

**HIKVISION** EUROPE

# SOLUTIONS

## [People Counting]



**HIKVISION**



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## Reading Tips

<b>Document category</b>
People counting products and system
<b>Brief description of product applicability</b>
<ol style="list-style-type: none"> <li>1. The proposal introduces the key products, product configuration, system structure, system functions of the Hikvision people counting system.</li> <li>2. The solution is suitable for the people counting scenarios, and please modifies the content based on the project requirement.</li> </ol>
<b>References</b>
<p>《iDS-2CD6412FWD/C specifications.doc》</p> <p>《People Counting Guide》</p>

## Document Control

No.	Revised Content	Time	Revised by	Reviewed by
1	V0.8	2015/9/16	Challen	Ethan
2	V1.0	2015/9/29	Challen	Ethan

# 1. Preface

## 1.1 Overview

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

**a. Slow Sales Growth**

Network B2C and C2C sales module is a new challenge for traditional retail. This factor tend to slow down the development of the retail industry.

**b. High Operating Costs**

For example in China in 2011, the staff costs of enterprises rose 26% and rental costs rose 10%.

**c. High Homogeneity**

The quality and features of department stores are almost the same, it leads to Decrease of Customer Loyalty.

**d. 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, managers need a new solution to get useful information and help them to make decisions.

## 1.2 Applicability

People counting system is the 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.

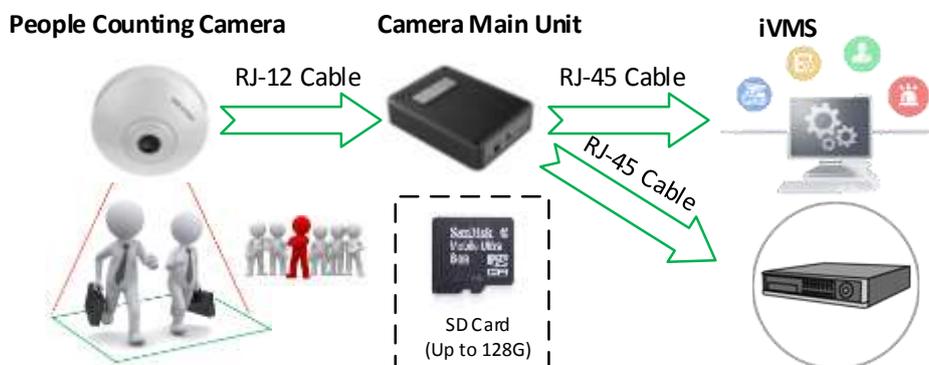


Fig.1 Deployment of people counting camera

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;
- Imperceptible behavior, It is harmless to humans through the video recording of People Counting;
- Construction is simple, It is simple to install cameras in public areas;
- Function is powerful, it can statistics two-way People Counting;
- Easy to operate, support client and web to view the data;
- Convenient system expansion and renovation, system expansion and renovation can be achieved through network configuration and adding new cameras;

Provides a variety of graphical reports of shopping malls, exhibition halls.

## 2. Regulation Applicability

Considering the widely deployment of the people counting cameras, the iDS-2CD6412FDW/C that adopts the separated structure design between video collecting unit and coding unit, has better field angle, concealment , shorter focus length, and price benefit.

NVR is a good storage for recording and querying. We suggest DS-77, DS-96NI-ST, series. They are not only be a storage, but also a good place to query people counting statistic with daily/month/year report.

iVMS-5200 is widely adopted in the video surveillance industry, and provides people counting module from v3.2.0. The front end video and real time people counting data are previewed together and the data is sent to the platform to create the different reports.

## 3. Solution

Hikvision adopts iDS-2CD6412FDW/C+NVR/iVMS-5200 solution to help the management to collect the people counting statistic information for the doors/stores/buildings by different time requirement.

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 reports.

Note: People counting data is saved locally inside the camera. So SD card is necessary for people counting function.

### 3.1 System Structure

The system is consist of front end people counting camera, NVR and the platform VMS. For small-sized retails, the “IPC+ NVR” mode has high performance with cost effective. For large-scale retails, the “IPC+ surveillance center” mode is proposed. So the key devices are people counting camera and the platform that provides the initial data and gives the statistics reports.

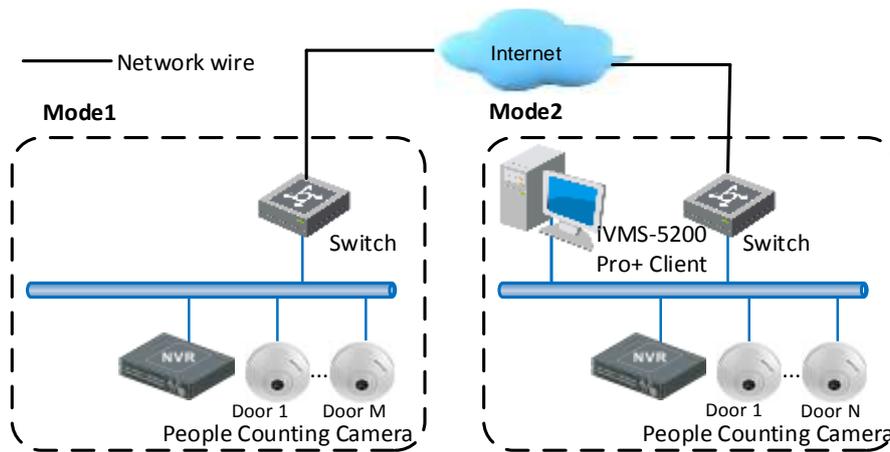


Fig.2 Topology of people counting system

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.

The basic process of People Counting statistics system shown below:

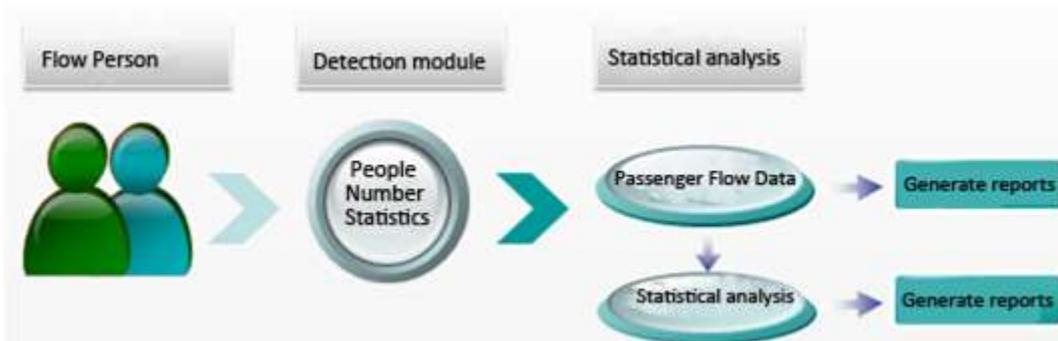


Fig.3 Process of people counting

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/ 5200 platform.
4. The NVR/ 5200 platform statistics the data and generates various types of report.

