Milesight

PRIVACY & SECURITY

VS133 AI ToF People Counting Sensor

OVERVIEW

In today's digital landscape, privacy has become a paramount concern due to the prevalence of information leakage. With the rapid advancement of diverse electronic devices and widespread internet connectivity, personally identifiable information is increasingly vulnerable to be captured and misused.

The potential risks associated with the unauthorized access and exploitation of personal data have raised significant concerns among individuals and organizations alike. This concern has been further amplified by the implementation of the General Data Protection Regulation (GDPR) in the European Union.

The need to safeguard sensitive information and protect user privacy has never been more critical.

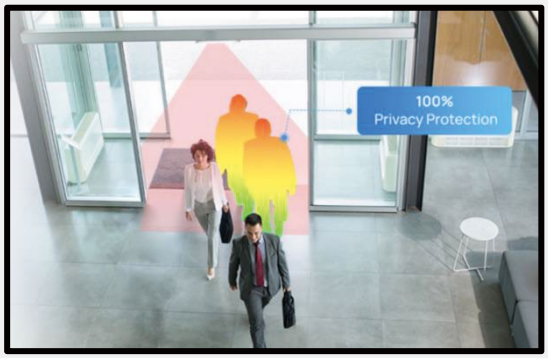
To allay the fear of information leakage, Milesight AI ToF People Counting Sensor (VS133) adopts both AI and ToF technologies and transmits data via LoRaWAN® protocol to 100% guarantee privacy.

The following provides a brief overview of the privacy protection and security architecture of VS133. It is intended for both technical and non-technical readers.

VS133 Privacy Protection Features:

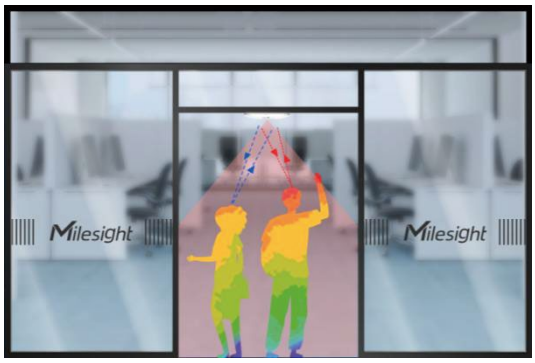
100% Anonymous Detection

By applying 2nd generation ToF technology, the sensor only gets 3D depth information without involving personally identifiable information 100% guaranteeing privacy protection at source.



2nd Generation ToF Technology

ToF forms 3D depth information through time of flight rather than capturing images which involve personally identifiable information through the lens. ToF technology eliminates privacy leakage worries ultimately.



Security Best Practices (GDPR)

The Milesight 3D ToF People Counting Sensor abides by GDPR compliance considering all possible factors at design.

LoRaWAN®

LoRaWAN® only transmits small-size payloads like sensor data over long distances, which makes it fit for anonymous detection. This is a double assurance of anonymous detection.

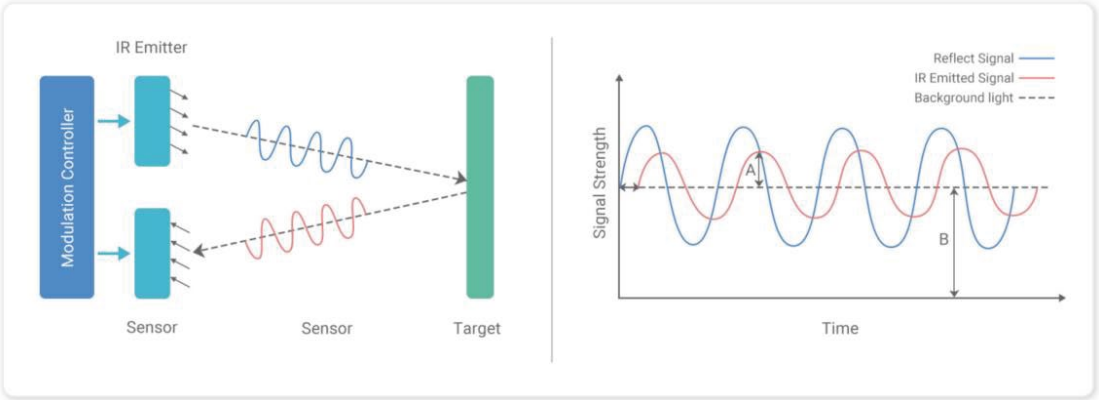
HOW TO REALIZE?

