



# Functional entities for enabling per service eco-data reporting

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# Objective

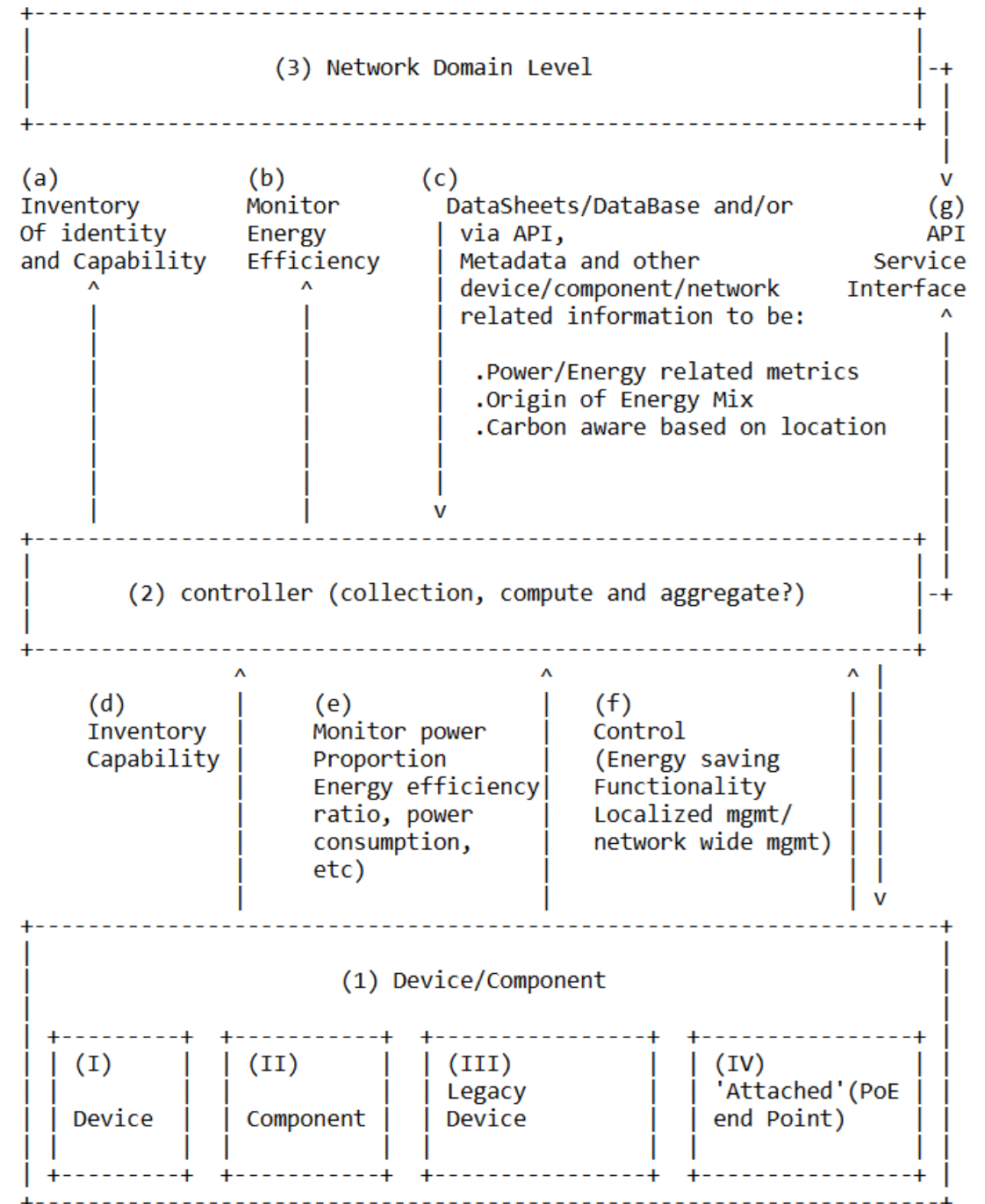
- Different functional blocks can be defined in order to collect the energy consumption associated to a given connectivity service
- Such functional blocks will allow to provide energy attribution at connectivity service level through a consistent functional pipeline
  - Service Discovery, Resource Allocation, Energy Measurement, Attribution, and, if necessary, Green Orchestration.
- As final block, a reporting function is required so to enable interaction with other domains or consumers of the GREEN framework
- Moreover, this enables the creation of an end-to-end energy-reporting overlay collecting, reporting and aggregating attributional data from different domains (either IETF or not, which are out of scope)

# Key concepts

- Functional components: identification of components enabling per-service energy attribution within the network domain.
- Energy objects, interfaces, and green reference framework functions as defined in [*I-D.belmq-green-framework*] (now [*I-D.ietf-green-framework*]).
- Mapping of those functional components onto IETF GREEN Reference framework

# IETF GREEN framework

- **Device & Component Level:** Energy Objects, physical meters, PoE endpoints, legacy devices, and the energy topology relations among them.
- **Controller / EnMS Level:** Aggregation, computation, and policy-driven control; supports centralized, distributed, or hierarchical layouts.
- **Network Domain Level:** Inventories, data repositories, analytics platforms, and service APIs (e.g., PETRA [*l-D.petra-green-api*]).
- **Interfaces (a-g)** which define how discovery, monitoring, metrics, control, and higher-level service APIs interact across levels.



