HIKVISION EUROPE

SOLUTIONS

[People Counting Solution]

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Revision Record

New release –June 8, 2018

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Reading Tips

Document Category
People Counting System & Products
Brief Description of System
● The proposal introduces the key products, product configuration, system structure, system functions of the Hikvision people counting system. ● The solution is suitable for the people counting scenarios, and please modifies the content based on the project requirement.
References
iDS-2CD6810F/C specifications.doc *iDS-2CD6810F-IV/C specifications.doc* *People Counting Guide*

Revision History

No.	Revised Content	Time	Revised by	Reviewed by
1	V1.0	2018/5/2	Ricky Lee	
2	V1.2	2018/5/30	Kelsen Zhang Peter.Yang	Ronny.Lin
3	V1.3	2018/6/8	Joyce Zhou	Ethan Qu

Chapter 1 Overview

1.1 Background

At present, the development of retail industry in the world is showing characteristics:

- **Slow Sales Growth**
  Network B2C and C2C sales module is a new challenge for traditional retail. This factor tends to slow down the development of the retail industry.
- **High Operating Costs**
  For example in China, the staff costs of enterprises rose 26% and rental costs rose10%.
- **High Homogeneity**
  The quality and features of department stores are almost the same, which leads to decrease of customer loyalty.
- **Excessive Expansion**
  The majority of Department store grows much faster than the growth of people actual purchasing capability.

To solve these problems and work more effectively, we need a new solution to get useful information and help you to make decisions.

1.2 Overview

People counting system relies on the human body recognition algorithm, multi pattern recognition algorithm and artificial intelligence algorithm technology, to distinguish people and other objects in specific areas such as screen door stairs, identify regional head, shoulders and feature, and determine the entering or leaving based on the customer's trace. And finally export the data in defined time.

People counting system is a good solution to help to collect the customer information and adjust the sale strategy. It has the ability to count persons passing through cameras and analyze these data with sales data. The result can be presented in reports or graphics for managers' reference.

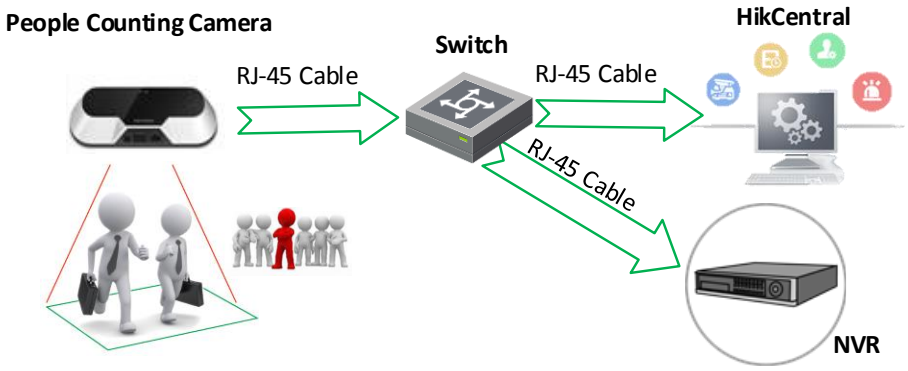

Figure 1-1 Deployment of People Counting Camera

1.3 Key Features

Comparing with infrared technology and other Statistics system, the Hikvision People Counting system has the following advantages:

- Accurate statistics, suitable for crowded flow, scene of complexity object;
- Simple construction for easy installation in public areas;

- Powerful two-way people counting statistics;
- Easy to operate, support client and web to view the data;
- Convenient system expansion and renovation via network configuration and new cameras adding;
- Provides a variety of graphical reports of shopping malls, exhibition halls, etc.

Chapter 2 Solution

2.1 Introduction

Hikvision adopts people counting camera +NVR/HikCentral solution to help the management to collect the people counting statistic information for the doors/stores/buildings by different requirements.

The people entering/leaving data is collected by the intelligent cameras that is flexible deployed in different scenarios. The data is sent to the platform to create the statistics reports.

2.2 Soution Architecture

Depending on different application scenario requirements, two solution architecture modes are available for selection: **NVR+ IPC**, and **IPC+ Surveillance Center**.

- **NVR+ IPC** (Mode 1): Convenient to manage and operate the devices in the system with high performance and cost effective. Suitable for the small-scale solution scenario requirement
- **IPC+ Surveillance Center** (Mode 2): Easy to operate with the iVMS platform. Suitable for the large-scale solution scenario requirement.

Refer to the following topological map:

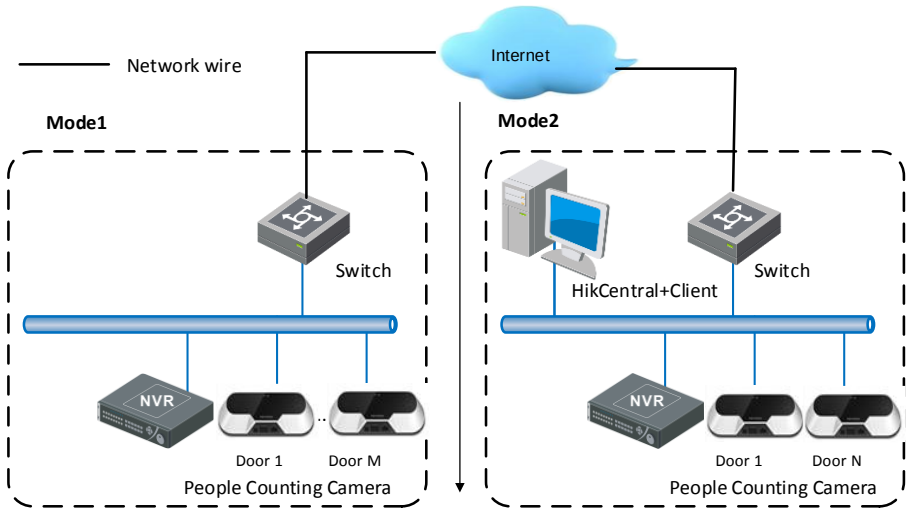

Figure 2-1 Topology of People Counting System

The people counting system has the ability to count persons passing through cameras and analyze the data , and the statistics result can be presented in reports or graphics for reference.

