XY SENSE

Technical
Specification
Summary

Version 06

01. Company Overview

XY Sense helps enterprises make the most out of their office spaces with actual real-time usage analytics based on data captured from XY Edge AI sensors.

Corporate Real Estate Teams are tasked with managing their organization's office space and accommodating headcount growth; yet they struggle to know how well space is actually being utilized.

— Which desks are hardly used that can be re-allocated?

— Are departments asking for more space when they're not really using the space they already have?

— Are all meeting rooms booked yet actually half empty?

— Are collaboration spaces being used at all or should they be repurposed?

02. Solution Overview

XY Sense combines its own AI IoT edge sensors, cloud analytics, and a real-time API to capture accurate utilization data and provide recommendations on ideal space layouts. The XY Sense solution includes 2 main components:
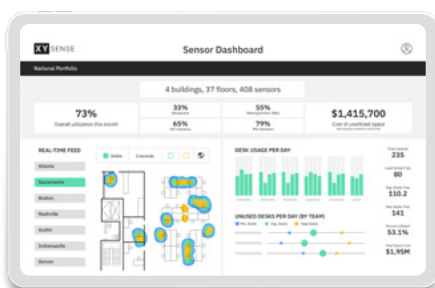
2.1. AI Sensors & Hub

XY's sensors can understand how people use office spaces. Sensors can count and locate people on a floor-plan. All data collected is anonymous. There is no requirement for people to change, no bluetooth/wifi dependency, and no carrying an additional device. The sensors perform AI Deep Learning Inference at the Edge, and send anonymous information to XY Sense's secure cloud platform.

Sensors communicate to the cloud via our hub. Typically one hub per floor is required. Hubs use a built-in 4G cellular connection.

