Overview of DER Interactions

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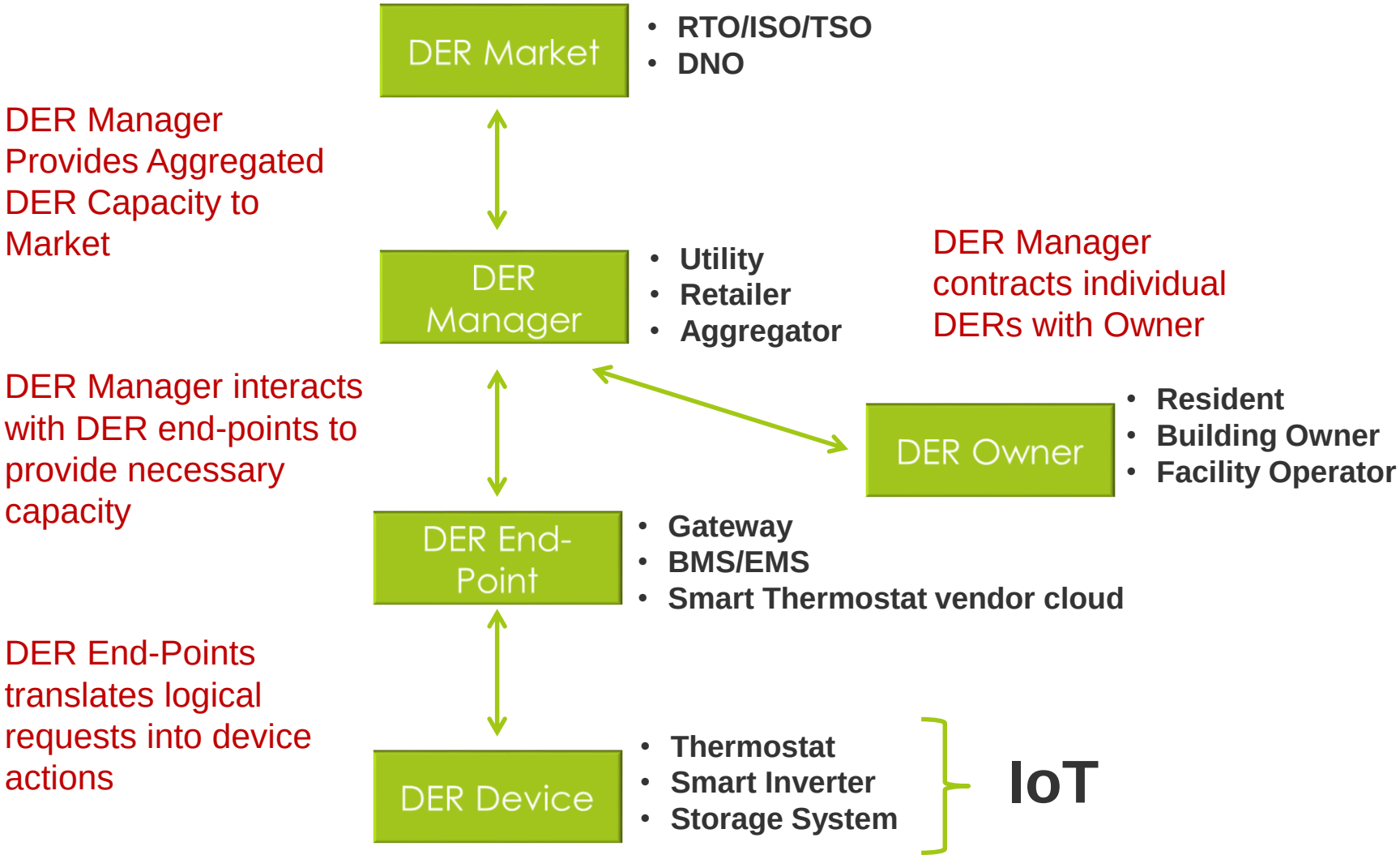
Background