Refer to the following diagram for the data processing flow:

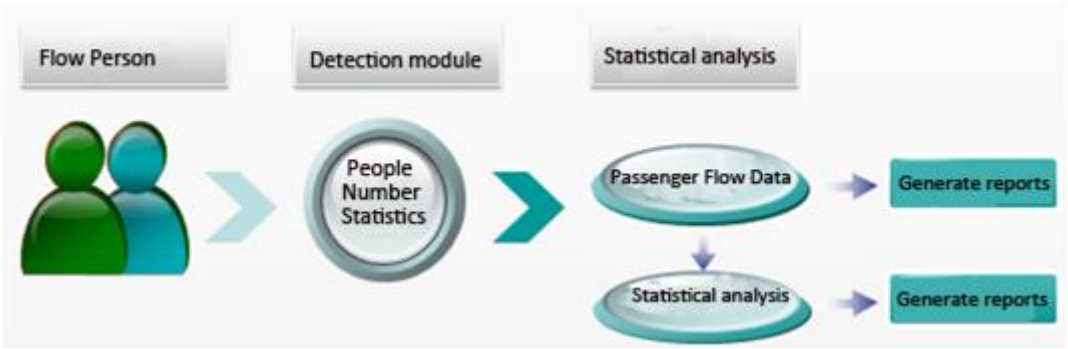

Figure 2-2 Process of People Counting

- 1. People pass the camera.
- 2. People counting system uses a specialized algorithm to record the people counting data.
- 3. The people counting data is sent to the NVR/ HikCentral platform.
- 4. The NVR/ HikCentral platform statistics the data and generates various types of report.

Chapter 3 System Composition

The system mainly consists of the following product parts:

- **People Counting Camera (iDS series)**
  People counting algorithm is inside the cameras. No extra server is needed to collect the data.
- **NVR (DS-96/77/76NI-I, etc.)**
  The local output of NVR will be used for querying the people counting data and statistics.
- Platform **(HikCentral)**
  HikCentral can use the client to display the data and reports.

3.1 People Counting Camera

We take iDS-2CD6810F/C as an example to introduce.

3.1.1 Camera Mounting

Figure 3-1 People Counting Camera

Single Camera Mounting

Please pay great attention to the mounting position. Inappropriate mounting position may cause loss of accuracy. The recommended mounting position is shown below:

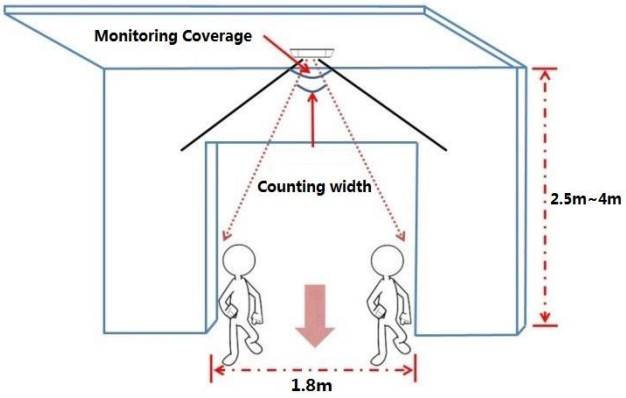

Figure 3-2 Horizontal Sketch Map of Mounting Position

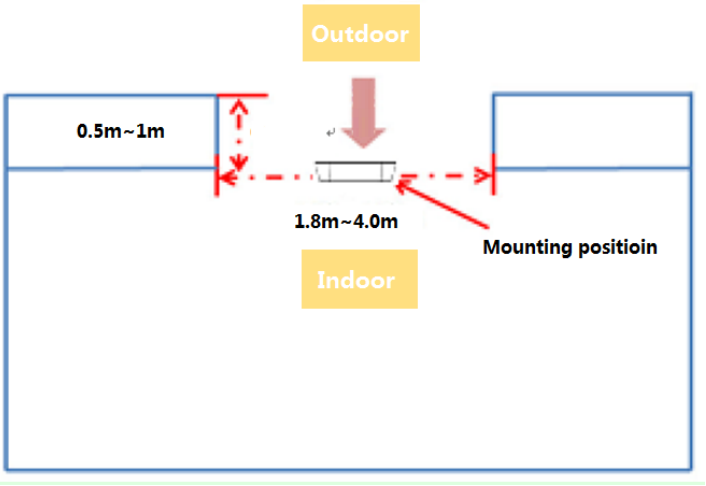

Figure 3-3 Vertical Sketch Map of Mounting Position

The counting width depends on the installation height. The recommended installation height for dual-lens camera is less than 4.0m (13.1ft). The specific corresponding relation shown below:

Table 3-1 Deployment Requirement

Focal length	Installation height	Max. counting width	Without doorframe	With doorframe
2/0.066	2.5/8.2	1.8/5.9	Placed in the middle	**0.68m(2.2ft)** to door
	3.0/9.8	2.9/9.5	Placed in the middle	**1.1m(3.6ft)** to door
	3.5/11.5	4.0/13.1	Placed in the middle	**1.52m(5.0ft)** to door
2.8/0.082	3.0/9.8	2.2/7.2	Placed in the middle	**0.85m(2.8ft)** to door
	3.5/11.5	3.1/10.2	Placed in the middle	**1.17m(3.8ft)** to door
	4.0/13.1	4.0/13.1	Placed in the middle	**1.5m(4.9ft)** to door
4.0/0.13	4.0/13.1	2.8/9.2	Placed in the middle	**1.05m(3.4ft)** to door
	4.5/14.8	3.4/11.2	Placed in the middle	**1.28m(4.2ft)** to door
	5.0/16.4	4.0/13.1	Placed in the middle	**1.5m(4.9ft)** to door

Make sure camera mounted vertically above the passenger flow (90°vertical by the ground), see picture below:

Figure 3-4 90° Vertical Mounting Position

Multi-Camera Mounting

For some scenarios where there are multiple cameras, mount the cameras according to two rules.

- **Rule 1:** If there are turnstiles, each camera should be mounted to monitor certain turnstile.

Figure 3-5 Mount above Turnstiles

- **Rule 2:** If there is no turnstile, mount the cameras in one line, and make sure the cameras have the same focal length. And then keep a proper distance between each camera according to the overlap (see the yellow area below) of the adjacent two cameras' counting width. The suggested overlapping length is between 0.2-0.5m.

