



MODERNSYSTEMS

# CASE STUDY

## **SHOOTING FOR THE S.T.A.R.S.**

MODERNIZING THE SINGAPORE TITLES AUTOMATED REGISTRATION SYSTEM (STARS) BY TRANSLATING NATURAL/ADABAS TO JAVA/ORACLE

## Introduction

The Singapore Land Authority (SLA) handles the registration of property transactions, the issue of new title documents for all properties in Singapore. The Singapore Titles Automated Registry System (STARS) captures this information, applies current policy rules and ensures accurate data for the Land Register, which is guaranteed by the government under the Land Titles Act. If this information is inaccurate, or if the updated policy information is not applied, the government is open to legal and financial liability. Modern Systems was brought into this project by NCS, an international systems integrator.

## Project Summary

The STARS system was built in 1995 on OpenVMS (DEC-Alpha), leveraging Natural/ADABAS as the programming language and database. The objectives of the system were to:

- Automate several aspects of Title Registration for private properties and public housing to save time and reduce errors of manual entry
- Quickly and efficiently catalogue and report on title data

However, as requirements evolved, the legacy systems were unable to efficiently support business needs. Specifically, SLA needed increased system flexibility to:

- Respond to policy changes quickly and uniformly
- Allow new types of property transactions to be added to meet future business needs and data sharing requests across government agencies
- Extend capabilities of search and data filtering

The STARS system had accumulated nearly 20 years of data and application customization. It was imperative to translate the appearance and functionality of the system in a manner that minimized user impact.

To ensure accuracy at all points, the SLA mandated:

- Measuring/optimizing data quality and planning data synchronization
- Mapping of existing data, tasks and functionality from current systems and database to target platform
- Ensuring accuracy of mapping and translation plan
- Plans for ensuring adherence to strict security policies during migration/conversion

System performance was a top priority as well. The new system had to perform as well or better than the legacy system. Therefore, the SLA requested comprehensive tests (unit, integration and system testing) conducted under the peak load specified within the application requirements.

Lastly, the code produced in the target state had to be of high quality to support STARS' integration requirements. The data from STARS is integrated into multiple form versions and over 100 external applications and databases.

**In all, the following legacy workload was refactored to Java with Oracle Database:**

- Over 1M lines of Natural code
- Over 150 DDMs representing more than 70 ADABAS files
- 700 DCL programs

# Engagement Details

## Integrated Partners For Delivery

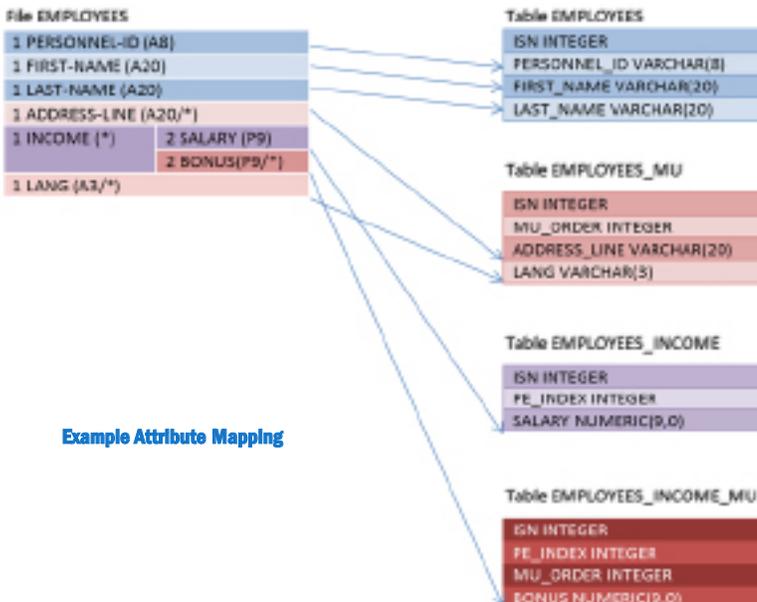
The maturity of our solution enables us to deliver seamlessly through partners, who often use us to either complete or enable the scope of their core services. For SLA, we partnered with NCS, a multinational information technology and communications engineering company headquartered in Singapore. NCS has over 8,000 staff located in more than 10 countries across Asia Pacific and Middle East regions. Since its inception, NCS has implemented over 3,000 large-scale, mission-critical as well as multi-platform projects for various Asian and Middle East government ministries and agencies. NCS architected, developed and delivered the target state infrastructure for the applications refactored by Modern Systems. They also handled project management and tested refactored code.

