# undo

# FINDING CUSTOMER-CRITICAL BUGS WITH UNDO

cādence®

> ## "We immediately saw value in Undo after our trial use, so we rolled it out to developers in both the US and India."
>
> *Jonathan DeKock, Senior Architect, Cadence*

## CUSTOMER PROFILE

Cadence Design Systems, Inc (NASDAQ: CDNS) enables global electronic design innovation and plays an essential role in the creation of today's integrated circuits and electronics.

Customers use Cadence's software, hardware, IP, and services to design and verify advanced semiconductors, consumer electronics, networking and telecommunications equipment, and computer systems.

# THE CHALLENGE OF DELIVERING AT VELOCITY IN COMPLEX SOFTWARE ENVIRONMENTS

At the heart of Cadence's success is a commitment to quality that ensures its customers can meet their development goals, creating their **increasingly complex** electronic products in **ever-decreasing timeframes**.

Cadence's Advanced Verification Solutions (AVS) business unit, part of the System & Verification Group, works with customers to verify their designs before they are committed to silicon using the Incisive® functional verification platform. It comprises **hundreds of developers**, situated in the US and India.

Operating with complex code, large memory-intensive applications, and challenging customer timeframes, the AVS team is continually looking for ways to **improve productivity** and **speed up customer time-to-market**.

> *"We operate in a very complicated environment. Essentially, at the heart of our platform is a compiler that has been developed over 20 years by hundreds of engineers. Customer code in any one of five specific languages feeds into this for testing and verification. As the next step is to produce physical chips, debugging is vital, and we are continually looking for tools that deliver greater insight into code, improve productivity and help us track down any bugs quickly and efficiently."*
>
> *— Andy Eliopoulos / Vice President, AVS, System & Verification Group*

# CAPTURING INTERMITTENT FAILURES "IN THE ACT" WITH THE UNDO SUITE

The Cadence AVS team evaluated the Undo Suite as a viable solution to enhance their productivity and have complete visibility into their software's behavior. Undo enabled developers to **record a failing process** down to the instruction level - capturing the failure "in the act." Developers could then **replay a 100% reproducible recording of their code**, forward and backward, to accelerate time to resolution of critical bugs, increase their productivity and deliver at velocity.

> *"When tracking down bugs, we need to gain insight into the code that we are debugging – traditional tools helped, but we needed a deeper level of understanding to solve extremely difficult problems that potentially affect our customers."*
>
> *— Jonathan DeKock / Senior Architect, Cadence*
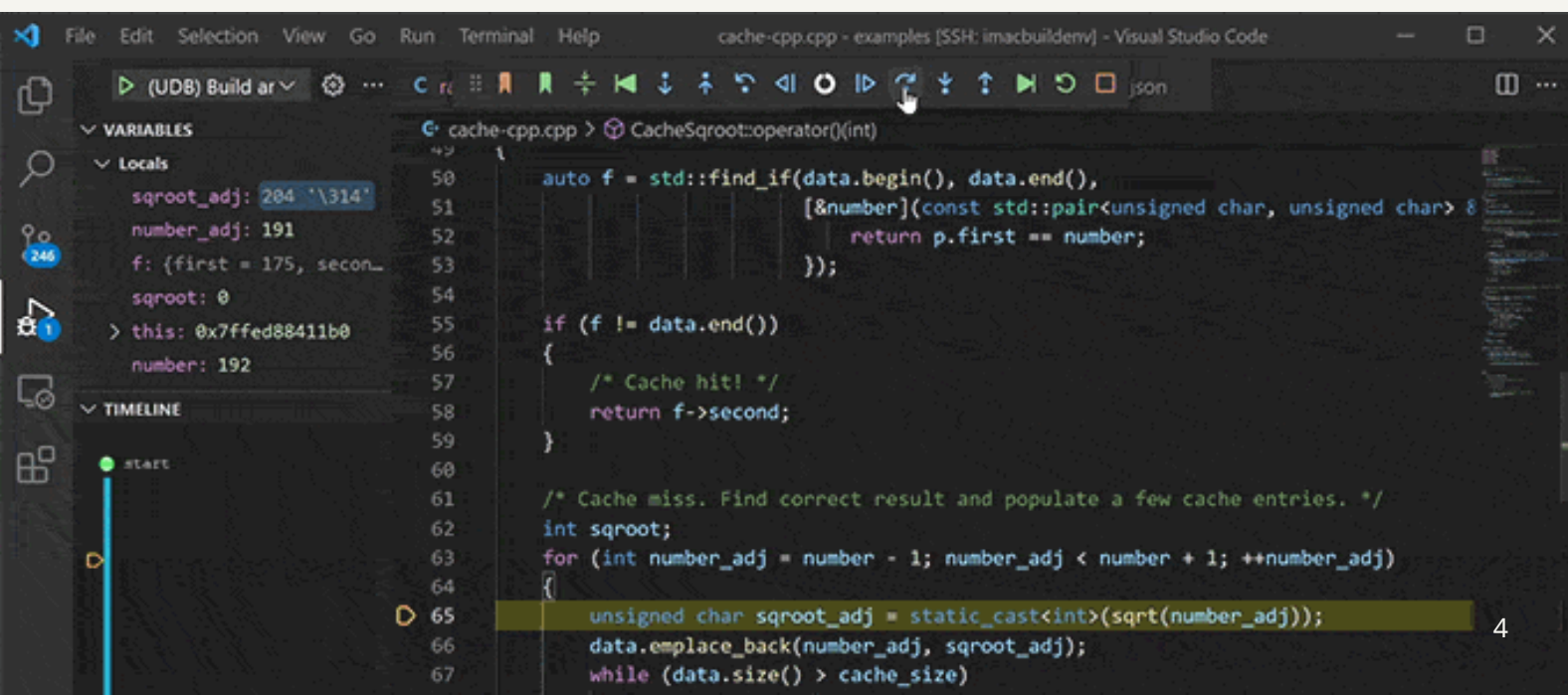
Cadence was able to integrate Undo's time travel debugger into its existing working practices. Undo is **fully compatible** with the open source debugger GDB, which was already in use within the team, drastically reducing learning time. As DeKock explains, "**Any user on GDB can use Undo** as they don't have to change how they work, just learn a few new commands."

