


# RANDome - Create 4G/5G Network Coverage Bubbles

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## The Connectivty Gap

Public mobile networks are built for permanence and density, economically justified by sustained subscriber demand in a fixed location. However, this model breaks down in several recurring scenarios:

- **Disaster response**: Cell towers are frequently among the first infrastructure to fail in floods, earthquakes, and cyclones
- **Defense and tactical operations:** Forward-deployed units and temporary bases cannot wait for, or rely on, commercial network availability, and often operate in denied or contested electromagnetic environments requiring a standalone coverage bubble
- **Maritime and offshore:** Vessels and platforms operate far outside terrestrial coverage, dependent entirely on satellite links for any connectivity.
- **Remote industrial sites:** Mining, construction, and exploration sites are frequently active for months before any commercial coverage is viable.
- **Rural and underserved regions:** Low population density makes permanent tower infrastructure economically unviable for operators, leaving these communities permanently unconnected.

**In each case, the requirement is the same: an independent, self-sufficient bubble of cellular coverage that doesn't depend on the surrounding infrastructure being intact or present,** but which can connect to the public network via transport network POPs if available, or through satellites.

## Lekha's RANDome Solution

Lekha's RANDome architecture, shown below, addresses this critical need.




**RANDome: Self-Sufficient Standalone or Interconnected 4G/5G Network Coverage Bubbles**

RANDome collapses the traditional multi-site cellular architecture — including the radio tower, backhaul link, core network, and, where available, public connectivity — into a single, deployable unit that creates its own independent coverage bubble around the site, providing cellular voice and video services. Sites can operate standalone or be interconnected via a transport network, allowing the services to extend seamlessly over large geographical areas with multiple coverage bubbles.

RANDome is built using Lekha's Vyapi™ LTE or 5G Network-in-a-Box (NIB) units, discussed in sections below.

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## Why Bubble Model Over Traditional Buildout

- **Fast network services availability** – in less than an hour
- **Independence**: The bubble stands on its own, with no dependency on surrounding infrastructure being intact, present, or accessible
- **Portability and Reusability**: The unit can be quickly disconnected, and redeployed to project a new bubble at a different site or mission
- **Flexible Network Interconnectivity**: The unit adapts to to whatever transport medium is available on-site to connect the network bubble to the public network

## Use Cases

- **Defense/Government**: Tactical field communications, forward operating bases, border and perimeter security
- **Disaster relief:** Rapid restoration of a communication bubble in the immediate aftermath of infrastructure loss
- **Maritime**: An onboard vessel coverage bubble connected to others via a SATCOM link
- **Enterprise/Industrial**: A temporary coverage bubble for mining, construction, and exploration sites
- **Rural/Remote**: Extending a coverage bubble to underserved communities and research or expedition sites

## The Vyapi™ NIB

The Vyapi™ NIB integrates RAN, core, edge-compute and network management capabilities in a single IP67 chassis. This is a critical design choice; with it, the RANDome coverage bubble does not depend on reach-back to a remote core, meaning it stays fully functional even if backhaul is degraded or entirely absent, providing a self-sustaining bubble with local device-to-device communication.

The NIB's RAN element supports configurable frequency bands to match spectrum availability or licensing constraints, in each deployment region. Pneumatic masts can be used to increase radio height, expanding bubble radius. Onboard compute supports use-case-specific edge applications running directly inside the bubble, keeping latency-sensitive workloads local rather than traversing constrained transport links. Multiple NIBs (coverage bubbles) can be interconnected through standalone terrestrial or SATCOM links.

A deployed bubble is only as useful as an operator's ability to see and control it. The Vyapi™ NIB includes an EMS, for onsite or remote provisioning, configuration, fault handling, and performance monitoring.

### Enclosure and Form Factor

The Vyapi™ NIB is light, compact, and built in a rugged IP67 enclosure suited for both outdoor and indoor deployments, It is a field-proven solution, deployed today in defense networks in challenging environments.

