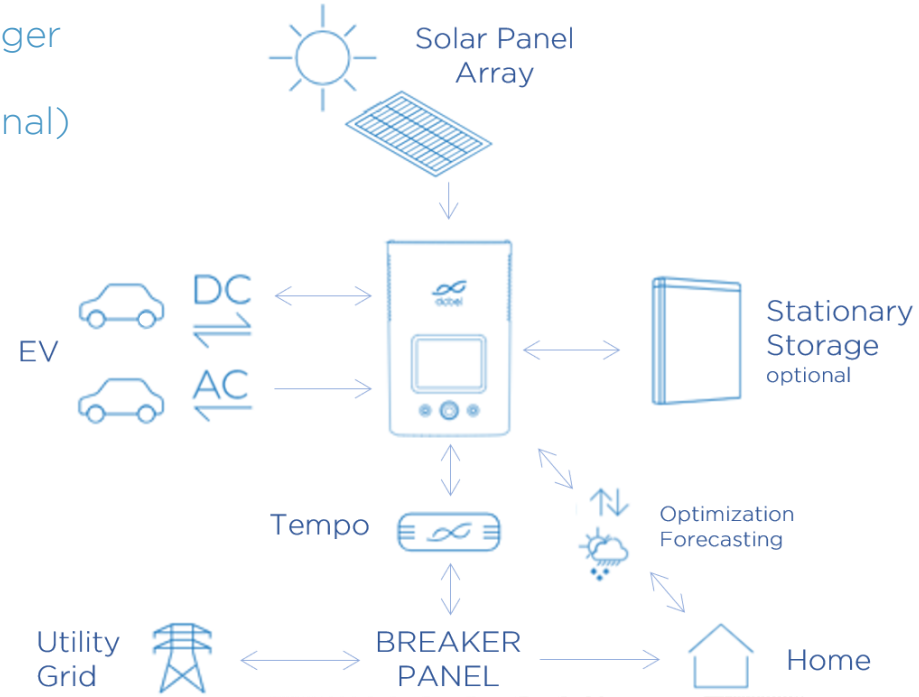
dcbel™ Utility Integration Brief

dcbel™ r16 is a unique technology that incorporates many functionalities into a single integrated unit offering ultra flexible grid-edge computing.

- Fastest residential EV charger
- Powerful solar inverter
- Blackout Power (bidirectional)
- Smart home energy
- Orchestrate™ Energy
- Stationary storage

