Data Center

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1 INTRODUCTION

The Retail Equation's (TRE's) Verify® return authorization, Receipt Verification™, Return Rewards®, and Identify systems reside in a data center that ensures security, performance, availability, and accessibility for TRE’s customers. This document describes the architecture, scalability, and data center for all three services.

2 EXECUTIVE SUMMARY

TRE’s host system resides in an outsourced internet data center provided by AT&T that features state-of-the-art power, physical security, and fire suppression.

The system’s hardware and software provide a secure, reliable, and scalable system for processing return authorizations. TRE’s services run on multiple Wintel and Linux servers and use redundancy in communication hardware, application servers, web interfaces, and disk storage to ensure availability. Access to this hardware is restricted by physical security, authentication protocols, and firewall policies. TRE permits a limited number of technical employees to have access to the equipment.

The system uses a scalable hardware and software architecture that enables it to expand to accommodate increasing customer traffic. The base configuration supports over 6 million TCP/IP transactions per day and 330,000 dial-up transactions per day. Transaction turnaround time is sub-second, even at peak usage.

For retailers requiring additional capacity, the modular structure of the base configuration easily scales to accommodate large volume accounts. Similarly, its software architecture allows TRE to conveniently add additional features when needed. New hardware and software undergo a rigorous quality assurance process before entering production use.

Except for scheduled system maintenance, which takes place during off-hours, TRE’s services are available 6:00 a.m. – 10:30 p.m. Pacific Time seven days a week. Extended hours are available.
3 FACILITIES

TRE’s equipment resides within an outsourced Internet data center run by one of the leading hosting services in North America, a division of AT&T (formerly SBC Communications). AT&T provides a robust data center infrastructure including:

- Advanced fire suppression
- Reliable power featuring
  - Dual preferential commercial power feeds
  - Redundant parallel transformers
  - Battery backup
  - Caterpillar emergency power generators
  - 2-week supply of generator fuel
  - Double-conversion UPS
- Dry-pipe water protection systems
- A secure raised floor
- Sufficient floor space for expansion

AT&T has an excellent reputation for ensuring security. Motion-sensitive cameras monitor the exterior of the site. AT&T controls physical entry with motion-sensitive cameras, 24x7 onsite personnel, proximity tracking of all visitors, multiple-level entry checkpoints and entry controls that use both card access and biometrics scanning for identification. TRE’s equipment is located in a locked area that is accessible only to TRE employees and cleared AT&T technicians. Access beneath the raised floor is prohibited to all but cleared AT&T technicians, and the floor is alarm-protected.

AT&T provides redundant network access through two OC-48 circuits that are scalable to OC-192s. The center connects to the Internet via two central offices, thus providing dual-path dual-entry connectivity. Dual routers distribute the traffic from the dual circuits. On-site personnel monitor network access and traffic 24x7.

AT&T is Statement of Auditing Standards (SAS-70) certified. SAS-70 is an internationally recognized auditing standard developed by the AICPA for assessing controls and safeguards in facilities that handle customer data.

TRE also has a disaster recovery data center that is available as an option. This center is located in Phoenix, Arizona and has redundancy and security infrastructure similar to the data center in Irvine.
4 COMPUTER SYSTEMS

TRE’s computing system resides within the secure, reliable shell of the AT&T data center. The main components of its system are servers that process requests for return authorizations, maintain and manage the return authorization database, and provide administrative services such as user management and reporting. To achieve scalability and redundancy, TRE uses three types of servers in its base system configuration:

1. Database servers - these systems provide reliable access to the returns database for returns processing, report generation, and administration.
2. Web servers - these systems process requests for reports and administrative services via the web.
3. Application servers - these systems process return transactions that arrive via TCP/IP or dial-up.

Figure 1 below summarizes TRE’s scalable base system configuration.
5 SERVER CONFIGURATIONS

TRE’s servers are high-end Wintel machines running Windows Enterprise Server. They can support up to 6 million TCP/IP transactions and 330,000 dial up return transactions per day.

Database servers are clustered and connect via fiber channels to a storage area network.

Web servers have hot spares and/or virtualized instances on standby in the event of failure.

Traffic to application servers flows through high availability load balancers. Several application servers handle the transaction volume, with transparent failover in the event of an application server failure.

All systems are monitored with various commercial and custom-written tools. TRE provides 24/7 on-call support for these systems and uses a multi-layered approach to notifying the appropriate personnel if needed.

6 DATA AND COMMUNICATION SECURITY

Access to data is controlled at the user terminal, via the web, and in the data center.

The stand-alone terminals (VeriFone devices) support two levels of users: clerks and store managers. Store managers can add clerk-level users, run reports, and delete clerks. Clerks are able to process return transactions. TRE authenticates both types of users by ID number.

