A MARCH NETWORKS APPLICATION NOTE

Retail Transaction Investigation Software

Release 5.5

Table of Contents

References:

1. RTI Software Manual - English and Spanish
2. RTI Getting Started Guide
3. RTI Demo Guide

Introduction

Losses from organized retail theft have topped $30 billion annually in the U.S., triple what they were a decade ago, contributing to higher prices and frequent out-of-stock problems. Inventory shrinkage, losses from internal theft, shoplifting and vendor fraud, have become such a problem that retailers need more sophisticated methods of identifying areas of risk, and dealing with them quickly and effectively before they erode profit margins.

By combining high-quality video images with transaction data from a retail chain's transaction controller, loss prevention managers and executives not only combat employee theft, but also quickly resolve customer disputes, and tackle vendor fraud. The March Networks® Retail Transaction Investigation (RTI) software and NVRs/DVRs/Encoders deliver the required performance for an enhanced loss prevention application.

Exception Monitoring

The Retail Transaction Investigation software enables:

- Search transaction data – transaction number, operator number, item description, amount, transaction type (void, refund, …), etc.
- Drill down into the data with data refinement tools
- View associated video
- View associated receipt data
- Save video clips, images, case notes and/or receipt data to the Evidence Manager case management software

Integrated playback of register data alongside video, and even audio, from March Networks video recorders makes a compelling ROI argument. The ability for supervisors, managers and franchisees to resolve customer disputes, and to capture incidents of employee theft without the need to analyze lengthy receipt tapes and manually match the video clip, means that they can spend more time running a profitable enterprise. And since the March Networks solution requires no interface unit (sometimes referred to as a "black box"), the integration is very economical and highly reliable.

Deployment Methods

There are two primary methods of deploying the Retail Transaction Investigator software, and a third alternative solution for medium to large enterprises:

1. **Locally captured data** - which is investigated using two methods:
   A. Local Capture Store using keyword searches – an application that is integrated with the Investigator Standard.

   Local capture offers a cost-effective tool for matching keywords such as 'void' and 'refund' with the video clip, so that real-time viewing by a store manager, or post analysis by a storeowner or franchisee ensures that transactions are monitored and quickly reviewed.

   B. Local Capture Enterprise – central aggregation of the locally captured data, where drill-down searches are conducted using the Retail Transaction Investigator Pro.

   The Retail Transaction Investigator enables effective drill-down through straightforward refinement rules on the search data, without having to restart the entire search. Examples are '>$50 void for a specific cashier before a certain date'; 'refunds made by a specific cashier on a certain day'.

2. **Central Capture Enterprise** – using central capture of the POS (T-log*) data and conducting drill-down searches using the Retail Transaction Investigator Pro. Two different architectures may be used:

   A. Transaction capture distributed at each store (type 2a)

   B. Centralized at the head office (type 2b)
   Central Capture utilizes the entire content and history of the chain's database, so that thorough investigations can be carried out, tracking such problems as sweethearting deals and credit card fraud even across multiple locations.

*Note: T-log or Transaction Log data is the centralized transaction capture database either at each store (distributed server architecture) or at the head office for the entire retail chain (centralized server architecture).

Summary Chart

Business/ Integration	Data Capture	Search Method	Search Example	Search Example	Performance
SMB type 1a	Local Capture Store	Text strings	"Void"	Investigator Standard	Low
SMB type 1b	Enterprise	Receipt Data	"Voids >$10" in Store 100	Pro with Retail Transaction Investigator	Low - Medium
Enterprise: type 2a	Central Capture Distributed (Store)	Drill-down on T-log Data	"Voids >$10" in Store 100	Investigator Pro with Retail Transaction Investigator	Medium
Enterprise: type 2b	Central Capture	Drill-down on T-log Data	"Voids >$10" in Store 100	Investigator Pro with Retail Transaction Investigator	Medium

Type 2b is preferred because a single server connection is required instead of multiple servers (type 2a) or multiple cash registers (types 1a and 1b).

Transaction Data Translators

Translators can be developed for any cash register and any POS server provided that the sample output data and the requirements for parsing and searching are clearly defined (see Appendices).

At the time of publication, the following cash registers and POS systems were supported:

- Clearview
- Fujitsu GlobalStore
- Gilbarco G-Site
- Horizon
- IBM GSA
- IBM SA
- IBM SurePOS
- MultEPoS, IBM Partner
- NCR Compris
- Omni
- Panasonic JS-550WS
- Pinnacle Palm
- POSitouch
- Radiant
- Retalix
- Samsung ER-5200
- Sharp
- Unisys
- VeriFone Ruby SuperSystem
- Wayne

Please note that even if a translator has already been developed, further development and testing for new sites is always required because of customization and deviations from the manufacturer's original.

SMB Transaction Capture (Types 1a and 1b)

SMB (small-medium business) transaction capture refers to transferring POS data from each in-store cash register to a local DVR/NVR. The POS data is captured as local text from the POS terminal via DVR/NVR RS-232 port or via the network port. The POS data collected by in-store DVRs/NVRs is searched using the Investigator Standard. Alternatively, the data can be transferred to an ESM (Enterprise Service Manager) server where it is linked to video for viewing with the Investigator Pro and Retail Transaction Investigator – see Figure 1.

