

# Empowering Early Access: Leveraging Quartus® Development Software for Cloud-Based Development

## Authors Abstract

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The latest innovation from Intel is the addition of the Intel® Quartus® Development Software to the Intel Developer Cloud, providing cloud access to Intel’s leading-edge FPGA software. This revolutionary step allows FPGA developers and partners access to Intel’s latest technologies for evaluation and solution development. It also underscores Intel’s dedication to a customer-first user experience by providing convenient access to leading-edge performance.

This white paper discusses the benefits of a cloud-hosted environment and the compelling reasons users should embrace the Intel Developer Cloud. This cutting-edge cloud platform provides FPGA designers the Intel Quartus Development Software for evaluating the latest Intel technologies while developing their next-generation FPGA designs. With the promise of early access to new features and reports on the latest supported hardware, the Intel Developer Cloud is the optimal choice for FPGA designers seeking to reduce time to market and unleash their innovation.

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## Leap Over Innovation Lag

In a landscape driven by rapid technological advancement, FPGA designers face the dual challenge of staying ahead of the curve while managing complex design environments. Cloud-based development plays a pivotal role in solving these issues by providing them with early access to the latest software and devices necessary for innovating and delivering high-quality applications in an increasingly competitive and dynamic environment.



## Challenges of the Software Release Cycle

Designing a complex FPGA can be challenging, especially when the optimal features or devices are only available in the next release of the design software. This delay results in an innovation lag where FPGA developers cannot apply their ideas and innovations because they must wait for the next release before taking advantage of the latest technology in their existing design or delay decision-making on what technologies to use for the future. All this delay reduces time-to-market.

Innovation lag can hinder the design's performance, efficiency, and overall capabilities as designers may need to manually implement solutions that would have been simplified or automated in the updated software, leading to wasted time and increased risk of errors. In the rapidly evolving tech landscape, time to market is crucial. Delaying designs due to software releases can lead to missed opportunities and revenue loss. Competitors with access to the latest features may launch their products sooner, gaining a significant edge.

To resolve the problems of innovation lag and time to market, it is essential to consider solutions that provide early access to software features and hardware devices.

New features can be provided online months before the remainder of the software is ready for release. FPGA developers can continue to develop the bulk of their applications on-premise with the latest released software. Early access to cutting-edge online features and analysis reports from leading-edge devices enables FPGA developers to explore novel concepts and push the boundaries of their designs. Without timely access, designers might be forced to compromise on their innovative ideas.

Cloud-based environments enable early access to technologies and offer avenues, such as early-access partnerships, to overcome the challenges of waiting for the next software release. These strategies empower designers to stay on the cutting edge of technology, enhance design quality, and maintain a competitive edge in the market.

## Cloud-Based Advantages

A cloud-based environment provides flexibility, global accessibility, enhanced security, and reduced development costs for FPGA development by liberating software from physical hardware constraints, allowing global access, investing in security, reducing upfront expenses, and providing scalability for leading-edge applications and algorithms that may benefit from access to multiple CPUs or greater memory available in a cloud data center.

### Benefits of Cloud-Hosted Software

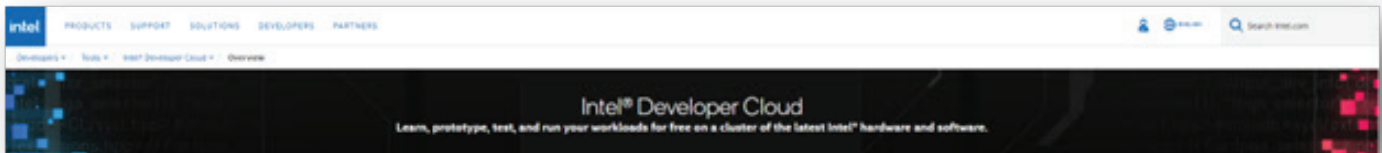
1. **Flexibility:** Cloud hosting liberates software from the constraints of physical hardware, providing the flexibility to match varying implementation demands.
2. **Global Accessibility:** Geography is no longer a barrier to accessing Intel's leading-edge software. Cloud deployment allows users to access their applications from anywhere with an internet connection, breaking down boundaries and enabling collaboration on a global scale.
3. **Reduced Development Costs:** Traditional FPGA development entails hefty investments in design and development and the cost of acquiring on-site hardware to confirm performance. Cloud-based evaluations reduce these upfront expenses, allowing you to use the latest software and hardware to quickly confirm that your development goals are achievable with real silicon and allow your team to focus on innovation and growth, even as they save money.
4. **Flexibility and Scalability:** Cloud environments allow you to provision and configure virtual machines with the required software quickly. Additionally, cloud resources can be easily scaled up or down based on project requirements, ensuring you have the right computing power when needed. You are reducing the burden on local on-premise IT departments until the solution has been proven online.

