

3Logic Virtual Telephony Application Grid (V-TAG)

1,000+ Seat Distributed Contact Center Performance, Scalability and Reliability Evaluation

EXECUTIVE SUMMARY

As contact centers continue to grow in scale and complexity, administrators are often forced into situations where costly upgrades or overhauls are required in order to maintain business continuity. With the traditional telephony model, many dedicated servers are typically required for each call center deployment, and can often lead to performance bottlenecks during peak load.

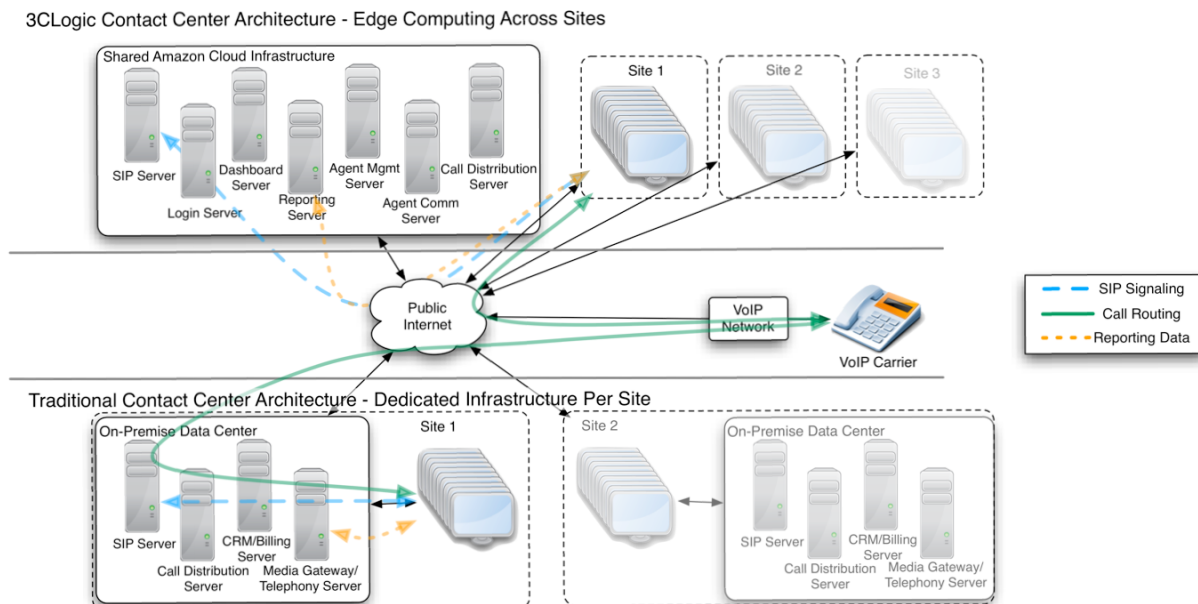
3Logic commissioned Tolly to evaluate its Virtual Telephony Application Grid cloud-based contact center solution, validating its performance and reliability benefits versus traditional, centralized server based deployments. 3Logic's V-TAG solution eliminates the need for any on-site server infrastructure, instead provisioning a set of shared cloud servers, capable of providing additional redundancy and far greater scalability.

THE BOTTOM LINE

3Logic's V-TAG Distributed Contact Center:

- 1 Easily scales to handle 1,000+ agents on a single AWS-hosted instance
- 2 Has no single point of failure, enabling business continuity for small or large scale deployments
- 3 Turns unused client PC resources into a fault-tolerant VoIP system, offloading signaling to the cloud
- 4 Uses 40% of CPU at full load to provide Call Center capabilities to 1,000+ agents

Multi-Site Contact Centers: 3Logic Distributed Architecture vs. Traditional VoIP Solution



Notes: In traditional solutions, all call traffic is routed through the local SIP gateway, with 3Logic calls are routed directly from and to the carrier.

Source: Tolly, August 2014

Figure 1



3CLogic Architecture

Overview

At its core, the 3CLogic V-TAG solution is built around distributed processing with cloud-based management. Each agent instance contains its own lightweight call server while a set of shared, cloud-hosted resources provide supporting infrastructure such as customer relationship management (CRM), reporting, and SIP Gateways. In a traditional call center architecture many of these elements are co-located with the call center and must be duplicated at each call center. See Figure 1.


