Digital Lockout-Tagout in Australian Mining

A white paper on the use of electronic lockout devices and software-based Lockout-Tagout systems in the control of hazardous energy sources in Australian Mining.

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This white paper discusses the use of electronic lockout devices and software-based Lockout-Tagout systems in controlling hazardous energy sources during the servicing and maintenance of mining plant and equipment. In the Australian mining context, where high-energy systems (electrical, hydraulic, and mechanical) are prevalent, the unexpected energisation or release of stored energy remains a leading cause of fatalities and injuries.

The aim is to introduce Mine Site Senior Executives (SSEs), Electrical/Mechanical Engineering Managers, and Safety Professionals to the benefits of Digital Lockout-Tagout systems while addressing alignment with state-based Work Health and Safety (WHS) Mining regulations.

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1 Background

Controlling hazardous energy sources through isolation is a statutory requirement across all mining jurisdictions. Traditional manual practices have remained largely unchanged for decades; however, as mine sites grow in complexity and workforce size, manual systems face significant challenges:

- Logistical Burden: Managing hundreds of physical locks and keys across expansive sites leads to lost keys and unauthorised lock removals.
- Verification Gaps: Manual tags provide no data-driven assurance that an isolation was actually tested for effectiveness (the "Test for Dead").
- Administrative Friction: Paper-based permits and isolation registers are prone to legibility issues, slowing shift handovers.
- Compliance Risks: Difficulty in providing immediate, real-time audit trails for inspectors from regulators.

Digital Lockout-Tagout systems utilize cloud computing, IoT sensors, and mobile interfaces to transform isolation from a manual administrative task into a monitored, data-verified safety process. By integrating software "Virtual Lockboxes" with physical electronic hardware, mines can achieve easy LOTO operations and a higher level of visibility over isolation status.

Benefits of Digital Lockout-Tagout systems include:

- Enhanced accountability by ensuring that all participants in the process are individually identified and their activities are electronically recorded.
- Greater flexibility by allowing some traditional Lockout-Tagout activities to be performed better to match the service and maintenance needs of the business.
- Improved visibility and control of lockout activities across workgroups by providing all participants with the latest up-to-date information to ensure coordination of safety activities.
- Reduced costs by dramatically improving setup time in large or complex group lockouts, reducing the overall number of locks and group lockout hardware, and eliminating the need to cut or replace locks.

2 The Digital Lockout-Tagout System

2.1 Overview

Digital Lockout-Tagout systems typically comprise four major components: the electronic lockout device, a smartphone or tablet device, a SmartTag, and various cloud-based software services.

The following figure shows a simplified overview of the Digital Lockout-Tagout system and the interconnection between the different components.

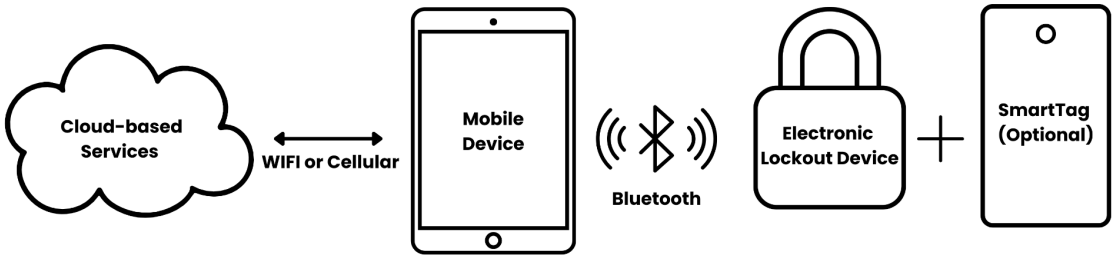

Figure 1: System Architecture and Connectivity — An overview showing how Cloud-based services communicate with Mobile Devices via Wi-Fi/Cellular, while Mobile Devices connect to electronic lockout devices via Bluetooth and have the option to attach a SmartTag for identification purposes.

The mobile device communicates wirelessly with the electronic lockout device (typically over Bluetooth) and communicates with the cloud-based services over Wi-Fi or Cellular data networks. An optional SmartTag, typically including a QR code, allows users to scan to retrieve information about the lockout.

2.2 Physical Components

The physical components of a Digital Lockout-Tagout system typically are:

- A machine, or equipment, requiring isolation for service and/or maintenance (e.g., conveyors, crushers, LV/HV switchgear).

- An energy isolating device that prevents the unexpected energisation or startup of the machines or equipment, or the release of stored energy, could cause injury to employees.
- An electronic lockout device is an electronic padlock used by an authorised employee to lock out a machine's energy isolating device.
- A smartphone or tablet device that runs the Digital Lockout-Tagout application used by all employees involved in the lockout process.
- A SmartTag with a QR code that can be scanned by mobile devices to identify who is locked on, when they locked on, and what machine they are locked on to.

2.3 Software Components

The software-based components of a Digital Lockout-Tagout system typically are:

- A Digital Lockout Application that is the user interface to the Digital Lockout-Tagout System used by all employees involved in the lockout process.
- A cloud service that provides the digital keys, virtual lockboxes, and virtual personal locks.
- A digital key is used to open the electronic lockout device.
- A virtual lockbox is a software version of a physical lockbox; it performs the same function as a physical lockbox and contains the digital key required to open the corresponding electronic lockout device.
- A virtual personal lock is a software version of a physical personal lockout lock that can be applied to a virtual lockbox.

2.4 Persons Involved

Typical persons involved in a Digital Lockout-Tagout system include:

- An authorised employee (Isolation Officer) is responsible for applying and removing the electronic lockout device from the machine's energy isolating device.
- A non-authorised employee (Work Group Member) who is assigned to the service and/or maintenance of the machine but is not responsible for

applying or removing the electronic lockout device from the machine's energy isolating device.