## 3.2 System Composition

For “people counting camera + platform VMS” mode:

- **People Counting Dome (iDS devices)**  
People counting algorithm is inside the cameras. No extra server is needed to collect the data.
- **Backend (DS-96/77NI-ST)**  
The local output of back-end units will be used for querying the people counting data and statistics.
- **Platform (iVMS-5200 pro)**  
iVMS-5200 Pro can use the client to display the data and reports.

### 3.2.1 People Counting Camera

We take iDS-2CD6412FWD/C as an example to introduce.

#### 3.2.1.1 Introduction



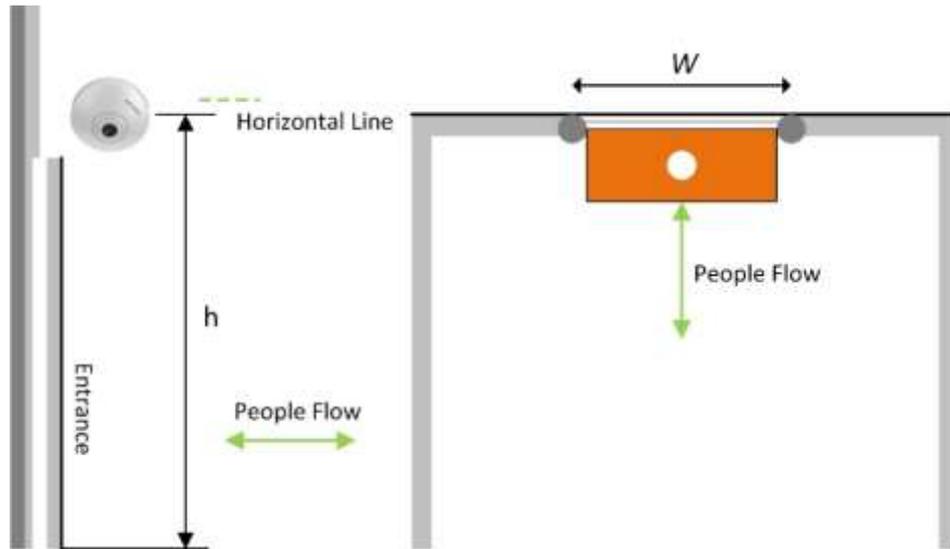


Fig.4 Side View and Vertical View of the Camera in Vertical Mounting

- **h**: mounting height of the camera
- **w**: width of the access.

Installation requirements:

- For the vertical mounting, the horizontal distance (*d*) between the camera and the access is generally assigned to 30cm spacing from the door line. If this distance is not proper, the value can be ranged from 10cm to 50cm.

By default, the camera angel in vertical mounting generally has no need of adjustment.

Vertical installation is required to ensure the accuracy of visitor flow accounting. The following data is for reference. Please consult our technique for details.

Table 1 Deployment requirement

Height (m)	Recommended Focus (mm)	Width of Gate (m)
2.5	2.1	2.0
2.6	2.1	2.2
2.7	2.1	2.4
2.8	2.1	2.6
2.9	2.1	2.7
3.0	2.1	2.8
3.1	2.1	2.9
3.2	2.1	3.0
3.3	2.1	3.0
3.4	2.1	3.0

$\geq 3.5$	2.8	3.0
$\leq 5.0$	2.8	3.0

- **Note:** The mounting height of the camera is corresponding to a max. access width being covered by the camera's view. The actual width must not exceed the value *w* defined in the table.
- Refer to the following figures for the correct vertical mounting:

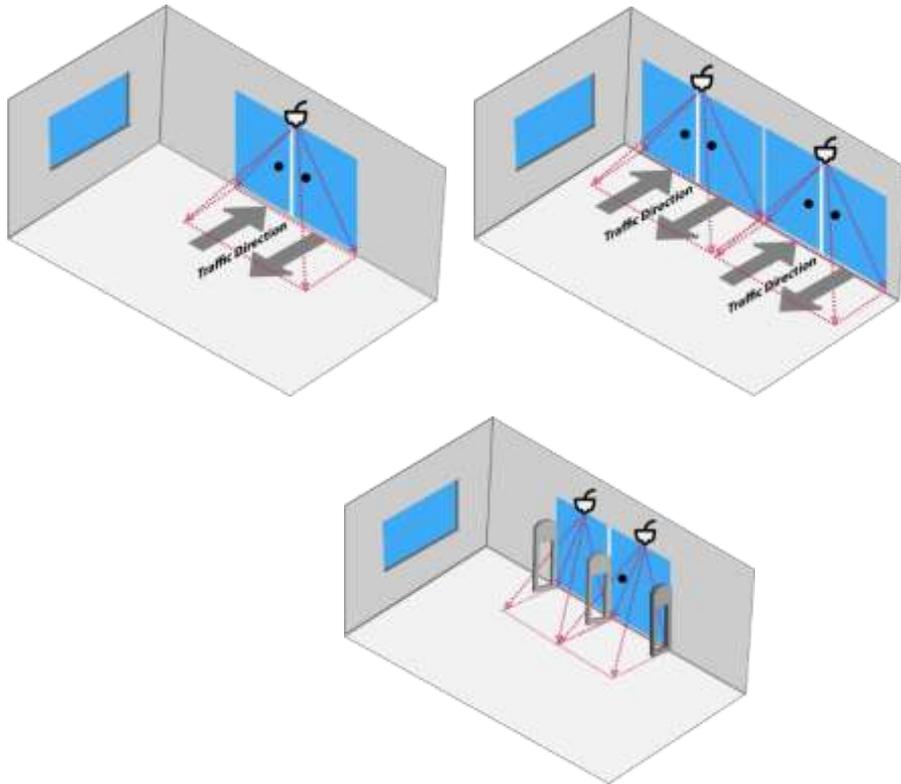
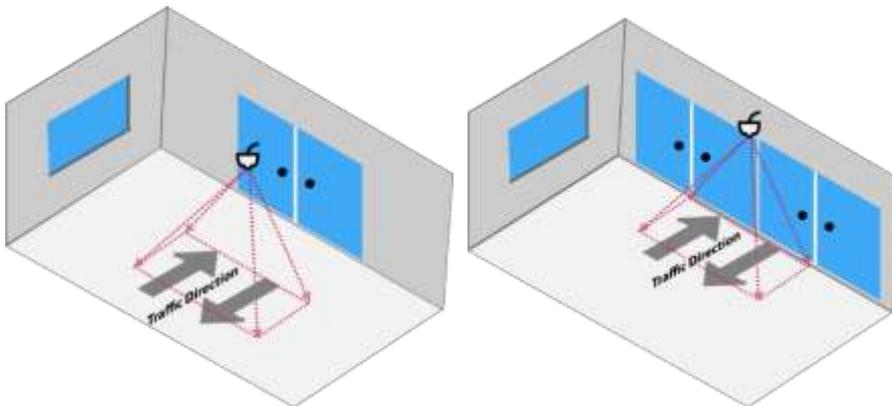


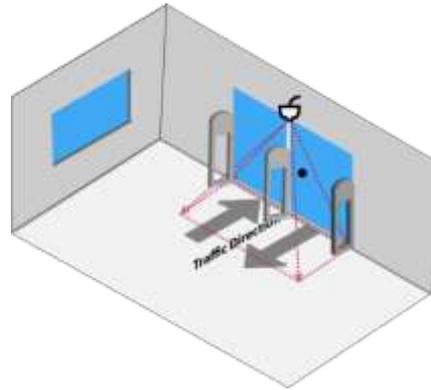
Fig.5 Position and Effect of the Vertical Mounting

- The following figures have shown the incorrect vertical mounting:



Far away from the entrance

doesn't cover the entrance



Shelter under the camera

Fig.6 Incorrect vertical mounting

If the entrance is separated by the obstacles (such as the glass door, screen doors), and the preview screen covers most of the bodies when going into and out of the entrance, it will seriously affect the accuracy of statistics. At this point, every channel should be considered as one separate entrance, and increase the number of cameras.

