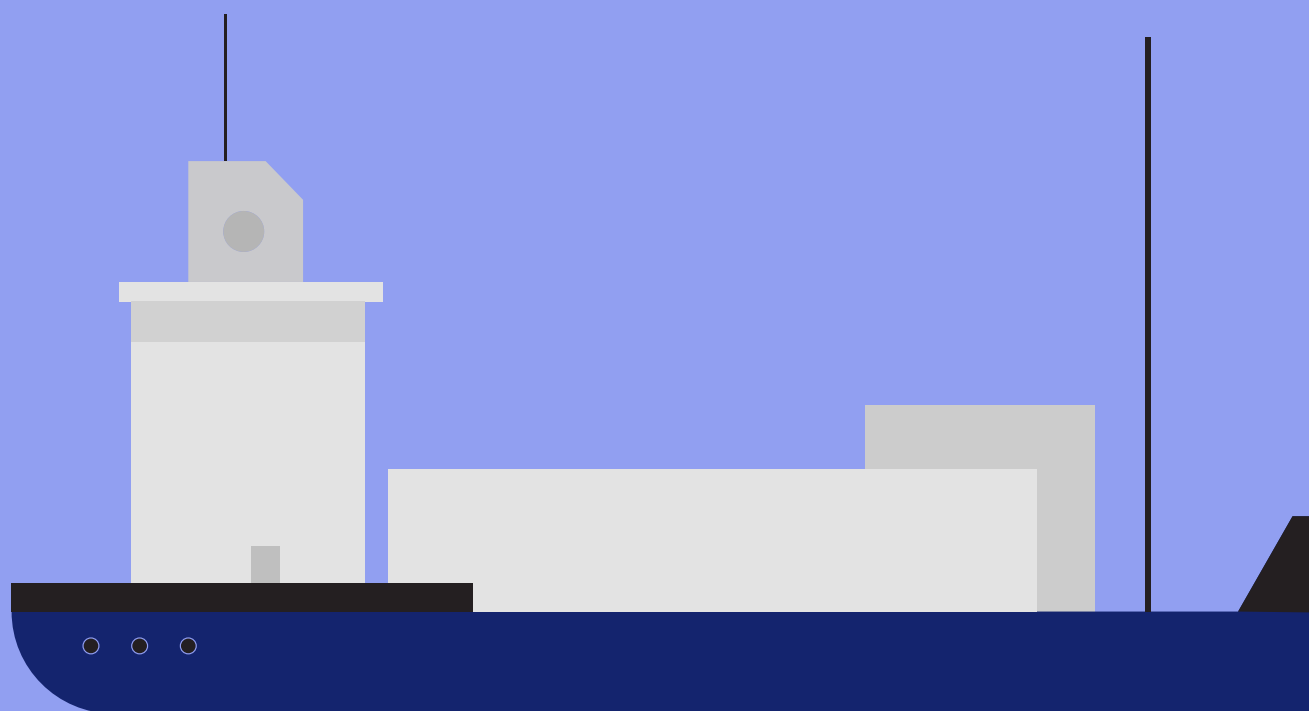
Digital Transformation Secrets of the Panama Canal.

Whitepaper



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Significance of the Panama Canal for the world

The Panama Canal is the interoceanic navigation route that connects the Caribbean Sea and the Pacific Ocean, allowing for the shortening of distances and streamlining commercial and economic exchange between countries.

Nearly 57,000 workers took part in its construction, and in 14 years they built what has been distinguished as the world's greatest civil engineering achievement. This observation was confirmed in 1994 by the American Society of Civil Engineers when it called it "one of the seven wonders of the modern world."

Since its inauguration on 15 August 1914, more than one million ships have transited it. By 2019, the Panama Canal is expected to contribute US$1.736 billion to the country's National Treasury.

Panama Canal Expansion

After its official opening, the second most important milestone of the Panama Canal was its first expansion, inaugurated in June 2016 with the objective of allowing large vessels to transit through the Canal.

The New Panamax or Neo-Panamax (NPX) vessels have a 49 meter beam (transverse measurement of the ship, i.e. from starboard to port), and can carry up to 19 rows of containers on deck. Their measures exceed up to twice the capacity of ships of the next smaller size.

The project, which had a budget of US$5.6 billion, included the creation of a third lane, which changed geography and with it, the world map.

GeneXus' role in the new Panama Canal locks

GeneXus has played an important role in the digital transformation of the Panama Canal operations. The new route was not only a civil engineering challenge, but also a challenge in terms of technology.