Cadence also needed the ability to debug code on customer sites. Given the **highly confidential, mission-critical** nature of customer designs, they can only be run on the customer's servers and cannot be transferred off-site. The Undo Suite is capable of recording all or part of a program's execution, down to instruction level, for subsequent **analysis directly on customer servers**.
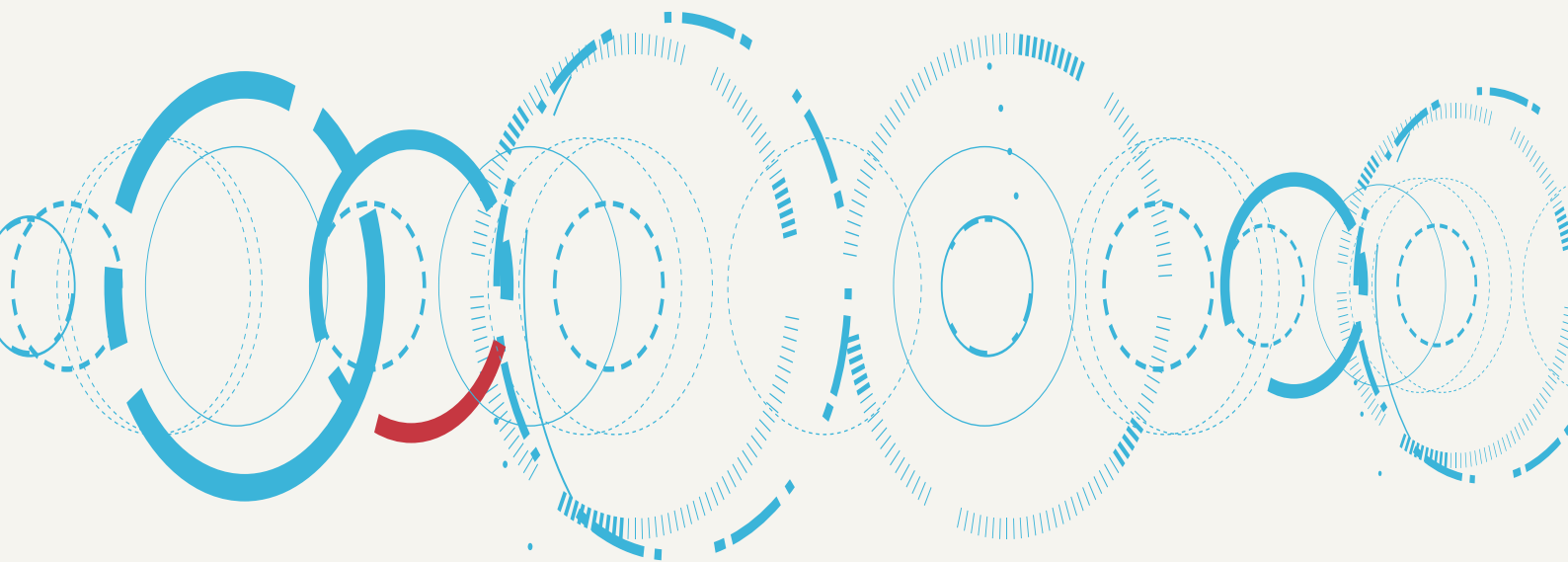
# ELIMINATING THE GUESSWORK IN DEFECT DIAGNOSIS

On one customer site, Cadence was faced with an intermittent, yet potentially serious, bug in its compiler which was being used to develop a design for a new chip. Given that this compiler is used by multiple customers, and the client had tight deadlines, it was business critical that the bug was tracked down.

> *"Our engineer had spent months struggling to try and track down the problem. It only struck in 1 in 300 runs, making finding it like looking for a needle in a haystack. We'd been using GDB, but that didn't let us see what had caused the problem, as when the code failed we were so far past the point of failure that we couldn't find the source of the bug."*
>
> *— Jonathan DeKock / Senior Architect, Cadence*

Cadence turned to Undo and set up a 20-machine server farm on the customer site, running multiple instances under recording 24x7 until the bug next struck.

> *"As soon as the code failed, we got experts on the line; they were able to use the recording generated on-site to step backwards and forwards line-by-line using Undo's playback capability.* **We found the bug in three hours, and it then took just two hours to solve, which was a huge win after three months of searching using other methods**. *Given its nature we simply couldn't have found it through source code analysers, as it was generated within dynamic code."*
>
> *— Jonathan DeKock / Senior Architect, Cadence*

| Time searching for the bug **before** trying Undo | 3 months |
| Time searching for the bug **with Undo** | 3 hours |
| Time resolving the bug | 2 hours |

Solving this customer problem proved the value of Undo's solutions to Cadence and has led to an expansion of its use within other Cadence groups. In-house engineers at any of AVS's four sites can now use it, through a group-wide licence.

> *"The problem with traditional debugging is that you can see the failure but not why it happens. With Undo we're able to debug the impossible problems and see what caused them. It is now one of our most important tools for these customer-critical situations – using it for these problems has delivered real value and we can also see the productivity gains it provides for day-to-day debugging."*
>
> *— Andy Eliopoulos / Vice President, AVS, System & Verification Group*

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