2.5 Digital Key

Each electronic lockout device has a matching encrypted digital key that is securely stored in the cloud service and can be downloaded to the Digital Lockout application to open the corresponding Electronic Lockout Device.

2.6 Electronic Lockout Device

An electronic lockout device is typically a battery-powered Bluetooth Padlock specifically designed for Digital LOTO. The electronic lockout device performs the same function as a traditional lockout device. Still, instead of using a physical key, it uses a digital key that is communicated to the device over Bluetooth from the user's smartphone.

2.7 Virtual Personal Lock

A virtual personal lock is a software version of a physical personal lockout lock. A virtual personal lock performs the same function as a physical lock, and one or more virtual personal locks can be applied to a virtual lockbox.

Each virtual personal lock is associated with an individually authenticated user of the system (the owner), and the identity of that user is attached to the virtual personal lock.

Only the virtual personal lock owner can open or close their corresponding virtual personal locks.

2.8 Virtual Lockbox

A virtual lockbox is a software version of a physical lockbox. A virtual lockbox performs the same function as a physical lockbox in a group lockout activity, but

exists in the cloud service and is accessible to the smartphone app via the internet.

A virtual lockbox can contain none, one, or more digital keys, and each virtual lockbox can have none, one, or more virtual personal locks attached.

A virtual lockbox is ‘open’ when no virtual personal locks are attached. When the virtual lockbox is ‘open’, the contained digital keys can be used to apply and/or remove the corresponding electronic lockout device using the mobile application.

A virtual lockbox is ‘closed’ when one or more virtual personal locks are attached. When the virtual lockbox is ‘closed,’ the contained digital keys cannot be accessed or used, and the corresponding electronic lockout device cannot be opened by any mobile application.

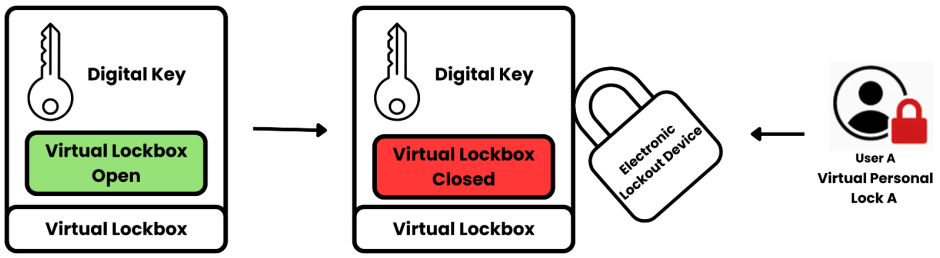

Figure 2: The Virtual Lockbox Mechanism — Visualizing the transition of a Virtual Lockbox from an "Open" state (containing an accessible Digital Key) to a "Closed" state once a user (User A) applies their Virtual Personal Lock.

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3 An Example Digital Lockout-Tagout Procedure

The following procedure is an example of a typical electronic group lockout procedure involving a single authorised employee and a single non-authorised employee working as a group in the service or maintenance of a machine under the following conditions:

- The single authorised employee shall assume the overall responsibility for the control of hazardous energy for all members of the group while the servicing or maintenance work is in progress.
- The machine has a single energy isolating device that requires a single electronic lockout device.
- All lockout participants are using their personal smartphone devices, have the Digital Lockout-Tagout application installed and running, have signed into the mobile application, and have been assigned the correct permissions.

3.1 Notification and shutdown

The authorised employee notifies unauthorised employees and shuts down the machine.

3.2 Isolation and verification

The authorised employee applies the electronic lockout device to the machine's energy isolation device as follows:

1. The authorised employee opens the mobile app and verifies their identity.
2. The authorised employee activates the electronic lockout device
    a. The mobile app detects the activated electronic lockout device and retrieves the corresponding digital key from the cloud service.
3. The authorised employee opens the electronic lockout device
    a. The mobile app transmits the digital key to the electronic lockout device to open it.

4. The authorised employee applies the electronic lockout device to the energy isolating device to lock out the machine.
5. The authorised employee attaches a SmartTag if necessary.

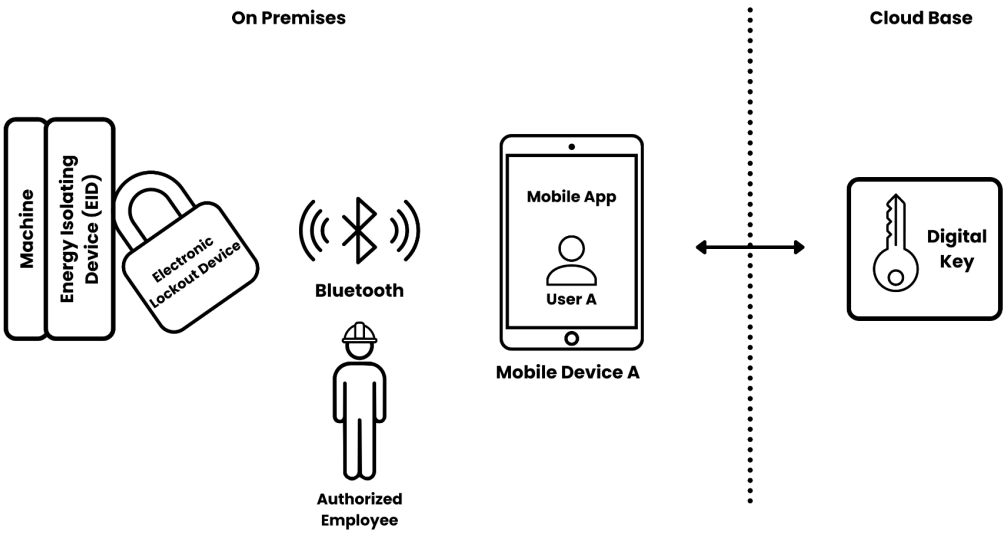

Figure 3: Initiating Isolation — The Authorised Employee uses a mobile device to establish a Bluetooth connection with the electronic lockout device on the machine's energy isolating device.

