

**SOLUTION BRIEF**

CA TEST DATA MANAGER AND CA AGILE REQUIREMENTS DESIGNER

# Rigorously Test Composite Applications Faster With CA Test Data Manager and CA Agile Requirements Designer

Generate rich virtual data that covers the full range of possible scenarios and provide the unconstrained access to environments needed to deliver rigorously tested applications on time and within budget.

Model complex live system data and apply automated rule-learning algorithms to pay off technical debt and uncover in-depth understanding of composite applications, while exposing virtual data to distributed teams on demand and avoiding testing bottlenecks.

# Executive Summary

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## Challenge

Faced with increasingly complex, composite applications, testers and developers often find themselves waiting idly for unfinished or unavailable components. Service virtualization is a popular way to provide distributed teams with parallel access to these components, but this requires realistic virtual data. Often, this is created and provisioned manually by a central team so that a lack of self-service access creates further delays for test teams.

Creating the realistic, sample request-response pairs for virtualization is itself slow and complex and is usually performed manually or by writing complex scripts. The data must be synchronized across components, and much laborious manual design effort is therefore required to ensure the data consistency needed for testing.

Manual virtual data creation is made especially challenging by a lack of in-depth understanding about complex live systems. As systems evolve, understanding of how data flows through the system becomes fragmented. Complete documentation is typically scarce, and the only available knowledge is often subject matter experts or the copious amount of data that goes in and out of a system. When such expertise is no longer available, “technical debt” mounts, and creating realistic virtual data becomes an increasingly hard task.

Not only does this technical debt hinder effective virtualization, but it leaves testers without the knowledge they need of a system needed for rigorous testing. Test coverage is typically poor as a consequence, while time is wasted trying to understand what needs to be tested across the inter-related components, especially after a change has been made. As a consequence, defects are detected late, and the ultimate user experience suffers.

Record and playback is often used as an alternative to manual data creation, but this is only possible for existing services. The virtual responses created with these methods will usually therefore represent past scenarios and will not cover the outliers, unexpected results and future scenarios needed for rigorous testing.

# Executive Summary

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## Opportunity

Using CA Test Data Manager and CA Agile Requirements Designer (formerly Grid Tools Agile Designer), realistic virtual services that cover the full range of possible scenarios can be generated without manual data creation or maintenance. Technical debt can be paid off using data visualization to interactively analyze a message specification and identify what variables exist in live data and how they relate. CA Agile Requirements Designer will convert this data model into an unambiguous flowchart, providing the in-depth knowledge of how data flows through a system needed for effective virtualization and testing.

From this model, rich virtual data can be generated so that it contains every possible scenario. These “covered” responses provide a rich test bed that can be exposed to distributed teams on demand. Testers are provided with instant access to the environments they need to execute every possible test, while virtual data can also be generated automatically at the same time as the smallest set of test cases needed for rigorous testing. Defects are thereby detected earlier, delivering quality software earlier and at less cost.

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## Benefits

- Build virtual services faster, and eliminate the time wasted waiting for virtual data to be created.
- Avoid project delays by simulating unavailable or incomplete components.
- Expose virtual data to distributed test and development teams in parallel and on demand, and deliver fully tested systems earlier and at less cost.
- Visualize and model complex live and legacy systems to pay back technical debt and quickly provide testers and developers with the in-depth understanding they need.
- Generate realistic virtual data at the same time as the smallest set of test cases needed for rigorous testing.
- Drastically reduce the time spent maintaining virtual service data and tests.

Section 1:

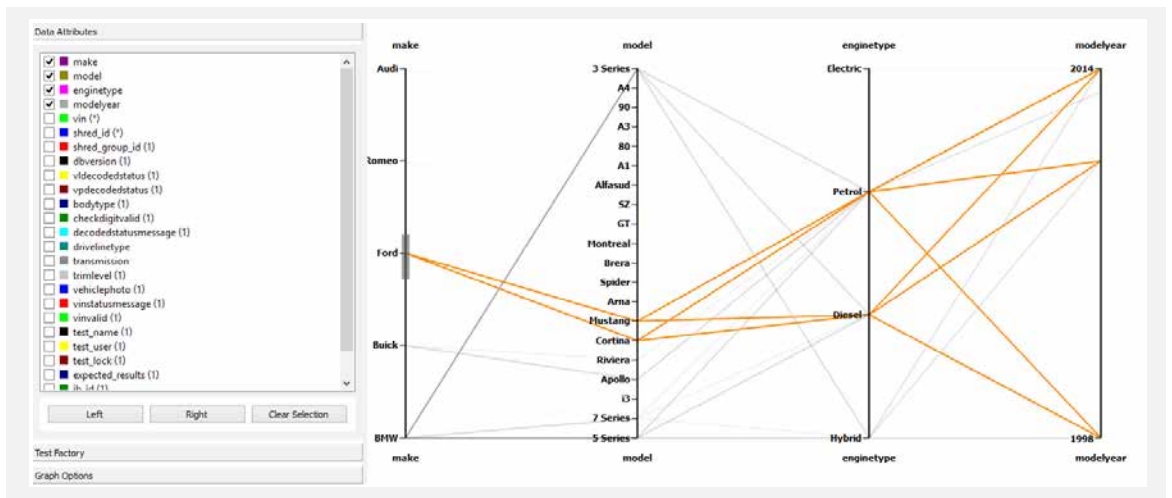
# Pay off Technical Debt and Understand Exactly How Data Flows Through Live Systems

CA Test Data Manager enables testers, developers and DBAs to derive the knowledge of complex live systems needed for effective testing and virtualization even when documentation or subject matter expertise is not available. Based on a message specification, data visualization can be used to interactively explore data flowing from live systems, identifying exactly what variables exist and how they relate.

By selecting specific test data attributes, service data can be dynamically queried to help understand exactly what variables exist and how they relate. This works to pay off the technical debt, providing the understanding of how data flows through systems needed for rigorous testing and effective virtualization.

Figure A.

Parallel co-ordinates within data visualization shows what data variables are available in existing data when a VIN number relating to a Ford motor vehicle is requested and how they relate.



Any missing or invalid data needed for rigorous testing can be identified at a glance, using accurate coverage to measure what proportion of possible combinations of variables exist. Specific combinations of data variables can be selected using the data Inspection tool and can be locked and reserved, or they can be exported out to CA Agile Requirements Designer.

Using Data Visualization you can:

- Dynamically query live data, to fully understand what variables exist and how they flow through a live system.
- Pay off technical debt and allow testers and developers to fully understand complex, legacy systems.
- Uncover the knowledge of complex live data flows needed for realistic service virtualization.
- Accurately measure test data coverage, and identify any missing responses needed for rigorous testing at a glance.