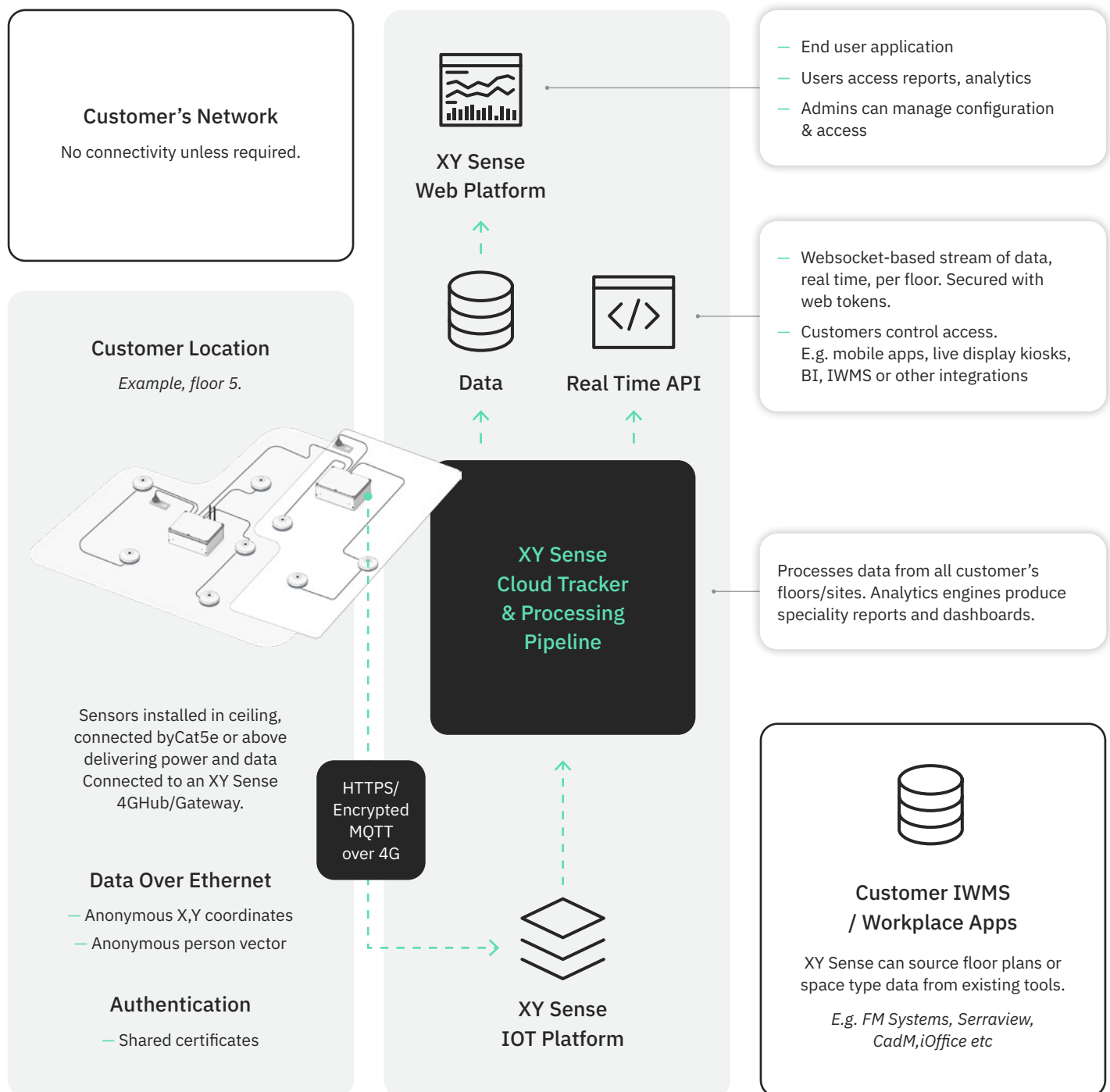## 2.2. Cloud Analytics & Application

XY Sense has a secure cloud platform hosted on Amazon Web Services (AWS). There, authorised users can view real time activity on their floors, explore our ever growing library of dashboards and reports, see recommendations in the form of predictive analytics and manage their spaces, floor plans and teams/neighbourhood allocations.

2.3. AI Sensors & Hub

The diagram below highlights the flow of data between the components. Sensors connect to the cloud via the XY Sense Hub connecting directly to our IOT platform. This is via HTTPS / Encrypted MQTT over 4G.

See the Appendix for sample payloads, including anonymous sightings collection and the downstream live heatmap/occupancy feeds.

Customer's Network

No connectivity unless required.

Customer Location

Example, floor 5.

Sensors installed in ceiling, connected byCat5e or above delivering power and data Connected to an XY Sense 4GHub/Gateway.

Data Over Ethernet

— Anonymous X,Y coordinates
— Anonymous person vector

Authentication

— Shared certificates

HTTPS/ Encrypted MQTT over 4G

XY Sense Web Platform

— End user application
— Users access reports, analytics
— Admins can manage configuration & access

Data   **Real Time API**

— Websocket-based stream of data, real time, per floor. Secured with web tokens.
— Customers control access. E.g. mobile apps, live display kiosks, BI, IWMS or other integrations

XY Sense Cloud Tracker & Processing Pipeline

Processes data from all customer's floors/sites. Analytics engines produce speciality reports and dashboards.

XY Sense IOT Platform

Customer IWMS / Workplace Apps

XY Sense can source floor plans or space type data from existing tools.

E.g. FM Systems, Serraview, CadM,iOffice etc

03. Sensor Hardware

3.1. Overview

Sensors by XY Sense leverage unique artificial intelligence algorithms designed to understand an office scene and accurately count and position people onto a floor plan. XY Sense has completely designed its sensors in house; spending over 2 years in research and development. Data processing is done at the edge on the sensor to maximise security and privacy.

3.2. Technical Specification Summary

SKU Number	XY-S-A* / XY-HS-A*
In-built sensor	CMOS
Technology	Low power deep learning at the edge running custom neural networks designed by XY Sense.
Power Consumption	Avg 6W (10W Max)
Input	RJ45 Passive PoE via Hub, or another XY Sense sensor. Provides power and data.
Output	RJ45 Passive PoE. Provides power and data. Output powers up to 5 more sensors daisy chained (6 max in chain from Hub)
Power Supply	External — Ethernet Cat5e (or better) cable via Hub
Weight & Dimensions	Diameter: 140mm / 5.5" Height: 50mm / 1.97" Weight: 250 grams / 8.8oz
Range	1022 sq ft / 95 sqm - line of sight for typical average ceiling height (10' / 3m)

