

PERFORCE

VERSIONING BEST PRACTICES FOR

EMBEDDED SYSTEMS DEVELOPMENT

ADTRAN

U-BLOX

TRANSURBAN

MATHWORKS

MAXIM INTEGRATED

METHODICS IPLM

We've Entered an Embedded Age

Embedded systems are everywhere, from digital watches and voice assistants to traffic lights and autonomous vehicles. And new applications are continuously emerging. In fact, according to Zion Market Research, the global embedded systems market is expected to generate \$225 billion in revenue by the end of 2021.

The increasing importance of embedded systems in our everyday lives is creating immense competition among embedded systems development companies. To stay competitive, the most successful companies are shortening design and development cycles – even while product complexity grows exponentially.

How?

Because they all understand that version control is the foundation for automated, streamlined product delivery. This eBook delves into proven version control strategies that help semiconductor, electronics, and other embedded development teams manage their IP and ship products faster. For example, learn how ADTRAN is achieving Continuous Integration (CI). Discover how u-blox is mastering component-based development.

In this version control best practices guide, you'll find useful insights from some of the most innovative embedded systems development companies.



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Gaining a Global Edge



THE CHALLENGE: MANY PRODUCTS, DISPERSED TEAMS

ADTRAN is a global provider of networking and communications equipment. Teams there develop products that enable voice, data, video, and Internet communications across a variety of network infrastructures used by service providers, private enterprises, government organizations, and millions of users worldwide.

At ADTRAN, development teams can be working on as many as ten major products at a time – each with individual modules, specific chipsets, CPUs, memory, and software. To compound the complexity, teams are located around the world. So, they needed a powerful version control solution that supports hundreds of contributors, terabytes of data, and distributed work environments.

THE SOLUTION: FEDERATED ARCHITECTURE

ADTRAN leverages Helix Core's federated architecture to version all of their files with speed and ease. Also referred to as "commit-edge," federated architecture significantly reduces workflow latency across the development pipeline. ADTRAN developers can work on assets that are stored locally (on an edge server) and then deliver those assets back to a single source of truth via the commit server. This powerful technology ensures that their global teams can pull, sync, and commit changes at LAN speed.

Beyond streamlining global development, federated architecture is localizing ADTRAN's CI workflows. At one office in Germany, ADTRAN hosts the commit

server and an extra edge server specifically for Jenkins builds. At a second office location in Germany, there are two additional edge servers – one for developers and one for Jenkins builds. To unite their India and U.S. counterparts, ADTRAN has two edge servers at each location.

Stefan Callsen, IT Manager at ADTRAN, finds the repository management features in Helix Core helpful in their CI and component-based development processes. After the Jenkins build, the artifacts and binaries are automatically stored in Helix Core with a unique identifier. This allows the developers to quickly link the artifact back to the originating source code for complete traceability and quality assurance.

"Thanks to the commit and edge servers, our teams are able to collaborate and share files quickly and efficiently."

Stefan Callsen, IT Manager, ADTRAN.

Scaling the Matterhorn



THE CHALLENGE: EXECUTING AN AMBITIOUS STRATEGY

U-blox is a global leader in wireless and positioning modules and chips for the automotive, industrial, and other IoT consumer markets. u-blox solutions help people, vehicles, and machines locate their exact position and communicate wirelessly over cellular and short-range networks.

The company's long-term engineering strategy was mapped out in a project called Matterhorn, named after one of the highest peaks in the Swiss Alps. The climb for u-blox was to create modules based on internally developed low-power wide-area modems. With R&D engineers scattered across seven countries, the u-blox team first embarked on their journey by standardizing processes, development methodologies, and tools.

THE SOLUTION: A NEW DEVELOPMENT PROCESS

As a foundation to the Matterhorn project, u-blox adopted a new development process: component-based development (CBD). Helix Core was integral to making this new development process a reality.

During the transition to CBD, u-blox allowed their developers to ease into the new tools, said Stephan Uyttebroeck, Principal Software Engineer, u-blox. "One team wanted to carry on using their existing version control engine, but when they saw that teams using Helix Core were working much faster, they made the move to Helix Core because of the stability and performance. Plus, it has the ability to coexist with Git."

