Calling all Kiwis
Crowdsourcing conservation with the aid of cloud computing

Monitoring an endangered bird species is both a complex task and huge responsibility, so in a resource constrained environment the Department of Conservation (DOC) is turning to innovative new technologies to crowdsource conservation.

In a pilot using Amazon Web Services (AWS) cloud computing, DOC staff and third parties can upload, analyse, and share recordings of kiwi calls. The result is a less costly, more mobile and collaborative way to monitor kiwis.

As part of their overarching goal to conserve and protect New Zealand's natural environment, DOC aims to restore and, wherever possible, enhance the abundance, distribution and genetic diversity of all kiwi species.

Monitoring New Zealand's kiwi population previously demanded trained experts to be sent out into the field with a pencil, paper and recorder to track and record kiwi calls. The sounds were then saved to a flash drive, sent from the remote location to head office, then saved to an external hard drive which was sent on to experts to confirm the kiwi audio, and determine other identifiers such as its species and sex.

Department of Conservation
Te Papa Atawhai

The Department of Conservation manages all New Zealand's conservation areas. Working with a wide range of organisations and individuals, DOC protects native species and special places, and to help New Zealanders get involved in conservation.

"We have a small number of bright, skilled, and committed people spread across a wide variety of data collection protocols and monitoring activities. We are also committed to working with others to create more engagement with conservation... and to more conservation being done within New Zealand.

Our experts need tools to amplify their skills, and partners need tools they can use without having to be experts themselves." **Barry Polley, Business ICT Strategist, DOC**

DOC turned to Fronde for an innovative approach to this laborious, heavily manual, and time consuming task of kiwi monitoring. The solution is the **Kiwi Audio Analysis Tool**, which allows both DOC staff and partner organisations to upload recordings of possible kiwi calls to the AWS cloud. Once there, sound files are automatically analysed for evidence of kiwi calls and classified accordingly.

The DOC kiwi experts can then stream audio files to a range of devices from wherever they are - using a remote desktop to access a virtual library of birdsong to help them assess the number, sex, and species of kiwis throughout New Zealand.

Experts can save time as the algorithm - which constantly improves through machine learning - has already analysed the sound for them, while the tool works as an added intelligence layer for DOC workers and third parties looking to identify kiwi sounds. By using a collaborative approach and enabling mobile uploads and streaming, DOC is able to reduce costs while increasing their kiwi monitoring capacity.

Why use the Amazon Web Services Cloud?

Hosting the large sound files on AWS cloud and automatically analysing the audio on AWS servers allows for:

+ **Unlimited computing with minimum cost** - the shared desktop costs as little as 20c per hour, while the automatic audio analysis component costs between 2c and 39c depending on usage levels.

+ **Saving on hardware, and increased DOC team mobility** - by being accessible from anywhere, on any device with an internet connection.

Technical Snapshot:

All systems run on the AWS Sydney region, with the ability to run in multiple availability zones for redundancy. AWS services used include:

+ EC2 for computing resources
+ S3 for highly available low cost file storage
+ SQS for reliable message queuing
+ SNS for email notifications

The system also uses the Raven audio analysis package developed by the Cornell Lab of Ornithology, and Microsoft Remote Desktop Services for application delivery and audio streaming.

Fronde took the original Ornithokrites application, developed by data scientist Lukasz Tracewski, and enhanced its operation on AWS. Functionality was extended with key AWS advantages, such as:

+ Monitoring storage buckets for new audio files, and then bidding on the spot market for unused compute capacity to process the data at minimal cost.

+ Creating server instances that deploy when required and terminate themselves when processing is complete.

Fronde also continue to supply Managed Services for the application platform, ensuring ongoing optimisation of AWS resources and a simplified billing process.

An icon in need of our help:

+ There are five species of kiwi. All are endangered.

+ We are losing 2% of our kiwi every year – this equates to 27 per week.

+ There are approximately 70,000 kiwi left in all of New Zealand.

Source: DOC, 2014

Fronde

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