The shop that closes at five: provider discovery and community-governed local infrastructure

Value exists within a few hundred metres of your home, yet few notice it.

Joshua Poddoku

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Abstract Within a short distance of most homes, people produce milk, eggs, and vegetables and offer skilled trades. Few buyers see them. This paper argues that discovery is the main barrier, not trust, payment, or information. The cost of ignoring it falls hardest on providers: they stop growing when no one shows up. This paper introduces Clansurf, a node with a radius of approximately 200 m that holds up to ten providers. It is governed by the people inside it and maintains a local, append-only record. The radio and record layers are detailed enough to be checked. They cover regional band availability, airtime under duty cycle limits, and a signed, hash-chained log anchored publicly whenever connectivity is available. The record tracks deliveries and receipts, not payments. This removes the offline double-spend problem and keeps a node manager outside payment-service regulation.

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The Clansurf project places a small piece of infrastructure in one locality, so the people who produce things there and the people who need them can find each other directly. It runs on local infrastructure and continues to work during a blackout.

What it is	Local hardware combined with community governance
Scale	One node, a radius of about two hundred metres
First localities	Southeast and East Asia, built with local communities

Project overview

Project summary	The project studies community governance alongside local infrastructure so that a locality can run its own nodes. A node is people plus hardware, working independently and reliably.
Problems addressed	A neighbour sells eggs, but people 50 m away do not know about it. Patrons buy from a brand, and the provider decides that there is no demand. The apps that could connect them run on remote servers and fail when the internet is down.
The working solution	Create a community-run node backed by hardware and local infrastructure. Clansurf also explores the possibility of integrating local AI agents for the productivity of the nodes.
Ownership	The community owns the node, meaning the providers and patrons inside it. Clansurf supplies the framework that brings local connections back to life. The hardware, LoRaWAN radio, is a tool for discovery, reliability, and sustainability.

Glossary

Term	What it means
Local value provider (LVP)	Anyone in a locality offering goods or services, such as eggs, milk, vegetables, local compute, or a trade such as carpentry. Called a *provider* in this paper.
Patron	A person buying from a provider, or looking for one.
Locavore	Someone who seeks out food grown or made nearby.
Node	A bounded locality with a radius of approximately 200 m, holding up to ten providers, one per category.
Node manager	The person who maintains the node, hears the problems, and keeps the record current.
The record	The node's append-only log of deliveries and receipts, signed by both sides and hash-chained.
Agent (local agent)	An AI agent that runs locally, on compute owned by the locality rather than on a remote service. It handles bookkeeping, such as keeping the map of value current and reconciling records, but never makes decisions about people. Listed as a possible later stage in the roadmap (Section 12).

This paper originates in an observation I made in a neighbourhood in Southeast Asia: a small shop that sells fresh eggs but displays no signage. The lady who runs it closes at five in the evening, when her working day ends.

Within the same walking distance, three branded supermarkets remain open long after she closes.

When I asked my host, a resident of the same street, where to buy eggs, she directed me to a supermarket. The recommendation did not reflect the quality of the shop or any distrust of its owner. The shop simply did not come to mind.

This observation rules out several explanations. The barrier is not trust: the people who know the owner trust her completely. It is not payment: I carried cash, and the shop accepts it. It is not even information: the information existed all along, and my host lived in the middle of it.

The barrier is recall. The supermarkets have invested years and considerable money in securing a place in residents' memory, and the lady across the street has no means of buying the same position.

No one needs to create this value. It already exists, and its discovery is blocked.

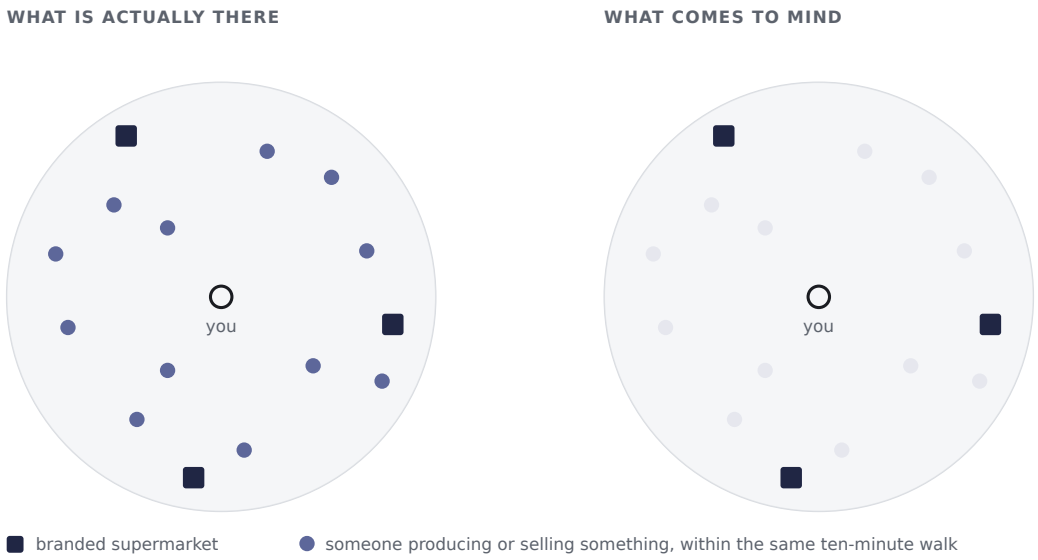

Figure 1: Nothing moved between the two maps. The supply did not change; only what came to mind did. Every dot is real, reachable, and open for business, and almost all of them are invisible on the only map that decides where anybody goes.