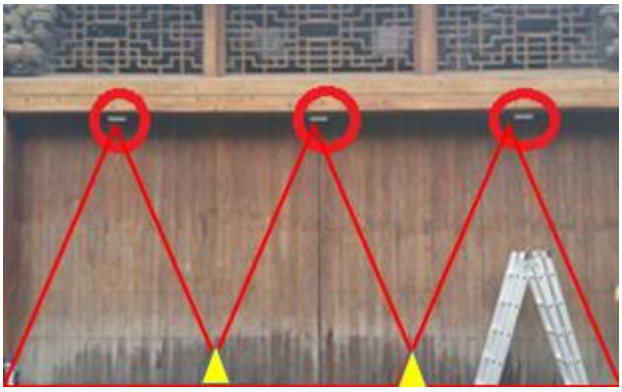

Figure 3-6 Mount with No Turnstiles

Notice for Mounting the Camera

- The people flow should be in vertical up-and-down direction.

Figure 3-7 People Flow in Vertical up-and-down Direction (Right)

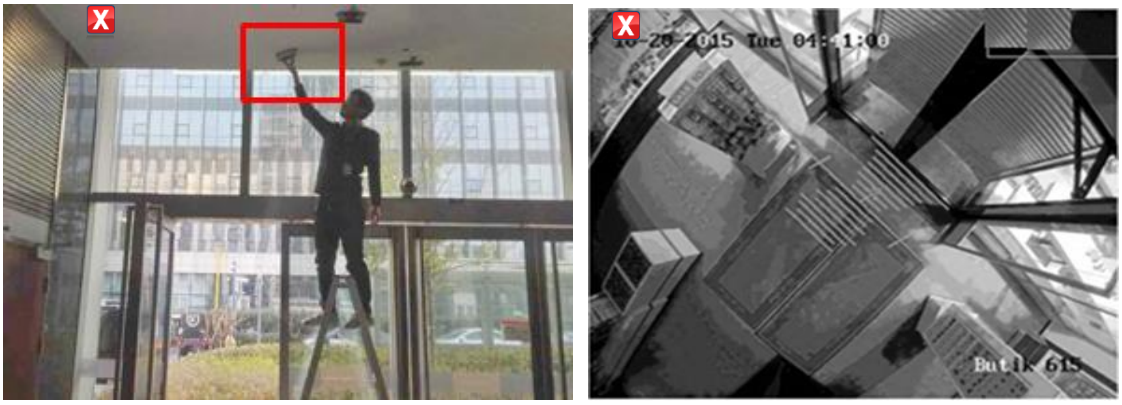

Figure 3-8 Passenger Flow in Horizontal Direction (Wrong)

Figure 3-9 Passenger Flow in Slant Direction (Wrong)

- Passageway width should be within camera's counting width.

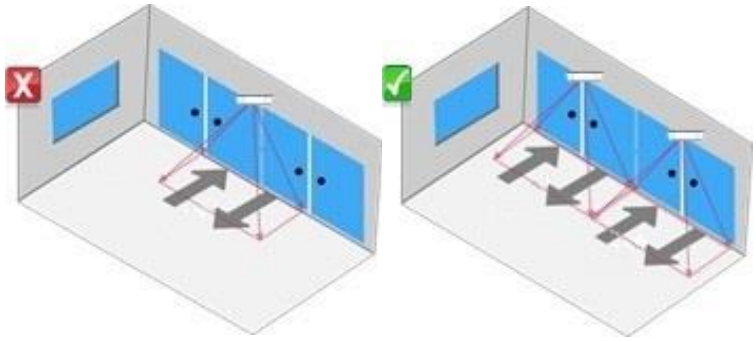

Figure 3-10 Passageway within Camera's Counting Width

- Avoid obstacles such glass door, shield door and turnstile that block the camera. For each divided passageway, mount one camera right above.

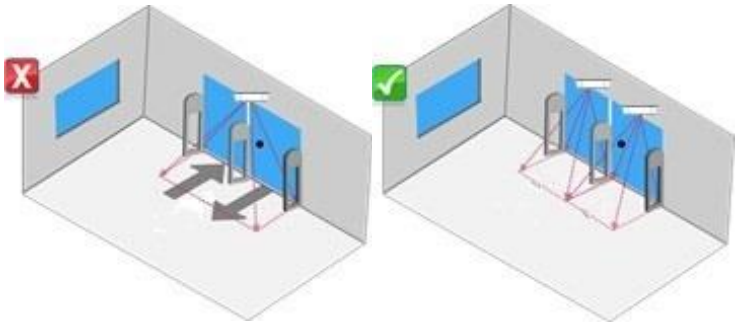

Figure 3-11 One Camera for Each Passageway

- The camera should be mounted as close as possible to the passageway without obstacle.

Remove the obstacle or adjust the camera mounting position if there is obstacle below the camera. Meanwhile, to prevent miscounting, if there's sliding door onsite, make sure the trajectory of sliding door not overlap the detection line. Otherwise, the counting number may be misled by the door opening and closing

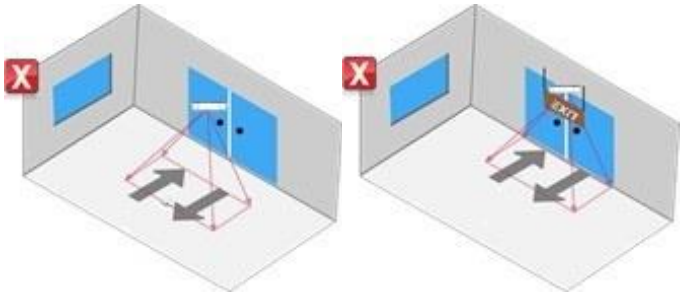

Figure 3-12 Avoid View Obstacle below Camera

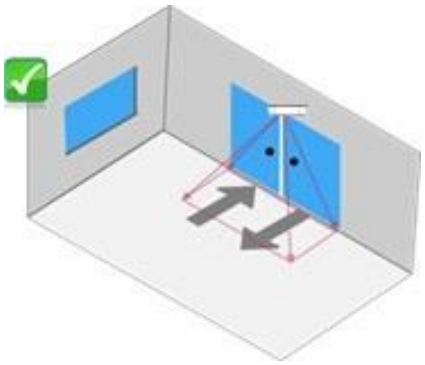

Figure 3-13 Recommended Camera Mounting

3.1.2 Key Features

- Real-time people entering/exiting/passing by data.
- Statistical traffic report based on configurable time interval (day/week/month/year).
- Flash memory storing people counting data
- 1/3'' progressive scan CMOS sensor
- Support Smart Codec, high bandwidth efficiency, low time delay and optimized bit rate.
- Support 3D DNR.
- Black and white image

3.1.3 Configuration

Configure Detection for Single Camera

Step 1 Access and log in to the camera via Web browser.