Based on the favorable ToF (Time of Flight) technology which features high accuracy and anonymous protection, the sensor revolutionarily adapts the upgraded technology with stronger performances, higher precision, and better scenario adaptability to boost application. **Achieve 100% anonymous data people counting.**

1. How ToF Technology Works?

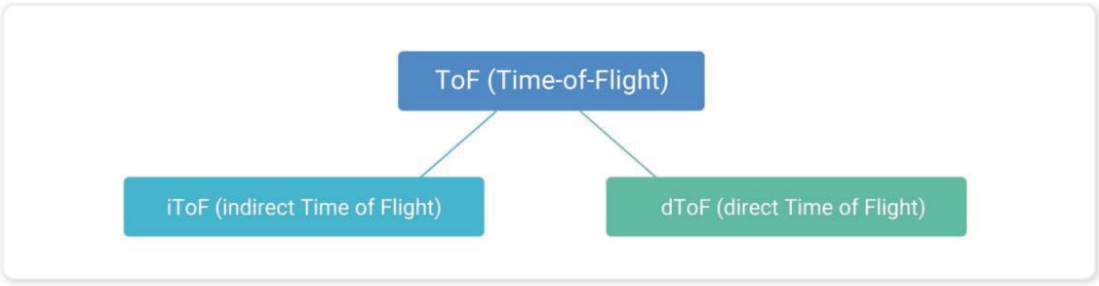
Three-dimensional sensing (3D Sensing) is the process of obtaining length, width, and depth information electronically and using this data to improve the interfaces between humans, devices and the world. 3D sensing technology uses near-infrared light reflection, geometric principles, photography, and advanced computing power to enable machines to “see” people and objects in a detailed, meaningful way. One of the primary categories of 3D sensing technology is known as ToF (Time-of-Flight).

ToF (Time-of-Flight) refers to emitting light at an object and measuring how long it takes to bounce back and return, then converting the time measurement into distance using the speed of light, giving the object’s shape and position in its surroundings.



The ToF technology consists of dToF (direct Time of Flight) and iToF (indirect Time of Flight) which are distinguished by different detection methods.
For more details about iToF and dToF Technologies, please click: EXPAND:

iToF and dToF Technologies.



Advantages of ToF Technology

Working Conditions

It works even in completely dark environments. As an active technique, it is able to project ToF light without relying on any external source of light to scan its surroundings like passive imaging techniques (such as stereo cameras) do.

Processing Speed

The time-of-flight principle is based on pretty straightforward math and relatively simple algorithms, as opposed to stereoscopic cameras that require complex calibration and processing to generate the image.

Precision

The accuracy greatly depends on the distance from the object as it is generally estimated at 1% of that value. So if an object is 5 meters away, a ToF device can achieve an accuracy of about 5 cm.

