

Evolving Systems for Biodiversity Science: The Atlas of Living Australia's Next-Gen Cloud Platform Journey

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eResearch 2025



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Cape York Graceful Tree Frog
(*Ranoidea bella*)
Photo Credit Mark Simpson

The Atlas of Living Australia acknowledges the Traditional Owners of the land we're meeting on today – the Turrbal, Yuggera & Jagera Peoples. We pay respect to the past and present Elders of Aboriginal and Torres Strait Islander communities.

We honour and celebrate their spiritual, cultural and customary connections to Country and the biodiversity that forms part of that Country.

Reliable, open access to biodiversity data is critical

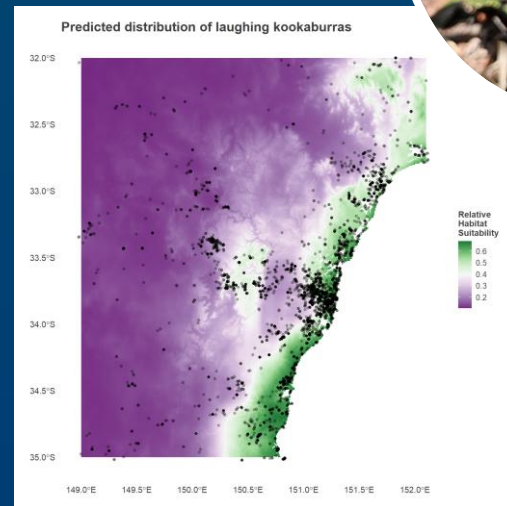
Timely access to quality data supports scientific research, conservation efforts, land-management & biosecurity initiatives.

This presents challenges and opportunities –

- New data types
- Data storage availability
- Authentication and authorisation
- **Need for scalability, adaptability, and robustness in products and infrastructure**



Prohibited cactus detection – Blind Prickly Pear (*Opuntia puberula*)
Photo credit Darren Fielder



Species distribution model of laughing kookaburras (*Dacelo novaeguineae*)
by Dax Kellie & Shandiya Balasubramaniam

Atlas of Living Australia (ALA)

Australia's national biodiversity data infrastructure

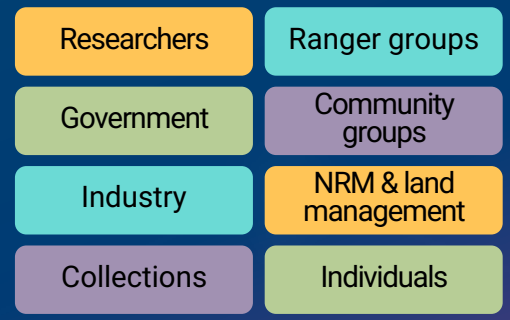
- Our mission is to:
 - Support research and decision-making on Australia's biodiversity
 - Provide trusted and robust biodiversity data services
- ALA aggregates & openly provides data