6. The authorised employee applies a digital lockout using their smartphone app.
    a. The mobile app places the digital key in a virtual lockbox.

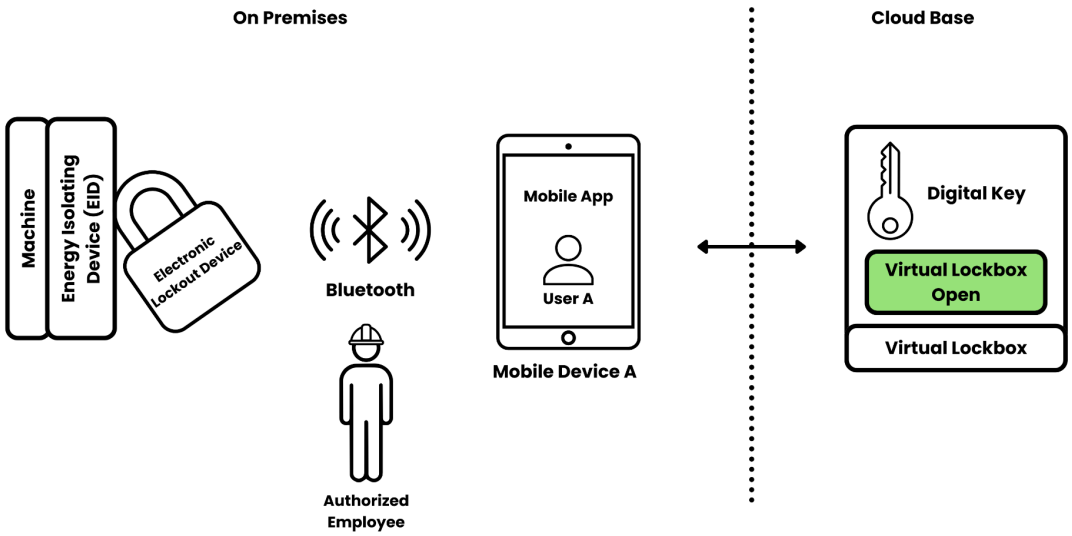

Figure 4: Securing the Digital Key — The process where the mobile app transfers the Digital Key from the physical device into an "Open" Virtual Lockbox residing in the cloud service.

b. The mobile app places the authorised employees' virtual personal lock on the virtual lockbox.
c. The virtual lockbox is now closed, and the digital key is no longer accessible.

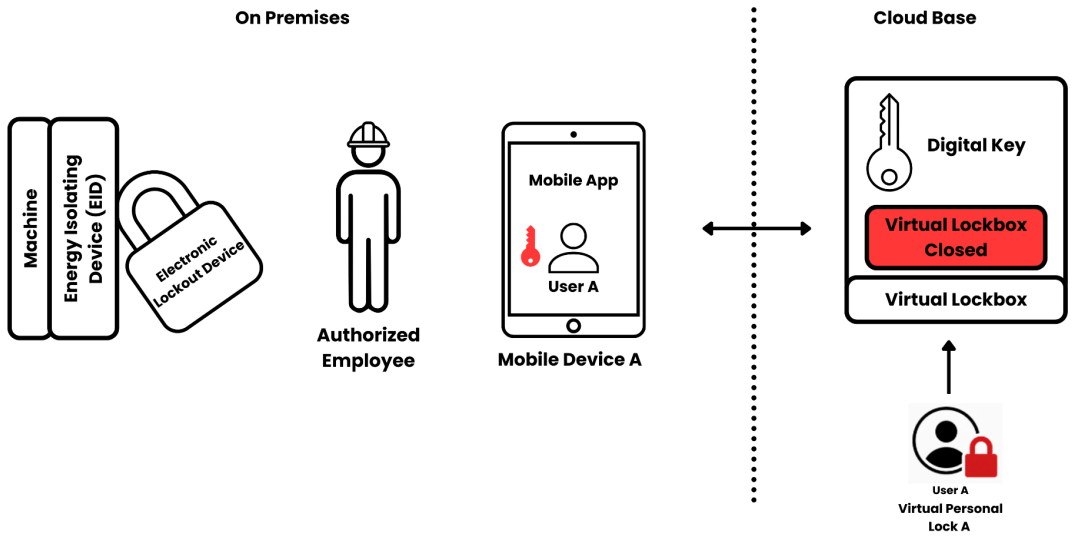

Figure 5: Closing the Virtual Lockbox — The Authorized Employee applies their Virtual Personal Lock to the lockbox, rendering the Digital Key inaccessible and effectively locking out the system.

6. The authorised employee verifies that the machine has no residual or stored energy and notifies the non-authorised employee that servicing can begin.

3.3 Group Lock On

The non-authorised employee locks onto ('joins') the digital lockout by applying their virtual personal lock to the virtual lockbox.

1. The non-authorised employee opens the mobile app and verifies their identity.
2. The unauthorised employee uses the mobile app to find the virtual lockbox created by the authorised employee in 3.2 above.
3. The unauthorised employee uses the mobile app to place a virtual personal lock on the virtual lockbox.
    a. The mobile app places the unauthorised employees' virtual personal lock on the virtual lockbox.
4. The unauthorised employee now has a level of protection equivalent to that provided by the implementation of a personal lockout and can commence work.

