

D3A - An Energy Market Design for the Transactive Grid

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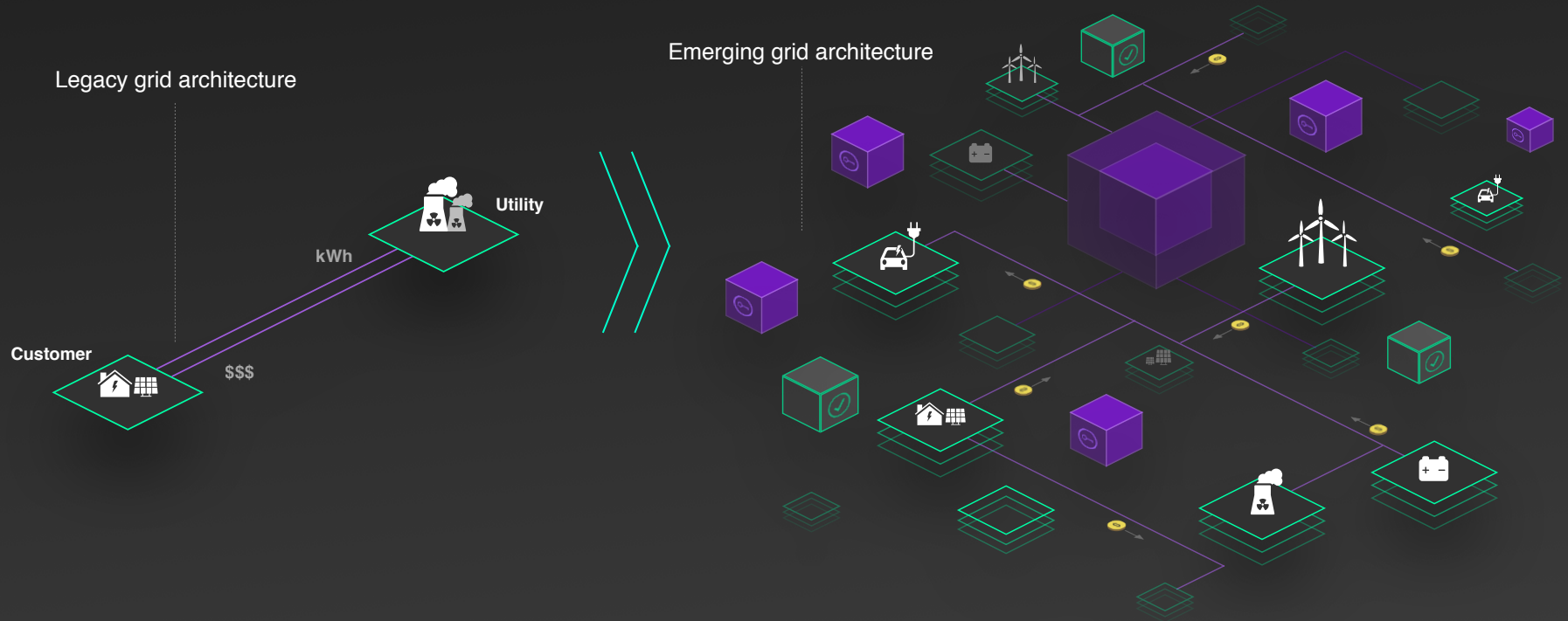
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Why are we building the D3A?

The energy system is fundamentally transforming

A grid based on low-cost, renewable, intermittent power needs a new architecture capable of securely coordinating an increasingly distributed, decentralized electric system.

