Virtual Grid

iPERC, The Univ. of Electro-Communications
NTT East
IWATSU

Virtual Grid

Target: Energy platform for Super Smart Society (Society 5.0) and for pursuing UN SDGs
- Electricity supply control to maximize the value of services by devices
- Renewable energy system in the areas without electricity access

Tools
- Cooperative electricity supply by synthesizing the electricity of batteries with different output power and capacity into electricity suitable for electric loads
- Policy-aware electricity distribution control

Objective of Virtual Grid

Increase renewables use

Balance electricity supply and consumptoin

Electricity Storage

Mobility and flexibility of electricity supply

Society5.0/IoT: Supply electricity to devices or IoT services

Problems with mobile power sources or electricity storages
- Worried about flat battery
- Bothersome energy saving device operation
- Purchase expensive and heavy batteries with excessive capacity
- Difficult to select the power, capacity and interfaces of batteries
- Unable to apply combination of batteries

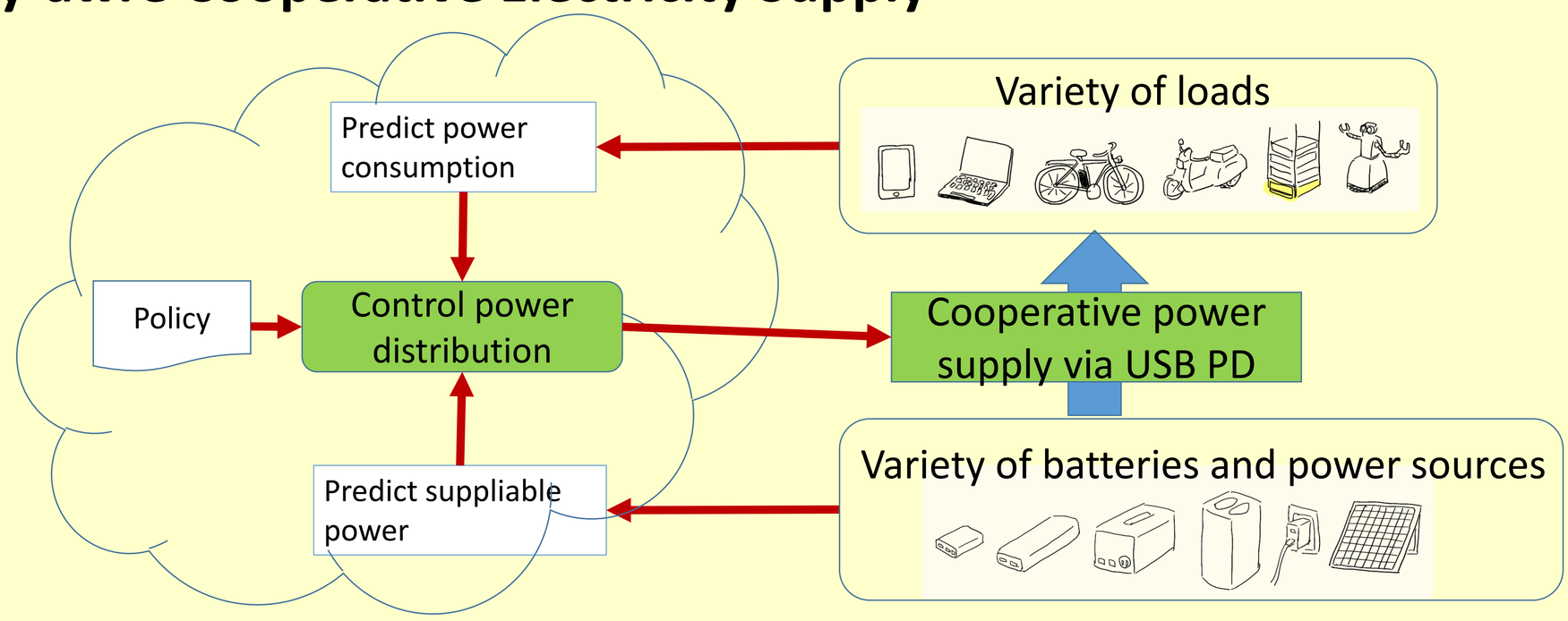
Problem: Mismatch between battery performance and electricity loads