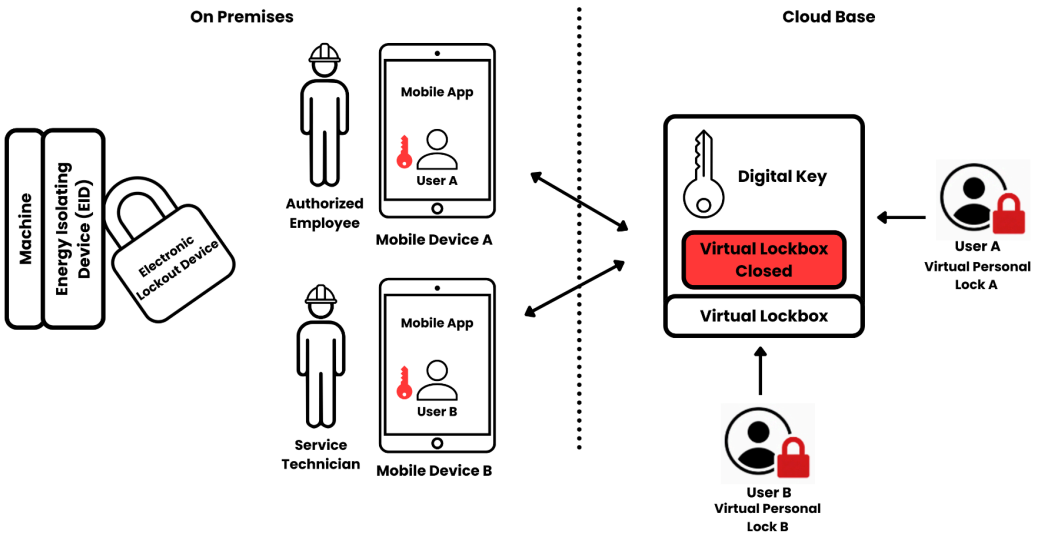

Figure 6: Active Group Lockout — A multi-user lockout state where both an Authorized Employee and a Service Technician have applied their specific Virtual Personal Locks to the single Virtual Lockbox.

A group lockout situation is now in effect, and the electronic lockout device cannot be removed until all participants have removed their virtual personal locks from the virtual lockbox.

3.4 Group Lock Off

The service is completed, and the unauthorised employee removes their virtual personal lock:

1. The unauthorised employee opens the mobile app and verifies their identity.
2. The unauthorised employee uses the mobile app to find the virtual lockbox from 3.2 above.
3. The unauthorised employee uses the mobile app to remove their virtual personal lock on the virtual lockbox.
    a. The mobile app removes the unauthorised employee's virtual personal lock on the virtual lockbox, leaving the authorised employee's virtual personal lock in place.

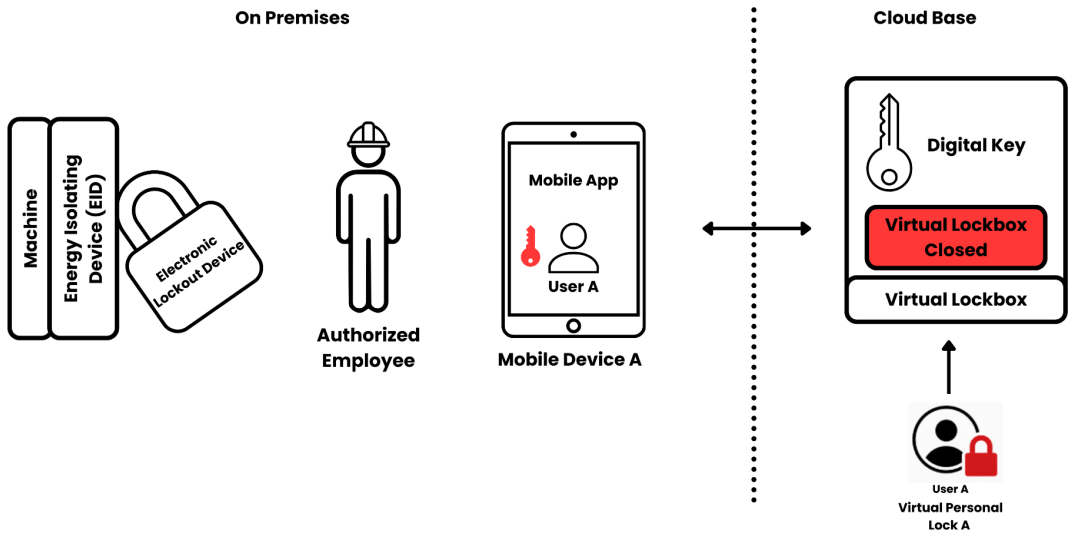

Figure 7: Partial Group Disengagement — The state of the Virtual Lockbox after the Service Technician has finished work and removed their personal lock, while the authorized employee remains locked on.

3.5 Remove Lockout and Reenergize

The authorised employee removes the electronic lockout device:

1. The authorised employee checks the machine and the work area to ensure all employees have been safely positioned or removed and verifies that the controls are in neutral.
2. The authorised employee opens the mobile app and verifies their identity.
3. The authorised employee uses the mobile app to remove their personal virtual lock from the virtual lockbox.