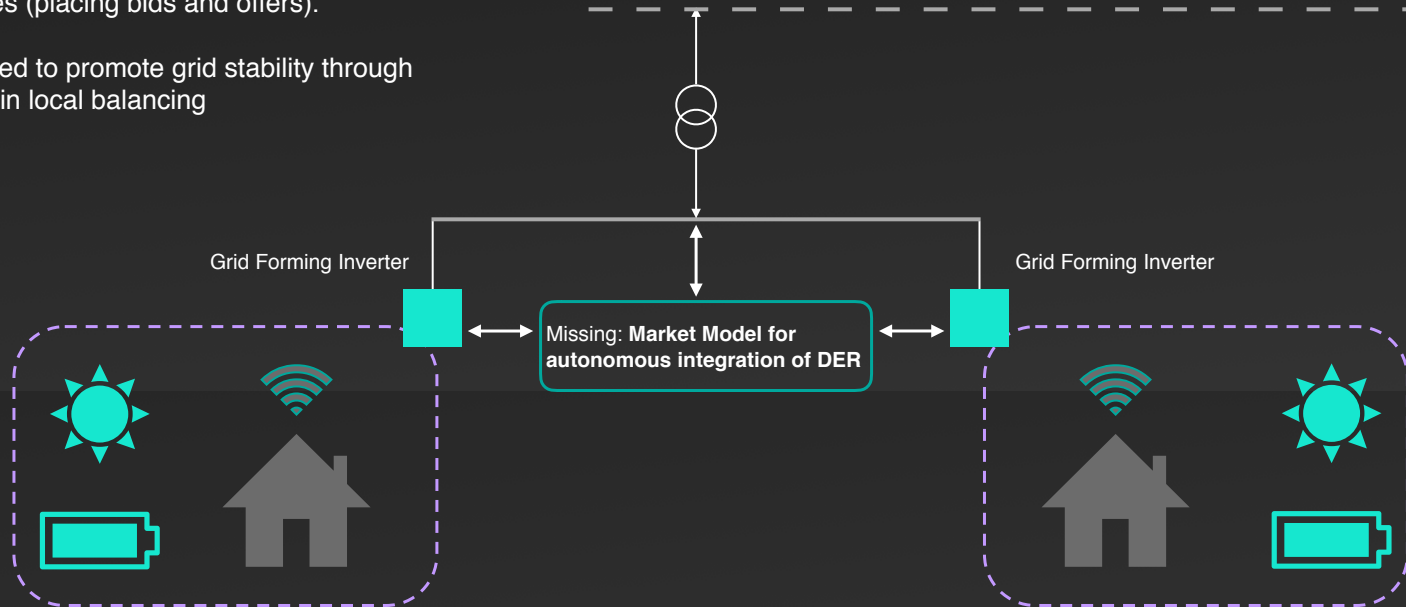


D3A Mission: Establish markets for monetising DERs, including flexible and grid forming devices

A reliable market structure that monetises DERs creates a rational incentive for their mass adoption and contribution to the energy transition.

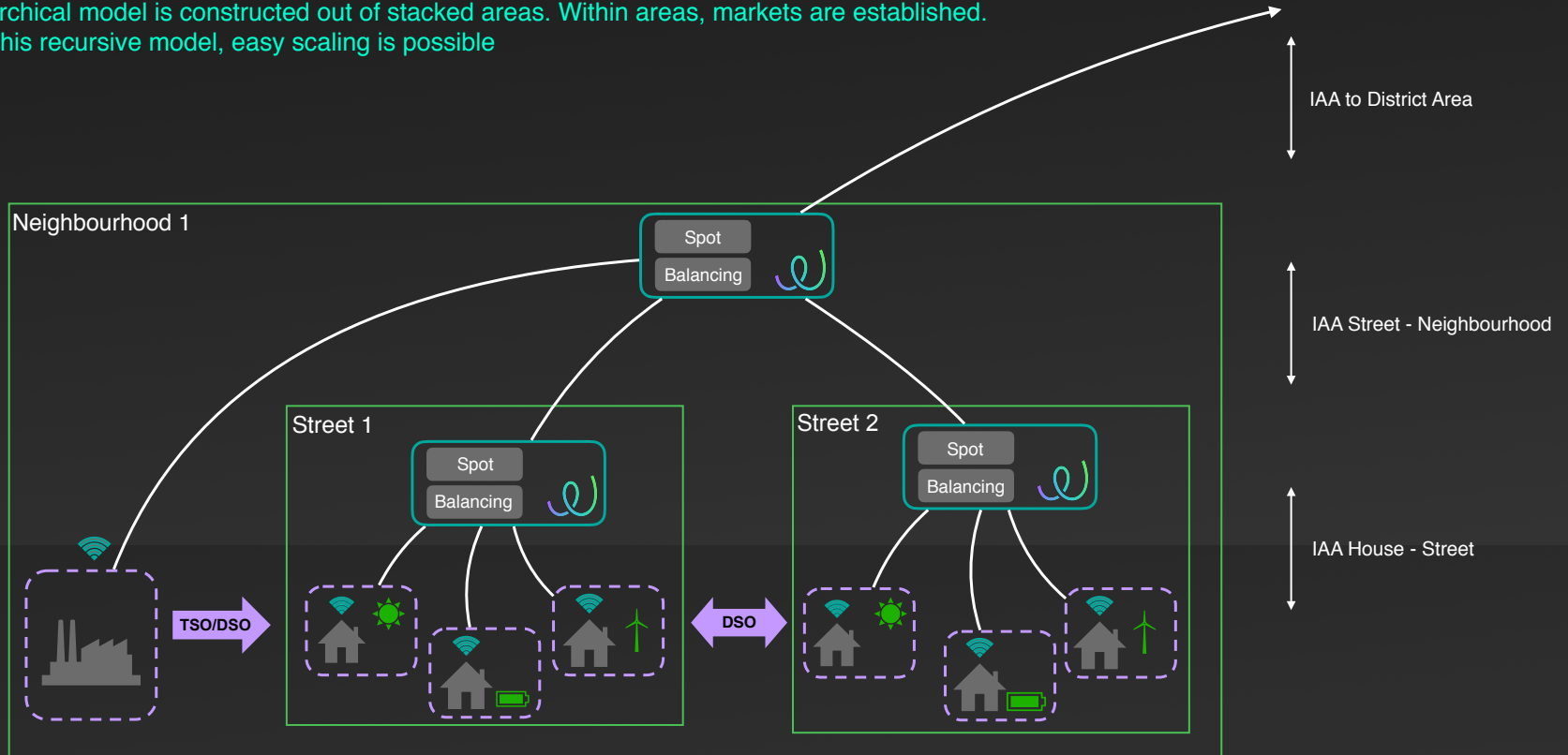
To effectively utilize distributed energy resources (DERs), DERs must be