An entirely different class of administrative user has access to more sophisticated reports via the web. TRE authenticates these users by user ID, password, and retailer ID. Thus access to transaction histories and other more sensitive data is subject to a higher level of scrutiny.

The data on the database server is protected from unauthorized access by the physical security measures and a limit on the number of people, even within TRE, who have clearance to enter the AT&T data center.

TRE servers are protected from the public Internet by redundant firewalls and an intrusion prevention system. Port traffic is strictly limited to support only essential functions.

All released security packages (i.e. Microsoft Security Bulletins) affecting software running on TRE Servers are installed within 30 days of release. Any emergency release packages are evaluated and installed if needed on the day they are released.

All data is logged hourly. Incremental backups occur nightly, and full backups occur weekly. Backup jobs are monitored 24x7. Backup tapes are strongly encrypted and are stored securely offsite to support TRE’s disaster recovery plan. In addition to these backup procedures at TRE, many of TRE’s customers elect to receive an encrypted copy of their transaction data every night, and follow their own data backup procedures with that copy of the data.
7 PERSONNEL AND PROCESS SECURITY

TRE is PCI compliant and uses the PCI standard to assess and continually refine its security and privacy practices.

TRE is sensitive to its customers’ concerns about data access, and it follows a stringent hiring process to screen employees who must have access to sensitive systems and information. Within the company a limited number of employees have access to the production systems and the data they contain. All employees adhere to published privacy and network security policies.

All new equipment, software, and procedures that impact the TRE data center are implemented only by cleared employees. All equipment and software changes undergo a rigorous introduction process. This process includes a disciplined approach to quality assurance that exercises the new system components under realistic loads before the changes enter production use.

8 PERFORMANCE AND THROUGHPUT

The capacity of the base system configuration is as follows:

- TCP/IP transactions per day: 6 million
- Dial-up transactions per day: 330,000
- Database capacity: No practical limit. TRE expands database capacity, if necessary, as part of scheduled maintenance.

Even at peak loads, the system processes a return transaction in an average time of less than one second.
9 SCALABILITY

TRE’s server architecture supports rapid growth in usage by accommodating additional servers in its server farms and clusters. Future sources of growth and TRE’s response to each are as follows:

- TCP/IP transaction growth — the system supports adding additional TCP/IP application servers to accommodate greater numbers of TCP/IP-capable standalone terminals.
- HTTPS transaction growth — the system will accommodate adding additional servers to handle increases in web site usage.
- Dial-up growth — to accommodate increases in dial-up transactions, TRE uses a dial-access multiplexer to process phone calls. The multiplexer receives dial-up transactions on T-1 lines (the phone company multiplexes the dial-up calls onto the T-1 lines) and routes them to the system’s TCP/IP application servers. The dial-up multiplexer, T-1 lines, and application servers are all scalable, i.e. additional components will be added as necessary to meet growing demand.
- Database growth — no practical limit. Its capacity is increased through a variety of techniques such as hardware upgrades, partitioning, and ongoing optimization of the data access layer.
- Reporting growth — TRE accommodates increases in web site traffic by adding web servers and partitioning activity among retailers on those servers.

For information on the system’s software architecture and how it supports the scalable server architecture, see the document *The Retail Equation Software Architecture White Paper*.

10 FLEXIBILITY

By using common Microsoft products in its data center, TRE is able to take advantage of improvements in the industry-standard Wintel architecture and Windows-based software.

Standard development tools, such as Microsoft Visual Studio .NET, SQL Server Enterprise, SQL Server Reporting Services, and SQL Server Integration Services enable TRE to develop and introduce new features.

TRE follows a formal release policy and deploys new releases and upgrades to the software during off-hours.

11 RETAILER ACCESS

TCP/IP server access is via VPN over the open internet, MPLS circuit, or dedicated line. Dial-up access is via analog phone lines. Phone lines need not be dedicated at the retailer location. Network access to the website for reporting and administration is via standard web browsers using secure http.

Customers receive user training as the end-user terminals are installed or as POS terminals join the system. The training covers administration, authentication, clerk transactions, manager-only features, and common problems and solutions.
## 12 VERSION HISTORY

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<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Comments</th>
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<td>TRE6003-2.0</td>
<td>11/04/2009</td>
<td>Second version</td>
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<tr>
<td>2.1</td>
<td>03/18/2010</td>
<td>Changes for Verify-2, simple re-formatting</td>
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<tr>
<td>2.2</td>
<td>07/12/2013</td>
<td>Changes to remove Verify version numbers, added mention of DR site, and</td>
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<td></td>
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<td>updated scalability section.</td>
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<tr>
<td>2.3</td>
<td>12/9/2014</td>
<td>Added mention of Linux servers and Identify, updated standard hours, and</td>
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<td></td>
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<td>added MPLS as a connectivity option.</td>
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