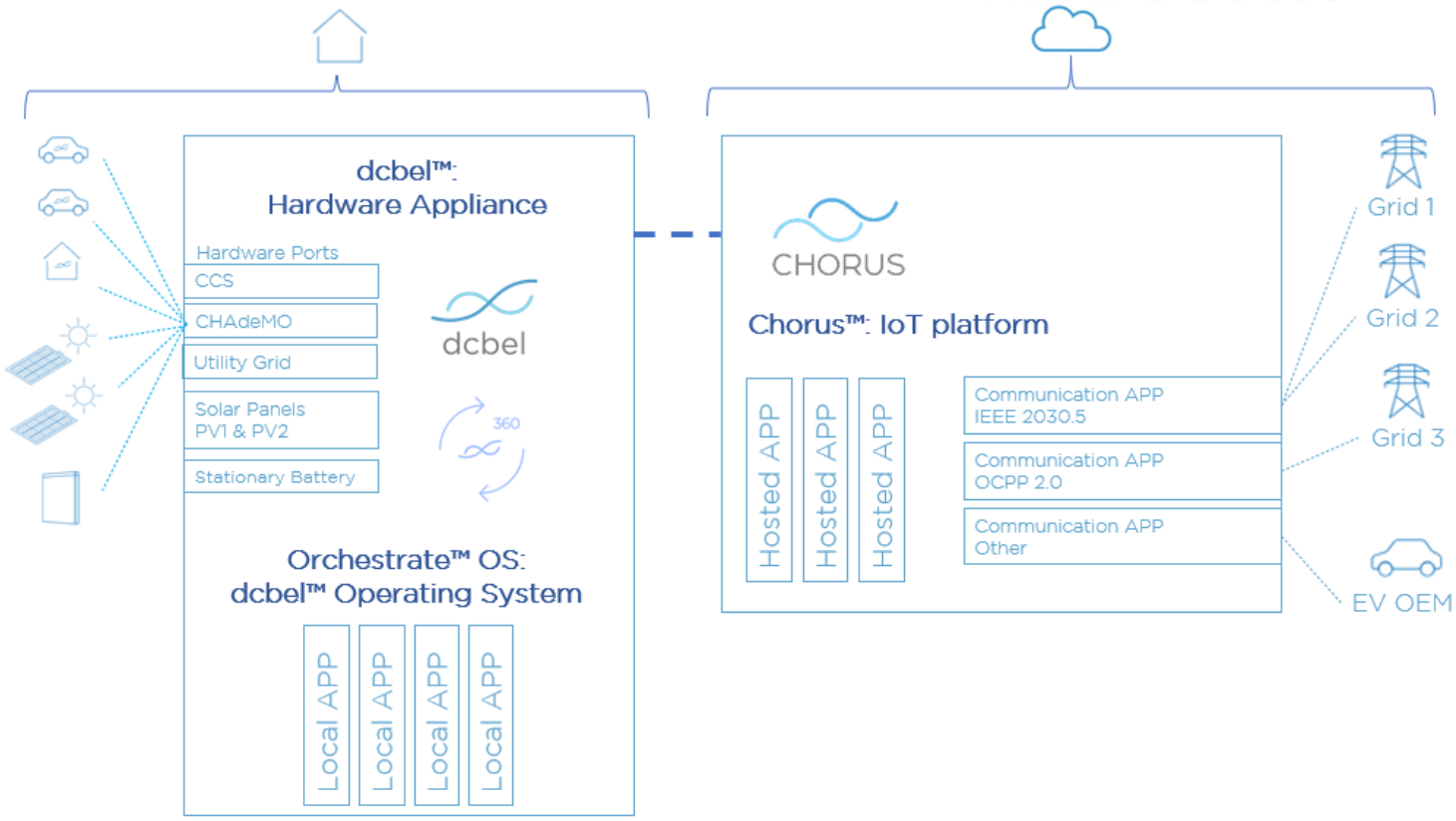


An Architecture Designed with Utility Integration in Mind

The changing nature of the modern energy grid requires the role of Distributed Energy Resources (DERs) to evolve into a more proactive, cooperative, and responsible member of the energy ecosystem that is no longer just a beneficiary, but rather, a contributing participant. Like all relationships that govern society, communication is a key factor to success. In the context of the energy grid, communication means a live "conversation" among the DERs, the public utility, and, potentially, other actors.

An increasing number of Utilities need to have full visibility into the entire grid including the wealth of data that is collected behind the meter. The collection, analysis, and communication of this data requires a robust, reliable, and secure software infrastructure. The infrastructure that supports the dcbel™ suite of products and provides Internet of Things (IoT) capabilities are: dcbel™, Orchestrate™ OS and Chorus™.

dcbel™'s unique technology and architecture presents an exceptional opportunity for Utilities and DER Aggregators.



dcbel™:

dcbel™ is a **Smart Home Energy Appliance** that sits at the heart of a home energy ecosystem. This all-in-one unit generates, manages, consumes, and stores residential energy. Using its proprietary Orchestrate™ OS, dcbel™ can learn your energy needs, download new functionality, adapt, enable, and integrate with new smart home devices, as well as participate in a variety of energy markets.

Orchestrate™ OS:

Orchestrate™ OS is the proprietary operating system developed by dcbel™ that allows applications to run locally on any dcbel™ unit. Using our AI-based analytics APP, Orchestrate™ can learn a user's energy patterns and adapt its decision-making to their life.

Orchestrate™ allows for incredible flexibility and reduced costs while enhancing reliability over current cloud-only platforms. Further, running data transactions locally (as opposed to in the cloud) can reduce costs by more than 60% over traditional cloud or blockchain platforms. This approach unlocks scalable grid-edge computing reducing cloud operating costs by > 300$ / user / year.