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Stephan Uyttebroeck, Principal Software Engineer, u-blox.

CBD is important for u-blox because it allows distributed developers to divide and conquer, said Uyttebroeck. Since they can store all their digital assets in Helix Core – regardless of file type or size – developers can quickly access components and assemble variants. More than facilitating reuse, Helix Core lets developers share resources across u-blox's development locations.

Finally, Helix Core's many integration capabilities, such as support for Jira and Jenkins, and SDKs for popular scripting languages, allow u-blox to integrate their version control with internally developed tools that facilitate the specialized operations necessary to create and test the very custom, OEM specific devices produced by the company.

Fueling the Agile and DevOps Engine



THE CHALLENGE: SLOW DEPLOYMENTS

Transurban manages and develops urban toll road networks in Australia and the United States. They partner with governments to provide infrastructure solutions. And they're bringing IoT to traffic by supporting the development of smart roads.

Transurban's development environment is characterized by large deployments that involve complex files, multiple environments, technologies, components, and contributors. Before streamlining their deployment process using Helix Core, a medium-sized deployment for Transurban's toll system took up to eight hours. Large releases were very cumbersome. "All our builds were incremental and we had an ever-growing list of deployables that needed packages," said Matthew de Vanny, Technical Environment Specialist, Transurban.

THE SOLUTION: FASTER VERSION CONTROL

With Helix Core, Transurban can release larger deployments faster. Medium-sized deployments that once took eight hours, now only take two. Transurban witnessed these benefits first-hand in 2017 when they brought the systems from their Queensland office on board. "We completed that in a weekend," said de Vanny. "With our previous methodologies, that wouldn't have been deployable in the given development window."

Transurban used Helix Core's flexible branching and workflow options to fully customize and improve their software

configuration management process from end to end. Key to this workflow was Transurban's use of the jobs feature, which let them quickly trigger labels on demand. Unique to Helix Core, labels can be applied to both code and artifacts stored in the version control system. This is well-suited to a complex back office tolling system that includes a variety of technologies, like Transurban's smart-road sensor systems.

Consistent labels, names, and descriptions for code and dependencies in artifacts ensure that when it's time for deployments, everything is strictly managed. Because of that consistency, Transurban now deploys faster and more reliably.

"The performance is so fast that we take it for granted. Merges and integrations run like greased lightning. Even when we're doing 4,000-6,000 objects in an integration, it runs in moments. It's fantastic."

Matthew de Vanny, Technical Environment Specialist, Transurban.

Solving the Innovation Equation



THE CHALLENGE: DELIVERING ON INNOVATION WITHOUT STALLING

MathWorks is the leading developer of mathematical computing software for engineers and scientists. Their flagship products include MATLAB and Simulink, which support modeling, algorithm development, data analysis, numerical computing, and simulation.

Embedded software development is a complex endeavor, in large part due to the evolution of IoT and artificial intelligence, said Dr. Marco Dragic, Senior Product Manager, MathWorks. "As we incorporate more intelligence and state-of-the-art algorithms into embedded systems, software is becoming more complex, the code is growing in size, and diverse teams participating in the development are getting larger," explains Dr. Dragic. "In a race to deliver great products faster, the underlining challenge is how to ensure effectiveness of design methods and efficiency of the development processes due to these trends."

MathWorks is helping embedded software and hardware engineers combat these challenges with MATLAB and Simulink. The technical computing and Model-Based Design tools are promoting concurrent development and efficiency throughout the development process by integrating seamlessly with Helix Core. The simple plugin provides developers access to Helix Core capabilities for asset versioning, collaborative development, change tracking, and process automation directly from MATLAB and Simulink.

THE SOLUTION: CONTINUOUS INTEGRATION + SOURCE CODE MANAGEMENT

MathWorks is more than a strategic integration partner – it's a Helix Core

customer, too. MathWorks developers use Helix Core to manage the company's primary products.

