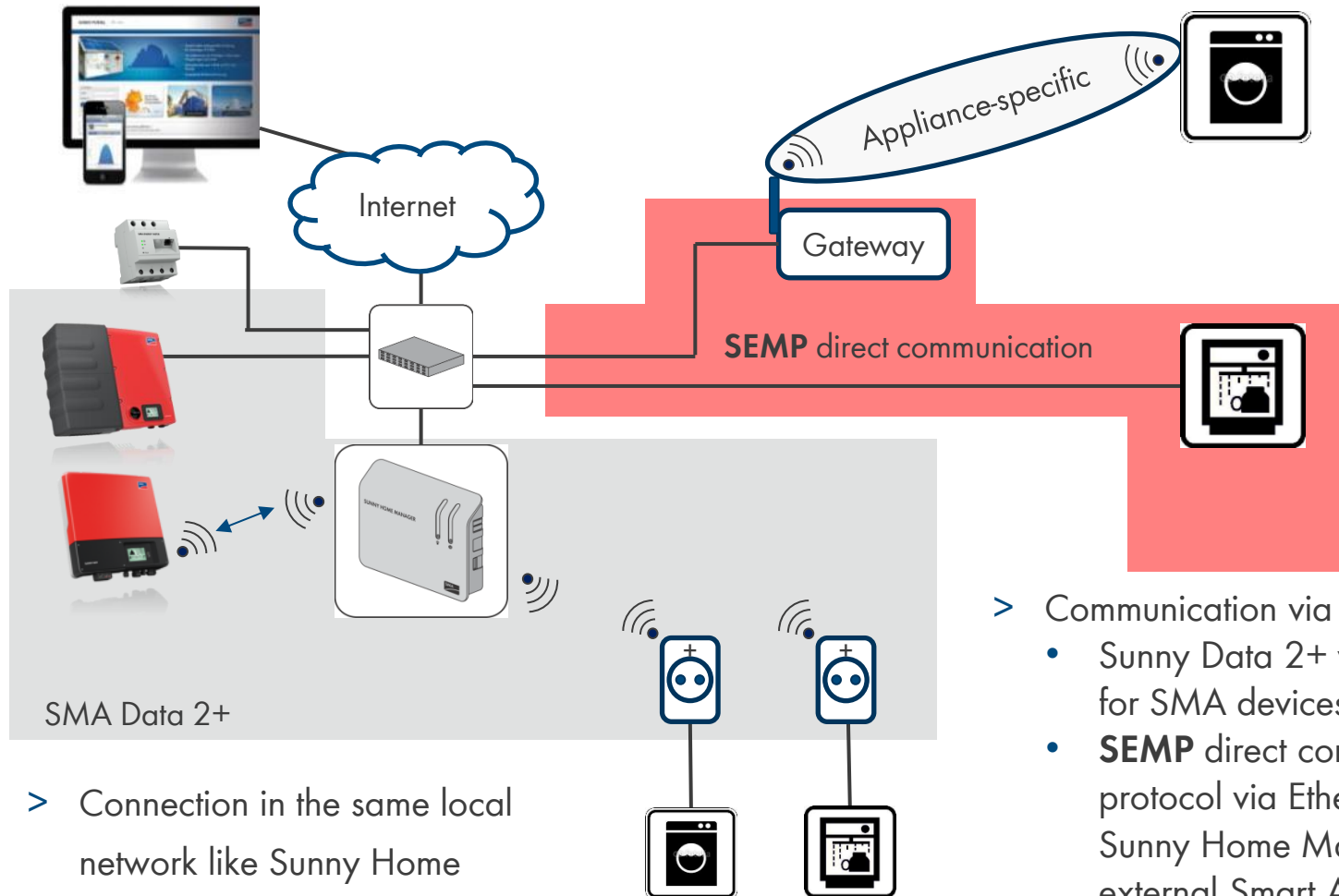


INTRODUCTION **SEMP** FOR SMA SMART HOME SIMPLE ENERGY MANAGEMENT PROTOCOL



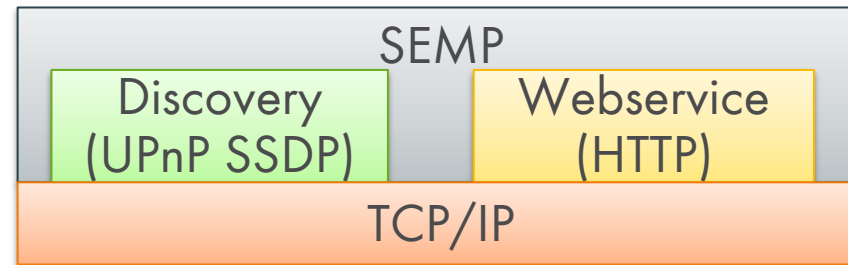
SMA SMART HOME CONTROL OF SMART APPLIANCES VIA SEMP



- > Connection in the same local network like Sunny Home Manager via Internet router or switch

