

Why Air Gap Your App?

A Closer Look at a Unique Way
to Be On-Prem

By **Tracie Stamm** | Replicated
Jason Bloomberg | Intellyx

Table of Contents

Intro	02
What Is 'Air Gap', Anyways?	03
What's Driving On-Prem Air Gap?	04
The Software Market Matures	04
Primary Use Cases for an Air Gapped Environment	05
More Reasons to Love Air Gap	06
Where Does Air Gap 'Fit' for ISVs?	07
Wider Market Opportunity	07
Higher Value Market Opportunity	08
Case Study: Kubos Distributes Moderns Apps to a New Frontier	09
The Problem	09
The Solution	10
The Future	11
Final Thoughts	12

Intro

Applications – and organizations that run them – have come a long way in the last many years. Organizations used to have the choice between apps that ran right ‘out of the box’ (think widely available and uncustomized) or home-grown and totally bespoke to their own unique needs. And running those apps was strictly the domain of their sysadmins, in their on-premises data centers, no less. Over time, this landscape evolved to ‘the cloud’: someone else’s data center, be that a public cloud or that of a managed service provider (MSP), and to that end even someone else’s app admin. What’s more, ‘cloud’ today can mean a lot of different things: different public clouds, different hosting models, and even different management models. From building to consuming apps, this diversity is great. It gives customers at different sizes, regulatory requirements, and IT staff the ability to leverage a solution in the way that best suits their organizational needs. For organizations looking to be agile and responsive, this is a ‘win’. But what about the data that underlies every app and microservice? Is it secure? Is it private? Who else has visibility to it, or broader access even?

These very questions are leading organizations in some verticals (even some application teams within others) to re-assess specifically how they consume their applications and whether those apps are running where they can better serve the privacy and sovereignty needs of their data. For many orgs and many apps, the key is to run apps closer to home and hit that big red button to disconnect them from the internet – still running perhaps in a virtual private cloud, in a private data center, or anything in between, so long as it is disconnected from outside sources. In very specific instances still, this means leveraging an ‘air gapped’ environment: an environment with little to no network connection to the outside, like having a layer of air between the environment and any inbound or outbound risks to the underlying data.

In this whitepaper, we’ll cover what’s driving on-prem air gap installations, key air gap use cases for the security-conscious enterprise, and finally, take a close look at how air gap installs are expanding the market opportunity for software vendors.

What Is 'Air Gap', Anyways?

If you are new to the concept of air gapping, that's OK. Those who have some history of supplying software for banks and government agencies have encountered the need for air gapping — basically, installing into an environment that is disconnected from external influences, whether those are fully disconnected hosts (both on LAN & external internet), hosts disconnected from any IP not specifically approved for egress connection, or external networks (but can access other hosts with a VLAN / LAN). But for many others who have not had (yet) a mandate for much in the way of data security, this is likely a new concept.

Basically, air gapping is really a subset of on-premises software delivery – and the purest form of it, in that absolutely everything needed for that software to run must be packaged for local installation and ready to run disconnected from most networks.

This means no calls out to external authentication providers. No remote license keys. No checking for version updates and patches. 'Sneakernet installation' in older slang, meaning someone would need to walk in with a disk or drive and manually execute the install onto the target air gapped system. Once on-site, ideally, this would have been a double-click, plug-and-play event — but often, the configuration, install, and patching process for one of these systems was a Sisyphean effort.



Vendor product experts and customer sysadmins would work together to run bash scripts, tweak manifest settings and validate the environment and the app, sometimes through terminal consoles, once it went live. Mess one step up, or realize the need for a later product update, and both sides would be looking at another extended and costly consulting visit.

It's not hard to tell why air gapping was reserved for only the most mission-critical security use cases. Many software vendors simply chose to opt-out of this side of the market, waiving their right to work in such secure domains in favor of less troublesome Internet-friendly SaaS business models.

