



**Critical Systems Labs**  
Innovating Safely



# Innovating Safely

✓ Hazard and Risk Analysis

✓ Safety V&V

✓ Safety Requirements Definition

✓ Assurance Cases

At Critical Systems Labs, we turn uncertainty into confidence. Specializing in safety-critical systems for aerospace, defense, automotive, rail and energy applications, we help innovators bring groundbreaking technologies to market with certainty in their safety and reliability. Our proven expertise in risk analysis, certification, and regulatory compliance empowers clients to navigate complex challenges, making us the trusted partner that solves your toughest problems so you can focus on what's next.

## HAZARD AND RISK ANALYSIS

- ✓ Identify hazards, their causes, and assess risk for complex systems
- ✓ Address inherent uncertainty and limitations
- ✓ Use advanced methods such as STPA, SOTIF Analysis, FMEA, HAZOP, FTA
- ✓ Resolve interdependencies with cybersecurity threats



# SAFETY REQUIREMENTS DEFINITION

- ✓ Refine and elaborate a safety concept into verifiable safety requirements
- ✓ Specify safety requirements for AI/ML based functionality
- ✓ Integrate formal (mathematical) methods into requirements
- ✓ Perform independent review and gap analysis



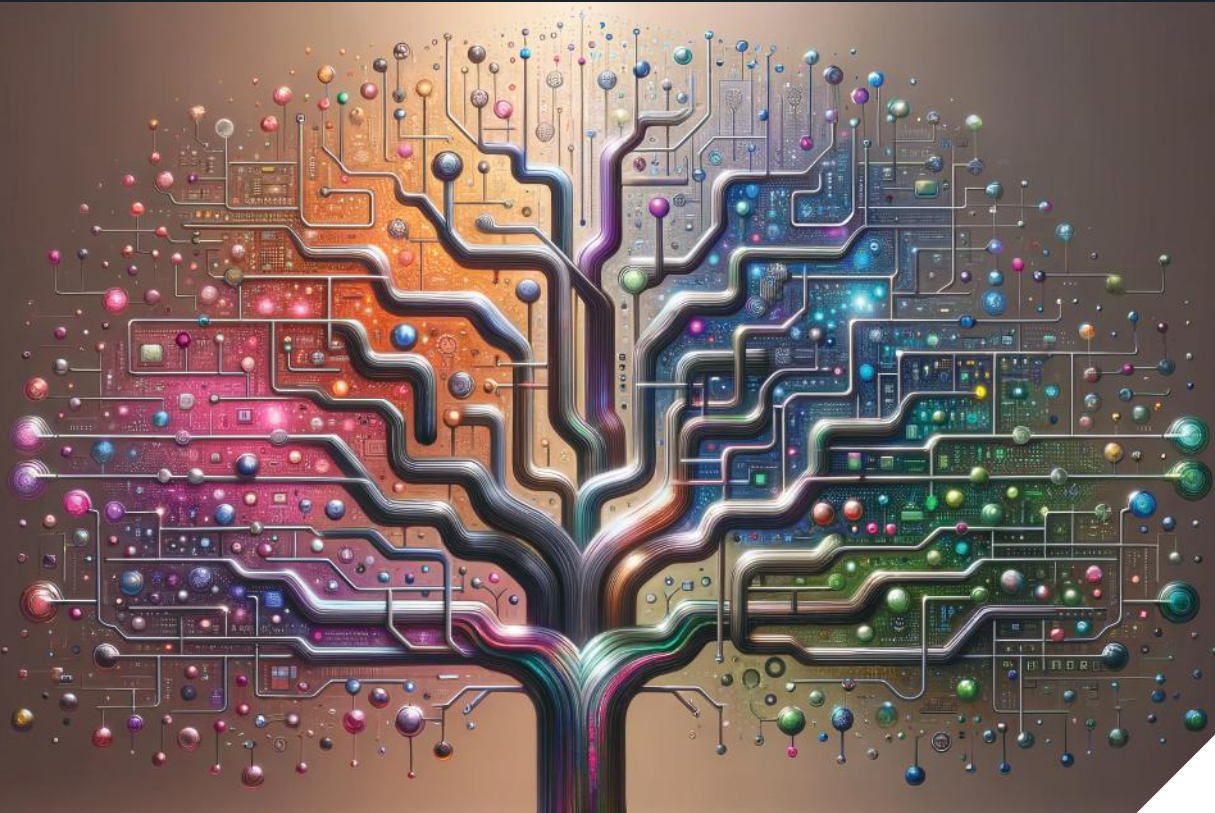
## SAFETY V&V

- ✓ Align safety verification strategy with assessed risk
- ✓ Derive scenarios that challenge effectiveness of safety mitigations
- ✓ Apply advanced verification methods, e.g., formal (mathematical) verification, combinatorial testing and metamorphic testing
- ✓ Evaluate functional coverage and traceability



# LIVE ASSURANCE CASE

- ✓ Develop a compelling and robust assurance case linking claims to evidence
- ✓ Use GSN or other graphical notations to build a structured argument
- ✓ Enable traceability by embedding assurance artifacts directly within the assurance case.
- ✓ Instrument assurance cases with dynamically updated indicators



# ASSURANCE OF AI/ML SYSTEMS


- ✓ Define functional and performance requirements for AI/ML systems
- ✓ Identify test plans that include test oracles for ensuring alignment with functional requirements
- ✓ Identify data quality assessment plans
- ✓ Develop a trust strategy that includes identification of system limitations

# A BETTER WAY TO **BUILD** ASSURANCE CASES



Assurance cases are complex engineering artifacts. Creating an assurance case is a 'team sport' requiring contributions from experts across an engineering organization.

