White Paper

OCPQR: Open Charge Point QR Code

Standardized QR Code Format for EMSP and EV Charger Apps

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1.0 Summary

This proposal presents a standardized QR code data format for Electric Vehicle (EV) chargers, designed to simplify access and usage across various mobile apps. By adopting a standard format for QR, we aim to enhance interoperability, improve the user experience, and support broader EV adoption.

2.0 Problem Statement

EV chargers typically feature QR codes on their display or nearby areas, allowing users to scan the QR using an Electric Mobility Service Provider (EMSP) mobile app. This functionality enables users to directly navigate to a specific charger, bypassing the need to manually search for it on a map, list view or any other option in the mobile app. The QR code generally contains:

- **Charge Box ID**: A unique identifier for the charger.
- **EVSE/Connector ID (Optional)**: To specify the exact connector on a multi-connector charger. This is particularly useful if the QR code is implemented at the EVSE or connector level to ensure precise identification."

Upon scanning, the EMSP app uses this information to fetch charger details via API calls.

2.1 The Problem of Fragmented QR Code Formats

Despite the existence of established protocols for EV roaming (e.g., OCPI, UEI) that facilitate seamless communication and interoperability between Charge Point Operators (CPOs) and EMSPs, there is no standardization in the QR code formats used by different networks. These protocols aim to:

1. Standardize data exchange mechanisms between CPOs, EMSPs, and utility providers.
2. Enable seamless EV charging experiences across networks, allowing users to access multiple networks with a single app.

However, the lack of a standard QR code format introduces the following challenges:

- **Limited Compatibility**: Mobile apps can only recognize and process QR codes from their own network. QR codes from other networks remain unreadable.
- **User Inconvenience**: In multi-network locations with numerous chargers, users are forced to manually select a charger from a map view, list view or through any other option, which can be cumbersome.
- **Non-Standard Integration Efforts**: Even if a EMSP/CPO is willing to support other network's QR codes, the process is time-consuming and lacks a consistent standard. EMSPs and CPOs face additional development burdens to support multiple formats.
- **Hindering Interoperability**: The absence of standardization undermines the seamless EV charging experience that roaming protocols aim to deliver.

2.2 QR based on EV Roaming Protocols

Existing EV roaming protocols, such as OCPI and UEI, can be enhanced to include specifications for a unified QR code standard. However, in real-world scenarios, many platforms integrate multiple protocols to maximize charger visibility. This approach often results in a single charger having multiple QR codes—one for each protocol—leading to confusion and inefficiency.

To overcome these challenges, we propose the development of a **standardized QR code data format** that works alongside EV roaming protocols. This format will enable all EMSP apps to recognize and interact with any charger, regardless of the Charge Point Operator (CPO), EMSP, or protocol involved.

3.0 Objectives

The primary objective of this initiative is to create a standard QR code data format for EV chargers. This format will allow users to simply scan the QR code to identify and interact with a charger, eliminating the need for manual selection from a map or list view.

3.1 Key Components of the Standardized QR Code Format

1. **Unique Charge Box ID**:
    a. Every charger in the CMS network is assigned a unique Charge Box ID.

   b. This ID is a critical part of the OCPP URL configured in the charger and serves as the primary identifier for the QR code.
2. **Optional EVSE and Connector ID**:
   a. To further enhance the user experience, the QR code can also include:
      i. **EVSE ID**: Identifies the specific Electric Vehicle Supply Equipment in a multi-EVSE setup.
      ii. **Connector ID**: Pinpoints the exact connector in multi-connector chargers.

3.2 How It Works

- When the QR code is scanned, the mobile app retrieves the Charge Box ID (and optionally the EVSE/Connector ID) from the code.
- Using this information, the app makes API calls to the CMS platform to fetch the charger details.
- This process simplifies and accelerates user interaction with the charger, especially in locations with multiple chargers.

3.3 Prerequisite

The EMSP/CMS platform will share the EV charger's information across networks using various protocols like OCPI and UEI, enabling seamless interoperability and EV roaming. However, these protocols must be enhanced to support additional fields that specifically identify the **Charge Box ID**, a critical component for standardized QR code functionality.

3.3.1 Existing Protocol Capabilities and Challenges

1. Share Charge Box ID in OCPI Protocol:
   a. The OCPI protocol includes fields that allow sharing of custom information, such as the **Charge Box ID**, which can be used to uniquely identify a charger.
   b. While this flexibility is helpful, the lack of standardization in how the Charge Box ID is defined and shared can lead to interoperability challenges.
   c. Each network may implement these fields differently, resulting in inconsistent data exchange and reduced compatibility between platforms.

3.3.2 Need for Standardization

- Without a standardized approach, mobile apps and CMS platforms will face difficulties interpreting and using the Charge Box ID effectively.
- Standardizing the inclusion of the Charge Box ID in protocols like OCPI, UEI, etc., will ensure consistent implementation across networks, fostering greater interoperability.

