

CASE STUDY



Ambiental[®] Risk Analytics Saves Lives with Fast, Accurate Flood Plain Analyses Running in an OnApp[™] Private Cloud Powered by Intel[®]

Omnis Systems provides Ambiental[®] with a turnkey private cloud appliance using OnApp[™] software and Intel[®] Data Center Blocks for Cloud



Ambiental Risk Analytics (www.ambientalrisk.com) is a UK-based company, operating globally, that uses advanced simulation and analysis techniques to predict flooding and other natural hazards. Each year flooding causes billions of dollars of property damage and loss of life all over the world. Accurately predicting when and where a flood will occur can help governments and residents prepare and minimize the damage. Producing an accurate prediction, for even one section of a major river, requires the simulation of thousands of cells of data all interacting with each other, a hugely compute-intensive process. With Ambiental taking on new projects and working on a proposal to provide flood analysis for an entire country, they looked for a way to increase their computer resources. To provide Ambiental with the compute power they needed to meet current and future processing needs, systems integrator Omnis Systems created a solution built on the OnApp Enterprise Cloud, a private cloud infrastructure with OnApp private cloud management platform running on Intel[®] Data Center Blocks for Cloud.

The Challenge

Ambiental Risk Analytics (a trading name of Ambiental Technical Solutions Ltd) headquartered in the Sussex Innovation Center in Brighton, UK is a specialist in flood risk and hazard services. Ambiental produces ultra-high-detail flood risk data, risk maps and reports for (re)insurance companies, utilities, property developers, city council planning departments and governmental organizations.

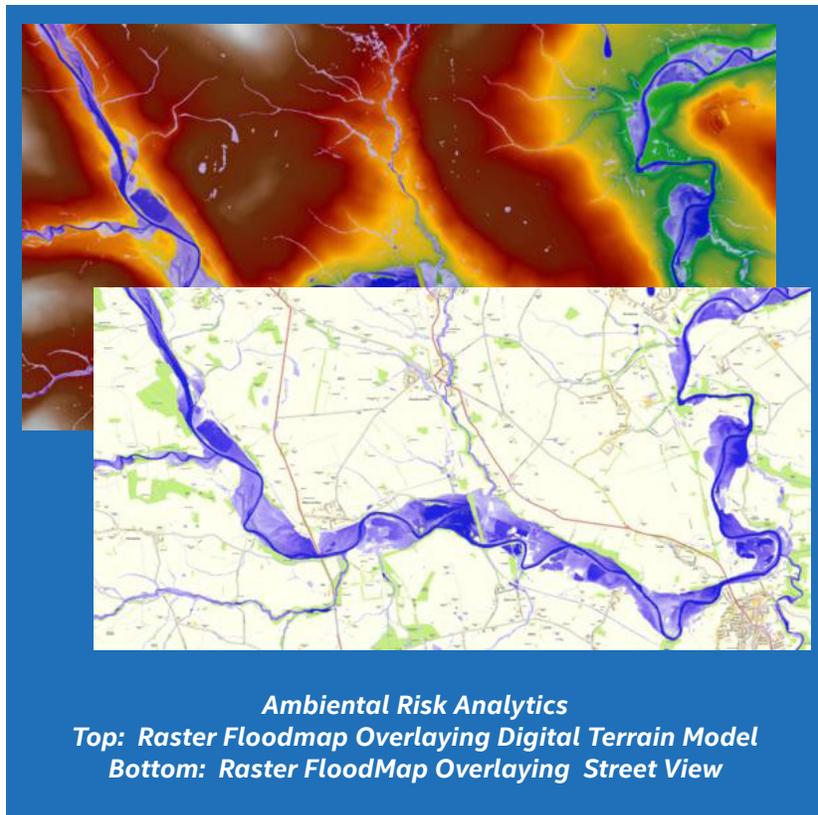
Building upon the success of its insurance-focused flood risk mapping and loss estimation platform, Flowroute-i[™], Ambiental has developed leading-edge technology for river, tidal, and surface water risk mapping, modeling and forecasting. The process starts by collecting data for the area under study including terrain models and hydrological inputs such as rainfall, and running simulations to show how river levels will behave under a number of conditions. Then

Ambiental analyzes simulation outputs to turn raw data into meaningful and actionable information – for example, relating them to a portfolio of insured assets, calculating the predicted impact of a potential flood event from a weather forecast, or quantifying future risk within a region to inform investment decisions.

This is a tremendously compute-intensive process. To simulate all rivers in the UK, Ambiental would need to simulate over one million independent models, with each model consisting of anywhere from a few tens of thousands of cells, to a few million, with each cell communicating with its neighbors at every iteration/time-step of the simulation. Each simulation models between a few hours to a few days of 'simulated time'.

