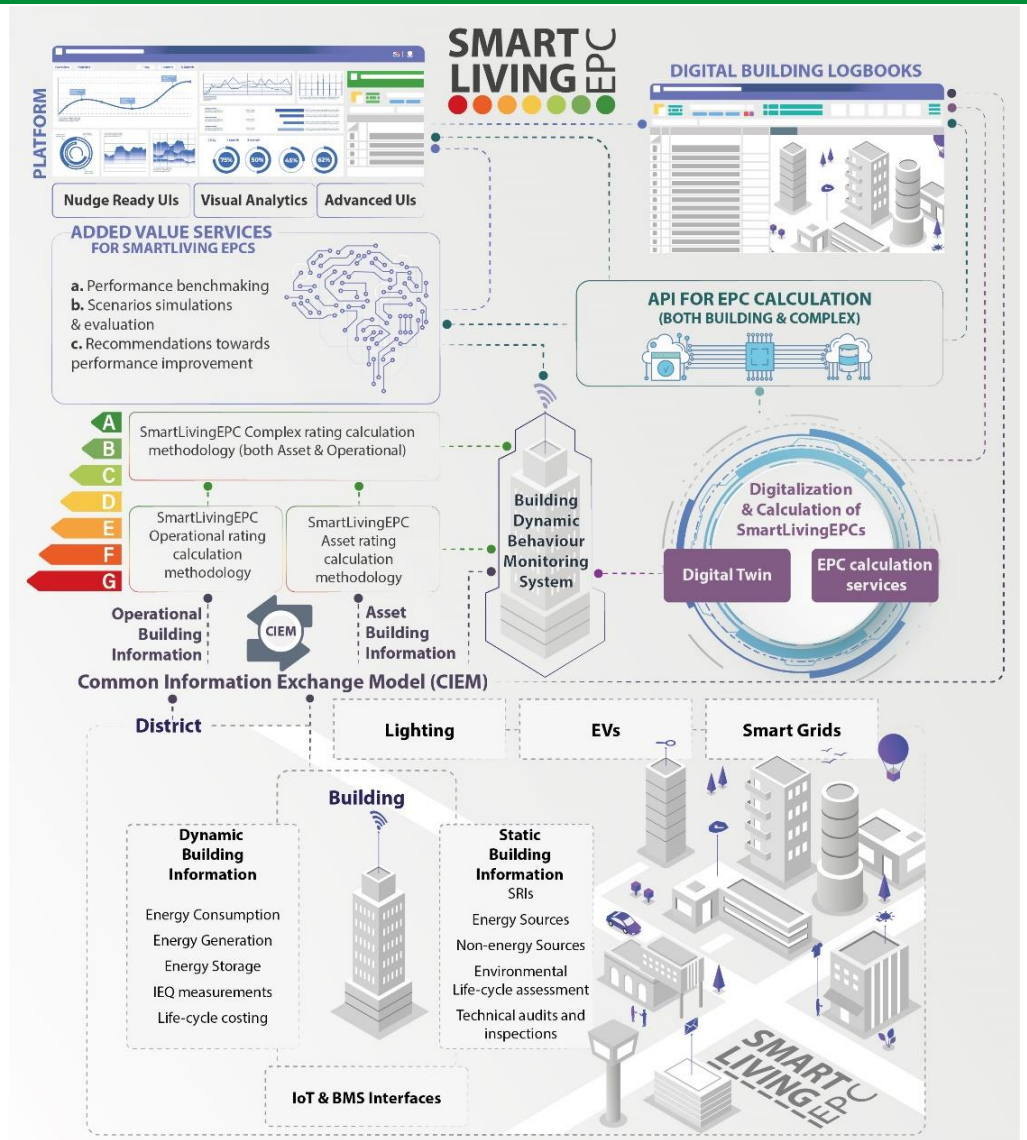
Conceptual Architecture

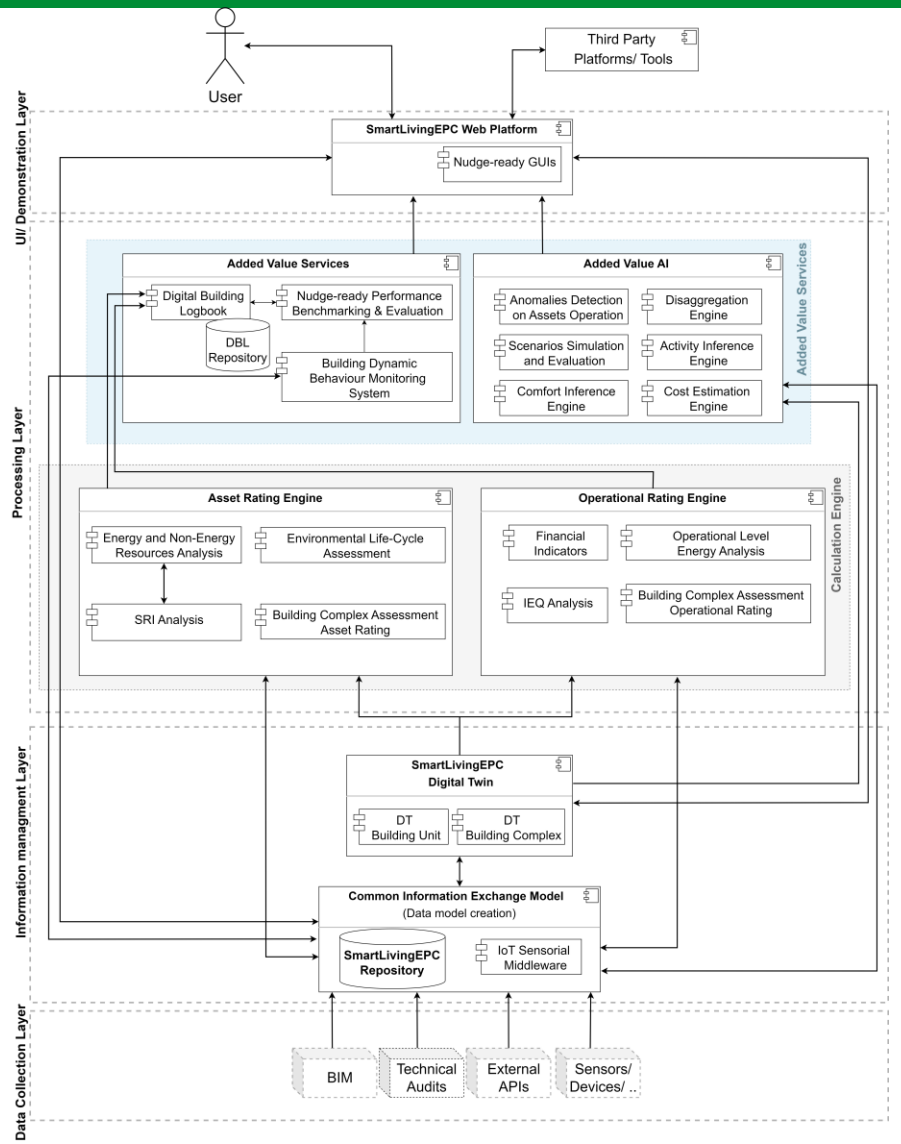
Three distinct progress stages

1. Improving the method used to rate buildings based on energy efficiency, sustainability, technical audits, and smart features
2. Incorporating digital design tools to issue Energy Performance Certificates
3. Developing a Digital Platform and AI services that enhance the user experience and potential of SmartLivingEPC