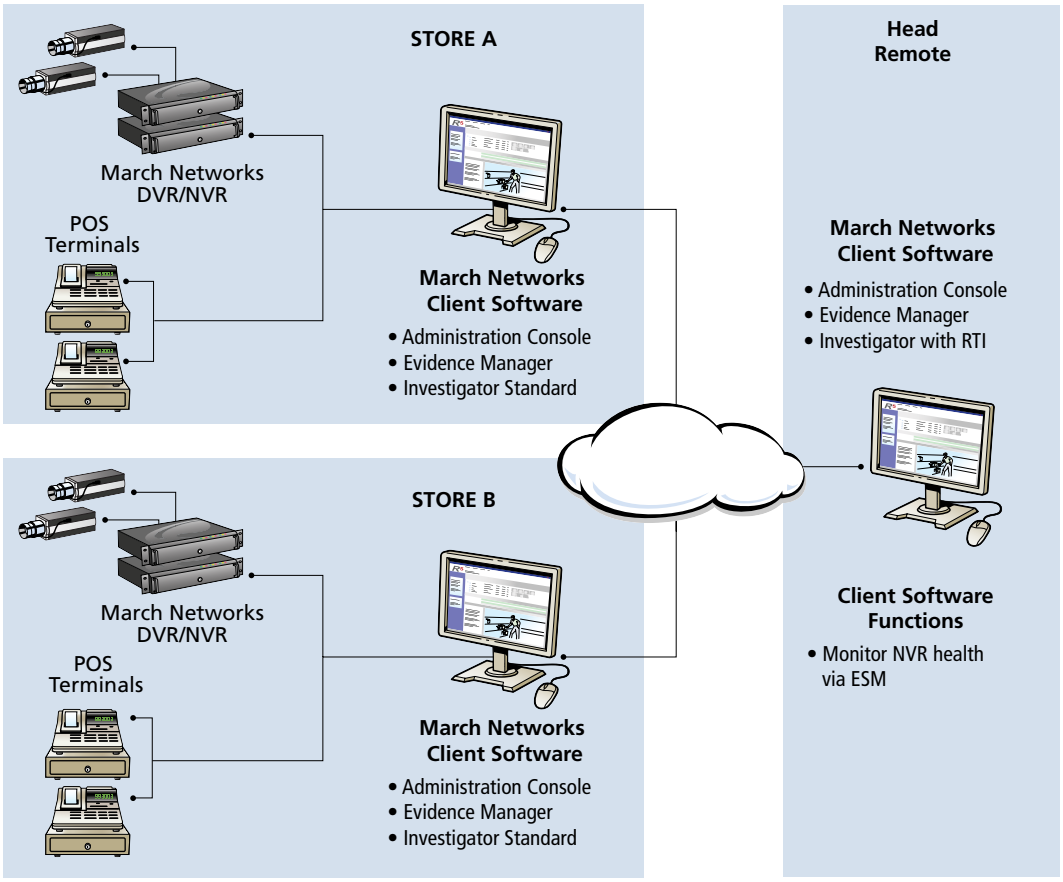


Figure 1: Local Transaction Capture (Types 1a and 1b)

March Networks DVRs and NVRs with direct connect serial interfacing enable the following:

DVR / NVR	Maximum Number of Cash Registers Supported	Notes
4000 C Series NVR	8	4 ports per RS-232 option card. Two option cards may be installed.
3108 DVR	2 / 4	Single RS-232 port built-in. If PTZ control is not required, an RS-485 to RS-232 converter may be used to add a second register. The RS-232 Option Kit provides 4-port expansion.
3204 DVR	3	Dual RS-232 port. If PTZ control is not required, an RS-485 to RS-232 converter may be used to add a third register.

Note: In practical terms an RS-232 cable can be routed about 100 feet before an RS-485 connection needs to be considered.

Implementing SMB POS Transaction Capture

March Networks DVRs/NVRs support a variety of standalone and networked cash registers or POS terminals from leading manufacturers. Creating an interface between the DVR/NVR and a cash register can be as simple as connecting a cable between the two, and configuring the DVR's/NVR's dataport for local transaction capture.

Steps to Implementation

1. Ensure that the cash register is supported by the March Networks software – the latest list of supported registers is available from your March Networks Sales Representative.

   Terminals which are not directly supported by March Networks software may work nevertheless, for example terminals that support standard ASCII text output – see Step 5 on the following page.

2. Order the appropriate interface cable listed in the March Networks Price List. The interface cables have been designed with even the largest convenience stores in mind, utilizing CAT5 cable to ensure that data transfers over distances of up to 100 feet can be reliably achieved. Bundled with the appropriate RJ45 to DB9 or DB25 converters, these cable kits are both reliable and easy to install [Figure 2]. For more information about installing the cable, see the Technical Instructions document which accompanies the kit.