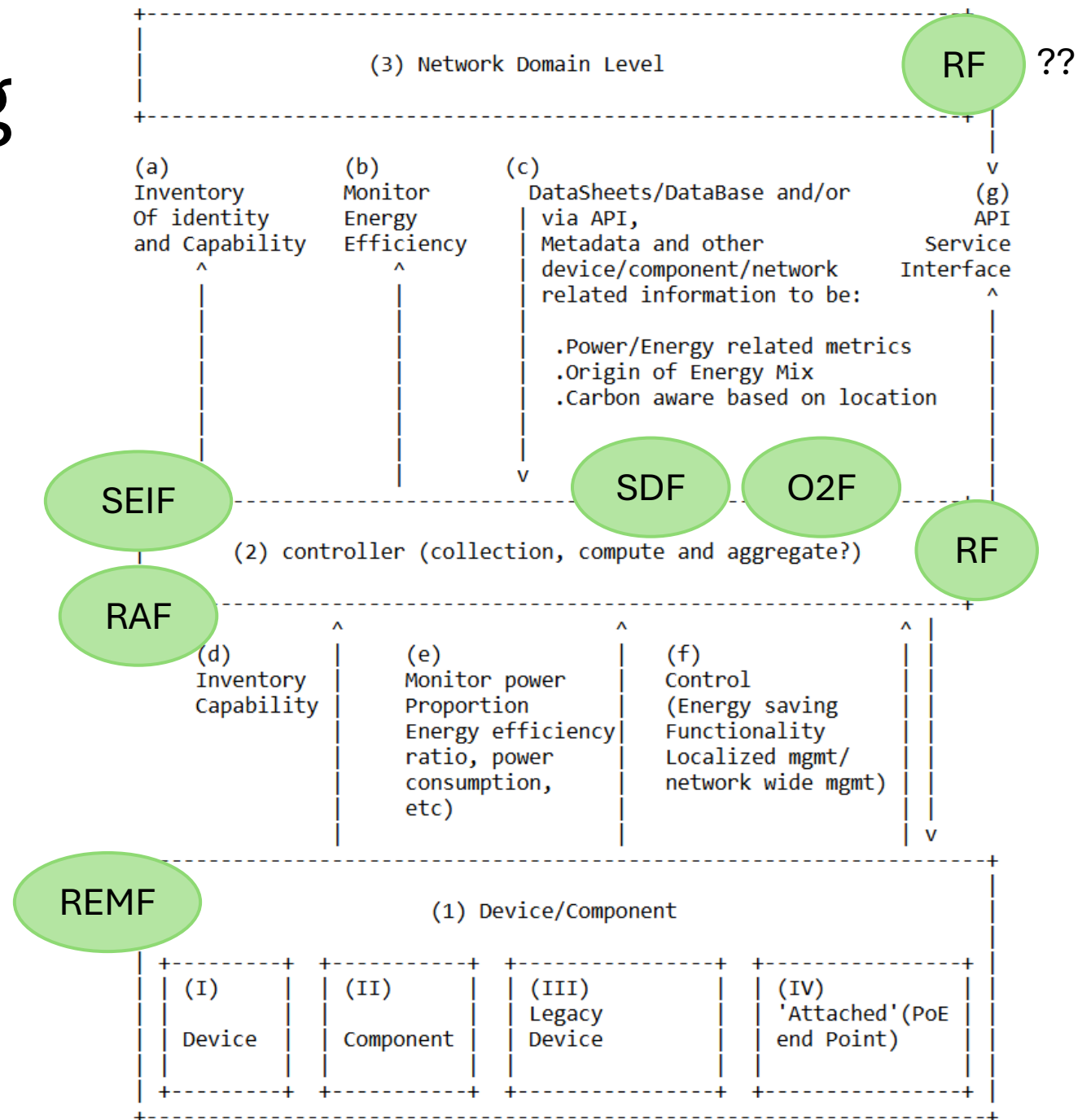
# Proposed Functional Blocks

- **Service Energy Information Function (SEIF):** this function is **responsible for attributing resource-level energy measurements to service-level energy consumption**. It produces the service-oriented energy information consumed by the Reporting Function.
- **Resource Energy Measurement Function (REMF):** this function measures the energy consumption (and carbon information, when available) of any resource in the network domain, **providing the raw energy telemetry used by higher-level functions**.
- **Resource Allocation Function (RAF):** this function **tracks which resources are allocated to which service**, maintaining mappings so that energy usage can later be attributed correctly.
- **Service Directory Function (SDF):** this function maintains the **list of active services and maps each service identifier to the service instances** running in the domain
- **Orchestration and Optimization Function (O2F):** this **orchestration function optimizes and manages service placement and lifecycle from an energy-aware perspective**. It could include capabilities such as optimal placement, service lifecycle, incentives, etc.
- **Reporting Function (RF):** this function is in charge of **consolidating the eco-data information and reporting it** by means such as APIs (for instance, [I-D.petra-green-api] or [I-D.amalj-sustain-shape]).

# Functional Mapping

## Process Flows and Interfaces

- GREEN Discovery Interfaces (a,d): SDF and RAF consume resource and service inventories from the domain
- Monitoring Interfaces (b,e): REMF streams energy measurements.
- Metrics Interfaces (c): SEIF transforms raw metrics from REMF into service-level ones using RAF mappings.
- Control Interface (f): An Optimization Function can executes lifecycle, energy-variant optimization, and domain reallocation
- Service API Interface (g): The RF exposes ecodata for inter-domain or multi-layer energy composition (e.g., by means of PETRA).



# Conclusions

- This document propose the identification of functional blocks assisting the purpose of providing energy attribution at connectivity service level
- Preliminary identification of functionality required for such purpose
- Next steps
  - Gather interest from the working group on this topic
  - Move the draft to GREEN WG (initially was submitted to SUSTAIN RG)
  - Prepare new version for IETF 126 incorporating comments already received (from Adrián Gallego)