



NGN Contact Center

White Paper

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Abstract

This white-paper presents the challenges of Contact Center Implementation. One of the most important implementations, which are used by financial organizations and Banks, is the **Contact Center**. NGN based Contact Center is a powerful tool that provides the enterprises with the capability to improve their level of service to their customers. Furthermore, it enables the enterprise to provide the end-user with add-on services that were not accessible using the traditional circuit switch environment.

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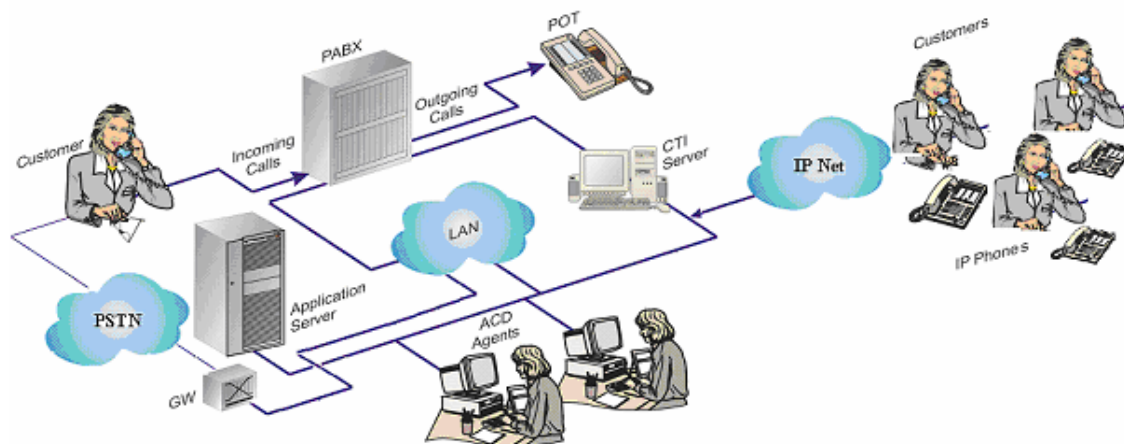
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Executive Summary

NGN based Contact Center converged Real-time applications (such as voice, video and fax) and data over IP networks (Account status, Billings, etc.). However, the nature of connectionless media over packets on one hand, and the different Contact Center implementations presents many complexities and challenges. Typical examples include problems of integration into traditional telecom infrastructures and billing systems; the many add-on services and large variety of protocols involved; the issues of quality and reliability, which are essential but often difficult to provide; the necessity for network specialists who are expensive and hard to find. Additionally, the hostile environment of IP networks presents challenges to gain high Quality Of Service (QoS), Grade Of Service (GoS) and media quality. What is clear is that a better understanding of the VoIP based Contact Center components and behavior will definitely help the enterprise in pre-planning and predicting performance and level of quality and service.



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Main Components and Functionalities

In this section we shall present the typical Contact Center vital components and the problems that may be involved.

In order to overcome these problems, it is essential to be able to predict them and use proper procedure to pinpoint them.

Before deploying a Contact Center system, a predictive environment should be constructed simulating reality.

ACD- Automatic Call Distribution

Provides the system with automatic mechanism that distributes the incoming calls between the Agents that provide the Enterprise customers with the needed services.

The ACD mechanism mainly dealing with Voice sessions, however the mechanism can be elaborated in order to support On-line chat (Such as ICQ) between the customers and the agents.

During rush hour, the ACD mechanism should maintain its functionality and withstand the stress. The ACD mechanism should manage the calls distribution in conjunction with the Queuing management.

It is important to simulate the incoming calls according the Poisson model, and verify the efficiency of the system meaning:

1. What is the maximum, minimum and average response time per calls?
2. How long each agent was busy, available and how many calls he handles during one busy hour?

IVR- Interactive Voice Response

Provides the customer with the capability to receive voice-based services using DTMF for indicating the service type that is needed.

There are two main factors that should be tested:

1. Does the system react according the DTMF streams that had been sent (Inband or Out-band) using VoIP?
2. Does the IVR system properly function under stress?

Comprehensive acceptance tests enable the enterprise to get the answer for these two important questions.