Policy-aware cooperative electricity supply control

Virtual Grid

Electricity supply anywhere anytime

Policy-awre Cooperative Electricity Supply



Use cases

Shared rented office space, satellite office constructed without equipment work
Electric power system for events
- Power supply and Wi-Fi mesh network for attendees at conference sites
- Outdoor leisure power supply

Disaster time power system for refuge lives
At olympic game
- Power system for temporary press seats

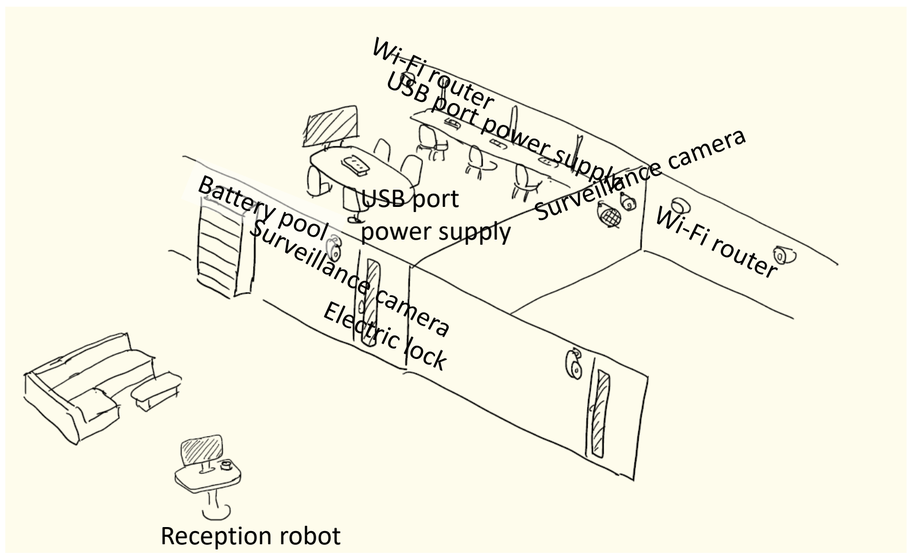
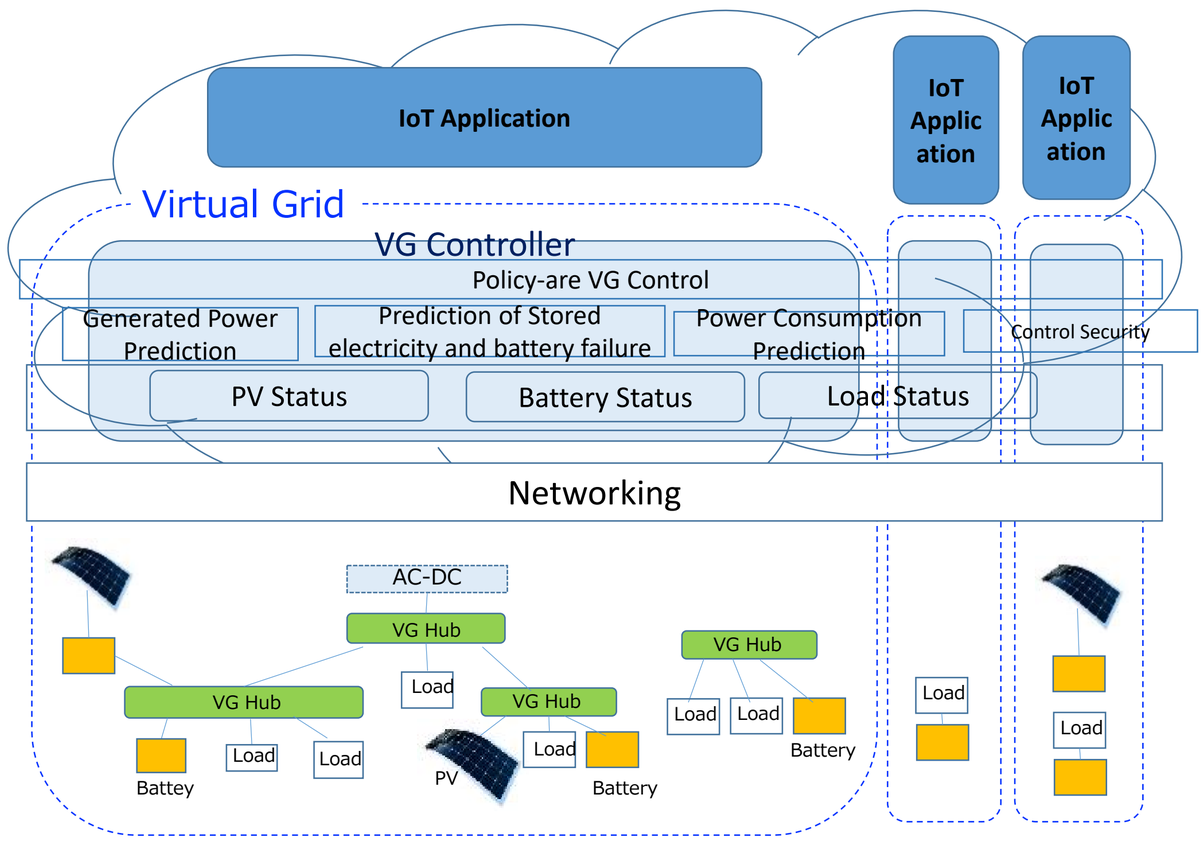