### 3.2.1.2 Features

#### Key features:

- Embedded intelligent analysis algorithm, support people counting function, give the statistic to the people entering and leaving, and display by daily/weekly/monthly/annual report.
- 1280 x 960 @ 30 fps
- Support Micro SD/SDHC/SDXC card (maximum 128G) local storage
- Support separated installation between lens and IPC body with the choices of 2 or 8 meters, and has focal lens of 2.1mm or 2.8mm.

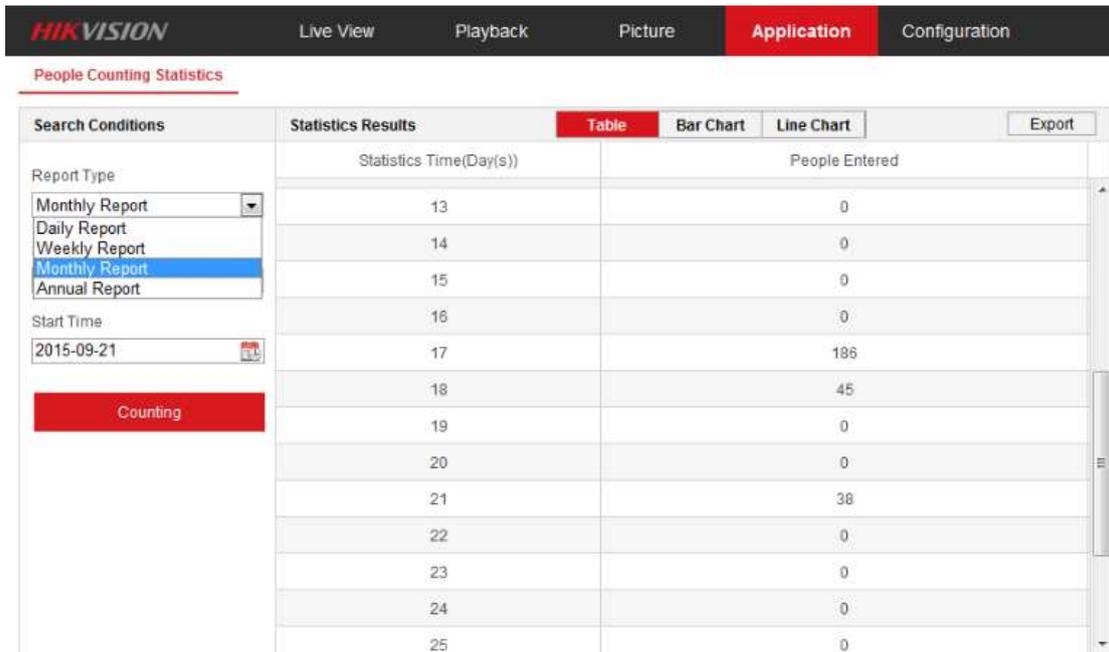


Fig.7 Table format



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Fig.8 Bar Chart format



Fig.9 Line Chart format

The daily/weekly/monthly/annual reports with entering/leaving data by table list/bar chart/line chart can be showed.

Accuracy Rate:

Accuracy Rate

= 1

$$\frac{|True\ entering\ value - Statistic\ entering\ value| + |True\ leaving\ value - Statistic\ leaving\ value|}{True\ entering\ value + True\ leaving\ value}$$

The condition of the accuracy rate statistic is the people amount in single direction should be bigger than 100. Then you can avoid the occasional error when the samples are too small, gives the great impact to the accuracy of statistics. In accordance with installation requirements, see staff profile clearly and there are no special circumstances cases, accuracy rate can be bigger than 90%. If it is overcrowded about the scenes or testing personnel wandered along the line for a long time, the accuracy rate will decline.

Common interference 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;

### 3.2.1.3 Configuration

The configuration is very easy, including the steps of drawing one line, fixing one direction

and defining one width.

- ① Select “People Counting”
- ② Enable People Counting, Camera Calibration and OSD Overlay.
- ③ Configuration:
  - Draw a Detection line to define a valid range;
  - Choose a direction arrow on Detection line;
  - To set the line width by dragging the mouse position. The distance between the endpoint of detection line (as shown at the left picture) and the width line should follow the width of customers’ shoulder, in order to ensure the highest detection accuracy.
  - Every reference line indicates the statistic shoulder width of historical people flow.
  - There isn’t any reference line if there isn’t anybody passing by. Therefore, it is strongly recommended to take some walking in/out trial for having an accurate width setting.

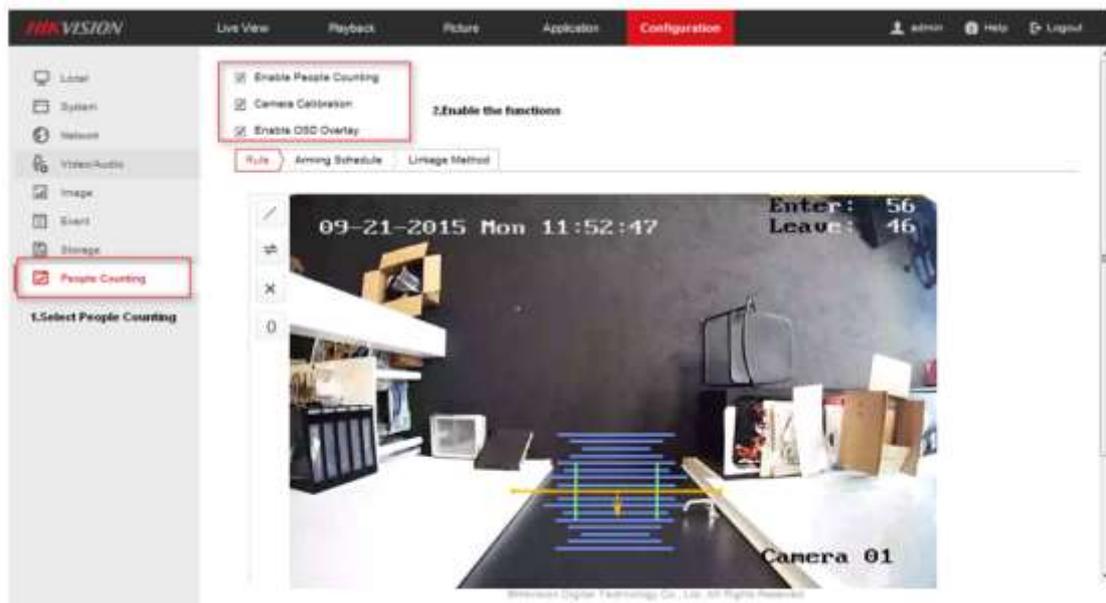


Fig.10 People Counting Camera Web Client

In the above figure, the **yellow** line is the detection line, **green** line is the width line and **blue** line is the reference line.