- > Communication via protocols:
 - Sunny Data 2+ via BT and Ethernet for SMA devices
 - **SEMP** direct communication protocol via Ethernet between Sunny Home Manager and external Smart Appliances
 - Appliance-specific protocol between gateway and appliance

SEMP consists of two components:



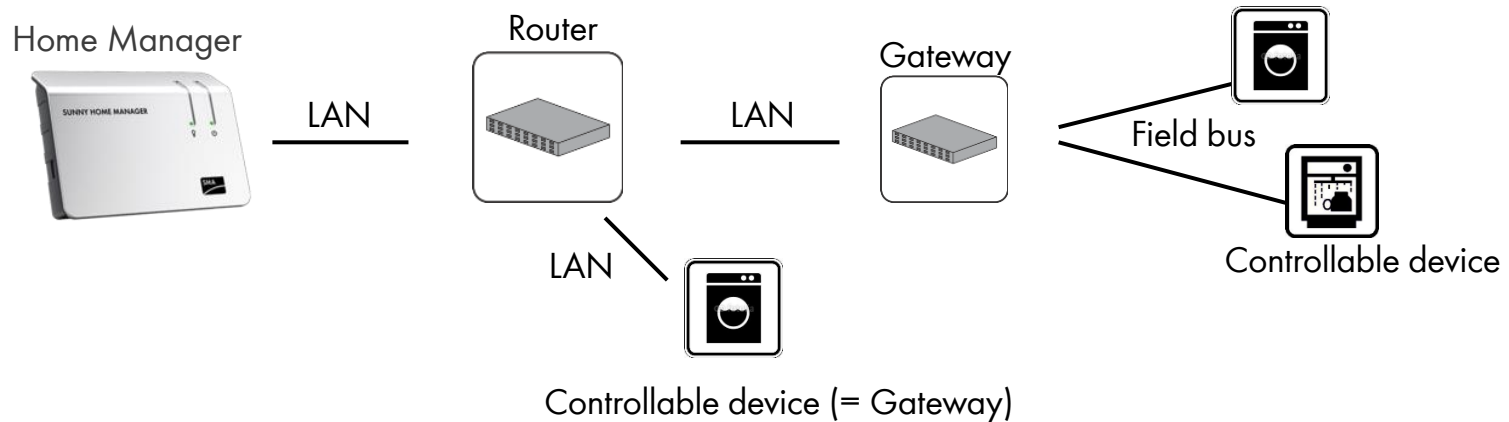
> **Discovery mechanism**

- > Discovery of controllable SEMP devices
- > Based on von SSDP (Simple Service Discovery Protocol)

> **Web service**

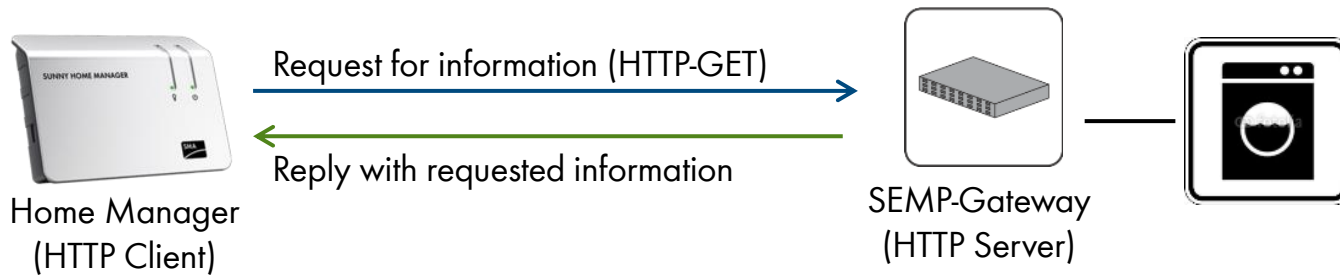
- > Exchange of device information, status and operation planning information
- > Simple (similar to REST) interface, based on HTTP

SEMP DEVICE TOPOLOGY

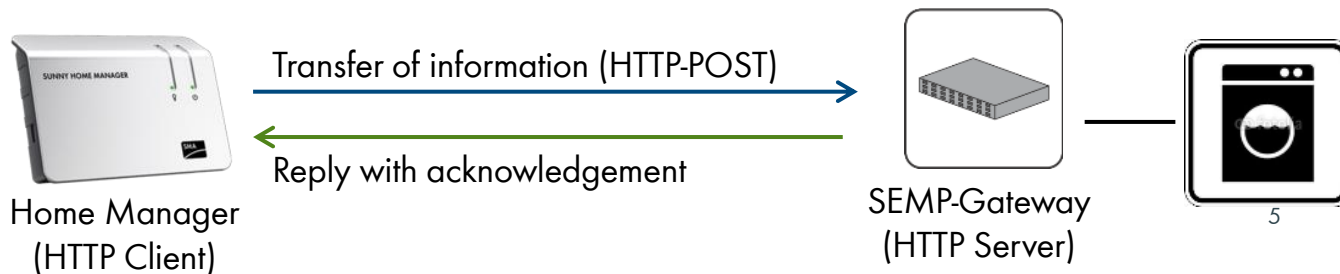


- > Sunny Home Manager often does not interface directly with a controllable device but with a gateway
- > If direct communication is possible, the device itself acts as a gateway
- > A device may consist of several sub devices