Air gap environments are those that are largely disconnected from outside sources.

What's Driving On-Prem Air Gap?

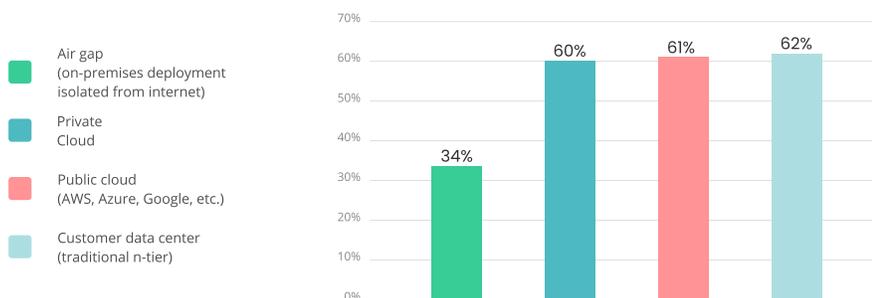
The Software Market Matures

If you were to believe pundits who made SaaS and cloud computing predictions ten years ago, we'd be operating everything-as-a-service by now. But for many kinds of secure work, SaaS run in someone else's cloud isn't a viable option, and even connections to external services and APIs are undesirable.

Remarkably, a 2021 study on [The State of On-Prem](#) revealed that customer demand for software run in a customer-controlled environment – virtual private cloud or on-prem datacenter – is almost equally as high as for public and private cloud options. Even more, more than one-third of vendors surveyed have customers that want to procure air gap software.

On-Prem: a customer-controlled environment – virtual private cloud or on-prem datacenter

On which environments do your customers want to install your company's software? *(Select all that apply)*



Source: [The State of On-Prem, 2021](#).

More than one-third of customers surveyed wanted to procure air gap software.

Again, this flies in the face of more common assumptions in modern software, primarily that 'everything' is going to third-party public clouds. When you consider the breadth and depth of need for modern, enterprise-grade software in regulated or sensitive IP scenarios like those of government, healthcare or financial services, this really hits home. Other verticals, too, will have some data in particular (customer information or intellectual property, for example) that needs to stay close to the vest. As the software market has become more mature, enterprise buyers have become increasingly savvy about pursuing IT strategies that are uniquely tailored to their specific data and app needs – strategies that include on-prem and even air gapped environments.

Primary Use Cases for an Air Gapped Environment

There are a couple of key reasons why an organization would consider installing an application in an air gapped environment.

Data Security

When we think of some of the most demanding security environments, it's easy to bring to mind the mission-critical, on-premises secure installation scenarios of government or even national defense systems. Take for example something as sensitive as a missile silo. If there ever were a reason to be absolutely 100% certain that a system was inaccessible to the outside world, and thus largely unhackable, it would be to prevent the unauthorized launch of a missile. Any software update that happens in that organization's control room must be hand-installed from a disk and checked by a high-security clearance individual. This is a great (if highly specialized) use-case for an air gapped installation: applications packaged for local install, disconnected from any network. Scenarios like this serve to minimize if not eliminate any network attack vectors; the only attack vector at this point is either an inside threat or via the software supply chain.

Granted, most of us don't have to sweat the global consequences of a Wargames-style nuclear brinkmanship event if our business software isn't securely air gapped. Consider, however, the heightened cyberthreats of our time. Millions of automated exploits and attacks are seeking out threat vectors for sabotage, theft, and data exfiltration at any given time. Ransomware is perhaps the worst of it, as the target of the attack is your data itself. So, it wouldn't hurt to take a page from the missile-command playbook in thinking about your organization's mission-critical environments to understand when on-prem air gap installations provide the best balance of risk avoidance and value for critical systems. Air gapping by nature offers almost zero threat surface, other than an inside threat or software supply chain attacks.

