A Game-Changer

Accelerating Various Aspects of Game Development

INCREDIBUILD

Table of Contents

Gaming studios have to meet the highest standards of quality and time-to-market. They are expected to deliver updates/patches and new features on a monthly or weekly basis. Ironically, their development cycle is complex and entails more than the usual dose of CPU-intensive processes (compilations, tests, etc.) in the field of game graphics.

In this whitepaper, we will review the various challenges game developers face. By using real-life examples, we will demonstrate how Incredibuild's distributed processing technology solves some of these challenges.

Challenges game developers are facing today

1. Various software development time-consuming tasks

As with every software development genre, game development entails quite a bit of time-consuming tasks such as compilations, tests, code analysis, packaging, etc., that take their toll on delivery dates.

2. Slow visual asset processing pipeline

Compilations, code analysis and testing are just the beginning. Game development involves many industry-specific tasks related to graphics and design (texture compression, lighting, rendering, shading, etc.). These tasks have a direct impact on overall delivery times and game quality. On the one hand, game developers can't afford to compromise on the number of times they run and experiment with these time-consuming graphics tasks, as this has implications on the game's quality. On the other hand, meeting deadlines and releasing quickly is crucial.

Sadly, quality is compromised often when there are fewer builds, releases, code analysis, and testing iterations, which often happens due to a lack of processing power.

3. Cross-Platform with Multiple Porting Tasks

Developing the same game for multiple platforms is a challenge. For example, juggling between Windows and Linux, while developing in multiple languages, can become extremely challenging and create serious backlogs for development teams. Porting is another challenge. More often than not, the code has to be adapted and reused on various platforms (multiple gaming consoles, desktop, mobile and so on), which prolongs time-to-market even further.

Overcoming these challenges by utilizing a distributed processing technology

The above challenges are the reason why top gaming studios such as The Coalition, Ninja Theory, Milestone, Epic Games, Undead Labs, Electronic Arts and many others utilize **Incredibuild's** distributed processing technology to accelerate code builds and graphics execution.

Our solution allows indie, AAA game developers and technical artists to run builds, iteration cycles in graphics and additional time-consuming development tasks (tests, code analysis) in very short intervals and increase the number of iterations running various time-consuming workloads.

Compilation acceleration

Ninja Theory has a track record of releasing AAA titles such as Devil May Cry, Heavenly Sword and Enslaved: Odyssey to the West.

Regardless of its success, this studio has stayed relatively small (30 programmers, divided between 3-4 projects at any given time). The company made minimal investments in dedicated build servers; making the most of their existing hardware in order to handle UE4 compilations proved itself to be a tricky task.

Luckily, Incredibuild helped Ninja Theory reduce its UE4 build time by 90%, from 56 to 8 minutes, without any need to buy additional hardware.

Compilation Acceleration Using IncrediBuild

- ● Before Incredibuild
- ● With Incredibuild
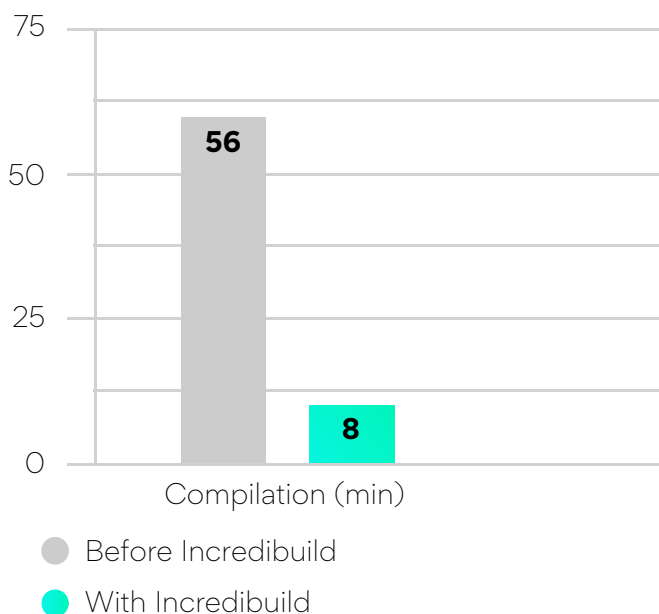
"We've found the impact on programmers' machines of running the Incredibuild agent to be fairly minimal, so although we have some dedicated build servers as well, I would say that you can still get a lot out of Incredibuild without having a build farm"

Henry Falconer, lead programmer at Ninja Theory

UE4 compilation acceleration

Gaming engines are great! They can help tackle multiple tasks in one place and simplify tasks related to physics (in-game immersions), input issues, and visual assets processing (depth-of-field, texture-mapping, etc.).