The Intel Developer Cloud presents a game-changing solution by merging the power of the Intel Quartus Development Software with the agility of cloud technology. By allowing users to harness the software's capabilities and access new features early, the Intel Developer Cloud opens the door to unparalleled innovation.



## Intel Developer Cloud

The Intel Developer Cloud is a cloud computing platform provided by Intel Corporation. It offers developers, researchers, and businesses a scalable and flexible environment to evaluate, develop, test, and optimize software and applications across various Intel hardware and software technologies.



The Intel Developer Cloud facilitates experimentation, innovation, and collaboration without requiring users to invest in dedicated hardware or infrastructure.

Key features and aspects of the Intel Developer Cloud include:

- **Software Technologies:** The Intel Developer Cloud supports various software development tools, libraries, frameworks, and platforms. This includes tools for artificial intelligence, machine learning, data analytics, cloud computing, and the Intel Quartus Development Software for FPGA development.
- **Flexibility and Customization:** The platform provides users with pre-configured environments already set up with the latest software, intellectual property (IP), software libraries, supporting EDA software, and licenses.
- **Enhanced Security:** [Intel's longstanding commitment to security](#) has never been stronger. We continually invest in our people, processes, and products, integrating security in the ways we work and everything we work on to ensure [your Intel Developer Cloud data is secure](#). Any data uploaded to [the user area is solely your property](#).

The Intel Developer Cloud's primary benefit and focus is that it provides immediate access to emerging technologies. Developers can gain early access to Intel's emerging technologies, become immediately productive in a familiar working environment, test their software against future hardware releases, download the results to their standard on-premise office development environment, and provide feedback to Intel's development teams.

## Develop with the Latest Software Features

In today's fast-paced technological landscape, where innovation is the driving force behind success, having the right tools at your disposal can make all the difference.

The Intel Developer Cloud is a one-stop solution for FPGA developers seeking to utilize the latest advancements in FPGA software development and IP libraries. In addition to the Intel Quartus Development Software, complete IP libraries and FPGA development environments are fully provisioned with everything needed to complete your FPGA design flow.

## Intel Quartus Development Software: Early Access to Algorithmic Advances

The Intel Quartus Development Software is Intel's FPGA development software and is an indispensable solution for anyone wishing to design FPGAs. This comprehensive toolset streamlines the design process from inception to implementation, ensuring that your FPGA design becomes reality most effectively.

- **Efficiency:** The Intel Quartus Development Software optimizes the design process from design capture through timing analysis, verification, and routing by providing a rich set of advanced features and libraries. This accelerates development, reduces design iterations, and ultimately shortens the time to market.
- **Advanced Algorithms:** The software incorporates advanced algorithms that enhance design efficiency and performance, resulting in more robust and capable FPGA designs.

The relentless improvements, new capabilities, and features added with each Intel Quartus Development Software release can improve your design productivity and performance. Access to features before a software release can positively impact your FPGA development features.

Utilizing the Intel Quartus Development Software in the Intel Developer Cloud environment empowers FPGA developers using the latest software features to create, develop, and verify their designs with unmatched precision and efficiency.



## Explore Possibilities with Fully Licensed IP Libraries

A significant advantage of the Intel Quartus Development Software lies in its extensive library of IP cores. These pre-designed functional blocks provide a solid foundation for your projects, saving time and effort while ensuring reliability. The IP libraries cover a broad spectrum of functionalities, including memory controllers, interfaces, processors, and more, as seen in Table 1 below.