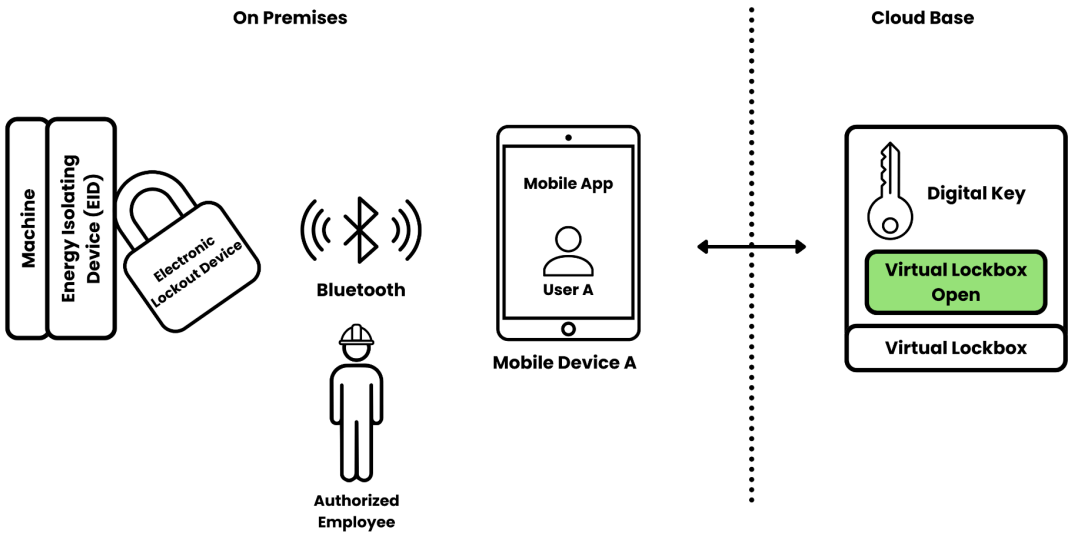

Figure 8: Releasing the Lockout — The Authorized Employee removes the final Virtual Personal Lock, returning the Virtual Lockbox to an "Open" state so the Digital Key can be retrieved.

4. The unauthorised employee now has a level of protection equivalent to that provided by the implementation of a personal lockout, and the unauthorised employee can commence work.
    a. A. The mobile app detects the activated electronic lockout device, finds the corresponding virtual lockbox, and verifies that the virtual lockbox is open.
    b. The mobile app retrieves the digital key that corresponds to the electronic lockout device from the virtual lockbox.
    c. The mobile app transmits the digital key to the electronic lockout device to open it.

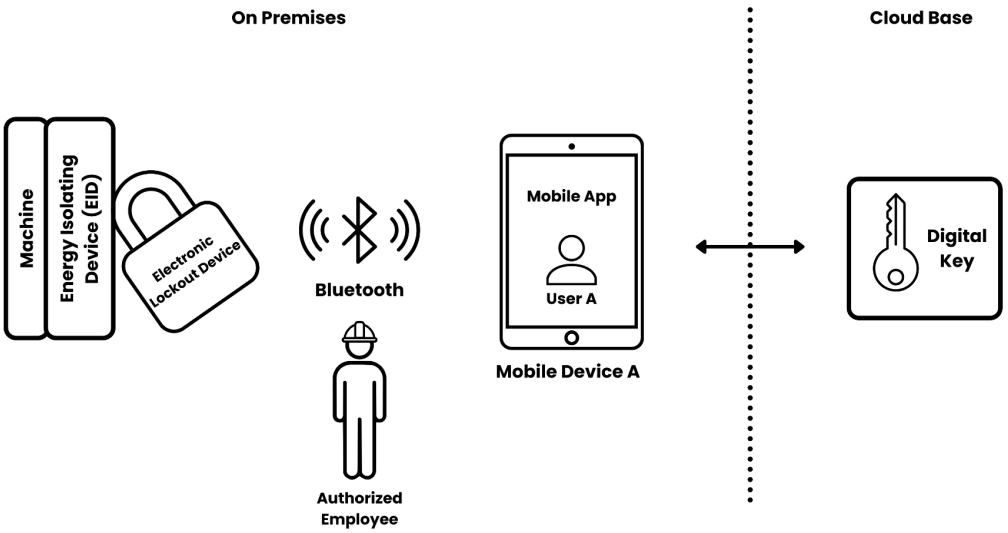

Figure 9: Removing the Electronic Lockout Device — The Authorized Employee uses the mobile app to transmit the retrieved Digital Key to the physical device, allowing them to unlock and remove the electronic lockout device from the energy isolating device.

5. The authorised employee removes the electronic lockout device from the energy isolating device.
6. The authorised employee reenergises the machine.

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4 Regulatory Framework: Western Australia

4.1 Statutory Requirements

The following excerpts from the Work Health and Safety (Mines) Regulations 2022 [1] represent the legal baseline for energy control:

r. 213 — Maintenance and inspection of plant

"(1) The person with management or control of plant at a workplace must ensure that the maintenance, inspection, and, if necessary, testing of the plant is carried out by a competent person."

"(4) The person must ensure that the plant is isolated before maintenance or cleaning commences."

Interpretation: The regulation explicitly mandates isolation. Digital Lockout-Tagout satisfies sub-regulation (4) by ensuring a state of isolation is not only achieved but digitally verified and maintained through encrypted "Digital Keys." This provides the "maintenance of isolation" required by law until the specific worker who applied the lock removes it.

4.2 High-Risk Work and Electrical Safety

r. 641A — Managing risks due to electricity [1]

"A person conducting a business or undertaking [PCBU] at a mine must manage risks to health and safety associated with electricity at the mine... [including] the appropriate design, installation, maintenance and testing of electrical equipment and electrical installations."

Interpretation: Under Western Australian mining law, electrical isolation is a "Principal Hazard." Digital Lockout-Tagout supports r. 641A by preventing unauthorised re-energisation. By requiring a digital verification step in the

software before a machine can be considered "Isolated," the system fulfills the PCBU's duty to provide a safe system of work.

4.3 The WorkSafe WA Code of Practice

The Code of Practice: Managing Risks of Plant in the Workplace (2022) [2] provides the "reasonably practicable" standard for how Lockout-Tagout must be executed.

Section 4.5 — Isolating Energy Sources

"Isolation of plant should be the first line of defence... An isolation procedure should involve:

De-energising the plant: All energy sources must be disconnected.

