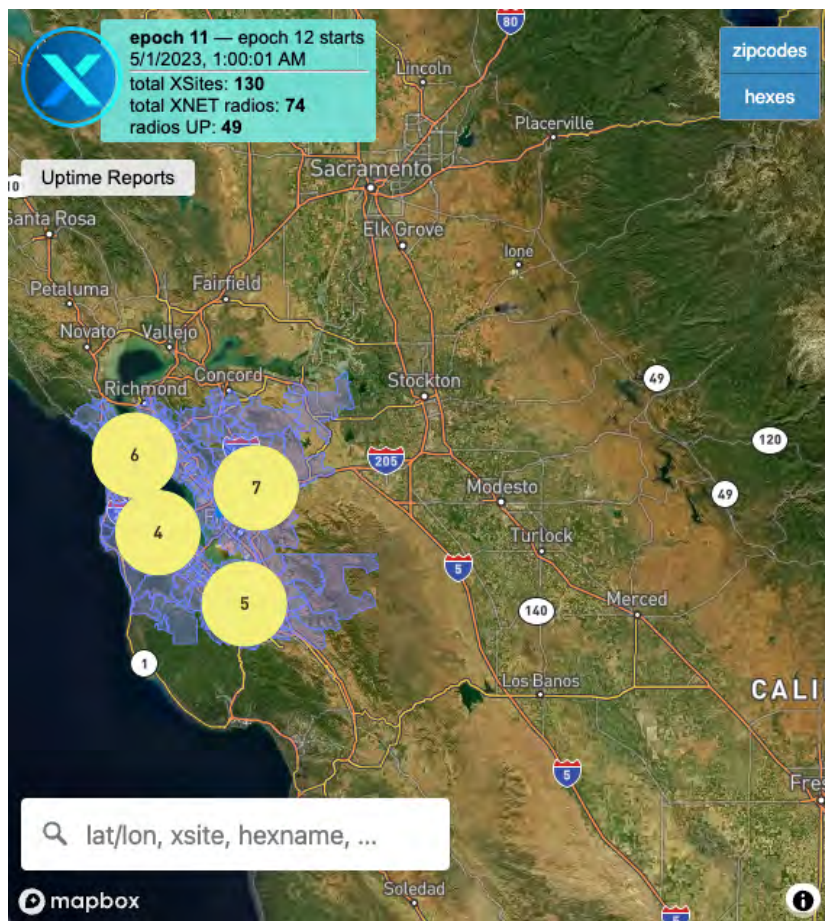


# The XNET Explorer

Version 1, 24 April 2023 – Sint Connexa, aka Rich DeVaul

This document is an introduction to the functions and use of the XNET Explorer, which can be accessed at <https://explorer.xnetmobile.com> – this app provides a near-real-time view of the XNET network, including the status of active radios and gateways. The XNET Explorer is a functional tool but still in an early stage of development. If you have comments or suggestions for improvements, please contact the XNET team on our discord server, or email [connexa@xnet.company](mailto:connexa@xnet.company)



## Status Box

In the upper left hand corner, you see the status box. The status box shows the current date and time in the viewer's local time zone, the current XNET epoch number, and the date and time of the start of the next XNET epoch. It also displays the total number of provisioned radios "**total XNET radios**" and the number of radios currently operating "**radios UP**", as well as a total number of provisioned sites "**total XSites**". After ten minutes this information is considered stale, and the app will prompt you to reload.

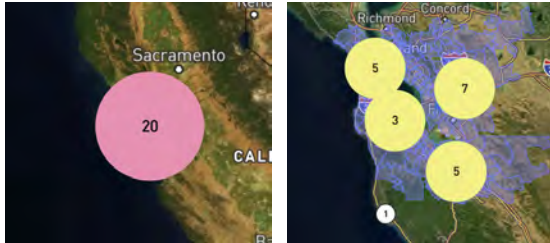
## Map Surface

The map surface can be panned and zoomed in the usual way, either with a mouse or with a touch interface. Zooming out far enough will show a view of the globe.

## Map Layers

In the upper right corner there is a list of toggle buttons for map layers. Right now there are two layers you can toggle visibility on: activated **Zip Codes** and **Hexes**. Both of these layers are toggled on by default. You can learn more about Zip Codes and Hexes below.

## Site Groups



A pink or yellow circle with numbers represents a group of XNET Sites, or XSites. As you zoom in, site groups will split into smaller groups and eventually to individual XSites. To zoom in, you may use the standard pinch/zoom control for the map surface or you may click on a site group.