1 Suppression loop

Consider the situation from her side of the counter.

She is not focused on growth. She is thinking about who comes to her, and over a long time she has found that few people come to her. She makes enough to feed her children, so she stays put.

Why would she expand from five chickens to ten when no one asked for the first five? Closing at five is not a business decision. It reflects the demand she can see.

The loop feeds itself: fewer patrons mean less production, which means even fewer patrons in the future. Everyone inside it acts reasonably, yet it becomes tighter over time.

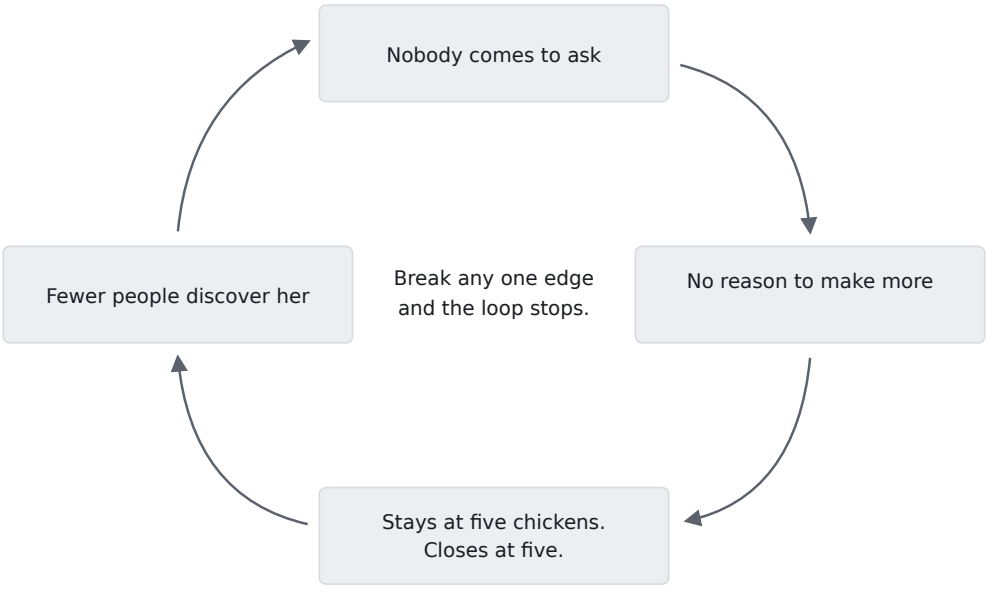

Figure 2: She is not short of skill, stock, or willingness to work. She is short of evidence that patrons want more than she already makes. A node is not a marketplace. It puts that evidence back into the loop, and that is what lets five chickens become ten.

2 Platform layer

Plumbers and carpenters existed long before the advent of branding. They worked independently, and people delivered items to each other's doors without a middleman.

They then put on a branded shirt.

An organisation adds a layer that takes a cut for making them findable and then claims credit for work that was already happening. Coordination is real work, but it comes at a cost. Being findable is now something providers rent, and when they stop paying, they become invisible again.

Clansurf aims to make existing providers visible without compromising their independence or privacy.

3 Unmatched needs and capacity

The problem is straightforward.

On one side, you have needs: eggs, milk, vegetables, a carpenter, wiring that needs fixing. On the other, you have capacity: a neighbour with two cows, another with a patch of ground, a carpenter two streets away, and the lady who closes at five.

Both sides are full, yet almost nothing connects them. A locavore does by hand what a node would do without being asked.

Figure 3: Both columns stay the same between the panels; only the lines are added. Neither supply nor demand needs to be created, because both already exist within the same few hundred metres. The work lies in the edges. One need served by two providers is not waste; it helps a locality hold together when one of them has a bad week.

4 Social barriers

This part is not about radios, and it is the harder half.

The recommendation of a supermarket reflects more than the shop's absence from maps. Asking a neighbour has become rare. You must talk to a stranger, guess whether they sell to the public, and risk interrupting them. It feels like it will cost more time and awkwardness than it saves. So, you open an app, and it all happens in silence.

This instinct has been studied and found to be wrong. When commuters were asked to talk to a stranger on the train, they expected it to be unpleasant. They guessed that four in ten strangers would be willing to chat. In reality, everyone approached was willing, and those who talked reported a better journey than those who stayed silent (Epley and Schroeder, 2014). The barrier is not the neighbour. It is people's prediction of how the neighbour will respond.

These small exchanges matter. Interactions with people you barely know make up most daily social contact. On days with more of them, people report more belonging and higher well-being (Sandstrom and Dunn, 2014). For many people, the conversation at the shop is a meaningful part of their human contact that day.

Phones make this worse in a subtle way. In a study in which pairs of strangers had a ten-minute conversation, those with a phone on the table rated it lower than those without (Misra and colleagues, 2016). The phone does not need to ring. Its presence is enough.

This is a public health issue. The World Health Organization made social connection a global priority in 2023, ranking the risk of disconnection alongside smoking (WHO, 2023; US Surgeon General, 2023).