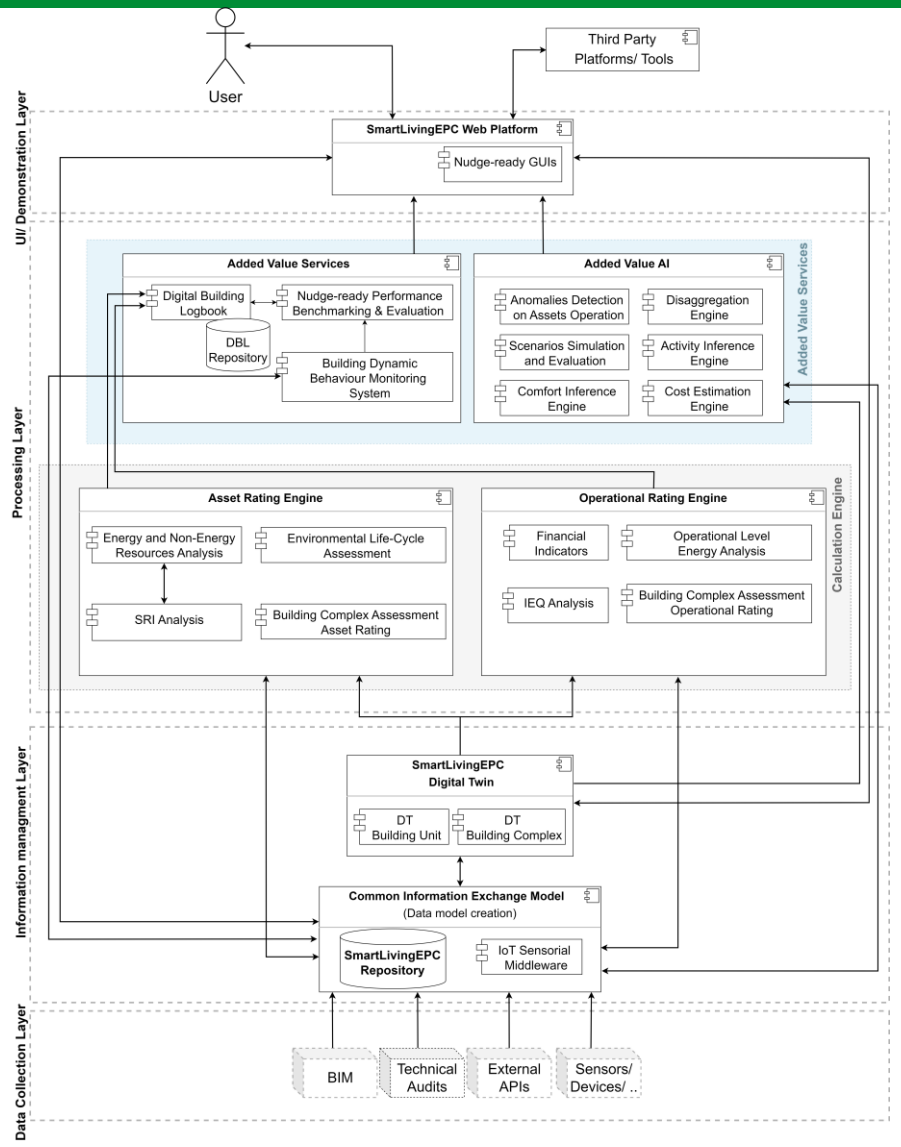


From Conceptual to Framework Architecture





Framework Architecture



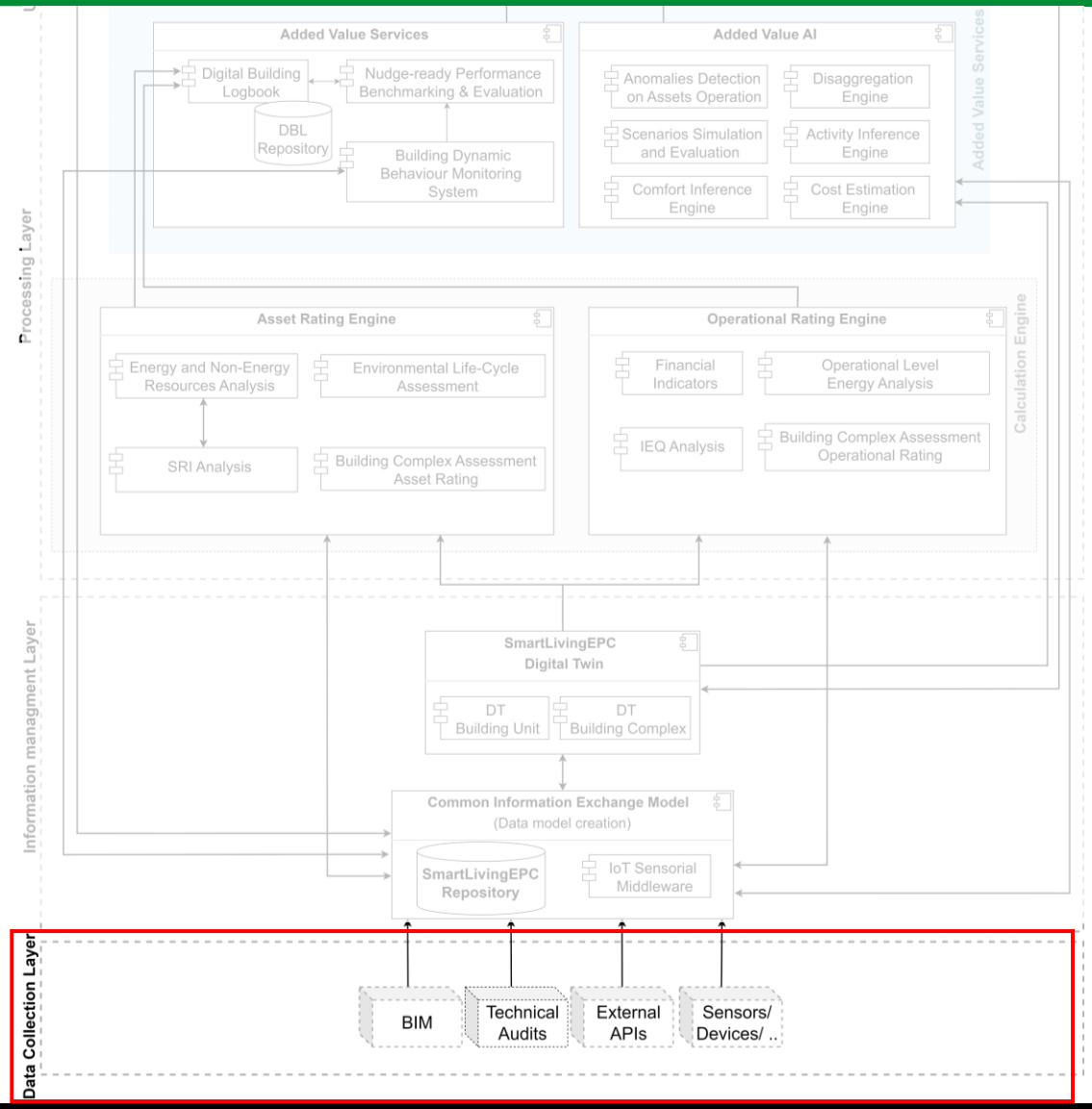
Layers

1. Data collection Layer
2. Information Management Layer
3. Processing Layer