Take Unreal Engine for example. There's no denying it is a powerful tool for game developers. But even the magical Unreal Engine still needs to compile all of its shaders before an artist can launch a level. What if you could reduce all those code compilations as well as shaders compilations by up to 90%?
That's a whole new ballgame, isn't it?
Incredibuild has an integration with UE4 that upgrades the Unreal Engine game development experience with a major speed boost. For example, The AAA game developer Milestone studio was able to accelerate their UE4 editor compilation and game compilation, as demonstrated by the chart below.

Milestone Studio - Build Acceleration
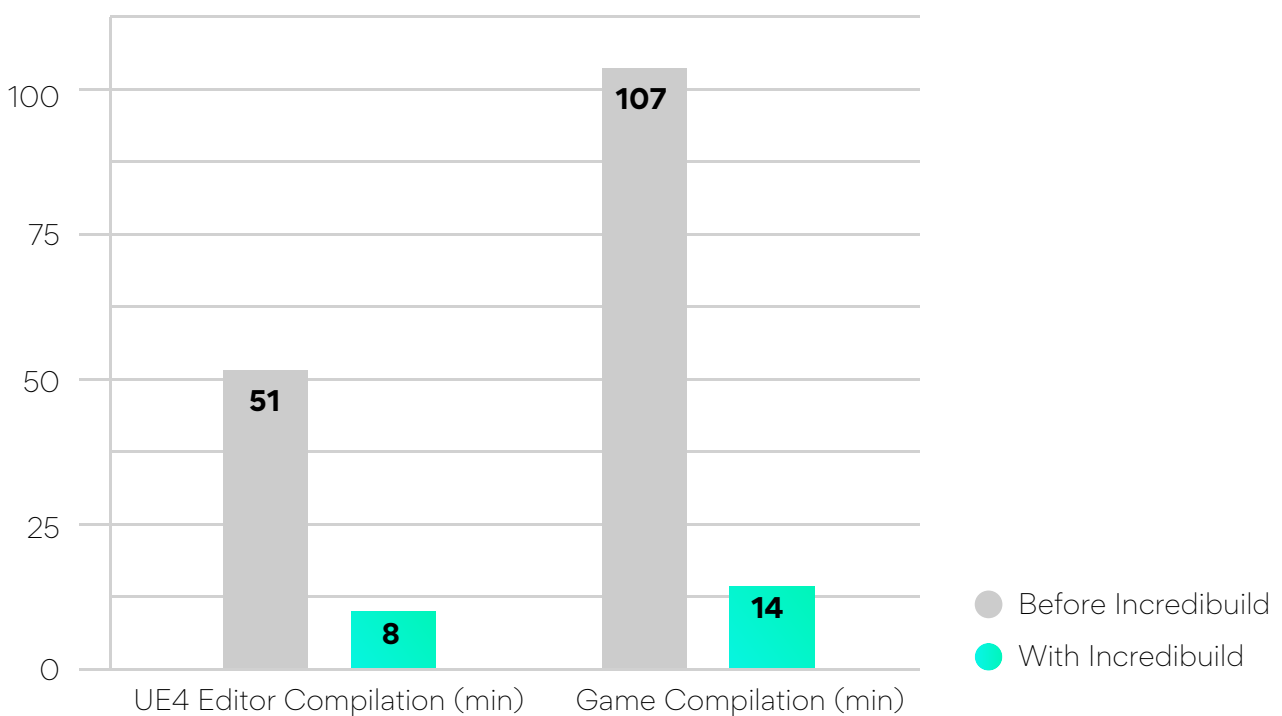
"The top challenge to overcome was the long compile times of the Unreal Engine 4 Editor and the game. We were taking almost three hours for a single build. With Incredibuild, that time went down to just over twenty minutes,"

Ivan Del Duca, technical director at Milestone

In UE 4.19 and later, Incredibuild users enjoy an automatic integration with Unreal Engine, where Incredibuild's acceleration capabilities are used by default to accelerate shader compilation, on top of the previous integration which allows accelerated distributed code builds. The acceleration also applies to speeding up the Unreal Engine start up time when loading a project.

Incredibuild also provides the ability to speed up custom scripts. This can be a huge advantage for Indie developers.

Moreover, Incredibuild accelerates Unreal Engine-related 3rd part tools such as Enlighten and tasks like text compressions, rendering (Maya batch) and more.

Related: Top 7 Gaming Engines You Should Consider for 2020

Incredibuild can accelerate much more than just UE4 compilations...