The Vyapi™ NIB is available in two portable configurations, both designed for rapid deployment to create a coverage bubble, or to fill coverage holes in otherwise-covered areas:

- **Manpack Configuration** — 5W output power, ultra-portable, carried and activated by a single operator. Built for field agents, tactical units, or first responders who need on-the-move connectivity without vehicle support
- **Vehicle-Mount Configuration** — a 40W output power unit, that integrates with command vehicles or emergency response units, extending the bubble's reach while maintaining mobility for convoys and large-area operations

### Plug and Play Activation

Setup requires no specialized technical staff on site. Only the antenna and power need to be connected onsite to activate a coverage bubble and establish full 4G network services with standard commercial mobiles. The RAN and

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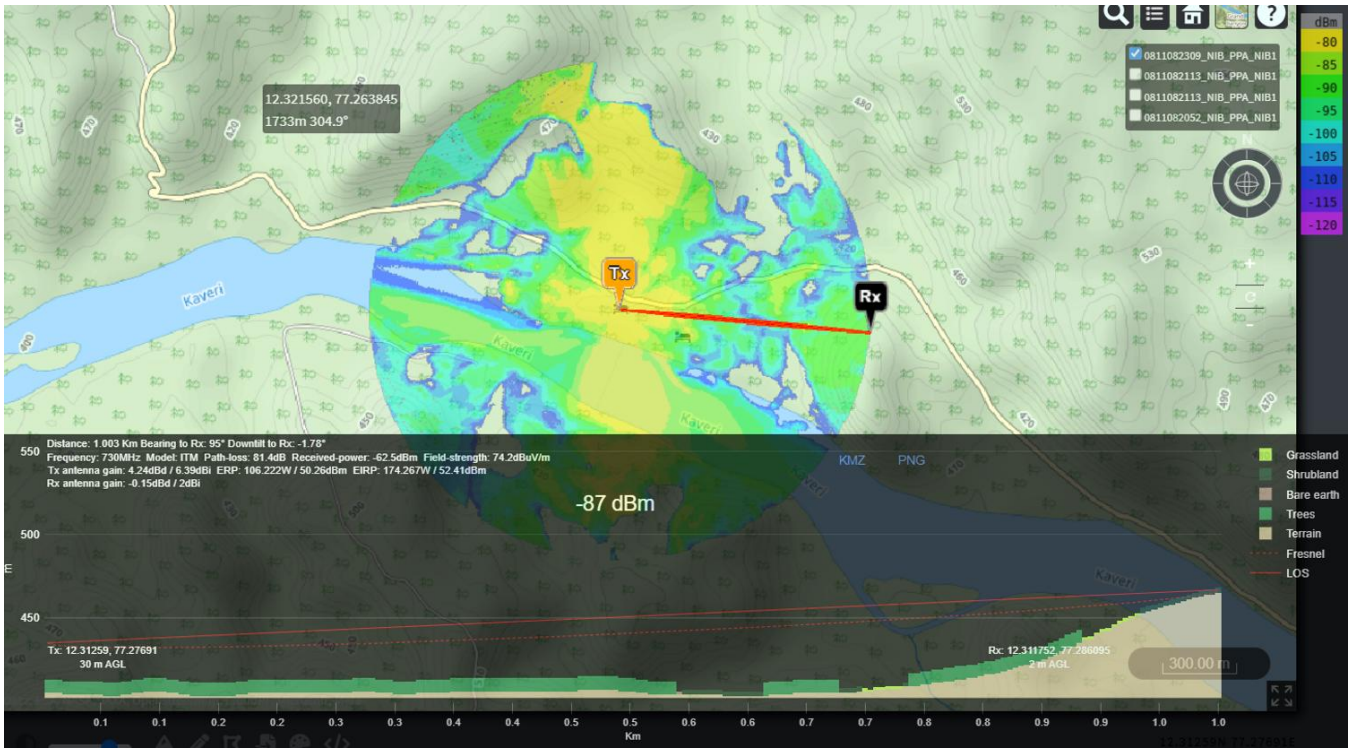
EPC auto-initialize with no manual network configuration required in the field. Time-to-coverage is reduced from a complex, multi-step field engineering task, to under an hour.

## Indicative Bubble Coverage Maps

The figure below shows indicative coverage maps for the 40W and 5W Vyapi NIBs, operating in LTE band 28, with the following assumptions:

- **Freq.:** 730 MHz
- **Tx Height:** 30 m | **Antenna Gain:** 6.4 dBi
- **Rx Height:** 2 m | **Rx Gain:** 2 dBi
- **Rx Sensitivity:** −110 dBm
- **Propagation Model:** ITM | **Reliability:** 98%
- **Terrain, Land Cover & Buildings:** Enabled




**Predicted RF Coverage with a 40W Vyapi NIB**

Theoretical prediction showing robust signal strength at about 1 Km; actual coverage may vary with terrain, clutter and deployment conditions.