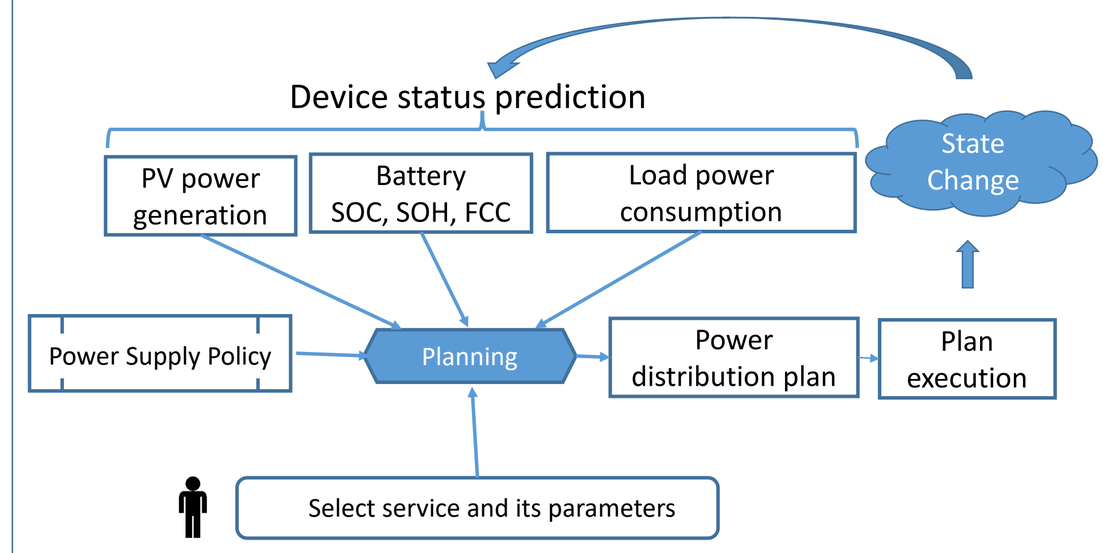
Image of shared rented office space without equipment work