As mentioned earlier, focusing only on the basic development milestones is not enough to release great games. Incredibuild is a generic infrastructure that accelerates almost any kind of multi-process execution, and as shown by the charts below, there are many kinds of applications for this technology.

Some processes are general software development processes, such as compilations, dynamic code analysis, testing, packaging, static code analysis and more. Others are specific to the gaming industry and related to graphics, such as: texture compression, lighting, rendering, shading and more.
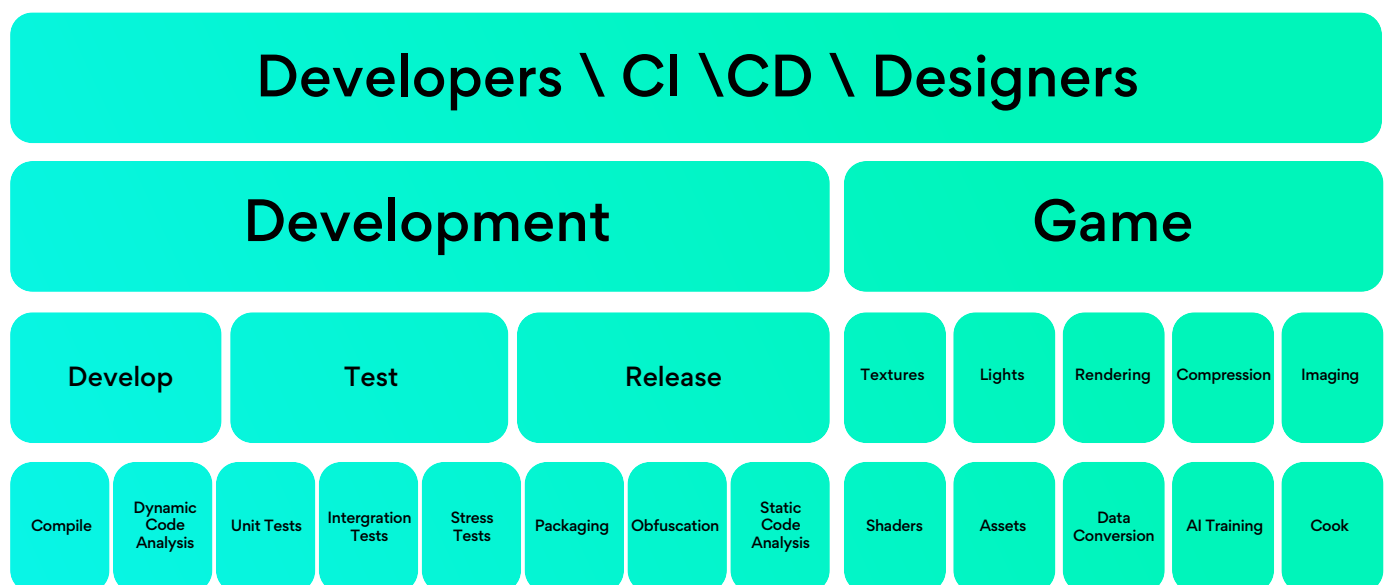
Developers \ CI \CD \ Designers

Development			Game				
Develop	Test	Release	Textures	Lights	Rendering	Compression	Imaging
Compile / Dynamic Code Analysis	Unit Tests / Intergration Tests / Stress Tests	Packaging / Obfuscation / Static Code Analysis	Shaders	Assets	Data Conversion	AI Training	Cook

Chart: Various software development aspects Incredibuild accelerates

Next up, we will present examples of the various multi-process graphic tasks Incredibuild accelerates.

# Shaders and lighting acceleration

Using Unreal Engine, Incredibuild accelerates shaders compilations (In fact, Epic, the creators of Unreal Engine, are using Incredibuild solution to accelerate shaders compilation for the games they develop).

Undead Labs, the AAA game developer best known for its hit zombie survival simulation game, State of Decay, puts a heavy emphasis on game graphics and prioritizes graphic task iterations accordingly.

In order to iterate as much as possible with shaders and lighting (on various platforms), a speed boost on game compilation, lighting pre-compute and shaders was required.

Undead Labs integrated Incredibuild as part of their Continuous Integration leading to performance improvements of up to 10X when compared to the time the workloads took to complete without Incredibuild.