4. UI/ Demonstration layer

Components

- 7 main components
- 22 sub components

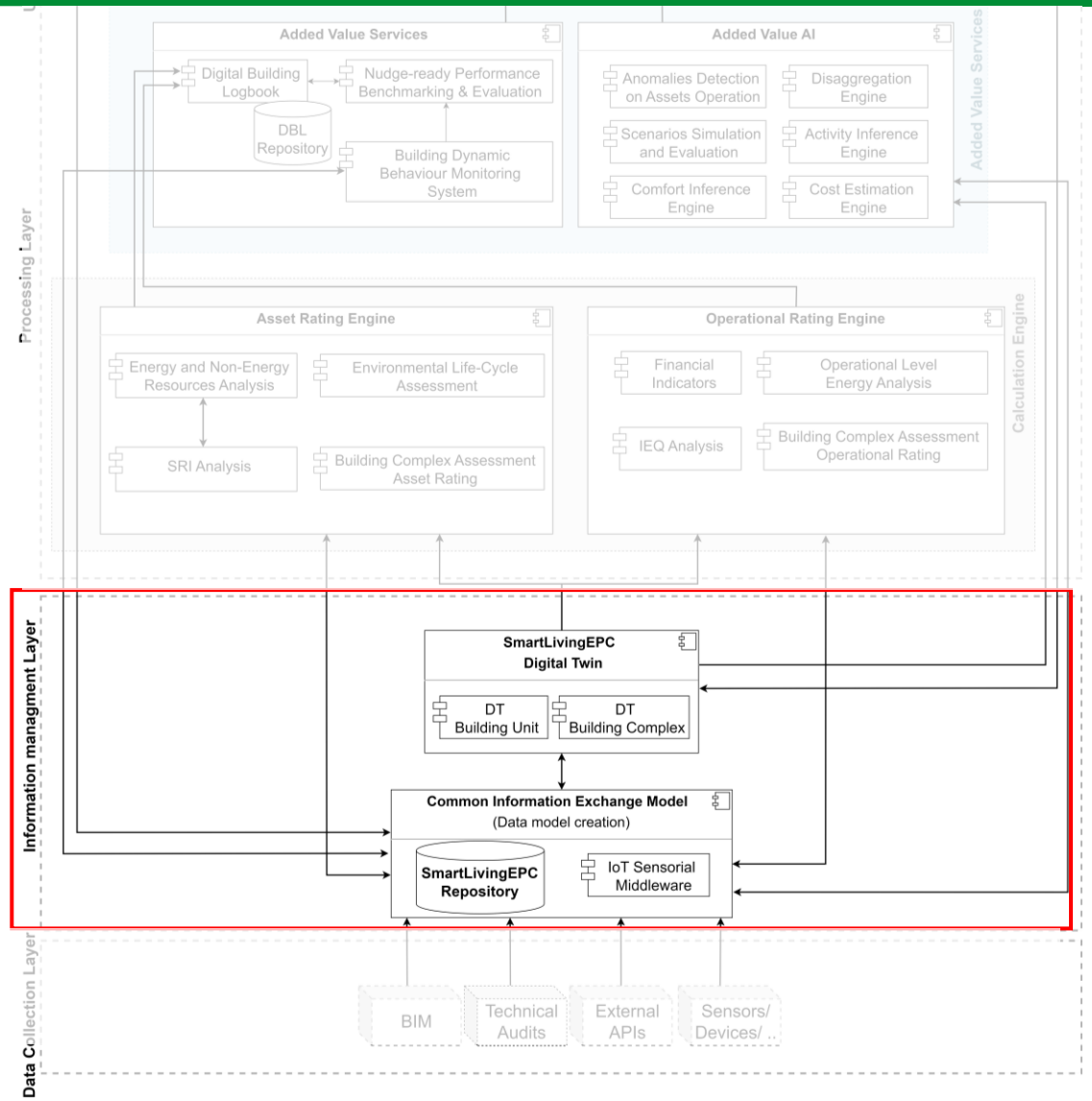
Data Collection Layer



Key functionalities

- Data collection from devices
  - Sensors
  - Meters
  - Internet of Things
  - BMS/ BEMS
