EnergyOptimizerSys SysD

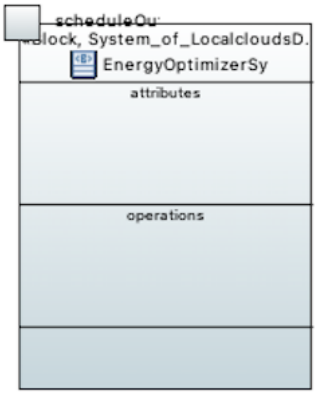
System Description

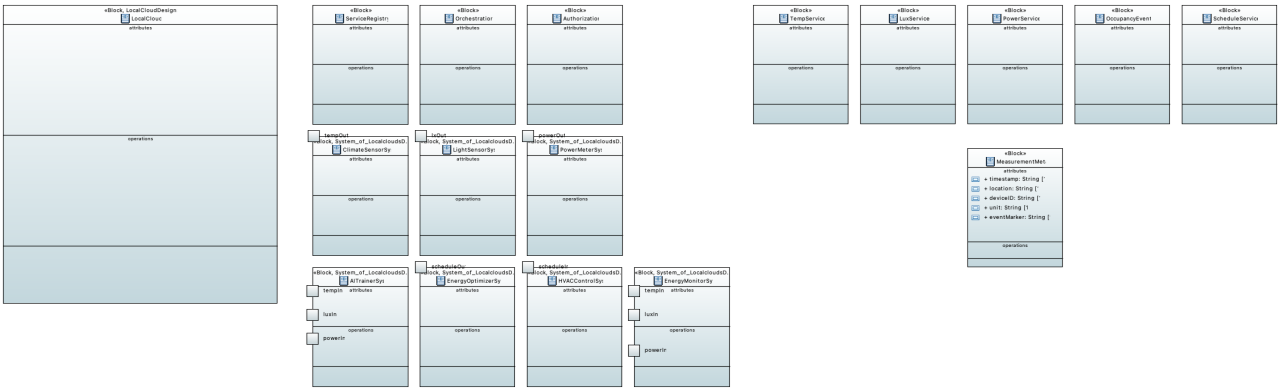
Abstract
EnergyOptimizerSys computes an energy-efficient HVAC schedule that satisfies comfort constraints and publishes it via **ScheduleService** within an Arrowhead Local Cloud.