Locking out: A physical lockout device (e.g., a padlock) is used to prevent the plant from being re-energised.

Tagging: A tag is used to warn others that the plant is being worked on and must not be operated.

Testing/Verification: Testing that the isolation is effective."

Interpretation:. Digital Lockout-Tagout aligns with this by ensuring the electronic locking device is the primary physical lockout device. The Virtual Personal Lock provides the same "One Worker, One Lock" protection as a physical padlock, while the software enforces the "Testing/Verification" step as a mandatory field before the work group can commence. SmartTags satisfy the tagging portion.

4.4 The "One Worker, One Lock" Principle (WA Guidelines)

The WorkSafe WA Guideline: Isolation of Hazardous Energies [3] states:

"Each person working on the plant must be protected by their own personal lock. This ensures that the plant cannot be re-energised until the last person has removed their lock."

Interpretation: Digital Lockout-Tagout achieves this through Virtual Personal Locks. Each worker must authenticate via the mobile application (biometrics or secure password) to apply their digital lock. The software logic prevents the Authorised Person from retrieving the Digital Key to remove the primary isolator until every individual worker has digitally "Unlocked" their personal lock.

5 Regulatory Framework: Queensland (QLD)

The primary legislative instruments are the *Coal Mining Safety and Health Act 1999* [5], the *Coal Mining Safety and Health Regulation 2017*, and the *Mining and Quarrying Safety and Health Regulation 2017* [4].

5.1 Statutory Requirements (The Regulations)

The following excerpts from the **Mining and Quarrying Safety and Health Regulation 2017** [4] define the legal standard for isolation on QLD mine sites:

Section 107 — Isolating, locking-out and tagging plant

> "(1) A site senior executive must ensure the safety management system for the mine includes a procedure for isolating, locking-out and tagging plant."
>
> "(2) The procedure must provide for the following—
>
> (a) isolating the plant from its energy source;
>
> (b) locking-out the plant to prevent it from being energised;
>
> (c) if it is not possible to lock-out the plant—tagging the plant to show it must not be energised;
>
> (d) testing the plant's isolation to ensure the plant is isolated;

(e) workers to be protected by a personal locking-out or tagging device."

Interpretation: Section 107(2)(d) is a critical differentiator. Queensland law mandates testing the isolation. Digital Lockout-Tagout systems support this by requiring the Authorised Employee to record testing isolation (e.g., zero-voltage verification) within the digital application before the Virtual Lockbox can be transitioned to a "Closed" state. This creates a statutory record that the SSE (Site Senior Executive) has fulfilled their duty under Section 42 of the Act.

5.2 Obligations of the Site Senior Executive (SSE)

Coal Mining Safety and Health Act 1999 — Section 42

"A site senior executive for a coal mine has the following obligations—

(a) to ensure the risk to persons from coal mining operations is at an acceptable level;

(b) to ensure the risk to persons from any plant or substance provided by the site senior executive for the performance of work is at an acceptable level."

Interpretation: Digital Lockout-Tagout provides a higher degree of risk reduction than paper-based systems by eliminating lost keys, improper locking, and ensuring that human error in the tagging process is caught by recording lockouts digitally. For an SSE, the real-time reporting dashboard provides the evidence required to prove that risks are being managed to an acceptable level.

5.3 Electrical Engineering and Isolation

Coal Mining Safety and Health Regulation 2017 — Section 157

"An electrical engineering manager for a surface mine has the following obligations—

(a) establishing and maintaining an electrical engineering management system for the mine...

(b) ensuring the safety of all electrical equipment and electrical installations at the mine."

Interpretation: For Electrical Engineering Managers (EEMs), Digital Lockout-Tagout ensures that the "Electrical Engineering Management System" (EEMS) is an enforced workflow. The system provides the EEM with a live view of all electrical isolations across the site, ensuring that high-voltage (HV) and low-voltage (LV) isolations are performed according to the specific site standards quoted in the EEMS.

5.4 Safety and Health Management Systems (SHMS)

RSHQ Guidance Note QGN01: Isolation and Analysis of Hazardous Energy

"Isolation is a process that provides for the protection of people... A personal lock is the most effective way of ensuring an individual's safety. The lock must be unique to the individual and under the individual's sole control."

Interpretation: Queensland regulators emphasise "sole control". In a Digital Lockout-Tagout system, the Virtual Personal Lock is controlled via the worker's unique biometric or encrypted login. This ensures that only that specific individual can release their lock, fulfilling the "sole control" requirement. Because the digital key is encrypted and stored in the cloud, it cannot be duplicated or bypassed without a highly regulated and digitally logged procedure.

6 Regulatory Framework: New South Wales (NSW)

The primary legislative instruments are the *Work Health and Safety Act 2011*, the *Work Health and Safety (Mines and Petroleum Sites) Act 2013*, and the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2022* [8].

6.1 Statutory Requirements (The Regulations)

The following excerpts from the Work Health and Safety (Mines and Petroleum Sites) Regulation 2022 define the legal standards for isolation:

Clause 34 — Principal Control Plans [8]

> "The mine operator of a mine must prepare and implement a principal control plan for each of the following—
>
> (a) Mechanical engineering control plan;
>
> (b) Electrical engineering control plan."

Schedule 2 — Specific Control Plan Requirements

> "The mechanical engineering control plan must set out the control measures for… the unplanned activation of plant… and the means of isolation of energy sources of plant."
>
> "The electrical engineering control plan must set out the control measures for… the prevention of accidental activation of electrical plant."

Interpretation: NSW requires that the "means of isolation" be codified in a formal engineering control plan. Digital Lockout-Tagout provides a unified engineering standard that satisfies both the MECP and EECP. By using a Virtual Lockbox, the mine operator ensures that the "means of isolation" is a software-enforced workflow that prevents accidental activation by locking the digital key behind authenticated worker profiles.

