How Fast Can You Call?

Demystifying Call Capacity in Telecom Notification Systems

A White Paper from Xancom

Table of Contents

Summary

Notification systems have evolved since their introduction in the 1980's to help schools notify families of student absences, emergency situations, application deadlines, event reminders, lunch monies owed, weather closures and other noteworthy occurrences. Schools have come to rely on the systems as a prominent feature in strengthening their relationship with parents and in supporting the academic success and safety of students.

In assessing notification systems, schools and school districts often encounter wide-ranging statistics on the call volume supported by competing products. While feature sets and statistics on capacity are easily compared, it is more difficult to anticipate how the products will work once installed. Furthermore, no supplier can accurately quantify or guarantee exactly the speed with which a system can deliver phone notifications to all of the families in a specific school district, among the most important criteria for purchasing the system in the first place.

The objective of this paper is to emphasize and explain the distinction between call initiation rates and call delivery rates in notification systems. It describes some of the steps in completing an automated call, focusing particularly on those over which the notification system has no control. Acknowledging that no system can guarantee exact delivery rates on submitted calls, the paper ends with an outline of what to look for in a notification system to ensure high call-delivery rates and maximize reliability.

Main Messages

- *In notification systems, there is an important difference between call-initiation rates and call-delivery rates.*
- *While it is easy to guarantee high call-initiation volume, capacity bottlenecks inherent to telecommunication networks prevent anyone from guaranteeing the precise delivery rates of all of these calls.*
- *A rapid notification system built on diverse telecommunication networks optimizes redundancy and failover in call initiation and delivery.*

Background – Call Routing

High-volume notification systems are built on more than simple cross-town phone calls. Systems tasked with delivering tens of thousands or hundreds of thousands of calls in a short period of time are hosted in vendor service centers to take advantage of huge capacity, nationwide infrastructure and economies of scale. Thus, the announcement sent out by a school district to 5,000 families in the surrounding community may travel much farther than just the five miles from the district office to the destination telephones. Figure 1 shows a typical route for such an announcement.

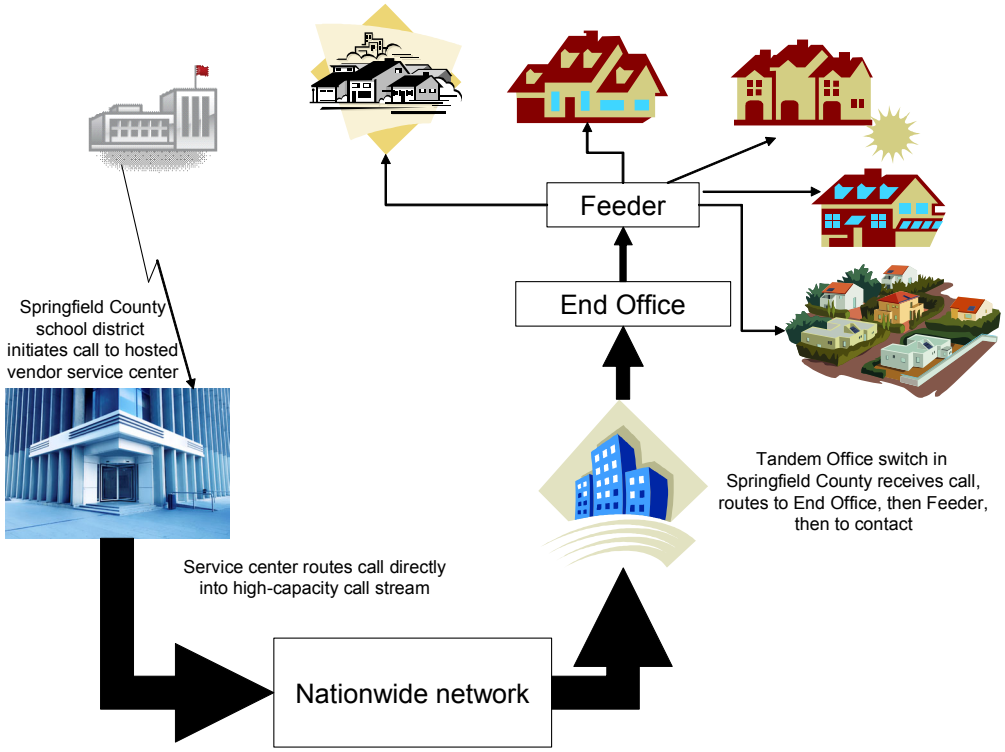

Figure 1 - Notification System, Call Routing

To initiate such high volume, notification systems introduce calls to the phone network from service centers around the country, rather than from the local telephone company (telco). The service center hands the call off to a nationwide carrier, the point of highest capacity (or "fattest pipe"). As the call moves from nationwide to local, it enters a switch in the local telco's tandem office, after which it moves to an end office, then to a feeder and finally to the destination telephone in the house.

Nationwide carriers have entire departments that study network utilization and then plan their resources accordingly. Based on typical traffic into a given region, they contract with the local telcos for an optimal, cost-effective number of dedicated physical ports in the switch in the tandem office ("tandem switch"). This number of physical ports translates into the maximum number of calls they can deliver into that area at one time.

