UNYDE® One

PLAYBOOK

The Mining Digitization Playbook.

Five stages of mine digitization, the eight disciplines of Unyde One, how an engagement runs, the architecture, and the work at operating mines.

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HOW TO USE IT

Start with the five stages and place each of your sites on one. The stage tells you which disciplines usually come first and what a first engagement covers. The discipline pages describe what each one measures, how it is installed and which equipment is used. The case studies describe engagements at operating mines without naming the client.

01 · THE FIVE STAGES

Where your operation stands

Each site is placed on one of five stages. The engagement is scoped from there.

Stage 1 **Paper-led**	Registers, slips and roll calls.
Stage 2 **Instrumented, in silos**	Devices from several vendors, each with its own login.
Stage 3 **Connected, not reconciled**	Data flows, but fuel, trips and tonnes disagree.
Stage 4 **Integrated**	One record. Reports arrive on time.
Stage 5 **Optimising**	Using the data to change how the mine runs.

1 Paper-led

SIGNS YOU ARE HERE

- Fuel issued is recorded on paper slips
- Trips are counted from a register or by the weighbridge
- Worker presence confirmed by roll call
- Month-end reports assembled by hand

WHERE UNYDE COMES IN

We start with the foundation: one asset register, fleet telemetry and tank-level fuel measurement on the machines that consume the most.

A TYPICAL FIRST ENGAGEMENT

A defined group of production machines, measured against parameters agreed with operations.

Fleet · Fuel

2 Instrumented, in silos

SIGNS YOU ARE HERE

- Some machines carry trackers, others do not
- Fuel sensors, bowsers and weighbridge on separate systems
- Data exists but nobody compares it
- Coverage gaps on lower benches

WHERE UNYDE COMES IN

We bring existing devices onto Unyde One through open protocols, fill the gaps in the fleet, and close coverage gaps with a hybrid network.

A TYPICAL FIRST ENGAGEMENT

Integration of existing devices, a coverage survey and the network design.

Connect · Fleet · Fuel

3 Connected, not reconciled

SIGNS YOU ARE HERE

- Dashboards exist for each system
- Fuel issued and fuel burned rarely match
- Despatch documents still re-keyed
- Reports disagree depending on the source

WHERE UNYDE COMES IN

We put issue, burn, trips and weights on one record: bowser automation, RFID dispatch and ERP integration.

A TYPICAL FIRST ENGAGEMENT

Reconciliation of fuel and despatch on one site, with the ERP chain automated.

Dispense · Dispatch · Payload · Command

4 Integrated

SIGNS YOU ARE HERE

- A single source for fleet, fuel and despatch
- Reports in agreed definitions
- Exceptions found after the shift
- Safety managed separately from operations

WHERE UNYDE COMES IN

We add safety to the same record, and move exception handling from review meetings into the shift.

A TYPICAL FIRST ENGAGEMENT

Collision avoidance and worker wearables on the operating fleet, with exception routing.

Safety · Command

5 Optimising

SIGNS YOU ARE HERE

- Leadership asks questions of the data
- Several sites to bring to one standard
- Planning wants measured inputs
- Head office wants cross-site comparison

WHERE UNYDE COMES IN

We standardise across sites and turn the record into planning inputs: cycle losses, fuel per tonne and cross-site benchmarks.

A TYPICAL FIRST ENGAGEMENT

A second or third site onboarded to the same definitions, with cross-site reporting.

Command · Fleet · Fuel

Fleet

Haul cycles, idle time and operators, by shift.

Position, cycles, idle, utilisation and the operator behind them, for trucks, excavators, loaders, dozers and ancillary vehicles.

WHAT IT ADDRESSES

Fleet losses usually sit inside individual shifts: queuing at a loader, idling through a break, a longer route repeated on every cycle. Monthly averages do not show them.