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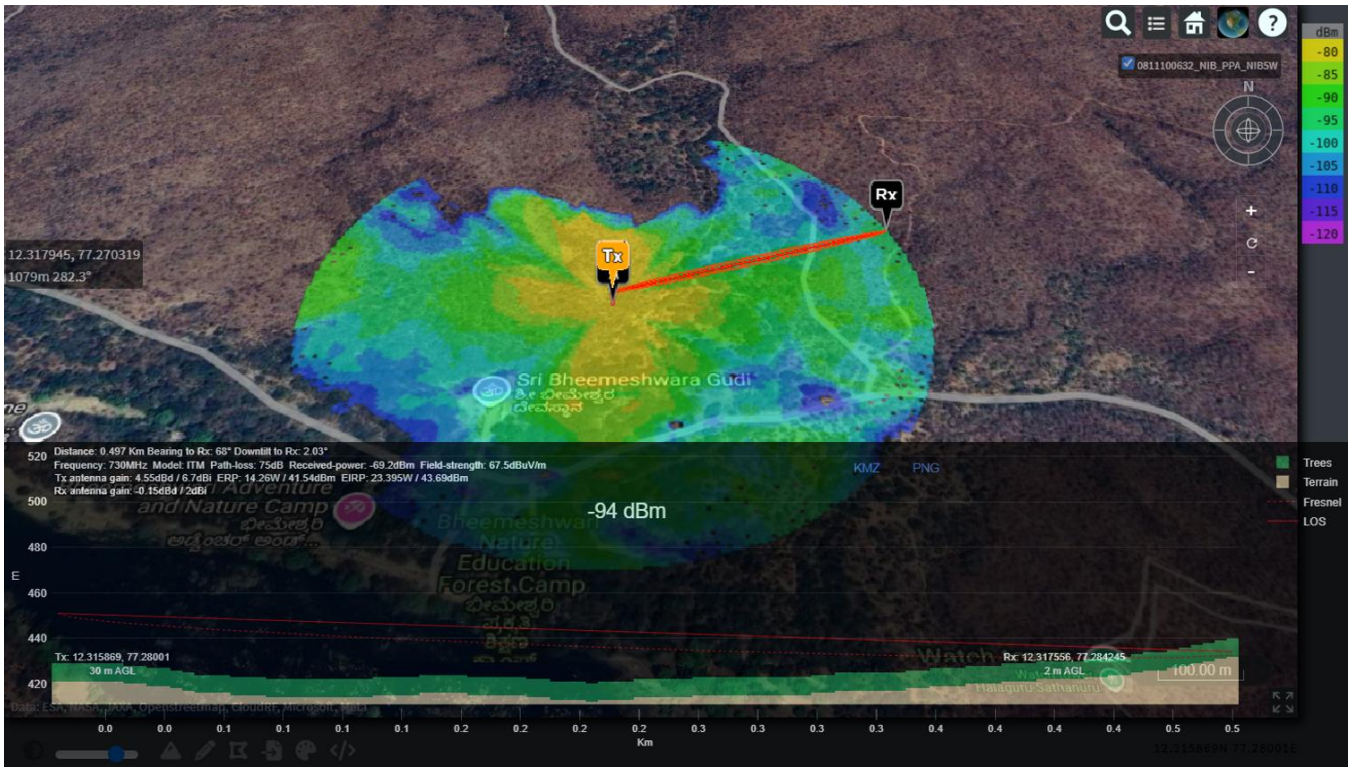
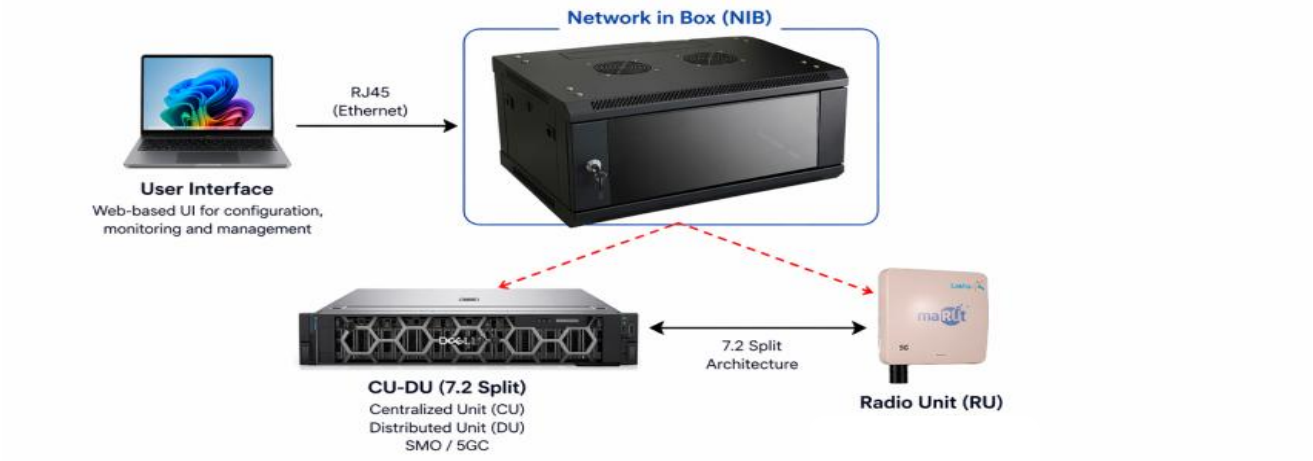