Orchestrate™ OS Local APP Analytics Overview

The dcbel™ architecture allows for different analytics or services to be deployed locally (on the dcbel™ hardware) as an APP or in the cloud (on Chorus™) as a Hosted APP.

Local APPs are typically time critical applications or services that need to continue operating during a telecommunication blackout. Local APPs reduce cloud computing costs and are well-suited for single thread CPU intensive calculations that do not require immense amounts of data. However, non-time critical, data intensive or communication APPs are well suited to be deployed in Chorus™ as a Hosted APP.

Chorus™ IoT:

Chorus™ is a purpose-built, real-time monitoring cloud platform that monitors all installed dcbel™ units and provides subscribed users (e.g., dcbel™ owners and utilities) with real-time alerts of any unit abnormalities before they become a problem.

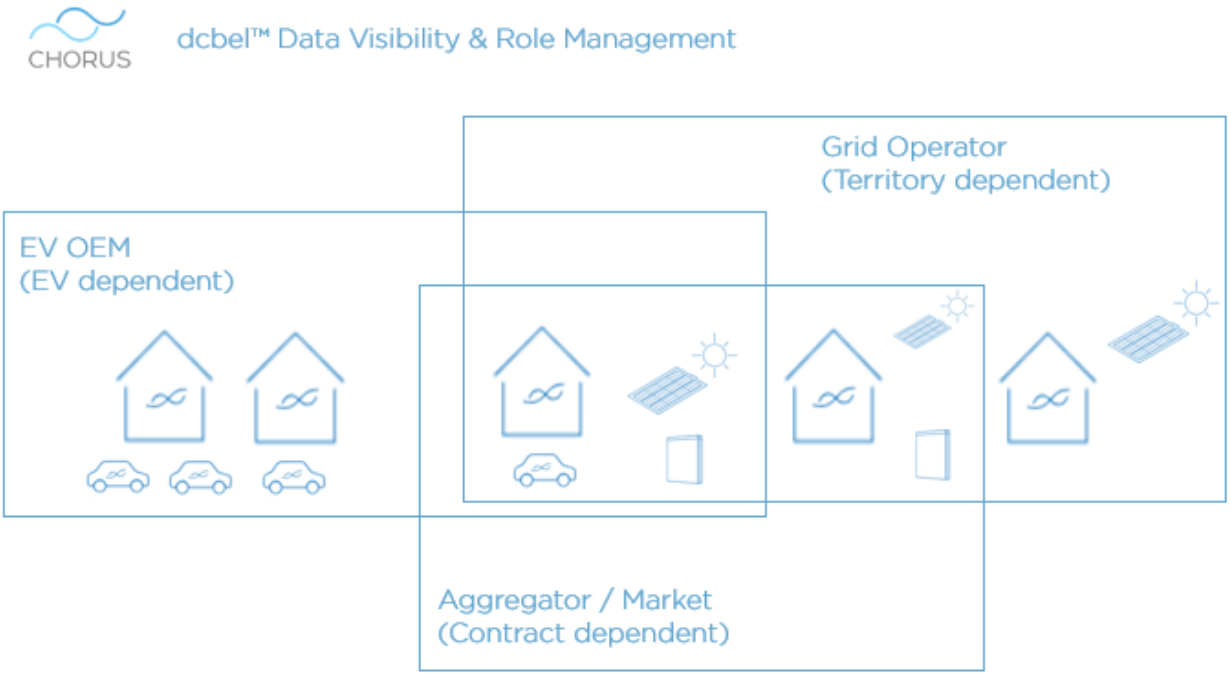
Chorus™ communicates with dcbel™ via the Orchestrate™ OS and provides the continuous balancing of loads (home, EV charging) and generation sources (utility grid, rooftop solar, battery storage). For Utilities and DER aggregators, Chorus™ also provides scheduled or real-time control of dcbel™ units in support of peak load shifting, Public Safety Power Shut-off events, or planned outages. All data is also accessible through an API for integration into Utility-owned VPP systems, and/or dashboards that can be configured using any commercially available reporting tool, such as BI Builders.