So, while a notification system can specify the **initiation** of tens of thousands or even hundreds of thousands of calls within a few minutes, it has no control over the **delivery** of these calls. The bottleneck usually lies at the point where the nationwide carrier hands off the calls to the tandem switch, a point far beyond the control of the notification system.

Call Initiation vs. Call Delivery

Facing a tornado watch, the superintendent of a 5,000-family school in a 20,000-household community in Mississippi decides to close schools for the day and notify parents. She knows that her notification vendor has stated capacity to initiate over 6,000 calls per minute, and she assumes that the job will take a few minutes at most. Days later, after the

weather has cleared, she reviews her system's call logs and is shocked to see that it took approximately 30 minutes for all of her calls to go through. Why the difference?

Here are some of the details behind the delay:

[1] As noted, nationwide carriers keep their costs low and optimize their valuable capacity with the local telcos based on a typical level of traffic. The effect of this capacity planning is that, at any one time, the network can serve only a fraction of total telephones in the community. It is never possible for all customers in a service area to use their phones at the same time.

[2] Although there may be ample unused capacity on either side of it, the tandem switch can handle calls only up to the number of dedicated physical ports, perhaps as few as 1,000 in this example. (See Figure 2.) After that, the switch will become saturated and return a network-busy tone or message ("All circuits are busy… please try your call again later.").

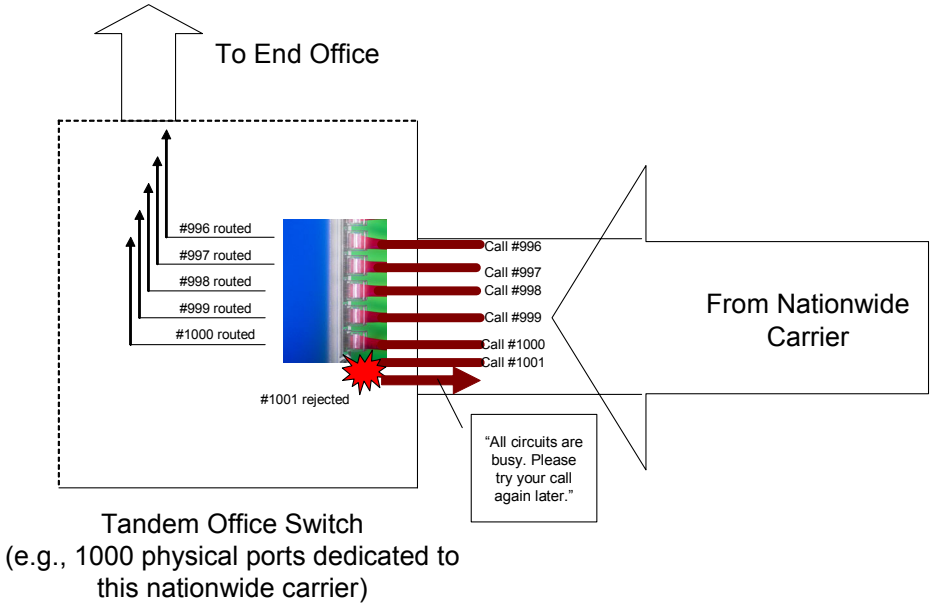

Figure 2 - Limited Physical Ports in Tandem Switch

[3] There are always many other users competing with the notification system for dedicated physical ports. Phone calls going into or out of the service area – especially with a tornado watch in effect – occupy dedicated ports in the switch, reducing available capacity for the school district's calls.

As a result of the notification system's ability to keep retrying the numbers, eventually all families receive the news of the school closure. However, call capacity based on typical network traffic explains the difference between the two minutes to initiate all of the calls and the 30 minutes to deliver them successfully.

Call Capacity – Analogy

The Rose Bowl in Pasadena, California, plays host to the football team of the UCLA Bruins, whose campus is 25 miles away in Westwood, west of Los Angeles. After each game, tens of thousands of students get into their cars and drive back to campus, eager to celebrate the game. While there are plenty of freeway onramps to the north, south and east of the Rose Bowl, and plenty of capacity on the freeways, there are only two offramps close to the campus, where post-game traffic slows to a crawl.

The notification system lies at the Rose Bowl end of this analogy, readily capable of handing traffic off to nationwide carriers, represented by the freeway system. Despite the high capacity of the onramps around the Rose Bowl, however, it has no control over the capacity at the campus end of the trip. It can claim with reasonable certainty that the students will arrive on campus eventually, but it cannot guarantee that all of them will arrive within a specific timeframe.

The campus and the department of highways realize that it would be cost-prohibitive to build all of the offramps required to accommodate the post-game spike in student traffic, and besides, the current offramps suffice for the usual amount of traffic. Similarly, the nationwide carrier contracts with the local telco for switch capacity based on typical traffic, not for occasional or unpredictable spikes.

Notification Systems Done Right – What to Look For

Notwithstanding the important difference between call-initiation and call-delivery rates, school districts are realizing the benefits of communicating in a timely, on-demand fashion using notification systems. Serving these districts are several top-tier notification solutions with the infrastructure and technologies in place to deliver messages into their local area as fast as physically possible.