- Full participants in local energy markets and contribute to trade prices (placing bids and offers).
- Be incentivised to promote grid stability through participation in local balancing



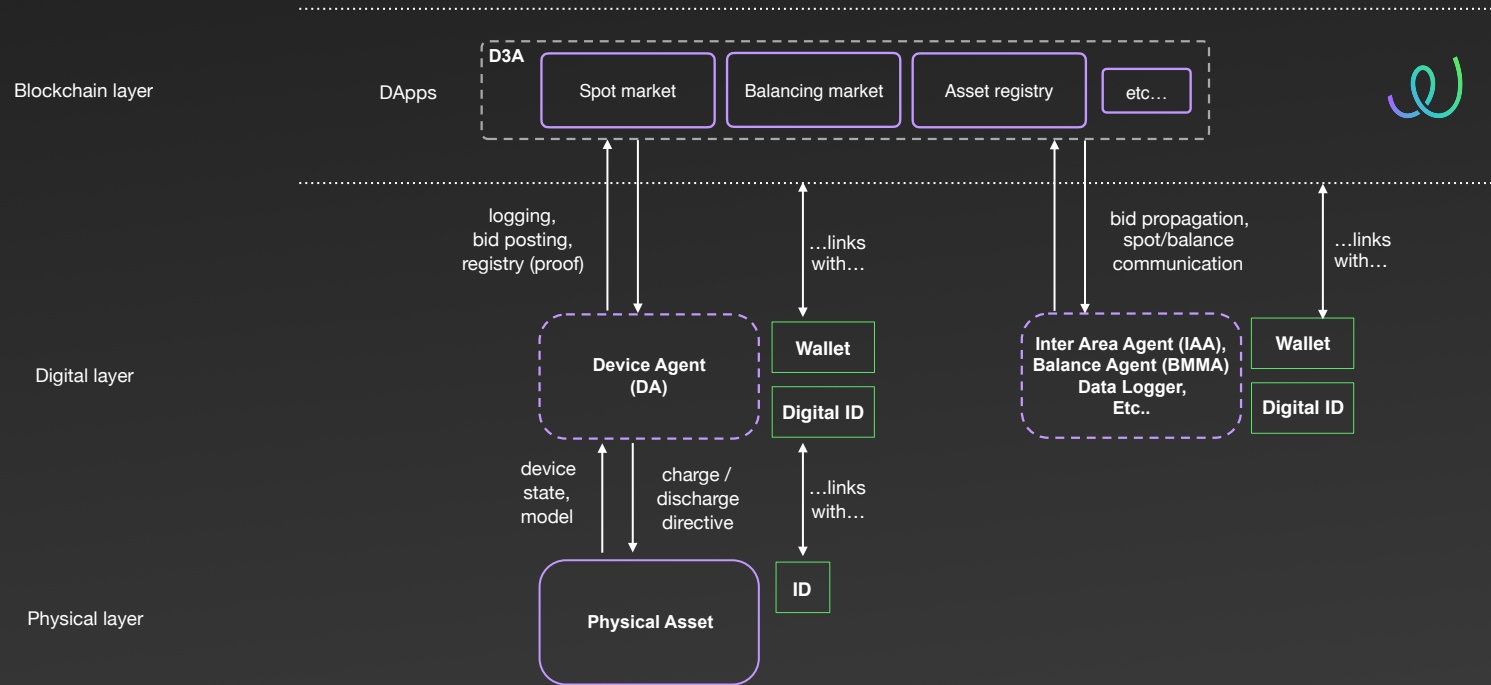
D3A: A Hierarchical Market Model

The hierarchical model is constructed out of stacked areas. Within areas, markets are established. Through this recursive model, easy scaling is possible