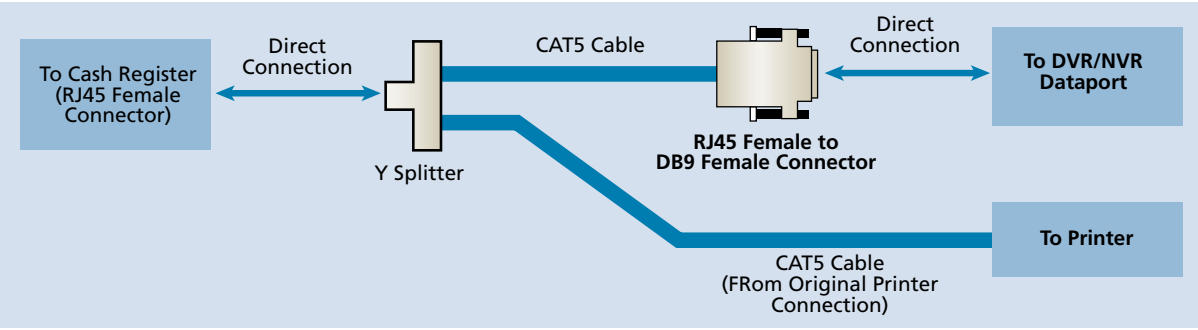


Figure 2: A Typical Register Interface Cable

3. Enable the data output function on the register; some registers use a journal data port, receipt printer port, or even customer pole display port. The data from the register must be output in real-time in order for video to be correctly synchronized. Therefore registers which produce nightly "batch data" are not suited to local POS transaction capture.

4. Ensure that the dataport settings you choose (baud rate, data bits, stop bits, and parity) match those of the DVR's/NVR's dataport, which are set by using the Administrator Console. The register's "installation and maintenance guide" is often a good source of information on the correct configuration of the terminal.

5. Setup the DVR/NVR by ensuring that the Administrator Console is loaded on the client PC or laptop being used, and that the DVR/NVR itself has been upgraded to version 5.2 or later. Navigate to the DVR's/NVR's dataport configuration, choose "Text Capture" as the Device Usage, and select the appropriate register type under "Text Capture protocols". Set the serial port parameters by clicking on the "Port Settings" button [Figure 3].

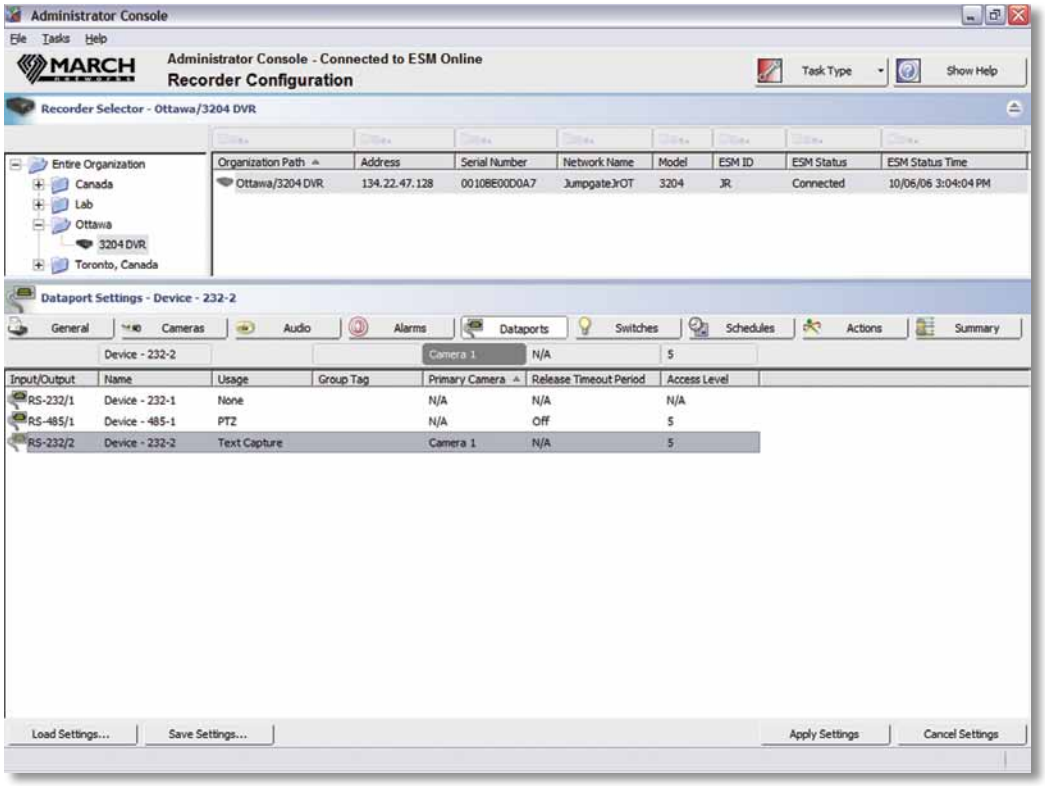


Figure 3: DVR/NVR Dataport Configuration

For cash registers not listed in the "Text Capture protocols" list, there are three options:

A. Contact your March Networks to see if support for the particular register was added after the initial software release, as an upgrade may be available.

