The Dallas Zoo now knows what its elephants are really doing at night. You can, too.

"The RFID and Microsoft solution really has the potential to increase the quality of life and care we can provide to animals worldwide. It's also an incredible tool to help us tell the story of elephants in human care today."

Nancy Scott, Coordinator of Elephant Behavioral Science, Dallas Zoo

Zoos worldwide have been working overtime to provide larger, more natural, and more varied environments for perhaps the most intelligent species they exhibit: elephants. Now, the Dallas Zoo has gone a step further, using a combination of RFID ankle bracelets and the Microsoft cloud to gather more data, and more accurate data, than was previously possible. It analyzes that data to better understand how elephants behave and how the Zoo can better care for them. The pioneering solution is garnering interest from institutions worldwide and may be applied to serve a growing range of exhibited animals.

Microsoft

Like a rapidly growing number of people, Jenny wears a fitness band that tracks how much she walks each day. It's an important tool to identify when she gets enough exercise and when she doesn't. When Jenny has been a couch potato, for example, her handlers quickly know it, confirm she's not sick, and put her food where she'll have to walk farther to get it.

Jenny is an elephant.

She's one of a growing number of elephants—10, with the newest addition, Ajabu, born in May— that are part of a pioneering use of Microsoft and radio frequency identification (RFID) technology at the Dallas Zoo that promises to better the lives of exhibited animals everywhere, as well as educate visitors and the public at large to better understand and appreciate them.

What Scott now knows

With the technology—which uses RFID sensors to capture and feed real-time data into the Microsoft cloud—Nancy Scott, Coordinator of Elephant Behavioral Science at the Dallas Zoo, now knows that her elephants each walk an impressive average of 10 miles a day. She knows that Congo—whom she's dubbed "The Great Explorer"—is the first one out of the gate when given access to an adjacent habitat to mingle with other species like giraffe, zebra, and ostrich, and can walk nearly 17 miles a day. That's useful information to measure the health of elephants not only against their own histories but also against the typical range of the herd.

And with the help of a Power BI dashboard that visualizes all this data, Scott knows much more: not only how far each elephant travels each day, but also how quickly they move at any one time. She knows where in the five-acre Giants of the Savanna exhibit the elephants like to go—and don't like to go. Some are explorers. Some frequent the mud wallows, or the pools, scratching posts, log piles, shady spots, or hanging hay nets. When an elephant suddenly moves more slowly or stays near one spot, Scott knows the animal may be ill, leading to faster diagnoses and better health outcomes. Scott now has a keener understanding of whether the elephants have enough space and how they are using that space, so she can help devise ways to optimize their use of the exhibit.

Elephants are highly social, and the technology helps Scott to better understand those interactions. She can see which elephants are loners (keeping their distance) and which ones may be friends (frequently traveling together or stationary at night together).

"When I see two elephants have been close to each other at night, I know they're probably spooning," says Scott, though how elephants spoon may be difficult for some to picture.

> ***"What we've done in gathering more data—more accurate data—and understanding the behavior of the elephants would not have been possible without UTD and [Microsoft solution provider] US Medical IT. Their expertise and collaborative effort have been incredible."***
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> Nancy Scott, Coordinator of Elephant Behavioral Science, Dallas Zoo

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Customer Name: Dallas Zoo
Industry: Nonprofit
Country or Region: US

Customer Website: www.dallaszoo.com
Employee Size: 334
Partner: US Medical IT

Customer Profile: Founded in 1888, the Dallas Zoo is home to more than 2,000 animals and is thriving with new exhibits such as the Giants of the Savanna, the Koala Walkabout, and Wonders of the Wild. The Zoo is at the forefront of the movement to create natural environments in which animals have minimal or no interaction with people. But that adds to the challenge of understanding the behavior of the animals and how to optimize the environment to enhance animal welfare.

Partner Profile: US Medical IT (www.usmedicalit.com) is a Gold Competency Microsoft Partner based in Dallas, Texas, that helps people (and elephants) live healthier lives through the thoughtful integration of healthcare and technology.

Microsoft

"The Microsoft cloud is essential to our being able to track the elephants, gain new insights into their behavior, and get the information where it needs to go in real time."

