Blockchain Commons for Autonomous Digital Custodianship

Designing a Dual NFT Infrastructure for Indigenous Food Sovereignty and Collective Benefit

Shoufeng Cao

Honorary Research Fellow, The University of Queensland

Founder and Director, DSC NextGen Ltd

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Cultural Acknowledgements

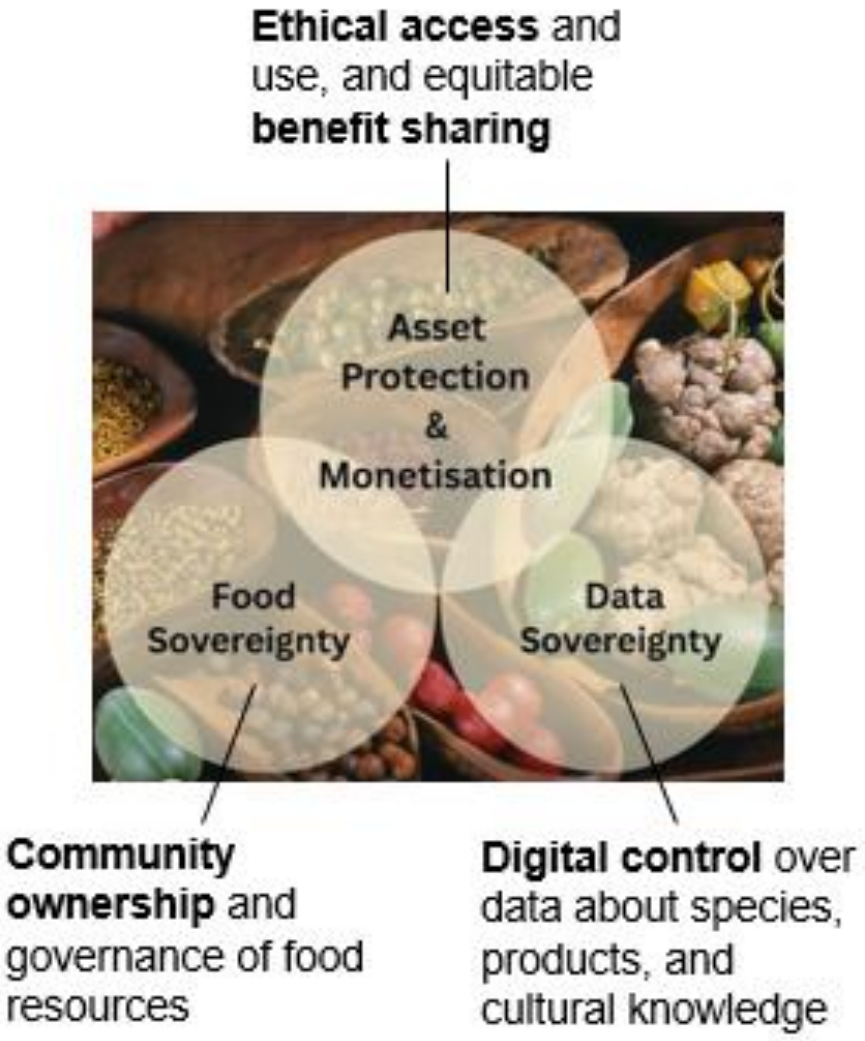
I would like to begin by acknowledging the Turrbal and Jagera peoples, the Traditional Custodians of the lands on which we meet today. I pay my respects to Elders past and present, and recognise their continuing connection to land, water, and community. I also extend that respect to all First Nations people.