B. Utilize the "Basic Text Capture" option under "Text Capture protocols". This option will work with terminal dataports where an acknowledgement from the DVR/NVR is not expected, and where the data requires no specific display formatting.

C. A new Text Capture protocol can be developed specifically for the POS protocol in use. To achieve this, a detailed data capture file from the POS terminal will be required. The data will be analyzed and a new protocol developed with the proper customization and formatting.

6. Associate a camera with the DVR's/NVR's dataport by navigating to Retail Site Management in the Admininstration Console.

7. Test the system. Run some transactions through the connected register, and search for video. The Administrator Console has built-in "Test" functionality in the installation task as does the Installer Console.

Enterprise Transaction Capture (Types 2a and 2b)

Enterprise transaction capture refers to transferring in-store POS data (T-log) from a store controller to an Enterprise Services Manager (ESM) server. The ESM server may be located within each store, as shown in Figure 4 (below), or deployed centrally at head office, as shown in Figure 5 (next page).

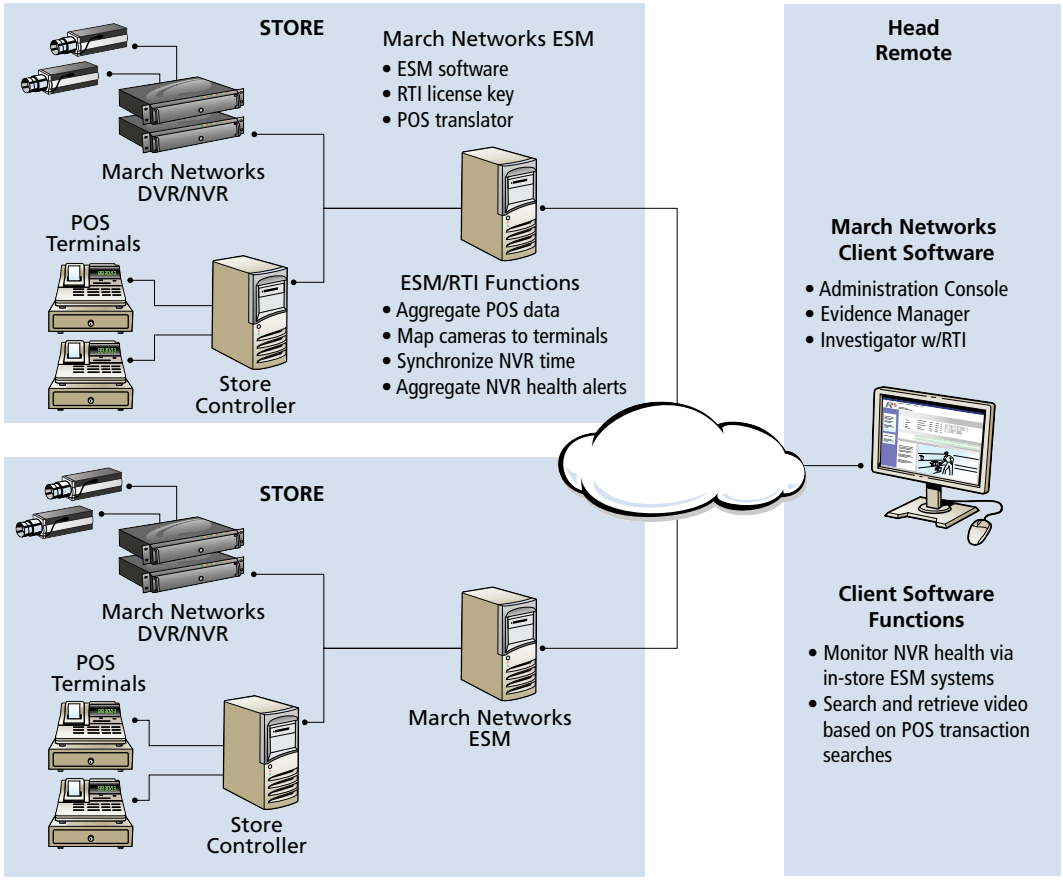


Figure 4: Distributed RTI Architecture per Store (Type 2a)