Step 2 Go to **Configuration**->**People Counting**.

Step 3 Enable **People Counting**.

Step 4 Calibrate the camera. Select the green box, drag it to proper location and click **Calibration**.

The **Height** in the configuration page will refresh (close to the real height). The red frame indicates the counting scope, and the yellow arrow shows the direction of entering. See picture below:

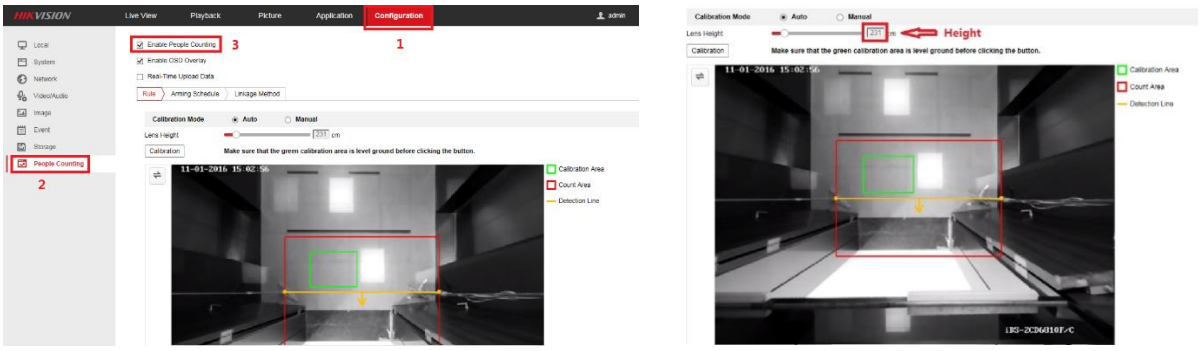

Figure 3-14 Calibrate the Camera

NOTE

If auto calibration fails, switch to [Manual] and input the measured “Height”, then click [Calibration].

Step 5 Set detection line.

Move the detection line to proper location, about 0.5m to the door. And adjust the length of detection line to the real door’s width by dragging detection line’s two ends.

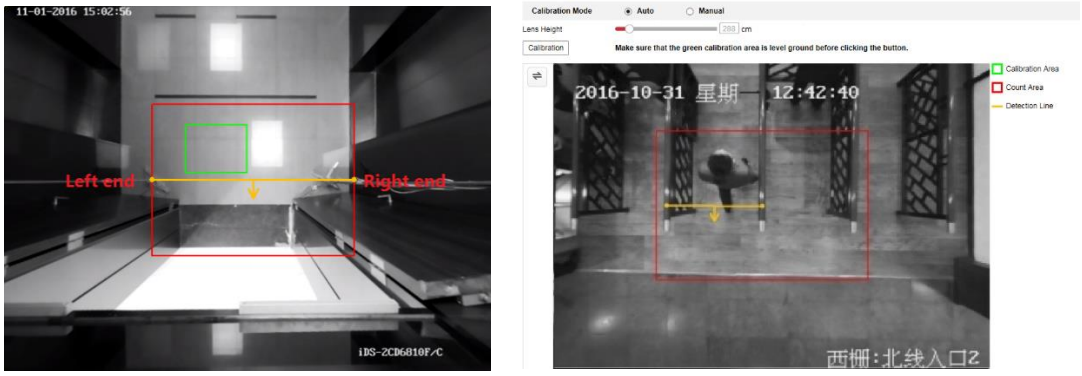

Figure 3-15 Set Detection Line

Step 4. Click **Save** and test.

In case of miscounting, slightly adjust the detection line's location and length.

Configure Detection for Multiple Cameras

Step 1 Configure the detection line for each camera by following the steps above.

Step 2 Move each camera's detection line and connect the ends of adjacent lines. Some objects could be placed on the image border for reference.

Figure 3-16 Connect Detection Lines of Cameras

Generate People Counting Statistics Reports

The system can generate the statistics reports of people entering/leaving data.

Step 1 Go to **Application**->**People Counting Statistics.**

Step 2 Select the report type to Daily/Weekly/Monthly/Annual Report.

Step 3 Set the start time.

Step 4 Click **Counting** to start statistics.

Step 5 You can select the statistics results to display in table, bar chart or line chart.

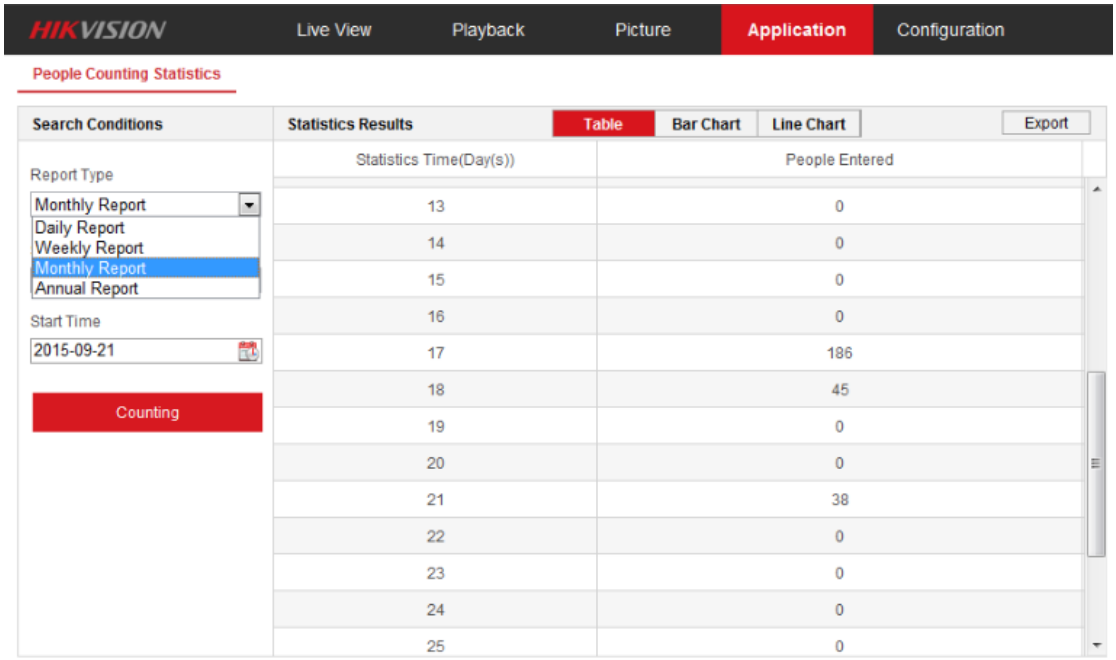

Figure 3-17 Statistics Report

Accuracy Rate

$$\text{Accuracy Rate} = 1 - \frac{|\text{True entering value} - \text{Statistic entering value}| + |\text{True leaving value} - \text{Statistic leaving value}|}{\text{True entering value} + \text{True leaving value}}$$

To ensure the high accuracy rate of statistics, the people amount in single direction should be more than 100, which can avoid the occasional error when the samples are too small. Install the camera properly and there are no special circumstances cases, the accuracy rate can be higher than 97%. If it is overcrowded in the scenes or testing personnel wandered along the line for a long time, the accuracy rate will decline.