Undead Labs Performance Gain (min)
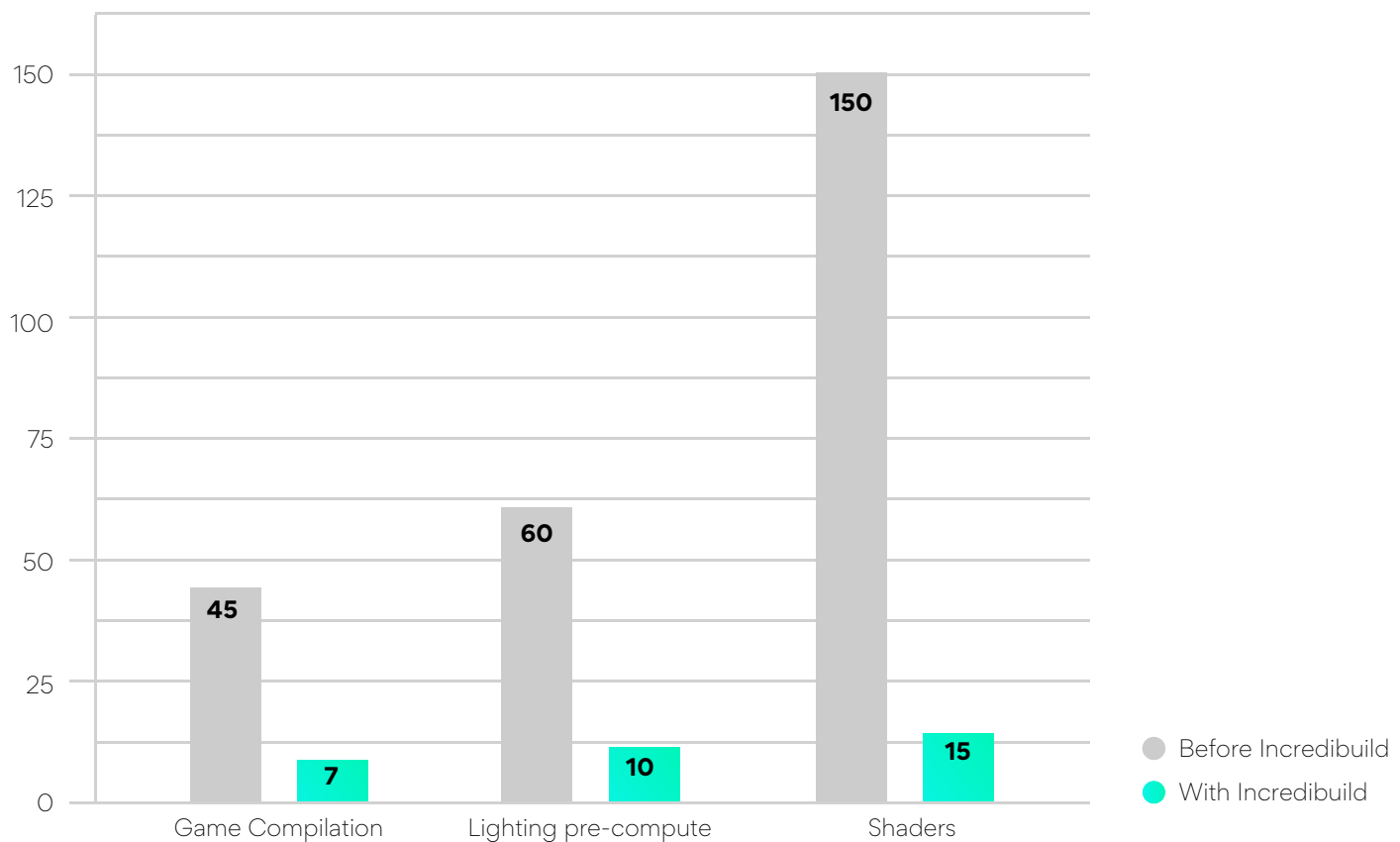
"We believe that rapid iterations is one pillar of productive game development."

Ted Woolsey, General Manager, Undead Labs.

Supermassive Games, the BAFTA-winning independent game developer responsible for the hit Until Dawn is another example of shaders compilation acceleration, reaching 10 minutes for shaders compilations instead of 40.

Cooking acceleration

Let's review Milestone studio again. Being a AAA studio focused on racing games (Superbike, MotoGP and World Rally Championship), graphics and model details are a crucial aspect of their game development cycle.

Using Incredibuild, they have experienced significant improvement in their game cook performance.