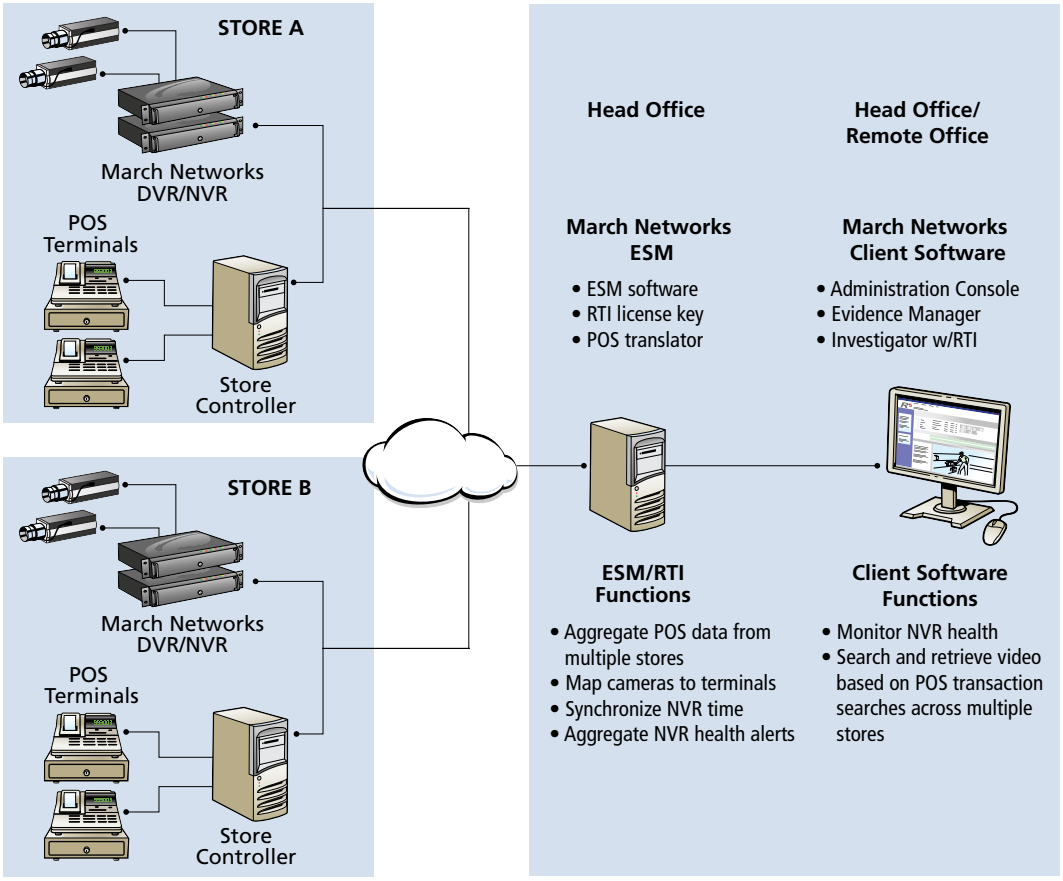


Figure 5: Centralized RTI Architecture at Head Office (Type 2b)

Figure 6: RTI Interface

Figure 7: An Example of Selecting an ESM Server

Pre-Implementation Phase

It is important that an understanding of the retailer's infrastructure is gained prior to integration. The questionnaire at Appendix A will provide sufficient knowledge of the retailer's security and network environment and their requirements, and thereby determine which product can best meet their needs. Deployment maybe in two separate phases – DVR/NVR deployment, followed by POS integration later.

Implementing Enterprise POS Transaction Capture Implementation is carried out in four steps:

1. Install DVRs/NVRs in first store.
2. With the assistance of IT, send a T-log batch file of transactions to March Networks for analysis of the data strings and development of a POS translator.
3. Integrate customer's POS data with the RTI.
4. Final test and acceptance.
   Please note that trials are possible, but are not a required step.

Other Points for Consideration

Video Analytics

Retailers can benefit from the use of intelligent video analytics including:
Occupancy Detection – to check on the number of people in a defined area
Area Obstruction Detection – for alerts to blocked aisles
Intelligent Scene Verification – to check for correct camera field of views
People Counting – to verify the number of shoppers
Queue Length Monitoring – to review cash register lineups

Panic Alarms and Audio

In the event of harassment or an event requiring security presence, an employee can simply press a wireless panic button, triggering the March Networks DVR/NVR to transmit an alert to a central monitoring station. Staff can visually assess the situation, listen to the audio in the store, and even speak to the employees and customers or warn off would be perpetrators through a loudspeaker system. This also ensures that police or security guards are dispatched only when needed, while providing comfort to staff and customers during or after a traumatic event such as a holdup.

APPENDIX A - POS INTEGRATION QUESTIONNAIRE

Networks and Bandwidth

- What type of LAN is deployed in the stores – Ethernet, etc.?
- What is the bandwidth of the LAN in the stores – 10Mbps, 16Mbps, 100Mbps, etc.?
- What type of WAN is deployed between the stores and head office – Frame Relay, DSL, etc.?
- What is the bandwidth of the WAN between the stores and head office – 56kbps, 128kbps, 256kbps, etc.?

POS System

- What POS system(s) is deployed in the stores?
- Is this a commercial off-the-shelf (COTS) POS system
- Is this a COTS POS system that has been customized for your needs?
- Is this a custom-built in-house application?
- How long have you been using this POS system? Do you have any plans to purchase a new system or undergo a major upgrade in the next 12 months?
- What is the average daily transaction volume for a typical store?
- Where does the POS system store transactions – database, transaction log file, etc.?
- If a database is used, what type is it – Oracle, SQL Server, etc.?
- Would it possible to grant access to a March Networks application?
- Does the POS system produce a transaction log file?
  If so, where does the transaction log file reside? Is it accessible by a Windows PC?
- Does the POS system produce an electronic journal?
  If so, where does the electronic journal file reside? Is it accessible by a Windows PC?

Time Stamping and Time Synchronization

- What system is used for time stamping the transactions – register/terminal, in-store server, etc.?
- What is the accuracy of the timestamps – to the minute or to the second?
- Are the registers/terminals time synchronized with the in-store server?
- Is it possible to time synchronize your POS system with a Windows PC?