4.0 Proposed QR Code Data Format

4.1 Format

OCPQRFIData

4.2 Format Description

Place Holder	Abbreviation	Length	Data Type	Description
OCPQR	Open Charge Point QR	5	text	Specifies the protocol
FI	Format Identifier	2	text	Specifies the data format
Data	-	Any	text	QR Information

4.3 Supported Format Identifiers

#	Format Identifier (FI)	Format
1	01	CSV
2	02	JSON

If required, we can extend the protocol to support additional formats. E.g. XML, YAML, etc.

4.4 Data Formats

4.4.1 CSV

4.4.1.1 Description

#	Field Description	Data type	Description	Mandatory
1	Schema Version	string	Specifies the schema version.	Yes
2	Charge Box Id	string	A unique identifier for the charger.	Yes
3	EVSE ID	string	Indicates the EVSE (Electric Vehicle Supply Equipment) port number.	No
4	Connector ID	string	Identifies the physical port in use.	No

4.4.1.2 Sample

#	Usage	Description	Example	
1	Charge Box ID	OCPQR01SchemaVersion,Charge Box ID	OCPQR011.0,PZTDC2028541	Schema Version: 1.0 Charge Box Id: PZTDC2028541
2	Charge Box ID with EVSE	OCPQR01SchemaVersion,Charge Box ID,EVSE ID	OCPQR011.0,PZTDC2028541,1	Schema Version: 1.0 Charge Box Id: PZTDC2028541 EVSE Id: 1
3	Charge Box ID with EVSE and Connector	OCPQR01SchemaVersion,Charge Box ID,EVSE ID,Connector ID	OCPQR011.0,PZTDC2028541,1,1	Schema Version: 1.0 Charge Box Id: PZTDC2028541 EVSE Id: 1 Connector Id: 1

4.4.1.3 Advantages

1. This approach is preferable when the size of QR code is limited.

4.4.2 JSON

4.4.2.1 Description

Data: Data in JSON format

#	Field	Field Description	Data type	Description	Mandatory
1	f0	Schema Version	string	Specifies the schema version.	Yes
2	f1	Charge Box Id	string	A unique identifier for the charger.	Yes
3	f2	EVSE ID	string	Indicates the EVSE (Electric Vehicle Supply Equipment) port number.	No
4	f3	Connector ID	string	Identifies the physical port in use.	No

The EVSE port and connector port are used in numbering format or as alphabets. E.g. Connector A, B, etc. So, the protocol is designed to have it as string instead of number.

4.4.1.2 Sample

```
OCPQR02{"f0":"1.0","f1":"PZTDC2028541","f2":"1","f3":"1"}
```

To minimize the QR code content length, we use concise field names such as f1, f2, etc., instead of more descriptive names like Charge Box ID and EVSE ID.

5.0 Advantages of Standardization

1. **EV Users:** A user can scan any charger's QR code with their preferred app and start charging immediately instead of manual charger selection from map or list view. Users can easily locate the correct port and initiate charging at multi-port stations without manual input.
2. **EMSP/CMS Provider:** Reduces complexity in app development
3. **Charger Manufacturer:** Reduces complexity in firmware development.
4. **Protocol:** Allows for additional fields for future requirements.

6.0 Implementation Details

To ensure backward compatibility, if the QR content/text starts with "OCPQR", it indicates that the data follows the standardized OCPQR format. Otherwise, the existing approach can be used to parse the QR content. This allows mobile apps and platforms to support both legacy QR formats and the new OCPQR standard seamlessly.

6.1 Approaches for Parsing the QR Code

There are two possible approaches for implementing the QR code parsing logic in mobile apps and backend systems:

6.1.1 Mobile App-Based Parsing

- The mobile app reads the QR code and determines whether it follows the OCPQR format or an existing format.
- It then extracts the relevant charger details (e.g., Charge Box ID, EVSE ID, Connector ID).
- The app sends this extracted information to the backend API to retrieve additional details and proceed with authentication, pricing, and session initiation.

6.1.2 Backend-Based Parsing

- The mobile app reads the QR code and sends the raw QR text to a backend API without processing it.
- The backend service determines the format of the QR code and parses it accordingly.
- If the QR follows the OCPQR standard, it is processed using the new format; otherwise, it is handled with the existing method.
- This approach keeps the parsing logic centralized in the backend, reducing complexity on the mobile app side.

By adopting these approaches, **CPOs, EMSPs, and mobile app developers** can ensure a **smooth transition** to the OCPQR standard while maintaining compatibility with existing systems.

7.0 Repository Details

To support the adoption of **OCPQR**, we have created an open-source repository that includes:

- Whitepaper (PDF) outlining the proposed standard.

7.1 GitHub Repository

- Repository Link: GitHub
- Contributions: Open to the community for feedback, improvements, and adoption.

8.0 Future Scope

1. Collaborate with international bodies to establish a worldwide standard.
2. Develop SDKs/libraries in various programming languages.

9.0 Conclusion

Adopting a standardized QR code format for EV chargers will transform the EV charging ecosystem, making it more user-friendly and efficient. This initiative helps EV users access the EV chargers with ease and convenience.

10.0 Contributors

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11.0 Document history

To be notified about updates to this white paper.

Change	Description	Date
Initial publication	White paper first published.	Jan 13, 2025