

CCS Analyzer

Improve EV charging interoperability and reliability:

- Increased accuracy in issue detection
- Deeper data insights for test analysis
- Reduced time for engineering teams

Overview

Achieving the highest levels of interoperability between electric vehicles and charging stations is complex, time consuming and complex — consuming the limited availability of today's test engineers. Yet over 25% of DC-Fast Charging charge sessions fail due to communication, hardware, or protocol exchange problems.¹ **QualityLogic offers a solution.**

The QualityLogic CCS Analyzer makes it possible to track down issues faster, find previously “hidden” charging issues, and achieve higher product interoperability for engineers working with DIN 70121 and ISO 15118 protocols.

Speed, Accuracy, Enhanced Reliability

The CCS Analyzer dives deeper into communication data to identify overlooked issues and diagnose the root cause of charging failures, enabling dramatically more accurate and complete charge failure analysis.

Maximize Charging Session Test Results:

- Identify session traffic anomalies
- Requires no additional hardware
- Analyzes PCAP files from any source
- Complements current tools
- Accelerates performance analysis

Supports message traffic for:

- DIN SPEC
- ISO 15118-2 & ISO 15118-20
- PWM & SLAC

“ I am able to run 50 - 100 more sessions in the same time it takes to manually analyze just one session.”

Jeremy Bibeau | EVgo

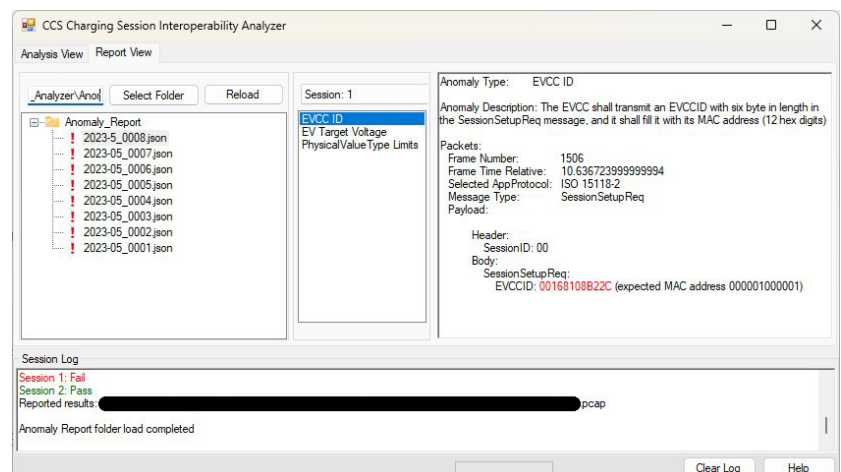


Figure 1. Anomalies are reported in CCS Analyzer via easy-to-understand reports.

1. Charger Help Annual Reliability Report Aug 2024

QualityLogic's CCS Analyzer is a new class of tool for engineers who analyze Combined Charging System (CCS) traffic between the EV and the EVSE. The CCS Analyzer is an "expert system" that significantly improves productivity of engineers by automating the analyses of session traffic to identify anomalies that cause failed charging sessions, extract timing data from the files and uncover non-fatal anomalies that may cause future issues. As shown below, CCS Analyzer eliminates multiple manual steps, reduces the Test Analysis activity by more than 50%, and automates certain repetitive steps from hours to seconds.