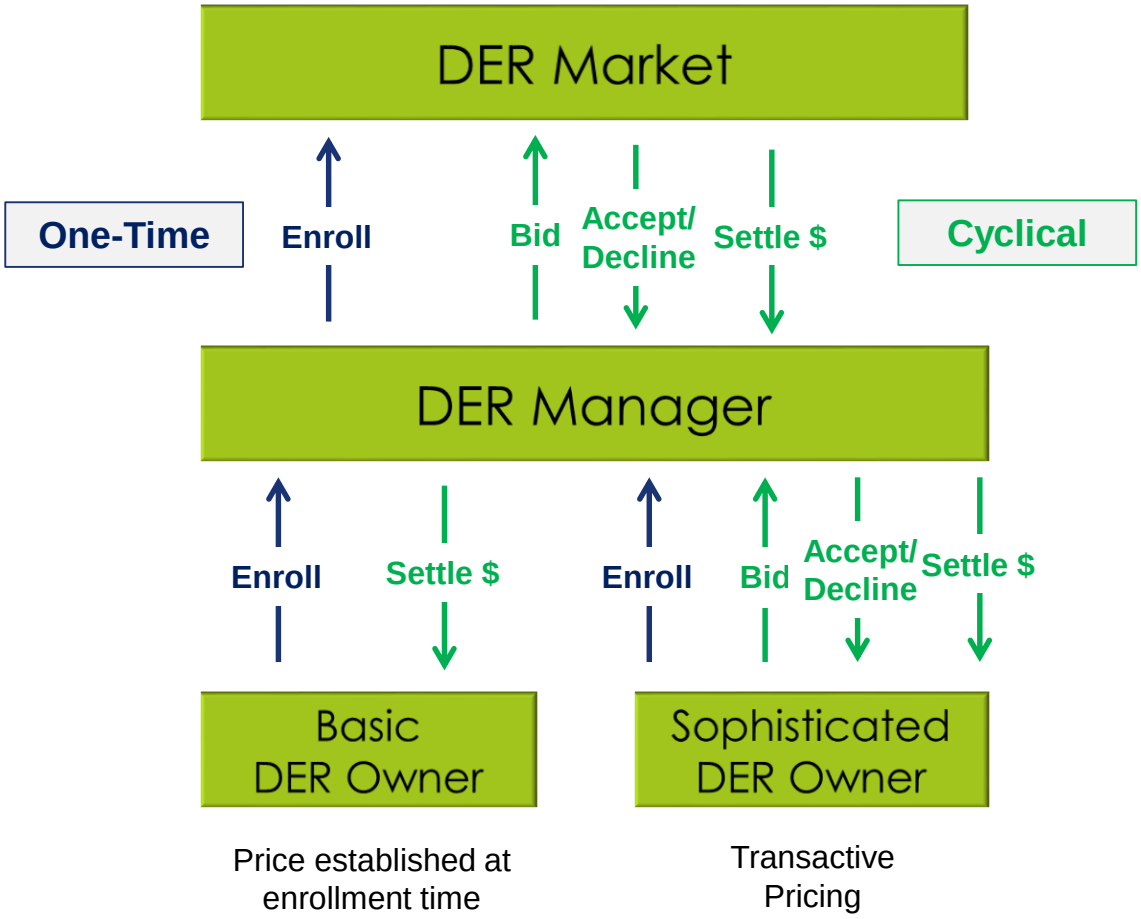
- Opportunities to leverage demand-side resources have expanded from demand response into a broad range of DER (Distributed Energy Resource) applications
- These applications include:
  - Economic DR within the scope of a utility
  - Aggregating and bidding DR resources into RTO/ISO markets
  - Leveraging DERs for grid protection/reliability/power quality
- The scope of DER technologies includes:
  - Controllable loads, including residential, commercial and industrial
  - Distributed generation, including customer owned solar systems, backup generators*, biomass, CHP, etc.
  - Energy Storage systems, including battery and mechanical technologies
  - Hybrid systems that incorporate several of the above technologies combined with intelligent local optimization and control

* Fossil fuel generators may or may not be able to participate in DSM (demand side management) programs in some jurisdictions