Cooking

586 Before Incredibuild

268 With Incredibuild
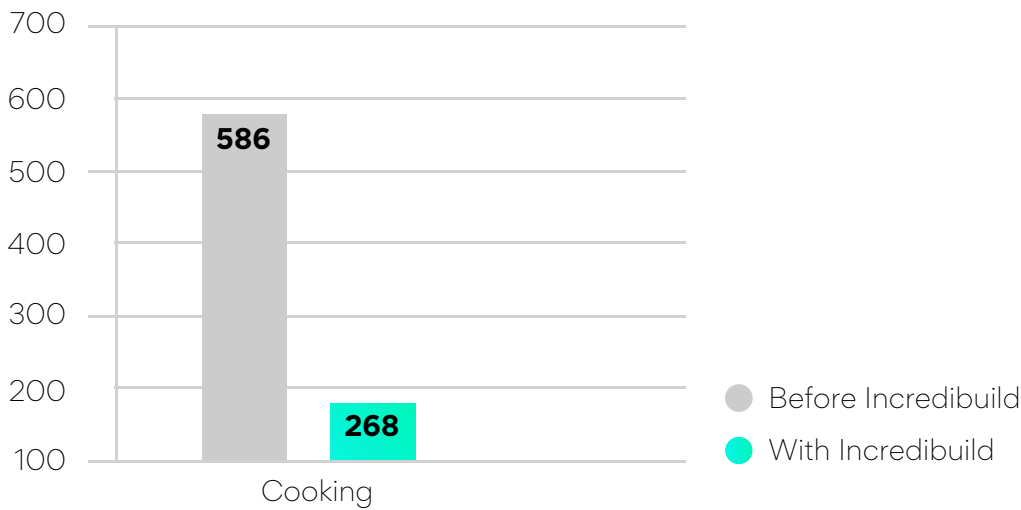
Data manipulation

Turn10, the developer of the Forza racing game, had very slow data conversions, compilation, rendering, and lighting times while using 3DS Max. This had to be done iteratively in order to achieve an optimal result, which Incredibuild helped accomplish by speeding up the process.

The conversion of Autodesk 3DS Max rendering output used to take as long as 6 hours. Using Incredibuild these times were reduced significantly; rendering was condensed to only 20 minutes.

**Forza Performance (min)**
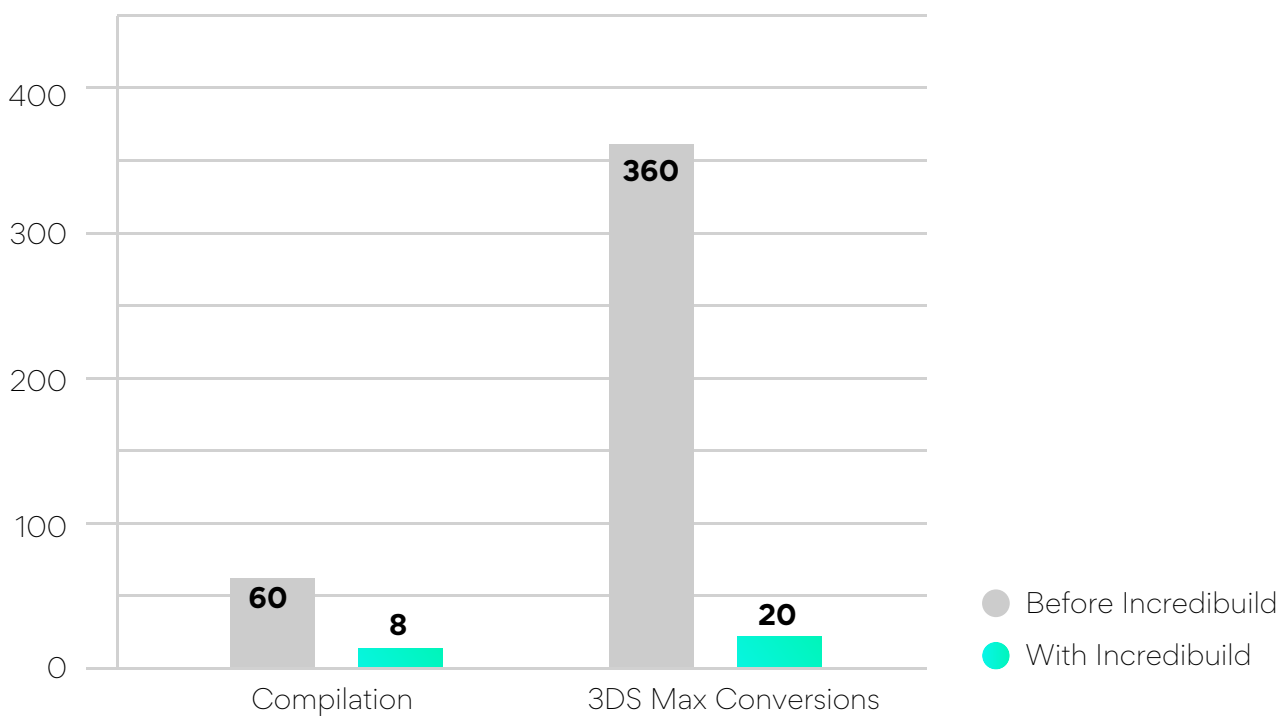
Asset creation

Electronic Arts, a world leader in interactive entertainment software, creates games for a variety of video game systems, personal computers, wireless devices and the internet. Its bestselling games include 27 titles with fiscal sales of over one million copies, and five titles with fiscal sales above four million copies, including FIFA 10, Madden NFL 10, Need for Speed SHIFT, The SIMS and Battlefield: Bad Company 2.