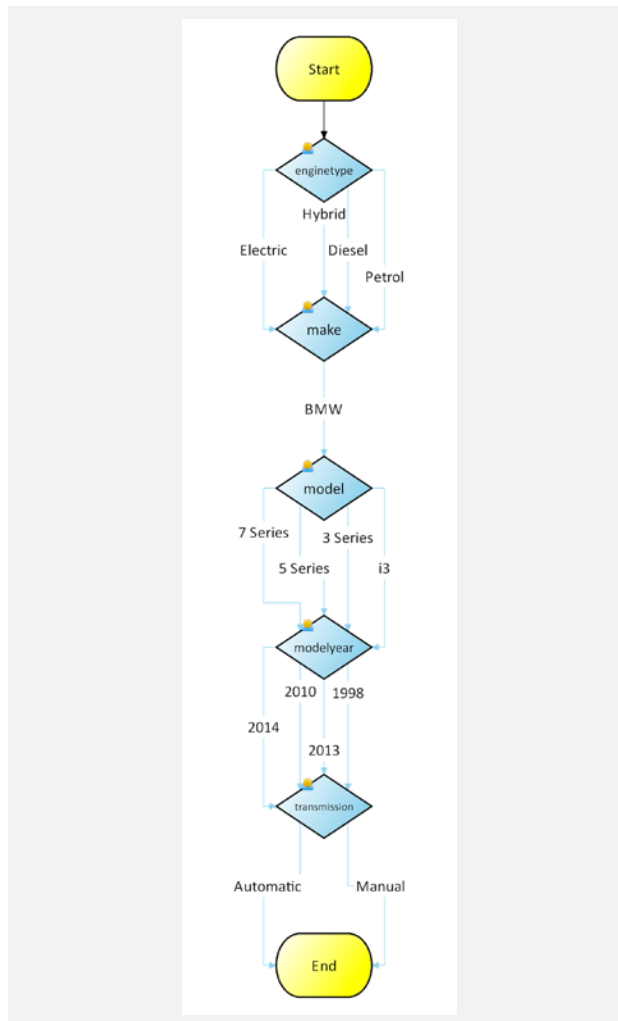
**Section 2:**

## Model System Data and Use Advanced Rule-Learning to Uncover the Complex Dependencies Which Exist in It

The data model can be imported to CA Agile Requirements Designer which will create a visual logic model of all possible requests and their associated responses.

**Figure B.**

A flowchart model of vehicle history service, containing the full spread of possible responses for a specific Vehicle Identification Number (VIN).

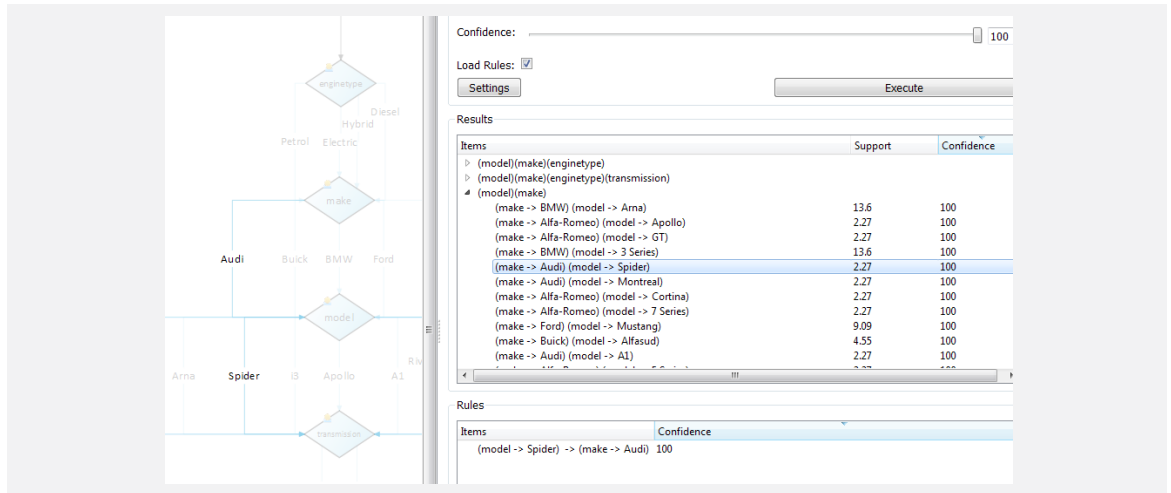


Sophisticated rule learning algorithms can be applied to identify automatically the constraints present in the live data flow and the relationships that exist between variables. These constraints can be generated on the basis of how well they are supported in the data model as well as on the degree of certainty attached. This provides testers and developers with an understanding of which responses depend on which requests and how variables relate while also offering the knowledge of complex live systems needed for realistic service virtualization.

Common response variables for a given set of request attributes can further be identified using sophisticated path analysis, providing a full understanding of constantly evolving live systems even when subject matter expertise is no longer available.

**Figure C.**

Automated rule learning identifies the constraints and validation rules evident in a data model based on how well the rule is supported in the data and the confidence attached to each rule. In this example, the specific car models are dependent on the manufacturer of the car.



Using data visualization you can:

- Import a data file to CA Agile Requirements Designer, and create a visual data model of the variables which flow through complex or legacy systems.
- Identify the constraints and validation rules which led to the creation of complex live data.
- Make informed business decisions on the basis of an in-depth understanding of live data and the predictions which can be inferred from it.
- Provide testers and developers with in-depth understanding of complex systems even when subject matter expertise is not available.