The generational dimension carries the greatest long-term risk. Being findable has become a condition of being trusted, especially for younger patrons. Nearly all consumers check reviews before using a local business. When asked for their most trusted source, Gen Z picks Google Reviews at about twice the rate of the oldest group (BrightLocal, 2024). From the lady's side of the counter, she is harder to find than the supermarket. To a patron in their twenties, she is also harder to believe, because she cannot produce the signals they rely on for trust.

5 Node design and governance

If the entire task is the edges, the infrastructure placed in a locality must be small enough for one person to hold in their head. This is the purpose of a node.

A node is physically bounded, with a radius of about two hundred metres. Stretch it further and it stops being a set of neighbours and becomes a directory, and directories already exist.

A node holds up to ten providers, one per category: one milkman per node. A second is added only when the need arises and the node agrees, not to inflate the numbers.

One person leads the node: the node manager. Their role is to hear problems, ensure that the other providers are doing well, and keep the record current. A local person is far better placed to do this than an outside organisation.

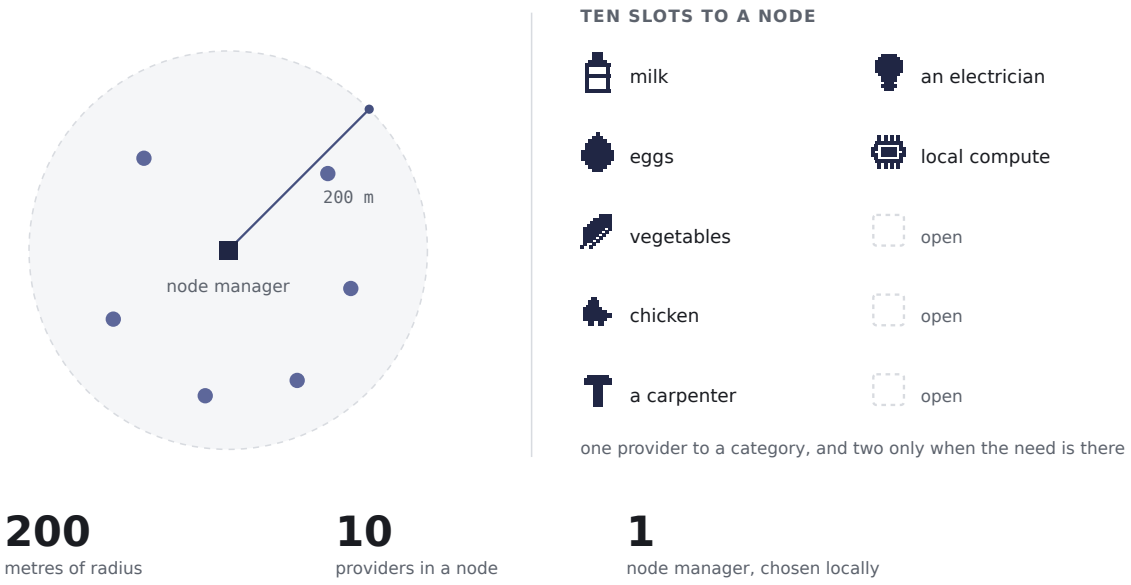

Figure 4: The three numbers define the entire setup. Nothing in the hardware requires them. They keep a node a group of neighbours who can recognise each other, which is essential for any of this to work.

These limits make the earlier arithmetic possible. A provider who can see that ten households on the same street want eggs every week is in a very different position from one who is guessing.

Figure 5: Five becoming ten is not a business plan and does not need one. It is what a person does once they can see that patrons will come for the extra five.

None of this works if Clansurf decides who belongs. Admission, removal, and leadership are decided by the people who live there, and Figure 14 shows where that line falls.

6 Communication without internet or cloud

When people hear that the record is meant to be public, they assume that the internet must be involved. This assumption makes all of this sound harder than it is.

A chain is a database with rules attached. It requires keys, a way to agree on what happened, and nodes that pass data to each other. None of these require the internet. The internet is simply the medium people reach for first, and if you change the medium, the chain keeps working.

The key piece is that signing is mathematics. A record is signed with a private key stored on the device, with no network involved. A phone in aeroplane mode can produce a signed record that cannot be forged or quietly altered later. No internet is needed for that record to be true.

Networks are used to carry records afterwards, and there are more ways to do this than people expect. Inside a locality, you can use a cable, Wi-Fi Direct, Bluetooth, or a LoRa radio mesh, where every node repeats messages for the next, so they hop across a neighbourhood. Meshtastic is an open-source project that does this today on inexpensive LoRa radios, each owned by whoever installed it.

Getting data out of the locality is a separate question with its own answers. Blockstream broadcasts the Bitcoin chain by satellite; therefore, a dish and a receiver are sufficient to stay in sync with no connection at all. Machankura lets people in several African countries transact over USSD, the same phone menus they use for airtime, with no mobile data. Radio operators have long sent signed transactions over long distances on amateur bands.