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Reliability is the key for success. User does not tolerate for mistakes or malfunction, due to a poor IVR mechanism that was not tested properly before and during the deployment process.

Application server

The application server enables to provide the customer with add-on services such as unified messaging, receiving the account status by E-mail, Fax or as a voice message form.

In order to provide the services in a very efficient way, the agent accepts the customer's details (on-line) several seconds before he answers the call that was transferred to him by the ACD mechanism. The details contain the customer name, account status and other valuable information. It allows the agent to provide a personal treatment and save a lot of time for both: the service provider- the agent, and the customer- the service receiver.

One of the most important challenges is to provide the SP and the customer with security: **only the customer should be able to receive details regarding his account.**

In order to assure the privacy and security aspects, the user that initiate the session (by phone or chat) should enter his PIN code (Personal Identification Number). Furthermore, in order to double security, the system/Agent may ask the customer several questions in random order and the customer should be able to provide the correct answers. A pre-defined list of questions and answers is prepared and entered to the system at the registration stage. In order to have a better security, the system/Agent presents different question during every new session.

The application Server should be tested under predictive environment/conditions.

Fault insertion tests (as part of acceptance tests) should be conducted in order to verify the immunity of the system against intruders and unauthorized users.

The functionality under stress should be tested as well, including the unified mechanism.

The "Pop-up screen" mechanism should be tested for incoming calls. Proper plans that predict the behavior of the system, traffic calculations (comply with Erlang C model) insure the performance and the level of service the customer gains from the system.

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Voice recognition system (VRS)

Another method to secure the system and avoid unauthorized personal to use the system is by combining a Voice Recognition application.

A huge progress takes place in this area. Using powerful dedicated DSP, sophisticated Conversion mechanism that represents the voice characteristics (Accent, Pronunciation, frequencies, Harmonies and amplitude) enables to authenticate the customer according his voiceprint.

Dynamic **VRS** has the ability to follow up changes in the human being voice due to Aging, and still provide a high reliable authentication mechanism.

VoIP based system may cause quality degradation due to several parameters:

1. Jitter – different latency per different packets over the network
2. Compression and decompression mechanisms
3. Silence suppression
4. Quantization distortion
5. Harmonic distortion
6. Packet Loss
7. Packets miss-order
8. Echo phenomenon

It is tremendous important to test the VRS under real-environment conditions by using an IP network emulator. Furthermore, these tests should be conducted under stress condition to verify the behavior of the VRS- Low MIPS DSPs can cause the system to work with low reliability and low efficiency.

Data base center (DBC)

In order to pullout the end user details during the session, a huge database should be accessible. The response time for replying queries and the capacity of the Database are important factors. Most of the databases are using redundant topology (RAID). In case there is a failure, a backup mechanism should take place so the system will continue to function.

The database should be protected against intruders and unwanted/unauthorized users that may pullout valuable information, or do some actions with others accounts.

In order to test the functionality of the Database and the integrity of the redundancy mechanism, tests should be conducted, simulating many incoming calls that send queries to the DBC.

Using the **Acceptance test simulators**, the enterprise can generate huge number of queries and find out how the DBC function.

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Management tools

The management tool of the Contact Center provides the enterprise to evaluate the level of service that the customers receive. It provides the managers some statistics and on line details regarding the Agents status, how many call they reply during a period of time, how long each one of the Agent was in a “Non working” mode- **DND** (“Do not disturb”) and what was the response time to the incoming calls.

Other parameters that should be analyzed:

The **queue status**- how many customers are in “Hold” position waiting to receive service?

Response time-What is the Maximum, Minimum and average time for the customer to Wait by the time they get a response for receiving services
How many **abandoned customers** during a pre-define time due the possibility they have to wait too long time in the queue for getting services
The Contact Center Management system is responsible for sending Alarms to the NOC (Network Operation Center) regarding malfunction of the Contact Center components, Traffic Blocking, Congestions and bottlenecks that avoid the customers from receiving an access to the system.

In many enterprises the Contact Center implementation is a **distributed network based**- the customer is routed to one of the agents that can be located any place: One of the Banks/Enterprise office, his private home, or any other location.