## Portfolio Analysis

It's necessary to have a complete, holistic analysis of the legacy system to ensure accurate results. Report output represents the legacy environment, covering technical inventory, business logic, and project risk factors. This output can also reduce maintenance costs of the legacy environment by mapping out functional code and identifying "dead code".

The output of this stage typically includes:

- Documentation of embedded languages, databases, 3rd party calls, etc.



- Discovery of business rules, facilitation of business logic extraction
- Dead code identification and removal
- Excess and/or problematic inventory identification and removal
- Project Plan: Timeline, duties, processes for error handling and change control

## Data Refactoring

Once inventory and legacy functionality is validated, the target environment for SLA was built and tested by NCS. Upon acceptance, Modern Systems began code refactoring and migration. The following process was automated and executed using Modern Systems' technology:

- Generate Natural unload programs to run against ADABAS
- Resulting data is transferred to the target environment
- Generate programs to transform the data
- Generate loader utility, load the data to Oracle
- Validate the data refactoring has been successful using check-sums and hash algorithms
- Full comparison of data from ADABAS vs Oracle
- Perform pre-delivery testing on every ADABAS file that will be migrated at Go-live
- Translate Alpha User ID's to LDAP User IDs in operational ADABAS data
- Add new tables and columns required by NCS/SLA in the Oracle database
- Preserve archived data

# Engagement Details

## Code Refactoring

The Natural code was refactored to Java using our automated solution. This included converting the DCL and any builds required to implement SLA's Security and Authentication Approach.

The logic of the application and presentation layer were converted directly, then refined to meet requirements articulated specifically for the target state.

## Testing and Delivery

A mutually acceptable Severity Index and Response matrix was created to classify and address bugs found in testing. Modern Systems worked together with NCS and SLA to validate unit tests and functionality of all converted code.



Example Screen for Migrator



## Delivery & Feedback

### Performance

Performance benchmarks were set to ensure the refactored application met the needs of the business. Batch was tuned to execute within the batch window without impacting the operational Service Level Agreement. For Online, a 3-second response time was achieved for 90% of the cumulative transaction volume over SLA business hours (8:00am to 5:00pm); and no more than 5 seconds for 90% of the remaining 10% of transactions.

### Custom UI Enhancement

All non-popup Natural maps were included in an HTML page that contained a Top Frame, Left Frame and Body Frame. The non-popup Natural map were included in the Body Frame of the web page. All searches and links were associated to the Top Frame and Left Frame and were coded to invoke a New Browser Window. Searches and links were removed from the Body Frame to ensure the 'conversational' integrity between the Web Browser client and the Web Application running on the Web Application server.

### Knowledge Transfer

For optimal value upon delivery, Modern Systems provided Developer Training to the SLA team to ensure proper understanding and usage of the refactored code and supporting framework.

### Customer Feedback

“We are pleased with the outcome of our engagement with Modern Systems,” says Li Phing. “We were able to achieve our project goals within the timeline and budget specified at the outset of the project.”

“Additionally, the refactored code and data tier acted as expected, enabling us to integrate with internal and external systems as needed, at the level of performance we required. The modernized STARS can now deliver data in ways that will provide new value to customers countrywide.”

## About Us



Modern Systems, Inc. is the leading provider of legacy application lifecycle solutions.

The Modern Systems portfolio includes a comprehensive suite of tools and services for automated database and application migration.

Leveraging over 30 years of best-practice domain expertise, Modern Systems works closely with its customers to minimize risk and provide a clear path from legacy platforms like COBOL, Natural/ADABAS and others to modern solutions like SQL, DB2, Java and more.

Modern Systems' customers come from diverse industries and vertical markets such as automotive, banking and financial services, insurance, manufacturing, and retail. Modern Systems has offices in the USA, UK, Italy, Romania, and Israel.