Distributed Computing

By integrating call server capabilities into each agent instance, 3CLogic has removed the need for a standalone telephony server, effectively offloading call processing and other telephony functions to each online agent. The removal of the telephony infrastructure from the on-site datacenter eliminates a single point of failure, providing a more resilient call center.

Cloud Management

By allowing each agent to perform most call-related functions independently, the backend infrastructure can take on more of an orchestration role, delegating tasks to agent PCs. Additionally, since the

3CLogic, Inc.



Virtual Telephony Application Grid

Performance, Reliability and Scalability

Tested August 2014

infrastructure does not need to interact with every transaction within the call

Cloud-Based Architecture Resiliency
Component failure impact on solution effectiveness

Component Failed	Solution Functionality with Component Failure					
	New Agent Logon	Dial Out	Dial In	CRM/Billing/Ticketing	Call Transfer	Reporting
3CLogic V-TAG						
Dashboard Server	✓	✓	✓	✓	✓	✓
Agent Logon Server	✗	✓	✓	✓	✓	✓
Agent<-->Agent Comm. Server	✓	✓	✓	✓	✗	✓
Reporting Server	✓	✓	✓	✓	✓	✗
SIP Telephony Gateway*	✓	✓	✓	✓	✓	✓
Agent Management Server	✓	✓ ¹	✓	✓	✓	✓
Traditional Solution						
SIP Telephony Gateway*	N/A	✓	✓	✓	✓	✓
Media Gateway/Telephony Server	N/A	✗	✗	✓	✗	✓
Billing/Reporting Server	N/A	✓	✓	✗	✓	✗
ACD Server	N/A	✓	✗	✗	✓	✓

Notes: ✗ denotes that a given feature is unavailable in the event of a failure. *Deployment assumes highly-available SIP gateways.
1. In the event of an extended failure (>30 min), the dial out functionality gradually degrades as pre-loaded contact lists are exhausted.

Source: Tolly, August 2014

Table 1



center, significant server resources are freed up, lending itself to higher scalability.

Instead of being the active path for traffic in/out of a particular site, the 3CLogic backend is able to be removed from the site entirely, providing call center services to one or more sites from a set of common infrastructure, and can withstand a barrage of outage scenarios.

Resiliency

By logically and physically separating the call center functions in this way, 3CLogic V-TAG is able to provide greater resiliency than traditional solutions, with much less hardware.

With 200 active agents in a simulated contact center, Tolly engineers tested the failover functionality of the 3CLogic in a variety of scenarios. All tests were conducted assuming the presence of

redundant SIP gateways, as well 100% WAN uptime.

Out of 36 potential failures, there were only three situations in which part of the solution functionality would be unavailable, but none critical to either inbound or outbound call completion.

While a traditional solution was not tested for this project, engineers generalized a subset of commonly-deployed on-site components.

Using the same criteria, engineers determined the possibility of seven situations where failing a component would immediately degrade the overall functionality, including three specific cases where either dial in or dial out services would be unavailable. See Table 1.

Flexibility and Scalability

The 3CLogic architecture enables a multitude of deployment options. Since each agent PC operates independently of physical location, requiring only Internet access, contact centers no longer need to optimize for hardware overhead.

The larger centers designed to maximize ROI for a traditional VoIP solution can give way to several, smaller sites, all utilizing the same cloud-based infrastructure. Going beyond the standard contact center, 3CLogic makes it seamless to support remote users and can scale on-demand, without needing to consider hardware constraints.