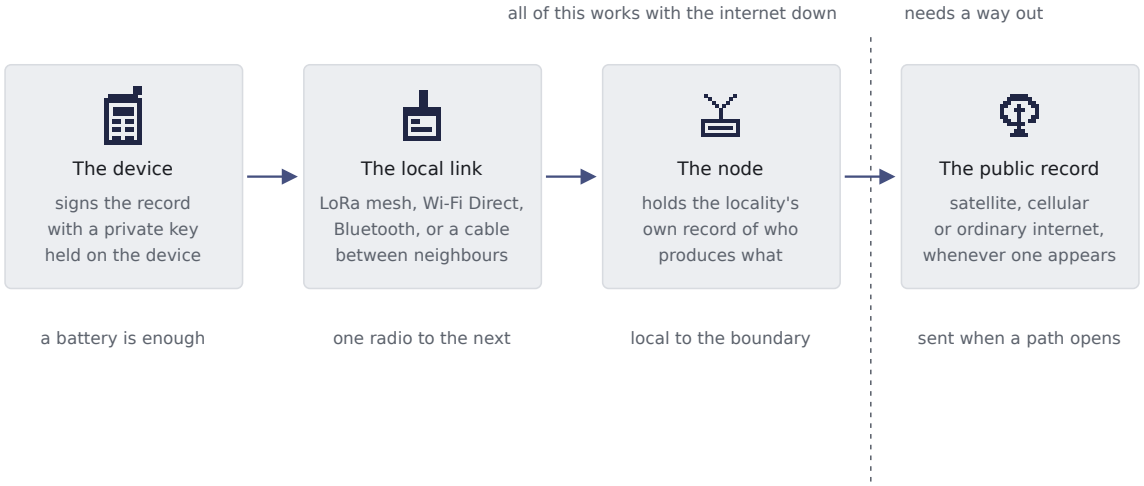

Figure 6: The record is true from the first stage; everything after is only delivery. This is the old store-and-forward method, which is how the post worked long before networks did: sign it, hold it, and pass it on when a path appears.

Choosing a carrier costs capacity, and the trade-off is consistent: long-range links carry little data, and high-capacity links do not reach far.

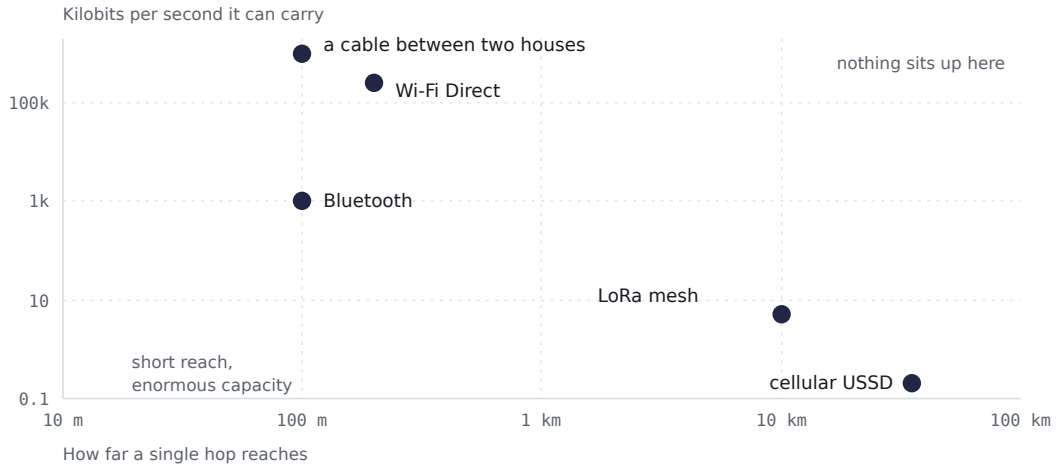

Figure 7: The top right of this chart is empty, which is why the design does not run agreement itself over radio. A LoRa hop cannot carry block traffic. It can easily carry a short signed line saying a provider has eggs today, and that is all the node needs to move.

7 Blackouts, outages, and crises

This system must work when things go wrong because that is when a locality needs it most.

The honest cost of this method is double spending. When two parts of a network cannot reach each other, the same coin can be promised to two people at once. For a payment system, this is a serious problem. It is handled with tamper-resistant hardware that destroys the sender's copy when it is sent, or with penalties once the network reconnects.

For Clansurf, it matters much less because the node does not move money. It records that value exists and who produced it. Being out of contact delays the record, but a locality can work well from a record that is a few days old.

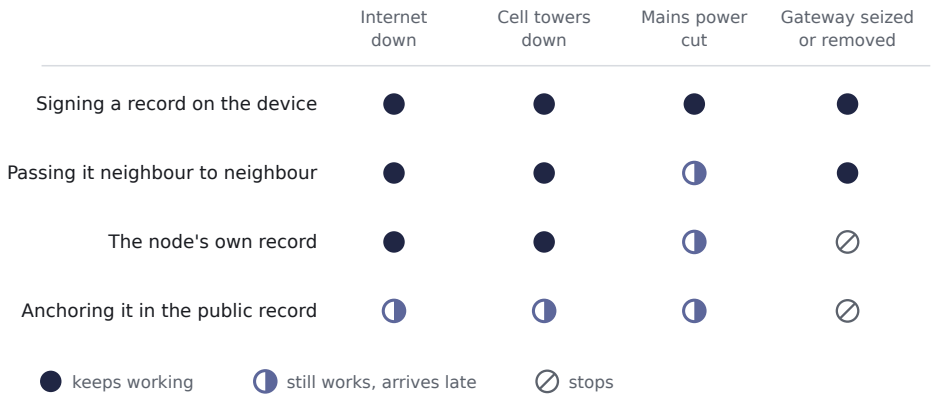

Figure 8: Read column by column, this shows what the design buys. Nothing in the first three columns stops the locality from working. The last column is the serious one: the gateway holds the node's record, so losing it stops that record and anything reaching the public. Signing still works, and neighbours can still pass entries to each other, holding them until a gateway is back. That is why the gateway belongs to the community, not to Clansurf.