The accuracy rate may be affected in the following conditions:

- The detected scenes has big shadow;
- The detected customer armed with large objects;
- The detected customer pushing a shopping cart or a baby car.

3.1.4 Product Selection

We recommend the following products for use in the solution.

Table 3-2 Product List

Product	Product Model	Description	Image
Smart IPC	iDS-2CD6810F/C	1/3" Progressive Scan CMOS; Lens: 2.0/2.8mm optional	

	iDS-2CD6810F-IV/C	1/3" Progressive Scan CMOS; Lens: 2.8/4mm optional; IP66	

*For detailed configurations, please refer to the user manual of the camera.

3.2 IPC+NVR

3.2.1 Description

Hikvision NVR supports VCA search function for behavior search, face search, people counting and heat mapping. DS-96/76NI-I series NVR is recommended.

3.2.2 Configuration

NOTE

Before configuring the people counting statistics on NVR, access the camera and configure the people counting function.

Step 1 Add the IPC to the NVR.

Step 2 Go to **Smart Analysis** > **Counting**.

Step 3 Select the camera for people counting.

Step 4 Select the report type to **Daily Report, Weekly Report, Monthly Report**, or **Annual Report**.

Step 5 Set the **Date** to generate people counting graphic. The camera can send the people counting data to the NVR to create the statistic reports.

Step 6 (Optional) Click **Export** to export the report in excel format.

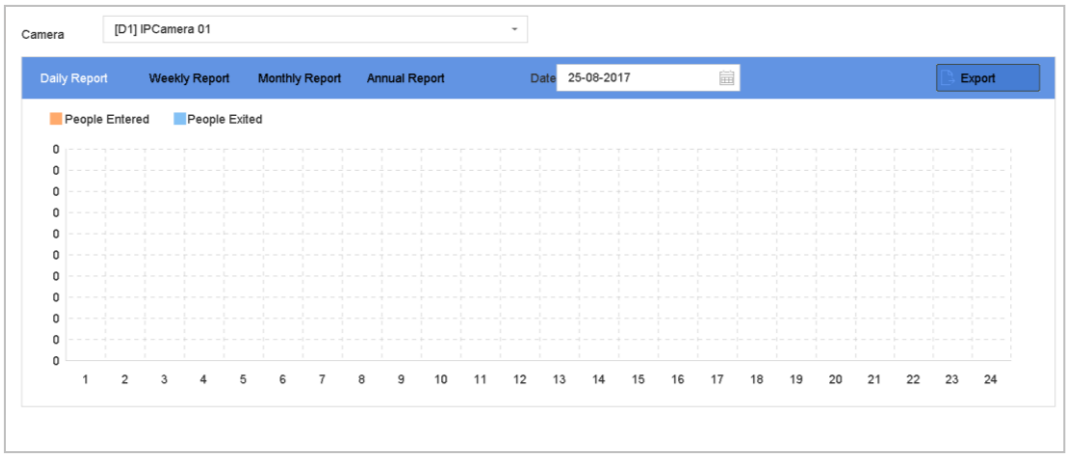

Figure 3-18 People Counting Reports

3.2.3 Product Selection

We recommend the following products for use in the solution.

Table 3-3 Product List

Product	Product Model	Description	Image
NVR	DS-9632/9664NI-I	Up to 32/64-ch IP cameras input, Up to 12 MP resolution recording, RAID 0,1, 5,10 supported	
	DS-7716/7732NI-I	Up to 16/32-ch IP cameras input, Up to 12 MP resolution recording	

3.3 IPC+HikCentral

3.3.1 Description

The HikCentral is a centralized management monitor system which is developed by Hikvision based on SOA architecture. It features flexibility, scalability high reliability and powerful functions. Integrating with multiple surveillance systems, HikCentral provides the central management, information sharing, convenient connection and multi-business integration.

3.3.2 Configuration

Check the People Counting Statistics on HikCentral

NOTE

Before checking the people counting statistics on HikCentral, access the camera and configure the people counting function.

Step 1 Open **HikCentral Control Client**, and connect to the correct VSM.

Step 2 Click **Monitoring** to view the live video of people counting camera.

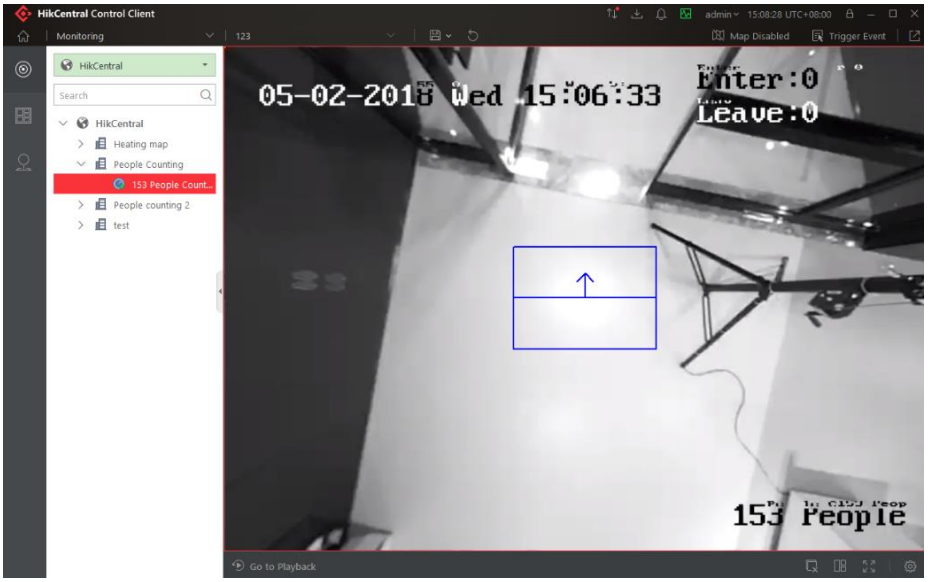

Figure 3-19 Live View of People Counting Camera

Step 3 Go to **Video Analysis** ->**People Counting**. Add people counting camera to the camera list. You can add 8 cameras at most.