Tolly validated the performance claims of 3CLogic's V-TAG solution in an emulated, 1,000+ agent call center, utilizing 100 Amazon Web Services (AWS) machines, each running 10 instances of the 3CLogic

3CLogic 1,000 Agent Call Performance and Scalability using 100 AWS Call Handling Instances at Saturation (as reported by 3CLogic Supervisor Dashboard and Nagios Core)

3CLogic V-TAG Cloud Implementation				
Solution Components		Steady State Performance		
Role	AWS Instance Type	1,000 Agent Inbound Call CPU (%)	1,000 Agent Outbound Call CPU (%)	1,000 Agent Blended Call CPU (%)
Dashboard Server	m3.xlarge	21	16	32
Agent Logon Server	m1.small	0	0	0
Agent <--> Agent Communication	m3.large	0	9	10
Call Reporting Server	m3.large	20	33	24
SIP Telephony Gateway	m3.large	0	0	0
Agent Management / CRM	m3.xlarge	37	16	31

Note: Reported metrics sampled at random intervals during one hour test execution for Inbound/Outbound scenarios, 12 hours for blended scenario. Average of ~1,100 concurrent calls at 10-20 calls per second.

Source: Tolly, August 2014

Table 2



agent. The 3CLogic infrastructure was also hosted on AWS. See Test Methodology section for details on the test process.

Tolly tested the solution in three different scenarios: inbound, outbound, and blended. In each case, with over 1,000 agents online and actively working, the backend infrastructure was only partially saturated, with some components needing very few resources. See Table 2.

Over the course of the hour-long inbound/outbound test runs, over 50,000 calls were processed by the system. During the 12 hour "worst-case" blended run, an impressive half a million calls were completed. Given the light utilization on the infrastructure, the Tolly test deployment could have easily supported over 2,000 clients.

Dashboard and Reporting

While there exist several VoIP offerings which boast cloud management, many are often limited to specific physical instances, and can lack a "global" operations view.

The 3CLogic cloud-based infrastructure acts as a centralized point of management for all sites, allowing agent and call center provisioning, contact and agent configuration, and a rich, real-time reporting dashboard.

An administrator is provided an 'at-a-glance' view into the overall call center state, including agent activities at each stage of the contact process. See Figure 2.

Furthermore, useful statistics are provided in real-time, giving an administrator

context for customer experience such as average wait times and call durations.

In terms of performance metrics, 3CLogic presents calls per second, and concurrent calls to a general overview. However, for advanced data collection, an administrator can query the embedded Athena reporting platform to view details about specific calls, agents, or customers.

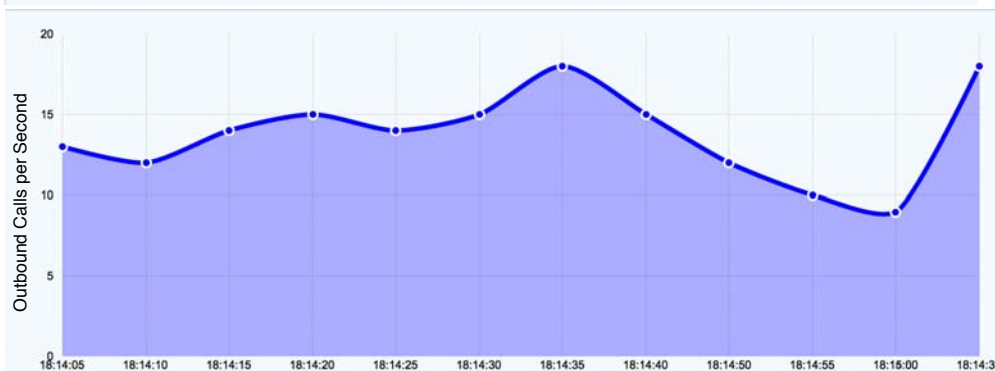
3CLogic Supervisor Dashboard Reporting and Visibility

Skill Name	Project Name	Avg Speed of Answer	Timeout	Abandon Call (%)	Average Wait Time
Tollyinbound	Tollyinbound	00:00:13	41	0	00:00:12

Dashboard Overview

55289 Total Calls	0 Away agents	0 Busy agents	1029 Logged-in agents
928 Agents on call	71 Agents on wrapup	30 Idle agents	0 Agents on preview

Customizable dashboard for monitoring agent status and call center health across multiple sites.



Concurrent Calls

1052

Concurrent Calls

Note: Average of ~1100 concurrent calls, 12-15 calls per second. Images depict metrics captured during both inbound and outbound call scenarios

Source: Tolly, August 2014

Figure 2



Test Setup & Methodology

Cloud Environment

Tolly validated the performance of the 3Logic V-TAG infrastructure by leveraging large numbers of Amazon EC2 virtual machines to emulate a fully-functional, 1,000 seat call center.

