WHITE PAPER

Purpose-Built Tools for Connected Design

Workflow Efficiency and Design Data Management

KEYSIGHT

Executive Summary

Modern semiconductor design is a data-intensive, globally distributed process. Projects often exceed a terabyte of design files spanning hundreds of thousands of components. Yet many design teams continue to rely on disconnected workflows and generic version control tools that are not built for the scale, complexity, or collaborative nature of chip design.

Disconnected systems hinder workflow efficiency, slow innovation, and create barriers to collaboration. As the semiconductor industry faces engineering talent shortages, escalating design costs, and growing AI adoption, the need for connected, purpose-built design data management has never been greater.

Keysight SOS delivers a unified, high-performance platform for semiconductor design data management. It provides domain-aware version control, global synchronization, and optimized data workflows to ensure engineering teams work faster, smarter, and more collaboratively—wherever they are in the world.

Disconnected Workflows and Inefficient Data Management

The pace of semiconductor innovation continues to accelerate, but many organizations still rely on fragmented systems and manual workflows that can't keep up. Before exploring how connected design transforms efficiency, it's important to understand the root causes of disconnected workflows and the obstacles they create across global design environments.

Growing Complexity of Semiconductor Design

Semiconductor technologies such as chiplets, advanced packaging, new power delivery architectures, and gate-all-around transistors have vastly increased design complexity. Each stage of system-on-chip (SoC) development—architecture, functional design, synthesis, physical layout, and verification—generates immense volumes of data across a mix of text, binary, and proprietary file formats.

As these designs evolve, the number of files multiplies rapidly. A single project can span terabytes of data, requiring efficient storage, retrieval, and version control across teams and geographies.

The Limitations of Traditional Version Control

Most semiconductor companies still rely on general-purpose Version Control Systems (VCS) like Git or Subversion (SVN). While these tools work well for software development, they fall short for chip design due to:

- **Inefficient handling of large and binary files:** VCS tools are optimized for text-based code, not large binary files like GDSII, OASIS, or NCF that dominate IC workflows.
- **Excessive local storage requirements:** Every team member must download entire repositories, consuming huge amounts of workstation disk space and network bandwidth.

- **Lack of file dependency awareness:** Traditional VCS treat each file independently, ignoring complex interdependencies that govern design correctness and simulation validity.
- **Limited collaboration features:** VCS lack native mechanisms for real-time, multi-site design coordination, dependency alerts, or contextual communication among engineers.
- **Security and traceability concerns:** Semiconductor IP is highly sensitive. Generic tools do not provide sufficient encryption, access control, or audit trails for regulated industries like automotive or defense.

The inefficiencies caused by disconnected workflows don't just affect individual engineers — they ripple across entire organizations, slowing collaboration and innovation. To overcome these barriers, leading semiconductor companies are adopting global collaboration models that unify teams, processes, and data across geographies.

The Business Impact: Productivity, Cost, and Collaboration

While the idea of global centers of excellence offers enormous potential, executing this vision is complex. In practice, engineering teams face a host of technical and organizational challenges that limit productivity and slow delivery. The following section explores these real-world obstacles to effective multi-site chip design collaboration.

Pressure to innovate faster

Chip design teams must deliver increasingly complex products under compressed timelines. However, inefficient data management and siloed workflows create costly delays in design iteration, verification, and tape-out.

The cost of fragmentation

When global teams operate on disconnected systems, the lack of synchronization leads to duplication, data divergence, and rework. Missed updates can result in teams designing from outdated IP, causing subtle errors that surface only in late-stage verification.

Talent and resource constraints

With a projected shortage of more than 23,000 chip designers by 2030, engineering efficiency has become a strategic imperative. Companies must empower smaller teams to do more — faster — by eliminating redundant manual tasks and improving data accessibility across sites.

AI-readiness challenges

AI-driven design optimization depends on unified, high-quality data. Fragmented storage and inconsistent metadata prevent teams from effectively training or deploying AI models across their design ecosystems.

To navigate these challenges, semiconductor leaders need a connected design platform built with their unique workflows in mind.