850+ data partners



140,000+ users



ALA application components



15+ applications



Servers



Monitoring



User & credentials management



Deployment pipelines



150+ web services & API Gateway



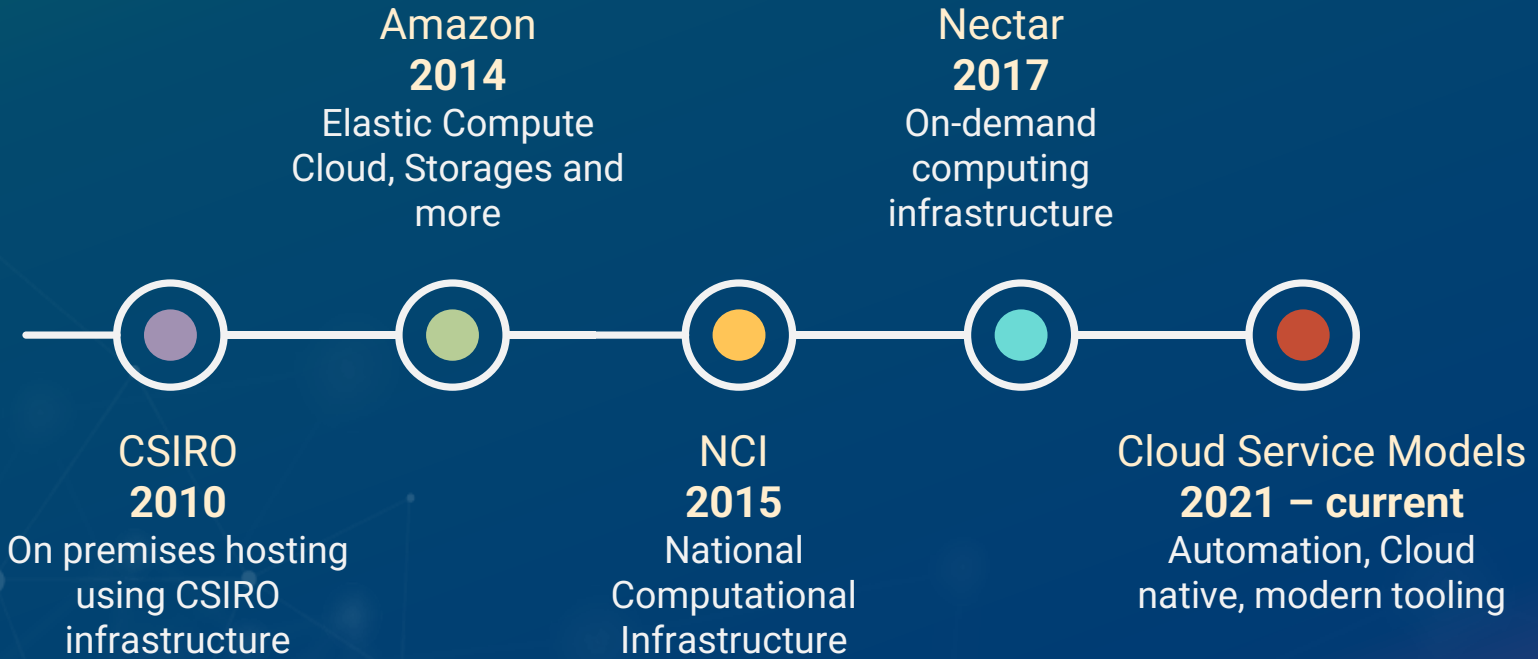
Databases

ALA's Next-Gen Cloud Platform Journey

Common Hermit Crab
(*Paguristes frontalis*)
Photo credit Johnheichler



ALA's Next-Gen journey



Growing pains

- Complex releases processes that were still prone to human error
 - Expertise & details locked up in individuals & local devices
- Manual processes
- Time-consuming server fleet management
- Reliability
- Security



Next-Gen Cloud Platform

Overhauling internal processes to make them automated, faster, more reliable

- ALA began our cloud uplift initiative in 2021
- Reduce management burden
- Team can focus on products / services, and our users
 - Product teams are empowered to control and launch systems



The Journey

Our goals



Full automation

deployment, scaling, auto-healing, rollback, notifications

Version control

across all infrastructure & configuration

Strong up to date security

High availability & fault tolerant architectures

Detailed monitoring & alerting

To enable our teams to deliver better services to our users through robust reliable products