Actors & High-Level Interactions



Business Transactions



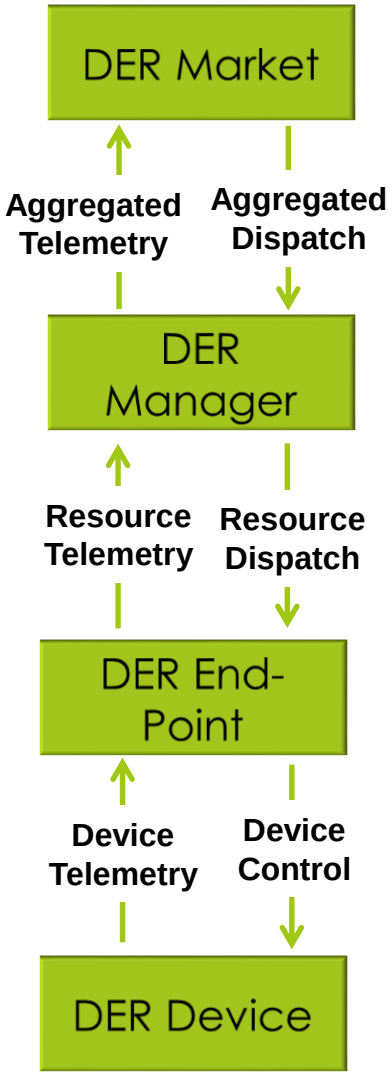
Common Technical Interactions & Protocols

Grid level optimization, scheduling and dispatch

Resource pool optimization, scheduling and dispatch in alignment with resource availably and forecasted behavior

Optimization of local devices to meet dispatch requests in alignment with occupant needs