“So, in terms of pure calculations, you would need to multiply the average number of cells, by the neighbors they communicate with, by the average number of iterations by the total number of simulations,” said David Martin, CTO at Ambiental Risk Analytics. “A rough estimate would therefore be 85×10^{15} (85 Quadrillion)... and that's just for the river model!”

With an increase in orders for their flood analyses and products, Ambiental started examining options to increase their computer resources. “We needed to significantly increase throughput. Due to increased demand we need more modeling, for more places, more quickly. And we currently have project proposals on behalf of clients involving flood forecasting for entire countries,” said Dr. Justin Butler, CEO at Ambiental Risk Analytics.”



Their existing resources were heavily reliant on outsourced HPC (High Performance Computing) infrastructures to do the bulk of their modeling. But this presented Ambiental with a number of problems. If the outsourced solution was down or not available, processing time was impacted. Typical issues encountered using outsourced HPC were increased data transfer time, maintenance control, troubleshooting, security, etc. Administration of Virtual Machines (VMs) was also problematic as some workloads required a large number of small VMs while other workloads ran on VMs requiring large quantities of RAM and CPU cores. Resource planning was always an issue.

Ambiental began their search for a platform on which they could run their workloads whenever they needed and for as long as

they needed without having to rely on an external provider's reliability. Potential remedies focused on a public cloud solution or increasing on-premises compute resources.

Enter Omnis Systems

Omnis Systems Ltd (<https://www.omnis-systems.com>) is an international distributor and systems integrator, also based in the Sussex Innovation Center in Brighton, specializing in commercially-backed Open Source and Linux based solutions. The solutions they promote scale from a few users to several thousands and are currently in use by many types of organizations in the Private, Public, Health Care, Education and Defense sectors. Mike Herd, the director of the Sussex Innovation Centre (<http://www.sinc.co.uk>), knew what Ambiental was doing and

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thought that Omnis could help them find a workable solution.

Omnis Systems had been evaluating cloud solutions, especially private cloud, for several years. They want to show both small and large organizations that they can own and be part of the cloud. "Centralization of services in the hands of a few conglomerates in the long term damages competition and innovation. It also has profound social and economic implications," said Paolo Vecchi, CEO at Omnis Systems Ltd. "Once most of the services are provided by a few entities there will be no choice but to give them all your data and pay them forever for the service. Owning a portion of the cloud allows you to maintain data privacy and security, an increasingly important concern due to new privacy rules and increased hacking." The idea of having a private cloud system in a self-contained unit was their highest priority.

As an Intel Technology Partner, Omnis learned about the new private cloud solution from OnApp and Intel, and saw its potential from the beginning. They liked the entire concept of being able to deliver an easy-to-use and extendable – locally and geographically – private cloud in a single appliance to their clients. "Now businesses can use the same platform that is used by ISPs (Internet Service Providers) to manage their workloads as if they were running on third-party services like AWS or Azure," said Vecchi.

A Cloud in a Box

Working together, OnApp and Intel have created a turnkey private cloud appliance that combines OnApp's cloud management software platform with Intel Xeon-based server hardware. Seeing the increasing need for private and hybrid cloud infrastructures, Intel assembled its latest compute, storage and networking technologies, based on its Data Center Blocks for Cloud, into a self-contained appliance in a 2U Intel H2224.

These data center blocks are unbranded, pre-configured and fully validated server systems that are designed for hyper-converged software infrastructure and optimized for software-defined storage solutions. Intel® Data Center Blocks for Cloud:

The appliance features up to four compute nodes, up to 24 hot-swappable drives and redundant power. Each node has two Intel® Xeon® processors and 16 DDR4 DIMMs for breakthrough performance, compute density, high-speed networking and I/O with stability and increased uptime.

But a server needs orchestration software to create a cloud. After examining several cloud management solutions, Intel selected OnApp for its feature-rich capabilities and ease of use. OnApp software gives you an extremely robust, end-to-end toolkit for building and managing clouds. It includes everything you need to build a production cloud, including comprehensive orchestration, provisioning, management, metering, security and multi-

cloud/hybrid cloud connectivity. Using OnApp enables companies to unify compute, storage and networking in one easy-to-deploy, easy-to-manage environment.

You can deploy OnApp and have everything ready to run – your hyper-converged compute, storage and networking in a private or hybrid cloud – in less than a day, rather than weeks or more using other orchestration packages. OnApp has a simple flat-rate license that is significantly more cost-effective than other vendors. And there is typically no need for professional services work, providing a healthier return on your IT investment.