Chorus™ IoT comprises the following key features:

- Fully secured IoT platform
- Asynchronous communication
- Real-time/geo-located performance
- iOS Mobile App
- Visual language
- Voice recognition
- Remote update
- Utility protocol compliant

Chorus™: A Unique & Secure Approach to Role Management

Chorus™ is a unique IoT platform due to its ability to provide access to information and control to different Users (or Actors) over the same dcbel™ unit while respecting customer privacy and regulations.

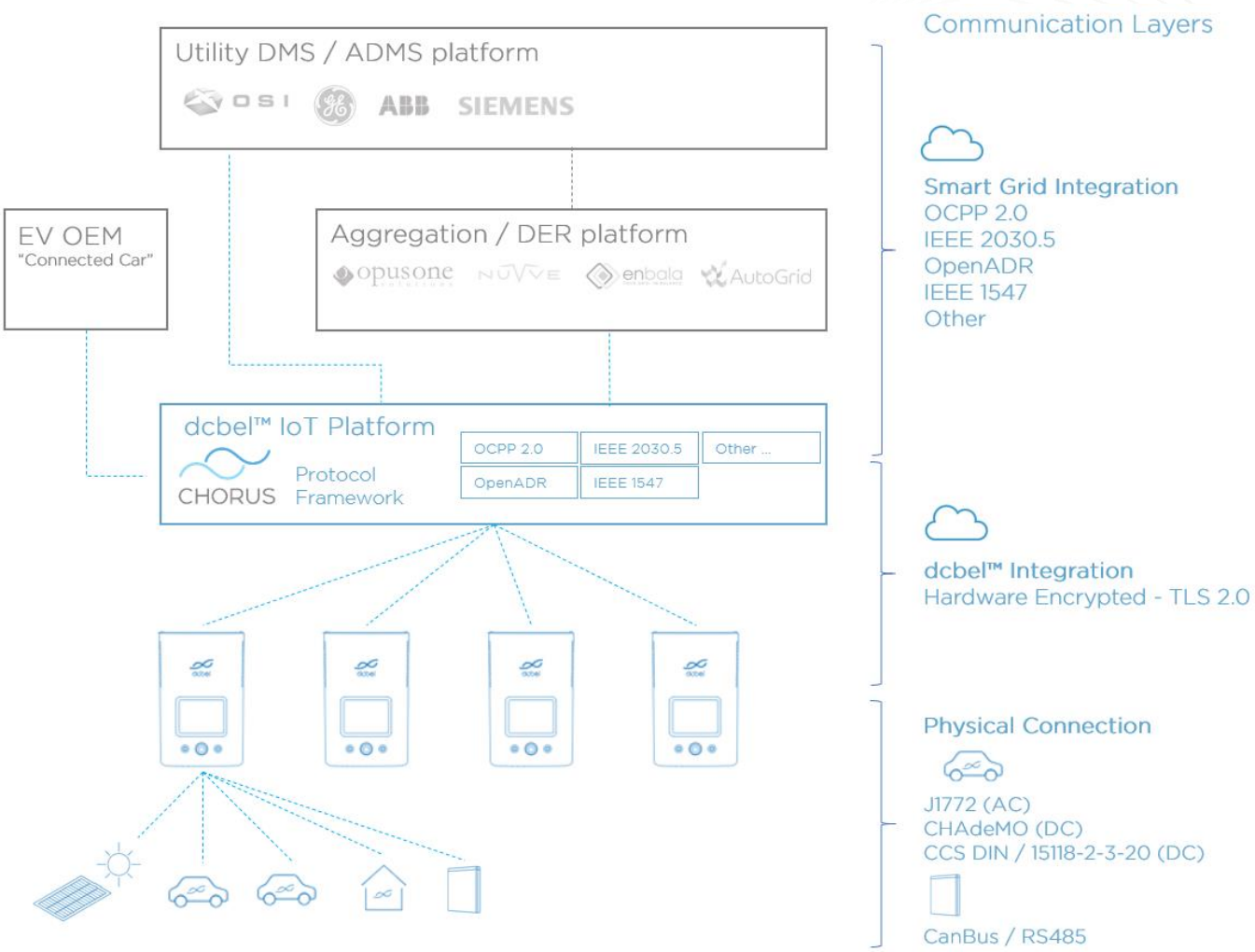


Subscribed Users can also create their own event notifications based on the monitored performance of their dcbel™ via the dcbel™ mobile app or a group of dcbel™ units installed in their jurisdiction via the Chorus ™ API if they are a utility or ESCo.

Seamless External Communication and Cybersecurity via Chorus™ IoT

Many of the protocols in use today were developed within industry silos and were not designed to support a full ecosystem of connected devices. As the EV, residential solar power and smart home industries begin to converge and interconnect with legacy electrical distribution networks, it becomes increasingly urgent to find a way to support the multitude of protocols at the residential level.

At the highest level, the utility communication with EVs, EV chargers and aggregators may meet IEEE 2030.5 and OpenADR 2.0b standards. However, we can still get conflicting instructions between demand (charge my EV more quickly) and demand response (curtail one of my loads). Once you go one level deeper, the number of protocols to adhere to explodes with multiple protocols each for demand response, solar inverter management (Rule 21, for example), distributed stationary storage, EV charging management (OCPP 2.0, for example) and EV discharging management (V2G). Multiple protocols combine to create multiple points of weakness which threaten an important part of our energy ecosystem: Security.



Third party system shown as reference only. Logos and trademark are owned by the respective corporations.

Bulletproof Security via Chorus™ IoT

IoT poses unique security, privacy, and compliance challenges which, unlike traditional cyber technology where issues revolve around software and how it is implemented, are concerned with what happens when the 'cyber' and the 'physical' worlds converge.