In many instances, assurance cases are managed with legacy methods like email and spreadsheets. These methods fail to scale as systems grow more complex, making assurance cases harder to evolve and maintain.



**Designed by engineers for engineers, Socrates helps tackle the challenge of assuring modern and complex systems.** The tool allows your team to create a live assurance case that evolves alongside your system.

## WHAT IS AN ASSURANCE CASE?

An assurance case is a “structured argument, supported by a body of evidence, that provides a compelling, comprehensible and valid case that a system is safe for a given application in a given environment” (UL 4600). Assurance cases are typically expressed using graphical notation and are required for compliance with internationally recognized standards like ISO 26262, CENELEC EN 50126, UL 4600, UK Def Stan 00-56 and those published by the IAEA.



# SOCRATES AT THE **FOREFRONT**

Socrates is the premier collaboration platform for structuring complex arguments and decisions. Originally built for safety and cybersecurity assurance, it empowers distributed teams to seamlessly navigate intricate challenges, fostering clear, data-driven decision-making. With unmatched capabilities and intuitive design, Socrates is revolutionizing collaborative decision-making across high-stakes industries, driving innovation and reliability where it matters most.

A photograph showing several hands reaching up to assemble large puzzle pieces. The background is a bright, hazy sunset or sunrise, with the sun's glow illuminating the scene. The puzzle pieces are dark and silhouetted against the bright light.

## CYBER **SECURITY**

Modern infrastructure and defense systems are vulnerable to cybersecurity attacks. Use Socrates to prepare cybersecurity assurance cases and manage these risks. Socrates helps demonstrate that a system meets its security objectives and complies with cybersecurity regulations and standards by linking specific security policies and controls to your organization's to-level security objectives.



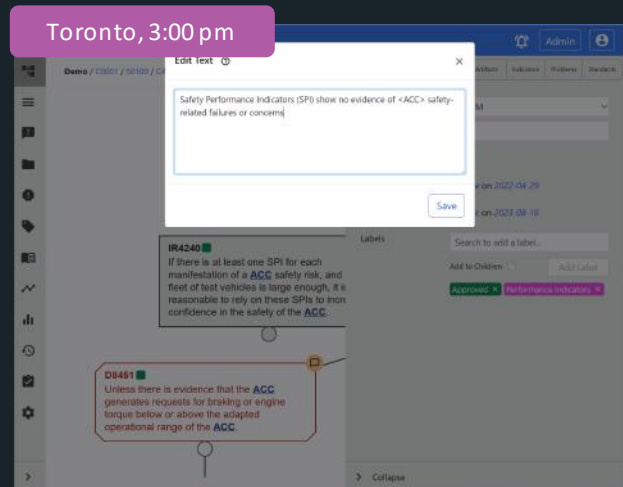
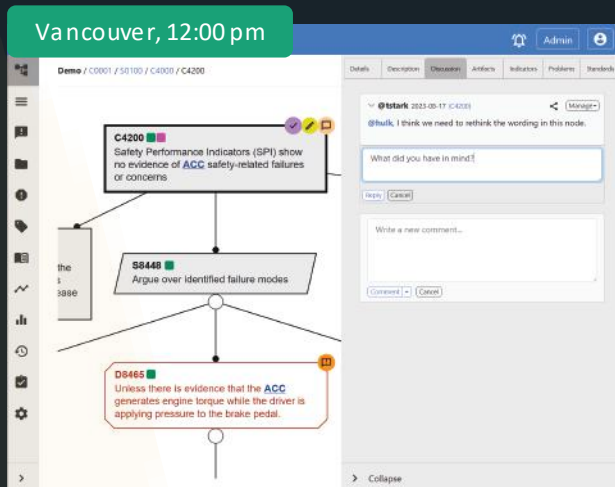
# KEY FEATURES

- **Notation Support** - Prepare arguments using EA, GSN, FAN or CAE notations.
- **Comments & Issues** – Leave comments and track issues to facilitate reviews and team discussions.
- **Indicators** – Track performance indicators in Socrates and view them in the context of the argument.
- **Standards** – Import and assess compliance of your arguments against industry standards.
- **Versioning** – Take ‘snapshots’ of an argument and track changes over time with version management.
- **Labelling** – Organize your work by creating customizable labels.
- **Report Generation** – Export content from the argument in Microsoft Word, Microsoft Excel, and JSON formats.
- **Metrics** – Get a bird’s eye view of the argument from the metrics dashboard.
- **Collaboration Without Borders** - Work as a team on a live argument from anywhere in the world.
- **Evidence Management** - Link and manage artifacts to add supporting evidence to the assurance case.
- **Patterns** – Create a library of re-usable patterns and templates.
- **Glossary** – Keep terminology consistent throughout the argument with the Socrates’ dynamic glossary.
- **Argument Filtering** – Filter your argument to show specific criteria.
- **Away Nodes** – Link multiple independent arguments together using away nodes.
- **Flexible Integration** – Use the REST API to integrate Socrates into your organization’s workflow.
- **Confidence Assessment** – Evaluate confidence in your argument and evidence using analytical methods.