Installation Mount Height	Minimum 2.44m / 8', Maximum 3.6m / 12'
Positional Accuracy	Locate people on a floor plan within 1m (3') - typically within 0.3m (1')
Data Output (from sensor)	For each person detected: — Anonymous X,Y coordinates relative to the sensor — Anonymous sighting metadata In future versions: — Anonymous human behaviours - eg sitting, standing, using computer, talking on phone — Anonymous person vector to help differentiate people and prevent double counting. Eg [1.375, 2.75, 0.375, ..., -2.875, 3.25, -1.5, 0.125] This is an encrypted binary packet sent via a direct connection to the Hub.
Communication Protocol	HTTPS / Encrypted MQTTOver Ethernet Between sensors & gateway - wired (supports IPv4) Between sensors & corporate network (supports IPv4, IPv6) *It is possible to connect the sensors to the corporate customer network via PoE adaptor, this may require additional security sign-off from the customer infosec team.*
Mounting mechanism	Mounting bracket system: — Flush ceiling mount — Rod mount (eg. from exposed ceiling)
Software Updates	Secure over-the-air remote updates
Data Usage	4G Data Included in subscription (XY-CLOUD-4G10). A typical sensor uses approximately 300MB per month.

04. Hub

4.1. Overview

The Hub receives data from the sensors and relays it on to the cloud. No additional data is collected at the Hub. By default, the Hub uses a cellular connection to push sensor data securely to the cloud.

4.2. Tech Spec Summary

SKU Number	XY-HUB-PR* / XY-HS-HUB-PR* XY-HUB-SC* / XY-HS-HUB-SC*
Technology	Secure proxy Hub to provide an external secure connection to the XY Sense cloud platform and manage caching on any service interruptions
Range	Up to 18 sensors powered from one hub.
Power Supply	External - single phase socket outlet. Separate circuit breaker recommended.

Number of Hub(s)	Max # Sensors
1 Hub (4 Sensor Links)	18
2 Hubs (7 Sensor Links)	36
3 Hubs (10 Sensor Links)	48
4 Hubs (13 Sensor Links)	60
5 Hubs (16 Sensor Links)	72

A maximum of 4 Secondary hubs can be connected to a Primary hub.

Weight & Dimensions	Length: 32cm / 12.6" Width: 27cm / 10.6" Height: 12cm / 4.7" Weight: 3.1 kg / 109.3oz
Power Consumption	Typical 120W (300W rated power supply)
Installation	Location required with sufficient cellular coverage if using 4G
Data Output	The encrypted binary packets from each sensor connected to the Hub is proxied to the XY Sense cloud platform.
Communication Protocol	Between sensors & Hub - wired Between XY Sense cloud platform - 3/4G cellular Supports IPV4 *It is possible to connect the Hub to the corporate customer network, although this is not recommended for pilots as it can delay kickoff. This may require additional security sign-off from the customer info-sec team.*
Mounting mechanism	Unit is a standalone item and is typically attached to threaded rods or structural wall/ceiling.

Standard Configuration

Each floor will require a minimum of one Primary Hub. The number of Secondary hubs required will be influenced by the total number of sensors on the floor - as per below table.

Number of Hub(s)	Max # Sensors
1 Hub (1 Primary Hub) (4 Sensor Links)	18
2 Hubs (1 Primary Hub, 1 Secondary Hub) (7 Sensor Links)	36
3 Hubs (1 Primary Hub, 2 Secondary Hubs) (10 Sensor Links)	48
4 Hubs (1 Primary Hub, 3 Secondary Hubs) (13 Sensor Links)	60
5 Hubs (1 Primary Hub, 4 Secondary Hubs) (16 Sensor Links)	72
6 Hubs (2 Primary Hub, 4 Secondary Hubs) (20 Sensor Links)	90
7 Hubs (2 Primary Hubs, 5 Secondary Hubs) (23 Sensor Links)	108
8 Hubs (2 Primary Hubs, 6 Secondary Hubs) (26 Sensor Links)	120

05. Cloud

5.1. Overview

The XY Sense Cloud has 3 responsibilities

1. Collect data received from the sensors to stitch together and collate
2. Provide a near real-time feed to authorized 3rd party vendors (eg Serraview and other IWMS platforms)
3. Cloud analytics portal to view collated data from XY Sensors and view against anonymized industry benchmarks

5.2. Tech Spec Summary

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Platform	AWS multi-tenant cloud platform
Security	Authenticated access based on administrator roles
API Access	Token Based Key Access
Cloud portal requirements	The services fully operates with the current version, as well as the three prior versions of Microsoft Edge, Mozilla Firefox, Google Chrome and Safari (as well as such other Internet browsers agreed to by the Parties in writing)
Data maintained in XY Sense cloud platform	Via our web application and APIs customers can access and maintain the follow pieces of data (Or an XY Sense administrator can on behalf of the customer) — Floor plan images — Floor details such as name — Locations/Buildings - name, address — Space information for each floor - space area, space type (e.g. Meeting Room, Workpoint), name, capacity — Neighbourhood/space group information - name, assigned spaces — Utilisation information - which spaces are currently utilisation or not — Users - which users have access and the type of access they have — General settings to configure the XY Sense platform — Dashboards and analytics - information aggregated from the raw utilisation data to display useful insights into your portfolio across time