- Building documentation provided by end-users
  - BIM models
  - Technical Audits
  - other documentation sources

Information Management Layer



Key functionalities

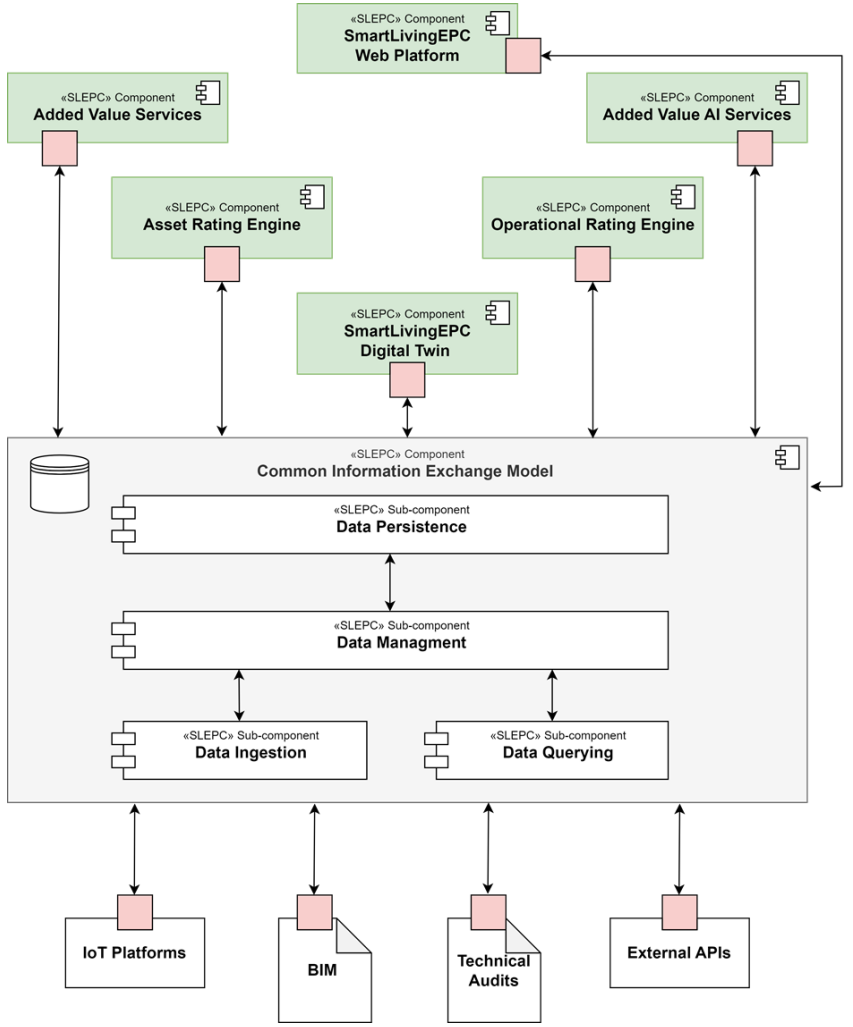
- Data Homogenization
- Data Correlate
- Storage