What I Will Cover in This Talk

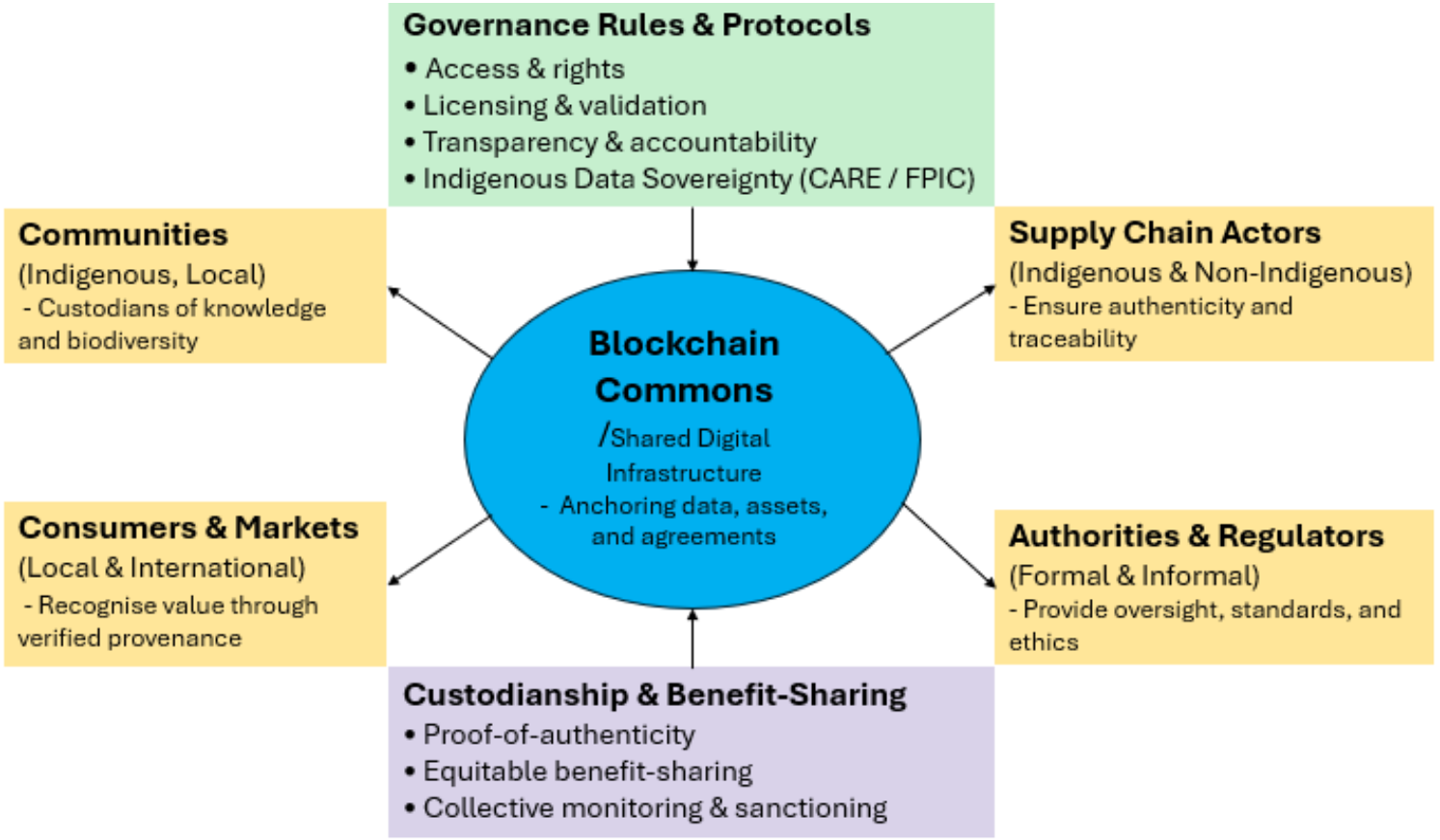
1. Context and Rationale
2. Conceptual Foundation - Blockchain Commons
3. Autonomous Digital Custodianship
4. Bushfood System as Case Context
5. Dual Bushfood NFT Infrastructure
6. Architecture Diagram & Technical Workflow
7. Proof-of-concept Implementation
8. Benefits and Outcomes
9. Conclusions & Next Steps
10. Closing & Acknowledgments