After select “enable OSD overlay”, the real time people counting data will be displayed on the top right corner of the video screen.

### 3.2.1.4 Product Selection

Table 2 Product List

Product	Product Model	Description	Image
Smart IPC	iDS-2CD6412FWD/C	1.3 megapixel (1280 × 960) @ 30 fps, Lens:2.1mm/F2.2 or 2.8mm/F2.0	
	iDS-2CD6124FWD-I (Z)/C	2Megapixel(1920x1080) @ 30fps,Lens:2.8-12mm @ F1.4 or 2.8-12mm @ F1.4	

\*For detailed configurations, please refer to the 《People Counting Guide》

### 3.2.2 “IPC+NVR” mode

#### 3.2.2.1 Introduction

From Hikvision NVR v3.2.0, Hikvision NVR supports VCA search function for behavior search, face search, people counting and heat mapping. Hikvision 77/96NI-ST series is recommended.

#### 3.2.2.2 Features

**Key features:**

- Query

So, for some small stores, the statistics data can be reviewed directly on the NVR local screen, and store owners can do the sale strategy adjustment immediately, based on the customer data.

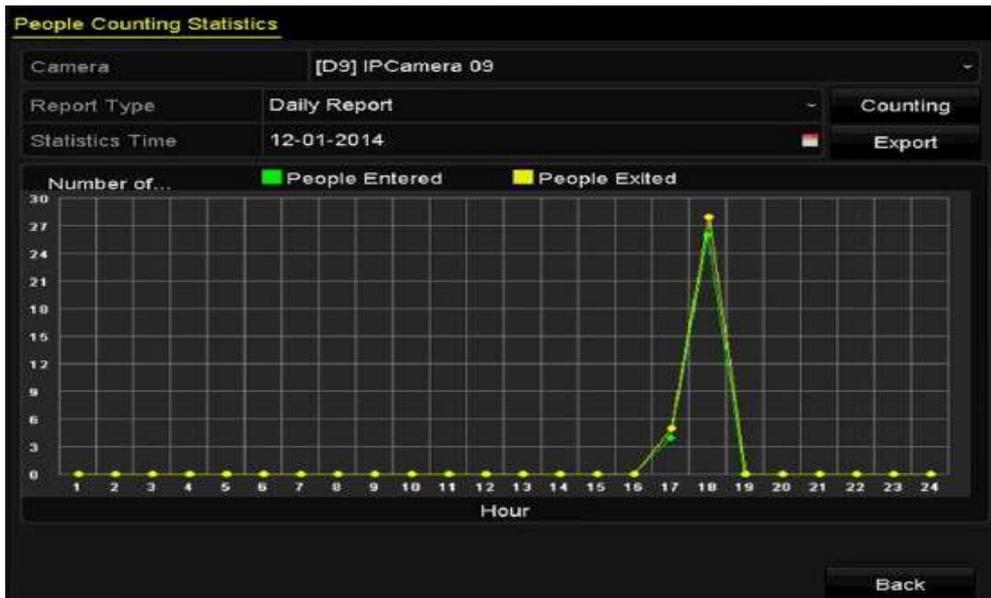


Fig.11 People Counting Camera on local NVR

■ Export

Click the “Export” button. NVR can export the data to the disk or USB to analyze, or it will show some information.

### 3.2.2.3 Configuration

Firstly, we set the people counting camera configuration on web IPC. Then, we set people counting configuration on local NVR:

1. We add the IPC to the NVR as a digital camera
2. Enter the People Counting interface
3. Menu>VCA Search> People Counting
4. Select the camera for the people counting
5. Select the report type to Daily Report, Weekly Report, Monthly Report or Annual Report
6. Set the statistics time
7. Click the counting button to start people counting statistics

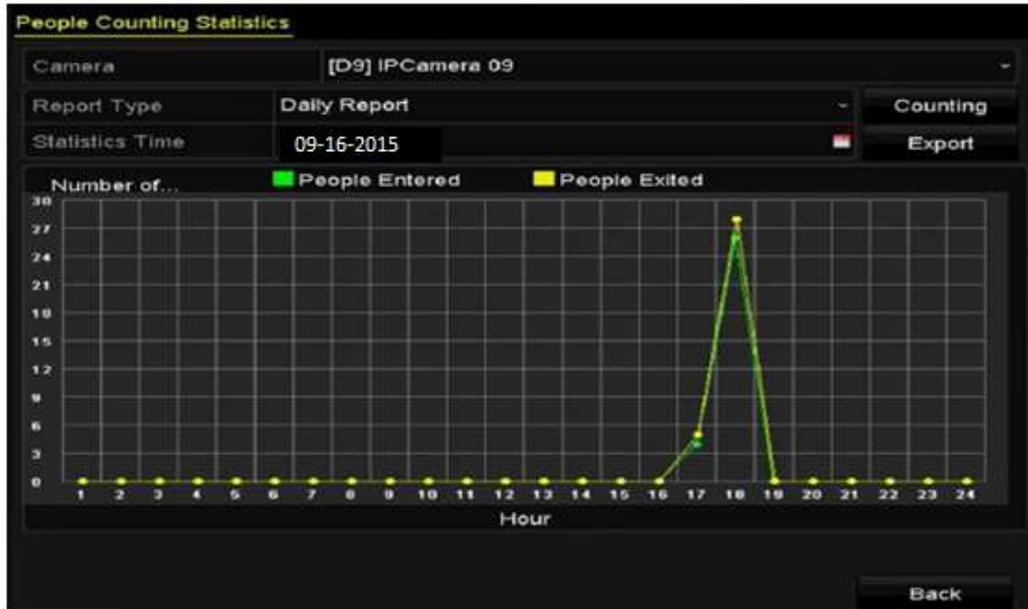


Fig.12 People Counting on local NVR report

The IPC sends the people counting data to the NVR to create the statistic reports.

### 3.2.2.4 Product Selection

Table 3 product List

Product	Product Model	Description	Image
NVR	DS-9608/9616/9632 /9664NI-ST	Up to 8/16/32/64-ch IP cameras input, 6 MP resolution recording, RAID 0,1,5,10 supported (DS-9632/9664NI-RT)	
	DS-7708/7716/7732 NI-ST	Up to 8/16/32-ch IP cameras input, 6 MP resolution recording	

### 3.2.3 “IPC+5200P” mode

#### 3.2.3.1 Introduction

The iVMS-5200 Pro 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, iVMS-5200 Pro provides the central management, information sharing, convenient connection and multi-business integration.

### 3.2.3.2 Features

**Key features:**

- Query

**1. Tools-> People Counting for querying people counting data**

For some small stores, the minimum time unit is 2 hours. You can choose a camera, a report type and the time to count.