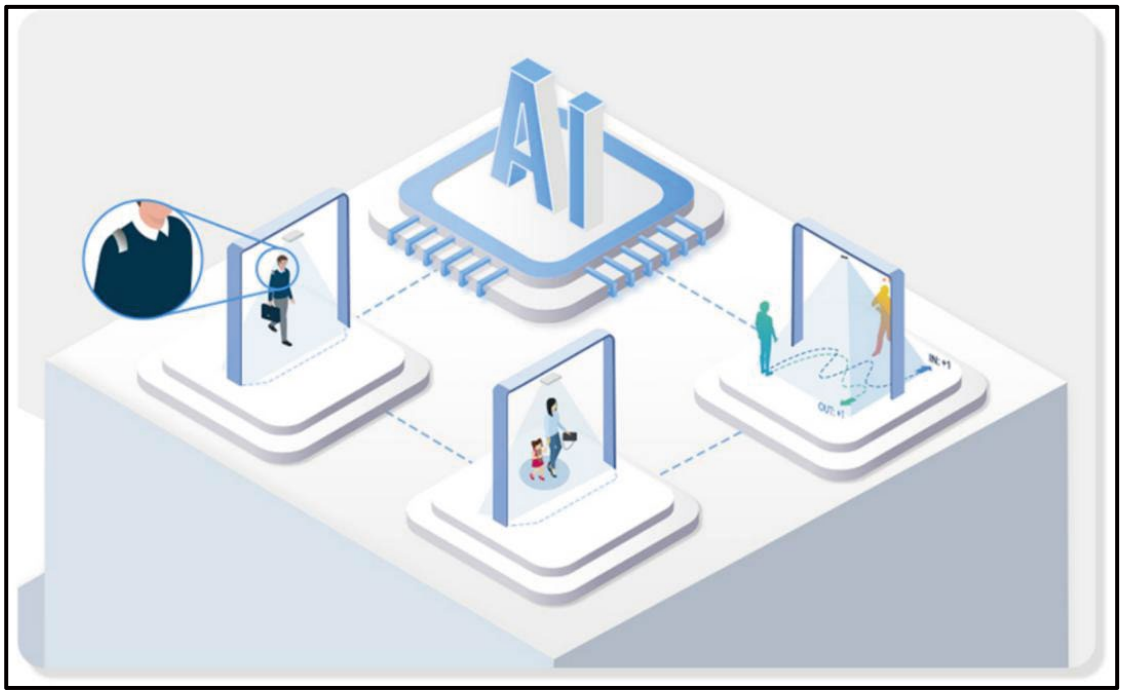
Anonymous Detection

One of the most noteworthy advantages of ToF people counting systems is that they are intrinsically GDPR compliant. Due to the relatively low spatial resolution of the sensors which produce 3D depth images, no personally identifiable information is captured.

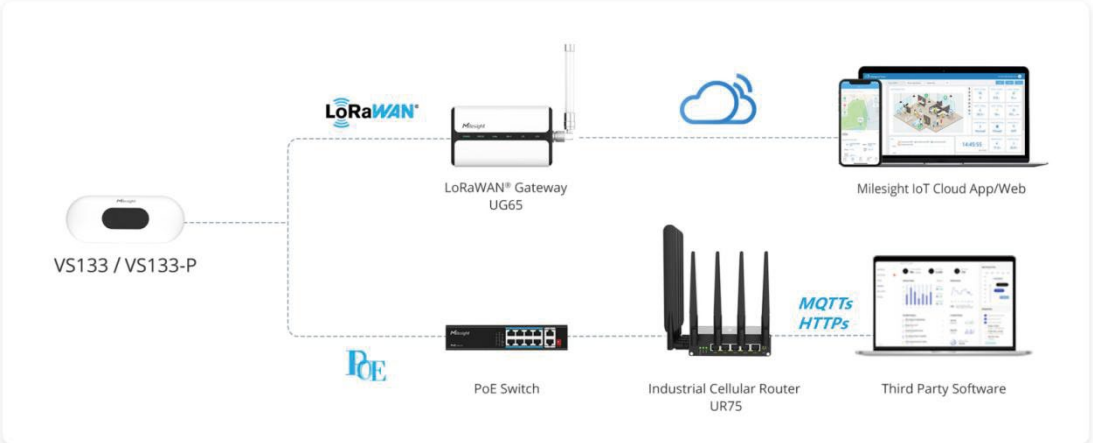
2. What Data VS133 Gets?

The data obtained and transmitted by VS133 does not involve any private personal attribute information.

- Identifying and counting people in the detection area, and the identification results are presented as depth maps.
- Adults/children are distinguished by ToF technology & AI. (depending on the height of the people)
- Staff Detection with the help of tags (reflective strips).
- Regional people counting and dwell time detection, group People counting.
- Motion heat map and dwell heat map. And so on.....