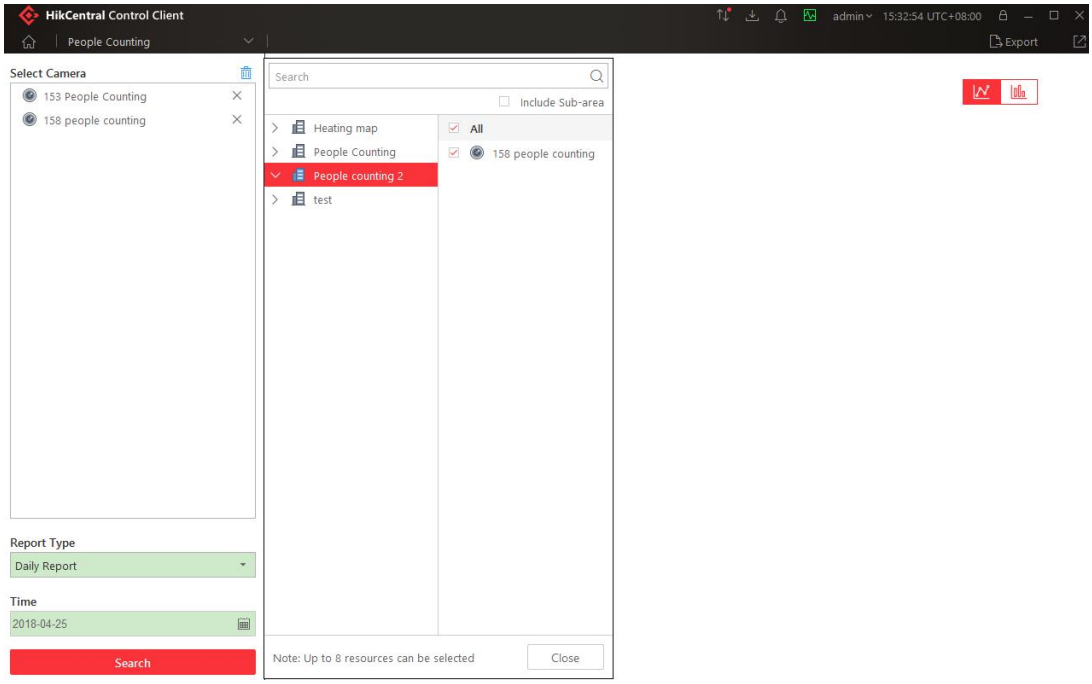

Figure 3-20 Add People Counting Camera

Step 4 Select the report type (Daily Report/Weekly Report/Monthly Report/Annual Report/Custom Time Interval) and set the time for statistics. The people counting results will be displayed in line chart or histogram.

The minimum time unit is 2 hours. You can check the report as Enter/Exit/Enter and Exit for each camera or total number.

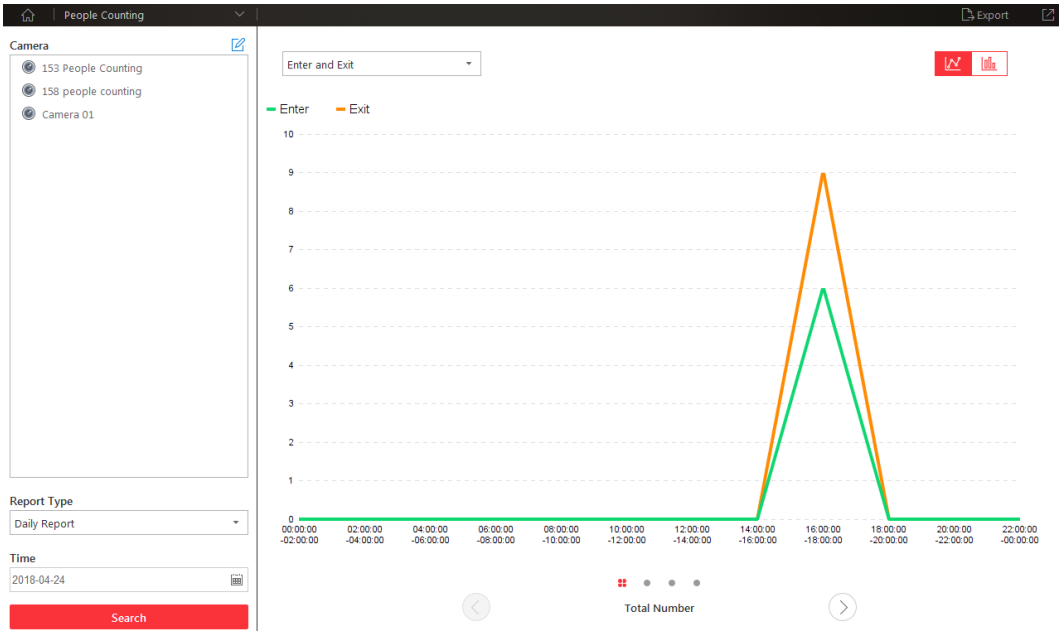

Figure 3-21 People Counting Reports

Export the People Counting Reports

Step 1 Generate the people counting statistics reports according to the steps in section *Check the People Counting Statistics on HikCentral.*

Step 2 Click **Export** to export the statistics file in excel to your local directory.

The CSV format file exported is as below:

Table 3-4 CSV Format

	00:00~02:00	02:00~04:00	04:00~06:00	06:00~08:00	08:00~10:00	10:00~12:00
People Enter	0	0	0	0	373	63
People Exit	0	0	0	0	321	59
Total Number	0	0	0	0	694	122
	12:00~14:00	14:00~16:00	16:00~18:00	18:00~20:00	20:00~22:00	22:00~24:00
People Enter	165	69	69	57	0	0
People Exit	168	53	61	70	0	0
Total Number	333	122	130	127	0	0

Apply People Counting Data

In retail scenarios, cameras under a store can be added and show the total traffic report for the store.

- **Customer Distribution**: A report of the total traffic volume of every camera during a period, to have an idea that which gate has the least traffic and then take action to get a better performance
- **Customer Tendency**: From the history of traffic volume for every store to expect the trending of traffic volume during a day, a week or a month etc.
- **View the Video**: Click the rectangle or line to view the video of the people counting camera.