APPENDIX B - DEPLOYMENT CONSIDERATIONS

Considerations	Advantages	Disadvantages
Local Transaction Capture	Little or no need for IT involvement. Inherent time synchronization and time stamp. Real-time viewing.	Less data – receipt view only. Additional cabling and interfacing to each POS terminal. DVR/NVR dependent.
Central Transaction Central Transaction	Installed only at the head office (central) or at the store T-log server (distributed). Much richer database including depart-mental codes, hand-keyed credit cards, etc. Software solution only – no additional hardware required (DVR/NVR independent).	External time sync. Some time delay in transaction processing and data transfer.

Considerations	Distributed RTI	Central RTI (preferred)
Where is POS data aggregated?	**Store** – send T-log data from store controller to in-store ESM (e.g. via ftp) **Head Office** – use Central model	**Store** – send T-log data from store controller to central ESM (e.g. via ftp) **Head Office** – send aggregated T-log data from head office controller to central ESM
Can cash registers or store controllers be time synchronized to a central time source at head office?	**No** – synchronize in-store ESM server and cash registers to store controller; time sync DVRs to in-store ESM **Yes** – use Central model	**No** – synchronize DVRs and cash registers to store controller **Yes** – synchronize store controllers and central ESM to same time source; sync DVRs to central ESM
Will transaction/video searches typically span multiple stores?	**No** – Search for data/video with a single query **Yes** – Search for data/video across stores with multiple queries	**No** – Search for data/video with a single query **Yes** – Search for data/video across stores with a single query
Is ESM clustering required?	**No** – purchase one server per store **Yes** – use Central model	**No** – purchase one server at head office **Yes** – purchase multiple servers at head office
Are existing servers available in each store for ESM?	**No** – purchase one server per store **Yes** – use existing servers, if feasible	**No** – purchase one server at head office (or multiple servers if clustering) **Yes** – in-store servers not required
Is DVR/NVR health monitoring performed on a single store or across all stores?	**One Store** – connect to in-store ESM from Admin Console **Multiple Stores** – connect to store ESMs Individually via the Admin Console (see Figure 7)	**One Store** – connect to central ESM from Admin Console **Multiple Stores** – connect to central ESM from Admin Console

APPENDIX C – SAMPLE RTI INTEGRATION PROJECT PLAN

The RTI integration described below is Type 2b, i.e. central transaction capture enterprise of the T-log data.

Purpose

This document will serve as a project definition document for an integration between the Point-of-Sale (POS) system controller at Company X, and the March Networks Enterprise Service Manager (ESM), specifically to enable the Retail Transaction Investigation (RTI) functionality.

Background

The March Networks Visual Intelligence Suite is a series of advanced client and server-based applications designed for organizations requiring an enterprise-level video surveillance system. The Evidence Manager and Investigator Professional applications enable users to quickly identify media (video and audio) segments of interest (either based on a data event such as a transaction, by an alarm event, or by date and time), to download and annotate clips, and to build a case consisting of one or more pieces of evidence.

The Investigator Professional application contains the RTI functionality, which allows users to view video, audio, and POS receipt data recorded at the time of a specific transaction. This media can be searched by the user by querying for certain transaction attributes, such as those transactions during which more than $20 worth of item voids occurred, or a No Sale transaction.