In this context, dcbel™ is the only charger / PV system in the world embedding a Trusted Platform Module (TPM) 2.0 chip for superior hardware security encryption and futureproofing its adherence to possible future NERC CIP compliant rules.

For this reason, it is not possible to directly access a dcbel™ unit. Rather, all communication is done via the Chorus™ IoT platform that oversees the encryption and transfer of information to dcbel™. This provides easier integration, the possibility to support legacy (unsafe) protocols and make sure that the physical assets already deployed in the field will be compatible with protocol evolution for years to come. **This approach fully supports "direct to device" type of communication protocols such as OCPP by providing a direct to dcbel™ virtual interface.** The advantages of this approach include enhanced security and data privacy, and ease of deployment.

Chorus™ External Communications Services

Communication between Chorus™ and external Users can be done via 3 different services:

- **Data Lake:** Unstructured historical/forecast/status data accessible by an authenticated User's BI Tools.
- **Low Level API:** Available on demand.
- **High Level API:** OpenADR, SEP2.0 and IEEE 2030.5.

Chorus™ Protocol Framework

The Chorus™ Protocol Framework is a set of objects and services that allow various protocols to be implemented as a Hosted APP on the Chorus™ Cloud. This approach means that deploying and maintaining new protocols or updates to existing protocols is can be done in a matter of hours, not months.

dcbel™ Connectivity

Every dcbel™ unit is designed and delivered to be communication-ready with a RJ45 port that can be connected to an Ethernet cable. Alternatively, dcbel™ can also use external hardware to connect to the Internet via WiFi, Cellular or Zigbee, unlocking the following capabilities:

- Two-way communication
- Data and measurement monitoring
- Send commands to control the unit
- Send software and configuration updates
- Report on errors and failure

For reliability, dcbel™ requires a wired Ethernet connection to the following dcbel™ installation components: Tempo™ (home sensor) and the Automatic Transfer Switch (ATS).

dcbel™ Use During a Communication or Power Outage

In case of a communication network failure, dcbel™ will continue to operate offline, and won't be able to communicate with Chorus™ during the duration of the network failure.