The Requirements

Ambiental's requirements were simple. The system had to be able to run at least 60 computational VMs for core services with the ability to spin up additional VMs to manage collaboration and security for the cluster. Management of the cluster had to be easier than competing products. It had to be easily and quickly scalable beyond the initial configuration. And the system had to be cost competitive.

Processing-wise, Ambiental needed a platform on which they could run their types of workloads whenever they needed and for however long they needed without having to rely on an external provider's availability.

The Evaluation

Ambiental first considered Public Cloud services. But they soon discovered that the costs

of running their types of workloads would make them prohibitive. When they compared the cost of contracting for public cloud services with implementing their own private cloud, they found that the cost for just three months of cloud service was more than installing and owning their entire OnApp/Intel private cloud system.

So they turned their attention to a private cloud solution. "The ability to be self-sufficient when it comes to data hosting, delivery of our products and running the simulations is very important to us. This drove the need to have an in-house HPC/Cloud Computing solution that we can fully control," said Butler.

Omnis provided Ambiental with an OnApp private cloud cluster based on Intel's L9 Cloud Block to evaluate for two months. They were immediately impressed with its ease of setup, complete single pane of glass management, and feature rich software for private cloud. From receiving the cluster to the actual running of their first test workloads was only three days. This far exceeded Ambiental's expectations. And they saw how they can spin up an additional 60 VMs in just a few days by adding more memory, or in a couple of weeks by adding a new cluster – which, thanks to OnApp's ability to automatically discover and configure new servers added to the cloud, takes very little effort.

Omnis showed Ambiental how their system could scale and replicate easily. This is a big benefit for Ambiental to be able to spin up VMs anywhere and anytime they need. "It only takes

"It only takes a couple of clicks to add a VM."

David Martin
CTO
Ambiental Risk
Analytics

a couple of clicks to add a VM," Martin said. And being able to set up templates and scripts to automate VM creation will make the process even faster.

After initial setup, Omnis Systems helped Ambiental test the platform with Ambiental-specific workloads, which convinced them that they were on the right track. To give them a reasonable quantification of the benefit of the OnApp private cloud, they mapped out their processes from core production, applied each solution and evaluated how well it could improve each step of the process.

They also ran benchmark tests against another platform and examined technical results as well as administrative overhead. In this part of the evaluation, the benefits of OnApp included having everything in one place with fast administration of VMs and increased security. Ambiental now plans to use the system for flood forecasting for Malaysia, due in part to Asian governments' sensitivity to security. Information such as terrain maps, river maps, etc. are often considered sensitive military information.

Looking to the future Ambiental saw an additional potential benefit in being able to provide a cloud cluster to its customers on-premises. This will allow Ambiental to operate anywhere in the European Union without transmitting sensitive information over the Internet.

When the evaluation was complete, Ambiental presented the business cases with benefits and investment required to its board of directors which quickly approved the purchase.

The Solution

Omnis Systems provided Ambiental with a base model, rack-mounted OnApp private cloud based on Intel® Data Center Blocks. It has four nodes in an H2224XXKr2 chassis with 144 cores, 1TB RAM + Intel DC P3520 Series SSDs.

Each node was configured with 6TB storage, which is only needed for analysis and post-processing. Then the job is moved off to other servers for QA. Storage or RAM can easily be added if required.

After configuring the OnApp software Omnis completed Ambiental's Private Cloud with some additional components:

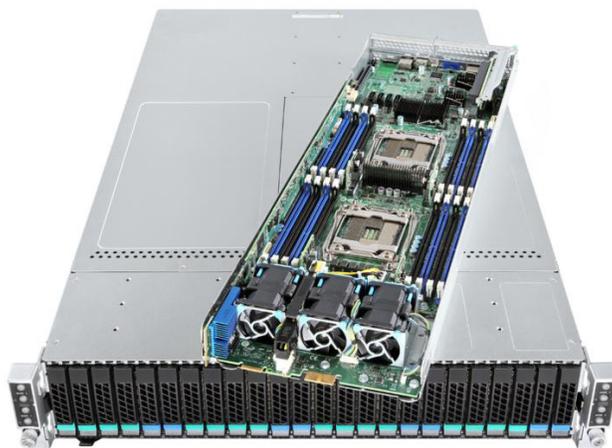
- Cumulus Network to manage the 10Gb switch on which data from the compute and storage nodes is distributed and replicated to guarantee resiliency
- Kopano Collaboration Platform for secure communications



including email, instant messaging and video conferencing

- NextCloud with integrated Collabora's LibreOffice on-line for internal and external secure file sharing and collaborative document editing.

