Sixgill
— Govern IoE —

SENSE 2.0
The Sensor Data Destination

For developers and product owners who are building sensored asset applications, Sixgill Sense enables any organization to acquire sensor data in any volume and velocity, understand it, and act on it programmatically.

Sense universally supports the data service requirements of any sensor-informed application.

YOUR BACKBONE FOR GOVERNING IoE

THE IMPORTANCE OF IoE GOVERNANCE

Unending torrents of sensor data from exploding numbers of devices and assets – including both people and things – are creating major challenges as well as opportunities. The biggest question marks surround IoE governance and finding the best ways to tap IoE's potential for achieving business objectives flexibly and uniformly at scale.

In the context of IoE, governance means knowing what assets you have, where they are and what their operating status is, in order to keep their deployment and actions on track. Thus, every IoE application must be able to acquire all available sensor data, infer meaningful understanding, and programmatically trigger appropriate responses and instructions.

SIXGILL
sense™
The Sensor Data Destination

THE SIXGILL IoE IMPERATIVE

The numbers associated with what most people call IoT are staggering. Billions of connected objects gushing vast quantities of data and growing by the minute. In response, overwhelmed industries split the realms of people and things to create an Internet of Things.

From a business standpoint, however, combining things and people in a single Internet of Everything (IoE) solution or platform makes far more sense. People, places and things are all varying types of assets. They generate data derived from sensors and interact person-to-person, person-to-thing, or thing-to-thing.

SIXGILL'S REALM IS IoE WHERE PEOPLE ARE A VITAL PART OF THE EQUATION.

Many organizations are well aware of their asset governance challenges but are constrained from solving them by closed, fragmented application and data systems that also lack portability between cloud and installed computing platforms. As a result, many frustrated, companies are simply stockpiling data for future uses only vaguely defined.

Sixgill Sense 2.0 is a powerful data automation platform for supporting sensor-informed applications and solving a range of system level IoE governance and data integration problems. It can simplify IoE applications development and deployment by providing universal sensor data services that underlie task-specific applications. This allows developers to avoid more difficult alternatives that aren't scalable, open or compatible.

Within three years, two-thirds of companies that have adopted IoT/IoE are expected to use a platform for at least one project.[1] A few that have already chosen that route are hitting speed bumps trying to integrate disparate platforms to create a unified view of IoE operations.

Meanwhile, Gartner predicts that by 2020, 80% of all IoT projects will have failed at the implementation stage due to improper methods of data collection.[2]

What restores order to this chaos is a return to the established practice of building task applications on universal data and application services that support specialized applications in uniform ways.

1 "Competitive Landscape of IoT Platform Vendors," Gartner. May 26, 2017
2 "Competitive Landscape of IoT Platform Vendors," Gartner. May 26, 2017

THE SENSE U3 ARCHITECTURE

UNIVERSAL: One data services backbone for all sensor dependent applications, with the ability to acquire, analyze and act on any type of sensor data.

UNRESTRICTED: Open to any type of data or data source offering full customer control of data handling. Includes editable and configurable rules facilities and is extensible with APIs and plugins (built-in or custom). Allows outputs to any external system.

UNBOUNDED: Ingests data at any volume and velocity with cloud-managed, on premise or hybrid deployment at any scale.

A POWERFUL BASELINE DATA SERVICES ARCHITECTURE

Successfully governing IoE is largely an exercise in capturing all of the data, filtering out the noise, pinpointing relevant data intersections and quickly triggering actionable responses.

Sense solves fragmentation and integration problems with an architecture that offers total flexibility to develop a wide range of applications for sensor-equipped assets. Because there are no intrinsic limits on data sources and scalability, enterprise developers are free to build exactly what they need.

Sense offers modular capabilities via Sixgill's pre-built, custom and third-party plugins, services, APIs and SDKs that developers can use to build custom applications, then replicate and repurpose systems and apps in the future.

Applications built on Sense are able to acquire sensor data *from all input paths* quickly, then organize, process and analyze the events that are most meaningful, and trigger responses programmatically. Sense's distributed computing architecture allocates processing at or as close to edge resources as possible.