Autodesk Maya 3D animation software, a key element of EA's game development toolkit, is used to process most of EA's game assets, including animations, models and textures used to support gameplay. Let's explore how EA used the Maya-Incredibuild integration to significantly accelerate the development of SIMS.

For the development of the new SIMS, EA used Maya to convert asset files into their game-ready formats. SIMS has tens of thousands of asset files and requires building an enormous amount of data files. Rendering all these asset files took several hours each.

Incredibuild reduced EA's overall rendering runtime from 4 hours to only 40 minutes, resulting in processing results that were six times faster. All of this was achieved with a brief installation and integration process that didn't take more than a few hours.

EA - Asset Rendering (min)
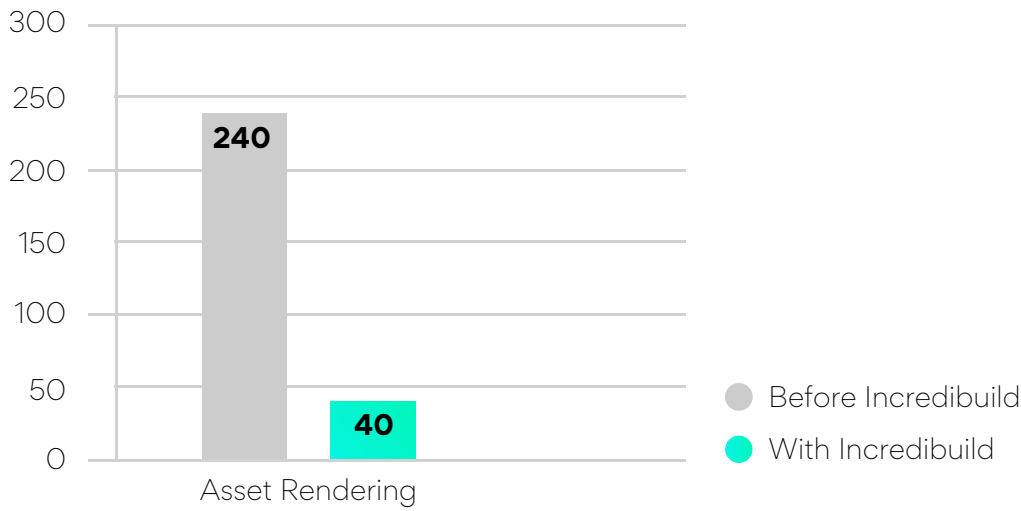
Texture processing

The creator of the famed ArmA game series, Bohemia Interactive, chose to use satellite imagery in order to achieve a very large, yet very detailed and realistic, terrain. Satellite imagery provided the most flexible and most photo-realistic option.

Unfortunately, realistic map terrains and textures require a ton of image processing and compression. It took up to 8 hours each time they processed the imagery, converting and compressing these massive raw images to in-game textures. Using Incredibuild, the studio's developers managed to cut that image processing time by more than 90%, to 40 minutes.

Texture Processing (min)
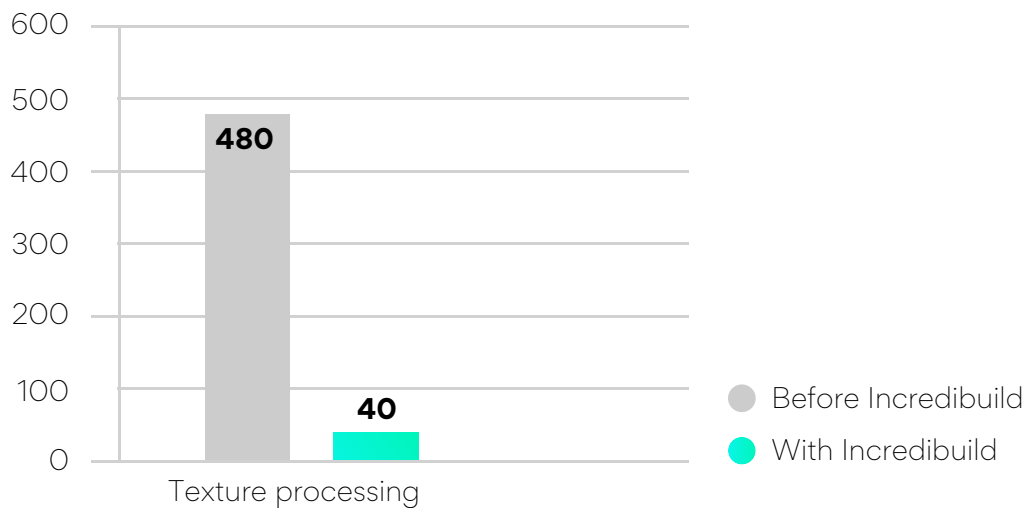
Accelerated cross-platform development and porting