# SOCRATES MAKES COLLABORATION SIMPLE

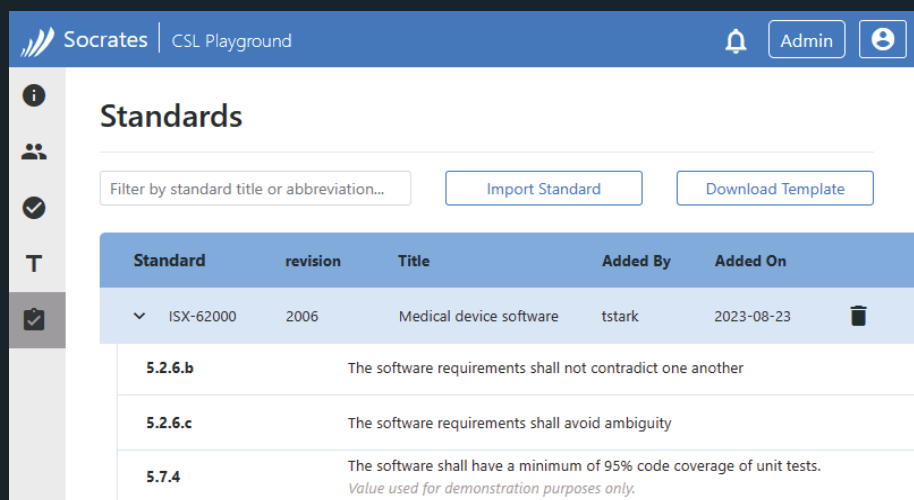
Systems assurance is a team sport requiring input from many contributors, each offering their own expertise. Socrates simplifies collaboration for your dispersed, multidisciplinary team and keeps your group unified and organized with a “live” assurance case.



# ASSESS COMPLIANCE WITH STANDARDS

Many systems must comply with a complex web of technical standards or regulatory codes. The Socrates standards mapping feature helps your team track and assess compliance right inside the assurance case.

You can link sections, clauses, or requirements from a standard to nodes in the argument and then review the coverage to find gaps in compliance.



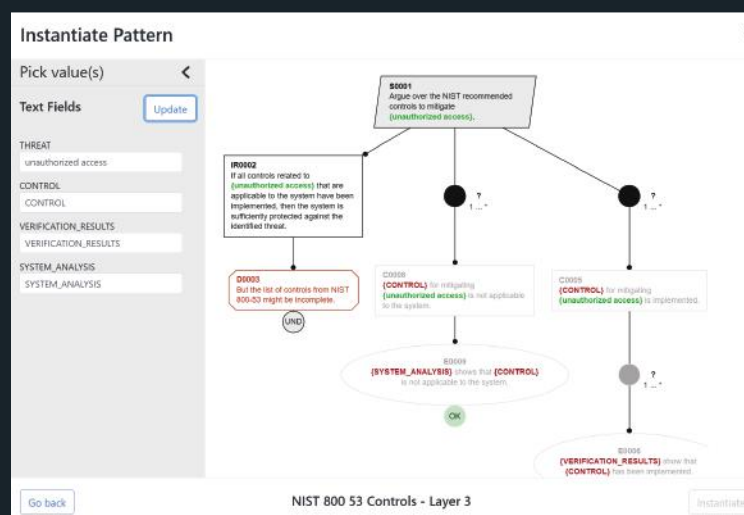
# TRACK PERFORMANCE INDICATORS

Socrates allows your team to embed performance indicators right in the argument, so you can assess them with all the right context.

The screenshot shows the Socrates application interface. On the left, a diagram represents an argument. A box labeled 'C3112' contains the text: 'In compliance with Paragraph 9.4.4 of ISO 26262-6, structural coverage using MC/DC was evaluated, and all gaps in coverage were analyzed and resolved.' Below this box is a circle labeled 'E3115 Coverage report.' with three smaller circles around it: a red one with '89', an orange one with '85', and a white one with '+1'. A green circle labeled 'OK' is at the bottom. On the right, a sidebar shows a list of performance indicators: 'Line Coverage' (89), 'Module Coverage' (99), and 'MC/DC Coverage' (85). Below the list is a search bar labeled 'Search indicators by name...' and a 'Link' button.