Two primary components:

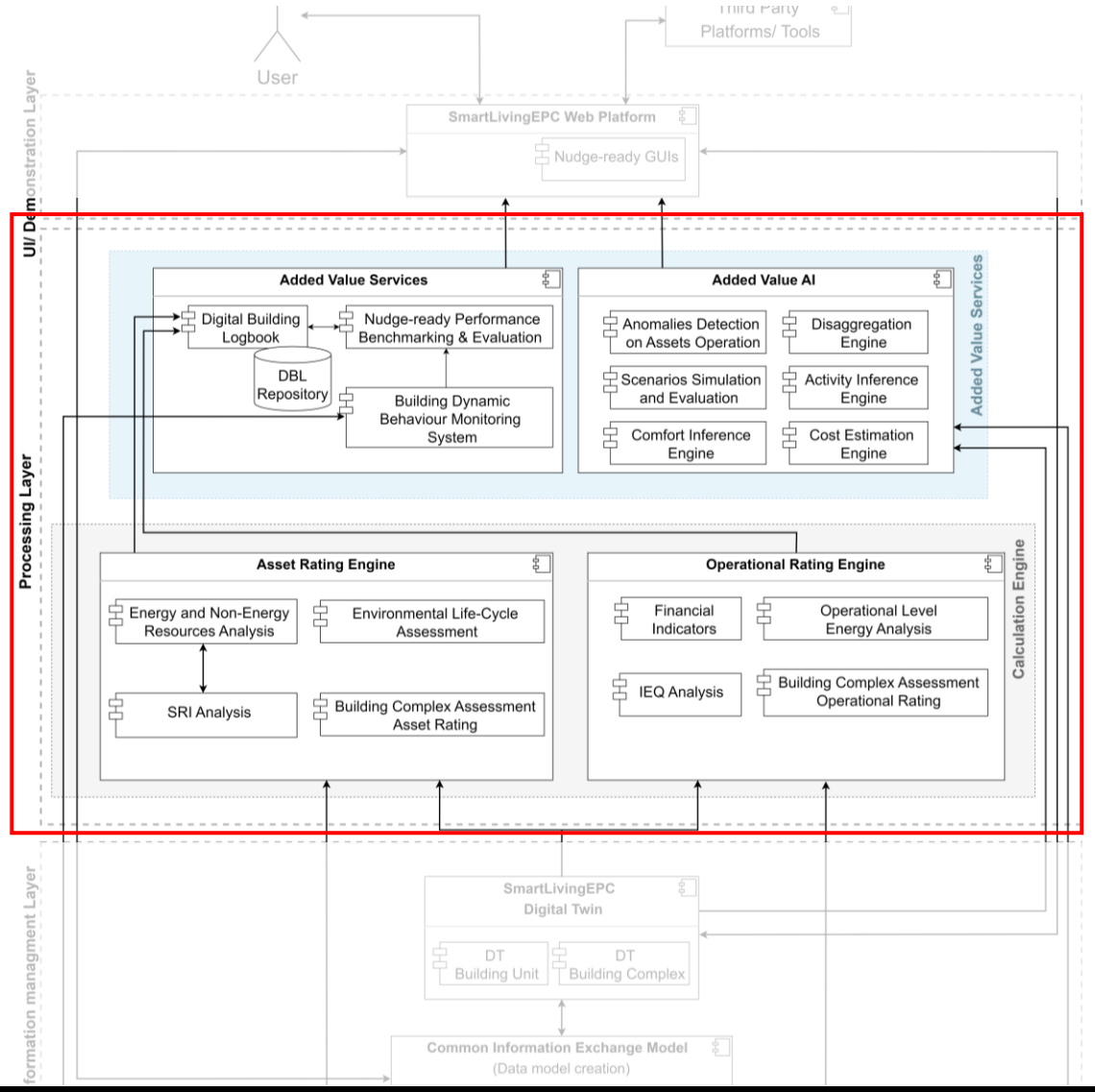
1. Common Information Exchange Model
2. Digital Twin

Common Information Exchange Model

- **repository** and **middleware** for the collected static and dynamic data
  - BIM, open standards (IFC)
  - IoT devices
- Internal structure of four distinct layers:
  1. **Data Ingestion** collecting data and alignment with the SmartLivingEPC data model
  2. **Data Querying** data retrieval from external sources
  3. **Data Management** cleansing, normalization, parsing .ifc files, and conducting quality checks
  4. **Data Persistence** encompasses various storage solutions such as file storage databases, time-series databases for IoT data, and key-value databases



Processing Layer



includes all the calculation modules for building performance assessment and optimization