Incredibuild is an out-of-the-box solution that empowers gaming studios to compile simultaneously for Xbox One, Sony PlayStation®4, Nintendo Switch, Nintendo 3DS, PS-Vita, Android, and Google Stadia, all with single batch builds that reduce coding time. This allows the gaming studio to avoid maintaining a separate solution dedicated to each platform.
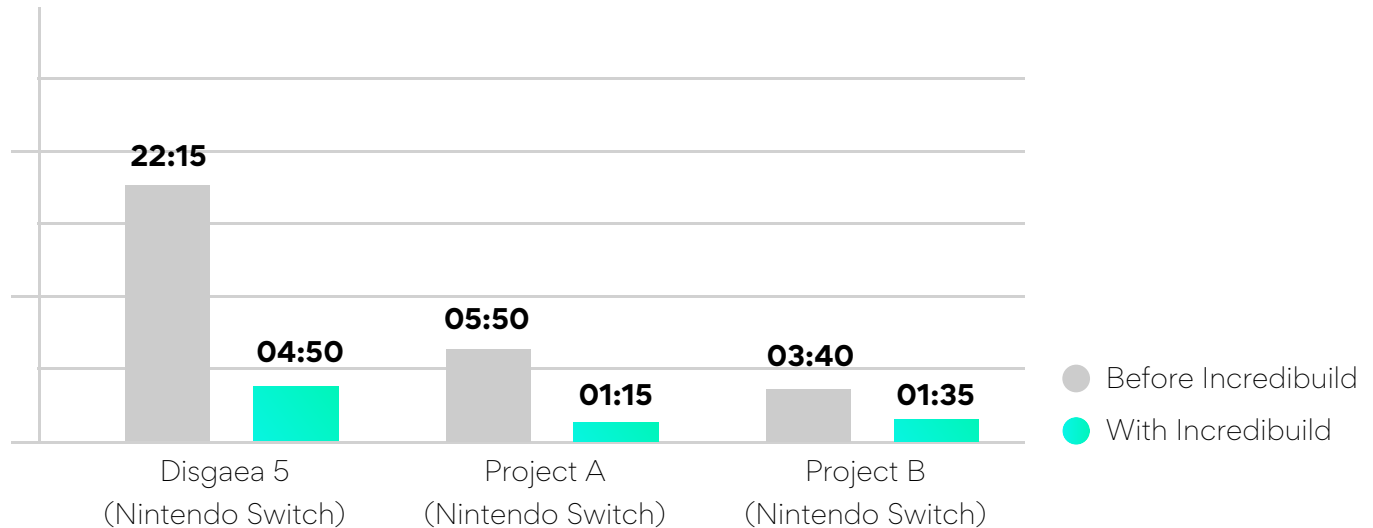
Incredibuild also supports cross-platform code builds, as seen in the case of Obsidian. Both Windows and Linux build times were cut down by more than half.

"Improved daily build times saves us QA time by having the build ready on time, perhaps on the order of 20-30 man hours a day."

Javier Olivares, lead programmer at Obsidian

Additionally, accelerating compilations facilitates gaming studios to quickly and easily port games to new consoles. Nippon Ichi Software, for example, used Incredibuild to port the Disgaea series from PlayStation 4 to Nintendo Switch. The results are evident, as demonstrated in the graph below.

Build Time Comparison

22:15 — Disgaea 5 (Nintendo Switch) Before Incredibuild
04:50 — Disgaea 5 (Nintendo Switch) With Incredibuild
05:50 — Project A (Nintendo Switch) Before Incredibuild
01:15 — Project A (Nintendo Switch) With Incredibuild
03:40 — Project B (Nintendo Switch) Before Incredibuild
01:35 — Project B (Nintendo Switch) With Incredibuild

⬤ Before Incredibuild
⬤ With Incredibuild

"In each project, we managed to cut the build time by using Incredibuild, especially in the case of Nintendo Switch."