Faster, Deeper Interoperability Testing

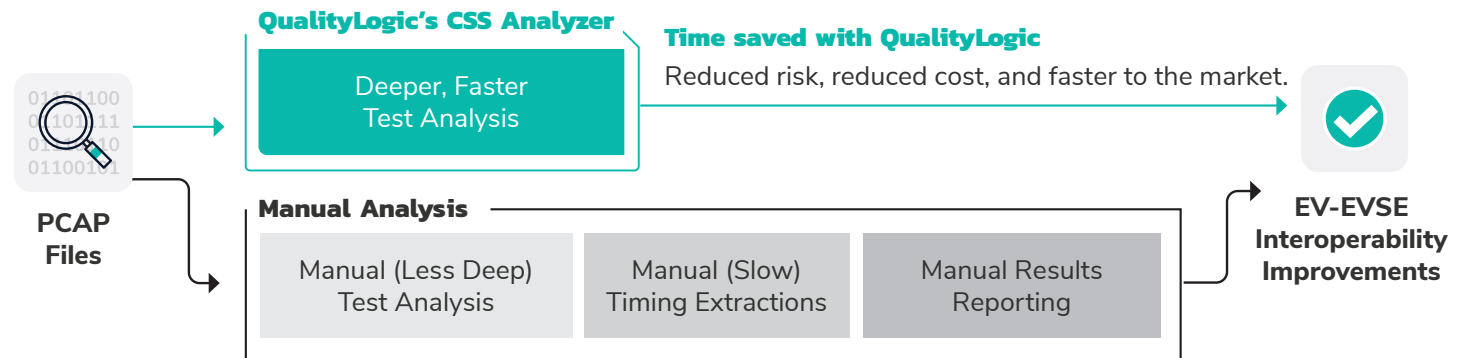
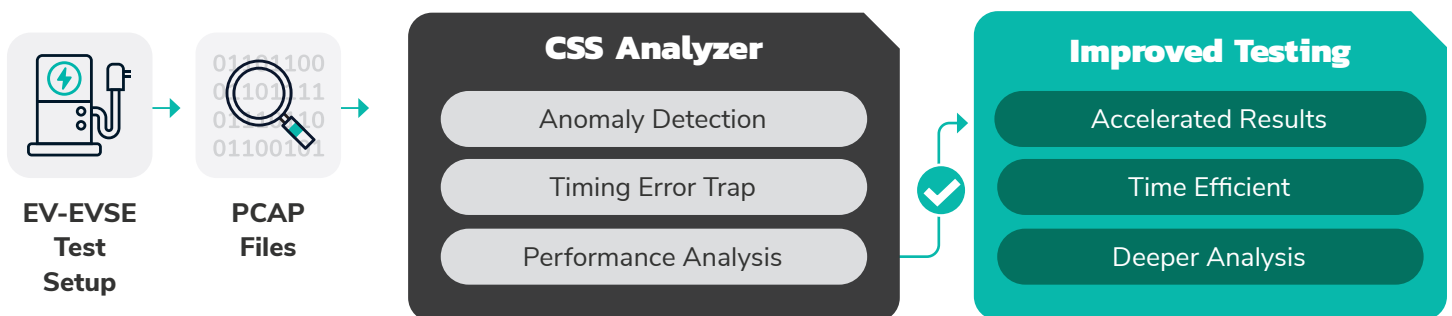


Figure 2. Timeline comparing manual test analysis with the faster CCS Analyzer automation.

Save Engineering Time – Increase Accuracy

The primary benefit of CCS Analyzer is to accelerate interoperability test analysis to reveal root causes of issues and even more interoperability anomalies, most of which go unnoticed when using today's engineering tools and manual analysis methods. Further time savings is achieved at each product or firmware related re-test.

The CCS Analyzer extends and enhances any interoperability testing setup, does not require any hardware, is compatible with existing engineering test tools and enables testers to look at files not previously considered. As illustrated below, the powerful tool works on PCAP files to achieve improved testing.



Key Benefits of CCS Analyzer

- What used to take 30 minutes to manually analyze one charge session can be done in seconds
- Run 100+ sessions in the time it takes to manually analyze 1 session
- Discover previously unseen anomalies when using existing tools
- Frees time of expert test engineers for other activities

How It Works

The CCS Analyzer is based on a formal QualityLogic Anomaly Specification which, unlike other industry test specifications, identifies potential anomalies – e.g. non-conformant behaviors, differing specification interpretations, mismatched expectations between a charging station and EV, etc. - in the captured message traffic. The most valuable benefit of the product is the reporting of the analysis results. A Robust Windows based report viewer enables users to drill into anomalies found; jumping to the relevant Wireshark trace; graphing key variables and outputting a PDF report; reporting of timing statistics; expected results versus actual results.