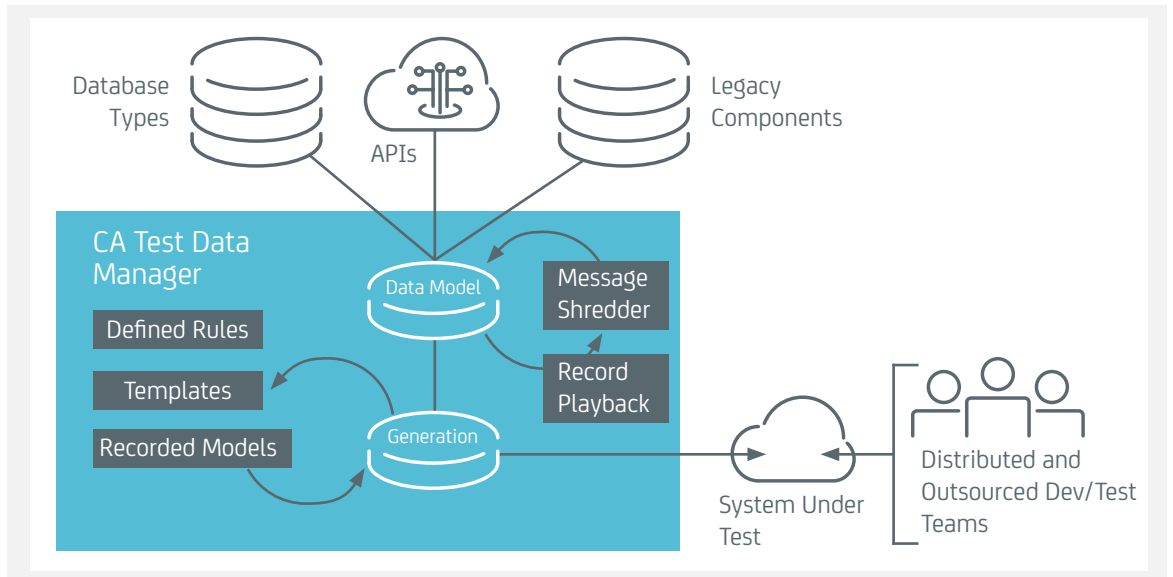
**Section 3:**

## Create “Covered” Sets of Responses That Provide the Full Range of Possible Requests and Scenarios

From this flowchart model, virtual data that covers 100 percent of possible scenarios can be created from scratch. Sophisticated coverage analysis can be used to identify every distinct combination of variables using CA Test Data Manager to synthetically generate request/response pairs. This creates a rich test bed that includes every combination of test data needed for rigorous testing and effective virtualization.

**Figure D.**

Synchronized virtual data across interdependent services, databases and components, allows highly distributed teams to test and develop in parallel.



Structured and unstructured messages can be generated, as well as dummy data for future scenarios and prototypes, providing testers with the virtual data needed to execute any possible test. The virtual data is generated so that is synchronized across inter-dependent databases and services to ensure data consistency. Unexpected results and negative scenarios can further be tested against so that defects are detected earlier, and fully tested software and APIs can be delivered on time and within budget.

CA Agile Requirements Designer enables you to:

- Generate virtual data to cover the full range of possible scenarios, and feed it directly into a staging database.
- Provide testers with a rich test bed which includes every distinct combination of test data, and deliver rigorously tested software on time and within budget.
- Create realistic virtual data to cover the full range of possible responses, to simulate unavailable or incomplete components and to avoid the bottlenecks created by upstream dependencies.



Section 4:

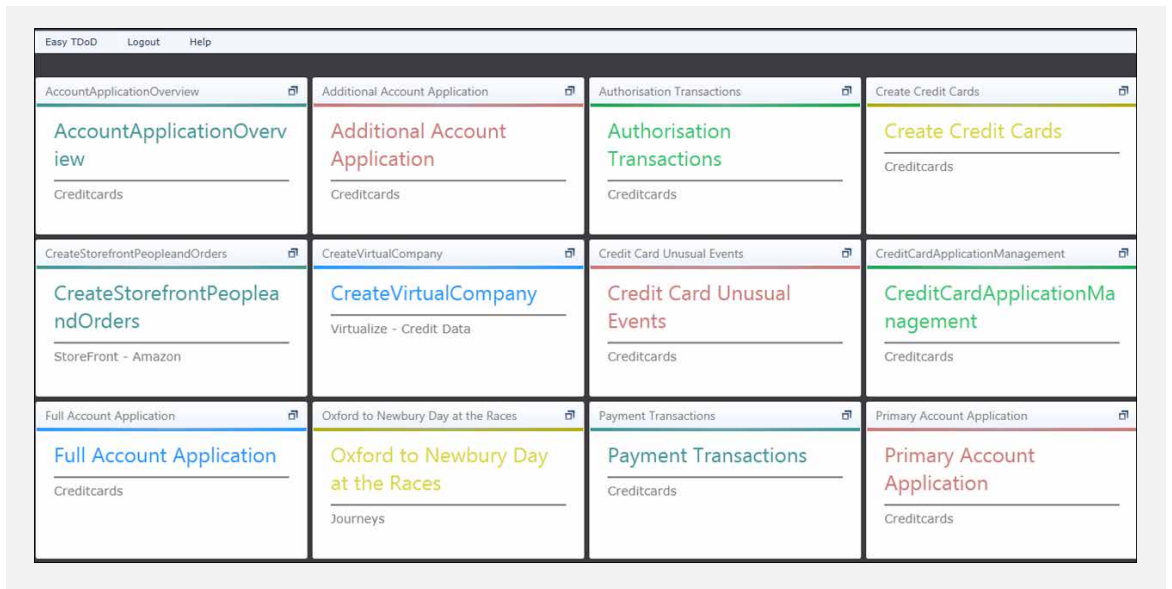
## Expose Virtual Data to Testers on Demand

This rich test bed of every possible scenario is exposed to testers and developers on demand and in parallel so that all the data they need is available to them immediately with no time wasted waiting for it to be created and provisioned by a central team.

Virtual data is stored as re-usable assets in a central test data warehouse and can be requested from a self-service web portal. Request/response pairs are then cloned and received in minutes using automated data mining, driven by CA Test Data Manager’s in-built workflow engine. This eliminates the time wasted writing complex scripts or designing data scenarios so that highly distributed test and development teams can have immediate access to the data they need to deliver quality software on time and within budget.

Figure E.

An on-demand web-portal, displaying various forms which have been created to provision specific combinations of data variables.



Dynamic form building means that specific combinations of data variables can be requested on the basis of specific criteria, and this is as simple as selecting variable types from drop-down menus. Testers can receive the exact request/response pair they need, “matched” to the specific tests they can execute, working in parallel to deliver fully tested systems earlier and at less cost.

### Section 5:

## Create Request/Response Pairs as You Design the Perfect Set of Test Cases

The smallest set of test cases needed for 100 percent test coverage can also be generated directly from a flowchart model of an API specification and linked to the virtual data needed to execute them. Virtual end-points and parameters can be defined in the model, allowing developers to identify exactly what in a service needs to be virtualized. CA Test Data Manager can then be invoked using the Find and Make tool within CA Agile Requirements Designer to rapidly find request/response pairs from multiple back-end systems, generating them where none exist.

In the test data warehouse, the generated tests are “matched” to the exact responses needed to execute them so that test teams can request and receive them in minutes from the Test Data on Demand portal.

With CA Agile Requirements Designer and CA Test Data Manager, you can:

- Publish synthetic virtual data directly into virtualized services and automated test scripts to execute all the tests needed to deliver quality software on time and within budget.
- Find or make request and response pairs, and “match” them to the smallest set of test cases needed for 100 percent coverage for rigorous message testing.

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### Section 6:

## Auto-Update Test Cases and Virtual Data When API Specifications Change

When an API specification changes or test cases are updated, CA Agile Requirements Designer can quickly update virtual data to retain maximum coverage. When a new variable is added to the flowchart, its exact impact on the data model is identified automatically. Any new combinations of variables needed for 100 percent coverage can be created using CA Test Data Manager while any broken or invalid combinations will be removed or repaired. This eliminates the time wasted on manual data maintenance, providing testers with the up-to-date data and environments needed to rigorously test evolving messages, systems and APIs.

Using both CA Test Data Manager and CA Agile Requirements Designer, you can:

- Avoid bottlenecks created by manual virtual service maintenance by injecting new parameters into existing virtual services.
- Keep up with changing user needs by providing testers with the up-to-date environments needed to test new scenarios.
- Automatically update test cases and virtual data at same time when the API specification changes, and provide testers with everything they need for rigorous message testing.

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