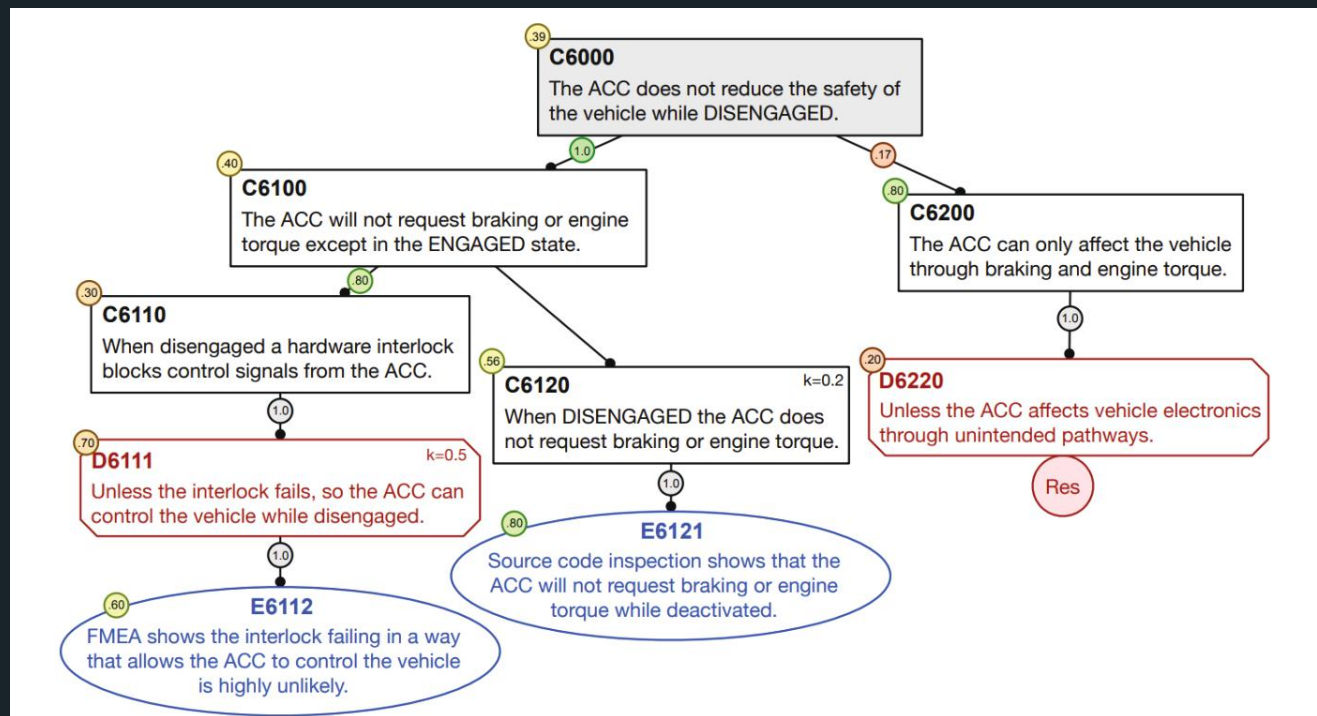
# PROMOTE RE-USE WITH ARGUMENT PATTERNS

Reduce repetitive work in Socrates by defining a library of patterns (aka 'templates'). Create patterns using the GSN pattern notation and then incorporate them into an argument using the pattern instantiation wizard.



# CONFIDENCE ASSESSMENT

Evaluate confidence in the argument and its supporting evidence to produce an overall confidence score. Socrates supports state-of-the-art confidence assessment methods, such as Bayesian Belief Networks and Dempster-Shafer Theory based approaches. Visualize confidence directly on the argument to see where to improve the argument.



# ARGUMENT FILTERING

Filter an argument to show information that matches specific criteria. Filtering helps manage product line assurance cases or can be used to tailor presentation of the argument to stakeholders interested in specific topics.

