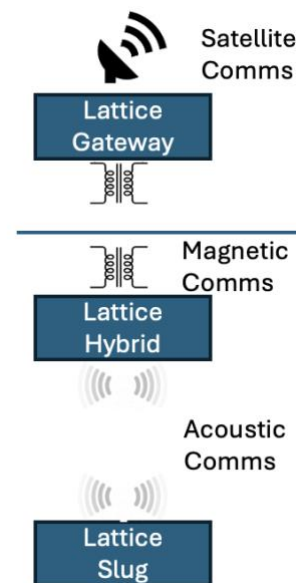




Lattice Link™ Slug provides real-time detection, classification, and quantification of slug-flow events—delivering continuous flow-assurance and integrity insight without intrusive probes or penetrations. Each compact node integrates a hydro-acoustic sensor, tri-axial accelerometer, and temperature sensor with embedded edge analytics and hybrid magnetic–acoustic communications for bi-directional data transfer.

On-board edge computing is able to fuse acoustic and vibration signatures to calculate a Slug Severity Index (SSI), dominant slug period, and regime stability, enabling active choke and anti-slug control. Processed data are transmitted acoustically to Hybrid Gateways and relayed magnetically to the topside Gateway—removing the need for umbilicals, connectors, or dunkers.

Within the Lattice MARS digital-twin environment, Slug data correlate with VIV and WMS measurements to link flow excitation, structural motion, and walking behaviour—supporting predictive, condition-based integrity management and reducing intervention frequency.



Features and Benefits

- **Real-time slug detection** – to improve flow-assurance control.
- **Hybrid magnetic–acoustic link** – topside-to-seabed wireless link without dunkers, umbilicals, improving safety and lowering cost.
- **Edge analytics** – Transmits only critical events: improved response time.
- **ROV-replaceable power** – Enables quick battery swaps, extending service life.
- **Compact ROV clamp** – Installs or relocates in minutes, reducing vessel time
- **Digital-twin integration** – Links slug data with VIV, walking and mooring data for predictive integrity and extended asset life
- **Slug Severity Index (SSI)** – Optionally quantifies slug strength and frequency for dynamic choke control and reduced fatigue.



Lattice Link™ Slug



Lattice Slug devices incorporate a hydro-acoustic module for flow-borne noise detection with a tri-axial accelerometer that captures the mechanical response of the riser or flowline. The hydrophone detects low-frequency pressure oscillations caused by gas–liquid interfaces, while the accelerometer measures corresponding structural impulses. On-board data fusion verifies slug arrival, localises impact zones, and distinguishes slugging from vortex-induced vibration.

Nodes communicate acoustically with Lattice Hybrid Gateways positioned ~20 m below the FPSO, which aggregate and forward event-driven data magnetically to the topside Lattice Gateway for near-real-time visibility. Each acoustic modem is powered by an interchangeable battery pack that can be ROV-replaced without wet-mate connectors. Redundant subsea and topside gateways ensure continuous, bi-directional data flow under all sea-state conditions.

Each device is fully sealed, maintenance-free, and designed for 10–30 years’ endurance. Compact ROV-installable clamps allow retrofit or relocation within minutes, supporting efficient field deployment and recovery.

Lattice Slug operates on the same hybrid communication backbone as the wider MARS platform, ensuring seamless integration with VIV and WMS modules and unified data management through the Lattice Gateway.

Lattice Slug System Architecture



Key Specifications

Parameter	Specification (Standard)	Options / Notes
Acoustic (Slug)	10–500 Hz band	Tunable bandwidth per field
Accelerometer / IMU	±4 g, 2 kHz; ≤100 µg/√Hz	6-DOF fusion with inclinometer
Temperature	±0.5 °C	±0.2 °C precision option
Acoustic Comms	10–200 bps (2–4 km range)	Mesh / relay capable
Magnetic Comms	10–50 bps (50–100 m range)	BLE ROV harvest / firmware update
Sampling Mode	Continuous / event-driven	User-configurable
Battery Life	≥5 yr continuous	Up to 10 yr (30 yr design)
Housing	Acetal	PEEK
Depth Rating	1500 m standard	3000 m option
Clamp / Mount	Custom ROV-installable	Retrofit or pre-installed
Integration	Lattice MARS / WMS / VIV / Twin	Unified Condition-Based Integrity (CBI)