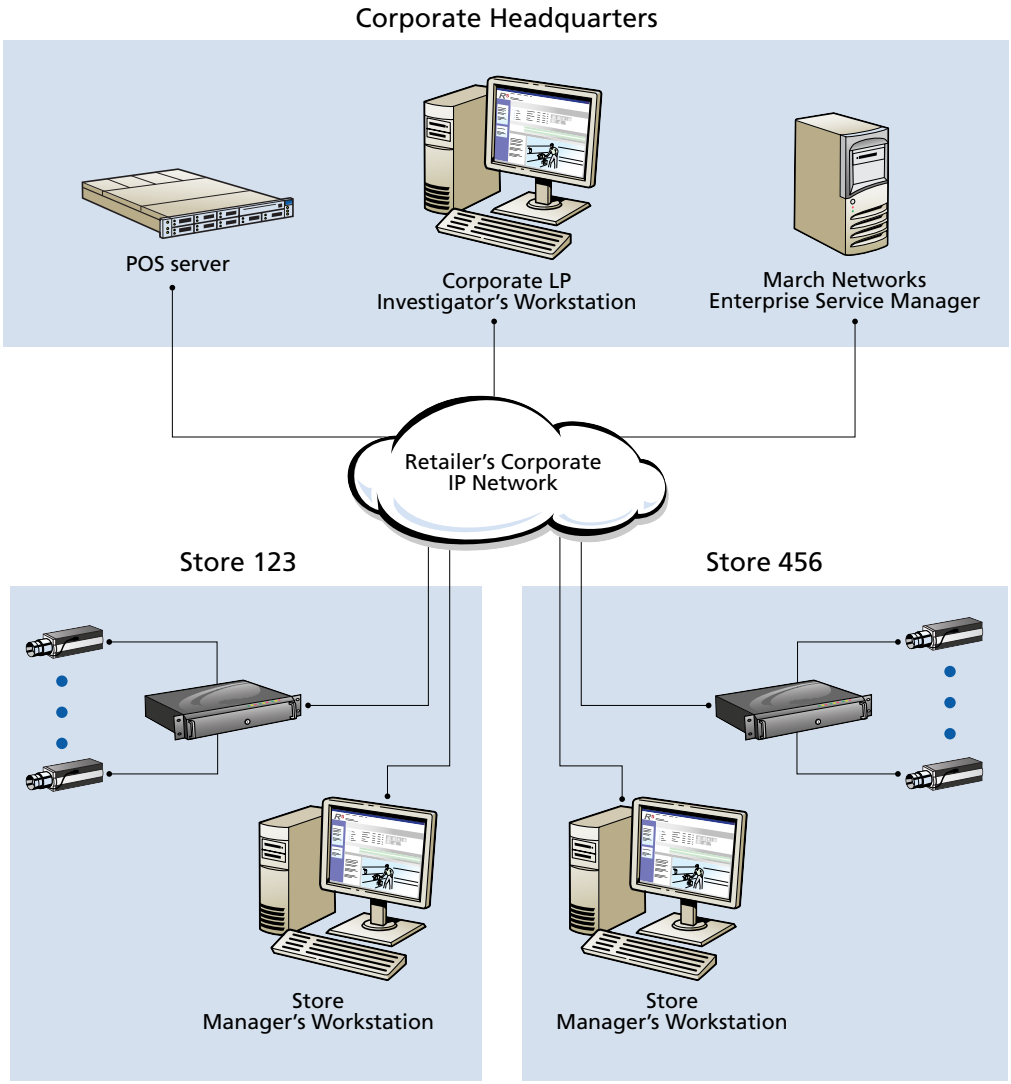
This is the second generation of user interface and integration between POS servers and the March Networks product line.

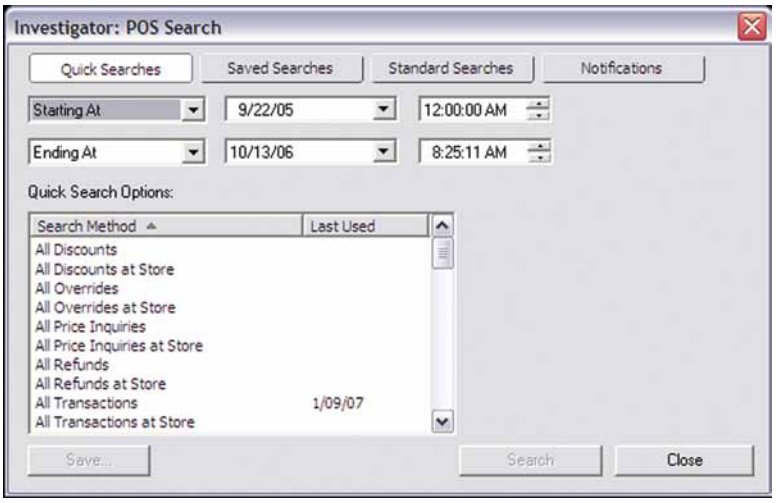
Architecture

The data flow can be described as follows:

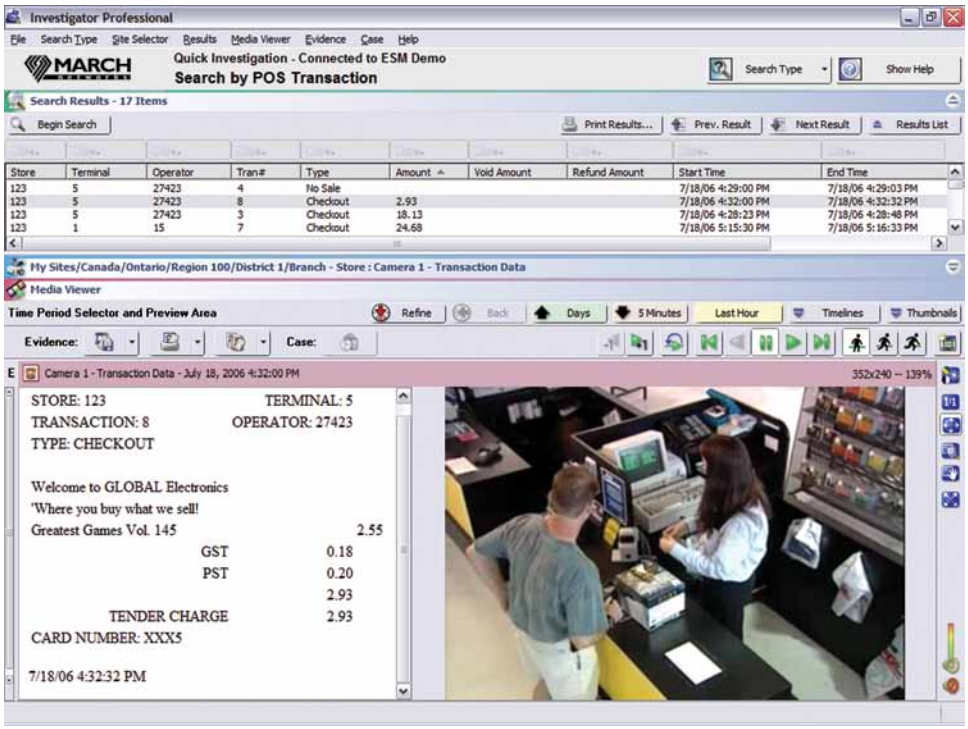
1. Each night, the centralized POS server at a retailer's headquarters generates a data file (often called a "transaction log" or "T-Log"). The server copies this log to the March Networks ESM server, also residing on the retailer's corporate network. The mechanics of this copy (whether via FTP, Windows file transfer, TCP stream, or other method) is agreed upon by the retailer's IT department and March Networks prior to the start of integration. A second file, often called an "item record" file (a mapping between UPC/PLU codes and item descriptions) is also transferred to the ESM, although this process generally only needs to take place on a weekly basis. A direct connection to the transaction database is also possible.
2. The transaction log is processed by the ESM, along with the item record file, and placed into the ESM's self-managed database.
3. An investigator logs onto the ESM from another point on the network using the March Network Investigator software application. The ESM validates that this user has permission to log onto the system, as well as to search through POS transactions (this authentication process can either be handled via the ESM's stand-alone user list, or by checking a Windows domain controller).
4. The investigator performs a series of queries for suspicious POS transactions. These queries can be ad-hoc or pre-stored. Once a suspicious transaction is located, they can choose to look at the video for this transaction (the mapping between a camera and a POS terminal is done by an administrator during system installation).
5. The Investigator application retrieves the appropriate video from the recorder, which is located across the network, and displays it to the user, alongside a replica of the receipt.

