



Top 20 Reasons Contact Center Voice Applications Don't Scale



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Introduction

Interactive Voice Response (IVR) and Computer Telephony Interface (CTI) applications are essential to the success of any contact center operation. When working properly, they can handle most inbound telephone transactions with a level of speed, efficiency and user-friendliness that rivals human agents – and an IVR/CTI-handled call costs only about 1/16 the cost of an agent-assisted call.

Unfortunately, IVR and CTI applications are also extremely complex – and are almost never error-free. Even the best-designed automated voice systems can have potentially crippling performance problems that frustrate and alienate customers while driving up a contact center's toll charges, equipment needs and personnel costs.

Automated test and monitoring solutions can help contact center managers reduce the numbers and severity of these errors, and can help pinpoint and diagnose these errors when they occur. The resulting savings can be astonishing: Automated testing allowed Connecticut-based People's Bank to save over \$750,000 per year in toll charges *alone*. Another major US bank estimated that it saved \$2 million per year in toll and personnel costs by using testing and monitoring to reduce service bottlenecks and queue build-up in its IVR system.

As the industry leader in load and performance test monitoring for PBX, IVR, CTI, port, trunk and multi-channel Web/voice contact center systems, Empirix has over a decade of experience in making sure that voice applications can scale to meet real-world demands.

Based on that experience, Empirix has put together this overview of the most common reasons that contact center applications fail to scale properly, as well as some common-sense suggestions about how to correct these problems and improve IVR/CTI scalability.

The Top Twenty List

In order to identify and resolve scalability problems in contact center voice applications, managers need to know both *what* to test and *how* to test it. Many problems will escape notice if the testing strategy used does not match the business objectives of the system under test – or if the test is not properly designed and executed. Below is a list of the top twenty most common performance problems found by Empirix consultants during the hundreds of hosted and onsite load tests conducted using Hammer IT™ technology, Hammer CallMaster™ test scripts and OneSight™ monitoring for Contact Centers. While there are a seemingly infinite variety of issues that arise, most problems fall into one of four general categories:

- Carrier Issues
- Mainframe or Database Issues
- IVR PBX Issues
- CTI and Call Routing Issues



Carrier Issues

Problem #1

- Symptom** Calls are dropped before a transaction is complete.
- Indicator** DISCONNECT errors from the test reports.
- Solution** Check for proper routing and vectoring code in switches. Be sure that trunk capacity is sufficient for your call volume.

Problem #2

- Symptom** When callers are being ramped, busy signals begin.
- Indicator** Detected by the performance test, busy signals may occur in combination with an easing of load on the IVR, CTI server, and the database.
- Solution** If the telephony network cannot carry all the calls that are coming in, the network itself is the bottleneck. The switches may take longer to recover from each call, thus creating a wall of protection that actually reduces the load on middle and backend components in the system.

Problem #3

- Symptom** Calls are not being connected to the switch as load increases.
- Indicator** Call disconnected events such as Ring No Answer, Timeouts, Busy, or Reorder are detected.
- Solution** More telephony capacity may be needed, or some switch tuning may help clear calls faster. Check IVR signaling to switch to ensure orderly call teardown.

Problem #4

- Symptom** Low CPU usage on all systems but poor performance.
- Indicator** Response times are increasing as callers are added, but the systems are not showing any signs of stress.
- Solution** Verify that system components and the telephony network are not exceeding their rated capacities and that no interactions with other external systems are affecting the system under test.



IVR/PBX Issues

Problem #5

- Symptom** Lost connections.
- Indicator** Performance test indicates calls are being dropped before transaction is complete.
- Solution** Check routing and vectoring code in switches. Check application code for unreasonably short timeouts.

Problem #6

- Symptom** Low memory conditions are observed on the IVR servers.
- Indicator** Available memory, measured from the IVR servers by Empirix OneSight™ or other monitoring tools.
- Solution** Verify that there is sufficient memory in the server for the application deployed on it. Add additional memory if needed. Also, verify that the memory isn't increasing during the load run, which would indicate a memory leak in the application code.

Problem #7

- Symptom** High CPU usage on the IVR servers.
- Indicator** CPU counter measured from the IVR servers by Empirix OneSight or other monitoring tools.
- Solution** There is no single solution. Check the application code of the transaction being executed and verify that it is optimized. Verify that the IVR servers have been tuned according to manufacturer specs. Consider adding hardware.

Problem #8

- Symptom** Certain prompts respond very slowly, even under lower load conditions.
- Indicator** Slow prompt response times are usually observed in the first prompt of an application. This may not be the first prompt the customer hears if the transaction covers more than one application.
- Solution** Make sure that the loading of applications is optimized or that applications are assigned to ports. Check memory conditions. Check vectoring and routing code. Optimize ANI- and DNIS-related code.



Problem #9

- Symptom** Certain prompts respond very slowly, even under lower load conditions.
- Indicator** Prompt is always slow (within the same unacceptable range) or is never within an acceptable range.
- Solution** Make sure the prompt was carefully recorded and edited so that there is no silence before the first word or after the last word.