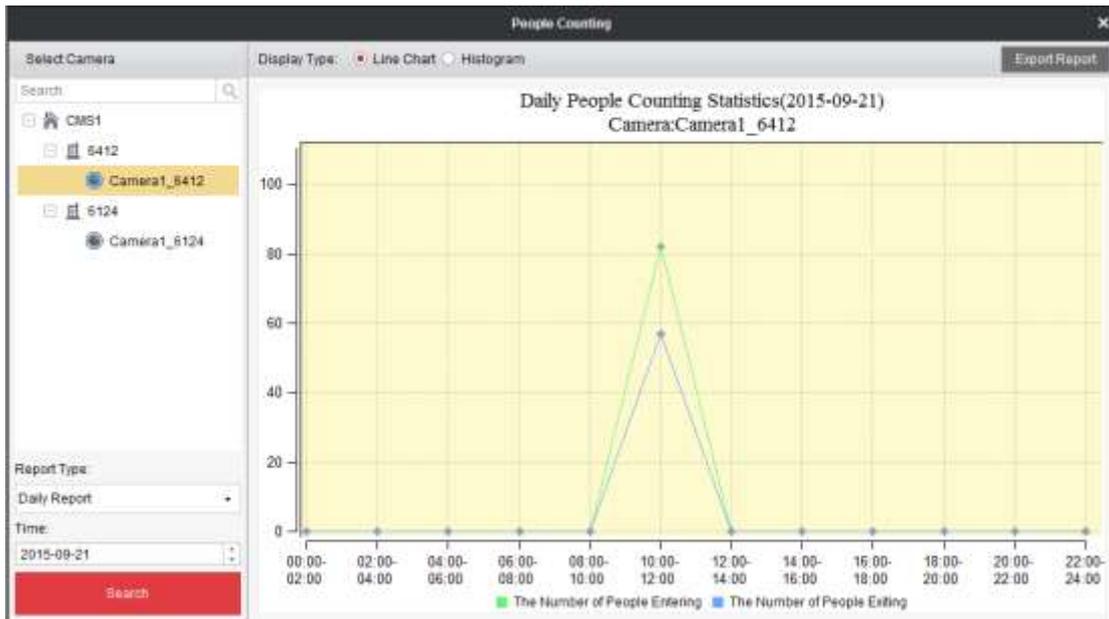


Fig.13 People Counting on client

**2. BI Module for querying people counting data**

In the following two reports, the statistical object is the area, which is the logical resource defined in the B/S and has a few cameras under it maybe. So in retail scenarios, one area can be one store and has the store name here, which has its own people counting cameras under it. So the statistical unit here is for per store, not per camera.

- 1) Customer Distribution: A report of the total traffic volume of every store during a period, to have an idea that which store has the least traffic and then take action to get a better performance
- 2) 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.