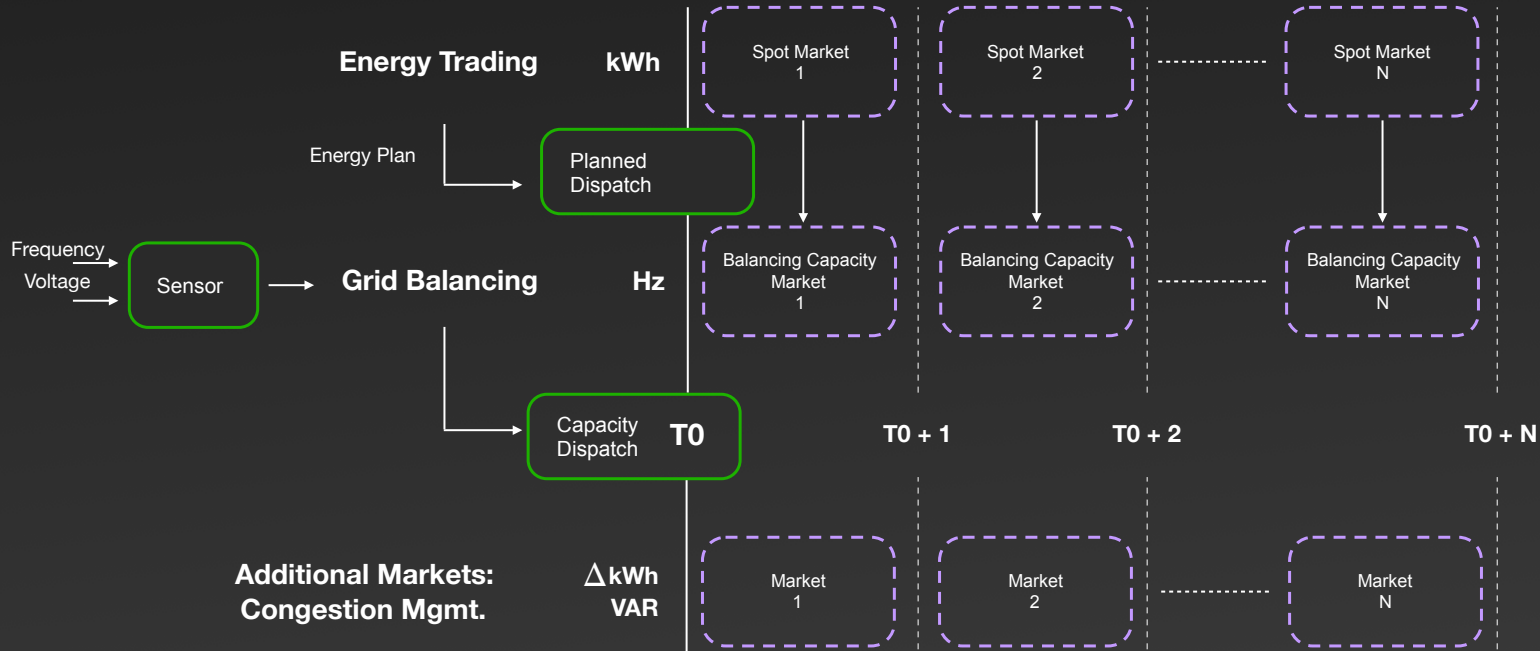
Semantics: Agents

“Agents” are digital representations, i.e. twins, of physical assets. “Virtual Agents” may or may not have a physical representative. In a decentralised system, agents interact through smart-contracts on Blockchain.