Context and Rationale

- Rising importance of **food sovereignty**, **data sovereignty** and **Indigenous-led autonomous governance**
- Fragmented systems for traditional knowledge, Indigenous IP and other key asset protection and monetisation
- Need for a **commons-based**, **custodianship-oriented digital infrastructure** to ensure autonomous digital custodianship, transparency and equitable benefit-sharing



Blockchain Commons



Adapted from Ostrom's Commons framework

- Core principles: shared governance, transparency, accountability and digital autonomy
- Data governance: links to AIATSIS, FPIC, Indigenous Data Sovereignty principles, and FAIR/CARE Framework

Autonomous Digital Custodianship

Digital custodianship is the secure storage and management of digital assets

- **Blockchain and smart contract** enable digital custodianship that is transparent, verifiable and self-executing
- **Tokenisation of real-world assets** is an emerging trend in autonomous digital custodianship for asset management
- **Non-fungible tokens (NFTs)** as trusted digital custodians, while creating ***new value streams***

Bushfood Systems as Case Context

- The Australian Indigenous bushfood sector is relatively small, but is growing rapidly and more importantly embedded with **cultural, ecological, and economic significance**

The Challenges:

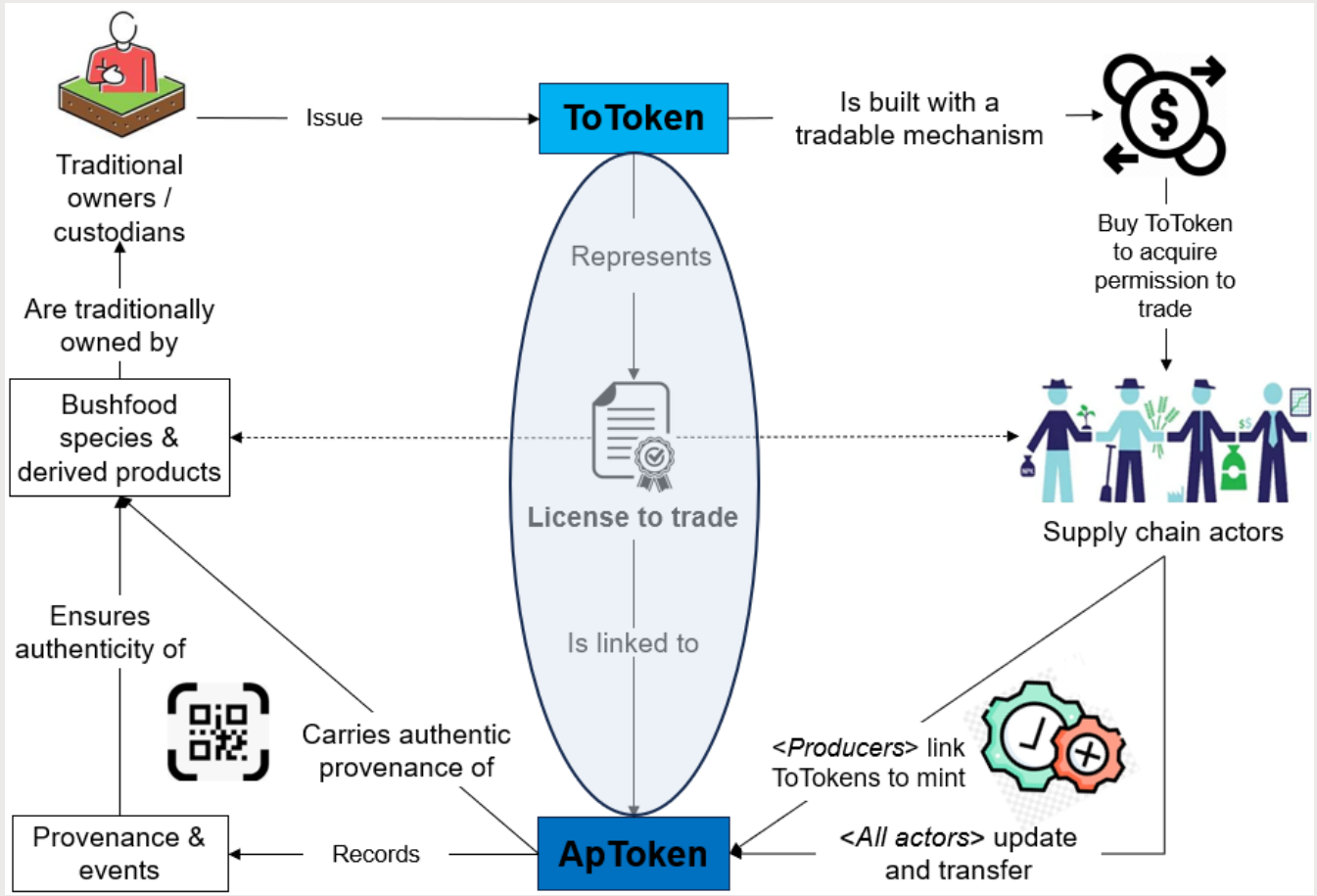
- Existing traceability systems privilege origin of the product, not ownership or custodianship