6.2 Record Keeping and the "Mine Record"

Clause 129 — Duty to keep mine record [8]

> "The mine operator of a mine must keep a mine record for the mine… The mine record must include… (d) a record of all plant maintenance and testing."

Interpretation: Digital Lockout-Tagout automates the "Mine Record" requirement. Every isolation event—including who performed it, what energy source was isolated, the verification of the "Test for Dead," and the time of re-energisation—is stored as an immutable digital log. This removes the risk of missing or illegible paper records during a regulatory inspection.

6.3 Isolation and Energy Release

NSW Resources Regulator — MDG 1010: Minerals Industry Safety and Health Risk Management Guideline [9]

> "Isolation is a critical control. A critical control is a control that is crucial to preventing the event or mitigating the consequences of the event. The absence or failure of a critical control would significantly increase the risk."

Interpretation: In NSW, isolation is classified as a “critical control”. Digital Lockout-Tagout supports "critical control management" by providing real-time data on control effectiveness. This provides the verification of control that NSW inspectors now prioritise over simple procedural compliance.

6.4 Safe Work on Electrical Plant

Clause 33 — Electrical Safety

> "A person conducting a business or undertaking at a mine or petroleum site must ensure that… electrical plant is not energised unless it is safe to do so."

Interpretation: Under Clause 33, the Digital Lockout-Tagout ensures it is "safe to do so" by verifying that workers have digitally removed their Virtual Personal Locks before the Authorised Person is granted access to the digital key required to unlock the physical isolator.

7 Regulatory Framework: Victoria (VIC)

The primary legislative instruments are the *Occupational Health and Safety Act 2004* and the *Occupational Health and Safety Regulations 2017*.

7.1 Statutory Requirements (The Regulations)

The following excerpts from the **Occupational Health and Safety Regulations 2017** define the legal standards for mining and plant:

r. 101 — Hazard Identification

> "An employer must, so far as is reasonably practicable, identify all hazards associated with the installation, commissioning, decommissioning, use, or maintenance of plant."

r. 105 — Hierarchy of Control [10]

> "(1) If it is not reasonably practicable to eliminate a risk... the employer must reduce the risk so far as is reasonably practicable by (a) substituting the plant with plant that has a lower risk... or (b) using engineering controls."

Interpretation: Victoria's OHS law is centered on the Hierarchy of Control. Digital Lockout-Tagout is an "engineering control" because the hardware component physically prevents the release of energy. By implementing Digital Lockout-Tagout, a Victorian mine operator can demonstrate they are meeting the "reasonably practicable" risk elimination more effectively than with manual systems.

7.2 Maintenance and Isolation in Mines

r. 412 — Isolation of Plant (Part 5.3: Mines)[10]

> "A mine operator must ensure that plant is not used... unless it is safe to do so. This includes ensuring that plant is isolated from all energy sources before any maintenance, inspection, cleaning or repair is carried out."

Interpretation: Digital Lockout-Tagout ensures that the state of "Isolated" is maintained with higher integrity. Under r. 412, the system provides a "Digital Lockbox" that ensures no single person can accidentally re-energize the plant while others are still working. The Virtual Personal Lock provides the individual protection required by Victorian inspectors, while the automated log serves as the "Mine Record" of safe maintenance.

8 Regulatory Framework: Tasmania (TAS)

The primary legislative instruments are the *Work Health and Safety Act 2012 (Tasmania)* and the *Mines Work Health and Safety (Supplementary Requirements) Regulations 2022* [12].

8.1 Statutory Requirements (The Regulations)

The following excerpts define the legal standards for plant maintenance and energy control on Tasmanian mine sites:

r. 29 — Conveyors, Plant Maintenance and Guarding

> "(1) The mine operator must ensure that... plant is not used, or operated, unless it is safe to do so."
>
> "(2) The mine operator must ensure that... plant is not restarted until the mine operator is satisfied that it is safe to do so."

Interpretation: Digital Lockout-Tagout shows the real-time status of every isolation point. Unlike a radio call or a paper board, the system provides binary, data-driven evidence that 100% of workers have digitally "Unlocked" and cleared the plant. This removes the reliance on human memory and handwritten paperwork and fulfills the operator's duty to ensure it is "safe to do so" before restart.

8.2 Maintenance of Isolation

Work Health and Safety Regulations 2022 (TAS) — r. 213

"(4) The person [with management or control] must ensure that the plant is isolated before maintenance or cleaning commences."

Interpretation: Digital Lockout-Tagout ensures that isolation is not just "achieved" but "maintained." In Tasmania, the regulator emphasizes the risk of "accidental re-energisation" during long-duration maintenance. The encrypted Digital Key system ensures that even if a shift change occurs, the isolation remains locked in the cloud. The incoming shift can be digitally "handed" the isolation ownership, ensuring the continuity of safety required by r. 213.

8.3 Information, Training, and Instruction

WHS Act 2012 (TAS) — Section 19(3)(f)

"The provision of any information, training, instruction or supervision that is necessary to protect all persons from risks to their health and safety arising from work..."

Interpretation: Digital Lockout-Tagout acts as a technical supervision tool and has the physical and compliance requirements to protect all persons from risk to their health and safety.

8.4 The Mine Safety Management System (MSMS)

Mines WHS (Supplementary Requirements) Regulations 2022 — r. 10

"The mine operator must implement a safety management system for the mine that provides a comprehensive and integrated system for managing all aspects of risks to health and safety..."

Interpretation: Digital Lockout-Tagout is an "integrated" solution that fits directly into safety management systems. It links the physical hardware (locks) with the administrative software (permits). For a Tasmanian mine, this integration satisfies the r. 10 requirement for a "comprehensive system" by replacing fragmented paper logs with a single, searchable digital database that can be audited by the regulator at any time.