### Manage Argument Filters

Filter Library

**Yours (1)** Others (0)

Reviewed Claims ☐

Dotted Omission ☒

Clear Applied Filters

Apply Selected Filters

Add Filter

Name

Undeclared Claims

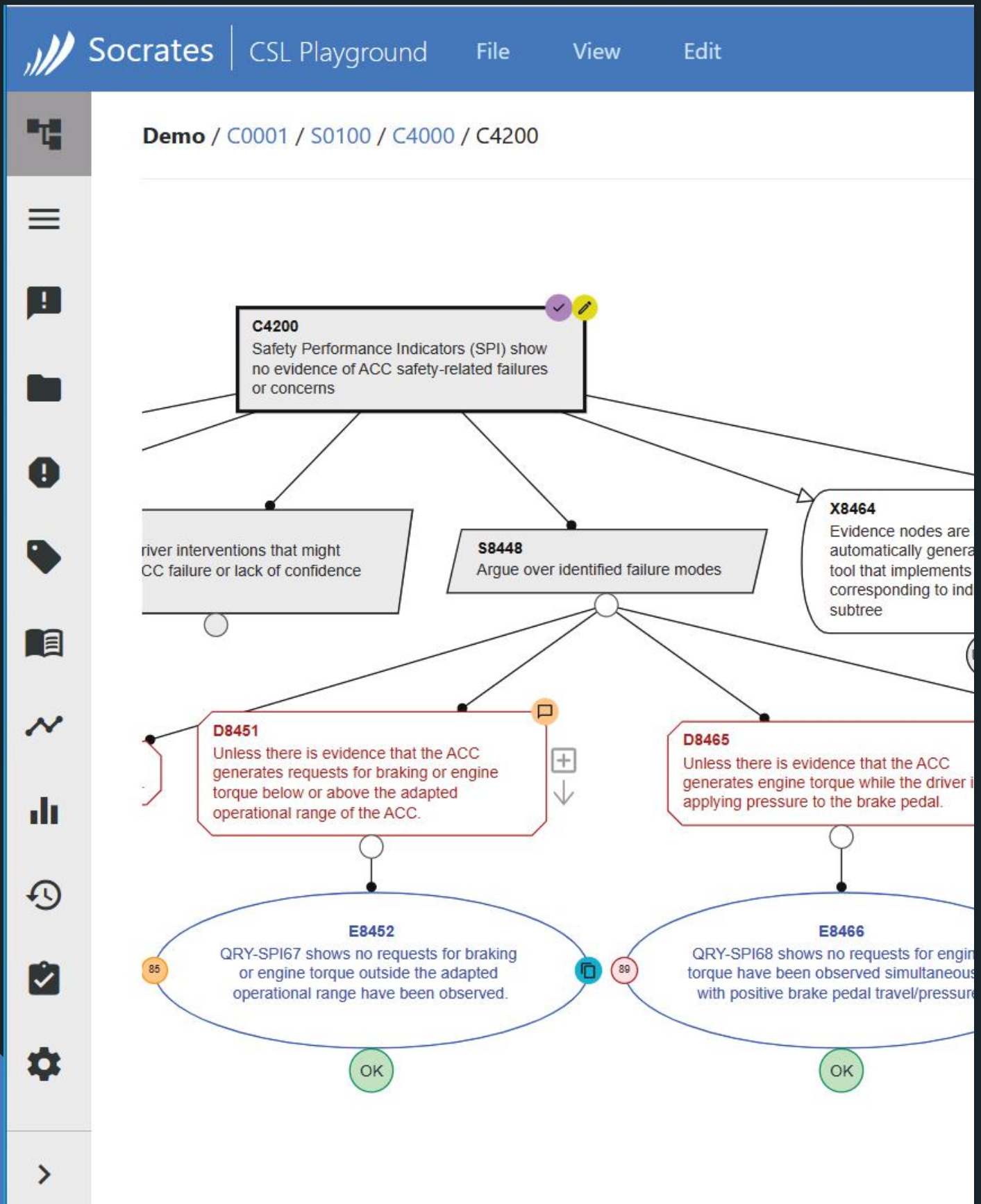
Description

Show all claims that are not declared.

(66/259) nodes included by this filter

Apply Without Saving Save and Apply

# Socrates is not just a drawing tool





Admin

Details

Description

Discussion

Artifacts

Indicators

Problems

Standards

Type

CLAIM

Node Id

4200

Tree Root

☒

Creation

@jjoyce on 2022-04-29

Modification

@tstark on 2023-08-16

Labels

Search to add a label...

Add to Children

☐

Add Label

No labels

> Collapse

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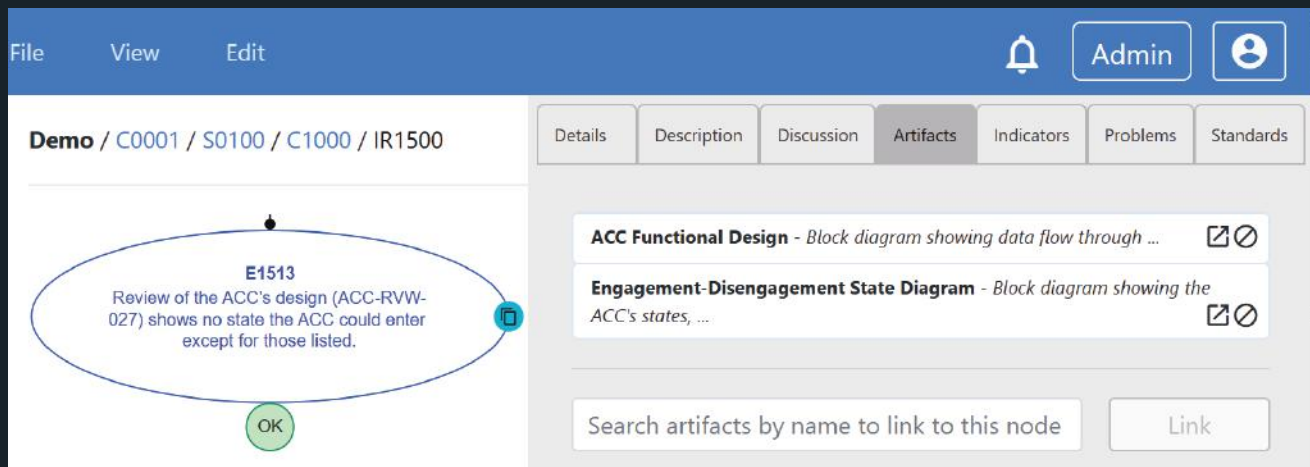
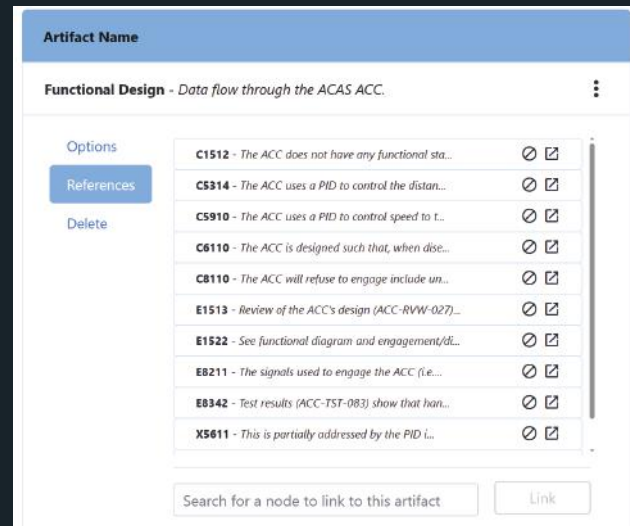
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Experience Socrates Assurance Case Editor

