

ScenGen: Scenario Generator

“Every Move”

A Scientific Approach to System Test



What is ScenGen?

ScenGen is a unique software program that can generate all possible scenarios for a given situation at a very high speed. People will often try to think of all possibilities for a given problem but depending on the complexity of the problem, can they be sure they thought of everything and can they do it fast enough?

Imagine it like this...If two chess computers were left to play against each other for long enough, they would eventually play every possible game of chess.

Now, if the rules of chess could be rewritten to represent any situation like a game, then ScenGen will output all the moves you can make according to the rules.



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Problem Statements

1. Generating test cases manually is expensive and time consuming; generates less than 25% coverage of system logic; is very error prone as it is not intuitive for humans; provides for no multiples...One Script = One Test Case.

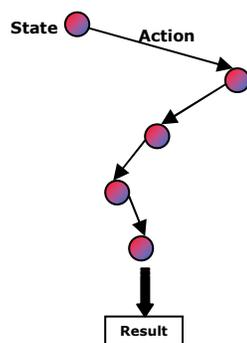
Resulting risks include incomplete automated regression testing; number of live production bugs and downtime; no accurate measure of coverage, quality or risk exposure to the business; and false positive scenarios lead to wasted development and diagnostic time.

2. Happy (Expected) paths rarely uncover errors/bugs in the later stages of testing. For example, a user logs into an email system by entering an acceptable user name and password and proceeds with composing and sending an e-mail message.

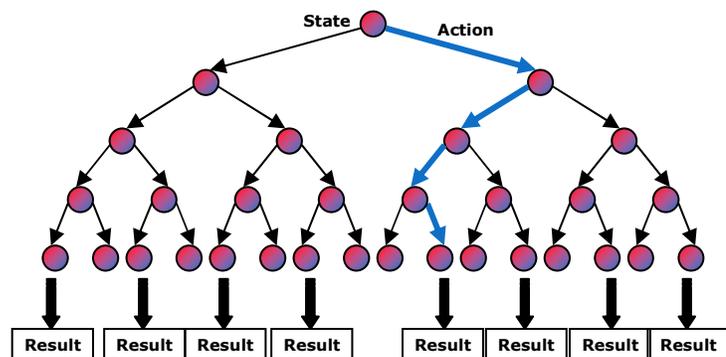
Latent bugs are usually uncovered when you stray from the "happy paths". For example, a user logs into an email system with user name that has special characters in it. Then, instead of composing an email, checks her calendar and goes into another application. In addition, the sequence of events/interactions with the compose screen might be different than the "happy path".

For ScenGen, there is no unforeseen path or combination of events or data; given the state of user knowledge, the scenario set is perfectly complete; see the figures below for manual and ScenGen test case diagrams.

Manual Expected Path Test Case



ScenGen All Paths Test Cases



ScenGen Benefits

- Scenarios are generated faster, better and cheaper than manual methods;
- All scenarios (expected and unexpected) are generated (100% system coverage);
- Scenarios are generated completely without error or duplicates;
- Scenarios are ready to be fed into regression automation suite;
- Maximize quality and delivery time; and
- Minimize cost, manual work and errors.

The ScenGen Process

- Build the ScenGen model - ideally in tandem with the application design but can be accomplished even after deployment;
- Automatically generate the test suite;
- Prune the test suite to suit the testing purpose whether it be for a smoke test, detailed evaluation, a regression test bed;
- Feed the test suite into the automated test execution engine; and
- Evaluate and resolve resulting defects.

ScenGen Applications

ScenGen can be applied to ensure quality engineering throughout the full mission thread. ScenGen reduces the time and effort needed to generate a comprehensive suite of test scenarios, determines Single Point of Failure (SPOF) situations and delineates optimization scenarios that indicate critical variables, inputs and events.

- 1) **Exhaustive Testing:** Mission critical computer systems such as navigation, mission critical networks, unmanned vehicle control systems, and fuel systems have a high cost of downtime. These systems need to be tested for all possible circumstances. ScenGen can produce that complete test set and the testing can be automated.
- 2) **Future Modeling:** ScenGen can provide "What If" data for the system to perform statistical regression on user scenarios and data.
- 3) **Impact Analysis:** When changes to a project are proposed and an impact assessment as to the impact of that change on the project needs to be made, then ScenGen can simply be run twice. Once on the old unchanged model, once on the new model and the results compared – the difference is the impact.
- 4) **Path Optimization & Defect Reproduction:** When the shortest path to a particular goal needs to be found, whether it's to reproduce a defect or to locate the fastest way to get to a location via travel options, ScenGen will simply generate all possible routes and then sort them by the ones with the fewest steps first.
- 5) **SPOF Analysis:** ScenGen can locate SPOFs in systems design including networks by generating all flows through the network, then systematically simulating if each server of the network went offline how many flows would be impacted.
- 6) **Disaster Recovery, Business Continuity:** ScenGen can generate test and exercise scenarios for worst case disaster or terrorist act combinations and ensure coverage in the emergency response plans.

Communications Applications

- Shortest path to action for optimization of mission performance
- Exhaustive Protocol Testing (all combinations of valid data streams)
- Concurrent Exhaustive Protocol Testing (Slipknot)
- Anti GPS Spoofing Technology
- Prove the absence or presence of a SPOF
- Race & Dup Broadcast Conditions
- Hammer/Load Testing
- Negative Testing of pessimistic coding – garbage generation, corrupt messages, invalid fields, NULL fields, etc.
- Full Migration Integrity (MI) for protection from internal malicious code
- Exhaustive Penetration Testing to protect against cyber attacks
- Many-to-Many Network Stack Issue
- Denial of Service/Jamming
- Monitoring and Diagnostics Migration