Bloomfield Cultivates Ongoing Growth

Plant-imaging company gains a cloud computing partner that enables it to evolve

Reduced costs | **Gained expert guidance** | **Drove growth**

Although major problems daunt some people, that's not the case for Mark DeSantis. Throughout his entrepreneurial career, he has advanced technological solutions to improve the way things get done. That has included everything from transforming math education with software complemented by certified tutors to developing an artificial intelligence (AI)–based product that monitors and manages roadway infrastructure.

Building on his experience with AI, he joined the co-founders of Bloomfield Robotics — a spin-off from Carnegie Mellon University — in harnessing AI and imaging to improve crop management. "I appreciated the opportunity to help farmers better manage crop health and yields and, in turn, better feed the world," says DeSantis.

Revolutionizing crop management

As CEO of Bloomfield, DeSantis is in charge of a company and team that are operating a straightforward business model: The company's portable smart cameras — which can be attached to any farm vehicle — capture images of plants. The images are uploaded to the cloud, where deep learning algorithms analyze key plant features to determine plant health and performance. Farmers pay an affordable monthly fee for the tools and technology to assess the condition of their plants and determine the best time to harvest and when to intervene in the case of health or performance issues.

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Industry
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Although this may not seem like a game-changing approach, it is. Even satellites and drones can only give growers a general sense of crop performance. Bloomfield makes it possible to understand the condition of every plant — down to the size and health of each leaf — including the presence of disease and infestation. And it does so via an elegant, easy-to-use solution. Its approach is so unique that NASA awarded it a contract to help the agency grow food in space.

But, as we all know, outward simplicity often masks complexity below the surface.

Empowering farmers with smart cameras

As DeSantis says, "What we do is easy to explain but technically challenging." Bloomfield built its own hardware to capture the data that it processes with a combination of AI and deep learning. However, to achieve minimum scale, it had to empower growers around the world with its specially designed cameras.

The cameras must:

- Arrive safely to any location around the world
- Be user-friendly, enabling anyone to easily attach the camera to a farm vehicle
- Work without fail in dirty, dusty environments and difficult conditions, like on a farm experiencing desert-like conditions
- Geolocate plants precisely so farmers can easily and quickly match the image to the plant as they walk their crops

DeSantis continues, "We don't want to burden a customer with learning something to use our service, and that includes uploading images." With that in mind, Bloomfield provides a server with every camera. Once images get transferred to the server, they get automatically uploaded for analysis. The photos are stored with the output and displayed on a dashboard for the grower. Again, this is no small task behind the scenes.

Calling upon AI-powered imaging

Some growers manage more than 100,000 acres. To organize and present images and analyses in a way that makes them usable for growers, Bloomfield detects objects within images and instantly segments them.

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> Akamai has meaningfully impacted our business by helping us determine how to best organize, store, and present our data to customers.
>
> – Mark DeSantis,
> CEO, Bloomfield

As Ryan Ernst, Principal Software Engineer, explains, "That's when our unique capabilities kick in. After detecting objects, we can assign interesting attributes and add valuable information that help growers make informed decisions, such as whether plants are ready for harvesting or need to be treated for infestation."

Since each image scan is approximately 200 gigabytes and the company serves numerous customers, Bloomfield processes anywhere from 1 to 10 terabytes of images and data on a given day. "That data volume grows quickly depending on the season, type of crop, and other parameters," says Ernst.

Harnessing cost-effective CPUs while embracing multicloud

Bloomfield had long relied on Amazon Web Services for data processing and storage. As the company sought to optimize costs, it launched a multicloud strategy and searched for another cloud provider. "Fortunately, we use containers and designed a portable architecture and code. Plus, we use an overlay network that allows us and our customers to access resources anywhere in the world," explains Ernst.

As it considered its options, Ernst needed to decide whether Bloomfield should use CPUs or GPUs. After a thorough assessment, he discovered that scaling up 1,000 CPU tasks would be much cheaper and easier than spinning up 100 GPUs. Knowing that, Bloomfield chose Akamai Cloud Computing to power its data processing. "Akamai enables us to efficiently and cost-effectively scale our processing with CPUs," says Ernst.

In addition to getting needed compute power, the company has greatly benefited from Akamai's cloud expertise. "With customers around the world, we are dependent on the cloud. Akamai has tremendously impacted us as a tech startup. Akamai's experts helped us determine how to best organize, store, and present our data to farmers," adds DeSantis.

Helping farmers in game-changing ways

Bloomfield's unique capabilities are paying off for farmers worldwide, enabling them to better manage crop health and yields. Some of the world's largest blueberry growers — who grow fruit on thousands of acres — use the company's data-driven insights to efficiently schedule thousands of workers based on optimal harvesting times.

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We already found the right price-performance with Akamai Cloud Computing. Now we're excited to explore cloud computing on the edge via Akamai Gecko.

– Ryan Ernst, Principal Software Engineer, Bloomfield

Akamai

And vineyards in France — which often struggle to fight off a deadly parasite — use Bloomfield's cameras and technology to understand and improve the performance and health of each grapevine. "When you're managing a vineyard by walking hundreds or thousands of acres, you can't see every vine. But we scan every part of every vine — down to the leaves, shoots, and grapes — making it possible for growers to remedy issues before they get out of hand," explains DeSantis.

Bloomfield is also helping growers better manage the world's fruits and vegetables. DeSantis says, "We can tell farmers how to improve plant performance not just for a season but for each plant's full life. Now, farmers can do long-term planning in ways never before imagined. Plus, they can predict yields far more accurately than is possible using traditional methods."

Moving processing to the edge

Like many organizations that scale as they perform data-intensive processing, Bloomfield plans to use automation and GPUs via edge computing. "By creating a wrapper around the Akamai SDK [software development kit], we can automatically and dynamically provision and deprovision Akamai edge computing instances in line with the number of images we need to process," says Ernst.

At the same time, the company is looking to manage infrastructure for its customers — many of whom lack strong internet connections. Bloomfield uses Amazon ECS Anywhere to manage its containers and has built Kubernetes clusters that it can deploy in bandwidth-constrained locations. This architecture means the company can process data on the edge while still leveraging containers. "We want to push to the edge and are excited to see how the industry evolves, particularly with the announcement of Akamai Gecko. We're on a shared edge journey with Akamai and look forward to evolving together," Ernst concludes.

Bloomfield develops AI-driven plant-imaging technology that provides plant-level insights to help specialty crop growers make more informed management decisions.