Phase	Duration (s)	Start (frame, time)	End (frame, time)	Notes
CM_SLAC_PARM_REQ to CM_SLAC_PARM.CNF	0.004	CM_SLAC_PARM_REQ (16, 10.270)	CM_SLAC_PARM.CNF (17, 10.274)	
CM_SLAC_PARM_REQ to CM_SLAC_MATCH.CNF	1.344	CM_SLAC_PARM_REQ (16, 10.270)	CM_SLAC_MATCH.CNF (36, 11.614)	
SDP_Req to SDP_Res	0.025	SDPRequest (48, 16.710)	SDPResponse (51, 16.735)	
SessionSetupReq to SessionSetupRes	0.070	SessionSetupReq (84, 18.411)	SessionSetupRes (87, 18.482)	
ChargeParameterDiscoveryReq to Res - finished	1.820	ChargeParameterDiscoveryReq (152, 25.7...	ChargeParameterDiscoveryRes (165, 27.543)	
CableCheckReq to CableCheckRes - finished	20.240	CableCheckReq (170, 27.772)	CableCheckRes (469, 48.012)	
PreChargeReq to PreChargeRes - finished < 500 V	4.518	PreChargeReq (472, 48.084)	PreChargeRes (540, 52.602)	EV Target Voltage: 424.5 V
PowerDeliveryReq to PowerDeliveryRes	0.039	PowerDeliveryReq (543, 52.692)	PowerDeliveryRes (545, 52.732)	
AuthorizationReq to AuthorizationRes - finished (OCPP and Backend Performan...	5.479	AuthorizationReq (108, 20.152)	AuthorizationRes (149, 25.632)	Authorization: PnC
Req/Res cycle (average from at least 4 Req/Res)	0.024			
PnC only - SDPRes to PaymentDetailRes	2.557	SDPResponse (51, 16.735)	PaymentDetailsRes (105, 19.292)	
PnC only - PaymentDetailReq to AuthorizationRes	1.579	PaymentDetailsReq (103, 18.782)	AuthorizationRes (110, 20.361)	
B2 to CM_SLAC_PARM_REQ	0.093	ControlPilotMessage (15, 10.177)	CM_SLAC_PARM_REQ (16, 10.270)	
CM_SLAC_PARM_REQ to CM_START_ATTEN_CHAR_IND	0.110	CM_SLAC_PARM_REQ (16, 10.270)	CM_START_ATTEN_CHAR_IND (19, 10.3...	
CM_MNBC_SOUND_IND Count 9 - 0	0.272	CM_MNBC_SOUND_IND (22, 10.470)	CM_MNBC_SOUND_IND (31, 10.742)	
CM_SLAC_MATCH_REQ/CNF to SDPReq	5.096	CM_SLAC_MATCH.CNF (36, 11.614)	SDPRequest (48, 16.710)	
SDP_Req to SupportedAppProtocolReq	1.641	SDPRequest (48, 16.710)	SupportedAppProtocolReq (80, 18.351)	
SDP_Req to SessionSetupReq	1.701	SDPRequest (48, 16.710)	SessionSetupReq (84, 18.411)	
AuthorizationRes to ChargeParameterDiscoveryReq	0.091	AuthorizationRes (149, 25.632)	ChargeParameterDiscoveryReq (152, 25.722)	

Figure 3. Sample CCS Analyzer output - timing statistics offer valuable insights to Test Engineers.

Powerful Charting Capabilities

Illustrated below, the CCS Analyzer is unique in its ability to chart multiple critical testing parameters to help engineers interpret and solve interoperability problems.