WHAT IT MEASURES

Position and geofences	Live location, zone entry and exit, restricted-area breaches
Engine hours and idle	Productive, idle and off time per machine and shift
Cycle events	Load, haul, dump and return, with queue time at each loader
Operator identity	Who drove which machine, by shift, through operator tags
Driving events	Overspeed, harsh braking and tilt, by operator

HOW IT WORKS

1. **Fit.** Telematics installed on each machine, read from the OEM CAN bus where available.
2. **Identify.** Operators log on with a tag, so events carry the operator's name.
3. **Measure.** Cycles are built automatically from position, load and dump events.
4. **Improve.** Shift reports expose queuing, idle and route losses per loader.

EQUIPMENT ON SITE

- **Telematics unit with CAN access** · Teltonika. 4G GNSS unit reading engine data from the OEM CAN bus.
- **Hybrid LoRaWAN tracker** · KCS TraceME. LoRaWAN and cellular, for machines on benches without reliable 4G.
- **Operator tags**. BLE identification by shift.

UNYDE ONE SHOWS

Cycle time · Idle · Utilisation · Engine hours

Payload

Tonnes per pass, per truck and per trip.

Onboard weighing on loaders, excavators and tippers records the load of each pass and each trip, and compares it with the weighbridge.

WHAT IT ADDRESSES

Trip counts multiplied by a nominal capacity give an estimate of tonnes moved. Underloaded trucks cost cycles; overloaded trucks cost tyres, suspension and fuel. Neither shows until weighbridge totals are compared, and some material never crosses a weighbridge.

WHAT IT MEASURES

Bucket weight	Load per pass on wheel loaders and excavators
Truck payload	Strain or pressure sensing on tippers
Under and overload	Against the rated capacity of each machine
Tonnes per trip and shift	By loader, truck, operator and material
Weighbridge comparison	Onboard weight against weighbridge net weight, per trip

HOW IT WORKS

1. **Fit.** Pressure sensors on the hydraulic circuit of loaders and excavators; strain or pressure sensing on tippers.
2. **Calibrate.** Each machine calibrated against known loads.
3. **Record.** Each pass and trip on fitted machines weighed and tagged to machine, operator and material.
4. **Reconcile.** Totals compared with the weighbridge and with fuel burned per tonne.

EQUIPMENT ON SITE

- **Loader and excavator scales** · Loadright. Hydraulic-pressure weighing per bucket pass, with an in-cab display.
- **Tipper payload sensing (PLMS)** · Synapsis. Structural strain sensors on the chassis.
- **Load identification**. RFID pairing of truck and loader at each pass.

UNYDE ONE SHOWS

Tonnes per pass · Passes per truck · Loader output · Under and overload · Payload vs rated · Overloaded trips · Tonnes per trip · Weighbridge variance

Fuel

Tank level, refuels and drains, per machine.

Calibrated tank-level sensing on each machine separates refuels, consumption and drains, and flags a loss during the shift it happens.

WHAT IT ADDRESSES

Bowser slips record what was issued. Without tank sensing, what each machine burned is not recorded, and any difference appears only as a month-end total.

WHAT IT MEASURES

Tank level	Litre-level readings from a calibrated sensor in each tank
Refuel events	Volume and time of every fill, matched to the dispensing record
Drain events	Level drops while stationary or outside a refuel, flagged during the shift
Consumption	Litres per engine hour, per trip and per tonne moved
Alerts	Theft and anomaly alerts to a named supervisor

HOW IT WORKS

1. **Calibrate.** Each tank is calibrated individually so readings are in litres, not percentages.
2. **Record.** Fills, burn and drops are separated automatically.
3. **Match.** Fills are matched against bowser transactions from the Dispense module.
4. **Alert.** An unexplained drop reaches a supervisor within the shift.

EQUIPMENT ON SITE

- **Capacitive fuel-level sensor** · Omnicomm. Sealed installation, calibrated per tank.
- **Explosion-proof sensor**. For bowsers and fixed fuel stations.
- **Telematics link**. Readings travel with the Fleet module unit on each machine.

UNYDE ONE SHOWS

Litres per engine hour · Drain alerts · Refuel match · Litres per tonne

Dispense

Fuel released only to authorised machines.

Bowser and fuel-station automation that authorises the machine and operator at the nozzle, meters every litre and reconciles it against the tank.