The Solution: A Connected Design Data Platform

Keysight SOS — Purpose-Built for Semiconductor Design

Keysight SOS is a global design data management platform built specifically for semiconductor workflows. It combines domain-aware version control, optimized storage, and secure synchronization to create a single source of truth for design teams worldwide.

Optimized data storage and retrieval

SOS introduces cache servers between user workstations and central repositories. Files are fetched on demand—only when accessed by users or tools—minimizing redundant downloads and drastically reducing network load.

Instead of duplicating large design files, SOS uses lightweight symbolic links to reference remote data transparently. This design reduces storage consumption across workstations by orders of magnitude while maintaining seamless tool compatibility.

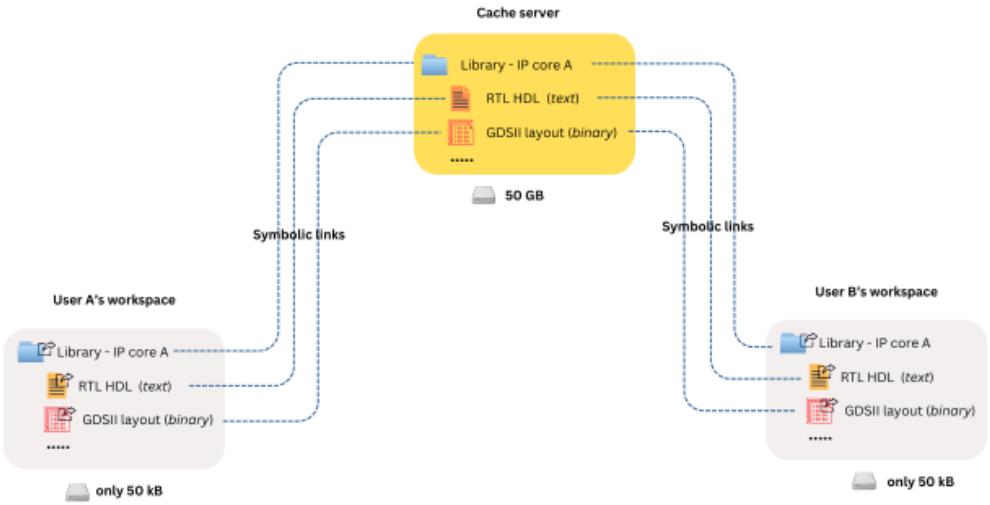

Figure 1. Symbolic links to files in SOS cache servers

Intelligent synchronization across sites

SOS automatically synchronizes cache servers across all global design centers, ensuring every engineer sees the latest version of every file. This eliminates version conflicts and maintains workflow consistency across time zones.

Built-in security and data governance

All SOS data transfers are encrypted end to end, with granular access controls that define who can view, edit, or approve design data. This ensures robust IP protection for sensitive semiconductor projects in industries such as automotive, aerospace, and telecommunications.

Workflow Efficiency and Collaboration

Seamless integration with EDA tools

SOS integrates directly with leading electronic design automation (EDA) environments, including:

- PathWave Advanced Design System
- Cadence Virtuoso Studio
- Synopsys Custom Compiler
- Siemens EDA Pyxis

This deep integration embeds version control directly within familiar design interfaces, minimizing context switching and ensuring data integrity across design and verification stages.

Domain-aware version control

Unlike general-purpose VCS, SOS understands semiconductor data structures. It efficiently tracks changes in large binary files and supports concurrent editing of schematic and layout data. Engineers can visually compare changes using Visual Design Diff (VDD) to quickly identify differences and generate impact analyses.

Global collaboration and continuous integration

SOS enables true multi-site collaboration by maintaining synchronized versions of projects and libraries across all design centers. It also supports automated workflows for design verification, approvals, and reporting — critical for Continuous Integration (CI) in chip development.

By reducing manual data transfers and enabling immediate visibility across global teams, SOS accelerates iteration cycles, improves design consistency, and boosts engineering productivity.

At the core of Keysight SOS is a centralized design data management framework that ensures every stakeholder has access to accurate, up-to-date information. This section outlines how a single source of truth empowers teams to work more efficiently and maintain design integrity throughout the product lifecycle.