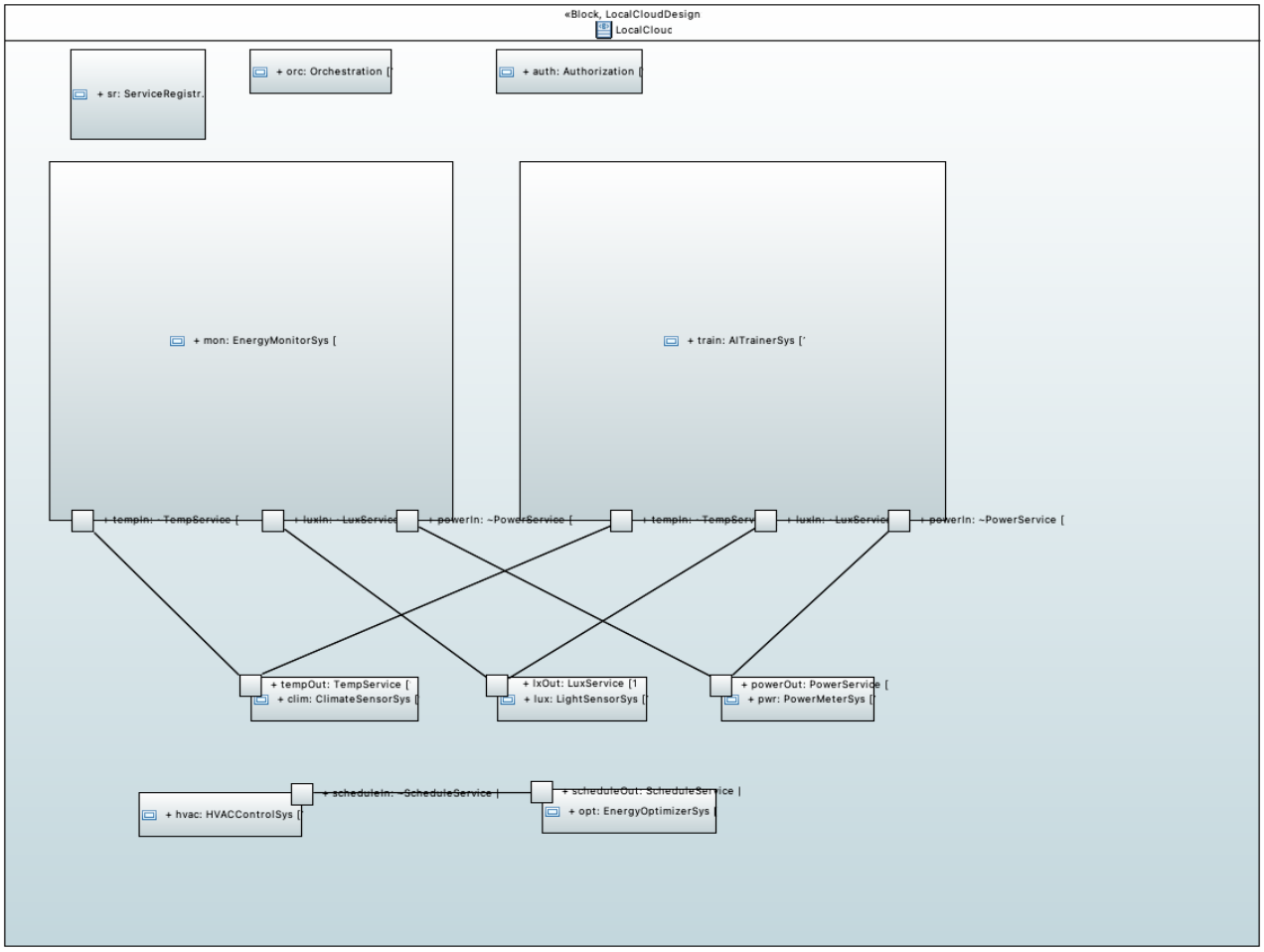
Contents

1 Overview

EnergyOptimizerSys computes an HVAC schedule that minimizes energy use while satisfying comfort constraints. It runs in the Local Cloud and publishes **ScheduleService** for **HVACControlSys** to consume.






«Block, LocalCloudDesign
LocalClouc
+ sr: ServiceRegistr.
+ orc: Orchestration [
+ auth: Authorization [
+ mon: EnergyMonitorSys [
+ train: AITrainerSys ['
+ tempIn: ~TempService [
+ luxIn: ~LuxService
+ powerIn: ~PowerService [
+ tempIn: ~TempServ
+ luxIn: ~LuxServic
+ powerIn: ~PowerService [
+ tempOut: TempService [
+ clim: ClimateSensorSys [
+ lxOut: LuxService [1
+ lux: LightSensorSys [
+ powerOut: PowerService [
+ pwr: PowerMeterSys [
+ scheduleIn: ~ScheduleService |
+ scheduleOut: ScheduleService |
+ hvac: HVACControlSys [
+ opt: EnergyOptimizerSys

1.1 Significant Prior Art

Omitted for beginner scope.

1.2 How This System Is Meant to Be Used

Runs periodically (e.g., every 15–60 minutes) once model training is available; outputs the next-period schedule to **HVACControlSys**.

1.3 System functionalities and properties

Functional properties

- Compute optimized HVAC schedule that meets comfort constraints.
- Publish **ScheduleService** for **HVACControlSys**.

Configuration

- Scheduling horizon/resolution (e.g., 24h horizon, 15-min slots).
- Comfort range (min/max temperature).

Data stored

- Last generated schedule (used as fallback).

Non-functional properties

- Late binding via *Orchestration*; authorization check before endpoint is returned.
- Operates inside Arrowhead-secured Local Cloud (TLS, certificates).

Stateful: preserves last schedule (functional state).

1.4 Important Delimitations

No algorithms, protocols, or encodings here (white-box/IDD out of scope).

2 Services

2.1 Produced

Service	Port/Type	Description	SD
ScheduleService	scheduleOut : ScheduleService	Next-period HVAC start/stop and setpoints	SD_ScheduleService

2.2 Consumed

None directly in the beginner scope (training data flow handled by **AITrainerSys** and sensors).

3 Security

Runs inside Arrowhead secure mode. Systems authenticate with Arrowhead-compliant X.509 certificates. Only authorized consumers (e.g., **HVACControlSys**) may consume **ScheduleService**.

3.1 Security model

- Protocols/encodings at IDD level (not fixed here).
- Data protection: TLS in Local Cloud.
- Authentication: certificate-based (Arrowhead-compliant X.509).
- Authorisation: policy { consumer=`HVACControlSys`, service=`ScheduleService`, permit=true }.

4 Revision History

4.1 Amendments

No.	Date	Version	Subject of Amendments	Author
1	2025-10-20	1.0.0	Initial SysD for EnergyOptimizerSys	Abdalrahman Nasser