Edge processing is vital with smart machines on the other end of the connection, as Sense can thus send real-time responses (triggered by specific situations) to assets with instructions to execute actions.

Sense integrates easily with internal systems, third-party services, existing tools and private big data networks.

It provides the foundation for organizations to finally build their IoE applications strategy for delivering real business value.

THE IMPORTANCE OF EDGE COMPUTING

The massive scale of IoE and need to act on data streams in real-time requires that data be acquired, analyzed and acted on in new and faster ways. In short, there isn't time to send data strictly to centralized resources for processing, and then back to where it's needed.

Decision services must be pushed closer to where the action is happening.

Edge computing is the capability of a system to process data closer to the "edge" of a network, rather than in a data warehouse or central cloud. This greatly speeds operations and makes new use cases possible.

IoE governance means knowing where your assets are and what their status is, while keeping deployment and actions on track. Every IoE application must be able to easily acquire sensor data, extract meaning and trigger the right responses at the right time at scale.

LOWER LATENCY = FASTER RESPONSE

Sense's edge services architecture reduces the need to send massive amounts of data to central resources in the cloud. Sense constantly attacks latency, which helps people and things communicate more effectively and act almost instantly.

Edge computing flexibly assigns computing resources on a central-to-edge continuum based on customers' specific needs for handling data acquisition, analysis and action – reliably taking in data arriving via any type of emitter, gateway or sensor.

Data that is most meaningful and immediately actionable for a customer is processed in memory. Other data can be sent for batch processing and stored for later analysis.

UNRESTRICTED ARCHITECTURE WITH UNBOUNDED SCALE

Sense is an open, highly scalable system designed for organizations to deploy and manage sensor-informed applications more easily and rapidly. Sensor data is generally time-series data that is often combined with contextual data for deeper insights.

Sense supports flexible integration of a wide variety of customer and third party data sources. It is optimized for ingestion and organization of high-velocity time-series sensor data that established enterprise relational databases are ill suited for when supporting real-time action requirements.

In the near future, aggregate sensor data volumes will dwarf all other data types. So to support Sixgill's "capture-everything" mandate for governing IoE, Sense uses a distributed computing, self-spawning capacity architecture that's scalable from thousands to billions to trillions of connected devices. This model allows scale without reliance on traditional data centers, specific cloud providers, or particular IaaS-type providers.

SENSE CREATES A HOLISTIC, DATA-CENTRIC VIEW

PEOPLE: Know where people are, where they're moving and what they're doing to connect and inform them in timely, relevant, valuable ways.

PLACES: Integrate location based sensor data services to gain dynamic context for connected asset location and motion, for targeting, messaging and analytics.

THINGS: Collect all physical device and object sensor data, understand what assets are available and their operating state to keep all things, behaviors and actions on track.

CONTEXT: Comprehend sensor data by combining internal or third-party contextual data, such as demographics, weather, etc., and integrate analytics and visualization tools for deeper understanding and more nuanced actions.
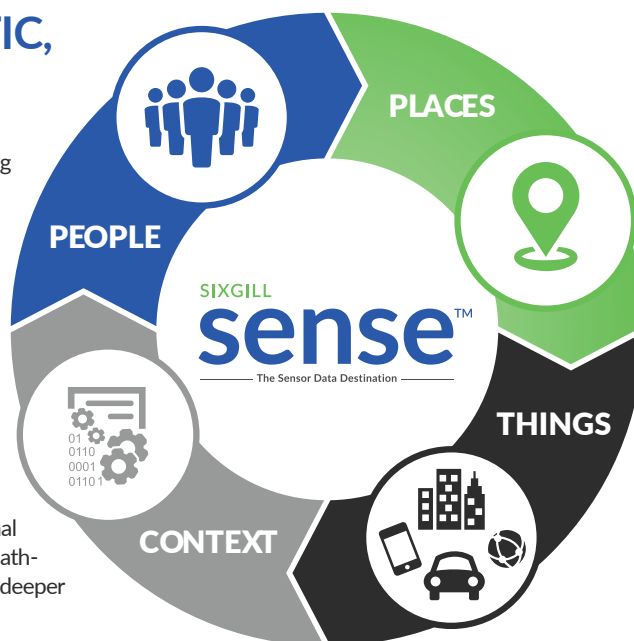
BUILT FOR FLEXIBILITY, CENTRALIZED CONTROL AND PORTABILITY

