Smart Grid Controller Blockchain Platform
For Virtual Power Plants
with Hyperledger Fabric

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Motivation

- Challenges for energy system
  - Climate change
  - Renewable energy
- Emerging technologies
  - Internet-of-Things
  - Blockchain
- Raspberry Pi
Overview of considered technologies

- Light energy footprint
- Modular
- Permissioned
- Privacy mechanisms
- Roadmap
- Resource-aware
- Smart contracts
Analysis – VPP example

VPP A

VPP B

VPP C

VPP = Virtual Power Plant
Analysis – VPP example

VPP A

VPP B

VPP C

Energy production or consumption

VPP = Virtual Power Plant
Energy surplus or demand

VPP A

VPP B

VPP C

VPP = Virtual Power Plant
Analysis – VPP example

VPP A

VPP B

VPP C

Matching algorithm

VPP = Virtual Power Plant
Implementation – HLF Components

Hyperledger Fabric → ARM → Docker → Chaincodes
Implementation – Applications

Applications

Dashboard

Simulation

Middleware

Hyperledger Fabric Components
Simulation – Simulation Model

VPP Consumers

VPP Mixed

VPP Producers
Simulation - Setup

VPP Consumers

VPP Mixed

VPP Producers
Organizations

- Name: Participants10rg
  Domain: participants1.sgcbp.com
  EnableNodeOUs: true
  Template:
    Count: 3
  Users:
    Count: 1

- Name: Controllers10rg
  Domain: controllers1.sgcbp.com
  EnableNodeOUs: true
  Template:
    Count: 1
  Users:
    Count: 1
Channels

Vpp1Channel:
Consortium: SGCBPConsortium
Application:
  <<<: *ApplicationDefaults
  Organizations:
    - *Controllers1Org
    - *Participants1Org
  Capabilities:
    <<<: *ApplicationCapabilities

InterChannel:
Consortium: SGCBPConsortium
Application:
  <<<: *ApplicationDefaults
  Organizations:
    - *Controllers1Org
    - *Controllers2Org
    - *Controllers3Org
    - *MatchingOrg
  Capabilities:
    <<<: *ApplicationCapabilities

Fußzeile, z.B. Autornamen einsetzen
Future development & ideas
Outlook

- Potential
- Gold digging
- Challenges
- M2M
THANK YOU!