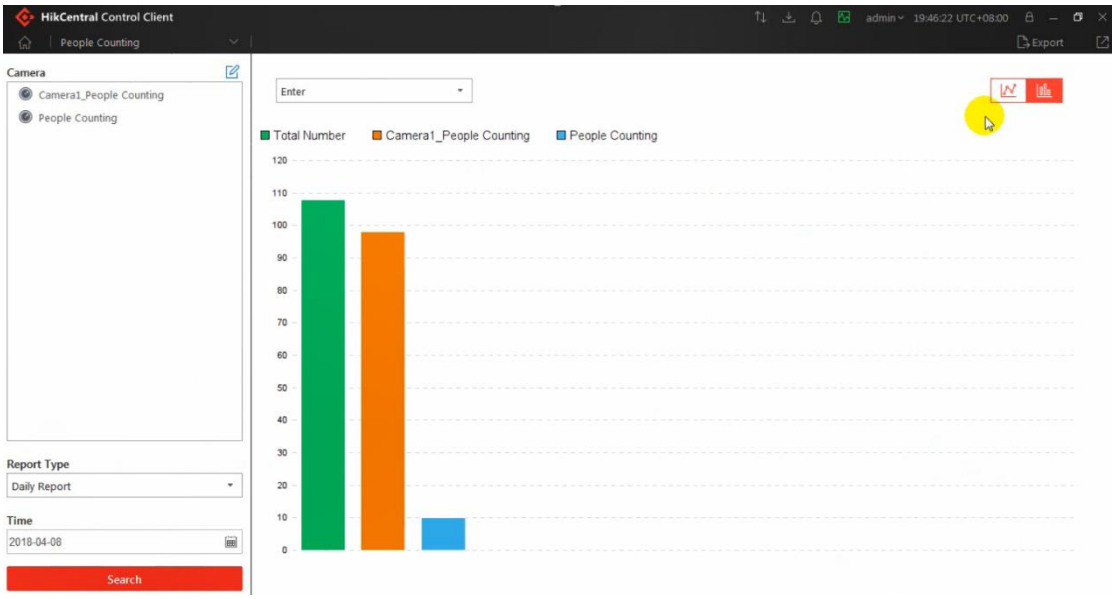

Figure 3-22 People Counting Reports in Histogram

3.3.3 Product Selection

We recommend the following products for use in the solution.

Table 3-5 Product List

Product	Product Model	Description
Platform	HikCentral	Supports up to 70 People counting cameras for 1 VSM

3.4 System Functionalities

The system has the following values:

- Analyzing People Counting Statistics with sales of different kinds of goods, manager can effectively improve management decisions and increase sales.
- By comparing the People Counting Statistics before and after promotion, manager can effectively evaluate the effectiveness of promotion.
- With People Counting Statistics, cost for retail rental can be evaluated exactly.
- With People Counting statistics in different regions, manager can make a reasonable distribution of service person and reduce costs.
- With People Counting statistics, manager can take measures to prevent emergencies in the larger flow area, and arrange the work of security guards and maintenance staff better.

Chapter 4 System Applications

4.1 Application Scenarios

Suitable application scenarios:

- Shopping Mall, Shopping Center entrances;
- Super Market entrances;
- Brand stores entrances;
- Museum entrances;
- Bus station, metro station entrance.

Unsuitable application scenarios:

- Indoor surveillance camera image is not suitable for the people counting statistics and it should be re-installed.
- Scenic areas, parks and other outdoor places. Mainly because of the installation position, the umbrella, outdoor wear hats, backpacks and other aspects will greatly affect the accuracy.
- Areas where need the accurate statistics. Mainly because the entering and leaving statistics deviation in the region will increase with the time.

The store owners can arrange the schedule of goods storage and purchasing, based on the people counting data. The data will also help the store owners to do the business analysis and adjust sale strategy.

4.2 Single Store

For some small single store without chain management requirement, one NVR + one monitor + one fisheye camera are enough to cover all the store corners. Sometimes, dome cameras and bullet cameras will also be adopted for the medium-sized stores. With the people counting cameras deployed in the store entrances, store owners can get the customer statistic data by table list or chart directly. The solution architecture of the small store is introduced as below.

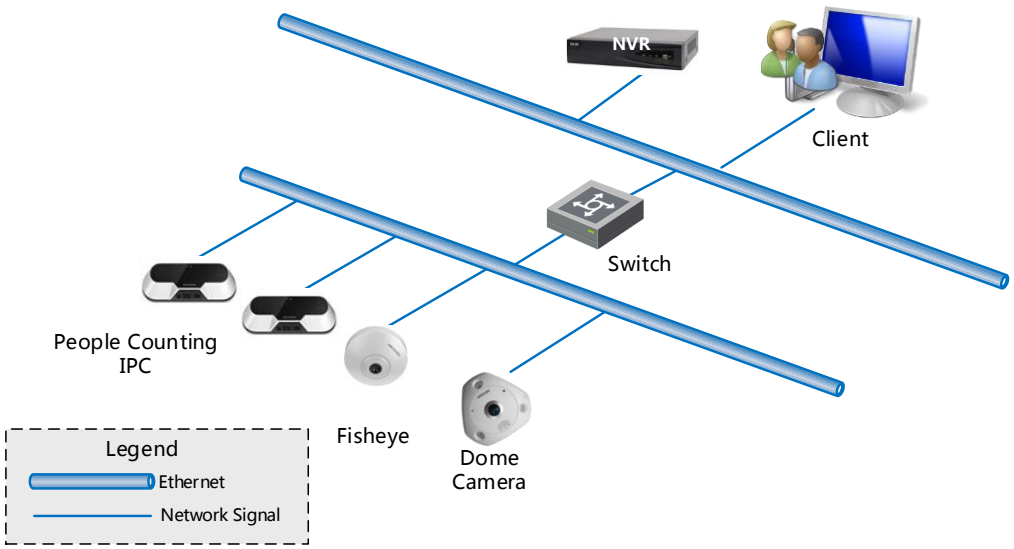

Figure 4-1 Single Store Solution Architecture

In this scenario, store owners can check the people counting data by IPC via web client or NVR directly or export daily/weekly/monthly/ report/chart to the local computer.

NVR:

1. NVR get the people counting data from IPC;
2. Check the people counting chart directly on the NVR;
3. Export the excel data to local computer to do the further analysis.