Asset Rating Engine

- as-designed energy and environmental performance

Operational Rating Engine

- as-operated performance metrics related to energy and IEC

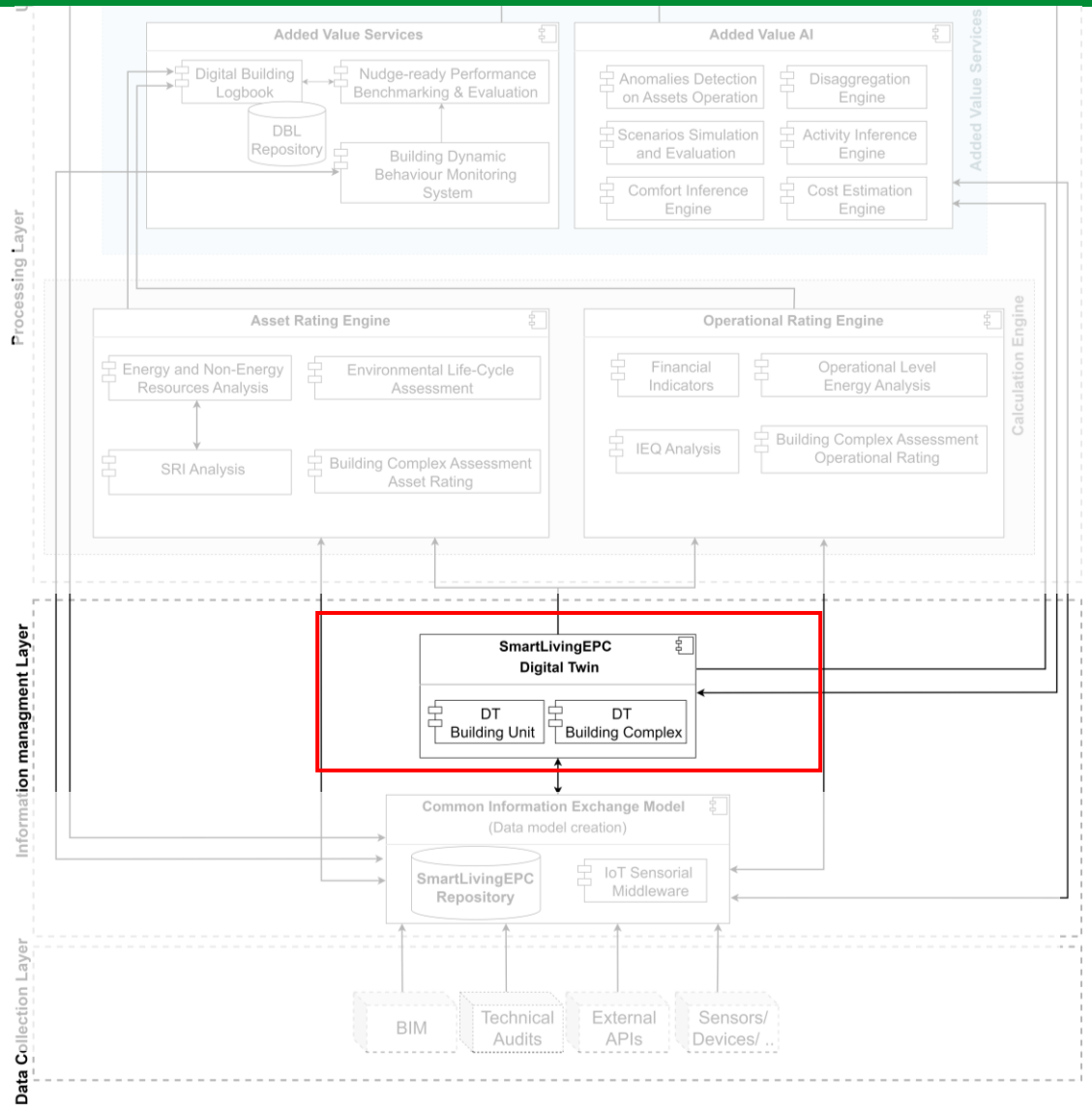
Added Value Services

- benchmarking and building dynamic behaviour monitoring, DBL functionalities

Added Value AI

- Additional services base on Artificial Intelligence

Digital Twin



- linking physics-based building models with real-time building data
- up-to-date representation of building performance

Building Unit Digital Twin

- analysis of the building's geometrical, physical, and operational characteristics
- establishment of baseline demand model
- ongoing building model calibrations
- prediction of near-future operational profiles

Building Complex Digital Twin

- aggregation of results from individual Building Unit Digital Twins
- IoT data updates at the building complex level
- holistic view of the Building Complex's energy use and performance

Asset Rating Engine

- as-designed energy performance assessment,
- non-energy parameters like structural risk and noise pollution

Energy and Non-Energy Resources Analysis

- Evaluation of environmental impact throughout the building's life cycle, with data sourced from BIM documentation
- Level(s) framework for sustainability

Environmental Life-Cycle Analysis

Asset Rating

SRI Analysis

•Assessment of building's intelligence, adaptability,
• based on European Commission guidelines