Problem #10

- Symptom** High levels of disk IO or CPU usage on the IVR servers as load increases.
- Indicator** Watch the disk IO or CPU usage on the IVR server.
- Solution** Verify that application server logging levels are set to minimum levels for production. Determine if the level of logging that is currently configured is necessary. The more logging the system must perform, the fewer resources are available for processing user requests.

Problem #11

- Symptom** Spikes in prompt response times. Response times will increase for a short period of time, then go back to normal.
- Indicator** Generally observed through CPU usage on the IVR and CTI servers and response times on the client side.
- Solution** The problem often is caused by a bottleneck in the switching or ACD system where calls are blocked. The system may recover, but then becomes overwhelmed again, causing the problem to recur. Look for inadequate resources or poor programming and make the necessary adjustments.

Problem #12

- Symptom** Multiple IVRs are not being utilized properly when there is a load balancer in use.
- Indicator** A high number of connections on a specific IVR or IVRs, as indicated by OneSight or another monitoring solution.
- Solution** Verify that the load balancer configuration is set to balance the load properly. Adjust the load balancer rules so that it balances across all IVR servers. Check the applications assigned to the IVR (or IVRs).



Database/Mainframe Issues

Problem #13

- Symptom** Slow response times for prompts that follow database access.
- Indicator** Slow queries found by a database-profiling tool.
- Solution** Optimize queries by minimizing sorting (for example, by index defaults), eliminating unnecessary triggers, minimizing the use of temp tables, and using parameter-based stored procedures whenever possible. Optimize SQL statements to properly select index values, minimize the result-set returned, and minimize the use of joins, order-by, and group-by clauses.

Problem #14

- Symptom** Long prompt response times but low database usage.
- Indicator** Low bandwidth to the database or slow access through the middleware.
- Solution** Verify that any external system interactions are not exceeding their rated capacities. If so, more bandwidth may be needed. Review all middleware components for efficiencies.

Problem #15

- Symptom** Certain prompts seem slow even under low load conditions.
- Indicator** High load on the database or application server as indicated by Empirix OneSight or other monitoring tools. May also be indicated by high amounts of data being moved from the database server to the application server and high queue wait times on the application server.
- Solution** Optimize data requests to the database server. Large amounts of data can strain the middleware and IVR code. Too little data requested may result in second or third requests being made.

Problem #16

- Symptom** Slow overall database performance and large amounts of data moving between the application server and the database server.
- Indicator** High CPU usage on database server and large amount of data moving between application and database servers as indicated by Empirix OneSight.
- Solution** Verify that you are using stored procedures or using queries that will not have to be recompiled at each run. Stored procedures generally have several advantages over inline SQL and will execute faster using fewer resources.



CTI/Call Routing Issues

Problem #17

- Symptom** No screen pop is seen on the agent desktop.
- Indicator** Failed screen pops as reported by agents or detected through end-to-end testing.
- Solution** Verify that the CTI server application code and routing procedures are correct. Verify all CTI links to other back-end systems such as databases and gateways. Verify that CTI desktop component is properly receiving call variables from the server.

Problem #18

- Symptom** Incorrect data is sent to the agent desktop.
- Indicator** Incorrect screen pop type or invalid customer data for a skill set, as reported by agents or detected through end-to-end testing.
- Solution** Verify that the correct customer data sets are being accessed in the database. Verify that the ACD or CTI server is using updated routing tables.

Problem #19

- Symptom** Calls are transferred out to an agent after the caller enters account information
- Indicator** The expected call flow is not traversed in the test scripts.
- Solution** Verify that the correct customer datasets are being accessed in the database. Verify that database queries are returning the expected results.

Problem #20

- Symptom** Poor CTI server performance during initial testing
- Indicator** High latency for call variables to reach the desktop
- Solution** Optimize the CTI server by using the vendor-recommended configuration settings for your environment. Also, check for the latest vendor and operating system patches and performance fixes.



Summary

Voice system performance is critical to contact center success. After all, if your systems don't perform, your agents can't perform. A thorough testing process will help ensure that your voice applications are performing smoothly and will scale to meet future business needs. Testing will not only reduce your application development time, but can also help you get the most out of your existing equipment and avoid unnecessary capital expenditures. Empirix offers a broad set of testing products and services including the Hammer IT test system and Hammer Voice Testing services that can provide you with the confidence that your voice systems will meet your and your customer's expectations. Additionally, Voice WatchSM hosted monitoring services and OneSight for contact centers can provide you with the tools you need to ensure that your voice systems remain up and running on an ongoing basis.

About Empirix Inc.

Empirix is the only test and monitoring company to provide enterprise and telecom network customers with a comprehensive range of performance-enhancing solutions for Web, voice and data applications; contact centers; and network infrastructure. Empirix products and services enable customers to accelerate development cycles, reduce operating costs, strengthen revenue streams and improve Quality of Experience for their end-users. The company serves over 2,500 customers worldwide, including Global 2000 enterprises, leading telcos, switch manufacturers and e-business leaders. Headquartered in Waltham, Massachusetts, Empirix has offices throughout the United States, and in Europe and Asia. For more information, visit Empirix on the Web at <http://www.empirix.com>.

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