- > Get device information, status and operation planning information (once per minute):



- > Sending of control commands (on request):



SEMP DATA STRUCTURE



Information request (Gateway → Home Manager)



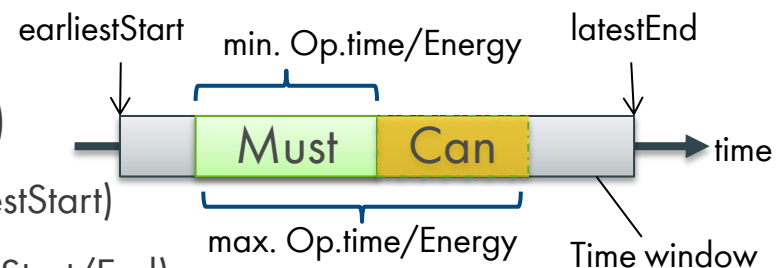
> Static device information (DeviceInfo)

- > General information (Typ label): Device-ID, Device name, Manufacturer, ...
- > Static operation Planning info: min./max. power consumption, operation interruptable (y/n), ...
- > Properties: Operation interruptable (y/n), uses absolute or relative timestamp, ...

> Dynamic device information (DeviceStatus)

- > Status: State (ON/OFF), accepts recommendations from Home Manager? (yes/no)
- > Current power consumption
- > Current sensor data (i.e. temperature, ...)

> Operation planning information (PlanningRequest)



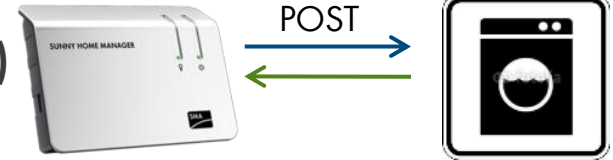
- Time window:
- Earliest operation start time (earliestStart)
 - Latest start/completion time (latestStart/End)

- Alternatively:
- Operation time: min. operation time (Must), max. operation time (optional)
 - Required energy: min. Energy (Must), max. Energy (optional)

SEMP DATA STRUCTURE



Transfer of Information (Home Manager → Gateway)