Key advances



Emperor Angelfish
(*Pomacanthus imperator*)
Photo Credit Steve Smith

Key advances

Deployment automation

Everything related to a deploy is tied up in a single commit

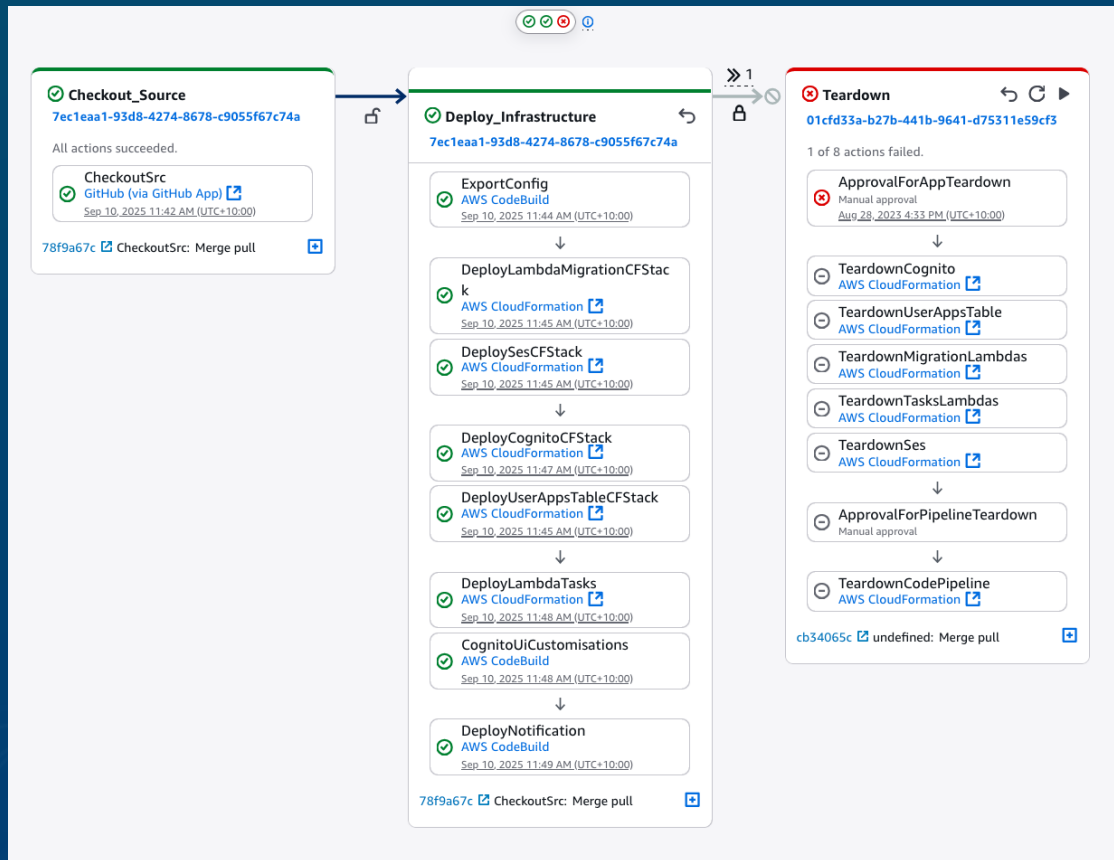
Includes:

- All code and application configuration
- Infrastructure and configuration
- Additional managed cloud services





Key advances

Deployment automation



Key advances







Deployment automation

user-auth-testing  

[Edit](#) [Stop execution](#) [Create trigger](#) [Clone pipeline](#) [Release change](#)