8 Radio bands by country

People often ask whether this is legal where they live. Almost everywhere it is, because nearly every country has opened a band below one gigahertz for low-power devices. The band varies by country and determines the radio you order.

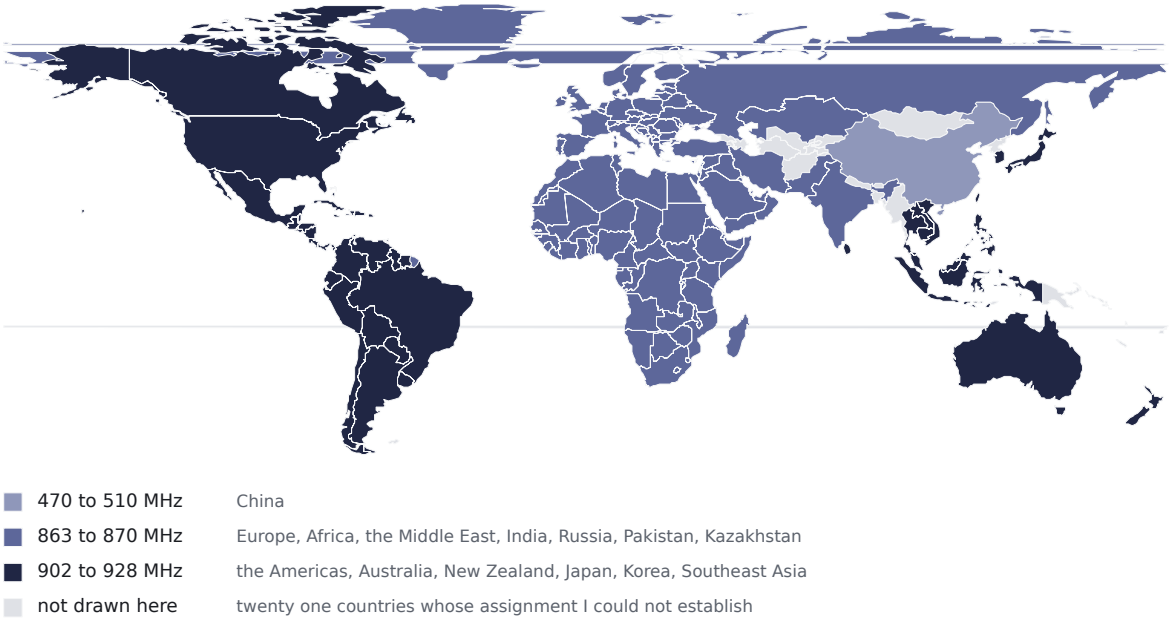

Figure 9: Three tones cover the globe. Providers in Kenya and Portugal use the same radios, as do providers in Peru and Vietnam.

In the crowded part of the spectrum, the frequency is not the number that matters.

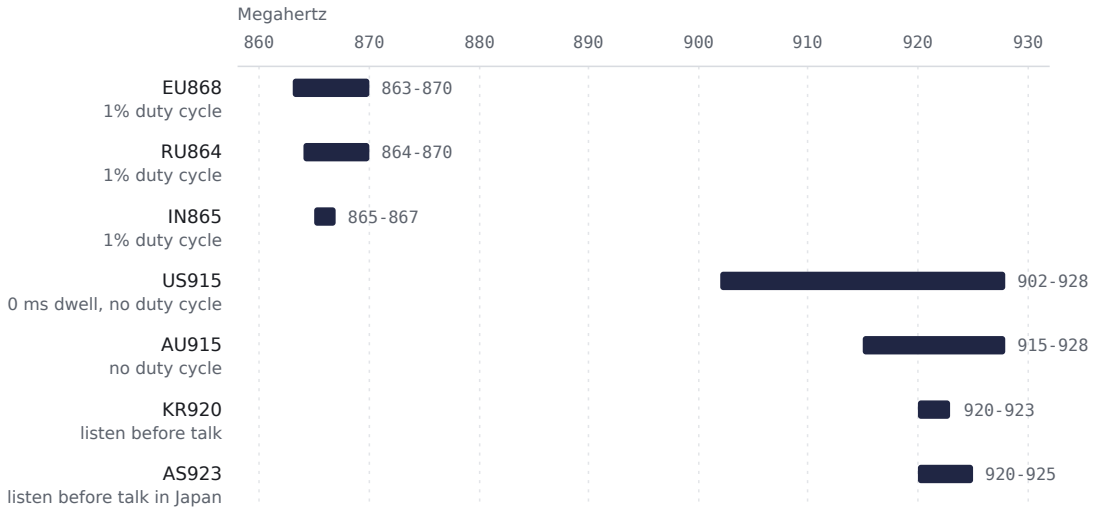

Figure 10: Frequencies are similar everywhere, but the rules differ, and the rule is what you design around: a 1% duty cycle in Europe, a dwell limit in the United States, and listen before talk in Japan and Korea. At the rates in Figure 7, 1% of airtime is still a few hundred short messages per hour across a locality.