IPC:

1. Check the people counting data or chart directly on the IPC
2. Export the excel data to local computer to do the further analysis.

The daily report example is introduced as below.

Table 4-1 Daily Report from IPC

Time(hour)	Camera1_people counting Time2015-04-22 People Entered
00:00-01:00	0
01:00-02:00	0
02:00-03:00	0
03:00-04:00	0
04:00-05:00	0
05:00-06:00	0
06:00-07:00	0
07:00-08:00	1
08:00-09:00	84
09:00-10:00	75
10:00-11:00	100
11:00-12:00	38
12:00-13:00	274
13:00-14:00	37
14:00-15:00	29
15:00-16:00	45
16:00-17:00	18
17:00-18:00	33
18:00-19:00	49
19:00-20:00	8

20:00-21:00	0
21:00-22:00	0
22:00-23:00	0
23:00-24:00	0

With the report, store owners will get the information immediately and take the deep business analysis to help to improve the sales.

4.3 Chain Stores

For Some large stores or chain stores, there is often nationwide or global chain management requirements. 5-20 gates for each store are installed with cameras for people counting. In this scenario, many other cameras or sub-systems will also be managed together by the iVMS platform. The people counting sub-system provides the people counting statistics data or chart by the platform directly to the store owners to give the strategy adjusting guide.

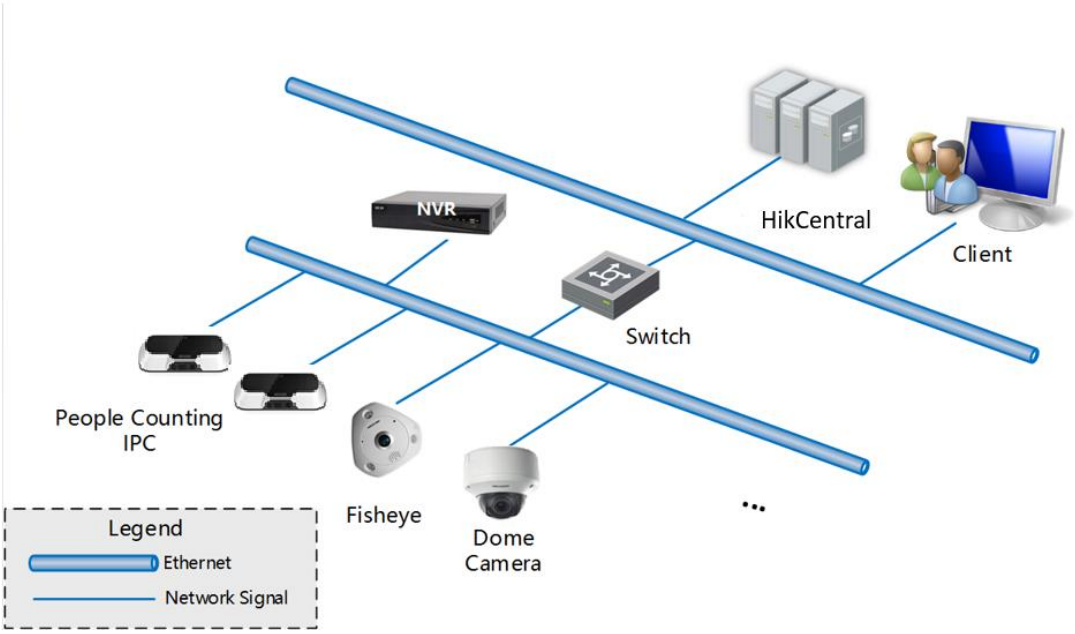

Figure 4-2 Chain Store Solution Architecture

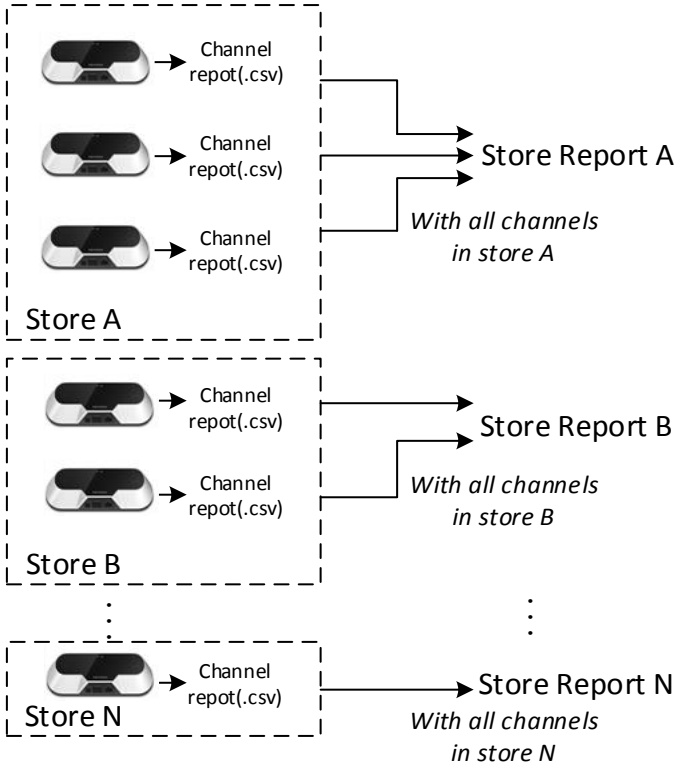

Figure 4-3 Connection between People Counting Channels and Stores

In this scenario, as many sub-systems, IPCs, NVRs, will be managed by the iVMS platform, management can't access every people counting IPC or NVR to get the data. They more care about the statistics data about every retail store that has many entrances maybe or all stores to give the business suggestions. So the statistics data and chart is very useful.

iVMS Platform

1. IPC is added to the platform;
2. Put the IPCs that are in the same store under the one area;
3. IPCs start to upload the data to the platform;
4. Build the connection between new reports and areas in the client server (CS client). For example, we may build different reports dedicated for every stores. One store with many channels only create one report.
5. Check the table data or chart directly by CS client;
6. Export the data to the local computer to take the further analysis or long storage.

For example, In order to obtain accurate and effective people counting data, GUCCI China headquarters have decided to use video people counting statistics system**.** Via network or VPN, all distribute stores are connected with GUCCI China headquarters. People counting statistics system is customized according to the needs of GUCCI China headquarters that create the separate reports for each store. It helps the GUCCI headquarter to do the customer analysis and give the correct strategy adjustment.


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