IP Library	Description
Basic functions	Provide basic functionality, such as arithmetic operations, logic gates, and memory.
DSP functions	Provide digital signal processing functionality, such as filters, oscillators, and modulators.
Interface protocols	Support standard interface protocols, such as Ethernet, USB, and PCIe*.
Low-power functions	Help to reduce the power consumption of an FPGA design.
Memory interfaces and controllers	Support different types of memory, such as DDR3, DDR4, and QSPI.
Processors and peripherals	Support different types of processors, such as Arm Cortex*-M and RISC-V.
Hardened IP cores	Are pre-verified and optimized for specific FPGA devices (paid licenses).
Security IP cores	Support security features, such as encryption and authentication (paid licenses).
Wireless IP cores	Support wireless communications standards, such as Wi-Fi and Bluetooth (paid licenses).

**Table 1.** Pre-Installed IP Cores Available Within the Intel Developer Cloud Environment

The free libraries are a great option for users starting with FPGA design, while the paid libraries offer more specialized functionality for demanding applications. The cloud environment allows you to use the paid licenses and obtain reports on how they will impact your design. IP downloaded from the Intel Developer Cloud environment will only include instantiations for paid IP, and you can use your local paid license to replicate the results on-premise.

Access through the Intel Developer Cloud guarantees you are using the latest, most advanced, and optimized IP for your design needs.

## No-Install Complete Design Environments

The Intel Quartus Development Software and its IP library provide a cutting-edge FPGA development environment. However, developers often require access to additional software tools to achieve the most optimal design for cost and performance.

The Intel Developer Cloud provides an additional benefit by supporting existing methodologies. Once inside the Intel Developer Cloud, users can access all licensed tools required to complete their FPGA development tasks, such as verification, design integration, and advanced IP creation.

Table 2 below highlights the software tools provided within a typical Intel Developer Cloud environment, eliminating the need for developers to install software, match tooling versions, or confirm correct installation.

Design Task	EDA Software
Verification	Siemens Questa*
DSP algorithm development	DSP Builder for Intel FPGAs
AI development	Intel FPGA AI Suite
SYCL/C++ IP development	Intel FPGA Add-on for oneAPI Base Toolkit
Embedded system design	Embedded software and tools for Intel SoC FPGAsv

**Table 2.** Software Pre-Installed in the Intel Developer Cloud Environment

Pre-installed tools ensure the Intel Developer Cloud provides FPGA developers with the same software and environments they use in their on-premise FPGA development, allowing them to focus on and leverage new cutting-edge features that enhance performance, efficiency, and reliability.

## Develop in Your Environment

FPGA design environments available in the Intel Developer Cloud are provided for several common operating systems, including Windows\* and the most popular Linux\* variants, allowing design teams to perform all their typical tasks in an environment they are familiar with in their existing on-premise setup.

Virtual Machines (VMs) pre-configured with the tools and IP required to develop an Intel FPGA enable FPGA developers to immediately begin developing hardware models, conduct simulations, run experiments, and test code across a wide range of hardware configurations and devices, including early-access devices which may not be in the released software.

As the methodology below highlights, setting up and provisioning cloud resources is faster than acquiring physical hardware. This enables quicker testing and validation of the application’s behavior under different conditions.

Intel Developer Cloud FPGA Methodology:

1. Upload design data through a secure file transfer
2. Select a Windows or Linux-variant VM.
3. Launch the Intel Quartus Development Software and other pre-installed licensed software and IP.
4. Select an FPGA device.
5. Develop, optimize, and verify the application.
6. Review reports and performance metrics.
7. Optionally, return to step 4 to explore a different device.
8. Download the optimized results through secure file transfer.

The Intel Developer Cloud can be used to confirm your expectations or as a learning tool to familiarize yourself with Intel’s newest hardware and software technologies before deploying solutions in production environments.

## Design with Industry-Leading Security and Peace of Mind

Considering security is necessary when using any cloud environment.

All data uploaded to the Intel Developer Cloud is your data; it is not shared with anyone else and is protected within Intel’s secure cloud environment. When you delete data from your cloud environment, it is deleted, and Intel does not retain any user data after deletion.

The Intel Developer Cloud’s architecture has data security designed from the start and follows the Security Development Lifecycle (SDL) process, which is integrated into Intel’s cloud product development lifecycle. SDL ensures that security is considered at every product development stage.