Once you zoom in far enough, you will see individual XNET Sites represented by XNET logos on the map, as described below.

## XNET Sites, or XSites.

An XSite is a combination of a gateway and at least one radio. All XNET-supported radios have a GPS receiver and an associated map location. When you have zoomed in far enough to see separate XSites on the map, they are represented by the symbols shown below:



### Operating XSite

This icon represents an XNET site that has at least one operating radio and has checked in within the last **30** minutes.



### XSite stale or down

This icon represents an XNET site that was previously operating but is now offline or has no radio that has checked in within the last **30** minutes.

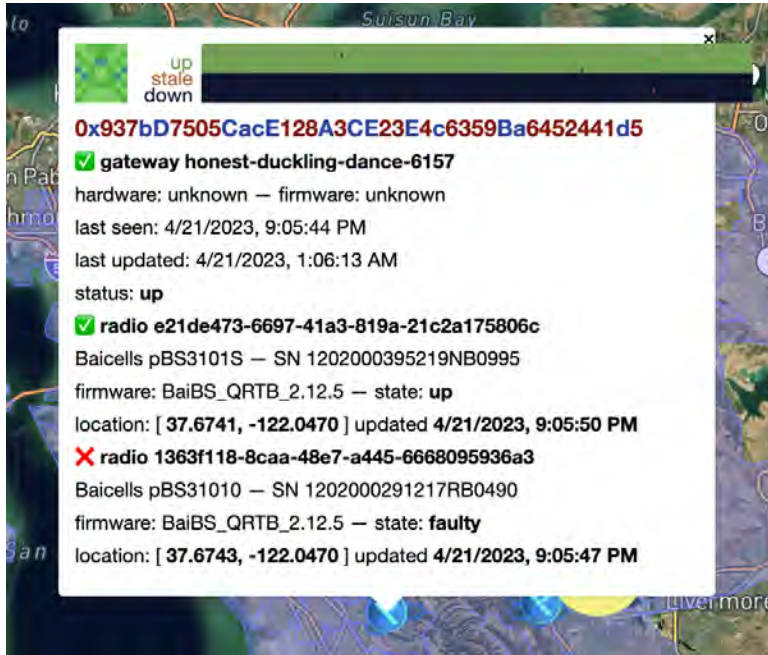


### XSite Out of Bounds

This icon represents an XNET site deployed outside the current permitted coverage area<sup>1</sup> or a radio associated with the site was moved from its registered location without advanced notice. Sites marked as Out of Bounds are not eligible for rewards.

<sup>1</sup> **An important note on permitted coverage area:** eligibility is determined by hex membership, not by Zip Code boundary. This means that some radios located outside of activated Zip Codes are still operating in-bounds because the hex containing the radio overlaps a permitted Zip Code. For more information, see the discussion of Zip Codes and Hexes below.

The XNET network attempts to query the state of each XSite every ten minutes. Clicking on an XSite icon will produce a popup with the latest reported information, such as the example shown below:







## XSite Popup

At the top of the XSite Popup you will see the blockchain identifier for the site (it looks like a Polygon wallet address) as well as a “blockies” icon that turns the address into a picture.

To the right of the icon is the uptime flag, representing up to two weeks worth of radio uptime for each radio in a stacked horizontal bar chart format. Each pixel column in the chart represents one hour, and the bars are made of individual blocks of color that represent ten minute increments.

As the legend indicates, green means up, brown means stale, and black means down. In the example shown here, the first radio has been up with high reliability, and the second down for the past two weeks.

Below the uptime flag and blockchain identifier is information on the gateway and radios associated with the XSite. A green checkmark  indicates an “up” state reported within the last 30 minutes. A red ex  indicates a down state, and a yellow warning symbol  indicates a stale state, which means that the last update occurred more than 30 minutes ago.

Each radio has a registered lat/lon location established when the site was commissioned and a current GPS location shown in the popup, along with the time that location was updated. If the current GPS location deviates by greater than 12m from the the registered location for two successive updates the radio will be marked Out of Bounds with a skull and crossbones  and the associated XSite will be ineligible for rewards until the radio is re-registered or the situation is otherwise addressed.

## Uptime Reports

Just below the status box, there is a button labeled “Uptime Reports,” which will provide you uptime statistics for the current epoch, and for the preceding epoch. These statistics are important because they are used to determine \$XNET token rewards eligibility.