The cluster ran 63 VMs for the evaluation and is ready to scale to hundreds or thousands of VMs by increasing the number of nodes. Nodes can be on the local cluster or even in remote sites, if customers require it due to regulations and data sensitivity, without disrupting current workloads.



Intel® Server Chassis H2224XXKR2 Supporting up to Four Hot-Pluggable Intel® Compute Modules, up to Eight Intel® Xeon® Processors and up to 24 2.5 Inch Hot-Swap Drives.

The Results

Quick setup means reduced time to start productive work

Ambiental immediately saw the potential for huge time savings since they don't have to book an HPC run with any third party or upload data to a remote system. Now they receive data and can start processing it straightaway without delay. This alone saves days of work. The ability to spin up VMs with a couple of clicks allows them to quickly meet current and additional processing requirements.

Increased compute power means more accurate results in shorter times

They also have realized significant efficiency gains by being able to run everything in one place. Before they would create the river flood model and, especially for a large territory, run thousands of overlapping scenarios. They would segment the terrain model into small pieces, integrate with hydrology on individual workstations, and transfer to the server for modeling. Then they would have to stitch it all together. Using their OnApp private cloud they do it all on the same disks for easier and faster connections. "It has allowed us to scope much larger projects, operating with higher resolution and accuracy levels in a shorter amount of time due to the speed and efficiency improvements," Butler said. "That means improved competitive advantage, and the highest quality data and predictive analytics for our clients so that they can make better strategic and operational decisions".

Greater throughput yields 3X process time improvement

In terms of throughput, Ambiental has seen a 3X speedup of their end-to-end process. They are still tuning and hope to soon realize a 4X improvement. And in addition to a dramatic increase in throughput, Ambiental is seeing an increase in interest and innovation from staff. It has created opportunities for process enhancement to turn up the efficiency of in-house processes. It has created a buzz with staff and clients. They are using it not only for flood modeling workloads, but also for secure storage and collaboration.

Decreased processing time yields larger and greater-resolution studies without additional cost

Simulation and analysis accuracy is always of prime concern. Prior to using their private cloud, for a new project Ambiental would examine the budget and time constraints and make engineering judgments on the precision and accuracy that they would be able to provide. With their OnApp private cloud they can usually do a full-resolution study with no extra cost.

On-premises system yields greater return on IT investment

And finally, they are saving on IT resources since they own their system rather than paying monthly for third-party compute resources. In the first year they will save 75% of the cost of renting cloud service. They have started with one unit which can handle their current project load. If they, or their clients, need more compute power they can easily expand to multiple units.

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Justin Butler
CEO
Ambiental Risk
Analytics

Learn More About OnApp Enterprise Cloud

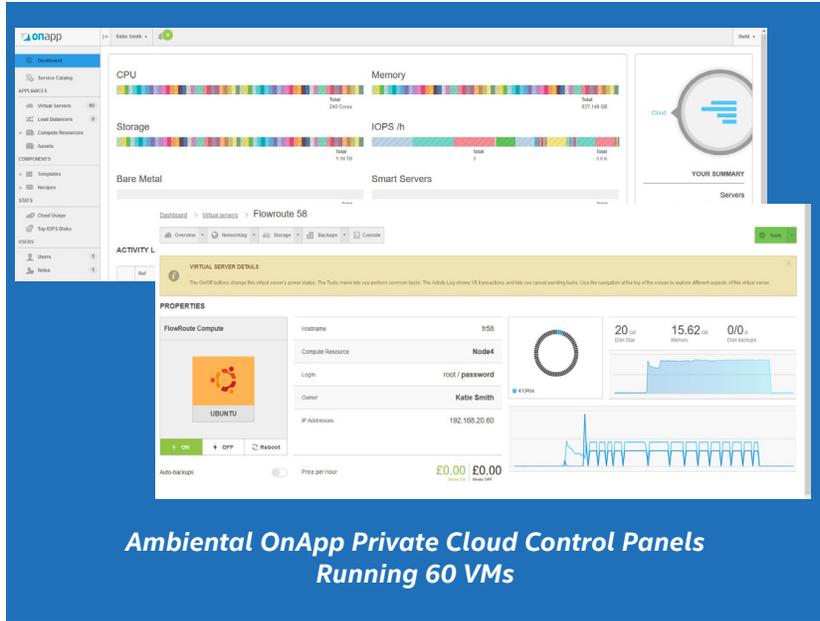
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Learn More About Omnis-Systems OnApp Enterprise Cloud Installation

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