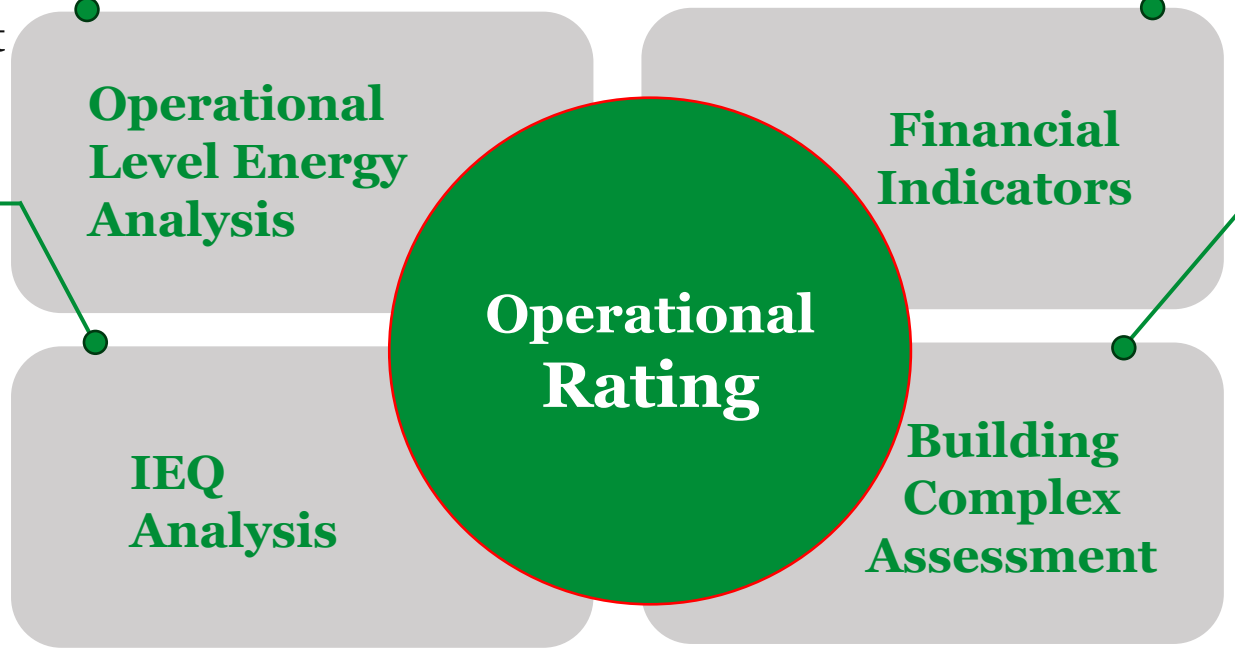
Building Complex Assessment

•synergy between built environments and surroundings
• aggregation of individual building assessments
• neighborhood asset assessments,
•technical and social aspects

Operational Rating Engine

- energy performance assessment using consumption data,
- no EU standards –custom SmartLivingEPC assessment methodology

- Human-Centric Building Operation Assessment
- based on sensor data
- IAQ, viral transmission risk, temperature, CO2, ventilation, and occupancy.



• Life Cycle Cost (LCC)
• Level(s) framework
• includes building maintenance, non-annual expenses, financial fluctuations

•Aggregation of data from individual buildings
• district-level infrastructure (e.g. smart grids, RES, storage)

Added Value Services

Digital Building Logbook

- **Centralized Repository** storage, indexing, and retrieval of essential building information
- **document traceability and versioning** track modifications and access different document versions, focusing on historically significant building data

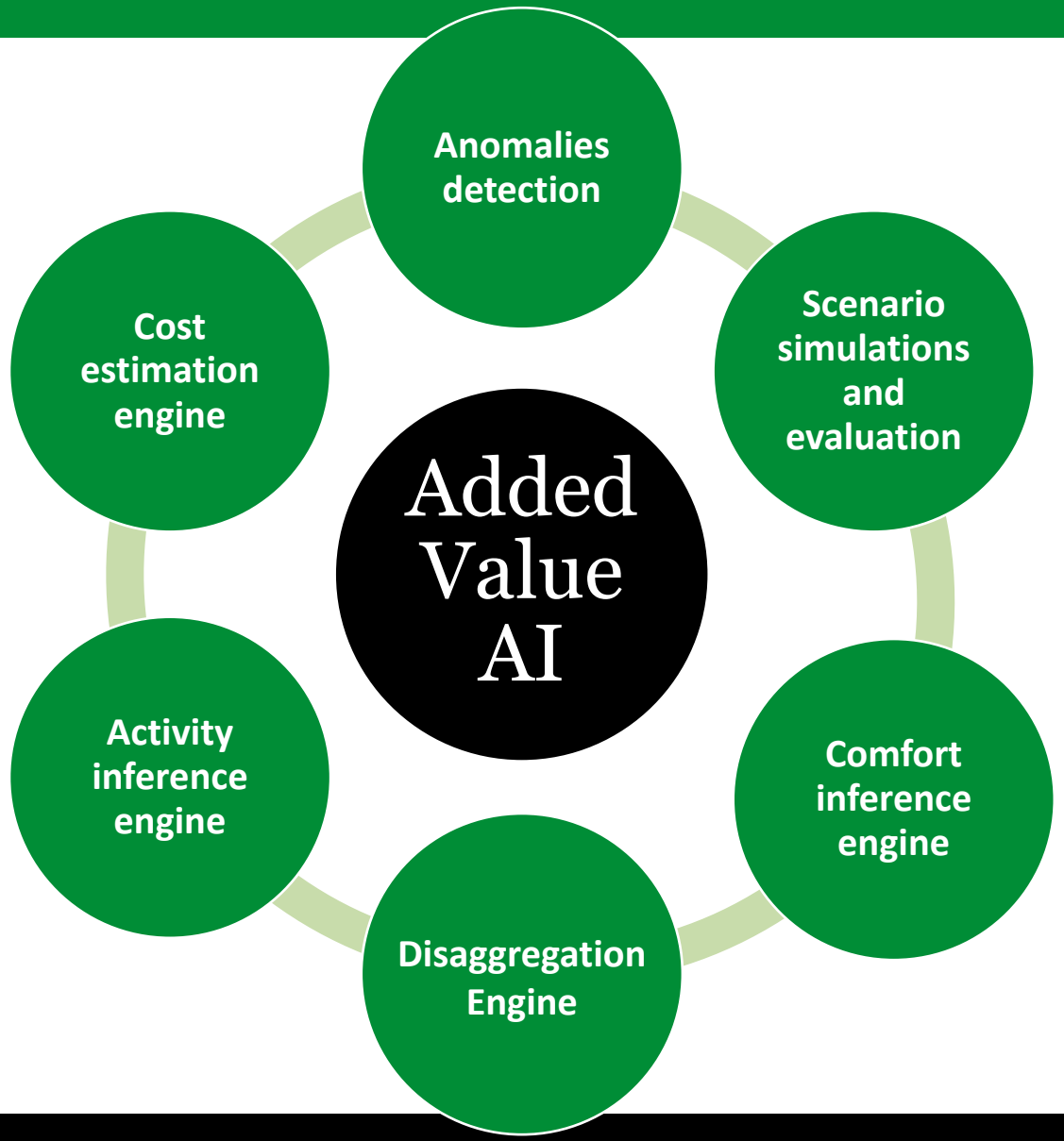
Nudge-ready Performance Benchmarking & Evaluation