Plan	MHz	The limit that bites	Where it applies
EU868	863 to 870	1% duty cycle per sub-band	Europe, most of Africa, the Middle East
IN865	865 to 867	1% duty cycle	India
RU864	864 to 870	1% duty cycle	Russia
US915	902 to 928	400 ms dwell, no duty cycle	United States, Canada, most of Latin America
AU915	915 to 928	no duty cycle	Australia, New Zealand, Chile, Ecuador
AS923	920 to 925	varies; Japan requires listen before talk	Japan, Malaysia, Indonesia, Thailand, Vietnam, Taiwan and neighbours
KR920	920 to 923	listen before talk	South Korea
CN470	470 to 510	national rules	China
EU433	433.05 to 434.79	10% duty cycle, very little room	legacy, rarely used for this

None of this changes how a node is designed. It changes the radio module and airtime planning, which are ordinary procurement questions, not community governance.

Twenty-one countries on the map are unshaded because I could not confirm their assignments. Anyone about to put a gateway on a roof should check their own regulator rather than trust a drawing.

9 Delivery record

The node keeps a record, but no money moves through it. Entries are deliveries and receipts: Fatima brought thirty eggs to number fourteen on Tuesday, and number fourteen agreed. Fatima signs the entry and number fourteen countersigns it; thus, each is a receipt, not just a claim.

This is smaller than a payment system, on purpose. A record of egg deliveries cannot be spent twice in a way that hurts anyone; therefore, the hardest problem in offline money never arises. It also prevents the node manager from settling their neighbours' payments, which in most countries would require licensing and identity checks.

This is exactly what this whole argument has been asking for. An invisible provider does not need a payment link. They need proof that they have supplied eggs every week for a year.

The record is simpler than people expect. A node has one writer and a known group of people. There is no disagreement between strangers to resolve, so no consensus algorithm is needed. The admin computer keeps an append-only log where each entry carries the hash of the one before it, and the node signs the chain. Inserting, swapping, or dropping an entry breaks every hash that follows, and checking costs almost nothing. The node publishes only the latest hash in the chain because that one hash commits to every entry before it.

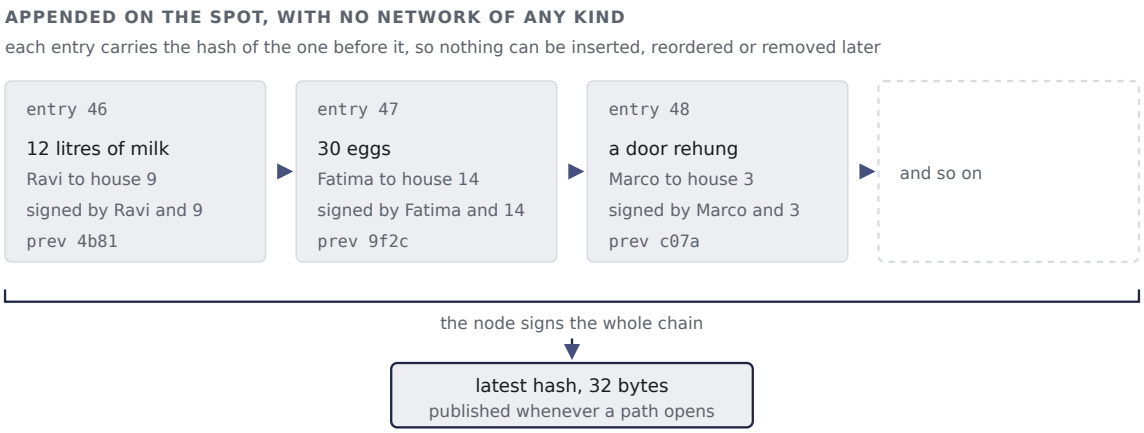

Figure 11: Every entry is true the moment both sides sign it, and the chain prevents the history from being edited afterwards. The provider and the household each keep a copy, the node keeps the chain, and only the 32 bytes at the bottom need to leave the locality.

Two people can settle a delivery dispute with no connection at all. Both hold the entry they signed, the log shows it in place, and the node's signature proves that the log has not been rewritten. When a path to the outside opens, only the latest hash needs to travel.

This is clearing, not settlement, and the distinction is older than the internet. Correspondent banking has run on it for centuries, and card networks still separate authorisation from final settlement by days.

This raises the question of whether the radio keeps up. The arithmetic is reassuring at close range and a warning at long range.