Compliance with device control commands within safety and operational parameters

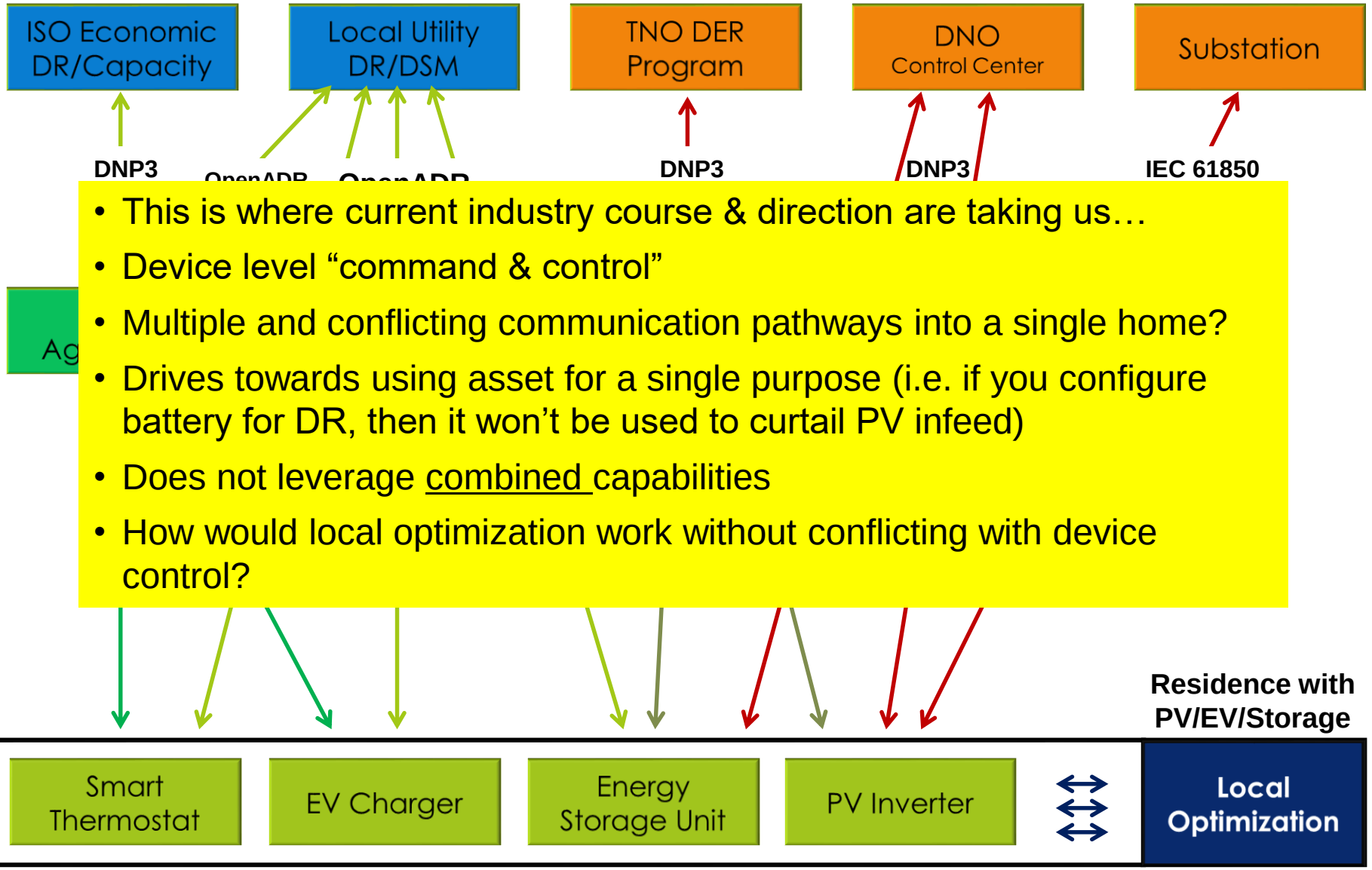


- **ICCP**
- **DNP3**
- IEC 60870-5-104
- Proprietary Web Service

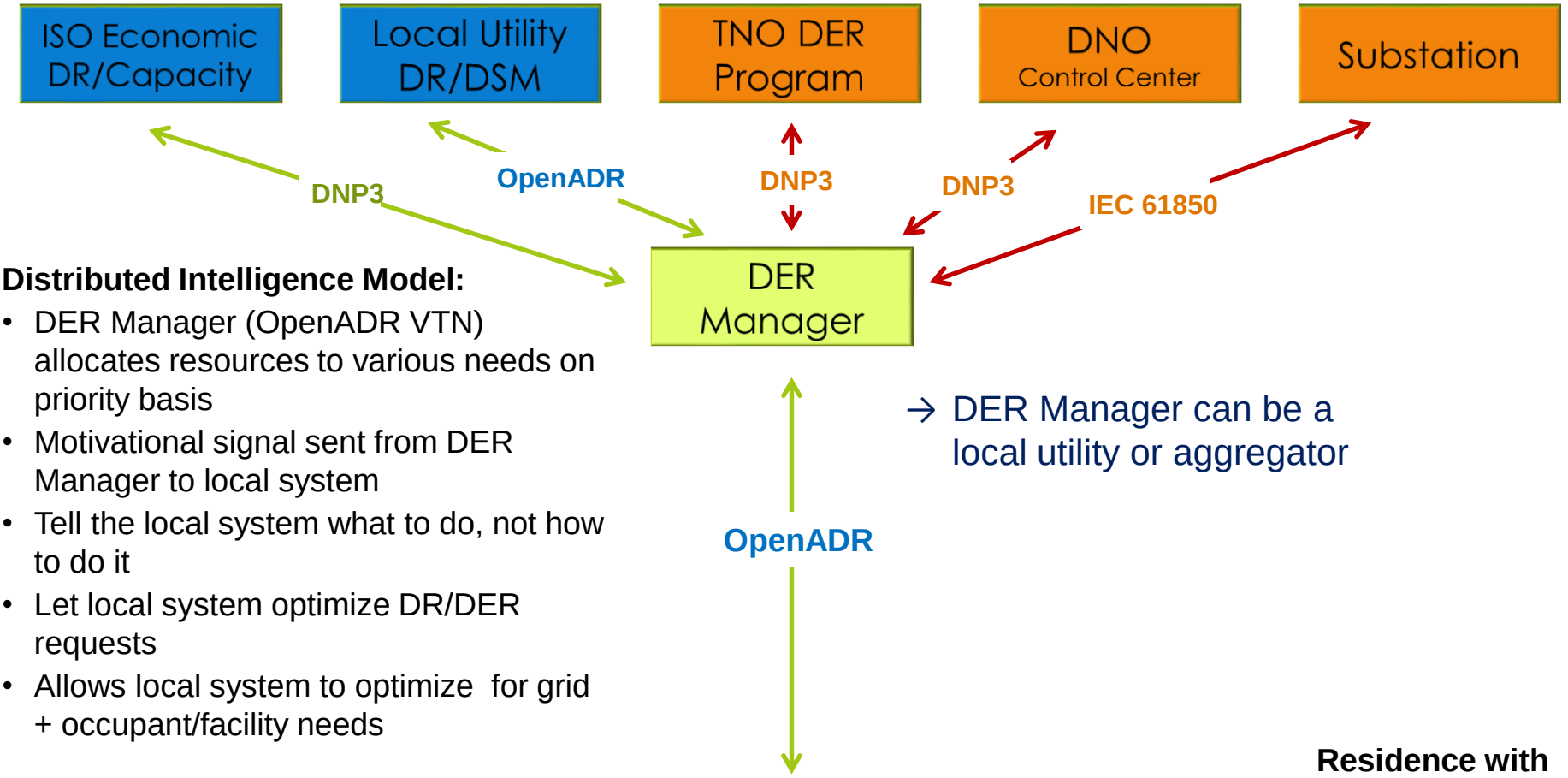
- **OpenADR**
- DNP3
- IEC 60870-5-104
- IEC 61850?