- Indigenous rights often “attached” but not autonomously controlled and appropriately monetised for community benefits

- Lack of digital mechanisms for shared benefit and collective governance

Dual Bushfood NFT Infrastructure

- *Traditional Ownership Token* (**ToToken**) represents ownership, rights and custodianship



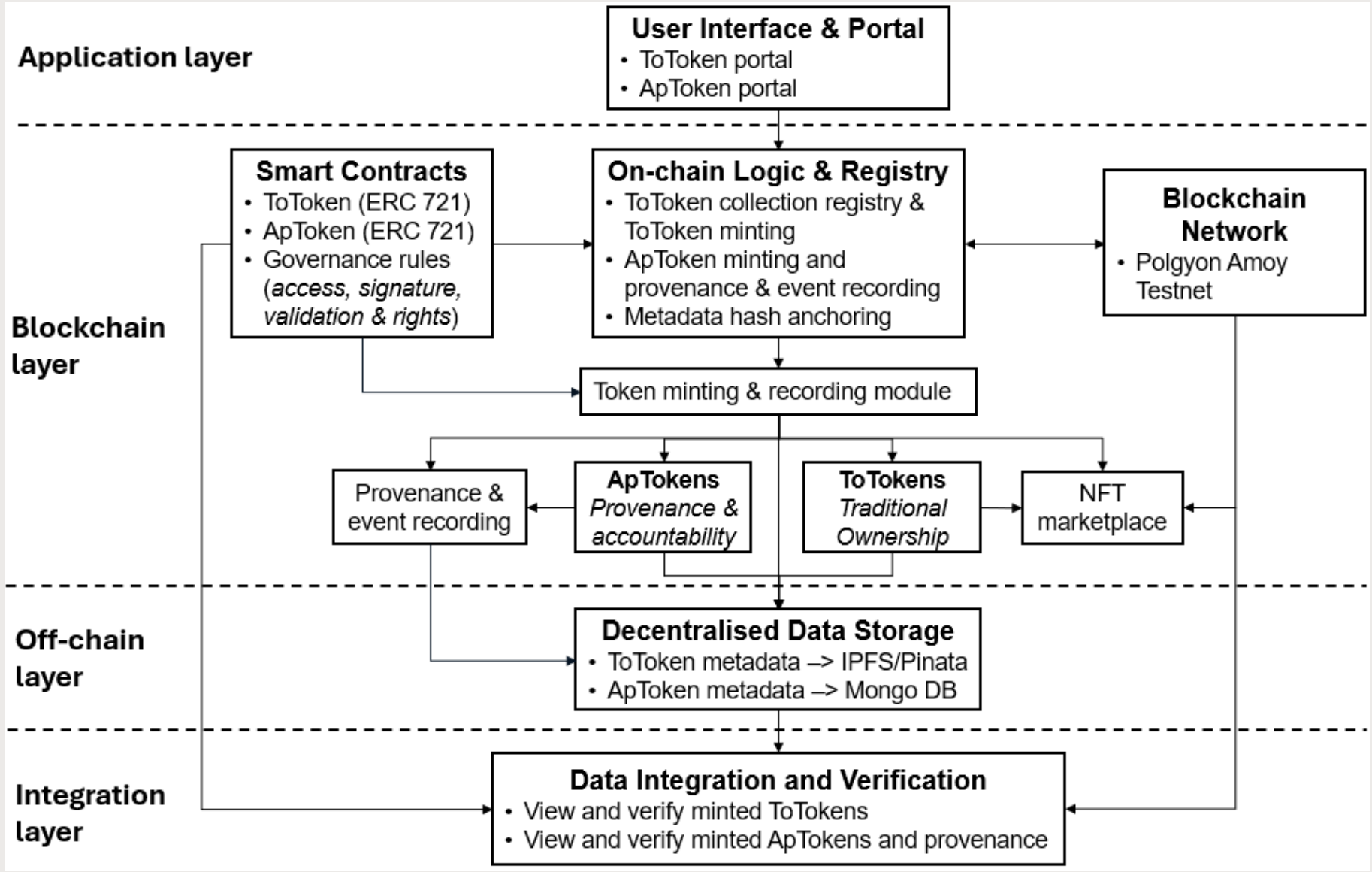
Ownership

Product

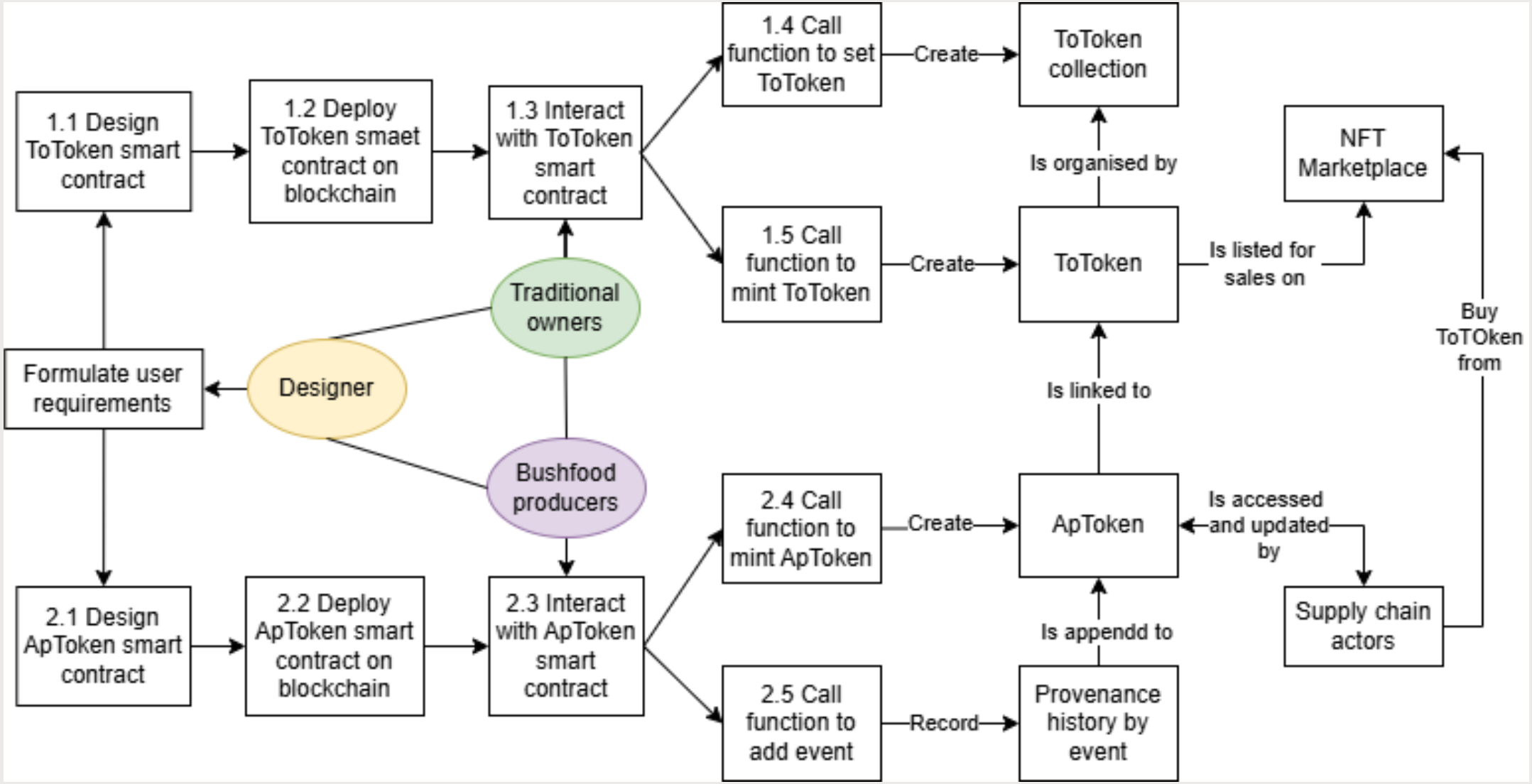
- *Authentic Provenance Token* (**ApToken**) represents authenticity and provenance