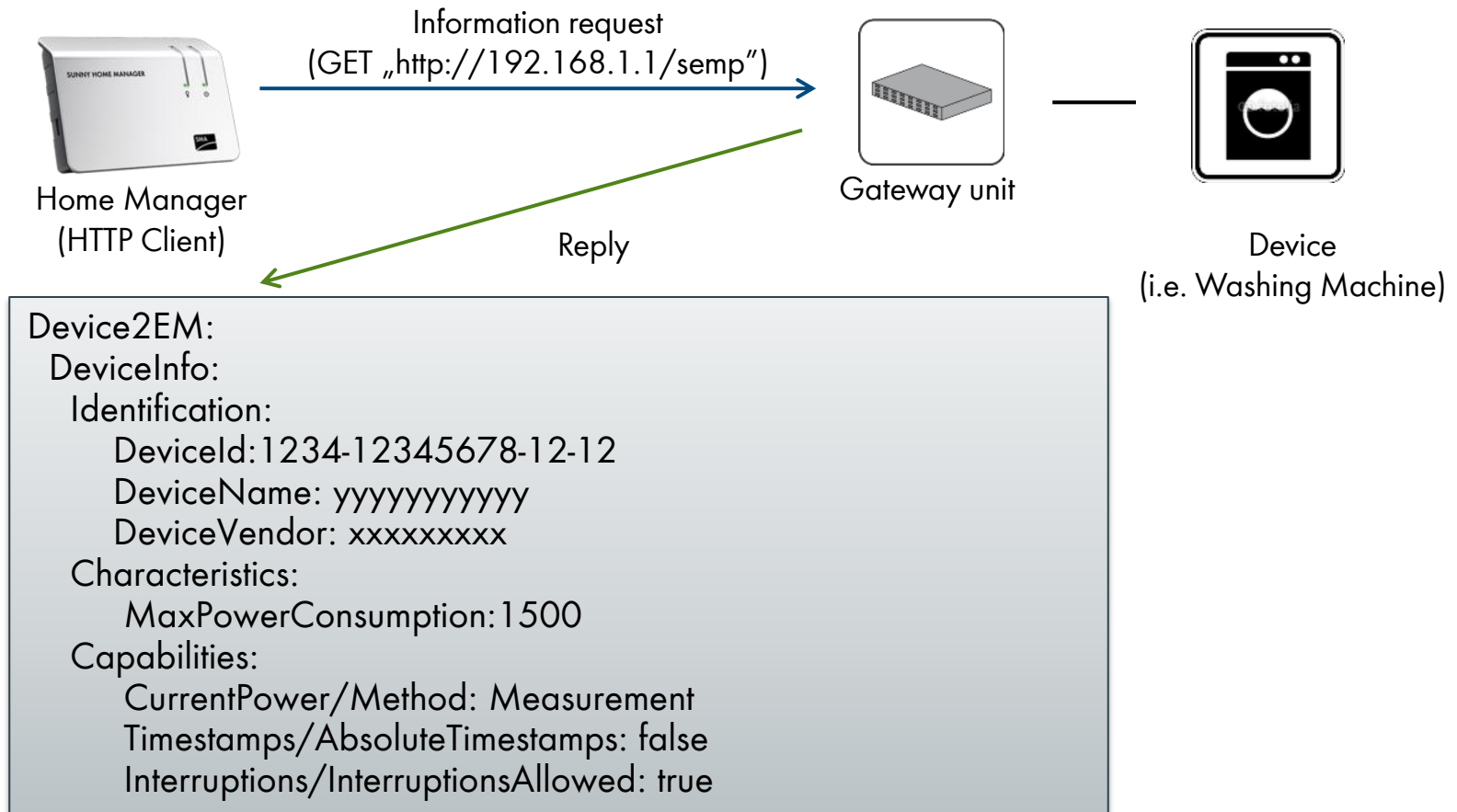


- > Recommendation for operation (DeviceControl)
 - > ON/OFF switch recommendation
 - > Recommended power consumption level
- > To avoid collisions with other device operation plans, devices should follow the operation recommendations
- > Device must ensure a safe and correct operation and may ignore operation recommendations, if conflicts exist

SEMP COMMUNICATION DETAILS



- > Get device information, status and operation planning information (once per minute):



SEMP COMMUNICATION DETAILS



- Continuation -

DeviceStatus:

DeviceId: 1234-12345678-12-12

EMSignalsAccepted: true

Status: Off

PowerConsumption/PowerInfo:

AveragePower: 0 (Watt)

Timestamp: 0 (point of power measurement)

AveragingInterval: 60 (seconds)

PlanningRequest:

Timeframe:

TimeframeId: 1

DeviceId: 1234-12345678-12-12

EarliestStart: 18000 (earliest in 5h)

LatestEnd: 25200 (latest in 7h)

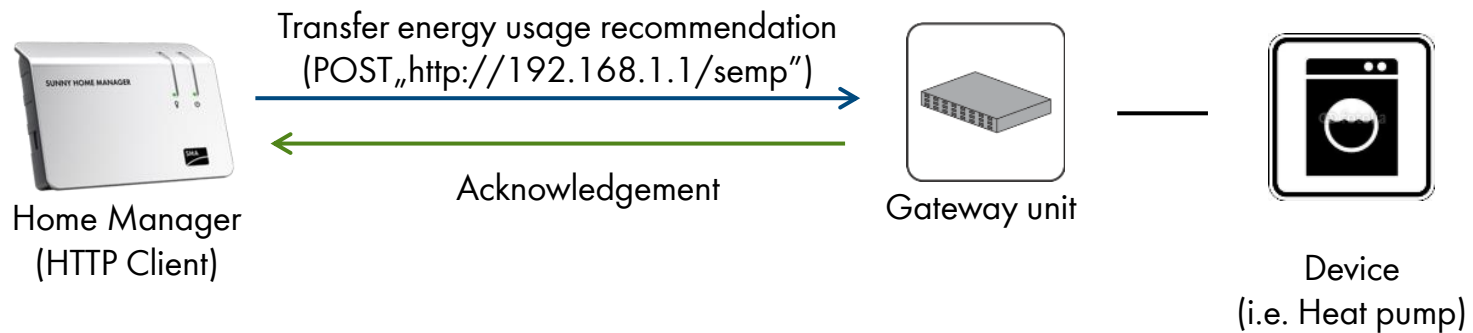
MinRunningTime: 3600 (MUST: 1h)

MaxRunningTime: 3600 (no optional operation)

SEMP COMMUNICATION DETAILS



> Transfer of an energy usage recommendation signal (DeviceControl)



```
EM2Device:
DeviceControl:
  Deviceld: 1234-12345678-12-12
  On: true (Start recommendation)
  Timestamp: 0 (Creation Timestamp)
```