Case Study

How Exodus Orbitals Simplifies Satellite and Space Prototyping with Docker

About company: Exodus Orbitals offers a "satellite-as-a-service" platform, allowing businesses and developers to host and run satellite applications in space. The company provides rentable satellite services, allowing users to develop, test, and deploy satellite software without needing costly hardware, thereby lowering entry barriers.
Industry: Defense & Space
Location: Richmond Hill, Ontario, Canada

Highlights

Development time reduced from years to days
Docker and Exodus Orbitals cut development timelines of satellite software for onboard processing from years to days, allowing Exodus Orbitals to deploy functional applications rapidly.

Significant cost savings
By eliminating the need for expensive satellite hardware during testing, Docker reduced development costs significantly, making satellite development more accessible to smaller teams and independent developers.

Access for non-experts
Docker's containerization enabled developers without specialized aerospace knowledge to create functional satellite applications. This approach democratized space innovation, allowing experts from GIS, ML, and other fields to contribute effectively.

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Introduction

Exodus Orbitals' primary audience includes software developers with experience in GIS and machine learning (ML), even without prior aerospace expertise. Typically, satellite software development projects take between 12 to 36 months and are closely tied to mission progress and hardware dependencies. However, with Exodus Orbitals' software developer kit (SDK), validated by the European Space Agency (ESA), and Docker's operating-system level virtualization, the company has cut development timelines by an order of magnitude, transforming the landscape of space-tech innovation.

Satellite industry software development practices traditionally require large investments, deep technical expertise, and long development timelines. Exodus Orbitals recognized this challenge as an opportunity to democratize access to space, using Docker technology to streamline the development process.

Simplifying satellite-specific complexities allowed non-expert developers to build, test, and deploy onboard data processing satellite software quickly and efficiently. Faster development cycles give developers more opportunities to experiment and innovate within the space industry.

> "Docker made it feel like we were building a web app, not space software."
>
> **Hackathon participant**

Challenges

Inaccessibility of space development

High costs, technical barriers, and lengthy development timelines have traditionally characterized the development of software for the space segment of satellite missions. Only large organizations with specialized engineering teams and multimillion-dollar budgets could build and deploy such types of software applications. For smaller companies and independent developers, the complex knowledge required — ranging from satellite-specific hardware to orbital mechanics — made entry into the field nearly impossible.

The stakes were exceptionally high for Exodus Orbitals, whose mission is democratizing access to Earth observation satellite capabilities. Without a solution, Exodus Orbitals risked failing to open the satellite industry to a broader community of developers. This would stifle innovation and limit opportunities for new, agile applications that could accelerate advancements across multiple industries — from insurance and finance to agriculture and supply chain logistics as well as media and cybersecurity.

Moreover, the traditional approach came with enormous financial costs — often running into the millions — and timelines spanned several years. The lack of a streamlined development process meant small teams were excluded, and industry-wide progress was slow.

Exodus Orbitals faced a clear challenge: to scale satellite software development in a way that lowered costs, accelerated timelines, and enabled developers without specialized knowledge to contribute to space innovation.

Solution

Satellite software development with Docker

Faced with the challenge of making satellite software development more accessible, Exodus Orbitals chose Docker, a leading containerization platform, to streamline the process. Docker's containers provided an abstraction layer that shielded developers from the satellite-specific complexities, enabling them to focus on building applications without needing expertise in satellite hardware or orbital mechanics.

> "We've been testing our platform through a series of hackathons where we allow developers without previous experience in the space industry to create solutions that can run on satellites."
>
> **Dennis Silin**
> CEO of Exodus Orbitals

Hackathons

To demonstrate the potential to simplify satellite software development, Exodus Orbitals hosted a series of hackathons. These events served as a real-world proving ground for Docker's ability to enable developers — with no prior satellite engineering experience — to build fully functional applications in a fraction of the time previously required.

The solution centered around three core components:

- **Containerization:** Docker containers allowed developers to package their applications into isolated environments, ensuring that each app could run consistently across different satellite systems. This approach significantly reduced the time spent on configurations and testing.
- **Pre-built templates:** Exodus Orbitals provided a library of Docker templates that mimicked satellite conditions, enabling developers to bypass initial setup phases. These templates included essential components like satellite telemetry receivers, orbit calculation libraries, and environmental control systems, reducing the need for satellite-specific knowledge. Developers could launch applications with minimal setup time, cutting the development phase from months to days.
- **Virtualized testing:** Developers could simulate a satellite's environment locally and run exhaustive tests before deploying directly to a real satellite using the sandbox environment. "We applied OpenCV libraries and the BFMatcher algorithm to extract features from satellite images, matching differences and outputting results. Docker allowed us to run this efficiently," one hackathon participant said.

The implementation process was straightforward yet impactful. By eliminating the need for developers to understand satellite hardware, Docker enabled non-experts to contribute to satellite software innovation. Exodus Orbitals also ensured a reliable and efficient deployment pipeline where applications could be developed and tested locally before being deployed on satellites in orbit.

The reduction in development time made space technology more accessible to a wider community of developers across multiple industry sectors in their preferred programming languages.

The development process typically involves three key phases:

- **Hackathon development:** An initial version of the app is created through a hackathon, taking just days, using Docker and the Exodus Orbitals SDK.
- **Integration and validation:** The app is then finalized and integrated into the satellite vendor's platform by Exodus Orbitals, requiring no additional code from the original developer. This phase takes 1-3 months.
- **Mission launch and operations:** After the satellite mission shakedown activities are complete, the app is ready for launch and deployment.