Architecture Diagram

Four layers



Technical Workflow for Dual NFTs

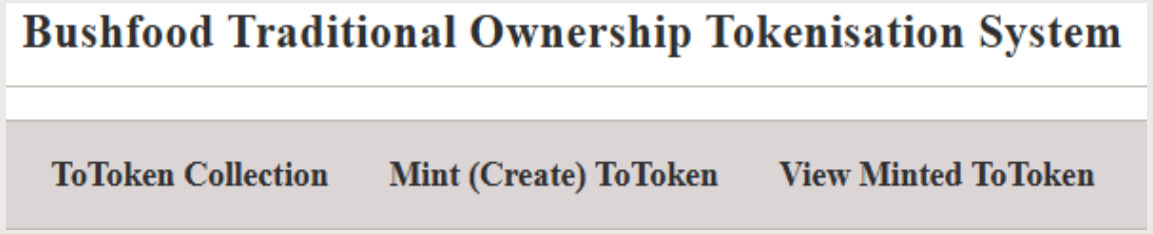


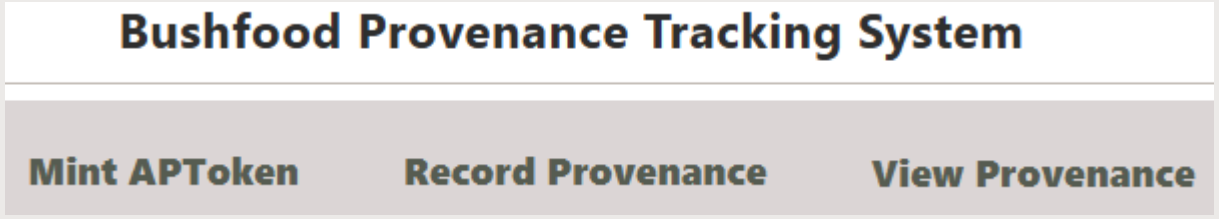
Proof-of-concept Implementation

Testbed: Polygon Amoy testnet – *a testnet that serves as a testing environment for the Polygon PoS network*

Features demonstrated:

- Minting ToTokens and ApTokens
- Linking ApTokens with ToTokens to ensure community benefits
- ToToken sales on an NFT marketplace
- ApToken for bushfood provenance recording