# LINK AND MANAGE EVIDENCE

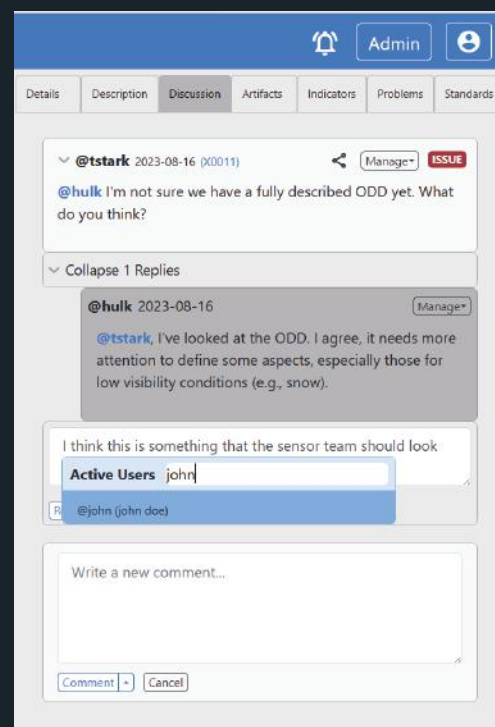
Create artifacts to represent the evidence that supports your argument. Quickly make bidirectional links between artifacts and nodes to connect the evidence to the argument. Visualize the evidence in the context of the argument and open it in your web browser.



# DISCUSS WITH YOUR TEAM

Participate in team discussions by creating new comments or replying to an existing one. Notifications and comment mentions keep the discussion flowing.

You can designate important comments as “issues” and track them with the built-in issue tracker.



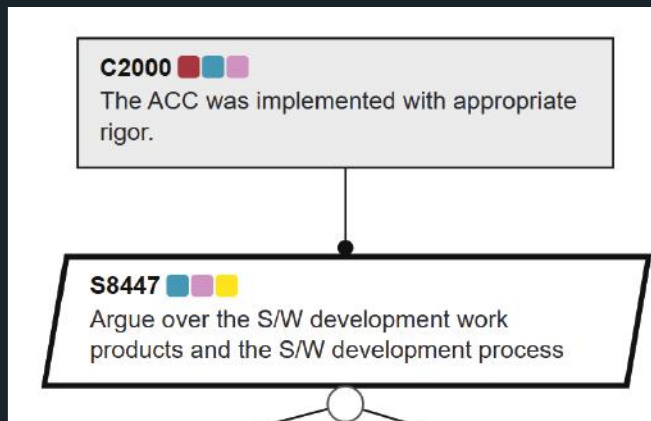
# FIX ERRORS AS YOU GO

Assurance is challenging, and we all make mistakes, especially when it comes to the finer points of GSN or EA notation. To help avoid these errors, the Socrates static argument analyzer checks every change to your argument and displays errors and warnings so you can fix them right away.

The screenshot shows the Socrates CSL Playground interface. The top navigation bar includes the Socrates logo, 'CSL Playground', and menu items 'File', 'View', and 'Edit'. On the right, there are 'Admin' and user profile buttons. The main content area displays a node labeled 'C5032' with the text 'The driver notification will not spuriously notify the driver of disengagement.' A red circle with an exclamation mark indicates an error. To the right, a panel titled 'ERROR Rule 1 Claim must be supported' provides the rule description: 'Claim must be supported - Claims must be supported by one or more Claim, Evidence, Defeater, or Strategy nodes. If no support is available, then the Claim must be marked as undeveloped.'

# ORGANIZE YOUR ARGUMENT

Use customizable labels to keep your argument and your team organized. Use labels to organize reviews and approvals, indicate problem areas, or differentiate between separate categories of information in the argument. Link labels to nodes and visualize them overlaid on top of the argument.



The screenshot shows the Socrates CSL Playground interface with the 'labels' section selected. The top navigation bar is the same as the previous screenshot. The main content area displays a table of labels. The table has columns for 'Label Name', 'Description', 'Creator', 'Created', and '# Nodes'. The first row shows a label named 'Approved' with a description 'This node has been reviewed and approved by the team lead ...', created by 'tstark' on '2023-08-16', and associated with 286 nodes. Below the table, there are sections for 'Details', 'Nodes', and 'Delete'. The 'Nodes' section lists several nodes with their descriptions and icons for editing or deleting.