**Predicted RF Coverage with a 5W Vyapi NIB**

Theoretical prediction showing robust signal strength at about 0.5 Km; actual coverage may vary with terrain, clutter and deployment conditions

### The Lekha 5G NIB

Lekha's portable 5G NIB a shown below. It includes our 3GPP Rel-16 and the O-RAN Alliance's 7-2x split complaint RAN, with a 4T4R 250mW/antenna RU; and CUDU, 5GC and SMO software running on a COTS server. This is planned to be condensed into an IP67 container like the Vyapi™ NIB, in an upcoming release.

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## Conclusion

Lekha's RANDome architecture turns cellular coverage into an on-demand bubble that a small team can carry, deploy, and operate anywhere. The rugged Vyapi™ NIB or the portable 5G NIB encloses the RAN, core, applications, and management functions in a single unit. This integration changes everything: field setup requires little more than connecting the antennas and power. Once live, the onboard EMS ensures the system is fully managed out of the box.

The value goes far beyond compactness. RANDome eliminates the need for a traditional tower, fixed backhaul, and remote core at each deployment site. Each bubble can operate independently when disconnected from the wider network, while multiple bubbles can be interconnected over terrestrial or SATCOM links to create a larger, seamless service area.

With RANDome, army forward units, disaster recovery teams, and enterprise network managers can rapidly deploy a complete cellular network wherever it is needed — without the civil works, fixed infrastructure, and deployment time required by a conventional cellular network.

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# The Vyapi LTE NIB




The Vyapi LTE NIB is a self-contained LTE Network-in-a-Box (NIB) available for deployment of LTE private networks for mission-critical applications, and disaster relief. The product is optimized for battery operation and works as a vehicle-mount or manpack basestation. The design is compact, supports low-power operation and is portable. It includes an element management system.

| Features | EPC Core |
|---|---|
| Supports VoLTE and ViLTE | Mobility Management Entity (MME) |
| Interoperated with most UE Chip Vendors | Serving Gateway (SGW) |
| NLOS Deployment | Packet Data Network Gateway (PGW) |
| Compact Design with IP66 Enclosure | Home Subscriber Server (HSS) |
| Power Saving Mode for Battery Operation | IP Multimedia Subsystem (IMS) |

| Specification |
|---|
| LTE Band 28, 5, 1 |
| 5, 10MHz Bandwidth |
| 2T4R Mode of Operation |
| Up to 64 Concurrent Users |
| FDD Mode |
| DL & UL Modultion: Up to QAM64 |
| Output Power: Up to 40W per Antenna |

| HW Specifications | |
|---|---|
| **Backhaul** | RJ45 Connector with 1GBps |
| **Console Ports** | USB 2.0/USB 3.0 |
| **Power Consumption** | <350W |
| **Enclosure** | IP66 |
| **Dimensions (mm)** | 467x384x181 |
| **Weight** | <19Kg |
| **Installation** | Wall or Pole Mount, Manpack |

*Lekha Wireless is an OEM focused on wireless communications, with a portfolio of products and IPs for 3GPP based and proprietary wireless links. We work with SIs and operators to deploy wireless networks using our own hardware and software solutions.*

***For further information or a demonstration, please send a request to business@lekhawireless.com. For details on other products please visit www.lekhawireless.com.***

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