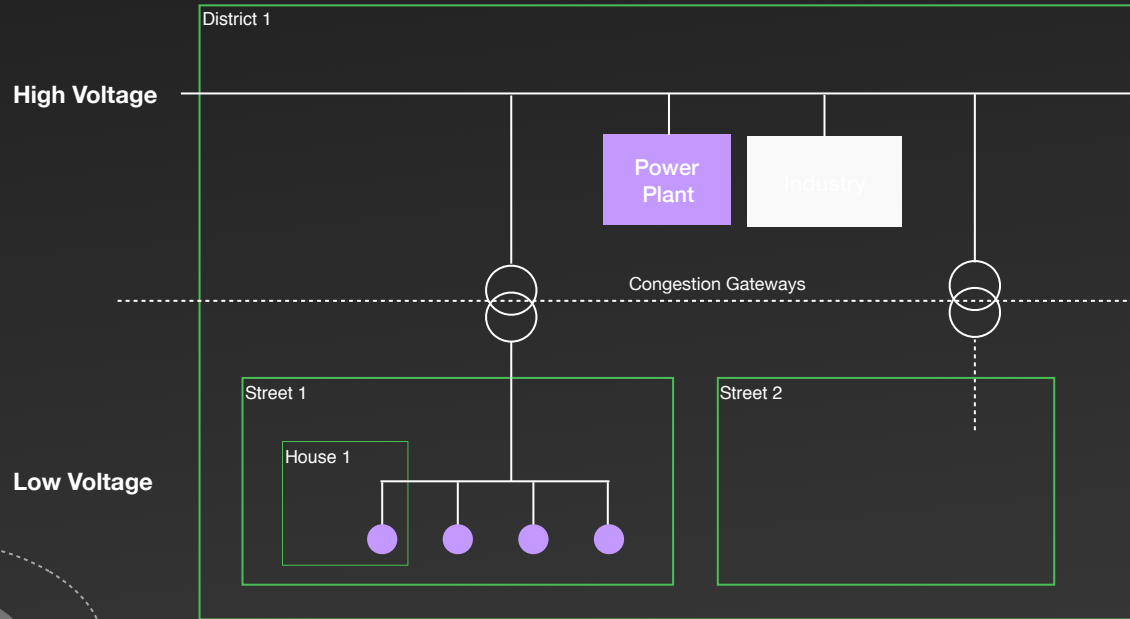
Semantics: Markets

Markets are the trading channels with which agents are representing their respective digital assets, every Area has its respective market.



Semantics: Areas

Areas are the market zones in which local markets are established. Deploying D3A, a grid would be divided into areas according voltage level and ownership (e.g. DSO, TSO, etc)

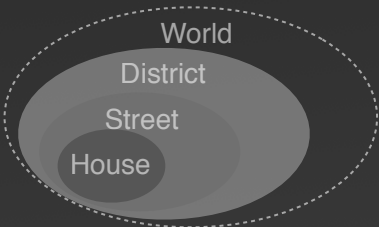


What is the function of an area?

- Agent registry
- Location for energy markets
- Defines ownership or context as profit center
- Stacks recursively into area hierarchy

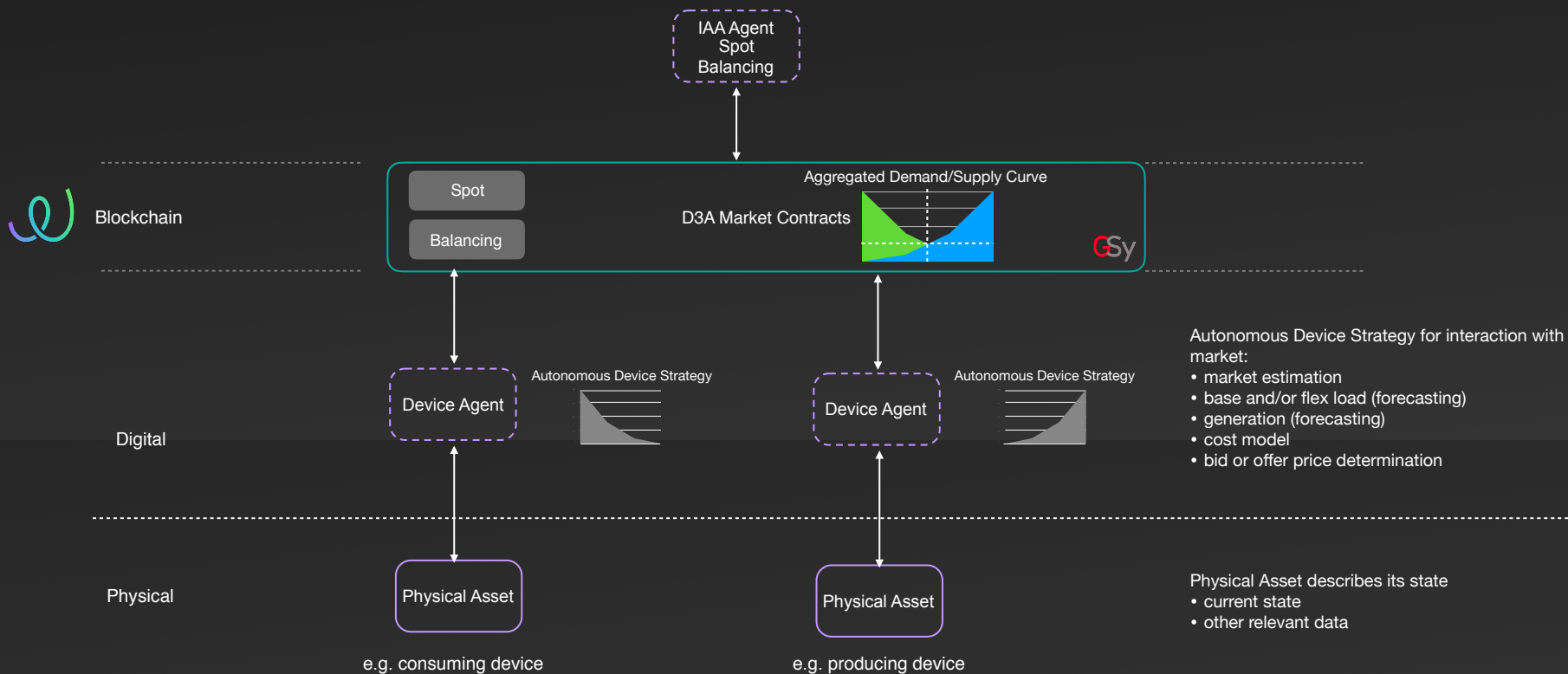
What defines an area?