The evaluation consisted of 100 servers deployed on Amazon Web Services (AWS), each simulating 10 instances of the 3Logic agent system. The goal being to have 1,000 emulated agents online and processing calls for a period of an hour, tests were run multiple times to ensure steady state performance.

Each client harness system was an AWS m3. large image, running on standard Elastic Block Storage (EBS) storage.

The set of servers implementing the 3Logic solution were deployed in the AWS US-East Availability zone, the instance types of which are detailed in Figure 2. Engineers also deployed a Nagios Core instance to monitor the resource consumption and critical services of each application server. For those not familiar, Nagios Core is an open source IT infrastructure monitoring solution.

Endpoints and phone lines outside the organization were created and managed by a set of four offsite Asterisk servers [<http://www.asterisk.org/>], each of which are capable of processing 300-400 concurrent calls per server, and emulating millions of distinct phone numbers.

Test Runtime

Tests were run in three scenarios: Inbound only, Outbound only, and blended.

For the inbound scenario, the Asterisk servers were configured to dial in to a static number configured for the call center, at which point they were placed in a queue by the system. The callee information was then queried in the 3Logic central CRM database. When an agent was available, the call was transferred and answered by a virtual agent. The average time to answer was between 10 and 15 seconds for all tests. For a detailed breakdown of the call processing steps for inbound and outbound calls, please see Figures 3 and 4.

The call duration was randomized between 30 and 150 seconds, after which the agents enter a five second "wrap-up" period, emulating an actual agent entering closing remarks regarding a conversation. The agents then returned to the idle pool, and were fed newly-received calls.

The 100 AWS client instances were provisioned shortly before runtime, allowing Tolly engineers to verify the login process of each of the agents. Once over 1,000 agents were logged into the management server, the Asterisk server was manually tuned to ramp-up at 10-20 calls per second until the call center was nearly saturated.

Due to the dynamic nature of the test, 100% agent utilization was infrequent, however, over the course of one of the inbound tests, the solution averaged 920-960 agents on call, 50-70 agents on wrap-up, 0-20 idle agents, out of a total of 1,029 logged-in agents.

For the outbound scenario, the call process was unchanged. Instead of external numbers dialing in to the call center, the

Asterisk servers were configured to answer from call lists generated by the 3Logic CRM component, and supplied to the virtual agents.

Two, one hour iterations were tested for both the inbound and outbound scenarios, while the blended scenario was run over the course of twelve hours at full saturation, emulating a worst case scenario for a call center. Over the duration of the twelve hour test, over 500,000 calls were completed with roughly a 7:3 Inbound/Outbound distribution.