Nancy Scott, Coordinator of Elephant Behavioral Science, Dallas Zoo

Not so a year ago

All this is a far cry from the insight that Scott could gain as recently as a year ago. The Giants of the Savanna exhibit was built in 2010 to take advantage of the latest knowledge in animal husbandry and give the elephants an environment that was far more natural to them than traditional zoo exhibits. But keeping detailed track of elephant behavior in the new exhibit wasn't possible: at first, zoo staff used a combination of video cameras and direct observation. But that left big gaps, and occasional errors, in the data.

That began to change in 2013 when the Dallas Zoo introduced elephant "ankle bracelets" powered by RFID technology. "Elephants are trained to show their feet to handlers for exams and pedicures," says Scott. "So getting the bands on them is simple, quick, and stress-free. It's like our wearing a watch or a wedding ring."

Now, Scott could know where each elephant was—down to one meter—and how far and how fast each traveled. But she had to manage many unwieldy spreadsheets to do so, and her software could handle only 15 days' worth of data at a time, making insights from long-term time data—such as what behavioral changes an elephant exhibited as it aged—impossible. Nor could the system integrate the observations about the animals with external data such as weather changes and even the Zoo's own attendance fluctuations.

That's where US Medical IT, a Microsoft solution provider and part of the

startup community at the University of Texas at Dallas Venture Development Department, came in. "What we've done in gathering more data—more accurate data—and understanding the behavior of the elephants would not have been possible without UTD and US Medical IT," says Scott. "Their expertise and collaborative effort have been incredible."

With the UTD Venture Development Center's financial support and US Medical IT's expertise, the Dallas Zoo enhanced its RFID system in 2015 with key components of the Microsoft cloud. A Microsoft SQL Server 2016-based data warehouse hosted on Microsoft Azure synchronizes the RFID data daily and links it to five other data sources. It then makes the data available to Power BI analysis and reporting services also running in Azure. The results of the analysis are displayed on Power BI dashboards on PCs, tablets, and even Apple watches, making insights available to handlers working in the exhibit, to visitors using proposed information kiosks, and to Scott wherever she happens to be.

"The Zoo uses SQL Data Warehouse in Microsoft Azure to integrate multiple internal and external data sources and make it available for powerful analysis," says Stephen Cracknell, CIO and President of US Medical IT. "This simply wasn't possible with the flat files and workstation that the Zoo formerly used for RFID data."

As a result, the Dallas Zoo can collect and analyze data across multiple years rather than just days. Scott and other staffers can avoid the need to set up or maintain computer systems for the solution and the Zoo is spared the cost of buying and maintaining that equipment. Also, additional internal and external data sources—such as attendance, weather, and moon cycles—can be factored into the analyses.

"The Microsoft cloud is essential to our being able to track the elephants, gain new insights into their behavior, and get the information where it needs to go in real time," says Scott.

Why respond to needs when you can anticipate them?

While the current solution is relatively new, its success has already led Scott to consider ways to expand both it and the benefits it generates. The addition of Azure Machine Learning, for example, could enable the Zoo not just to respond to its elephants' needs, but also to anticipate those needs, raising care to yet a higher level.

Nor are elephants the only animals that can benefit from the technology: giraffes, ostriches, and zebras can benefit too. Moreover, adding those other animals to the solution can help yield insights on how they interact with elephants and each other. Gorillas and other apes and monkeys pose an interesting challenge to the technology, because, unlike elephants and many other animals, they move not just in two dimensions, along the ground, but also in three dimensions, having the ability to climb trees. Scott is interested in exploring how the solution can be enhanced to take this into account.

Institutions around the US and the world are showing interest in the Dallas Zoo's innovative work, asking Scott how it can be adapted to their organizations and species. "The RFID and Microsoft solution really has the potential to increase the quality of life and care we can provide to animals worldwide," Scott says. "It's also an incredible tool to help us tell the story of elephants in human care today."

Can your fitness band do that?

Software

- Microsoft Azure
  - SQL Data Warehouse
- Microsoft Power BI
- Microsoft SharePoint Online
- Microsoft SQL Server 2016

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