Business executives and technical personnel alike are wary of overly complex solutions that apply only to narrow use cases and must be continuously reinvented. Sense is a simple, extensible services platform offering enterprise-wide consistency across applications, and permitting centralized data knowledge, management, monitoring and maintenance. It provides a flexible backbone on which you can test proof-of-concept IoE projects to determine value, and then scale to whatever size and capacity are needed.

And Sense is portable between the main hosting services AWS, Azure, Google and others, plus can be deployed on-premise, behind enterprise firewalls, without requiring deep integration with any host's proprietary components.

PROVEN IN THE FIELD AT SCALE

Sense is already proven at scale in the field. For example, Sense supports applications available on over 50 million devices by a major U.S.-based carrier, and has powered crowd management and global audience communications for major events in North America and Europe.

In addition, Sense has been used to track people and things globally, identifying and managing promotional opportunities and/or risk through automated, context-specific mobile messaging, and has enabled developers to quickly create and deploy enterprise-scale IoE applications.

(See the use case snapshots below and view or download other use cases on the Sixgill website here.)

SENSE CAPABILITIES AT A GLANCE

ACQUIRE

- Collect sensor data on people and IoE assets.

- Get a view of where people or connected assets are from the Sense Dash console.
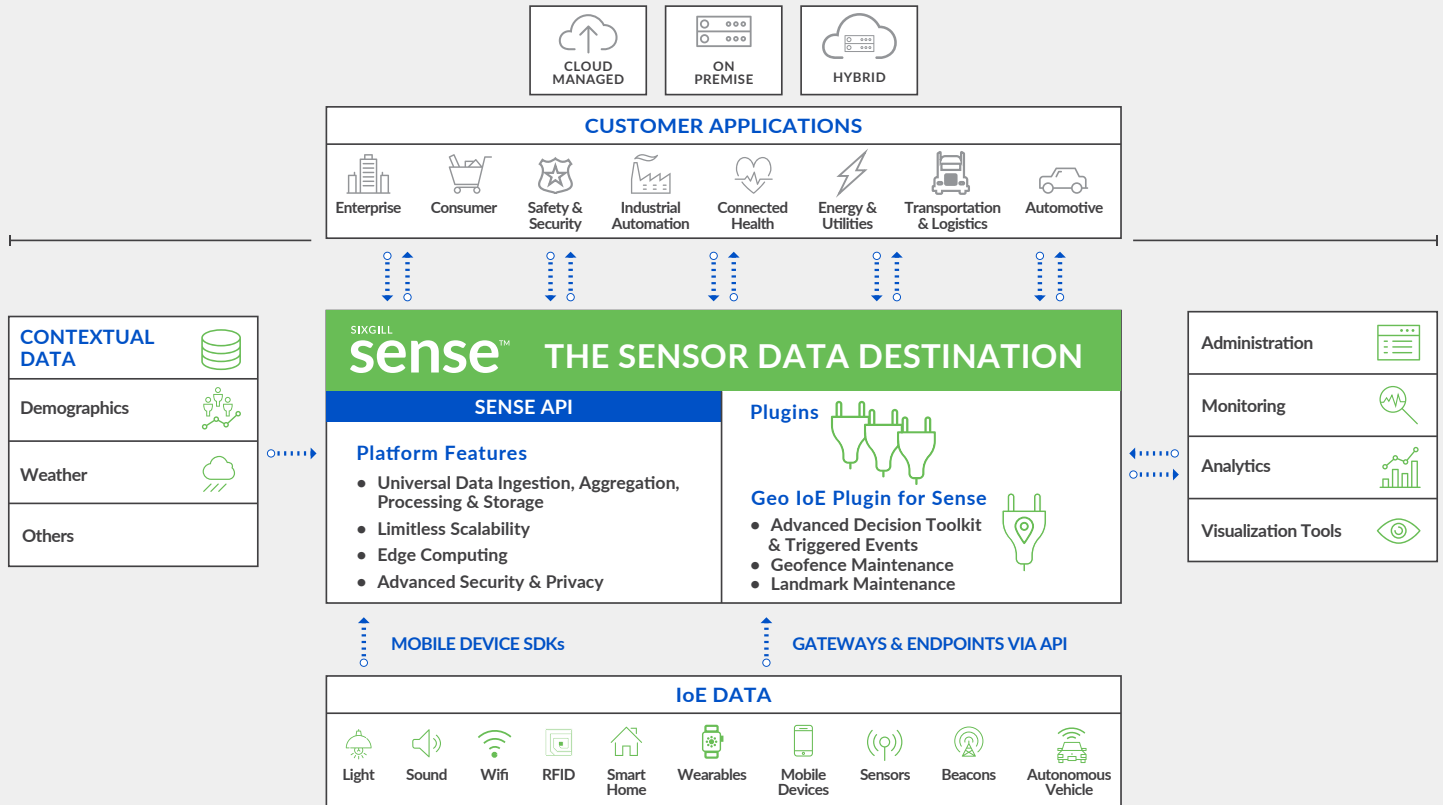
ANALYZE

