

CHAdeMO Technical Working Group Meeting

HPC Protocol SWG

CHAdeMO association

SUBARU Corporation

Kazumasa Arai

Role of this SWG



➤ Research of communication protocol for future DC charging (ChaoJi)

- Research and propose communication protocol for ChaoJi.
- Create a roadmap for the electric vehicle charging protocol
- Cooperation with ChaoJi (Japan-China Work shop and International ChaoJi TWS SWG3)



ChaoJi

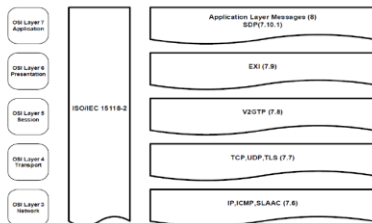


Proposal from CEC (China Electricity Council)

Approaches

- ISO 15118+
 - ✓ GB&CHAdEMO need to use ethernet communication

- IP over CAN+ISO 15118+



- CAN based

- ✓ Remain CAN communication
- ✓ Learn encryption, XML based data representation format, business model definition from ISO15118

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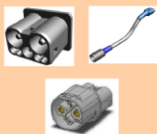


International ChaoJi Technical Workshop

Project Organization

CEC & CHAdEMO HPC SWG:
Feng Ni (NARI Group)
Utaka Kamishima (Nissan)

SWG 1 (coupler&adapter)
Leader: Feng Ni

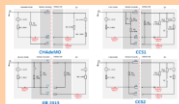


SWG 2 (system&safety)
Leader: Matthias Kuebel (VW)



CEC & CHAdEMO CONFIDENTIAL

SWG 3 (communication&
backward compatibility)
Leader: Feng Ni



- New communication protocol proposal applied to ChaoJi

Introduce a new Protocol that can support new functions (PnC, V2X, ACD, etc.)

Three candidates

- Ethernet
- IP over CAN
- CAN based

- International ChaoJi TWS

The new protocol will be discussed at International ChaoJi TWS SWG3.

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Mission



Research and propose the new protocol for future function from the physical layer to application layer

- Research and analysis of future functional use cases
- Functional analysis of each use case
- Communication test

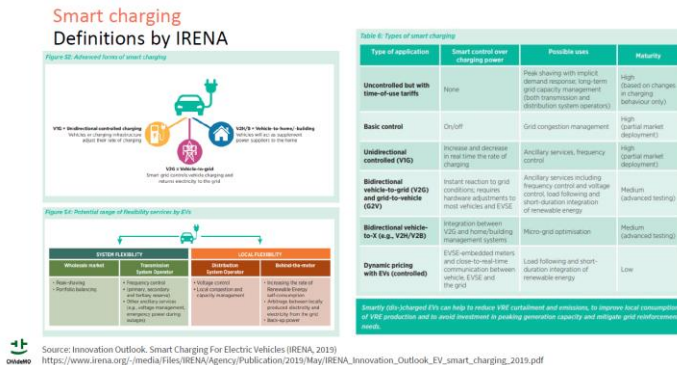


Research and analysis of future functional use cases

- Summarize future new charging features in Europe, Japan, China and North America

➤ Europe

Research PnC, V2X, Smart Charge and ACD information



ACD-U ACD-U Projects in EU

- CharIN issued a public request for concepts for ACUD* systems and interfaces (07/2019)
 - Goal: an interoperable connection interface and any related requirements for the Electric Vehicle Supply Equipment (EVSE), Electric Vehicle (EV), communication and related hardware.
 - Concept by 11/2019 → prototype

Possible Electric Vehicle Charging Situation in the Future



Notes: *Automatic Connection Device Underbody (ACDU)
 Source: <https://www.charin.eu/news/news-detail/2018/news/charin-requests-concepts-for-an-automatic-connection-device-underbody-acdu/>

- VOLTERIO (formerly called NRG-X), AU**
The ground unit communicates with the EV's on-board unit via a secure WLAN connection. Connection guided by an ultrasound based micro-navigation system and the charging process starts automatically. (22kW AC)

- Matrix Charging System by EASELINK, AU**
Connector and Pad communicate via a secure wireless connection. After a system check and an authentication process, the vehicle/connector automatically connects to the Pad. (working proto with a real life testing fleet, 22kW AC, secure payment via blockchain)

- DazePlug by Daze Technology, IT**
DazePlug is an Automatic Conductive Charger for Electric Cars, composed by an off-board device - the charger - and an on-board unit - the inlet - installed under the EV. (Demo, Horizon2020 and other fund, 17,22 kW AC)

E-mail questionnaire survey to related parties (January 2021)

Information gathering and analysis of future functional use cases

➤ Survey of Japan and China

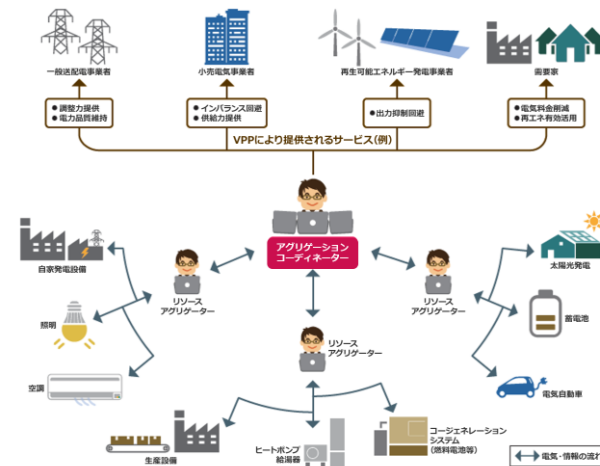
The survey items are under consideration