WHAT IT ADDRESSES

A bowser slip records a machine number, a volume and a signature, all entered by hand. Automation at the nozzle takes the machine from its tag and the volume from the flowmeter.

WHAT IT MEASURES

Authorisation	Machine tag and operator verified before the pump starts
Transactions	Litres per fill from a metered flowmeter
Stock	Bowser and station stock levels
Exceptions	Blocked attempts, overrides and manual entries
Reconciliation	Issued against burned, per machine, with the Fuel module

HOW IT WORKS

1. **Tag.** Each machine carries an RFID tag at the fuel inlet.
2. **Authorise.** The nozzle reads the tag; the pump runs only for a valid machine.
3. **Meter.** The flowmeter records the exact volume per transaction.
4. **Reconcile.** Every fill is matched to the tank reading on the machine.

EQUIPMENT ON SITE

- **Bowser automation terminal** · Hectronic. Rugged controller for mobile bowsers and fixed stations.
- **RFID nozzle reader and asset tags** · Hectronic. Authorises the machine at the point of fill.
- **Flowmeter**. Metered volume per transaction.

UNYDE ONE SHOWS

Issued vs burned · Authorised fills · Blocked attempts · Bowser stock

Dispatch

Trips, weights, permits and SAP documents, without re-keying.

Trip allocation, RFID gate events, weighbridge capture, transit permits and ERP documents, closed automatically as material moves.

WHAT IT ADDRESSES

Every despatch creates a chain of paperwork: a weighbridge ticket, a transit permit, delivery and billing documents. Where each is keyed by hand, errors and waiting time accumulate at the gate.

WHAT IT MEASURES

Trip allocation	Trucks assigned by loader, material and destination
Gate events	RFID reads at entry and exit, with time stamps
Weights	Gross, tare and net captured from the weighbridge
Permits	Transit-permit and e-way bill status per trip
Documents	Delivery, invoice and billing documents in ERP

HOW IT WORKS

1. **Allocate.** A truck is assigned to a loader and destination.
2. **Read.** Gates and weighbridges read the truck tag automatically.
3. **Issue.** The weight triggers the transit permit and tax documents.
4. **Post.** The ERP document chain closes without manual entry.

EQUIPMENT ON SITE

- **UHF RFID readers and tags**. At gates, weighbridges and loading points.
- **Weighbridge integration**. Automatic weight capture, no manual entry.
- **Gate controllers**. Boom barriers and signals tied to valid trips.

Safety

Proximity alerts between machines, vehicles and people.

Collision avoidance between heavy machines, light vehicles and people, with worker location, man-down and SOS on the same map as the fleet.

WHAT IT ADDRESSES

Operators of large machines cannot see a person or a light vehicle close to the machine. Roll calls confirm who entered a zone, not where they are now.

WHAT IT MEASURES

Proximity	Distance between machines, vehicles and people
Collision events	Near-misses and contacts, logged with context
Tilt and rollover	Warnings on dumpers and dozers
Worker location	Who is in each zone, throughout the shift
Man-down and SOS	Alerts routed to the control room as they occur

HOW IT WORKS

1. **Survey.** Network and site survey to define zones and coverage.
2. **Equip.** Machines receive collision units; workers receive smart bands.
3. **Alert.** In-cab and wearable alerts at defined distances.
4. **Review.** Every event is logged for investigation and training.

EQUIPMENT ON SITE

- **Collision-avoidance units** · RealTrac. Radio ranging with in-cab visual and audio alerts.
- **AI cameras** · Luis Technology. Detection of people and vehicles in blind spots, with in-cab alerts.
- **Worker smart bands**. Location, SOS and man-down.

UNYDE ONE SHOWS

Proximity events · Near-miss map · Alerts by operator · Zone breaches · Blind-spot detections · Person-in-zone alerts · Event clips · Alerts by shift

Connect

4G and LoRaWAN coverage, designed from a pit survey.

A dual-bearer network that uses 4G where it reaches and LoRaWAN where it does not, designed from a coverage survey of your pit.