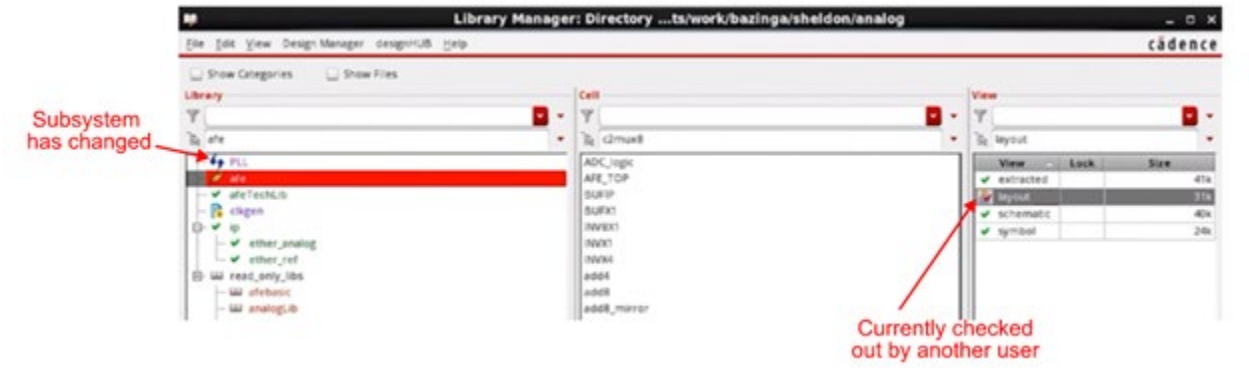

Figure 2. SOS version control integrated with an EDA tool

Benefits of a Connected Design Platform

Challenge	How SOS Solves It
Excessive storage and bandwidth use	Symbolic links and cache servers drastically reduce duplication and data transfer
Version conflicts between global sites	Auto-synchronization ensures all sites access consistent versions
Security and compliance risks	Built-in encryption, access control, and traceability
Slow collaboration and iteration	Seamless EDA tool integration and global data visibility
Inefficient binary file handling	Domain-aware versioning and graphical design differencing
AI readiness barriers	Unified, high-quality design data for analytics and machine learning

The advantages of a connected, purpose-built design platform like Keysight SOS extend far beyond individual engineering gains. As these capabilities come together — from centralized data management and integrated version control to streamlined multi-site collaboration — they form a unified digital backbone for semiconductor innovation. This holistic approach not only accelerates design cycles and improves accuracy but also empowers organizations to adapt quickly, collaborate globally, and harness their collective intelligence.

Conclusion: Enabling the future of connected design

As semiconductor complexity accelerates and global teams become the norm, traditional workflows and disconnected tools can no longer support the pace of innovation required to stay competitive. The challenges of data fragmentation, limited visibility, and inefficient collaboration aren't just operational problems — they are strategic barriers that slow time to market, stifle creativity, and dilute institutional knowledge.

Keysight SOS provides a transformative alternative: a purpose-built, connected design platform that unifies design data, accelerates workflows, and fosters global collaboration. By integrating with leading EDA tools, supporting high-performance data synchronization, and offering granular access control, SOS allows teams to operate as one cohesive design organization — no matter where in the world they are located.

Organizations that adopt connected design practices gain measurable advantages. They not only improve productivity and shorten design cycles but also build the foundation for AI-driven automation, intelligent data reuse, and continuous innovation. By breaking down silos and consolidating knowledge within a secure, centralized system, engineering teams can focus on what matters most: creating next-generation semiconductor technologies that drive progress across every industry — from automotive to AI to 6G communications.

In short, connected design is no longer optional — it's the cornerstone of a resilient, efficient, and innovative semiconductor enterprise.
Keysight SOS stands at the heart of that transformation, empowering design organizations to move faster, collaborate smarter, and build the future with confidence.

About Keysight SOS

Keysight SOS is a purpose-built semiconductor design data management platform that delivers hierarchical awareness, secure scalability, and native integration with major EDA tools. It provides the structured, contextualized, and verified data foundation required for AI-enhanced design and enterprise-wide reuse.

Get in touch with Keysight's experts to request a demonstration or trial of Keysight SOS