Deidentified customer data in XY Sense Cloud	XY Sense deidentifies customer data for use in industry benchmarking and data analysis studies. This data *cannot* be tied back to the customer in any way. Such data includes:
	— Industry sector of customer (eg finance, technology, telecommunications)
	— Utilisation by space type (eg meeting room, breakout space, workpoint)
	— Localisation data about spaces - eg how far a space is from amenities / view)
	— Behavioural activities (eg % ppl sitting / standing over time)
	Customer Data that is *not* included:
	— Any space, room, team, floor, building names
	— Customer floor plans
	— Customer admin login details (email address, firstname, lastname)
Port and domains required	**Port 443:** app.xysense.io core-api.app.xysense.io xysense.au.looker.com *.dev.xysense.io cognito-identity.ap-southeast-2.amazonaws.com **Port 80:** A3iun0ocnfkxx9-ats.iot.ap-southeast-2.amazonaws.com (web socket over port 80)

06. Installation / Configuration

Installation has been engineered to be simple and easy. XY Sense will organize for one of our installation partners to install the sensors and Hubs on site, or a customer can organize their own in-house installation.

The following is required;

— 1 powerpoint for each Hub, generally only 1-3 per floor

— 1 ethernet cable per sensor daisy chained together - XY Sense will provide an estimate of sensor layout before, but depending on obstructions sensor layout may change slightly during installation

— Floor plans - CAD (preferred), or PDF/ raster image (PNG, JPEG, etc.). Space types can be integrated from an incumbent IWMS solution, or if none available, each space (e.g. desks) can be geofenced so XY Sense solution can report on usage of different spaces.
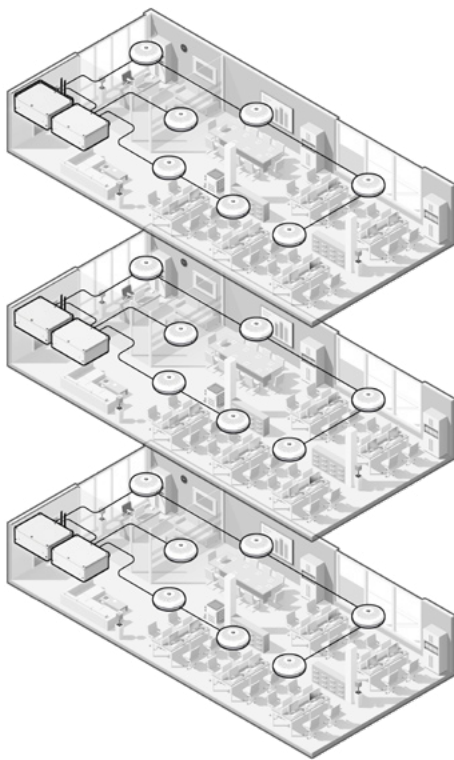
The installation procedure is as follows:

1. Hub will be installed and configured by our partners on the floor

2. Sensors will be installed near the predefined locations and cabled together according to the layout plan

3. Sensors will be once off configured/calibrated for their orientation and location.

4. The installer may need to install a few more or less sensors than originally planned - they check coverage of the floor/spaces
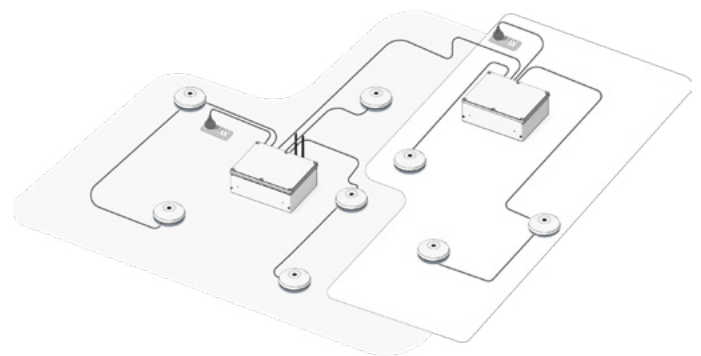
6.1. Cloud Inputs

1. Name and email address of administrators who will require access admin analytics.

If you have questions or require further information, email info@xysense.com or contact your nominated XY Sense representative who can assist.

www.xysense.com