Challenge
Deploying applications in large, complex environments requires thorough testing using realistic operation scenarios. Constructing a realistic testing environment of thousands of machines and software systems is time-consuming and resource intensive.

Focus
A flexible framework that can realistically emulate large-scale IT enterprises for server-to-server application testing and requires minimal time and equipment investments.

Result
A programmable testing environment that functions like a real large-scale enterprise but without the investment overhead will speed the software testing process to reduce the cost of development and lessen the risk of production deployment problems. It can also help with capacity planning for elastic cloud services.

An application designed for a large-scale IT enterprise can easily need to connect to thousands of other applications distributed across the environment. With high transaction volumes and IT complexity, making sure an application works before deploying it into production is critical for enterprise health.

Adding or upgrading an enterprise application requires extensive functional, performance and scalability testing against realistic real-time operation scenarios to ensure application service quality and reduce the risk of disruption or outage.

Constructing an enterprise-sized testing environment is costly due to resource and complexity constraints such as lack of hardware, high system configuration requirements, large I/O volumes, licensing, procurement and more. Replicating a large-scale environment using virtual machines is prohibitive, and scheduling test time on a production environment during off-peak hours may be impossible.

Existing tools for scalability testing do not adequately test volume-intensive connections, peer-to-peer communications or other server-to-server connections and integrations at the application layer. Current scalability testing solutions also lack support for interactions between application protocol-aware endpoint systems like LDAP, JDBC, Web services and more.

The CA Labs Reacto research project is targeted at the development of a general emulation framework based on lightweight models that are flexible enough to simulate the activities of a large range of enterprise systems. The project goals are to conserve and reuse computing resources for maximum scalability, and provide debugging and traceability features so that failed tests can be reproduced precisely.

Reacto can also be used in estimating elastic cloud computing provisioning requirements where applications are tested above capacity in the simulated IT enterprise environment to identify where resource thresholds are exceeded and extra computing power will be supplied by the cloud.
Reacto Lightweight Model Approach

Reacto tests the scalability of server-to-server connections and integrations at the application layer by emulating intelligent responses and protocols that typify application operations.

The Reacto approach is to use lightweight models of the enterprise endpoints with which an application interacts. These models run on a small number of physical machines within the Reacto framework to emulate an environment that has the transactional velocity of the production environment and the technical characteristics of various endpoints.

Tens of thousands of endpoints can be emulated according to an enterprise description. The endpoints can respond normally or misbehave with delays, failure to respond, or with faults (which may send back the wrong reply, send back garbage, or send back nothing). And most importantly, all test scenarios can be replayed so developers can repeat the conditions that led to a fault.

The Reacto approach also supports:

- Easy modeling of a wide range of endpoint systems.
- A model elements repository for saving reusable endpoint definitions.
- The emulation of a large-scale heterogeneous IT enterprise environment.
- The ability to program and configure the emulated environment by allowing automated testing systems to call an entire test environment and effect changes to model performance, volume and more.
- A runtime monitoring engine that can record the session of a particular machine for in-depth analysis.
- A learning gateway that registers operational characteristics of the production environment and applies those characteristics to subsequent tests.

Figure 2 Real-time emulation environment

More Information on CA Labs Reacto research project

CA Labs is collaborating with researchers from the Swinburne University of Technology in Australia. The following papers have been recently published about this research project:


This project has received a three-year Australian Research Council award.

For additional information about this or other CA Labs projects, please contact Steve Versteeg at Steve.Versteeg@ca.com.