Virtual Grid Implementation

Virtual Grid System



Policy-aware Power Distribution Control

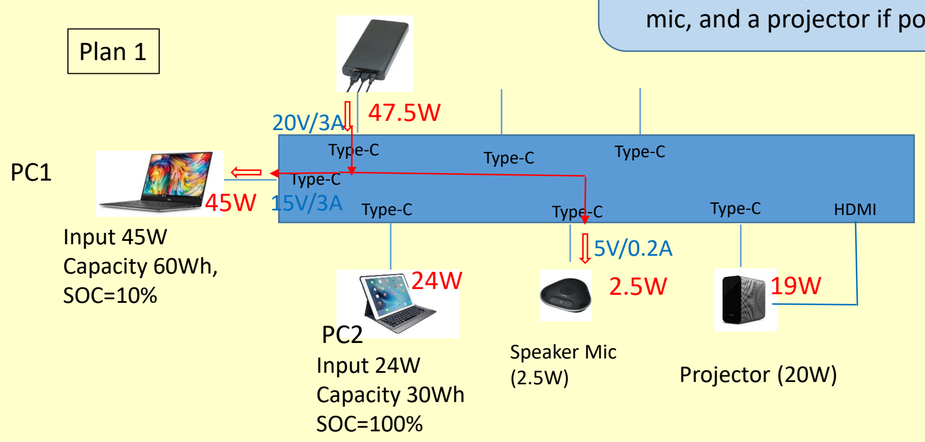


Policy-aware Cooperative Power Supply

Output 60W, Capacity 100Wh
SoC: 100%

Meeting service
Meeting time: 60 min.
Wants to charge PC1, use a speaker mic, and a projector if possible

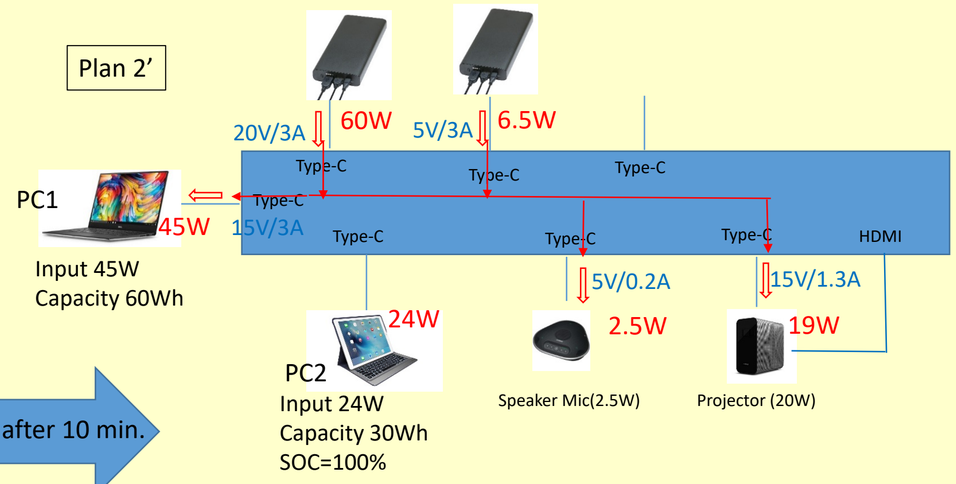
Plan 1



Add battery after 10 min.

Added battery
Output 15W, Capacity 20Wh
SoC: 10%

Plan 2’



	Execution time	PC1	PC2	Speaker Mike	Projector	Consumed power
Plan 1	60 min.	○	×	○	×	47.5Wh
Total	60 min.					47.5Wh

Power Distribution Plan

	Execution time	PC1	PC2	Speaker Mike	Projector	Consumed power
Plan 1’	10 min.	○	×	○	×	8Wh
Plan 2’	18 min.	○	×	○	○	20Wh
Plan 3	32 min.	○	×	○	×	25Wh
Total	60 min.					53Wh

Updated Power Distribution Plan

Battery Operation Support for Equipment without Power Cables