- **data visualization** (via dashboards or IoT) and personalized recommendations
- Data comparison and standardization across buildings for **benchmarking**
- **guidance** on energy efficiency, upgrades, and maintenance

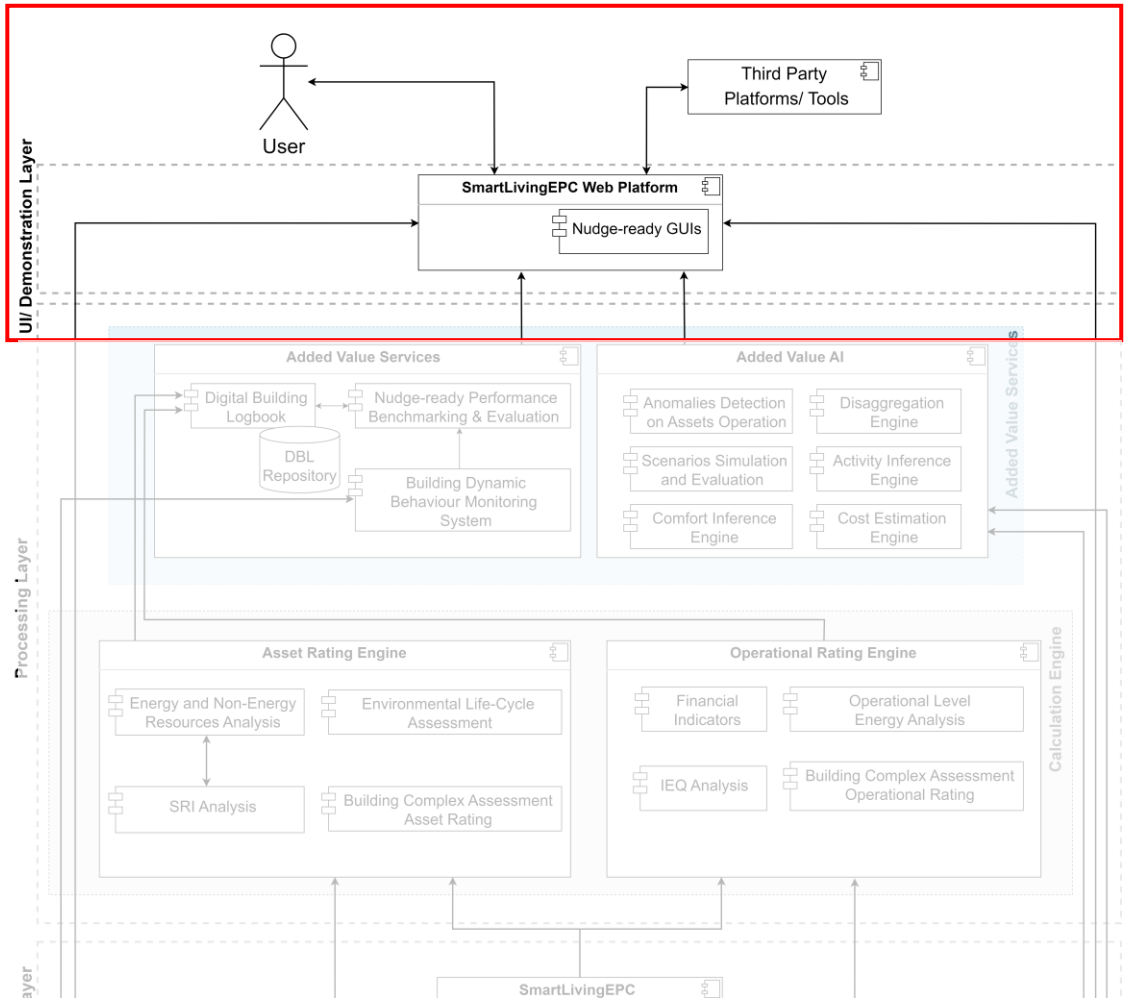
Building Dynamic Behaviour Monitoring System

- monitoring and **modeling building dynamics**, including energy usage, indoor conditions, and occupancy patterns
- **insight generation** and comprehensive **behavior modelling**

Added Value AI



UI demonstration Layer



Functionalities

- access real-time building performance statistics,
- upload and update the building related information (e.g., BIM files) and
- receive actionable insights for an efficient operation of their assets.

SmartLivingEPC Web Platform

- nudge-ready graphical user interfaces
- data in a spatiotemporal format
- visual analytics for data evaluation and correlation of data

SmartLivingEPC communication channels

www.smartlivingepc.eu/en

twitter.com/SmartLivingEPC
@SmartLivingEPC

linkedin.com/company/smartlivingepc/

youtube.com/@smartlivingepc3975

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Thanks for your attention!