Regulatory Compliance

Another key use case for air gapped environments is to support compliance and general data protection requirements. Government regulations and industry policies for retaining sovereignty and local control over sensitive data continue to evolve, and with it, so do the penalties for non-compliance and SLA failures. In these scenarios, air gap is quite attractive for its clean boundaries around an organization's applications and data. What's more, the landscape of countries with data sovereignty requirements is widening every day; cloud providers cannot reasonably put data centers in each of these countries. Selling to businesses that run in countries without a local public cloud data center is a non-starter without leveraging an air gapped environment. Air gap can make it easy for organizations to pass even the most exacting regulatory audits – a demand on a business that can be very resource-intensive. Imagine these orgs being able to hit somewhat of an 'easy' button for a review process that in other scenarios can consume weeks to months of time from multi-person teams, now reduced to simply showing the environment and its limited outside connectivity. When big regulations like the General Data Protections Regulation (GDPR) in Europe go 'live', businesses can be in a much better position to absorb those demands when they leverage an air gapped environment for the data and applications at issue.

And of course, these are not to the exclusion of another, perhaps roundabout use case – select edge environments like those in industrial or IoT scenarios that require software for onsite operations. These super-remote locations behave effectively like air gapped environments as well.

More Reasons to Love Air Gap

While data security and regulatory compliance are the main use cases that bring an organization to consider air gap, there are other ancillary benefits as well.

Improving Performance and Addressing Latency Challenges

This is an argument for running select apps on-prem in the first place, including running in air gap. Whereas running apps on remote systems in public clouds or even simply off-premises virtual private clouds, latency can arise when an application runs in a data center thousands of miles away. Installing new modules as close as possible to an organization's data and operations center can certainly abate this. Air gap app installs realize this benefit as well. Better responsiveness is a welcomed by-product of co-location, especially on the mainframe.

Containerization and Kubernetes Make Air Gap Easier, Less Costly

The widespread adoption of containers — and Kubernetes (or K8s) as a common reference architecture for orchestrating their deployment — isn't just the factory flipping an 'on' switch. K8s also offers on-prem installs and updates a far more stable and repeatable complete environment definition. Kubernetes, by nature, provides an excellent start to solving this exact problem as it can act as a reference architecture of containerized microservices. It's cloud-native, yes, but it doesn't need to run in a cloud. Bespoke customer installs can be tightly specified as code, configuring complete multi-tier applications that can be bundled and consistently delivered to customers as ready-to-deploy K8s packages.

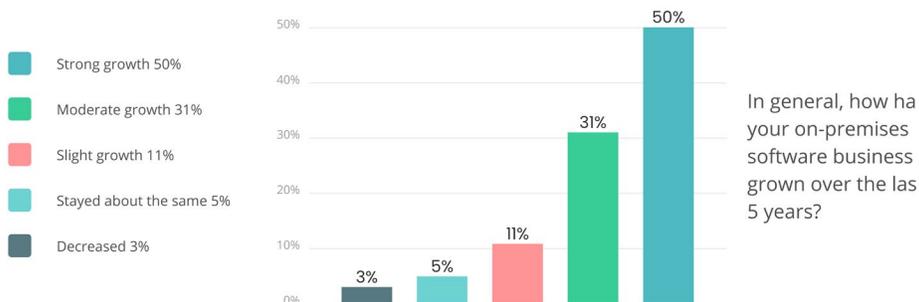
This more 'standard' way of deploying software is a huge benefit to air gapped environments because it makes a given workload much more easily migrated or even repatriated to this unique slice of the on-prem world. A workload modularized with containers and running on a modern architecture with new multi-prem installation solutions such as [Replicated](#) can do a lot to bring down the TCO of rolling out and maintaining applications in air gapped environments.

Where Does Air Gap 'Fit' for ISVs?