- Profit center / channel for transactions
- Ownership
 - Home / factory
 - Community
 - Grid owner



D3A: Strategies

Strategies describe the behaviour of agents, and thus the way they interact with each other through the market.

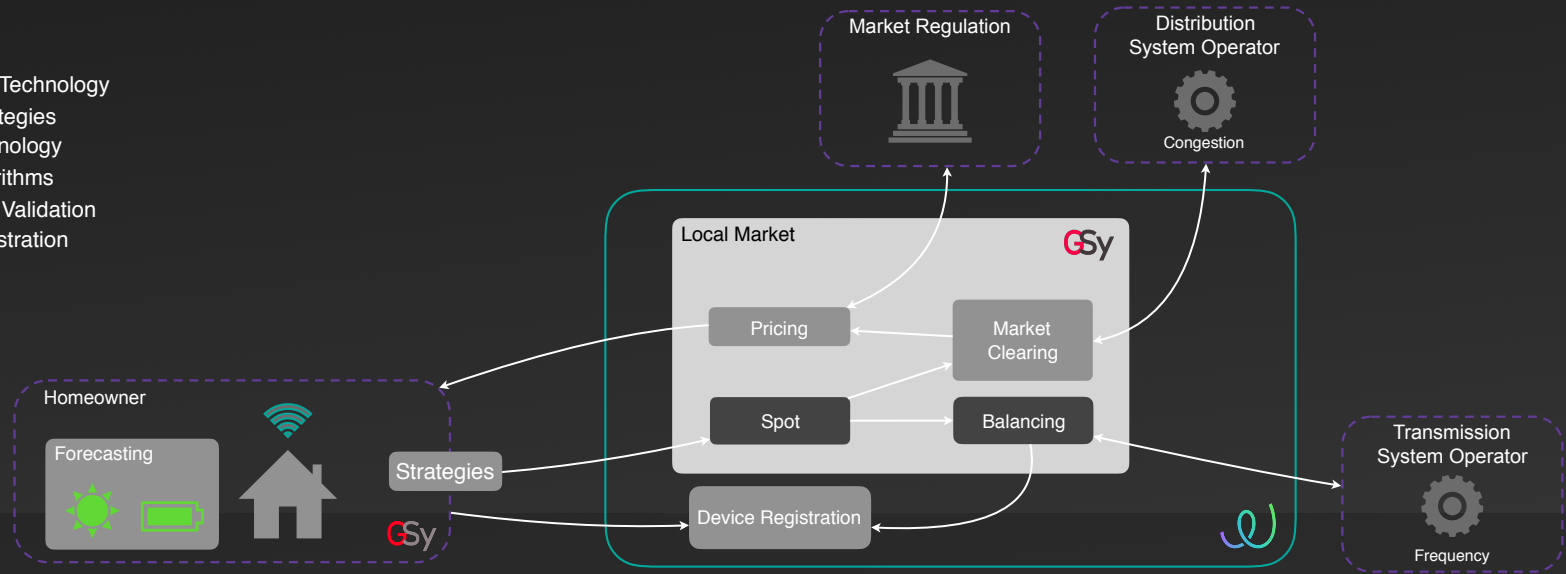


D3A: User Story

D3A is sub-divided into “tech” modules; each allowing certain shareholders access to its process:

D3A Modules:

1. Forecasting Technology
2. Bidding Strategies
3. Market Technology
4. Market Algorithms
5. Stakeholder Validation
6. Device Registration



Substitute “Homeowner” with:

Local Power Plant

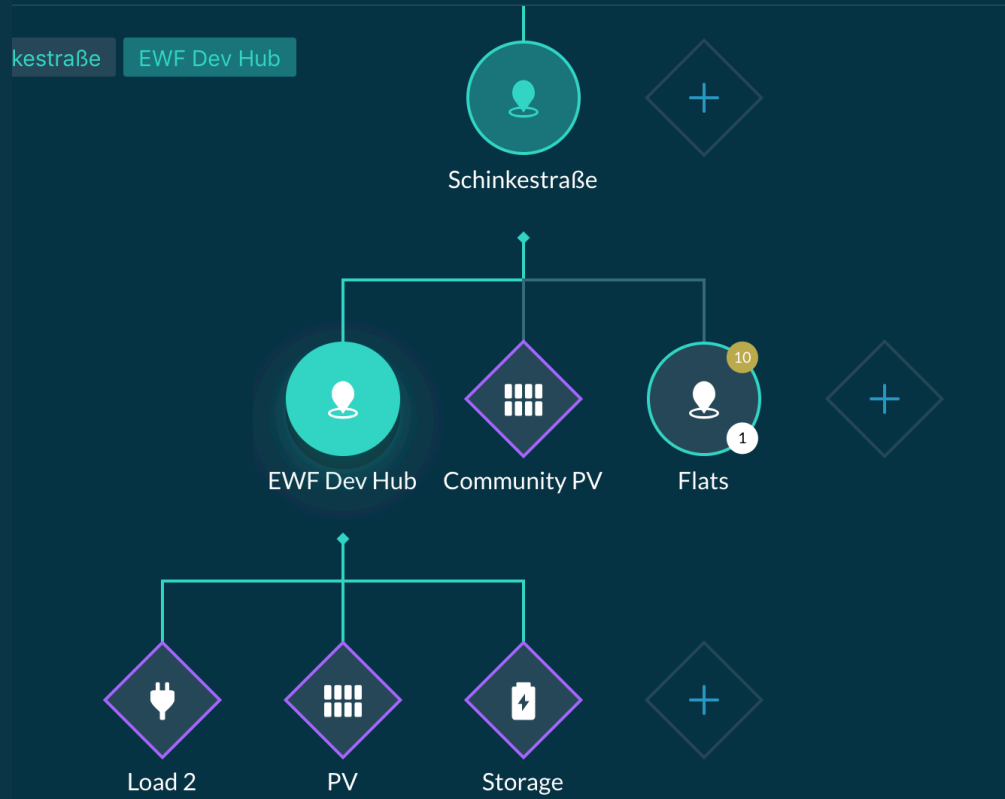
DER

Community Micro Grid

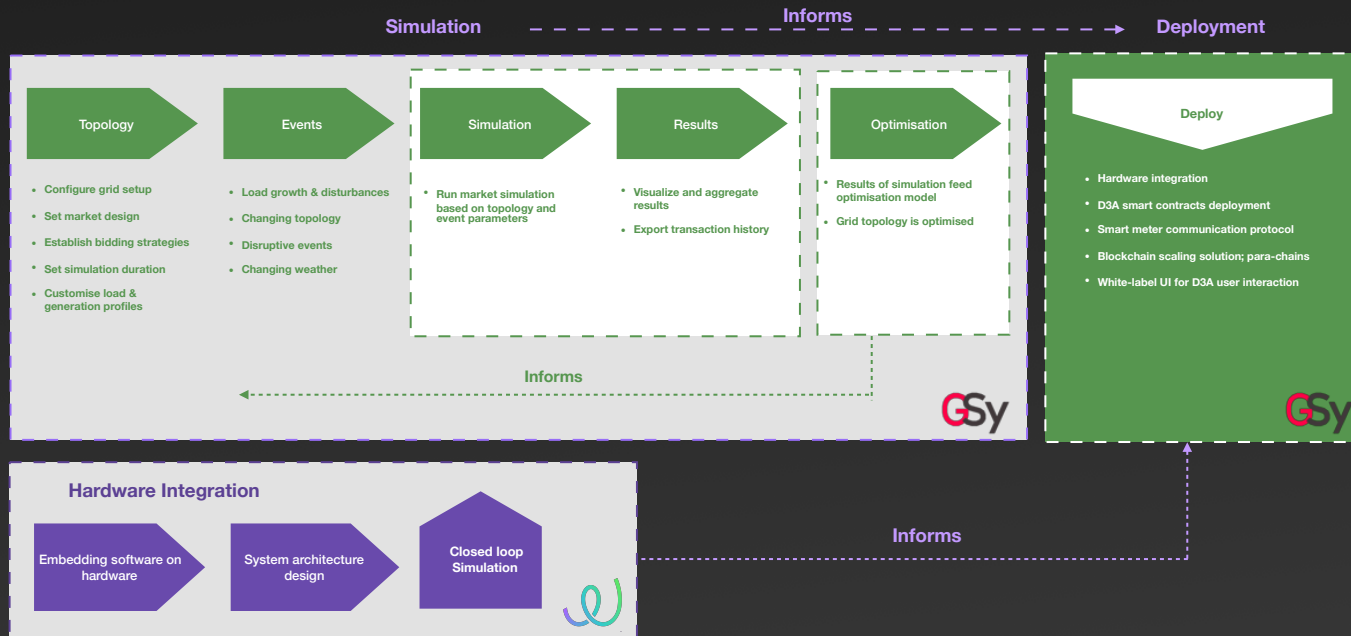
Etc...