In this case a Networking ACD will be activated. The management system should monitor the routing process and deliver the statistics and the status for this implementation.

Predictive dialing system (PDS)

Using manual methods to reach customers is expensive and inefficient. Calling consumers at home during the permitted times for unsolicited telemarketing (9 AM to 9PM) the probability to fulfill the sessions can be only 12% of the calls that the agents dial. The PDS provide the enterprise with the capability of initiate a call to the customer with a high probability to locate him and fulfill a successful session (Call completion).

The PDS is a sophisticated system that conducts the call during the time when the probability to reach the customer is high (such as the schedule for the customer to be back home from work and the phone number accordingly) and initiate the call to the customer during the time that the customer is

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available. At the same event, an agent should be accessible so the customer will be routed to this agent immediately after reply (Connect event). The PDS can use a “Follow up” mechanism that may locate the customer among different phone numbers.

There are two main goals for using predictive dialing system:

1. Telemarketing
2. Respond to abandoned customer that had no time to wait in the queue.

Data-logger

In order to be able to follow up the calls, the instructions and the actions that had been made, a Data Logger system accumulate the records and store the call details for on-line recording and history records

IP Phones/Internet Telephony Gateway

The access to the Contact Center can be done through the traditional PSTN or directly through the IP net.

The access through the IP net can be done directly by using an IP phone, or using a POT (Plan Ordinary Terminal/Telephone) through a Gateway.

In order to save BW the VoIP path can be implemented using Media Compression (G.729, G.723, etc.), Silence suppression, Multi-frames per packet structure, or CRTP (Compressed Real Time Transport Protocol). These mechanisms may introduce the Contact Center system several challenges:

QoS, GoS and Voice quality degradation.

Authentication center

In order to follow up the customer's actions, and to allow only permitted customers to use the system, an Authentication process should take place. By entering his PIN code (Personal ID Number), the system allows the user an access to the Contact Center functions.

New customer will be routed to the **Registration center** in order to receive a PIN code, Record their **voiceprint** (for the Voice Recognition system), and to enter other relevant information.

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Performance and Integrity

In order to insure that the Contact Center can withstand the predicted amount of traffic, calculations and tests should be conducted, based on the Erlang B and Erlang C traffic models.

One of the main tasks when deploying a Contact Center, is to test if the estimated number of agents and trunks (lines) that are needed per each hour during a working day, in order to handle pre-defined number of calls and provide with an acceptable GoS (Grade Of Service) are comply with the requirements.