- On an ongoing basis, Intel security teams perform extensive threat modeling, identifying critical assets, attack surfaces, threats, and mitigations.
- A cross-disciplinary team of long-time security professionals reviews Intel’s cloud architecture and threat modeling.
- Proactive penetration testing, or ethical hacking, is performed randomly before launching services in the Intel Developer Cloud at major release points.

Security issues are considered and addressed at every development and usage stage.

Intel operates a continuous monitoring and operational security incidence response center, backed up by Intel’s Product Security Incident Response Team (PSIRT) and industry security research, and requires mandatory security training and resources for employees to help develop a security-first mindset and ensure that security is integrated into every aspect of operations.

Development	Deployment	Monitoring and Support
<p><b>Security Development Lifecycle (SDL):</b></p> <ul style="list-style-type: none"> <li>▪ Product Security Experts assigned to each team to ensure Intel security compliance</li> <li>▪ Includes 100+ security checks and validation</li> <li>▪ Through Security Architecture and Threat Modeling review</li> <li>▪ Fuzzing of the external facing REST APIs</li> <li>▪ Update review and Quarterly scans</li> </ul>	<p><b>Secure Access and Segmentation:</b></p> <ul style="list-style-type: none"> <li>▪ IDC portal user authenticated through enterprise-grade Single Sign On (SSO)</li> <li>▪ Secure key-based SSH authentication. The user’s private key is never exposed</li> <li>▪ Network Micro-Segmentation. Each reserved node gets its own VLAN, which is isolated from other instances and provider network</li> <li>▪ Centralized secrets management through the vault for added security</li> </ul>	<p><b>Dedicated 24/7 SRE and Customer Support:</b></p> <ul style="list-style-type: none"> <li>▪ Continuously monitor and response to incidents</li> <li>▪ Dry run incident response exercise</li> </ul>
<p><b>Security Awareness Training:</b></p> <ul style="list-style-type: none"> <li>▪ Dev, SRE, Infra, and DevOps teams trained on security best practices</li> <li>▪ Teams participate in the Intel security belt program</li> <li>▪ Teams participate in the Capture the Flag internal competition</li> </ul>	<p><b>Endpoint Security:</b></p> <ul style="list-style-type: none"> <li>▪ Regular scanning of endpoint for vulnerabilities</li> <li>▪ Regular updates to OS and packages</li> <li>▪ Deploy tools for malware detection and remediation</li> </ul>	<p><b>Red Team / Blue Team Exercises:</b></p> <ul style="list-style-type: none"> <li>▪ Penetration testing done by Red teams</li> <li>▪ A simulated attack (red team) is carried out</li> </ul>

## Conclusion: Shaping the Future of FPGA Design

Early access to new features and hardware is a competitive edge.

The Intel Developer Cloud presents an unmatched opportunity for FPGA designers to revolutionize their workflow, streamline collaboration, and embrace innovation. By seamlessly integrating the Intel Quartus Development Software with cloud technology, the Intel Developer Cloud empowers designers to create, collaborate, and conquer the challenges of modern FPGA design.

Below are the main advantages of using a cloud-based environment:

- Eliminate the need for on-premises hardware investments, reducing upfront costs during technology evaluations.
- Pay only for the resources you use, optimizing budget allocation.
- Avoid hardware limitations and ensure optimal performance regardless of project complexity.
- Facilitate seamless collaboration among design teams, regardless of their geographical location.

In conclusion, the Intel Developer Cloud offers a transformative experience by combining the prowess of the Intel Quartus Development Software with the latest Intel hardware and the flexibility of cloud technology. With early access to new features and best practice examples for utilization, the Intel Developer Cloud is the ultimate platform to supercharge FPGA design innovation and efficiency.

Embrace the future of design with the Intel Developer Cloud and pave the way for limitless possibilities.

## Further Information

- To learn more about Intel's longstanding commitment to security, visit the [Security Development History](#) page.
- To learn more about data security, visit the [Data Security Technology Overview](#) page
- Read the [Intel Development Cloud Access & Software License Agreement](#)
- To learn more about the Intel Quartus Development Software, visit the [Intel Quartus Prime software](#) page



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