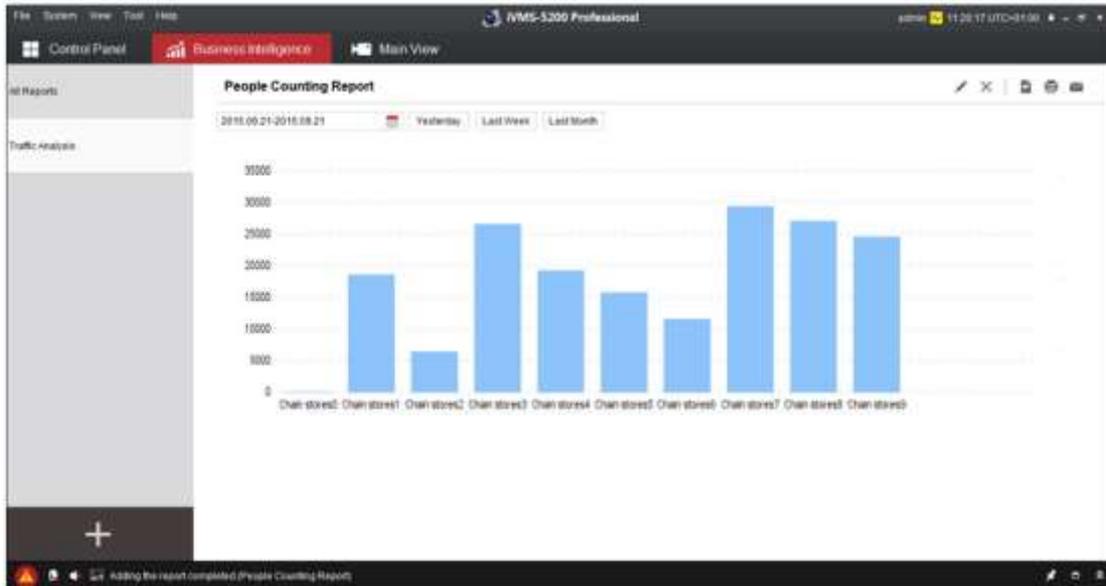


Fig.14 Customer Distribution

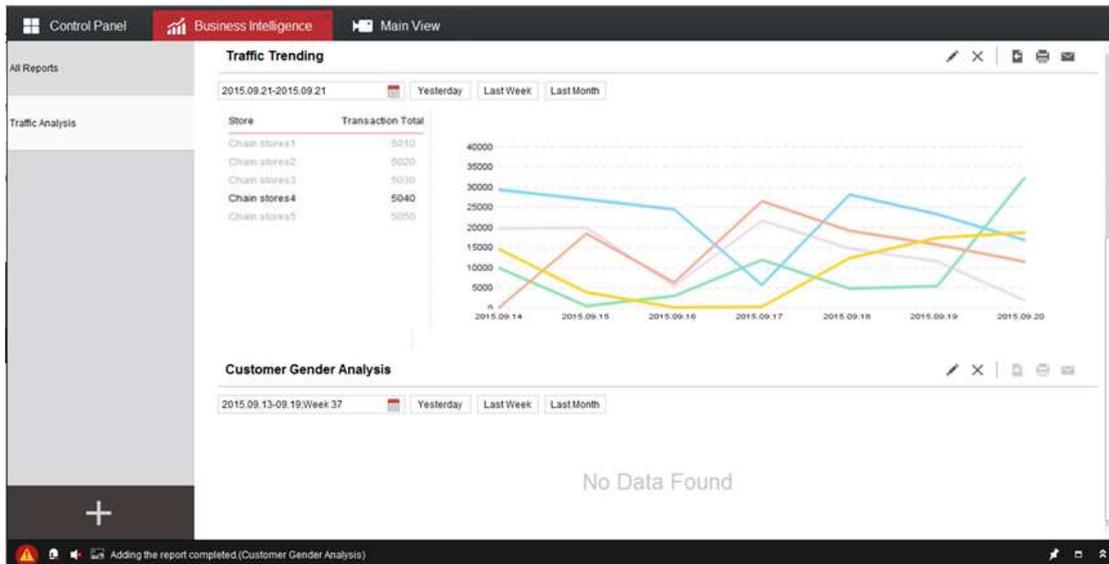


Fig.15 Customer Tendency

■ **Export**

You can export the excel file in this page

1. **Tools-> People Counting** for exporting people counting data

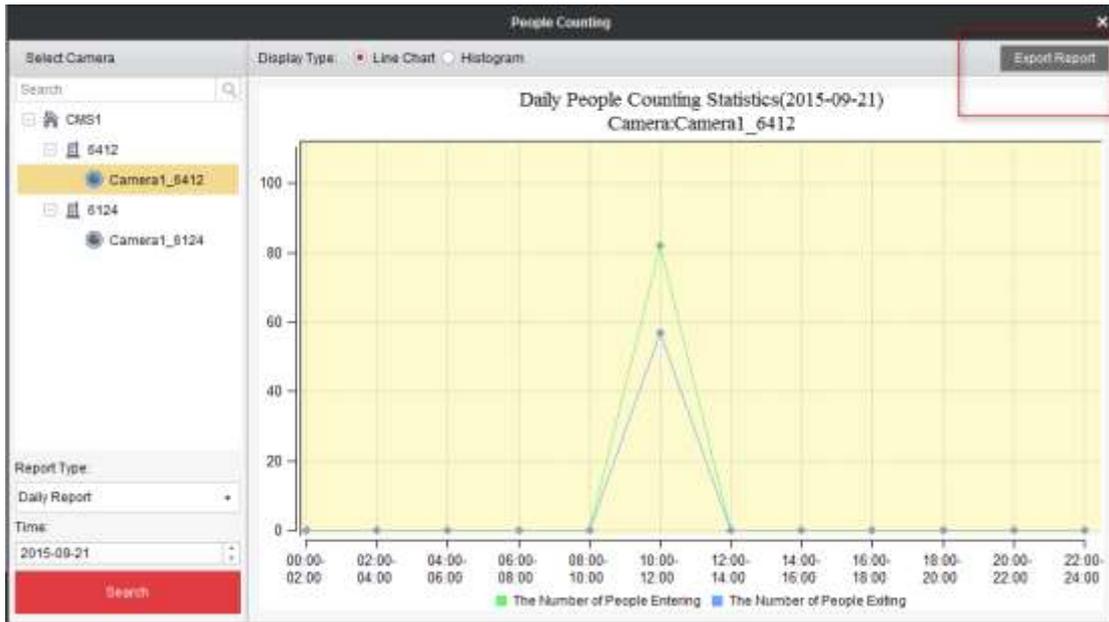


Fig.16 People counting export

## 2. BI Module for exporting people counting data

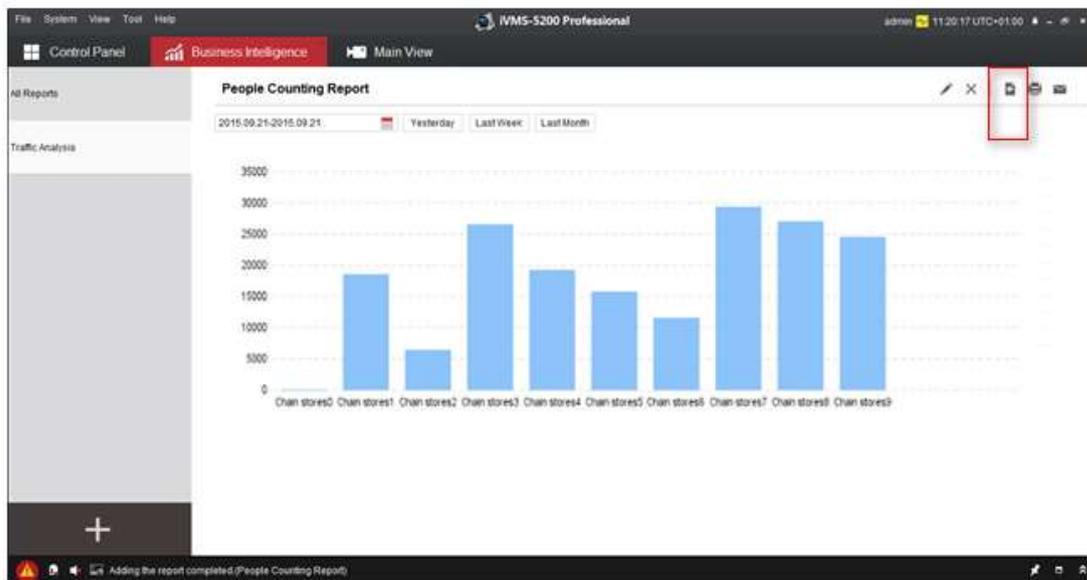


Fig.17 People counting print

The CSV format file exported is as below:

Table 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 Entered	0	0	0	0	373	63
People Exited	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 Entered	165	69	69	57	0	0
People Exited	168	53	61	70	0	0
Total Number	333	122	130	127	0	0

■ Mail

Open the “people counting” report in the BI module, after searching the data, we can send the email.



Fig.17 People counting mail

■ Print

Open the “people counting” report in the BI module, after searching the data, we can print

the data. It will show the print page.

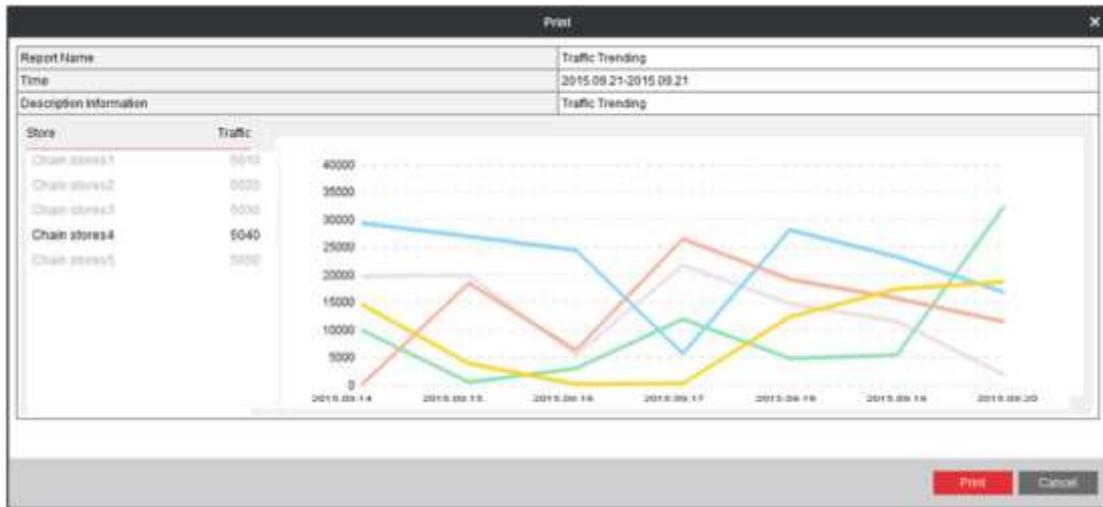


Fig.18 People counting print

### 3.2.3.3 Configuration

First of all, we set the people counting function via the configuration page of IPC web or via the remote configuration menu from iVMS5200 web manager.

Open *iVMS-5200 Control Client*, connect to the correct CMS, and click the “Main View” to see the image of the “People Counting” camera.



Fig.19 People counting camera liveview

#### 1. Tools-> People Counting

In the “Tool” menu, there is “People Counting” auxiliary function. After define the report type (Daily/Monthly/Annual) and time, line chart and histogram will be displayed. The minimum time unit is 2 hours. You can choose a camera, a report type and the time to

count, and export the excel file in this page.

