**TerramEarth**

**Company Overview**

TerramEarth manufactures heavy equipment for the mining and agricultural industries: about 80% of their business is from mining and 20% from agriculture. They currently have over 500 dealers and service centers in 100 countries. Their mission is to build products that make their customers more productive.

**Company background**

TerramEarth was formed in 1946, when several small, family owned companies combined to retool after World War II. The company cares about their employees and customers and considers them to be extended members of their family.

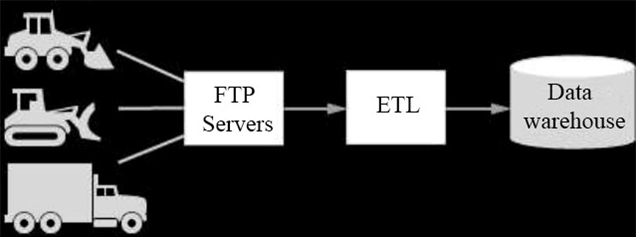
TerramEarth is proud of their ability to innovate on their core products and find new markets as their customers’ needs change. For the past 20 years, trends in the industry have been largely toward increasing productivity by using larger vehicles with a human operator.

**Solution Concept**

There are 20 million TerramEarth vehicles in operation that collect 120 fields of data per second. Data is stored locally on the vehicle and can be accessed for analysis when a vehicle is serviced. The data is downloaded via a maintenance port. This same port can be used to adjust operational parameters, allowing the vehicles to be upgraded in the field with new computing modules.

Approximately 200,000 vehicles are connected to a cellular network, allowing TerramEarth to collect data directly. At a rate of 120 fields of data per second with 22 hours of operation per day, Terram Earth collects a total of about 9 TB/day from these connected vehicles.

**Existing Technical Environment**



TerramEarth’s existing architecture is composed of Linux-based systems that reside in a data center. These systems gzip CSV files from the field and upload via FTP, transform and aggregate them, and place the data in their data warehouse. Because this process takes time, aggregated reports are based on data that is 3 weeks old.

With this data, TerramEarth has been able to preemptively stock replacement parts and reduce unplanned downtime of their vehicles by 60%. However, because the data is stale, some customers are without their vehicles for up to 4 weeks while they wait for replacement parts.

**Business Requirements**

– Decrease unplanned vehicle downtime to less than 1 week, without increasing the cost of carrying surplus inventory

– Support the dealer network with more data on how their customers use their equipment to better position new products and services

– Have the ability to partner with different companies C especially with seed and fertilizer suppliers in the fast-growing agricultural business C to create compelling joint offerings for their customers.

**CEO Statement**

We have been successful in capitalizing on the trend toward larger vehicles to increase the productivity of our customers. Technological change is occurring rapidly, and TerramEarth has taken advantage of connected devices technology to provide our customers with better services, such as our intelligent farming equipment. With this technology, we have been able to increase farmers’ yields by 25%, by using past trends to adjust how our vehicles operate. These advances have led to the rapid growth of our agricultural product line, which we expect will generate 50% of our revenues by 2020.

**CTO Statement**

Our competitive advantage has always been in the manufacturing process, with our ability to build better vehicles for lower cost than our competitors. However, new products with different approaches are constantly being developed, and I’m concerned that we lack the skills to undergo the next wave of transformations in our industry. Unfortunately, our CEO doesn’t take technology obsolescence seriously and he considers the many new companies in our industry to be niche players. My goals are to build our skills while addressing immediate market needs through incremental innovations.

Mountkirk Games makes online, session-based, multiplayer games for mobile platforms. They build all of their games using some server-side integration. Historically, they have used cloud providers to lease physical servers.

Due to the unexpected popularity of some of their games, they have had problems scaling their global audience, application servers, MySQL databases, and analytics tools.

Their current model is to write game statistics to files and send them through an ETL tool that loads them into a centralized MySQL database for reporting.

1. Solution concept

Mountkirk Games is building a new game, which they expect to be very popular. They plan to deploy the game’s backend on Compute Engine so they can capture streaming metrics, run intensive analytics, and take advantage of its autoscaling server environment and integrate with a managed NoSQL database.

2. Business requirements

Increase to a global footprint

Improve uptime—downtime is loss of players

Increase efficiency of the cloud resources we use

Reduce latency to all customers

3. Technical requirements

Requirements for game backend platform

Dynamically scale up or down based on game activity

Connect to a transactional database service to manage user profiles and game state

Store game activity in a timeseries database service for future analysis

As the system scales, ensure that data is not lost due to processing backlogs

Run hardened Linux distro

Requirements for game analytics platform

Dynamically scale up or down based on game activity

Process incoming data on the fly directly from the game servers

Process data that arrives late because of slow mobile networks

Allow queries to access at least 10 TB of historical data

Process files that are regularly uploaded by users’ mobile devices

4. Executive statement

Our last successful game did not scale well with our previous cloud provider, resulting in lower user adoption and affecting the game’s reputation. Our investors want more key performance indicators (KPIs) to evaluate the speed and stability of the game, as well as other metrics that provide deeper insight into usage patterns so we can adapt the game to target users. Additionally, our current technology stack cannot provide the scale we need, so we want to replace MySQL and move to an environment that provides autoscaling and low latency load balancing and frees us up from managing physical servers.

Dress4Win is a web-based company that helps their users organize and manage their personal wardrobe using a web app and mobile application. The company also cultivates an active social network that connects their users with designers and retailers. They monetize their services through advertising, ecommerce, referrals, and a freemium app model. The application has grown from a few servers in the founder’s garage to several hundred servers and appliances in a colocated data center. However, the capacity of their infrastructure is now insufficient for the application’s rapid growth. Because of this growth and the company’s desire to innovate faster, Dress4Win is committing to a full migration to a public cloud.