Tug suite, Land Transport suite, Transit Slot Reservation System, Vessel Admeasurement and Inspection System, TransitCast (the control panel used by upper management), are only some of the tools created with GeneXus to bring efficiency, security, and speed to the shipping market.

With the support of these applications, the Panama Canal has generated important revenues. In 2017 alone, slot bookings and tolls yielded revenues of US$203 million and US$2.217 billion, respectively.

Why GeneXus?

The agility, productivity and flexibility of the GeneXus software allowed the seven people who make up the development team of the Panama Canal operations area to effectively restructure the operation of the system in only 15 months.

Arístides de Gracia, head of the System Development Department, gave a presentation at the 2018 GeneXus Meeting (GX28), in which he affirmed that with other programming languages they would have needed up to two and a half years to achieve the same goal.

Tug suite, Land Transport suite, Transit Slot Reservation System, Vessel Admeasurement and Inspection System, and TransitCast, are only some of the tools created with GeneXus to bring efficiency, security and speed to the shipping market.

Tug suite

It is an application developed with GeneXus to manage the planning and crew schedules of tugboats, which are the small boats that assist ships to enter the locks.

The Panama Canal has 48 tugboats that operate 365 days a year.

Copies of timetables and technical information for each of the 700 crew members of the tugboats were printed weekly prior to its implementation.

Therefore, this application not only streamlines the Canal transits but also contributes to caring for the environment.

With the support of applications created with GeneXus, the Panama Canal has generated important revenues. In 2017 alone, slot bookings and tolls yielded revenues of US$203 million and US$2.217 billion, respectively.

The Tug Suite allowed the Panama Canal management to realize that GeneXus makes it possible to create mission-critical applications that directly support the Canal's operations.

Land Transport Suite, Transit Slot Reservation System

Although it is not necessary to make reservations to pass through the Panama Canal, there are agents and shipping companies that must book a slot if they wish to transit on a specific day, because they transport perishable products or merchandise on high demand at some time of the year.

The Transit Slot Reservation System is controlled with the Land Transport Suite, which was developed with GeneXus and is used by the most important shipping agencies and companies in the world.

One of the biggest challenges in the process of building this application was the integration of Oracle's identity manager with GeneXus Access Manager (GAM), which was achieved successfully. The maritime portal of the channel is developed in ADF Oracle, but the reservation application is within that portal. The customer does not know that they are using two different technologies. They are so similar that the experience for the user is that of a single solution. Actually, inside the maritime portal the customer is using a system efficiently created with GeneXus.

Its implementation has allowed customers to send their requests online, and not by fax as it was previously done. In turn, the system sends them notifications and all the information related to the slots available (there are only eight slots per day), as well as the cost and charges for the reservation, which can be around US$35,000.

Tonnage Admeasurement and Vessel Inspection System

One of the main activities of the Panama Canal is linked to the study of all the plans of the vessels that intend to pass through the interoceanic route. In order to be able to estimate the cargo volume of each of the ships, engineers must receive these drawings months in advance.

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There are many business rules that regulate the collection of fees for each market segment. For example, cruise ships are charged for the number of berths, full containers for the number of containers they can carry, submarines for the volume of water displaced. All these rules are included in the application developed with GeneXus.

In turn, the Vessel Admeasurement and Inspection System consists of eight systems related to the Maritime Service Portal, Fee Calculator, Finance System, Financial Backing, Pricing and Collection, Booking Management, Enhanced Vessel Traffic Management System (SIMAT) and Customer Service Management System (CSMS). By using GeneXus as an integrator, the application can exchange information from all these systems and provide relevant information for decision-making and recording.
The process involving pre-measurement (pre-measurement of the vessel) and admeasurement activities are at the core of this application, and was created using GXflow, the Business Process Management Suite (BPM) of GeneXus, which allows modeling, automating, managing and optimizing a company's business processes for creating critical applications in a simple and effective manner.

The other flow also controls the arrival inspection which is where it must be confirmed whether the vessel complies with the safety rules required to pass through the Panama Canal. If there is a deficiency, the inspector can take a photo and from the application send it to the port captain to decide whether or not the vessel can transit, or if it has to be anchored on one side until it improves or solves the problem.

GXflow provides an inbox with auto-assignable and automatic tasks. To each admeasurer, this engine assigns a vessel, a time to board it and a lock.

This mobile application was developed for native iOS. Its design reflects the surroundings that an admeasurer must face every day; there is a strip of water, a red line that simulates the draught, and a la-

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«The fact that everything works well, that it is invoiced in a timely and correct manner, and that reservations can be made seamlessly, depends on a good computer system running on the background. GeneXus is behind all this».