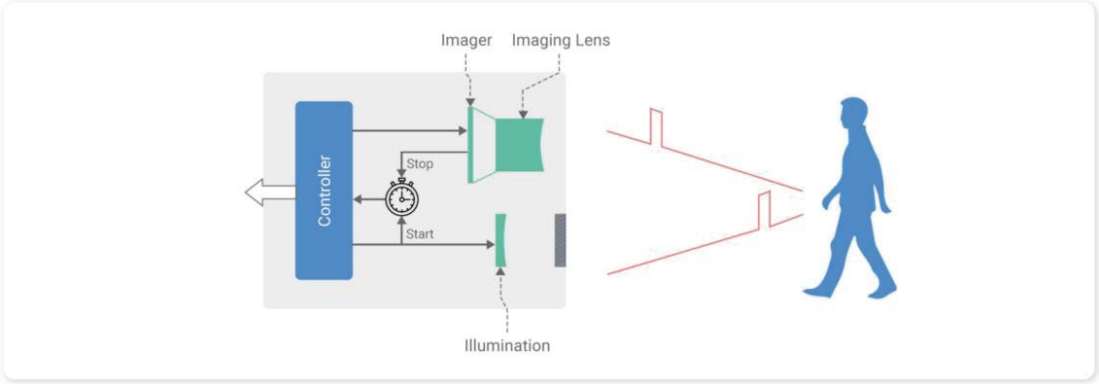


3. Topology of VS133

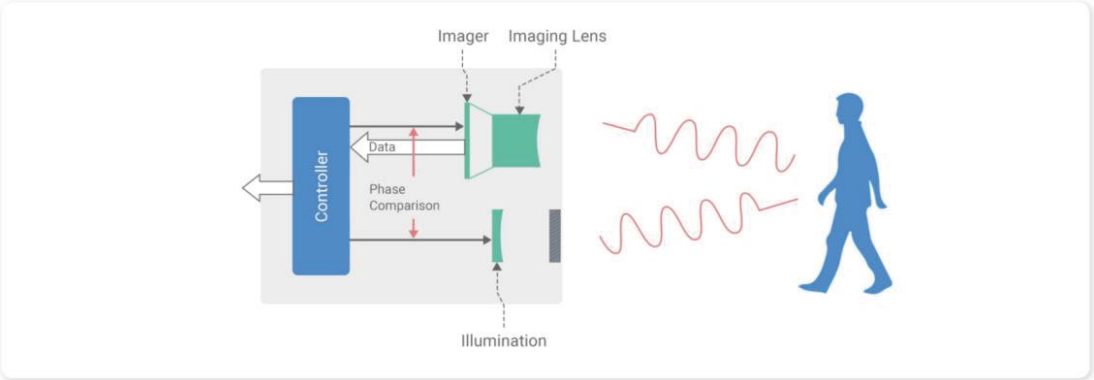


EXPAND: iToF and dToF Technologies

dToF: The abbreviation of Direct Time-of-Flight, is a technology that directly measures the time of flight. The core components of a dToF module include a VCSEL, Single-Photon Avalanche Diode (SPAD) and Time-to-Digital Converter (TDC). SPAD is a photoelectric detection avalanche diode with single-photon detection capability, it can generate current as long as there is a weak optical signal. The VCSEL of the dToF module emits pulse waves into the scene, and the SPAD receives the pulse wave reflected from the target object. The TDC will record every flight time of receiving the optical signal, that is, the interval of emitting pulse wave and receiving pulse wave. dToF will emit and receive N times of optical signals within a single frame measuring time, and then make histogram statistics for the recorded flight time, among which the flight time with the highest frequency is used to calculate the depth of the object detected.



iToF: The full name is Indirect Time-of-Flight, indirectly measures the flight time of light by the phase difference. The iToF module emits a modulated infrared signal into the scene, then receives the light signal reflected from the object detected, and calculates the phase difference between the emitted signal and the received signal according to the accumulated charge during the exposure time. It will get the depth information of the target object via the processes.



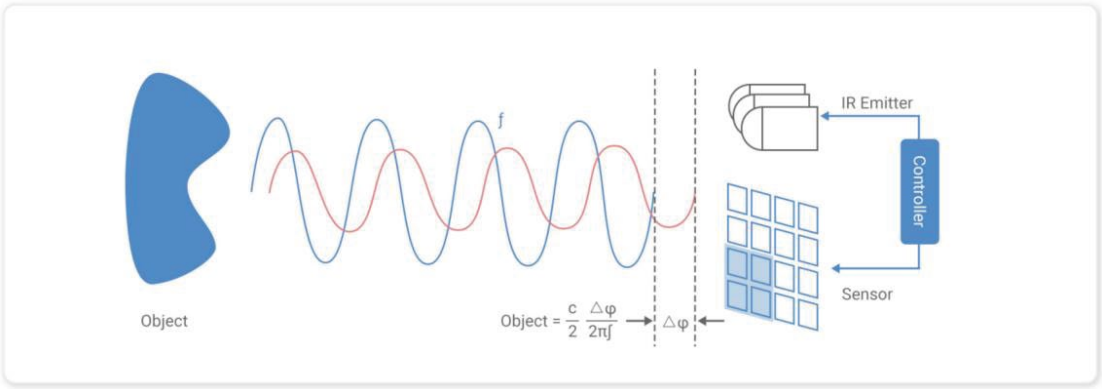
dToF technology is only used by a few manufactures like Apple not just because it lacks corresponding applications, but also because it has technical