Demo

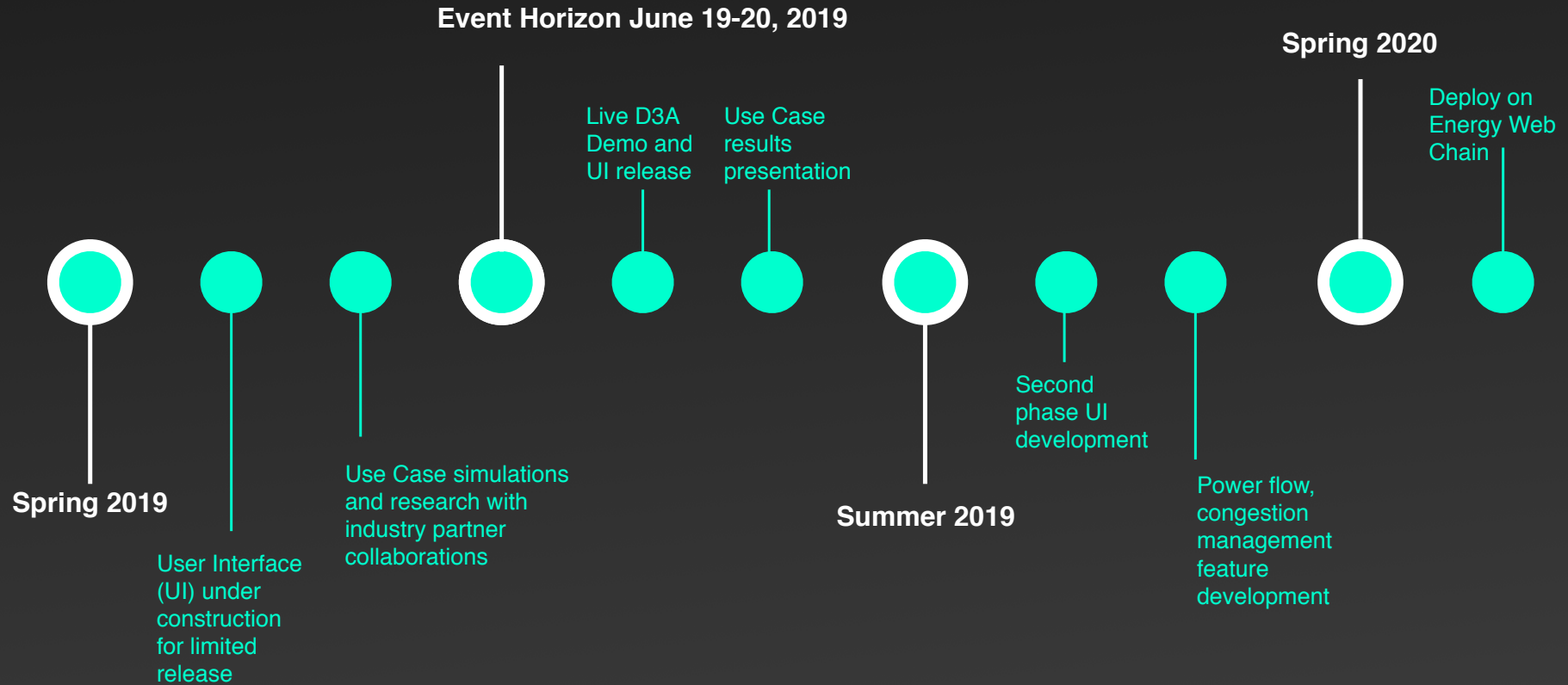
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D3A: Development Stages



D3A: Roadmap



Thank You!

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<https://github.com/gridsingularity/d3a>

Cumulative Trading For Each Area

The total energy traded for each area, segmented to show the origin or destination of trades to other areas