ToToken Demonstration

ToToken Collection and Bushfood ToTokens

ToToken Collection Profile:

Collection Name: BTOAC Collection

Collection Description: This BTOAC Collection contains various TOTokens owned by the BTOAC community

Collection Cover Image:

External Link: https://www.uq.edu.au/news/article/2021/02/towards-indigenous-led-bushfood-industry

Blockchain Explorer: View Collection (Contract) on Polygon

Token ID: 1

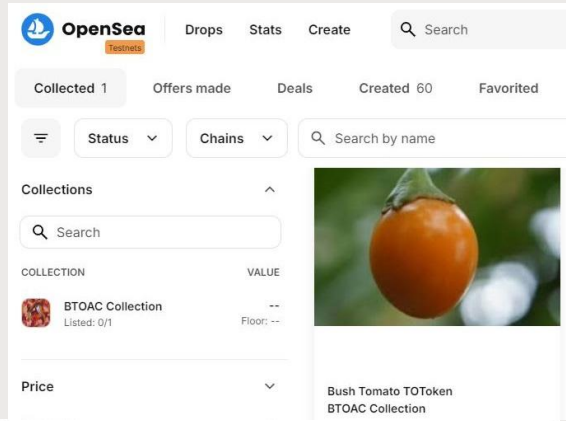
ToToken Name: Bush Tomato TOToken

ToToken Description: This Bush Tomato TOToken represents the traditional ownership of bush tomatoes owned by the BTOAC community

ToToken Image:

Blockchain Explorer: View Token on Polygon

NFT Marketplace: View & List Token on OpenSea



Token ID: 2

ToToken Name: Native Plums TOToken

ToToken Description: This native plums TOToken represents the traditional ownership of native plums owned by the BTOAC community

ToToken Image:

Blockchain Explorer: View Token on Polygon

NFT Marketplace: View & List Token on OpenSea

https://totoken-demo.vercel.app/

ApToken Demonstration

Token Details

Token ID: 1

Token Name: Bush Tomato Provenance

Token Description: This APToken is used to record and track the provenance of bush tomatoes owned by the BTOAC community

ToToken Url:
https://testnets.opensea.io/assets/amoy/0x100993cede29fbba22aba5ec3b1ba45ba4e4e073/1

Metadata Hash:
0xf06525fa4396574e039463972fb38e99abb34e9807b06196ad9183e4f6fc5dfb

Signature:
0xd58d04dfe5009827dad6998970ae64835e175260aeddd4566b903e7f911b6af22edf61fc21e4425bb74b5a5ff630211dd875a1f93f35f3fc4d3d8f8544b14d801b

Transaction Hash:
0xf91e61eb3a1ce09fb69953b144e48f008bbb0afa77ef64b75d91f696230d0e0d

Timestamp: 30/09/2024, 12:17:09

Blockchain Explorer: View Token on Polygon

Verify with Blockchain

Event 1:

Event Name: Production

Description: This bush tomato is produced by SC family.

Event Hash:
0xdec6ea8c56578483850719df676d1b08081a5246d7318d038c94356d9c2ed6b6

Signature:
0x1239504b03eb7432a5c44c70d52c7b5cc93d92a3ec5fdd756f73433f1daeb5df42aa6d4c44f887b3a1fc72543ca815012662d56a887e2125bc0a4554da372e9a1b

File:
services/uploads/6eaf4d7a290d231e7395d1f5b4c0652bdd081b4891c5fb5b08076fe554a6edf4.pdf

Transaction Hash:
0x2a80108cb1f53f9dd6491f195f3696ffe6a49640fe24e267e601ab8ce23632db

Timestamp: 30/09/2024, 12:19:25

Blockchain Explorer: View Event on Polygon

Event 2:

Event Name: Harvest

Description: This bush tomato is harvested on the LC farm

Event Hash:
0x83df29d27ff80260173ab233a495329d9d9142f3d6f490feff3acea8eb54ac97

Signature:
0xeb43b985235dbc322160862089ae6bc233f58bda937a1de4fd9c095a53009ef26f3dd598dc57ade2dff5275f0f8d50a3b9d52aa332b5d176e0c91a300ae1f6e21c

File:
services/uploads/0d41b85601ae2146e978a4fbb0aa6449fffc5b8764fb56c580113245075cc4e5.pdf

Transaction Hash:
0x4a3386f8281108ee10083982b8f71461d8cf18a1ff19cfeb2a26dca050624f81

Timestamp: 30/09/2024, 12:22:13

Blockchain Explorer: View Event on Polygon

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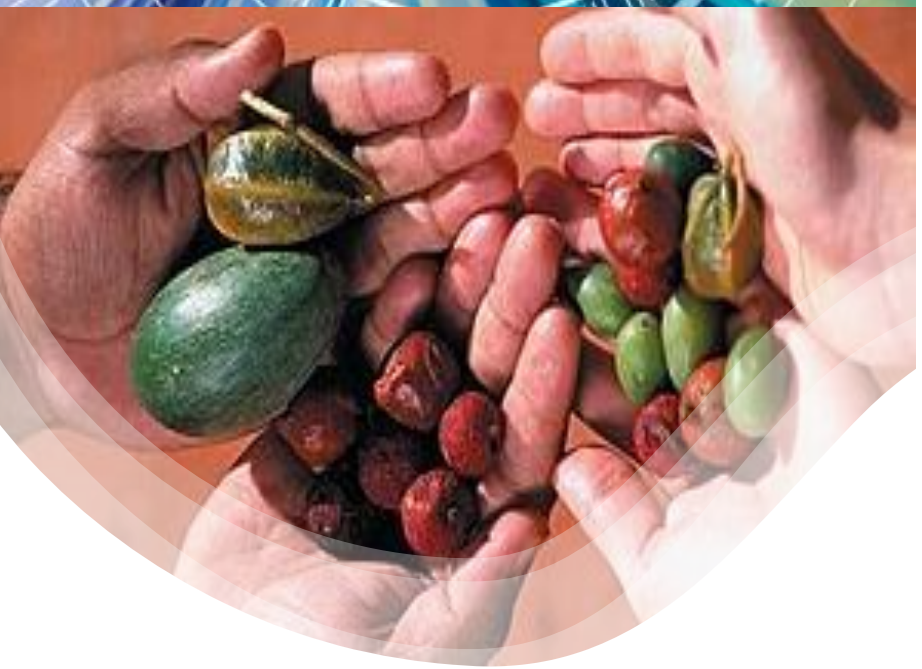

Collective Benefits and Outcomes

- **For indigenous communities**: Bushfood and data sovereignty, benefit-sharing, cultural and knowledge asset monetisation
- **For industries and businesses**: Ethical sourcing and market differentiation
- **For Consumers**: Trusted provenance, ethical purchasing and consumption
- **For ecosystems**: Transparency and accountability across value chains

Conclusions

Key Takeaways from Our PoC:

- Blockchain Commons provides a self-governing digital space that ensure transparency, accountability and digital autonomy

- Dual NFT infrastructure realises both custodianship and traceability

- Polygon (*A layer 2 scaling solution for Ethereum*) pilot confirms technical feasibility and cost effectiveness

Next Steps – Future Integration

- Integrate IoT/RFID for bushfood supply-chain tracking
- AI/ML for generative content and predictive analytics
- Ethics-controlled data pipelines ensuring CARE-aligned research and development
- Develop a **bushfood app-chain** or **layer-2 solution** to strengthen community-controlled governance.
- Pilot case implementation for industry adoption

- Indigenous Community Collaborators: WAC and BTOAC, YACHATDAC
- ARC Indigenous Discovery Funding
- Technical & research partners

Contact details

Dr Shoufeng Cao

The University of Queensland

DSC NextGen Ltd

s.cao@uq.edu.au