- Connect existing analytics software for application-specific purposes.

- Understand sensor data history and patterns to optimize planning and productivity.

- With Sixgill's Geo IoE for Sense Plugin, apply predefined scenarios and flexible location targeting such as Enter Area, In-Area, Exit-Area, Out-of-Area, Device-to-Device and more.

ACT

- Program context-based actions with flexible custom rules, leveraging device or user attributes, geospatial targeting and triggers.

- Customize mobile messages singly or by group with sensed or assigned variables.

- Programmatically post updates or trigger business logic on existing enterprise systems, *from events detected by Sense.*

CLOUD MANAGED   ON PREMISE   HYBRID

CUSTOMER APPLICATIONS

Enterprise · Consumer · Safety & Security · Industrial Automation · Connected Health · Energy & Utilities · Transportation & Logistics · Automotive

CONTEXTUAL DATA

Demographics

Weather

Others

SIXGILL sense™ THE SENSOR DATA DESTINATION

SENSE API

Platform Features
- Universal Data Ingestion, Aggregation, Processing & Storage
- Limitless Scalability
- Edge Computing
- Advanced Security & Privacy

Plugins

Geo IoE Plugin for Sense
- Advanced Decision Toolkit & Triggered Events
- Geofence Maintenance
- Landmark Maintenance

Administration

Monitoring

Analytics

Visualization Tools

MOBILE DEVICE SDKs   **GATEWAYS & ENDPOINTS VIA API**

IoE DATA

Light · Sound · Wifi · RFID · Smart Home · Wearables · Mobile Devices · Sensors · Beacons · Autonomous Vehicle

A 10-POINT TECHNICAL TOUR OF THE
SENSE 2.0 PLATFORM

1 **DATA INPUT CAPABILITIES:** Sense acquires, aggregates and processes sensor data from any type of emitter. There are three primary methods of bringing data into the system: SDKs (embedded agents) installed in apps on mobile devices that collect data and submit as JSON or Protocol Buffer structures; service nodes bringing data from gateways; or through REST APIs. Sense can be installed on premise, deployed as a cloud resource or as a combination of both. Processing capabilities are elastic and scale-intelligent. Users are able to monitor and administer the full range of features from the Sense Dash console, and can set or import key business rules and track results in real time.

2 **DISTRIBUTED SYSTEM:** Sense's architecture ensures that data can be ingested quickly from any input path. The system initially deploys nodes based on a predetermined model. The nodes subscribe to information and services (plugins) that are loaded when the service node is deployed. When a device wants to connect, it contacts the system to request a service node affinity. The device then connects to the node, and the node serves all devices assigned to that node.