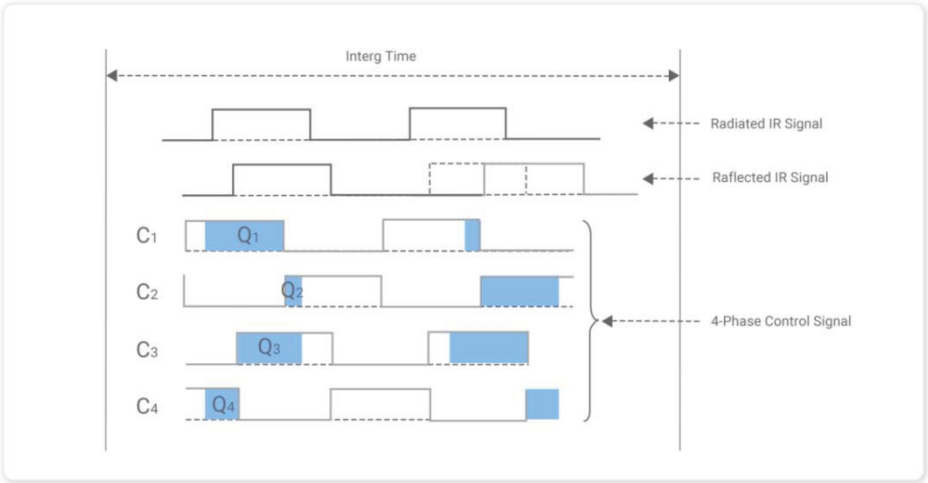
difficulty. Among them, SPAD technology is the core challenge. iToF has a high image resolution, which can reproduce more detailed information in the scene in application scenarios such as object recognition, 3D reconstruction and behavior analysis.

iToF - Indirect Time of Flight

Milesight 3D ToF People Counting Sensor VS132 is an application of Indirect Time of Flight (iToF) technology that uses the phase difference, rather than time signature, of the reflected light to measure the distance from individual points on an object. Indirect ToF technology includes a modulated light source at a set frequency. Distances are determined based on the phase difference between incoming and outgoing light. High accuracy iToF sensors perform best in short range conditions of 30 meters or less.

The core components of the iToF module include a VCSEL and an image sensor. The VCSEL emits modulated infrared light at a specific frequency. The image sensor receives the reflected light and performs photoelectric conversion within the exposure time. The data will be read after exposure and then passed to the calculation unit after getting through an analog-to-digital converter. Finally, the phase offset of each pixel will be calculated by the calculation unit. The method iToF applies to calculate the depth is usually the 4-sampling-bucket algorithm. It calculates the depth using 4 sampling signals with phase delays of 0°, 90°, 180° and 270°.





SUPPORT

We Take Your Data Security Seriously

Technology VS133 applied have been designed and engineered using industry best practices for data protection and security.

Every element of our solution - VS133 hardware, on-site networking technology, cloud-hosted infrastructure and software, as well as our APIs - have been designed to ensure that the data is captured,processed, transmitted and stored securely.

- The sensor is compliant with GDPR.
- Only gets in-depth images without involving personally identifiable information based on ToF technology, which protect security at source.
- All data is encrypted from the sensor to the cloud using the MQTT protocol and TLS 1.2/1.3 encryption over port.
- Our application is secured via HTTPS/TLS 1.2/1.3 over port.
- We provide regular over-the-air firmware upgrades and security enhancements.

For assistance, please contact Milesight technical support:

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