Label Name	Description	Creator	Created	# Nodes
Approved	This node has been reviewed and approved by the team lead ...	tstark	2023-08-16	286

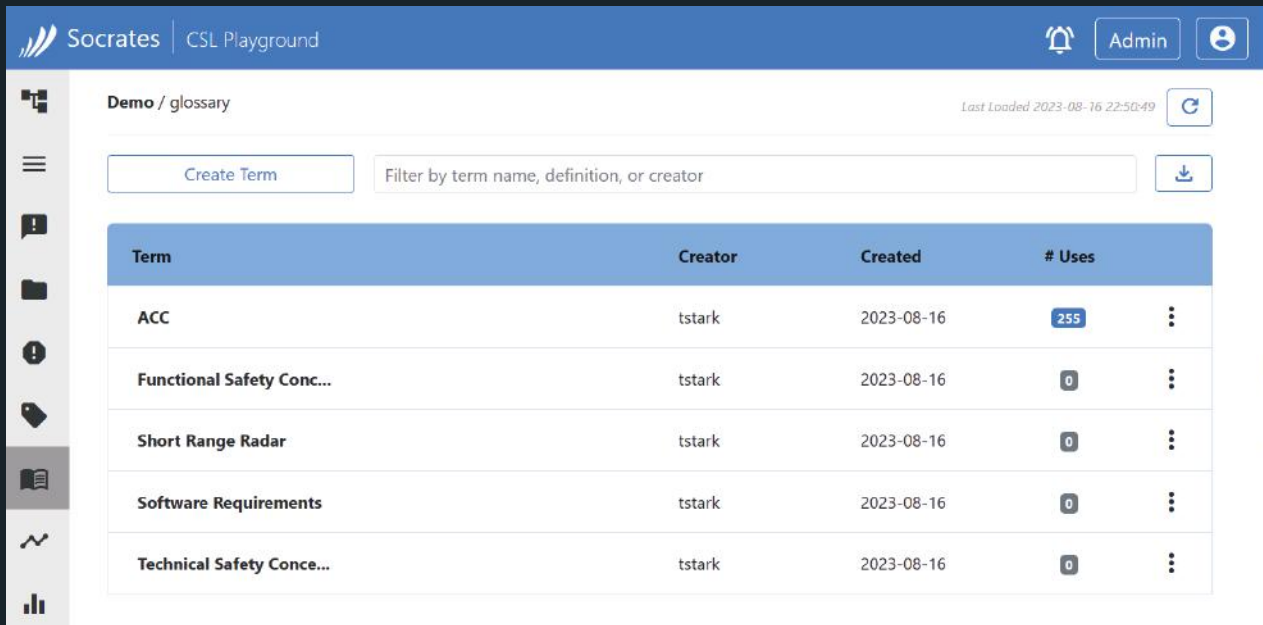
Details

Nodes

Delete

- C0071 - These missing data are expected to be ra...
- C1000 - The design of the ACC does not reduce th...
- C1011 - Per SR-1000: The initial state of the AC...
- C1512 - The ACC does not have any functional sta...

# MANAGE TERMINOLOGY



Term	Creator	Created	# Uses
ACC	tstark	2023-08-16	255
Functional Safety Conc...	tstark	2023-08-16	0
Short Range Radar	tstark	2023-08-16	0
Software Requirements	tstark	2023-08-16	0
Technical Safety Conce...	tstark	2023-08-16	0

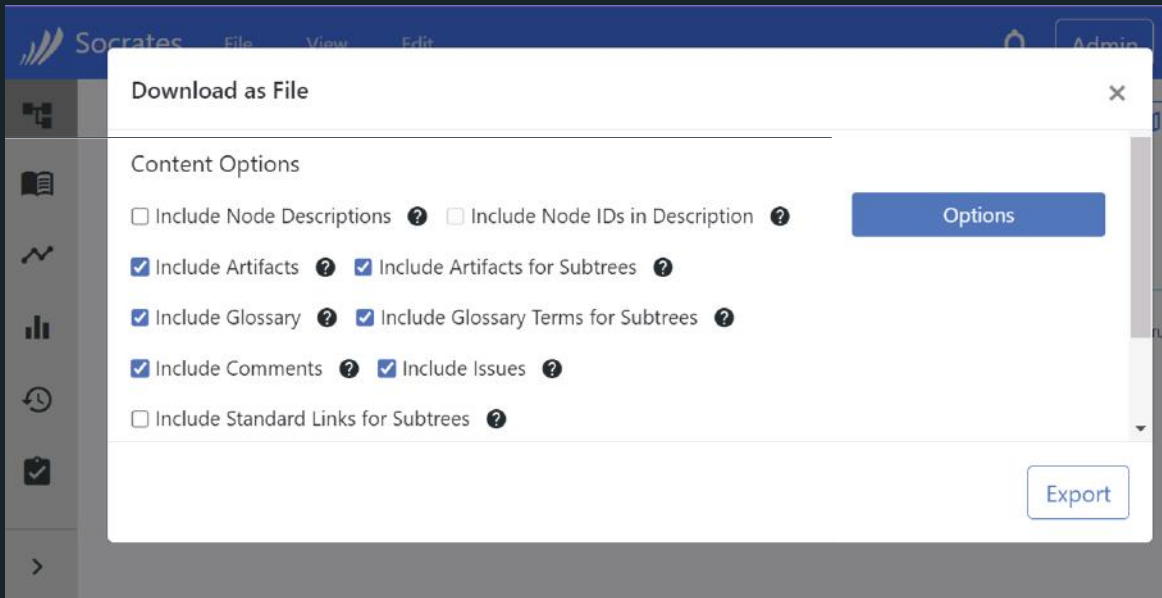
Use the Socrates glossary to manage the project specific terms and acronyms that accompany modern systems. This feature enables you to standardize terminology across your team. You can define terms in the glossary and then embed them in the text of the argument. Terms are highlighted in the argument; click to reveal their definition.