If a node disappears or faces service issues, connected devices are redirected to the system to find another node. If another service node isn't available, the system provisions a new one. This provides built-in failover and redundancy. In addition, service node assignments can be shifted based on population density, latency requirements, or other customer-defined characteristics.

3 **DATA DISTRIBUTION & PROCESSING:** Sense distributes logic and data, and is structurally fault tolerant and redundant. The most critical and meaningful data (as defined by the customer) is processed in memory and acted on swiftly. Other data – such as trend, historical or performance data – can be stored for later reference and analysis. SQL maintains persistent configuration data such as accounts, users, geofences, rules and others. An object repository retains sensor data. A time series database captures system activity for management and debugging.

4 **EDGE PROCESSING:** Edge processing allows data and operations to be processed as close as possible to the sensor data source or governed device. This improves processing latency. Automated responses are generated and received while they are still relevant. Intelligent edge computing enables an automated process that can "spin up" processes as needed for real-time coordination between sensors, analytics, and other edge services.

5 **PROGRAMMABILITY:** Sense has two primary means of automation. The nodes are generally edge processed and can be programmable in the form of plugins, and the persistent object stores make data available for any back-end processing. The primary difference between these two is "real-time" edge processing vs. "post" processing of ingested data.

OTHER PLATFORM COMPONENTS

Sense works in tandem with the Sense API, Sixgill Reach and Sixgill Sync.

SIXGILL
sense™**API**

Embed Sense's awareness into your platform and applications, and connect to the platform's full range of services via the Sense API.

SIXGILL
reach™
—— The Mobile SDK for Sixgill Sense ——

The Sixgill Reach SDK connects Sense quickly and seamlessly to your own mobile app. It integrates seamlessly and creates a channel to communicate data to Sense. Available for iOS, Android and Windows Mobile.

SIXGILL
sync™
—— The Proximity App for Sixgill Sense ——

Sixgill Sync is a mobile app for Sense that plugs smart iOS, Android and/ or Windows Mobile devices into the platform. Sync lets you unlock the power of Sixgill Sense without requiring you to develop your own custom app. Sync allows you to easily scale a Sense project and add as many devices as you want.

6 **PLUGINS:** Sense Plugins offer customers options to integrate their own custom plugins or leverage pre-built Sixgill and ISV extensions. For example, Sixgill offers its Geo IoE Plugin for proximity-based applications. Geo IoE loads landmark, polygons and other geographically related data into a node's memory.

When an update arrives from a device, Geo IoE quickly determines if the information is relevant to a geospatial event. If so, the input is processed by Sense Decision Services. If not, the data is discarded, stored or sent to a data service, as defined by the customer. The persistent data that feeds plug-ins is held in an HA Cassandra cluster accessible by service nodes. Additional Cassandra instances can be deployed to enhance performance or for redundancy. Other noSQL or SQL databases can be easily introduced into the system.

7 **RULES AND ACTIONS:** The Custom Rules Toolkit for Sense lets users specify the logic for triggering actions programmatically – based on specific data inputs – including notifications, automated responses, maintenance alerts, and instruction sets to smart devices.

Whether the scenario calls for messaging a user, logging a key piece of information into a corporate database, issuing instructions to an intelligent device, or sending an alert to another enterprise system, Sense can do it. Create triggers based on proximity, business logic, complex data intersections and people attributes in any app with the Sixgill Reach SDK. Schedule push notifications, send emails, serve content or log data into a hardware systems monitor.

8 **CONTROLLING AND ACCESSING DATA:** For data maintained by Sixgill, customers are able to write processes that modify or leverage that data in numerous ways. To support data distribution and desired scale, Sixgill makes data available in a distributed file system structure or other object store.

This offers several benefits. Data can be easily segregated, which allows for file system level access control. And placing file systems in appropriate locations can control the data's physical location. By implementing different processes against data sets, customers can manage data lifecycles, encryption strength, data anonymizing schemes, indexing structures and back-end logic for machine learning, AI or other analytics purposes.