- **Zigbee/Zwave/Insteon/ Thread/Bluetooth LE**
- **Modbus/BACnet/OPC**
- **Wi-Fi/Proprietary**
- IEEE 2030.5 (SEP2)

The IT/OT Divide: There is only one resource!



Integrated DER Architecture



Distributed Intelligence Model:

- DER Manager (OpenADR VTN) allocates resources to various needs on priority basis
- Motivational signal sent from DER Manager to local system
- Tell the local system what to do, not how to do it
- Let local system optimize DR/DER requests
- Allows local system to optimize for grid + occupant/facility needs

→ DER Manager can be a local utility or aggregator

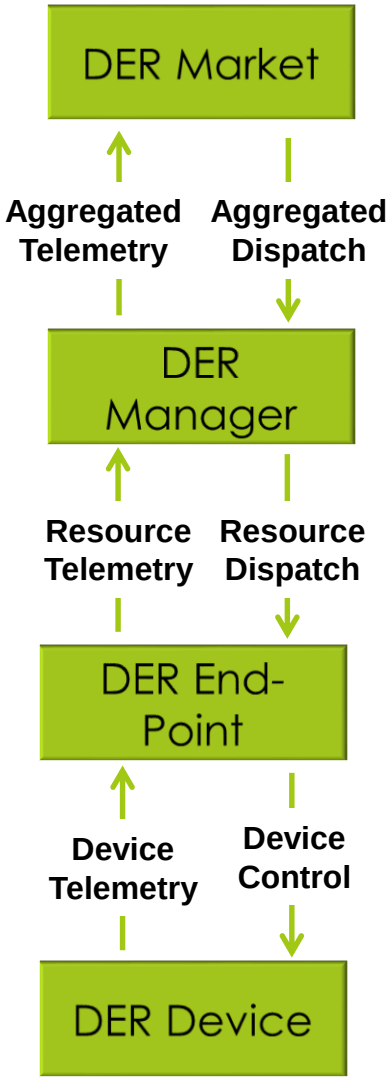
Recommended Protocols?

Grid level optimization, scheduling and dispatch

Resource pool optimization, scheduling and dispatch in alignment with resource availably and forecasted behavior

Optimization of local devices to meet dispatch requests in alignment with occupant needs

Compliance with device control commands within safety and operational parameters



- **ICCP**
- **DNP3** (N. America)
- **IEC 60870-5-104** (Europe)

- **OpenADR**

- **Zigbee/Zwave/Insteon/ Thread/Bluetooth LE**
- **Modbus/BACnet/OPC**
- **IEEE 2030.5 (SEP2)**