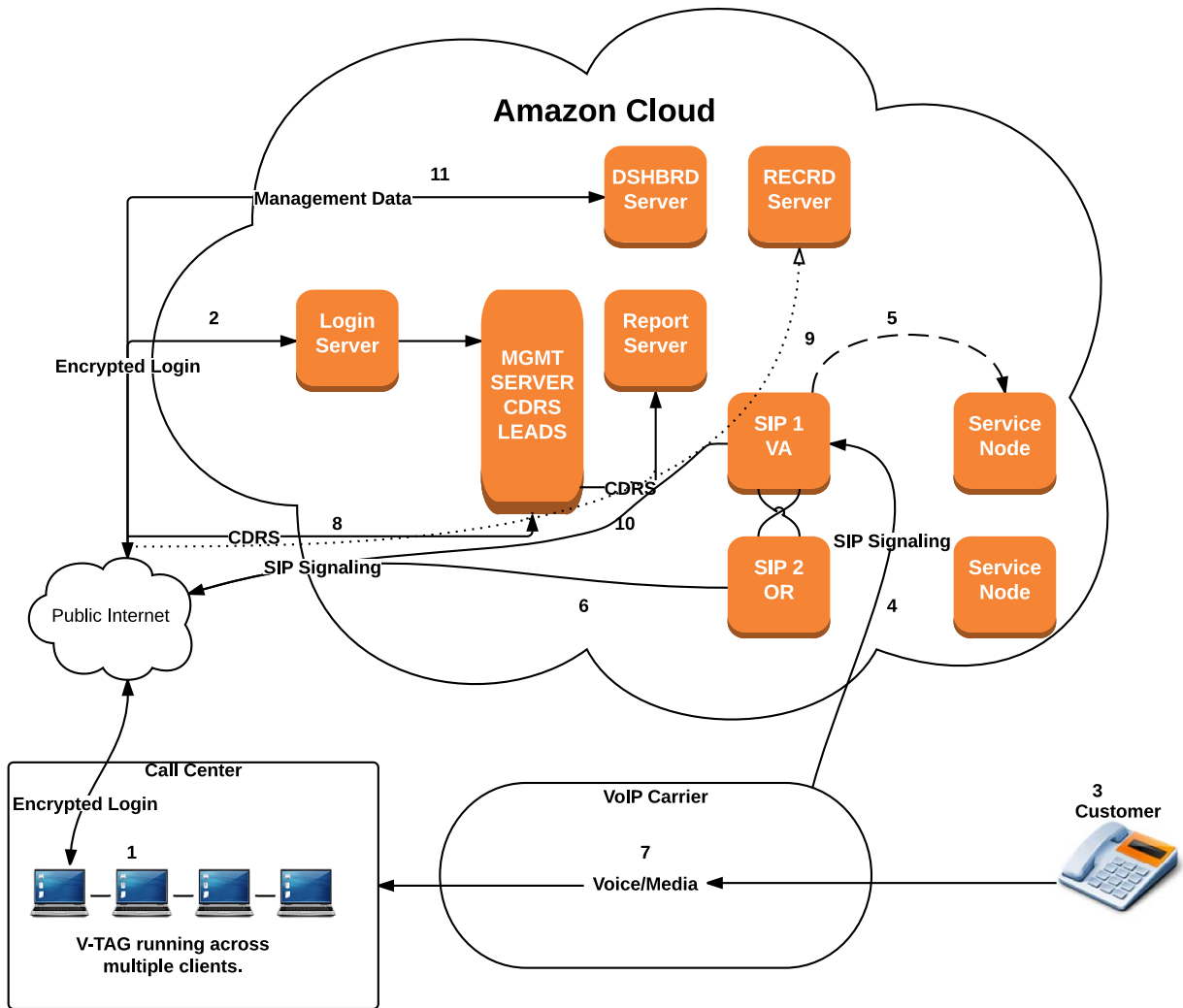
Resiliency Testing

To test the resiliency of the 3Logic solution when deployed at scale, engineers recreated the inbound test with 200 online agents, and started making calls as per the previous methodology.

With the assistance of 3Logic engineers, Tolly then selectively failed each individual component of the solution by killing the Java process associated with the application.