Pipeline **Executions** Triggers Settings Tags Stage

Q

Execution ID	Status	Source revisions	Trigger	Started	Duration	Completed
7ec1eaa1	 In progress	CheckoutSrc – 78f9a67c : Merge pull request #325 from AtlasOfLivingAustralia/development	StartPipelineExecution - assume-ala-developer/bri288@csiro.au	Sep 10, 2025 11:42 AM (UTC+10:00)	0 seconds	-
b6f2bb64	 Superseded	CheckoutSrc – 4353cc2f : Merge pull request #324 from AtlasOfLivingAustralia/feature/dccew_cms_ecodata_g...	StartPipelineExecution - AWSReservedSSO_PowerUserAccess_1ee3f748e3c5bf33/kan088@csiro.au	Sep 4, 2025 12:36 PM (UTC+10:00)	5 days 23 hours	Sep 10, 2025 11:49 AM (UTC+10:00)
651edc8d	 Superseded	CheckoutSrc – aa314635 : Merge pull request #322 from AtlasOfLivingAustralia/development	StartPipelineExecution - AWSReservedSSO_PowerUserAccess_1ee3f748e3c5bf33/kan088@csiro.au	Aug 13, 2025 9:04 AM (UTC+10:00)	22 days 3 hours	Sep 4, 2025 12:43 PM (UTC+10:00)
1d08cc06	 Failed	CheckoutSrc – 90becaaa : Merge pull request #321 from AtlasOfLivingAustralia/development	StartPipelineExecution - AWSReservedSSO_PowerUserAccess_1ee3f748e3c5bf33/kan088@csiro.au	Aug 13, 2025 8:45 AM (UTC+10:00)	7 minutes 24 seconds	Aug 13, 2025 8:53 AM (UTC+10:00)
8ae64d8	 Superseded	CheckoutSrc – 029182e0 : Merge pull request #316 from AtlasOfLivingAustralia/development	StartPipelineExecution - assume-ala-developer/bri288@csiro.au	Jul 14, 2025 2:23 PM (UTC+10:00)	29 days 18 hours	Aug 13, 2025 9:10 AM (UTC+10:00)
9e931bf8	 Superseded	CheckoutSrc – 1758be7a : Merge pull request #313 from AtlasOfLivingAustralia/development	StartPipelineExecution - assume-admin/lip042@csiro.au	Jul 7, 2025 10:29 AM (UTC+10:00)	7 days 4 hours	Jul 14, 2025 2:30 PM (UTC+10:00)

Key advances

Deployment automation

Benefits

- All changes source controlled and reviewed
- Easy rollback of entire app ecosystem to any point in time
- Consistent environments between testing and production
- Easy to spin up any number temporary development environments
- Automated cleanup
- Development teams empowered



Key advances

Application re-architecture

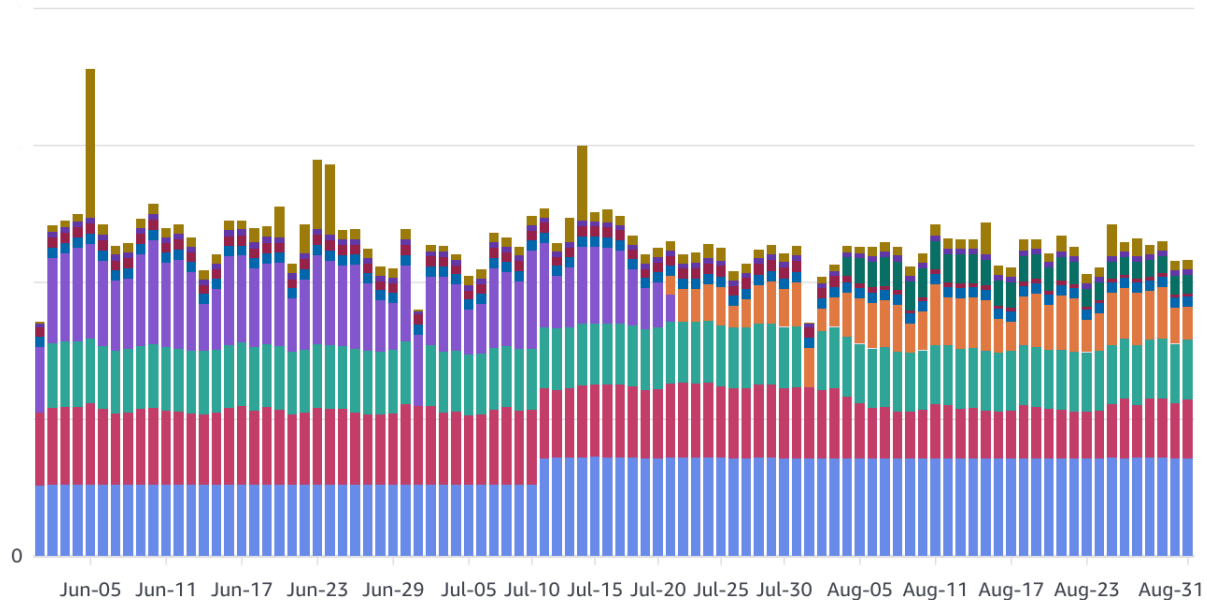
- Applications re-architected to take advantage of new capabilities
 - Use of managed services where possible
 - Apps become self healing in the case of hardware or systems failures
 - High availability – If a system fails it gets automatically detected and relaunched
-
- Fault Tolerance – Redundant systems so if one fails then another picks it up
 - They can scale up and down automatically to respond to high load