9 Regulatory Framework: Northern Territory (NT)

The primary legislative instruments are the *Work Health and Safety (National Uniform Legislation) Act 2011* and the *Work Health and Safety (National Uniform Legislation) Regulations 2011*.

9.1 The Risk Management Plan (RMP)

r. 612 — Risk Management Plan

> "(1) A mine operator must manage risks to health and safety associated with mining operations in accordance with a risk management plan... (2) The risk management plan must be: (a) in writing; and (b) certified by a person who is competent."

Interpretation: In the Northern Territory, a risk management plan (RMP) is a live document that must be "certified" and audited. Digital Lockout-Tagout serves as a core control within the RMP for the unplanned release of energy." Unlike a paper-based procedure which is difficult to verify for compliance, Digital Lockout-Tagout provides a Compliance Dashboard that proves the isolation controls outlined in the RMP are being executed exactly as certified.

9.2 Maintenance and Inspection of Plant

r. 213 — Maintenance and inspection of plant

> "(4) The person [with management or control] must ensure that the plant is isolated before maintenance or cleaning commences."

Interpretation: NT WorkSafe emphasizes the "Competency" of the person performing maintenance. Digital Lockout-Tagout supports r. 213 by using Role-Based Access Control (RBAC). The system ensures that only an "Authorized Employee" (verified in the software as competent) can initiate a primary isolation. This technical barrier prevents untrained personnel from manipulating energy isolating devices, satisfying the competency requirements of the RMP.

9.3 Information, Training, and Instruction

r. 39 — Provision of information, training and instruction

> "A PCBU must ensure that information, training and instruction provided to a worker is suitable and adequate having regard to... (c) the control measures implemented."

Interpretation: Because many NT mine sites are remote, the "Supervision" aspect of r. 39 is challenging. Digital Lockout-Tagout allows for Remote Supervision. A Mine Manager or Safety Officer in Darwin or Alice Springs can log into the cloud service and verify the isolation status of a remote site in the Tanami or Barkly regions. This digital oversight ensures that "suitable and adequate" supervision is maintained, even when the supervisor is not physically at the isolation point.

9.4 Record Keeping and Review

r. 38 — Review of control measures

> "A PCBU must review and as necessary revise control measures... (a) if the control measure does not control the risk it was implemented to control."

Interpretation: The NT Regulator requires proof that controls are reviewed after any "Dangerous Incident." Digital Lockout-Tagout provides the data necessary for a Root Cause Analysis (RCA). If a near-miss occurs, the system provides a playback of exactly who was "Locked On," what time the isolation was verified, and when the re-energization sequence was initiated. This satisfies the r. 38 requirement to review and revise controls based on actual performance data.

10 Regulatory Framework: Australian Capital Territory (ACT)

The primary legislative instruments are the *Work Health and Safety Act 2011* and the *Work Health and Safety Regulation 2011*.

10.1 Statutory Requirements (The Regulations)

The following excerpts from the Work Health and Safety Regulation 2011 (ACT) define the legal standards for plant and energy control:

r. 213 — Maintenance and inspection of plant

> "(1) The person with management or control of plant at a workplace must ensure that the maintenance, inspection and, if necessary, testing of the plant is carried out by a competent person."
>
> "(4) The person must ensure that the plant is isolated before maintenance or cleaning commences."

Interpretation: In the ACT, the "competent person" requirement is central. Digital Lockout-Tagout supports r. 213(1) by utilizing Digital Identity Verification. The system ensures that only a worker whose digital profile has been "Certified Competent" in the database can initiate a primary isolation. This provides the PCBU (Person Conducting a Business or Undertaking) with a verifiable record that maintenance was performed by a competent person, as mandated by ACT law.

10.2 Management of Risks to Health and Safety

r. 35 — Managing risks to health and safety

> "A duty imposed on a person to manage risks to health and safety requires the person:
>
> (a) to eliminate risks to health and safety so far as is reasonably practicable; and
>
> (b) if it is not reasonably practicable to eliminate risks to health and safety, to minimise those risks so far as is reasonably practicable."

Interpretation: WorkSafe ACT interprets "Reasonably Practicable" (Section 18 of the Act) with a focus on State of Knowledge. As Digital Lockout-Tagout becomes the industry standard for mining and quarrying in 2026, the "State of Knowledge" suggests that relying solely on manual tagging (an administrative control) may no longer be sufficient where an engineering control (software-enforced lockout) is available. Implementing Digital Lockout-Tagout demonstrates a proactive move to minimize risk to the lowest level practicable.

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10.3 Duty to Notify and Record Keeping

WHS Act 2011 (ACT) — Section 38 — Duty to notify of notifiable incidents

> "A person who conducts a business or undertaking must ensure that the regulator is notified immediately after becoming aware that a notifiable incident arising out of the conduct of the business or undertaking has occurred."

Interpretation: If an incident occurs, WorkSafe ACT requires immediate access to the "Site Record." Digital Lockout-Tagout generates an automated, timestamped, and forensic-grade log of the isolation state. This allows the PCBU to provide the regulator with accurate data regarding who was "Locked On" and whether the isolation was verified—eliminating the delays and potential inaccuracies associated with reconstructing events from paper logbooks.

5 Summary

Digital Lockout-Tagout systems can strengthen existing safety management protocols while delivering improved operating efficiencies, greater accountability and control, and reducing operating costs.

In summary, the Digital Lockout-Tagout System proposed in this whitepaper meets the intent of Australian regulatory requirements for Lockout-Tagout and affords all participants in the lockout process with a level of protection equal to, or greater than, that provided by the implementation of traditional physical and personal lockout locks.

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