A deployment diagram and software screenshots are given below for clarity. Note that instead of being deployed at the corporate headquarters, the ESM may be deployed at each individual store location, should integration with individual store controllers be more appropriate.





Search Query Dialog Box



Retail Transaction Investigator GUI

Data Integration

This section will outline some of the technical details surrounding the integration transfer

- Transaction logs will be transferred to the March Networks ESM via <method, such as FTP, Windows file transfer, etc>. They will be deposited into and processed by the ESM from the <directory> directory. The ESM should expect a transaction log every <duration, 1 day, 12 hours, etc.>. Transaction logs <do/do not> contain item descriptions.
- (If necessary) Item Record files will be transferred to the March Networks ESM via <method, such as FTP, Windows file transfer, etc>. They will be deposited into and processed by the ESM from the <directory> directory. The ESM should expect an item record file every <duration, 1 day, 12 hours, etc.>.

Interpretation

- The following documents are available and have been provided to March Networks to aid in the interpretation of the transaction log and item description files.
    - <file 1>
    - <file 2>
    - …
- Transaction logs have been provided to March Networks for the following stores and dates:
    - Store 1, date 1
    - Store 2, date 2
    - …
- <The retailer>'s expert on interpretation of the data is <name>, and can be contacted at <email address> and/or <phone number>.
- (If required) <The POS system manufacturer>'s contact for data interpretation purposes is <name>, and can be contacted at <email address> and/or <phone number>.
- The following are customizations that <the retailer> has made to the data format/meaning which differ from the data specification:
    - <Change 1>
    - <Change 2>
    - …

Search Queries

- In addition to the below chart, the following additional queries are being requested (subject to whether either system can support them):
    - <Additional query 1>
    - <Additional query 2>
    - …

Query (all limited by date range)	Wildcards Allowed?	Desired by Retailer?	Supported by POS system? [To be completed by March Networks]
1 All Transactions			
2 All Transaction at Store n	N		
3 All Transactions by Operator n	N		
4 All Transactions at Register n	N		
5 Transaction Number n	N		
6 Voided Transactions	N		
7 Suspended Transactions	N		
8 Resumed Transactions	N		
9 Training Mode Transactions	N		
10 Refund Transactions	N		
11 Total < n	N		
12 Total > n	N		
13 Voided item total > n	N		
14 Voided item > n	N		
15 Refunded items total > n	N		
16 Refunded item > n	N		
17 Manager Overrides	N		
18 Loyalty Card Used	N		
19 Loyalty Card Number = x	Y		
20 Credit Card Number = x	N		
21 Debit Card Number = x	N		
22 Credit card rejected	N		
23 Debit card rejected	N		
24 Hand-keyed credit card	N		
25 Hand-keyed debit card	N		
26 Tender type x (credit, debit, cash, etc.)	N		
27 Tender amount < n	N		
28 Tender amount > n	N		
29 Coupons used	N		
30 Coupon value > n	N		
31 Item Code (PLU) = x	Y		
32 Item Description has x	Y		
33 Department n	N		
34 Quantity < n	N		
35 Quantity = n	N		
36 Quantity > n	N		
37 Item Inquiry	N		
38 Manually Keyed Item	N		
39 Item Price < n	N		
40 Item Price > n	N		
41 Discount Type x (Employee, etc.)	N		
42 Discount Amount > n	N		

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