## FLEXIBLE HOSTING

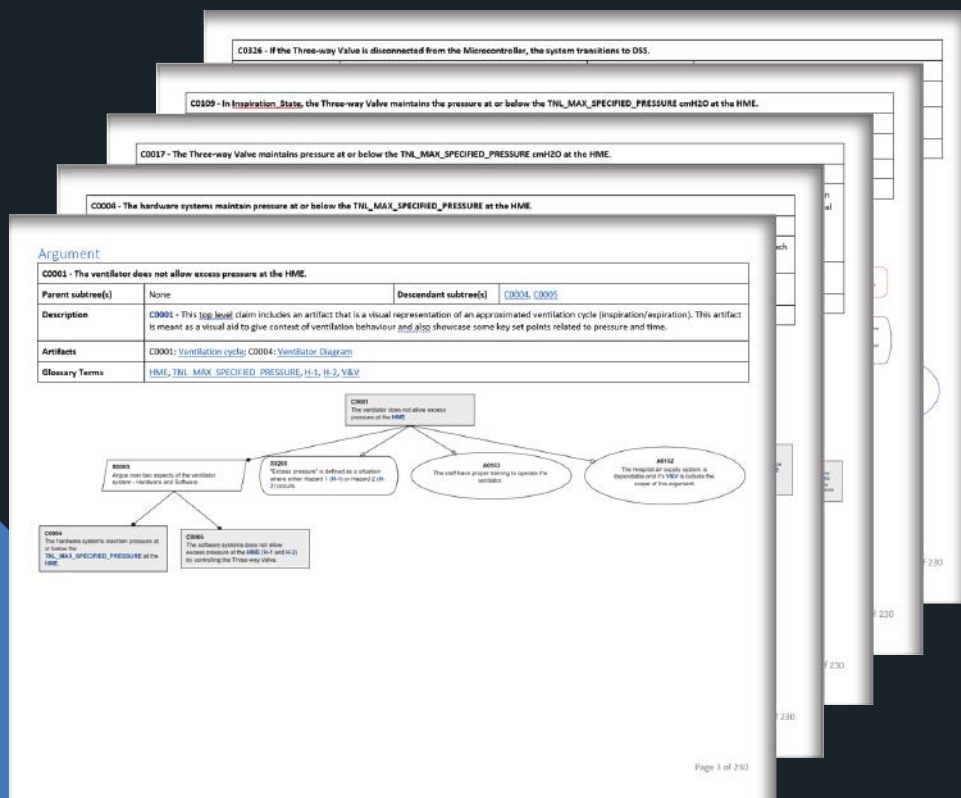
Socrates can be deployed in a range of IT ecosystems to meet the needs of your organization. A common strategy is to deploy Socrates on your organization's existing infrastructure so that you remain in control of your data at all times. Other hosting options are available. Please contact us for details.



# REPORT GENERATION



Generate a range of reports with graphics, text, and related data from the assurance case. Export a complete report in a Microsoft Word compatible format (.docx), including rendered images of the argument, linked artifacts, glossary terms, and your team's comments. Export other data in Microsoft Excel compatible format (.csv) using the high-customizable data export function.



# CSL & CERN

CSL is the proud recipient of the ISSS Scientific Achievement Award for their development of the Assurance Case for Machine Protection System of the CERN Large Hadron Collider.



## ABOUT CRITICAL SYSTEMS LABS

Socrates is a commercial software tool developed by Critical Systems Labs Inc. (CSL), a firm based in Vancouver, Canada. CSL has earned an international reputation from high profile clients in Europe, North America and Asia for solving challenges in managing safety risk for complex systems. Our innovative assurance tool, Socrates, is used under license by customers in aerospace, advanced automotive, critical infrastructure, defence, energy and other high assurance industries.

At CSL, we use Socrates every day to add value to client projects. We also maintain an active software development team that is continually improving Socrates and responding to our clients' needs. Our experience and CSL has earned an international reputation from high profile clients in Europe, North America and Asia for active use of Socrates in preparing and maintaining assurance cases informs development, making Socrates an industry-leading solution for assurance case management.



Critical Systems Labs

[www.criticalsystemslabs.com](http://www.criticalsystemslabs.com)



**A Better Way to Build Assurance Cases**

**CONTACT US**



**SCAN ME**

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