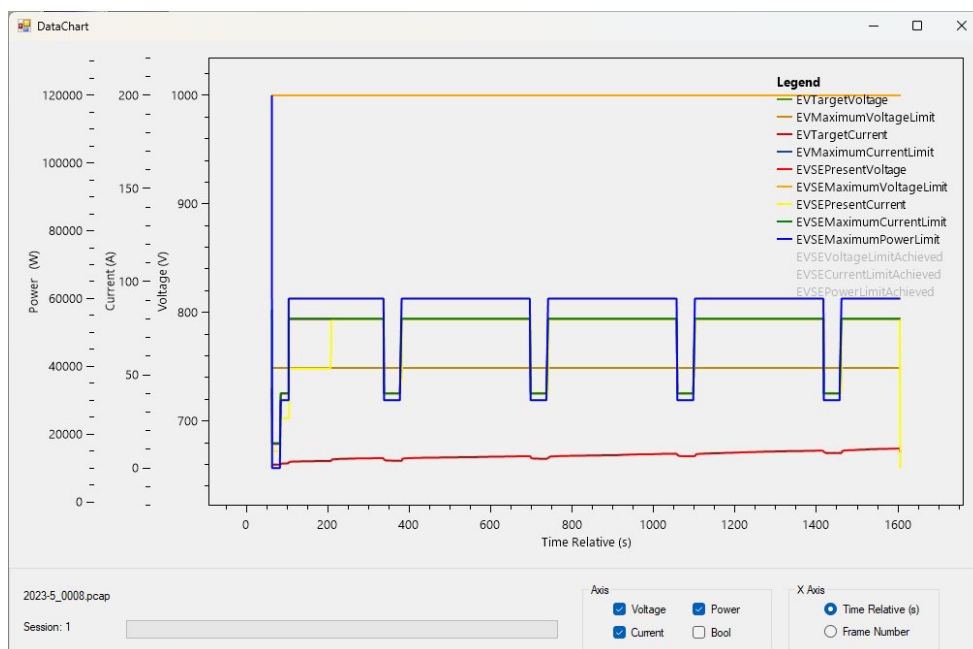


Figure 4. Easily plot the changes in voltage, current and power during the charging session

Key Features

- Validate that Control Pilot state transitions are within specification or are causing interoperability challenges.
- Customize Timing & Physical Value limits defined in the CCS spec
- Up to 45 timing statistics for EV and EVSE benchmarking, including:
 - average request/response time, vehicle plug-in to various key moments, session setup without authentication
- Support for large capture files to be analyzed with no upper limit.
- Display State of Charge (SoC) during current demand to graphs
- Multiple data point measurements can be displayed simultaneously on graphs with sticky labels.
- Analysis of ISO 15118-3 (SLAC), DIN 70121, ISO 15118-2, and ISO 15118-20.
- Support for the 2017 schema of ISO 15118-2 Edition 2.
- Decrypt traffic with a keylog file or on the fly from UDP frames in the PCAP file and report on TLS exchange failures
- The ability to jump into Wireshark traces at the exact frame where discovered anomalies occur
- Batch PCAP file processing of multiple PCAP files with multiple charge sessions in each
- Extraction of embedded Control Pilot state transitions in PCAP file if present
- JSON and PDF anomaly reports generated for each for each charging session analyzed
- Delivered as a Windows GUI application to view protocol traffic, run traffic analysis, and review results.
- **Coming soon:** Command Line Interface; MCS support; improved root cause identification and reporting.

Engineers can utilize the robust Windows-based report viewer to drill into anomalies found with CCS Analyzer, jump to the relevant Wireshark trace, graph key variables, and output the results to a PDF report, and do this for each analyzed PCAP to communicate discovered problems to colleagues

Addressing a CCS Analysis Tools Gap

The QualityLogic CCS Analyzer fills a gap in the current CCS Test Tools landscape. While

there are excellent engineering test systems to validate conformance and simulate EVs or EVSEs, and there are excellent man-in-the-middle and sniffers designed to capture message traffic between a real EV and EVSE, none of them focus exclusively on analyzing the message traffic for anomalies, charging failures, timings, and more.

The CCS Analyzer complements the existing test tools and human process by being able to take the output of those systems (as PCAP files) and apply our unique analysis automation engine to them. The CCS Analyzer is an important addition to the eco-system test tool set for achieving our interoperability goals.

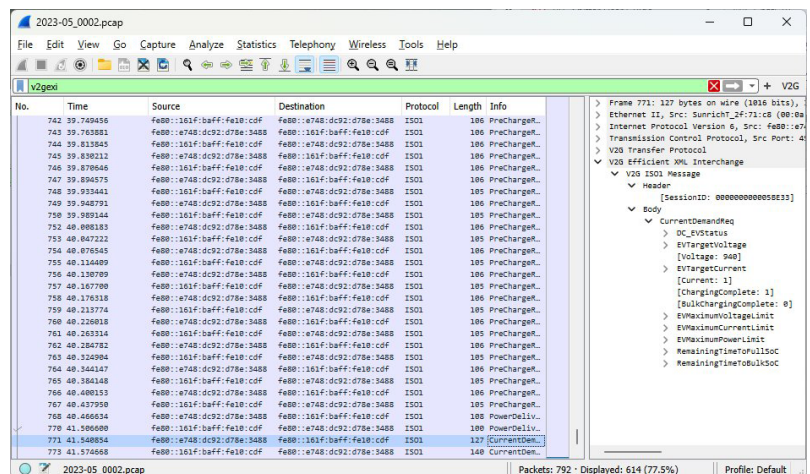


Figure 5. Jump to the exact Wireshark frame where the anomaly occurs

Interested in learning more? Contact us today for details about pricing and availability.