9 **INTRINSIC SECURITY:** Sense has data security built in. All communication between external data generators and Sense is encrypted. Once a valid connection is made to the system, there is negligible risk of a data breach. The encryption service leverages a shared secret protocol (TLS/SSL) with a lease, providing the ability to frequently modify the encryption key. Optional public key authentication during connection setup is available.

Access control decisions are based on a key assigned to devices that allows them to establish access to the system. Data is maintained in operational data stores for immediate processing and persistent data stores for long term storage. Persistent data can be encrypted or made anonymous based on customer needs.

10 **SYSTEMS INTEGRATION:** Customers are able to integrate their own, or third-party contextual data, such as demographics, weather and others, with sensor data for richer understanding and more nuanced actions.

Extensions such as data analytics and visualization tools – supplied by customers or third parties – are configurable and can be seamlessly integrated. By using Sense APIs and/or customer or product APIs, customers are able to develop a wide range of IoE applications easily, flexibly and at scale, while retaining common data and automation services.

SIX USE CASE SNAPSHOTS
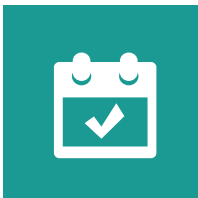
ASSET MANAGEMENT FOR ENTERPRISE

Sense can distill IoE sensor data insights to focus and direct maintenance resources, and redeploy or position assets to optimize value. Track your stock, manage consumption and ensure compliance. Examples range from a big beer maker monitoring product age/quality and inventory levels in kegs in public venues, to an outdoor advertising company that connects and monitors digital billboards.
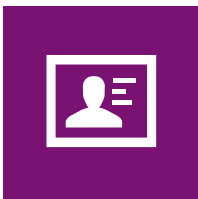
FINANCIAL SERVICES IDENTITY

Advanced user and entity behavior analytics can help security and risk management professionals verify identity, spot anomalies, provide enhanced visibility of user behavior and improve threat detection. For example, financial services firms can use Sense to conduct behavior-based identify verification to detect fraud and send alerts or other messages.

SMART CITIES & TRANSPORTATION

From connected and self-driving cars, to intelligent transportation and logistics, Sense helps bring vehicles, connectivity and the cloud together. Increase fleet productivity and profitability and gain real-time visibility for connected vehicles or fleets. Capture data from numerous sensor types and centralizing data knowledge to improve operations. Use the scalability and performance of Sense to build real-time video tokenization applications.

CONSUMER - EVENTS

For event organizers, large venue owners such as stadiums, arenas and convention centers – or anyone responsible for managing large, live events – the Geo IoE for Sense plugin offers new ways to improve safety, increase security, grow revenue and enhance patron experience. For example, the service offers capabilities to direct event attendees toward optimal travel routes to decrease congestion or find helpful services such as phone charging stations. With highly accurate geo location features, messaging can include highly targeted CTAs, from offers to directions.
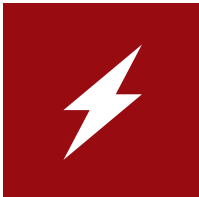
ENERGY

Smart meters and a wide range of other power grid devices can share information in real time, creating opportunities to speed maintenance and emergency repairs, while managing and distributing energy more efficiently. For example, utility companies can use Sense to cost-effectively monitor and manage remote smart switches and meters for water and electricity.

SAFETY & SECURITY

Sense enables mobile security systems that are quickly adaptable and can be dynamically optimized to locate and direct people to safety in an emergency. Send customized messages and instructions to specific groups of individuals based on who – and where – they are. For example, university faculty, staff, and students close to an emergency epicenter could receive a message with guidance to safety, while those outside the emergency zone could receive a stay-away message.

SEE MORE USE CASES ON THE SIXGILL WEBSITE HERE.

HELPFUL RESOURCES

For a quick visual introduction to Sense, view our two-minute animated explainer video here.

You can view and download a wide range of articles, product brochures and white papers in the Resources section of the Sixgill website.

Questions? Call (424) 322-2009 or email us (info@sixgill.com) for more information or a personalized demo.