Key advances

Costs and emissions

Cost and usage graph

Costs (\$)



■ APS2-CW:GMD-Metrics
 ■ APS2-CW:MetricMonitorUsage
 ■ DashboardsUsageHour-Basic
 ■ APS2-VendedLog-Bytes
■ APS2-VendedLogIA-Bytes
 ■ APS2-CW:DatabaseInsights-vCPU-Hours
 ■ APS2-DataProcessing-Bytes
■ APS2-CW:ObservationUsage
 ■ APS2-TimedStorage-ByteHrs
 ■ Others

Key advances

Security & performance management

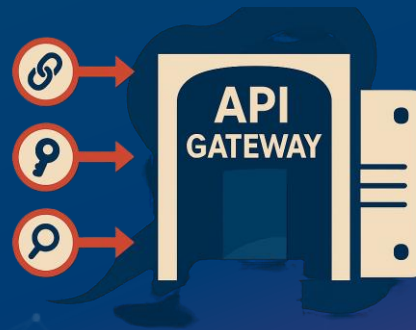
Web Application Firewall (WAF)

- Managed but highly configurable service
- Has been essential in limiting service degradation and downtime from malicious and high-volume bot traffic



API gateway

- Centralised management
- Integration with other services like WAF, Lambda
- Access keys for authentication and rate limiting
- Detailed reporting and dashboards



Key advances

Managed services

Databases (MySQL, Postgres, MongoDB)

- No server or OS to manage
- Vastly simplifies many operations tasks like backups, upgrades, monitoring replication and scaling



Managed secrets

- Secure centralised secrets management



User login and authentication

- Handles signup, user management, permissions, password resets, MFA, security



USER LOGIN



Key advances

Managed services

Containerisation

- Using Kubernetes
- Managed service looks after control plane and servers




Object storage

- Cheap and very resilient file storage and hosting
- Options for different applications to balance cost and features
 - E.g. long term backups vs. high volume millisecond latency



Challenges & lessons



Spectacular Crab Spider
(*Thomisus spectabilis*)
Photo Credit Steven Gill

Challenges & lessons

During transformation

- Time and resourcing to uplift while maintaining existing systems
- Significant change; can require rewrites and other changes
- New procedures
- Additional training

After transformation

- Costs must be consistently monitored
- Constantly changing product / feature landscape
- Vendor-specific solutions

Outcomes & future horizons



Black Swan (*Cygnus atratus*)
Photo credit doborod

Outcomes & impact

Security

- Stronger and up to date security through managed platforms and services e.g. Using S3 for storage, can't execute code on S3
- Systems like WAF provide active protection

Efficiency

- Greater speed and reliability of deployment through automation
- Additional versatility, applications faster to stand up and pull down

Costs

- Greater cost visibility has led to changes in the services we use
- Proactive alerting when we get unexpected usage spikes means faster remediation

Footprint

- Visibility on emissions impact of our services has led to different platform decisions




Future

- There's still a lot to do!
- We've migrated some existing applications, many more to do
- We could benefit from some deeper re-architecting with greater adoption of new tools and managed services
- It's journey that will continue as tools and techniques evolve and our requirements change, the journey continues





Atlas of Living
Australia
ala.org.au



Scarlet Banksia (*Banksia coccinea*)
Photo credit Tony Futcher

Thank you, please get in touch if you have any questions.

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B1/B2/B3