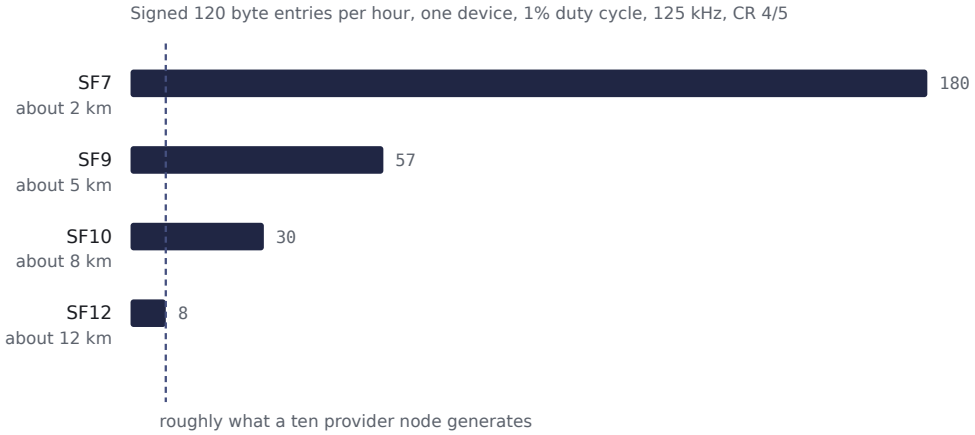

Figure 12: The dashed line is arithmetic and can be argued with. Ten providers making ten deliveries each is a hundred entries a day. Spread across twelve working hours, that is about eight an hour. At a node's defined range, there is more than twenty times the headroom needed. Move the gateway twelve kilometres away, and the headroom is gone, which is one more argument for the 200 m radius in Figure 4. The bars are for a plain LoRa packet. Under LoRaWAN in Europe, a 120-byte entry only fits at SF7 and SF8: SF9 caps the payload at 115 bytes and SF10 to SF12 at 51 bytes, so slower rates would need shorter or split entries.

The log does not record a price. Whether to include an agreed amount is for the node to decide. The software should not push either way, just as it stays out of admission and removal. If value transfer is ever added, it goes on top of a log that already works, which is the correct order.

10 Consequences at scale

One lady closing at five is not, in itself, a crisis.

Projected forward, however, the effect compounds. Providers in a locality fade into irrelevance, and over time, the locality forgets that they existed. Spread that across a region, then a country. A place ends up importing simple things it once made and sending its people elsewhere for work that used to be local.

That does not happen because people stop producing. It happens because no one can see what is made next door.

This is a community problem before it is a technology problem, and no radio can fix it on its own.

11 Well-being and human connection

So far, I have focused on the problem; this section describes the other side. The case is not only economic.

If a node works, the ordinary week shifts a little. Eggs come from a neighbour whose name you know. The carpenter is someone you have met, not a rating out of five. You have a few short exchanges each day that you would otherwise miss. As Section 4 showed, these exchanges are a real part of how well a person feels, not a cost on the way to a purchase.

None of this asks for sentimentality about the milkman. What changes is that the option is there, and the node has already made the introduction, which takes the awkwardness out. People skip their neighbours because they misjudge how it will go. A node removes the guesswork.

It also puts money back into the street, although this is a secondary point, because the local multiplier is not the central argument. The central argument is that a locality where people can

find each other has something a delivery network cannot supply: knowing who is there and what they can do. That is what gets a street through a blackout, and it is a better way to live.

And it is not transactional. A platform relationship ends when the payment clears. A relationship with the lady who closes at five does not; she will be there tomorrow, and so will you. This design is meant to leave that intact, not to insert itself in the middle of it.

12 Roadmap and local agents

This section distinguishes between what is running and what remains a proposal. Nothing in it is running yet; everything from here on is proposed.

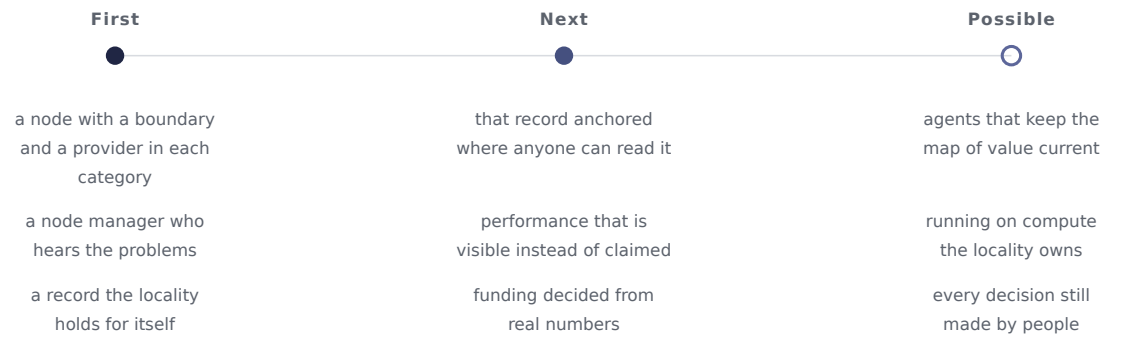

Figure 13: None of the three columns is running yet; they show the order in which the work must happen. The first column is essential. A locality that cannot maintain its own record will not get better at it by adding something clever on top.

The real challenge in the middle column is clerical. Once a node has a boundary, a set of providers, and a record, keeping it current is real work, and that work falls on the node manager. Multiplied across a hundred nodes, this work would require many people to spend their evenings reconciling entries that arrive out of order. That is work for a machine.

Therefore, I propose agents that run on the locality's own hardware: mapping value, keeping the record tidy, and handling administration rather than judgement.

