



APV SERIES CASE STUDY

Fuel Card Web Portal

Array APV Series application delivery controllers (ADCs) balance traffic for a large number of gas filling card customers across Web sites, application servers and data servers, and health-check server services, performance and traffic processing.

Background

One of China's largest oil and gas companies has developed an innovative prepaid fuel card program that allows cardholders to make purchases at thousands of locations nationwide, and features online account management, a rewards program and local rescue service. The program's Web portal allows users to administer their accounts. The program will eventually support up to 80,000,000 registered users, and daily user logins are expected to be 300,000.

All users can recharge their gas filling cards on the Web site and register their own accounts. A registered user can bind the account to a gas filling card, query bills and recharge the card. The online self-help reassignment service is available for gas filling cards bound

Industry:

Energy; Retail & eCommerce

Challenges:

Deliver an optimal user experience by balancing traffic across multiple leased links

Balance user access and application operation requests among back-end servers for maximum processing efficiency

Service stability and reliability must be maintained for a large number of users, 24x7x365

Solution:

Three redundant pairs of Array APV8600 application delivery controller appliances deployed in the fuel card program data center

AppVelocity-S hardware-accelerated SSL encryption, link load balancing, server load balancing and application acceleration

Benefits:

24/7 availability on a per-customer basis, even under maximum traffic load

Ability to scale services while maintaining single-digit millisecond latency

Scalable and cost-effective 2048-bit SSL secure transaction processing

to multiple user types, avoiding service operations and queues at service sites. Non-registered users can also quickly recharge their major gas filling card, and query service site information and time-limited preferential prices.

The energy company has deployed multiple servers to provide continuous services for large numbers of fuel card users and thus requires load balancing technologies for various applications including Web sites, application servers and database servers, and to check the health of server services, overall performance, and traffic processing capabilities.

Challenges

The requirements were as follows:

- Efficiently utilize two leased links by allowing cardholders to use the quicker link to access the Web site for operations such as recharging gas filling cards.
- Balance user access and application operation requests among back-end servers to achieve high processing efficiency, increase overall performance of the back-end server group, reduce waiting times, and improve the overall user experience.
- Service stability and reliability was also required to provide 24x7x365 service to cardholders.

Solution

Array Networks provided six APV8600 ADC appliances to meet the company's requirements. The APV8600 application delivery controllers perform application acceleration, link load balancing, and server load balancing among Web servers and Tomcat middleware appliances.

- Two APV appliances are deployed in front of the network architecture to provide link load

balancing, ensuring that users can use the faster link to access the online Web applications.

In addition, when a link fails, user access and operations are not affected because traffic is automatically route to a healthy link.

- Two APV appliances are deployed in the DMZ between two firewalls to balance loads among Nginx proxy servers that are also deployed in the DMZ. Web servers and Nginx proxy servers communicate in one-to-one mode through the other network segment, which guarantees the security of Web servers.

Two APV Series appliances are deployed behind the second-line firewalls to balance loads among Tomcat middleware appliances. In addition, both APV Series appliances provide hardware SSL acceleration to encrypt and decrypt transaction packets, which reduces the workload of back-end application servers as well as user wait periods.

Array Networks APV Series appliances provide high performance and integrated features to fully ensure large-scale deployment of the online applications. Multiple server load balancing (SLB) methods, connection multiplexing, SSL acceleration, and cache functions delivered by the APV Series appliances help improve response speed and assure high availability.

The APV Series appliances divert traffic to the server according to traffic loads to ensure that each user request is responded to in an optimal way. When a server fails, the APV appliance intelligently detects the failure and stops sending requests to failed servers when processing subsequent traffic. This process is transparent to users and thus does not affect the user experience.

The cache function stores frequently accessed content on the APV appliance. When a user requests cached content, the content is directly

returned from the APV Series ADC. No data request is sent to the back-end server, which reduces the response time for users and decreases server loads.