Arístides de Gracia. Head of Systems Development at the Panama Canal.

dder, like the ones that the admeasurer usually uses to board the ship.

The tool also has fingerprint recognition. On the left side there is a menu to access to all the options that the admeasurer needs to make an inspection.

In order to digitally capture the signature of the captain on board, a new GeneXus add-on module (an external object) was created, written in Java, which was later integrated into the application. Once the inspection is approved, the system automatically sends notifications to the ship's captain and to the shipping companies so that they can verify that the entire inspection process was carried out in accordance with the Panama Canal regulations.

Before this application existed, a person was in charge of manually assigning these tasks to each of the admeasurers, who boarded each vessel with a backpack loaded with documents. Once on board, they had to fill out the forms manually, give them to the captain to sign them and then go to the office to transcribe the data into a system.

With this mobile application, the inspection is directly entered into an iPad. The application can operate in offline mode and send all information to the database when it has a WiFi signal again.
Before leaving for the bay, the admeasurers load all the transits that are pending to pass through the canal, four days in advance. This way, if something happens to the system, the Canal or the admeasurers have up to four days to work offline.

There are many business rules that regulate the collection of fees for each market segment. For example, cruise ships are charged for the number of berths, and full containers for the number of containers they can carry. All these rules are included in the Vessel Admeasurement and Inspection System, which was developed with GeneXus.

TransitCast

The core business of the Panama Canal is the transit of ships, but around that transit a lot of information dispersed in different systems and technology platforms is handled.

For this reason, it was necessary to create an application to provide the Panama Canal managers with a summary of all these data sources, including Arrival Inspection, Admeasurement Management, Cameras, Transit Condition, Dashboard, Market Segments/Vessel Information, Records, Toll + OSM, Location and Cargo Information.

TransitCast, developed with GeneXus for iOS and Android devices, provides real-time information about everything that goes on in the Panama Canal. From this application, it is possible to know which vessels are passing through the waterway, how much each of the vessels is paying, how much they measure, their time of arrival in Panama, the time they passed through the first lock, the number of locomotives needed to make the transit, the type of cargo it brings, how the billing is broken down, and so on. You can also see photos of the ship, its flag, as well as the country it was built in and in what year. This entire database, which includes approximately 65,000 ships, is condensed in this application developed with GeneXus.

In this case, design thinking was applied so that this application is intuitive and allows reaching the same information from different access points.

Technological future of the Panama Canal

In October 2018, six additional applications were released for ship inspections, this time related to the chemical part, occupational health, sanitation, and oil spills, among others. Many of them have web and mobile parts.

Based on this experience, the Panama Canal authorities are confident that they can go much further than they have achieved so far, satisfying inter-

«Before, about 500 copies used to be printed with timetables and distributed among all crew members to know which tugboat they had to board and at what time. With this application, each employee has on their cell phone the information of the tugboat they have to board, the schedule, who they work with, and the best thing is that it is available 24/7».

Arístides de Gracia. Head of Systems Development at the Panama Canal.

nal and external customers with the right tools and approach.

More than two years after the opening of the extended Canal, projections and expectations have been exceeded. New records have also been achieved with ships the size of a skyscraper, the transit of up to three liquefied natural gas ships in one day, and the largest cruise ship to date, the Norwegian Bliss. These milestones reaffirm the positive effect of the expanded channel, and the impact it will have on the future of world maritime trade.

«The Canal is a very sensitive issue for the country as well as for the maritime sector and world trade, and results have shown that GeneXus can achieve powerful things in this regard».

Arístides de Gracia. Head of Systems Development at the Panama Canal.

7 developers

created in 15 months the set of applications required to operate the expanded Canal. With another programming language, they would have taken up to 3 years to reach their objectives.

48 tugboats

that operate 365 days a year, in 87 shifts of 8 hours, are assisted by the Tug suite developed with GeneXus. Thanks to this application, the thousands of copies received weekly by 700 crew members are no longer printed.

5 applications

were developed with GeneXus to support, from its inauguration, the operations of the Panama Canal expansion.

8 systems

containing real-time information about everything that goes on in the Panama Canal are part of TransitCast, the application specially developed for the Panama Canal managers.

6 applications

developed with GeneXus were launched in October 2018 to take care of the environment and the safety of the people who work at the Panama Canal.

Find out how GeneXus
can do the same for your company.

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