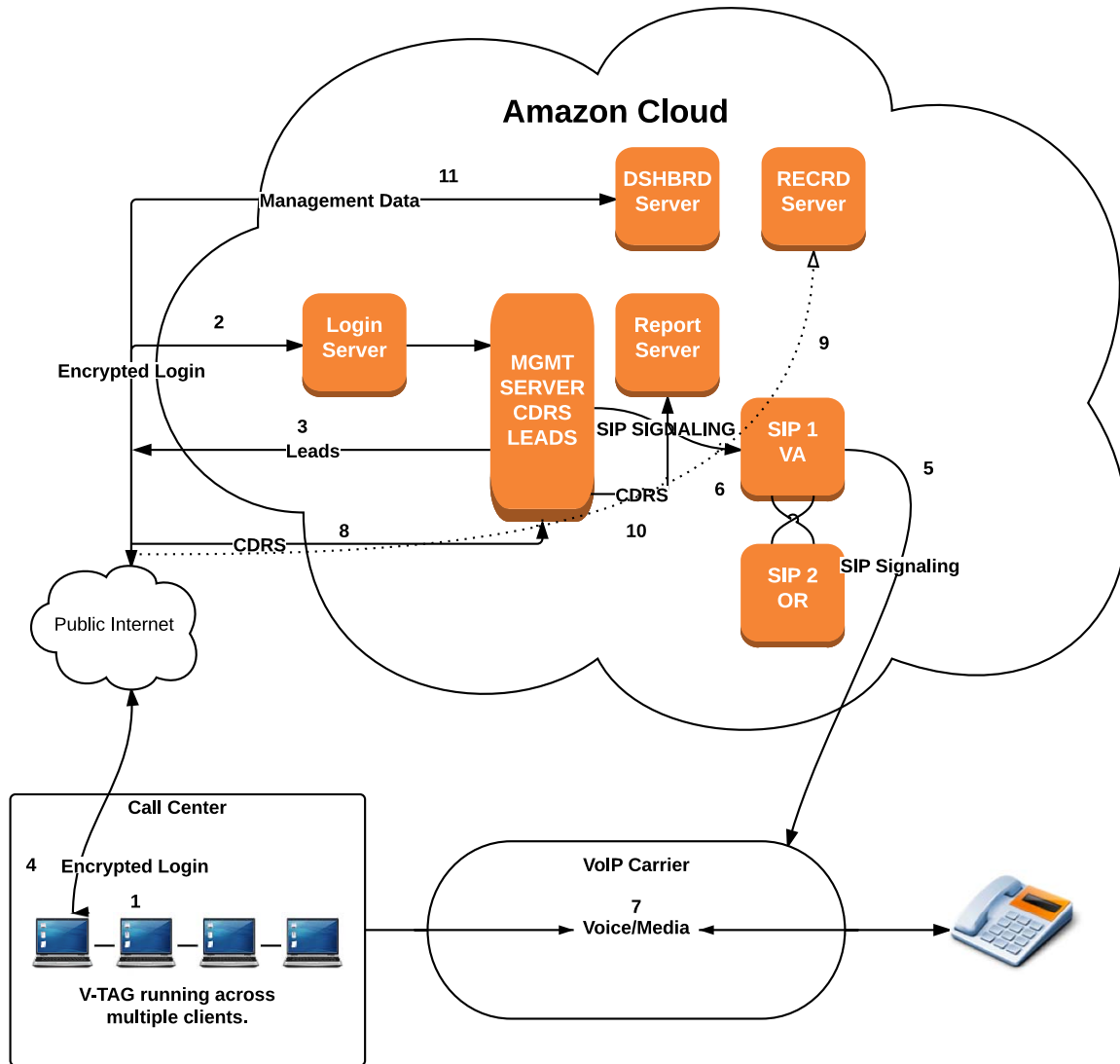
While each server was offline, Tolly validated, through the 3Logic supervisor dashboard, that crucial call center operations were not impacted. Both the 3Logic solution, and the theoretical traditional solution were assumed to have redundant SIP gateways and 100% WAN uptime.

Inbound Call Anatomy



1. Clients Launch unlimited number running V-TAG
2. Clients log into Login Server, each with encrypted PW.
3. Customer Dials DID or Toll Free Number
4. Signaling Comes through SIP Server
5. SIP queries Service Node which decides weather to play IVR, Voicemail or route to queue.
6. Signaling comes through secure connection.
7. Call is matched with Agent
8. Media is routed direct from customer to Call Center once call is established.
9. After call is disconnected CDR's are sent to MGMT server
10. Recorded call is kept on local PC, and then stored locally or transferred to Record Server.
11. CDR's are batched, sent to report server and deleted from MGMT.
12. Real time call data is sent from client to Dashboard Server

Outbound Call Anatomy



1. Clients Launch unlimited number running V-TAG
2. Clients log into Login Server, each with encrypted PW.
3. Leads loaded from Management Server.
4. Call is dialed from client.
5. Signaling comes through secure connection.
6. Call is matched with domain and carrier is selected.
7. Media is routed from customer network once call is established.
8. After call is disconnected CDR's are sent to MGMT server
9. Recorded call is kept on local PC, and then stored locally or transferred to Record Server.
10. CDR's are batched, sent to report server and deleted from MGMT.
11. Real time call data is sent from client to Dashboard Server

Source: 3CLogic, August 2014

Figure 4



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The Tolly Group companies have been delivering world-class IT services for more than 25 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

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About 3CLogic

3CLogic is a leading provider of inbound, outbound, and blended cloud contact center solutions based on an innovative approach designed to deliver modern-day contact center features to meet the challenges of a modern world.

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