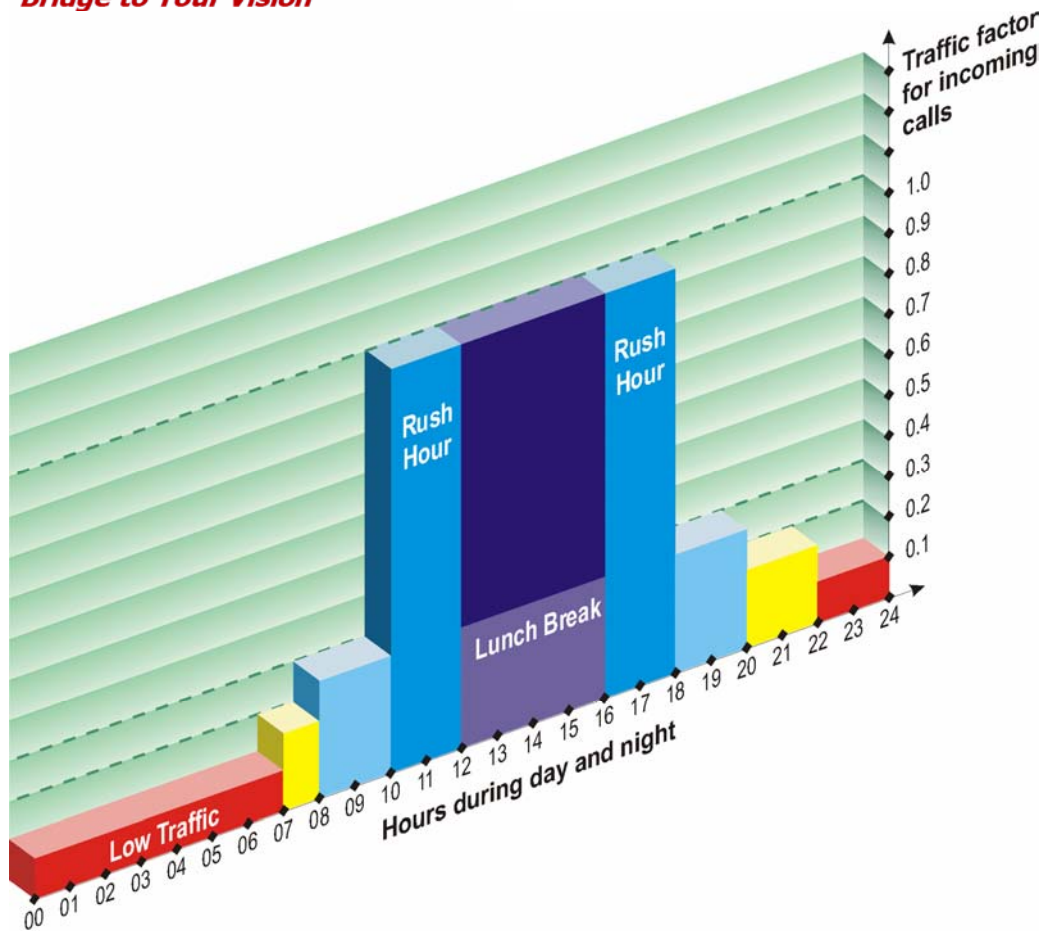
Dynamic tests should be done in order to evaluate the performance of the Contact Center versus number of agents that are required. This is an on-going process, which will require permanent reassessment as the circumstances of a Contact Center change. Factors such as peak hours, special periodic time (end of the year) and special events (marketing campaigns) should be taken into account.

Fundamental parameters should be known or anticipated:

1. Number of users
2. Average duration of a call including the wrap up time (the time an agent remains unavailable to answer a call after a call has been completed)
3. Number of incoming calls- Traffic is derived from the number of users, busy hour and low-traffic periods according the Typical Traffic Model as follow:

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X (T)- The hours during day and night

Y (N)- Traffic factor for incoming calls

- The Traffic factor represents the amount of the traffic related to the rush hour traffic.
- $N = \text{Amount of traffic} / \text{Maximum amount of traffic during rush hour}$
- During lunch break there is a probability that the traffic will be lower than the traffic during the rush hour. However there it can be different per geographical location and the characteristic of the business (due to Stock market activities, even the lunch break considered to be part of the rush hour).

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4. Average delay for the incoming callers (Queuing)
 - Level of service that should be defined by the enterprise reflected by the requirements: (X)% of calls are answered within (Y) seconds
5. *Average Wrap Up Time* - This is the time, in seconds, during which an agent is not available to answer a call after completing the last call.
6. GoS- Grade of service target. It is expressed as a fraction of the total calls, which will be lost because insufficient lines have been provided. For example, *0.010* means that 1% of all calls would be blocked.

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Summary

NGN call centers present many challenges: integrating traditional telecom infrastructures with the wide array of protocols that are required to support new, add-on services; quality and reliability issues, which are essential but often difficult to control; dependency on network specialists who are expensive and hard to find; and the challenges associated with achieving high Quality of Service (QoS), Grade of Service (GoS), and media quality.

Despite these complexities, an increasing number of enterprises are turning to VoIP call centers as a cost-effective solution that allows them to deliver the kind of customer experience that strengthens customer relationships. Growing at a rate of 20% per year, call centers are taking center-stage as the critical connection between a company and its customers. A company's call center empowers its customers to summon service in real-time or near real-time via phone, fax, email, website, and/or interactive voice response (IVR). However, the quality of service experienced by customers can substantially strengthen or severely try their loyalty.

The key to the success of call centers is the quality and performance they can provide. With an understanding of the system's components and the right-test tools, NGN call centers can be implemented with confidence and maintained with integrity.

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