WHAT IT ADDRESSES

Cellular coverage weakens as a pit deepens, and machines on the lower benches drop out of reporting.

WHAT IT MEASURES

Gateway uptime	Availability of each gateway and tower
Delivery	Packet delivery per device and per bearer
Device health	Battery, signal and last-seen per device
Coverage	Signal by bench and zone
Recovery	Data buffered in gaps and delivered later

HOW IT WORKS

1. **Survey.** Measure coverage across benches, haul roads and plant.
2. **Design.** Place gateways and towers to close the gaps.
3. **Switch.** Devices move between 4G and LoRaWAN automatically.
4. **Monitor.** Network health is visible in the platform.

EQUIPMENT ON SITE

- **LoRaWAN gateways**. Solar or grid powered, placed from the survey.
- **Towers**. Height and position set by the pit geometry.
- **4G routers**. Only where IP devices need them.

UNYDE ONE SHOWS

Coverage by bench | Records delivered | Buffered and recovered | Device health

Command

Dashboards, reports and exceptions across all disciplines.

Dashboards, shift and monthly reports, exception queues and APIs, drawing on every discipline through one asset register.

WHAT IT ADDRESSES

Where reports are compiled from several systems, they arrive after the shift and need reconciling before they can be used. Exceptions are found in review meetings rather than during the shift.

WHAT IT MEASURES

Live indicators	By pit, shift, machine and operator
Reports	Shift, daily and monthly, in the client's definitions
Exceptions	Queued with an owner and a deadline
Access	Role-based, with a full audit trail
Integrations	APIs to ERP, plant, weighbridge and HR

HOW IT WORKS

1. **Define.** Agree the indicators and definitions that matter to the mine.
2. **Build.** Dashboards and reports configured to those definitions.
3. **Route.** Exceptions assigned to owners automatically.
4. **Integrate.** Data flows to ERP and head-office systems.

EQUIPMENT ON SITE

- **Control-room displays**. Video wall and operator consoles.
- **Hosting**. AWS, in a region agreed with the client.
- **APIs**. REST and MQTT for downstream systems.

03 · HOW AN ENGAGEMENT RUNS

One contract, one team and one number to call.

Every engagement follows the same four phases, and the client signs off each phase before the next begins.

Phase 1

Scope

Assets, network, systems and the parameters the work will be measured against, agreed in writing.

Phase 2

Prove

A defined set of machines or a single site, measured against those parameters.

Phase 3

Scale

The full fleet, the integrations and the people who run it, trained.

Phase 4

Operate

Command-centre monitoring, spares on site and a monthly performance review.

WHAT EACH ENGAGEMENT IS BUILT ON

Agreed parameters

Each engagement starts with measurement parameters agreed in writing, and reporting is against those parameters.

One support line

Sensors, network and platform are supported through a single line.

Client-owned data

Open interfaces and exportable records. Hardware can be changed without losing history.

Designed for site conditions

Equipment and network design account for heat, dust, pit depth and coverage.

04 · ARCHITECTURE, INTERFACES AND SECURITY

Four layers. One owner.

Unyde selects, installs and supports every layer, so one party is accountable from the sensor to the report.

Command	Control room, dashboards, shift and monthly reports, exception queues and APIs into ERP, plant and weighbridge systems. Command
Platform	One asset register, one operator register and one event log shared by every discipline. Role-based access and a full audit trail. Fleet · Payload · Fuel · Dispatch · Safety
Connect	4G where it reaches, LoRaWAN where it does not. Devices hold data through coverage gaps and send it when back in range. Connect
Field	Telematics, fuel-level sensors, payload scales, bowser terminals, RFID, collision-avoidance units and wearables, chosen per site from partner equipment. Payload · Dispense · Safety

OPEN BY DESIGN.

Unyde One reads and writes over open interfaces, so the client keeps the data and the freedom to change hardware later.

`CAN / J1939` `RS-232 / RS-485` `BLE` `LoRaWAN` `4G LTE` `UHF RFID` `MQTT` `REST`

SECURITY AND HOSTING

Encryption	TLS in transit and AES-256 at rest.
Hosting	AWS, in a region agreed with the client.
Access	Role-based permissions and a full audit trail of every view and change.