Helix Core supports numerous strategies that are helping MathWorks maintain code base integrity. To effectively manage their source code, MathWorks engineers utilize a CI process of pre-commit check-ins that promote endless validation. They leverage Helix Core's proprietary Streams feature and sparse branching techniques to isolate developers' work while simultaneously eliminating needless revisions and rework.

Besides helping MathWorks obtain a single source of truth, Helix Core provides the company with scale and flexibility – two essential version control features for embedded design.

"Version control solutions should be looked at from the perspective of the connected development lifecycle, scalable workflows, and their interoperability. This means the tool's capacity to scale with growing data, processing, teams and design sizes."

Dr. Marco Dragic, Senior Product Manager, MathWorks.

Coordinating Global Collaboration



THE CHALLENGE: PROMOTING IP REUSE ACROSS SCATTERED TEAMS

Since 1983, Maxim Integrated has been at the forefront of developing analog and mixed-signal semiconductor products and technologies. To support their innovations in sensor platforms and IC solutions, Maxim Integrated has a global design network spread across three offices in North America and more than a dozen in Asia and Europe. In order to manage their growing volume of design data and IP, Maxim knew they needed to adopt an IP-centric design methodology that incorporates comprehensive version control.

“Version control is absolutely critical in semiconductor design for embedded systems,” said Michael Munsey, VP of Marketing, Corporate Strategy, and Business Development. “Teams need to know exactly what they’re building, testing, and sending to fabrication. In addition, the underlying version control solution must support distributed teams and allow them to work as if they are local.”

THE SOLUTION: VERSION AND TRACK EVERYTHING

To unite their global design teams and manage their worldwide portfolio of design data, Maxim Integrated is leveraging two Perforce solutions: Methodics IPLM and Helix Core. Methodics IPLM integrates seamlessly with Helix Core so developers can manage complex file relationships and large binary files. “Designers have to be able to keep track of the versions of every file that goes into the design of a chip,” explained Munsey. “With Methodics IPLM, Helix Core, and Perforce’s edge and proxy servers, they’ve been able to coordinate the designs on a worldwide basis and easily find all of the data needed for reuse.”

Helix Core doesn’t just foster IP reuse – it also promotes comprehensive traceability through many advanced features, including notifications, file-level permissions, and conflict management. Through the Helix Core and Methodics IPLM integration, embedded developers can create direct links from the requirements to the IP that they’re designing. “While Methodics IPLM tracks the version of the IP, it ultimately goes all the way down to the version level of the files stored in Helix Core,” said Munsey.

HELIX CORE + METHODICS IPLM

Learn more about how Helix Core and Methodics IPLM work together.

HOW IT WORKS

perforce.com/integrations/methodics-iplm-and-helix-core

“Rigorous version control is essential to keeping track of all the versions involved and implementing IP lifecycle management.”

Michael Munsey, VP of Marketing, Corporate Strategy, and Business Development

Conclusion

The market for embedded systems is on the rise. Companies that want their bottom line to follow the same growth trajectory need a version control solution that can scale and accommodate massive amounts of data. We hope this eBook provided some useful tips and best practices for how a version control system can solve the inherent challenges of modern embedded systems development.

As highlighted by Dr. Marco Dragic from MathWorks: "Version control solutions should be looked at from the perspective of the connected development lifecycle, scalable

workflows, and their interoperability. This means the tool's capacity to scale with growing data, processing, teams and design sizes."

ABOUT HELIX CORE

For the embedded systems companies featured in this eBook, Helix Core is the versioning platform of choice. Helix Core facilitates Agile and component-based development while allowing distributed teams to easily access and manage a single source of truth. The platform's scale and performance features allow teams to store and manage endless amounts of data, quickly reuse their IP, and achieve shorter design cycles.

And it provides endless flexibility and integration capabilities to provide development teams with a unified and cohesive design environment.

FREE VERSION CONTROL AND CODE COLLABORATION

Get Helix Core free for up to 5 users and 20 workspaces and discover how it streamlines embedded systems development.

[TRY HELIX CORE](#)

perforce.com/products/helix-core/free-version-control