➤ Japan

Case study of VPP, V2X, and so on
Market demand for PnC, ACD, and so on
-> Interview survey of related parties

◆ Topics

Prime Minister Suga declares that Japan aims to achieve carbon neutrality by 2050



Cited from Ministry of Economy, Trade and Industry, Agency for Natural Resources and Energy



Cited from NHK (Japan Broadcasting Corporation)



Functional analysis of each use case

ChaoJi HPC プロトコル検討 ~ユーザーの要件(ばらし・通信の特徴)~



- ・プロトコル選定のために、各ユーザーの機能要件・性能要件および取り扱うデータ種別を明確化
- ・各通信プロトコル(物理層)の特徴を表をまとめる

※下記内容はご参考のため、過不足・認識違いはご容赦願います。

表1.ユーザーに求められる要件

○: must, △: want, ×: none

ユーザー	機能要件						性能要件 ※従来FC: FastChargeとの比較						取扱いデータ種別					
	ユーザー操作	無線通信	自動充電	ユーザー認証	遠隔操作	計算処理	データ種別	リアルタイム性	CPU/メモリ	信頼性	接続時間	消費電力	充電速度	個人情報	車体情報	車体情報	課金情報	
従来FC (標準)	○	×	×	×	×	△	-	-	-	-	-	-	○	×	×	×	×	
Smart Charge	×	×	×	×	×	△	>FC	<FC	<FC	<FC	<FC	<FC	○	×	×	×	△	
V2X (V2L, V2V, V2I)	○	×	×	×	×	△	>FC	<FC	<FC	<FC	<FC	<FC	○	×	×	×	△	
Plug and Charge	○	×	×	×	×	△	>FC	<FC	<FC	<FC	<FC	<FC	○	×	×	×	△	
ACD	△	△	△	×	×	×	>FC	<FC	<FC	<FC	<FC	<FC	×	△	×	×	×	

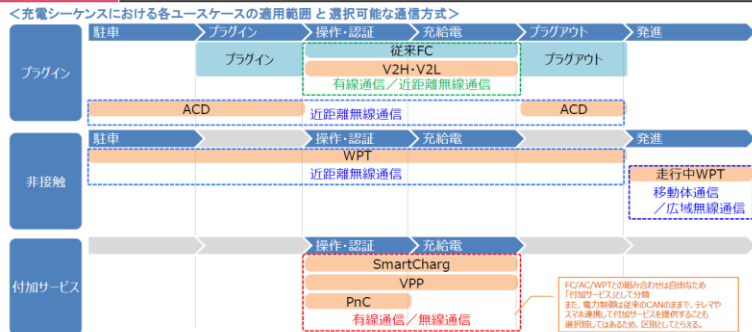
表2.各通信プロトコルの特徴

○: 良, △: 可, ×: 不可

プロトコル	機能/性能										その他		
	ChAdEMO 互換性	ISO互換性	通信速度 (理論値)	CPU/メモリ	信頼性	接続時間	消費電力	コスト	遠隔操作 (IPアドレス)	設計自由度	電圧認証	車載認証	電圧認証
CAN/ISO11895	○	×	Max1 or 2Mbps	△	○	×	○	○	○	×	○	○	○
FlexRay	×	×	Max10Mbps	△	○	○	○	○	○	×	△	○	○
Ethernet IEEE802.3av	×	○	Max100Mbps	○	○	○	△	△	○	×	○	○	○
Bluetooth IEEE802.15.1	×	×	Max1Mbps	×	×	×	2.4GHz電波干渉	×	×	○	△	○	○
Wi-Fi IEEE802.11n	×	○	Max20Mbps	×	×	×	2.4GHz電波干渉	×	×	○	△	○	○
PLC (DGP)	×	○	Max10Mbps	△	△	×	×	×	×	×	○	○	○

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ChaoJi HPC プロトコル検討 ~充電シーケンスとユーザーの関係~



物理層はユーザー(システム・サービス)に合わせて複数から選択でき、上位通信プロトコルは汎用的なプロトコルで共通化することで、物理層の多様性に対応できる形が好ましい。

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- Clarify the functional requirements and performance requirements of each use case
- Summarize the characteristics of each communication protocol (physical layer)
- Association of communication method with the scope of each use case in the charging sequence
- Relationship with physical layer, data format, standard (ISO)

Communication test



- Communication test from physical layer to application layer
 - Communication test to determine new physical layer

 - This year, we will narrow down the candidates for the physical layer and test next year.

 - Candidate of physical layer
 - Ethernet : BroadR-Reach(100Base-T1), 100Base-Tx, and so on
 - Wi-Fi : IEEE802.11n、802.11ac, 802.11ax, and so on

Timeline



		2020									2021		
		4	5	6	7	8	9	10	11	12	1	2	3
Information researching and analysis of future functional use cases	EU	Determine the survey content			Coordination with the European Secretariat			Confirmation of survey information and determining the content of the hearing			E-mail questionnaire survey		Summarize
					Research and summarize								
	CH							Discussion at International ChaoJi TWS SW3					
								Discussion at International ChaoJi TWS SW3 and Protocol SWG					
JP													
Functional analysis								◆ 12.10	◆ 13.11	◆	◆	◆	◆ Summarize
Test									Determination of physical layer to be tested and test content				
Protocol SWG		◆ 16.4			◆ 10.7	◆ 4.8	◆ 1.9	◆ 12.10	◆ 13.11	◆	◆	◆	◆
International TWS SWG3				◆ 29.6		◆ 18.8	◆ 30.9	◆ 21.10	◆ 23.11	◆	◆	◆	◆



Thank You!

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