Nagayasu-san, programmer at Nippon Ichi Software

What about peak times?

The gaming industry has its share of peak times. The holiday season, for example, is a known peak time. How can studios handle the holiday season and all of the increased builds and other game development tasks it brings with it?

That's exactly the reason we launched Incredibuild Cloud offering. It can further enhance development task times without any added investment in hardware, cumbersome migration processes or added stress on IT managers. It also provides a solution to outsource graphic designers and small contractors studios that are in need for on-the-fly high-performance computing environment.

Batch building and Incredibuild Cloud can be a potent combo during peak times or when development needs to be ramped up ahead of a big deadline.

How does Incredibuild's technology accelerate game development tasks?

Our innovative distributed processing technology harnesses the power of idle CPUs in your network (or on the cloud with Incredibuild Cloud), effectively transforming every workstation into a supercomputer with hundreds of cores and gigabytes of free memory to ramp up your development.

All of Incredibuild's innovative solutions are based on its unique Process Virtualization technology, which works with two different types of roles:

- **The Coordinator** - This can be installed on any participating machine, preferably one with high-availability. The Coordinator is the component that manages resource availability in an Incredibuild pool. It communicates with the Agents to identify the resources that are available or unavailable and manages them accordingly. You only need to have a single Coordinator per Incredibuild pool.

- **The Agent** - These are installed on each machine that you'd like to be part of the Incredibuild pool. Essentially, any Agent can act either as an Initiator (when it initiates executions via Incredibuild) or as a Helper (when it contributes its idle CPU's to processes distributed by Incredibuild across the network).

Incredibuild's Process Virtualization technology virtualizes processes on Helpers as if they are running on the initiator machine itself, regardless of the remote agent's file system or installation base.

Helper
(agent)

Helper
(agent)

Initiator(agent)

Coordinator

Helper
(agent)
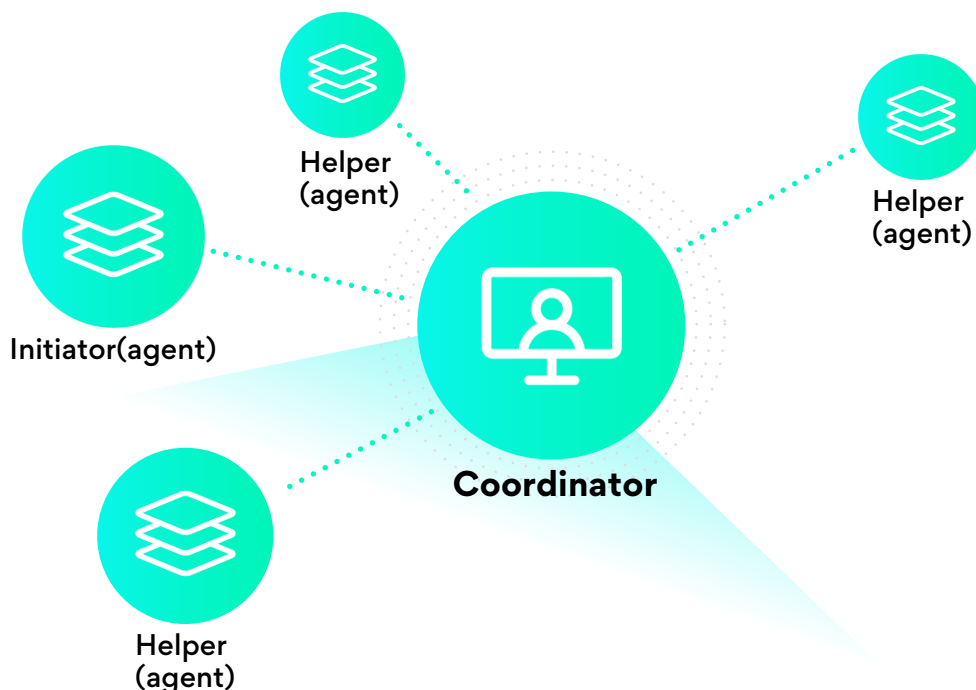
Additionally, Process Virtualization does not require any files to be copied from the Initiating Machine. All you need is to install the small and light Incredibuild agent on all machines; the files required by the remote process are transferred automatically and transparently from the Initiator to all Helpers.

The bottom line:
release better games, faster.

To sum up, a slow development cycle often leads to delays in releases, compromises on quality, bottlenecks around peak times and stress on IT and DevOps managers. Supplementing your development operations with a comprehensive game development acceleration solution can help you have your cake and eat it too - reach fast time-to-market without sacrificing quality.

Interested in trying out Incredibuild for game development?
Download and get started!