Wider Market Opportunity

For software vendors, the opportunity for air gapped application installations can help widen their total addressable market. For SaaS vendors, on-prem on the whole may still be a hidden gem. After all, rosy, cloud-based growth projections are still abundant. Every one of them touts the impressive sales growth stats of their latest SaaS or cloud offerings relative to their existing on-prem business. But these vendors may be well-positioned to take a longer view; for security, compliance, and control reasons, real-world businesses demand modern software delivered on-premises. This point is further underscored by more data from the previously cited [2021 State of On-Prem](#) study showing that almost all ISVs — 92% even — are reporting increased sales of on-prem software to customers — and at least half of them reported 'strong growth' in sales!

92% of companies indicate on-premises software sales are growing



Clearly, the market demand for on-prem app distribution – which includes air gap – is growing as organizations mature their cloud strategies to maintain or bring some apps and data back on-prem. Software vendors will not want to be left 'out in the cold' of not being able to support their customers for this.

Higher Value Market Opportunity

Air gapped environments (and installing and managing the apps that run in them) require some specialized skill.

To achieve effective air gapping, customers need solutions that address complex software configuration with consistency. They need protected IP and properly privileged usage from the point of distribution. To install an application into air gap, they'll need to be able to fetch everything they might need ahead of time since they won't have a network connection for any 'missed pieces' to be retrieved in real time. They will need the ability to update that software over time in the absence of a network connection. They'll need a way to access support for the app that doesn't require that they send telemetry to the vendor or screen share a session to debug a problem or worse -- need to literally read the contents of a screen to a vendor who then tells them what to type. Thus, optimizing for "disconnected" troubleshooting becomes highly valuable to the customer. So much of modern software today assumes – even requires – users to have internet access, but in air gapped environments you can trip an alarm by even attempting to access the internet.

And while these specialized needs may sound overwhelming, don't lose sight of the segments and verticals in the market that require them. Wherever there is a need for secure data and secure operations, there's probably an identifiable need for some aspect of that environment to be air gapped. For example:

Government development teams, especially those working on military or intelligence technology, often prefer to have their team's work environments and software packaged for delivery into an on-prem air gap system cordoned off from the internet. This ensures only approved components can be used by high-clearance developers and contractors, preventing software supply chain attacks.

Pharma research teams conducting clinical trials can do their surveys and calculations on air gapped software, complying with HIPAA and PII statutes while preventing the leak of both patient data and proprietary research information.

Financial software such as fraud detection algorithms and predictive stock trading tools are ideal for software air gapping to prevent any outside parties from attempting to gain an edge or 'game' these high-value decision support tools.

These segments and verticals offer large, long-term, and thus lucrative customers for software vendors to court and retain. Serious enterprise vendors will have a services team or certified partners to perform on-prem air gap delivery, as well as a support team that provides packaged installs and documentation for just such scenarios. For an ISV, securely compiling, packaging, and distributing runtime software on-premises — including into an air gapped environment — requires specialized skills beyond their 'bread and butter' of developing killer apps. However, it is arguably this specialization that all but guarantees the work to be of even higher value to customers.

Case Study: Kubos Distributes Moderns Apps to a New Frontier

Let's return to that hypothetical missile command story to see how it is more than just a theoretical air gap use case. For one organization, the need to support mission control for satellites became the driving use case for an air gapped environment.

Kubos is bringing the software revolution to space. By providing a robust set of satellite management and data collection services, Kubos has set its sights on the great unknown by decoupling physical infrastructure from satellite operation. This architecture empowers their customers to focus more on managing spacecraft while benefiting from a reduced operational overhead.

Their flagship product, **Major Tom**, is built on a robust ecosystem of tools and services that bring critical information and functionality to spacecraft operations. Major Tom connects to virtual satellites, flatsats, engineering models, and orbiting spacecraft all from a single dashboard, providing a universal platform for every aspect of satellite operations. Major Tom also seamlessly integrates with 3rd party ground services such as ground networks, mission analysis, and mission planning suites, analytics platforms, and other critical pieces of ground-based infrastructure.