## Search Box

In the bottom left is the search box. This search box will let you zoom in on any location in the US or globally by typing an address. The following kinds of addresses are supported:

- A standard street address, such as:  
**101 East Main Street, Meriden, Kansas 66512, USA**
- A latitude and longitude pair, such as: **36.952857, -122.030790**
- The name of an XNET gateway, such as: **honest-duckling-dance-6157**
- The name of an XNET hex, such as **astronomy-negative-canoe**

If you are searching for an XNET hex or gateway, partial matches are not supported. Any search that is not an exact match for a gateway or hex name will be treated as a street address, so searching for “honest-duckling” likely won’t produce the expected results.

## Zip Codes

XNET uses a list of activated US Postal Service Zip Codes to determine which hexes are activated, or eligible to host XNET radios. You can toggle your view of this layer as described above. When displayed, the Zip Code layer shows activated Zip Codes in translucent blue. If you hover your mouse over an activated Zip Code, the Zip Code postal code is displayed.

## Hexes

The XNET Explorer uses XNET’s [X5 Hex Grid](#) to divide the map into hexes defined by latitude and longitude. Each hex is about **1.8 km<sup>2</sup>** in area, and is uniquely identified by a **32** bit number and a corresponding three-word name.

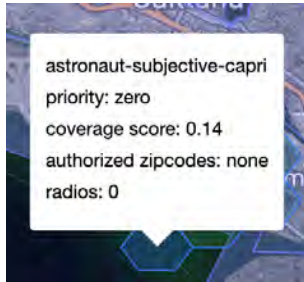
Hexes are very important in the XNET network, as they provide the basis for discretizing location and determining rewards eligibility. Only radios operating in the permitted coverage area are eligible for rewards, and the permitted coverage

Why are hex boundaries used to determine rewards eligibility rather than zip code boundaries? Zip codes can have very complex boundaries, and even be discontinuous. Testing a location to determine whether it falls inside a Zip Code is a computationally intensive process, and not one that can efficiently be accomplished by an ethereum virtual machine smart contract.

Our goal is to eventually perform all location-based validation on-chain. Even if it were feasible to store the full US zip code GIS database on-chain, doing the computational geometry calculations in an EVM smart contract to determine whether a location falls inside activated zip codes isn't feasible. However, we can pre-compute which hexes touch which zip codes, and testing a location to determine if it falls inside a hex is fast and easy. 🌟 ... the more you know!

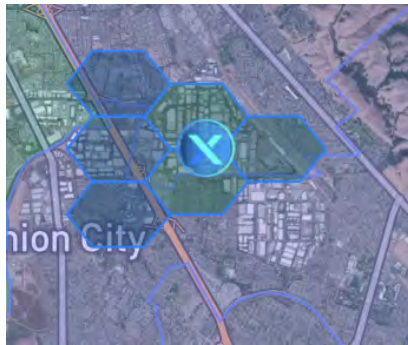
area itself is defined as a list of activated hexes. An activated hex is a hex touching one or more activated Zip Codes.

In addition to defining the permitted coverage area, hexes are also used to define priority coverage areas, as described below.



Hovering your mouse over a hex in the explorer will reveal a popup like the one shown to the left. This popup provides additional information about that hex, including its unique three-word name, its priority for coverage (“zero” means not eligible for rewards, “normal” means eligible, and “high” is described below in Priority Reward Hexes), its estimated coverage score (higher scores mean more radios are covering the hex), a list of authorized Zip Codes, which could be “none” and the total number of radios operating in the hex.

## Radio Coverage Hexes



Radio Coverage Hexes are overlaid on the XNET Explorer map to show nominal radio coverage areas. Around each XSite that is not out-of-bounds, you will see some light blue bounded hexes that represent an estimate of the coverage provided by the radios associated with the XSite.

This coverage estimate is a simple approximation and shouldn’t be relied on without independent verification — expect future improvements in coverage estimation.

## Priority Reward Hexes

Priority reward hexes are hexes that are associated with a named cluster, such as “Chicago” or “San Francisco”, and have a coverage priority of “high”. There are currently two types of priority rewards hexes, Silver and Gold. Radios deployed within priority reward hexes can earn significantly higher rewards than radios deployed in normal priority hexes. For more information on priority rewards, see [XNET: 2023 Cluster Updates](#).

## Questions/Comments

Was this helpful? Want more information? Please jump on the XNET discord at <https://discord.gg/3W5vTU8aCn> or email [connexa@xnet.company](mailto:connexa@xnet.company)