Case studies

Engagements described without naming the client. Each is available as a separate PDF.

Iron ore · Odisha, India · Open pit, captive · Stage 3: Connected, not reconciled

114 parameters for fleet, fuel and dispensing

Diesel issued at the bowser and diesel recorded against machines were reconciled from slips at month end. Any difference could not be traced to a machine or a shift, and machines on the lower benches went silent for parts of each shift.

Issue and burn reconciled monthly from slips	→ **Issue and burn on one record, per machine and per shift**
Losses visible only as a total	→ **Drains flagged against a machine during the shift**
Any machine could be fuelled	→ **Fuel released only to tagged machines**

Full case study: unyde.in/mining/unydeone/downloads/case-studies/unyde-case-study-iron-ore-fuel-fleet.pdf

Coal · Chhattisgarh, India · Captive mine · Stage 3: Connected, not reconciled

One gate read: e-Transit Pass, e-way bill and SAP documents

Weights, transit passes and SAP documents were each entered by hand for every truck, so delay and keying errors built up at the gate.

Weights keyed by hand	→ **Weight read from the weighbridge against the truck tag**
Transit pass raised separately	→ **Transit pass raised from the trip record**
SAP documents re-keyed	→ **Delivery and billing documents posted from the trip**

Full case study: unyde.in/mining/unydeone/downloads/case-studies/unyde-case-study-pit-to-plant.pdf

Coal · Mozambique · Open pit · Stage 2: Instrumented, in silos

A Mozambique coal fleet on the group's Indian standard

The group wanted its Mozambique fleet reported in the same definitions as its Indian mines, rather than in a separate local format, with a defined path to fuel reconciliation.

Site reports in local formats	→ **Reports in the group's definitions**
Fleet data held at site	→ **Site and head office read the same record**
Fuel known at purchase	→ **Fuel reconciled per machine in phase 2**

Full case study: unyde.in/mining/unydeone/downloads/case-studies/unyde-case-study-coal-mozambique.pdf

Iron ore · Chhattisgarh, India · Open pit · Stage 2: Instrumented, in silos

Worker location and man-down alerts on existing GSM and Wi-Fi

Presence in working areas was confirmed by roll call at the start and end of each shift, with nothing in between and no automatic alert if a worker fell.

Roll call at shift start and end	→ **Presence by zone through the shift**
Falls reported by colleagues	→ **Man-down and SOS raised by the band**
No movement record	→ **Location history for investigation**

Full case study: unyde.in/mining/unydeone/downloads/case-studies/unyde-case-study-worker-wearables.pdf

Limestone · India · Open pit, two shifts · Stage 4: Integrated

3,680 trips, ranked by where time was lost

Cycle times and output were reviewed as monthly averages, which hid where time was lost, on which shift and by which trucks.

Cycle time as a monthly average	→ **Cycle split into queue, load, haul and dump**
Idle recorded as haul	→ **Idle separated from empty haul**
Shift output compared in totals	→ **Shortfall traced to fleet parked on one shift**

Full case study: unyde.in/mining/unydeone/downloads/case-studies/unyde-case-study-limestone-trip-data.pdf

Coal · Chhattisgarh, India · Captive open pit · Stage 2: Instrumented, in silos

Pairing each truck with the loader that filled it

Haul cycles were recorded on instrumented trucks, but a trip loaded by an uninstrumented machine had no loading event, so its tonnes and the loader's output could not be attributed.

Loading events missing for some trips	→ **Missing events reported per trip, with the loader**
Tonnes from trip count and capacity	→ **Payload measured on fitted machines**
Loader output estimated	→ **Passes and load per loader, per shift**

Full case study: unyde.in/mining/unydeone/downloads/case-studies/unyde-case-study-loader-to-truck.pdf

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06 · NEXT STEP

Tell us where your sites are today, and what is already installed.

A first call covers three things: where your sites stand and what is installed; which disciplines would come first; what a first phase would include and how it would be measured.

Schedule a call

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