High Reliability Guarantee

High reliability was also of critical importance in guaranteeing proper operations of the Web site application systems. The APV Series ADCs help ensure high availability in several ways:

- Data is always processed in a stable and secure manner. In Web site application systems, the front-end application server generally reads data from back-end databases to meet access requirements from users. Through the APV Series' load balancing function, data integrity can be ensured even if a single appliance fails to provide services. By intelligent identification and health checking, the overall application can operate continuously and stably. Services are not interrupted even if a single appliance or multiple appliances fail.
- The entire Web site application network environment including application servers and databases can be better managed through high availability (HA), clustering, and convenient application and back-end server maintenance methods provided by the APV Series appliances.
- The overall benefits and capacity expansion of Web, application, and database servers can be optimized. That is, in addition to assurance of data integrity, the sustained operation capabilities of Web site application systems is supported and application or database servers can be added when needed without affecting application performance.
- The application flows and achieving modes of application systems frequently change, but performing these changes online is known to

cause certain problems. APV series appliances ensure sustained online capabilities of application systems when application server software is incomplete, for example.

The APV Series' load balancing function can intelligently search for the optimal server for user requests, ensuring that users get the best service from the server with the quickest response speed. Combined with performance-enhancing functions provided by the APV Series appliances, such as connection multiplexing, the loads of back-end servers are reduced and the processing capability of the entire Web site platform is improved.

Cache

Array APV application delivery controllers provide a memory-based reverse proxy cache function which allows all cacheable contents of the Website pages to be cached in memory. When receiving user requests, the APV appliance will directly respond to requests matched with the contents cached in memory, reducing load pressure on back-end servers and improving response speed and overall processing capability.

Server loads are decreased along with the increase of Web application capabilities, saving both software and hardware investments in servers. By setting the cache function for each application, the HTTP response capability of certain pages was improved by 80%, which significantly increased the maximum number of response connections of a single server.

SSL Acceleration

In traditional application scenarios, SSL processing is performed by back-end servers. Because SSL processing requires massive CPU and memory resources, transaction quality can be impacted.

Array APV physical appliances include an SSL hardware acceleration card with strong calculation capabilities. After SSL hardware acceleration is enabled, SSL encryption and decryption is performed by the APV appliance rather than the Web server. SSL offloading to the APV Series appliance improves server response speed, transaction times, and overall user experience.

Connection Multiplexing

Connection multiplexing – pioneered by Array Networks – converts a large number of short connections into a few connections needing more throughput, and leverages the servers' optimized bulk throughput settings without changing any configurations or content. Connection multiplexing offers a number of advantages:

- **Accelerating processing speed of TCP/UDP connections to back-end servers.** The APV Series establishes multiple connections with the back-end servers in advance and retains the connections. A client request will be diverted to a back-end server according to the load balancing method chosen in the APV Series appliance. The APV appliance will select a connection from the pre-established connection pool to send the client request to the back-end server. One connection can be used to send multiple requests; thus the number of client connections to be processed by the back-end server will be significantly reduced.
- **Improving server performance.** Because the APV Series appliances are maintaining continuous connections, the server is not required to establish and disconnect TCP/UDP connections. Server load to retain multiple client connections is thus greatly reduced.

Summary

In summary, the Array Networks APV Series application delivery controllers accelerate external cardholder access to internal application and server resources, improving throughput and user experience. In particular:

- The full proxy architecture of the APV appliance protects back-end servers in multiple manners and defends servers against DDoS and SYN flood attacks.
- The SSL hardware acceleration of the APV appliance relieves the workload of servers, accelerates transactions, and optimizes the user experience.
- The services provided by the application layer are checked by the APV Series appliances' application-layer health check to help ensure application reliability.
- The link load balancing and server load balancing functions of the APV appliances ensure continuity of services provided by the Web site.
- Servers can be added or suspended as required at any time. Appliances can be fully maintained and processed without affecting the applications, reducing operation risks and improving ease of maintenance.