The Problem

Kubos' mission is to bring modern software development and practices to the space industry by providing a robust set of API gateways and seamless integrations. Major Tom helps companies visualize, understand, and control data across their entire space and ground infrastructure through a cloud-native architecture and robust integrations with external applications and services.

These standard cloud connections work fine for most of their customers. Still, when Kubos began to generate interest from military and government contracts around the globe, they soon realized that the requirements and policies in place to operate Major Tom under strict security protocols requiring on-premise/physical access wouldn't allow for data transmission through the cloud.

As if communicating with satellites wasn't hard enough, Kubos now faced packaging their software for deployment into an air gapped environment — a task that they had not previously undertaken.

As Tyler Browder, CEO and Co-Founder of Kubos, recalls, "We knew that shipping into air gap environments was going to be particularly hard, especially to military bases that we couldn't get to easily, even if we needed to."

When posed with spending the internal resources necessary to build out air gap functionality, Kubos set out to look for a solution that would allow them to accommodate even the strictest of ground control environments.

"Without Replicated, we would have had to walk away from these contracts. We found a good way to open up our total addressable market with Replicated."

“Without Replicated, we would have had to walk away from these contracts. We found a good way to open up our total addressable market with Replicated.”



Tyler Browder
Chief Executive Officer and Co-Founder

The Solution

Kubos’ research led them to partner with [Replicated](#), a Kubernetes application delivery and management platform. Replicated provides commercial and open source tools to streamline the distribution and management of 3rd-party applications to complex customer environments — even air gapped ones.

“Replicated solved our problem immediately,” said Paul Jungwirth, a software developer helping lead DevOps at Kubos. “Not only can we now provide an air gap solution for our customers, but Replicated’s single architecture keeps our on-prem offering easy and consistent with the rest of our product.”

Kubos is now free to ship their Major Tom software to customers in an air gapped environment with little additional overhead. Adding to that, Replicated allows Kubos to troubleshoot customer problems from across the world by providing a robust set of Day 2 support tools.

As Paul puts it, “Replicated has really helped when it comes to any air gap customer problems. I can stand up a test instance, reproduce our customers’ problems, and come up with solutions before getting on a call from across the globe.”

“Replicated solved our problem immediately. Not only can we now provide an air gap solution for our customers, but Replicated keeps our on-prem offering easy and consistent with the rest of our product.”



Paul Jungwirth
DevOps Lead

The Future

When asked about how Kubos would have proceeded had they not found an air gap solution, Tyler puts it simply. “Without Replicated, we would have had to walk away from these contracts. We found a good way to open up our total addressable market with Replicated, and it allows us to target some unique opportunities in the future as less-spacefaring nations or areas with little internet connectivity begin to embrace spacecraft management.”

As Kubos grows, they can now ship Major Tom to any customer environment, even those with the strictest security needs. With their air gap deployment issues solved, Kubos can now get back to what’s important – providing ground control teams with cutting-edge satellite communication technology.

Paul concludes, “Nowadays, I wouldn’t recommend that anyone set up their own cluster for air gap installs. Just use Replicated.”

Final Thoughts

For many, 'air gap' may be a new or less familiar term. But as our software market matures in its approach to cloud and the data security and regulatory needs continue to grow and evolve, there's a compelling case to take a closer look at this specialized, unique 'flavor' of on-premises environment and what's needed to successfully distribute and manage applications to it. Whether you are serving organizations that exist in highly regulated environments or those that simply have bespoke privacy and data protection needs, the market opportunity to serve these customers can be quite compelling, widening an ISV's total addressable market with deeper, more valuable relationships.

Learn More:

Read: [Performing an Air Gap Install on an Existing Kubernetes Cluster](#)

Read: [Replicated -- Delivering Kubernetes Apps Anywhere, Including Air Gap](#)

Demo: [See firsthand how](#) Replicated can empower your enterprise software



REPLICATED

www.replicated.com