This approach allows Exodus Orbitals to reduce the traditional development schedule by an order of magnitude (as much as 10x), transforming a multi-year project into one that takes just a few months.

These hackathons underscored Docker's ability to lower the barriers of entry, enabling developers to create solutions in just a matter of days. By leveraging Docker's containerization, Exodus Orbitals successfully demonstrated that even complex tasks like satellite image and signal processing could be made accessible to a broader community, unlocking new opportunities for innovation in space technology.

Key benefits

The implementation of Docker by Exodus Orbitals led to several crucial benefits that reshaped how the development of onboard processing satellite software is approached:

Reduced development time

Docker containers dramatically shortened the timelines for satellite mission software development. What previously took years now takes just days. Developers in Exodus Orbitals' hackathons could build and deploy functional software applications for satellite onboard computers in a fraction of the time traditionally required.

Lower development costs

By leveraging Docker and Exodus Orbitals' SDK, the overall costs of satellite software development were cut by an order of magnitude — reducing project timelines from 12-36 months to as little as 2-3 months. This allowed smaller teams and independent developers to enter the space-tech industry at a fraction of the cost traditionally required.

Accessibility for non-experts

Docker's containerization enabled developers with little or no satellite engineering experience to build and test software applications for satellite onboard computers. By abstracting the technical complexities, Docker enabled dozens of new developers to create applications traditionally the domain of highly specialized teams.

Improved collaboration and portability

Docker containers ensured that all developers worked in a consistent environment, regardless of location. This enhanced team collaboration across multiple projects and satellites, with applications being easily shared and scaled across teams. As a result, development teams saw a 50% increase in efficiency.

Smooth testing and deployment

Docker's portability allowed developers to test applications locally in virtual satellite environments before deploying them to real satellites. This eliminated deployment issues, reducing errors and deployment times by 50%.

"We're partnering with satellite operators to eventually run these applications in space, taking the solutions from the hackathon to real-world satellite deployments."

Dennis Silin
CEO of Exodus Orbitals

Outcomes

Delivering simplicity and scale in hotel technology

Implementing Docker immediately benefited Exodus Orbitals, completely reshaping its satellite software development process. Development times, which once spanned years, were reduced to 2-3 months for full space missions, with initial prototypes developed in days through hackathons. By removing the need for expensive hardware during testing and simplifying the development pipeline, Exodus Orbitals slashed costs by an order of magnitude.

This approach was first tested in partnership with the European Space Agency on the OPS-SAT mission and has demonstrated its effectiveness. Currently, Exodus Orbitals is working with a key industry partner and hackathon sponsor to integrate apps from hackathon winners into operational satellite platforms.

The process of building and deploying satellite software — which traditionally took multiple years — was reduced to a few days, representing a 90% decrease in development time. In real-world hackathons, developers with no prior satellite experience created and tested fully functional applications in just 48 hours. This rapid development cycle allowed Exodus Orbitals to iterate and create at an unprecedented pace.

Using Docker's virtual environments, Exodus Orbitals was able to remove the need for costly satellite hardware during testing. This reduced overall development costs by an estimated 25%, allowing the company to reinvest resources into further innovation.

Docker's portability and containerization enabled Exodus Orbitals to easily scale its applications across various satellite platforms. Multiple teams could work in parallel without needing to reconfigure their environments, resulting in a 200-300% increase in development efficiency.

More than 50 developers participated in hackathons organized by Exodus Orbitals, using Docker's pre-built templates to build satellite applications. "Using OpenCV and Docker, we were able to process satellite images and detect changes, like counting containers in port areas," one participant said. Many developers who had no prior satellite engineering experience expressed surprise at how quickly they could develop and deploy applications.

> "Using OpenCV and Docker, we were able to process satellite images and detect changes, like counting containers in port areas."
>
> **Edie**
> Hackathon Participant

> "It was my first time joining this kind of hackathon, and I really liked working with space technology and machine learning."
>
> **Edie**
> Hackathon Participant

Conclusion

Docker has fundamentally transformed how Exodus Orbitals approaches satellite software development, cutting project timelines from years to days and reducing costs by 50%. With Docker's containerization, non-expert developers can build and deploy functional applications, thereby expanding access to the space-tech industry.

Docker will continue to play a pivotal role as Exodus Orbitals plans additional hackathons and deployments. "We're partnering with satellite operators to eventually run these applications in space, taking the solutions from the hackathon to real-world satellite deployments," says Dennis Silin, CEO of Exodus Orbitals. By expanding satellite software development, Exodus Orbitals is opening the doors for more industries — from disaster prevention to climate change monitoring — to use space-based applications for real-world impact.

200–300%

Multiple teams could work in parallel without needing to reconfigure their environments, resulting in a 200–300% increase in development efficiency.

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Exodus Orbitals actively seeks partnerships with enterprises, startups, and academic teams that have in-house software development expertise, and either already take advantage of various data originating from space (e.g. satellite imagery) or aspire to access extended satellite capabilities (including various instruments, data processing capabilities, and more). Interested to learn more?

Sign up for the Exodus Orbitals newsletter

Reach out directly to the team with feedback or interest

Join the Exodus Orbitals Discord to take part in our future hackathons

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