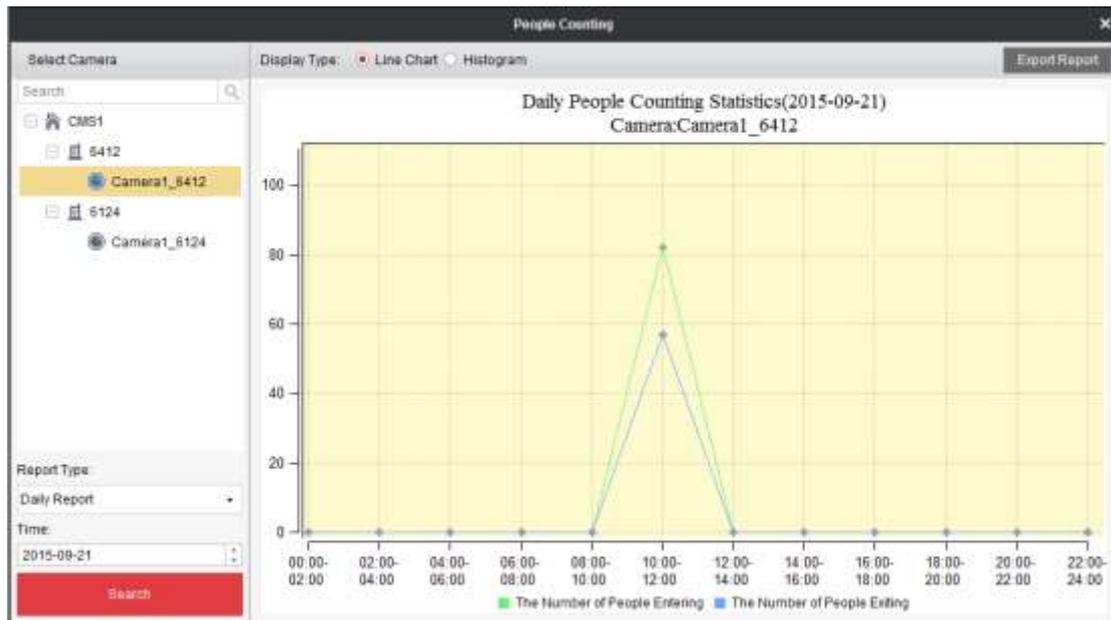


Fig.20 People counting quick entrance in the “Tool” menu

## 2. BI Module:

Open **iVMS-5200 Control Client**, and go to **Business intelligence** in the control panel.

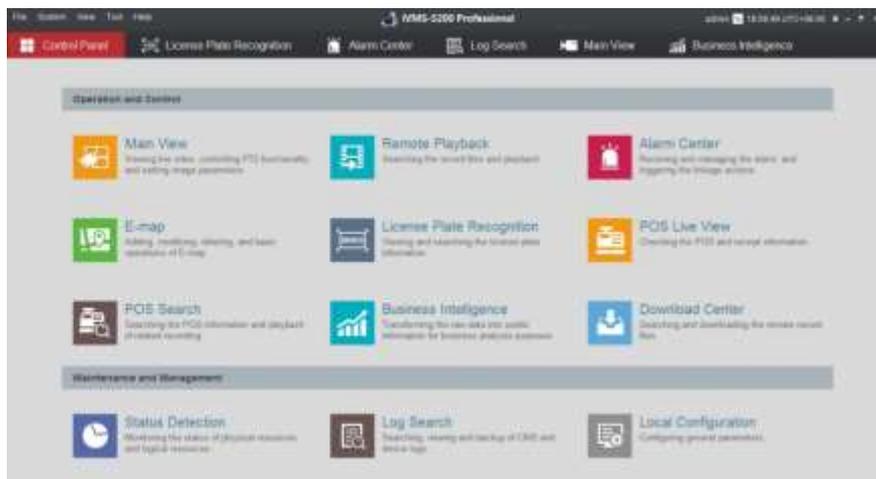


Fig.21 Control panel

After entering into the BI module, the default reports are blank, as there isn't any association between reports and channel. After click the “+” button on the left, we will go into the configuration page.

- ① Select “People Counting” report
- ② Define the report name, based on the channel name or store name
- ③ Select the areas, that is defined already in web manager
- ④ Click the “Add” button to create the report dedicatedly

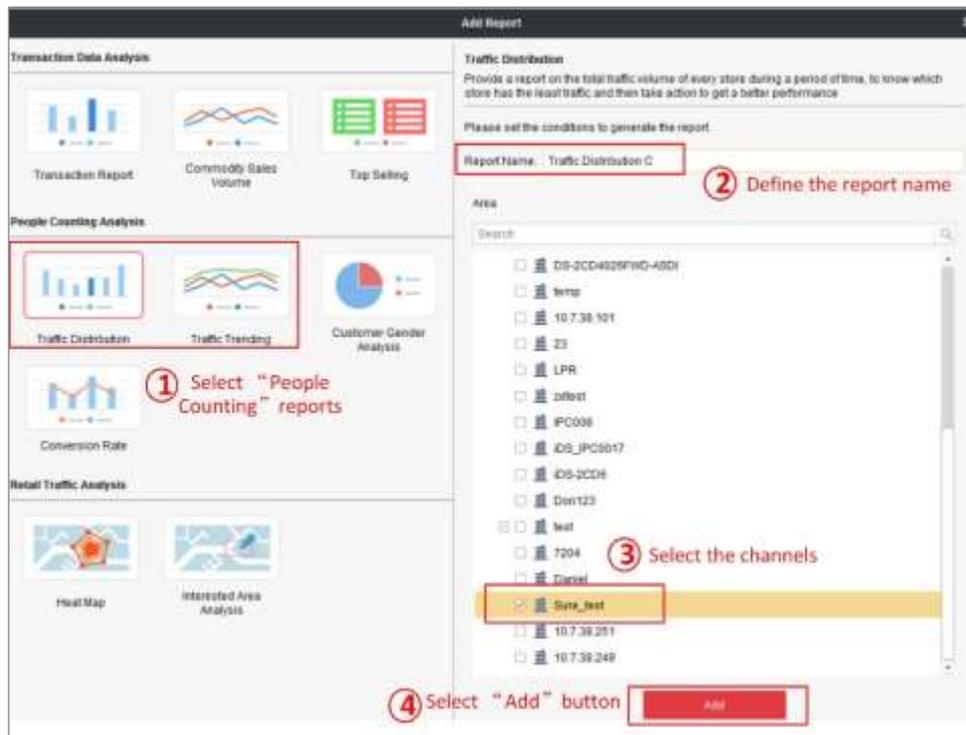


Fig.22 People counting report configuration

Then the result will be displayed, based on the channel configured and the defined time range.

Especially for the retails, where has the definition of headquarter/retail/channel, management can configure one report for one store, that has many people counting channels, and one report for all stores, in order to get the statistic data for different level.

### 3.2.3.4 Product Selection

Table 5 product List

Product	Product Model	Description
Platform	iVMS-5200 Pro, with BI module	2048 channel maximum

## 3.3 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.

## 4. System Applications

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.