However, dcbel™ was designed to house all of Orchestrate™'s computing power locally so that it can remain fully operational during a utility grid blackout and continues to store data which is then synchronized with Chorus™ once the communication network comes back online.

During an electrical blackout, dcbel™ is first powered by the home's stationary battery, if available. If a stationary battery is not part of the home's energy ecosystem, dcbel™ will be powered by a Universal Power Supply (UPS) until a compatible V2H EV is connected. Please refer to the dcbel™ Electrical Single Line Diagram for more information.

Chorus™ API Overview

Chorus™ provides an API that may be used by authenticated Users, such as:

- Installation partners
- Utility partners
- Support personnel

Functionalities available to the above users can vary according to the User's Role and the Privileges granted by the Administrator. Capabilities provided by the API can be particularly useful from a provisioning and utilities perspective, as they permit "at-scale" (or batch) execution of the functions normally accomplished on site by installation technicians using the dcbel™ Installer App. For more information on the Installer App, refer to the *dcbel™ Installation Manual*, available on request from dcbel™.

Functionalities available via the API include:

- User management
  - Create a new user
  - Assign a role to user or group of users
  - Set privileges to a role or group of roles
  - Delete users
- Site management
  - Create a site where a dcbel™ is installed
  - Update site information such as equipment make and model, utility rate schedule, micro-weather data, and more
  - Delete a site
- Device management
  - Add a new dcbel™ device
  - Link a device to a site
  - Update device information
- Device monitoring
  - Access dcbel™ data stored in the cloud
- Device control
  - Send command to dcbel™

Remote commands that Chorus™ can send to dcbel™:

- dcbel™ unit:
  - Enable dcbel™ (functional unit)
  - Disable dcbel™ (no functionality)
  - Software reboot complete unit
  - Lock screen and buttons (start/stop and rotary selection)
  - Display emergency message on screen
  - Authorize electricity export to the grid
  - Block electricity export to the grid

- EVAC:
  - Start charging
  - Stop charging

    - Limit charging at a specific current (A) or at specific power (W)
    - Reboot charging (stop and start)
- EVDC:
    - Start charging
    - Stop charging
    - Start power boost
    - Stop power boost
    - Start discharging
    - Stop discharging
    - Limit charging at a specific current on AC side (A) or at specific power (W)
    - Limit discharging at a specific current on AC side (A) or at specific power (W)
    - Enable V2X
    - Disable V2X
    - Reboot charging (stop and start)
- PV1:
    - Start
    - Stop
    - Limit production at a specific power (W)
- PV2:
    - Start
    - Stop
    - Limit production at a specific power (W)
- Stationar Battery:
    - Start charging
    - Stop charging
    - Start discharging
    - Stop discharging
    - Limit charging at a specific current on AC side (A) or at specific power (W)
    - Limit discharging at a specific current on AC side (A) or at specific power (W)
    - Reboot charging (stop and start)
    - Reboot discharging (stop and start)
- ATS
    - Open (isolate home from the grid)
    - Close (connect home to the grid)
    - Reboot unit
- Tempo
    - Reboot unit
- Rule 21 configuration

dcbel™ Data Measurements & Notifications

The measurement rate for the data used and stored by each dcbel™ unit is the average value of the last (1) minute (dcbel™ samples data at 70k samples per second). These data measurements include:

- EV AC - (V, A, W, State)
- EV DC - (V, A, W, SoC, State)
- PV 1 - (V, A, W, Curtail, State)
- PV 2 - (V, A, W, Curtail, State)
- ESS - (V, A, W, SoC, State)
- PUC5 - (V, A, W, Hz, °C, Fan speed, Operation mode, State)
- Temperature dcbel™ - (°C / °F)
- Fans - (RPM)
- dcbel™ interaction - (Button pressed, screens consulted)
- ATS - (V, A, Hz, Relay position)
- TEMPO™ Home current sensor - (A, Hz, import or export)
- Alarms/Notifications
- Errors

Each power unit measured will also indicate the direction in which it is flowing (e.g., charging or discharging).