1. Solution concept

For the first phase of their migration to the cloud, Dress4Win is moving their development and test environments. They are also building a disaster recovery site, because their current infrastructure is at a single location. They are not sure which components of their architecture they can migrate as is and which components they need to change before migrating them.

2. Existing technical environment

The Dress4Win application is served out of a single data center location. All servers run Ubuntu LTS v16.04.

Databases:

MySQL. One server for user data, inventory, static data,

MySQL 5.7

8 core CPUs

128 GB of RAM

2x 5 TB HDD (RAID 1)

Compute:

40 web application servers providing micro-services based APIs and static content

Tomcat - Java

Nginx

Four core CPUs

32 GB of RAM

20 Apache Hadoop/Spark servers:

Data analysis

Real-time trending calculations

Eight core CPUs

128 GB of RAM

4x 5 TB HDD (RAID 1)

Three RabbitMQ servers for messaging, social notifications, and events:

Eight core CPUs

32GB of RAM

Miscellaneous servers:

Jenkins, monitoring, bastion hosts, security scanners

Eight core CPUs

32GB of RAM

Storage appliances:

iSCSI for VM hosts

Fibre channel SAN - MySQL databases

1 PB total storage; 400 TB available

NAS - image storage, logs, backups

100 TB total storage; 35 TB available

3. Business requirements

Build a reliable and reproducible environment with scaled parity of production

Improve security by defining and adhering to a set of security and identity and access management (IAM) best practices for cloud

Improve business agility and speed of innovation through rapid provisioning of new resources

Analyze and optimize architecture for performance in the cloud

4. Technical requirements

Easily create non-production environments in the cloud

Implement an automation framework for provisioning resources in cloud

Implement a continuous deployment process for deploying applications to the on-premises data center or cloud

Support failover of the production environment to cloud during an emergency

Encrypt data on the wire and at rest

Support multiple private connections between the production data center and cloud environment.

5. Executive statement

Our investors are concerned about our ability to scale and contain costs with our current infrastructure. They are also concerned that a competitor could use a public cloud platform to offset their up-front investment and free them to focus on developing better features. Our traffic patterns are highest in the mornings and weekend evenings; during other times, 80% of our capacity is sitting idle.

Our capital expenditure is now exceeding our quarterly projections. Migrating to the cloud will likely cause an initial increase in spending, but we expect to fully transition before our next hardware refresh cycle. Our total cost of ownership (TCO) analysis over the next five years for a public cloud strategy achieves a cost reduction between 30% and 50% over our current model.

JencoMart is a global retailer with over 10,000 stores in 16 countries. The stores carry a range of goods, such as groceries, tires, and jewelry. One of the company’s core values is excellent customer service. In addition, they recently introduced an environmental policy to reduce their carbon output by 50% over the next five years.

1. Company background

JencoMart started as a general store in 1931 and has grown into one of the world’s leading brands, known for great value and customer service. Over time, the company transitioned from only physical stores to a stores and online hybrid model, with 25% of sales online. Currently, JencoMart has little presence in Asia but considers that market key for future growth.

2. Solution concept

JencoMart wants to migrate several critical applications to the cloud but has not completed a technical review to determine their suitability for the cloud and the engineering required for migration. They currently host all of these applications on infrastructure that is at its end of life and is no longer supported.

3. Existing technical environment

JencoMart hosts all of its applications in four data centers: three in North American and one in Europe; most applications are dual-homed.

JencoMart understands the dependencies and resource usage metrics of their on-premises architecture.

Application: Customer loyalty portal

LAMP (Linux, Apache, MySQL and PHP) application served from the two JencoMart-owned U.S. data centers.

Database

Oracle Database stores user profiles

20 TB

Complex table structure

Well maintained, clean data

Strong backup strategy

PostgreSQL database stores user credentials

Single-homed in US West

No redundancy

Backed up every 12 hours

100% uptime service level agreement (SLA)

Authenticates all users

Compute

30 machines in US West Coast, each machine has:

Twin, dual core CPUs

32GB of RAM

Twin 250 GB HDD (RAID 1)

20 machines in US East Coast, each machine has:

Single, dual-core CPU

24 GB of RAM

Twin 250 GB HDD (RAID 1)

Storage

Access to shared 100 TB SAN in each location

Tape backup every week

4. Business requirements

Optimize for capacity during peak periods and value during off-peak periods

Guarantee service availability and support

Reduce on-premises footprint and associated financial and environmental impact

Move to outsourcing model to avoid large up-front costs associated with infrastructure purchase

Expand services into Asia

5. Technical requirements

Assess key application for cloud suitability

Modify applications for the cloud

Move applications to a new infrastructure

Leverage managed services wherever feasible

Sunset 20% of capacity in existing data centers

Decrease latency in Asia

6. CEO statement

JencoMart will continue to develop personal relationships with our customers as more people access the web. The future of our retail business is in the global market and the connection between online and in-store experiences. As a large, global company, we also have a responsibility to the environment through “green” initiatives and policies.

7. CTO statement

The challenges of operating data centers prevents focus on key technologies critical to our long-term success. Migrating our data services to a public cloud infrastructure will allow us to focus on big data and machine learning to improve our service to customers.

8. CFO statement

Since its founding, JencoMart has invested heavily in our data services infrastructure. However, because of changing market trends, we need to outsource our infrastructure to ensure our long-term success. This model will allow us to respond to increasing customer demand during peak periods and reduce costs during off-peak periods.