Suitable Scenarios below:

### 4.1 Single Store

#### 4.1.1 Introduction

For Some small single store without chain management requirement, maybe one NVR, one monitor, one fisheye 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 structure of the small store is introduced as below.

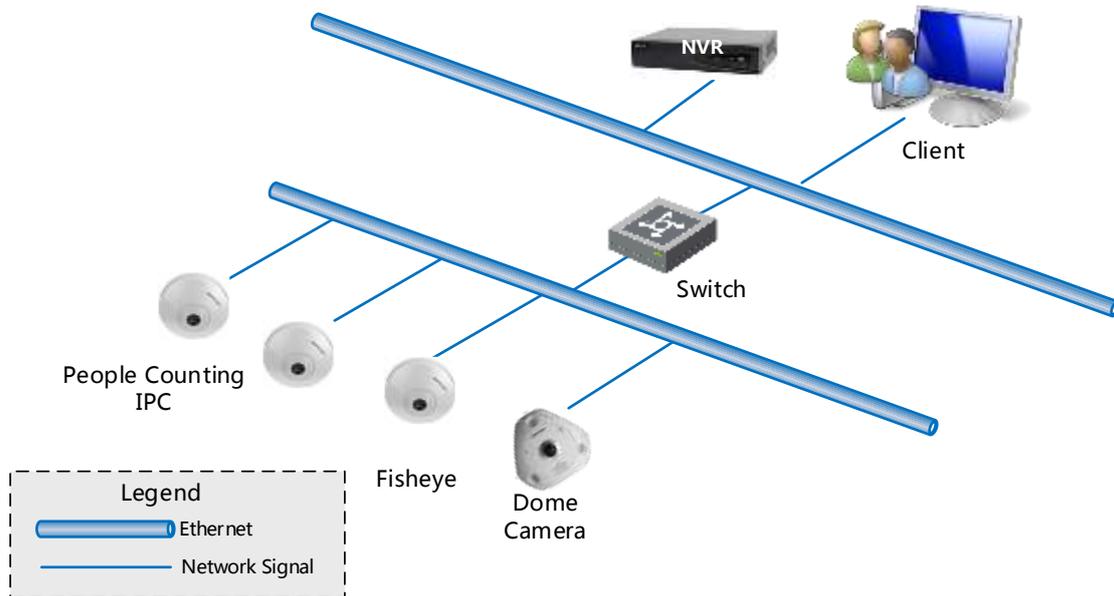


Fig.23 Single Store

In this scenario, store owners can check the people counting data by IPC web client or NVR directly that support to 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:

- 4) Check the people counting data or chart directly on the IPC
- 5) Export the excel data to local computer to do the further analysis.

Daily report example is introduced as below.

Table 5 Daily report by IPC Web Client

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

The chart format has been introduced in Figures before.

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

## **4.2 Chain Stores**

### **4.2.1 Introduction**

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 front end cameras or sub-systems will also be managed together by the 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.

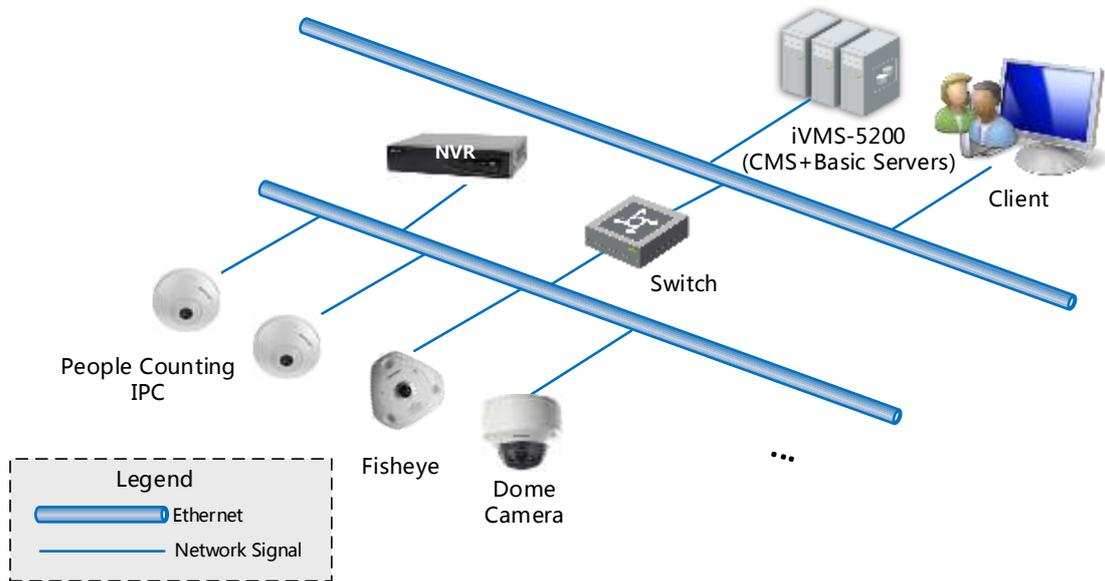


Fig.24 Structure

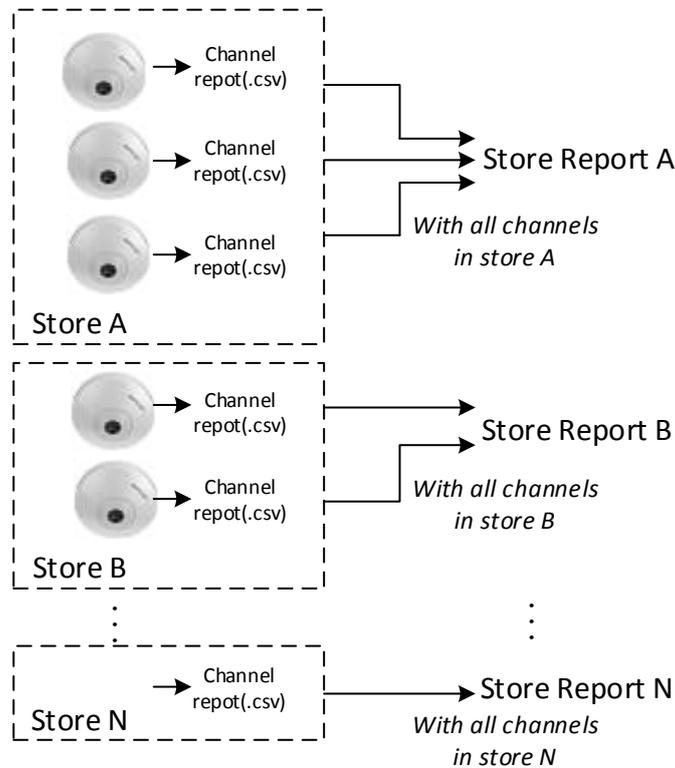


Fig.25 Connection between people counting channels and stores

In this scenario, as there are many sub-systems, IPCs, NVRs, will be managed by the platform, management can't access every people counting IPC or NVR to get the data.

And they more care about the statistic data about every retail store that has many entrances maybe or all stores to give the business suggestions. So the statistic data and chart is very useful.

Platform:

- 1) IPC is added to the platform;
- 2) Put the IPCs that are in the same store under the one area;
- 3) IPC 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 do 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.