The word *running* is key. An agent that depends on a service somewhere else is the same arrangement this paper has argued against throughout. Whoever owns that service can switch it off, and the locality is then renting its own visibility again. Local models on local compute are a requirement, not a preference. They also make compute one more thing a locality can own and provide, on the same list as milk, eggs, and wiring.

An agent must never decide. It can tell a node manager that a provider has not appeared in the record for three weeks, and it should. However, whether that provider is struggling, visiting family, or quietly leaving is not a question for a model, and what happens next is not its call.

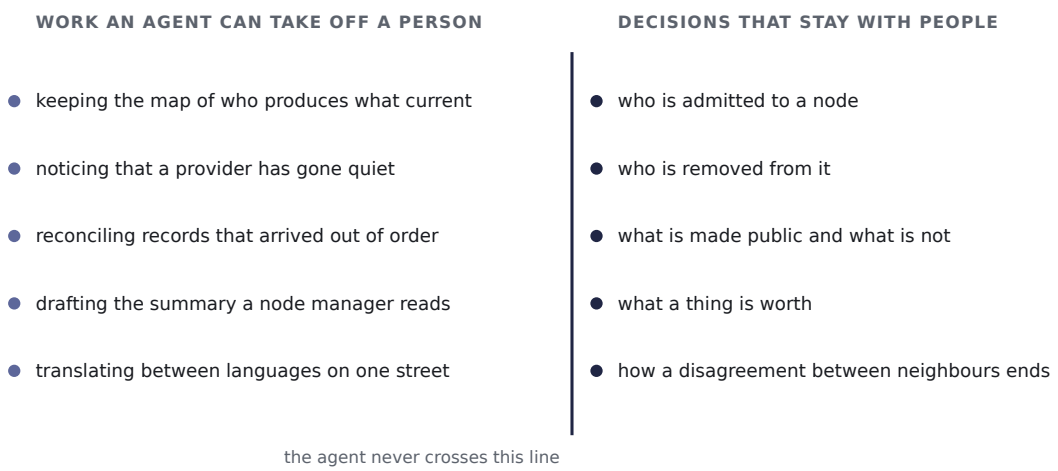

Figure 14: Everything on the left is bookkeeping; everything on the right is judgement about neighbours. Clansurf assists with the technology and nothing else. Who belongs to a node, who stops belonging, and how arguments between neighbours are settled are decisions for the community that lives with the result. Handing any of it to software would defeat its purpose.

13 Objections

There are already apps and websites for finding these people.

Those people existed long before the apps. The apps did not create the carpenter or the milkman. They put a shirt on them and built a gate. What I describe works the other way: it makes them visible and leaves them independent.

So this is a hardware project?

No, the hardware is just a tool. What goes into a locality is governance: who belongs, who maintains it, what is public, and who decides. The hardware allows all of that to run without anyone’s permission.

About the author

Joshua Poddoku works on open-source adoption in developer relations, market strategy, and community governance.

He is building Clansurf with local communities, starting in Southeast and East Asia. The node design, governance model, and record are currently being worked out. The estimates in this paper will be replaced with real figures once a locality is running.

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Take part

This is a working paper, unfinished on purpose. Help is most needed where I have used estimates instead of measurements: the dashed line in Figure 12, the twenty-one countries left unshaded in Figure 9, and most of the figures in Figure 4, which a real locality would quickly correct.

If you have something to add, write to research@clansurf.com. The most useful contributions are:

- A locality willing to be the first node, and a person there willing to manage it.
- A local value provider willing to correct any misreading of their situation.
- Anyone who has run a LoRa mesh in the field and can describe what breaks.
- A correction to the band table, especially for a country the map leaves blank.
- A study that contradicts something in Section 4, the section that relies most heavily on other people's research.

Anyone whose contribution changes the paper will be named in the version it changed. This is the only way to get a mention, and it is not for sale.

Working with Clansurf

Organisations considering a node in a locality will find the practical details on the separate working with us page. That is a different conversation from this one.

Sources

Where the radio numbers come from

- LoRa Alliance. RP002-1.0.3 LoRaWAN Regional Parameters. Band edges, data rates, duty cycles, and dwell limits.
- ARIB STD-T108. The Japanese standard behind the listen-before-talk requirement.
- The Things Network. Frequency plans by country. Used to check which plan each country runs.

Projects referred to by name. These show that the approach is practical. None of them is affiliated with Clansurf, and nothing here implies a partnership or endorsement.

- Meshtastic. Open-source firmware for long-range mesh over inexpensive LoRa radios.
- Blockstream Satellite. Continuous broadcast of the Bitcoin chain, receivable with a dish and no connection.
- Machankura. Bitcoin over USSD on ordinary phones, running across several African countries.

Social connection, trust and the phone

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Map data

- Natural Earth, public domain, at 1:110m. Packaged as TopoJSON by world-atlas.

Further reading on store and forward

- Hu, Zhou, et al. BcMON: Blockchain Middleware for Offline Networks.
- Hu and Zhang. A Delay-Tolerant Payment Scheme Based on the Ethereum Blockchain.
- Kietzmann, Schmidt, et al. Delay-Tolerant ICN and Its Application to LoRa.

How this page is made

- Written in Quarto and rendered as static HTML. Every diagram is hand-drawn SVG generated at build time. Typeset in Source Serif 4, Inter, and IBM Plex Mono, all openly licensed and served from this domain.