Given that call-initiation rates and call-delivery rates are not necessarily the same, and understanding that school districts must examine more than the simple statistic of how many calls per minute a system can initiate, the following are important characteristics in evaluating notification providers.

Technology Mix

A supplier taking advantage of different network technologies offered by its nationwide carrier will likely realize cost savings while introducing healthy redundancy to the system. Routing calls over a combination of traditional TDM (Time Division Multiplexing) and VoIP (Voice over Internet Protocol) technologies introduces failover and diversifies the call delivery method.

Geographically Dispersed Network Onramps

Nationwide infrastructure provides not only capacity, security and reliability, but also strategic geographic reach so that calls can enter the network from anywhere in the country. This reduces the risk that congestion in one area will interfere with call distribution.

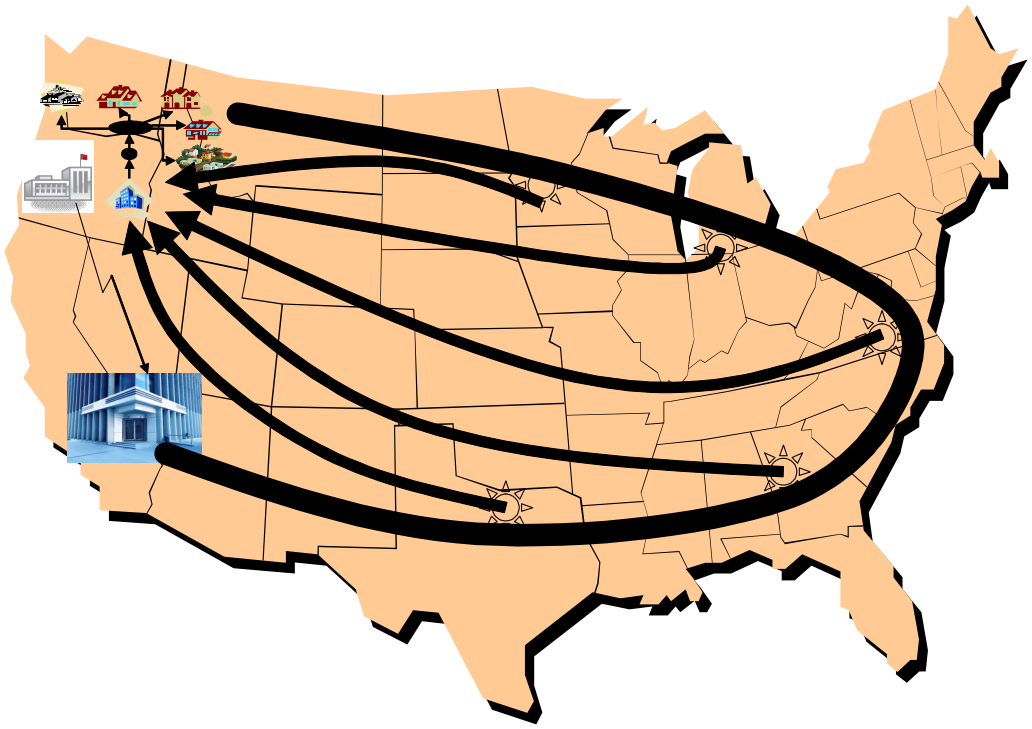

Figure 3 - Network Onramps

For example, severe storms force road closures in northwest Oregon, so the school district initiates a call to 5,000 families. An appropriately built system can break the calls into smaller batches and place them in the network as calls originating from Texas, Georgia, Virginia, Michigan and Minnesota as shown in Figure 3. The carrier delivers the calls to Oregon, but one parent could receive the call from Virginia, while her next-door neighbor could receive the same call from Texas, Georgia or Michigan. With no single point of potential failure, the risk of calls not being delivered is greatly reduced.

Robust Infrastructure

Another important layer of infrastructure behind the supplier of the notification system is the company that hosts the service. Between the school district office and the nationwide carrier is a layer of interconnection services and data centers that support the system. A high-profile provider that offers redundancy, security, backup power, disaster recovery and high uptime should host these services.

Average Capacity Utilization

How much capacity does the supplier use on average? Conversely, how much capacity does the supplier have available in case of an emergency of the magnitude of a Hurricane Katrina, for example?

The importance of this criterion is that it is possible for a supplier to sell more total capacity to its customers than it has contracted with nationwide carriers to provide, or at least more than it can satisfactorily service in case of a sudden spike in call volume. So if the average

actual system utilization of its school district customers in Idaho, Wyoming, Colorado and Utah adds up to 40% of the capacity which the supplier has available from its carriers, a heavy snowfall could easily result in poor system performance as the call volume in four neighboring states rises sharply.

Industry leaders favor a ratio of actual usage to contracted capacity in the range of 2-4%. While this may seem unnecessarily low, it favors school districts by demonstrating conservative planning and a more-than-adequate margin for eventual growth.

Throttling

While call-delivery bottlenecks are beyond the reach of a notification system, call-initiation bottlenecks should be within its control. The capacity to dispatch thousands of calls per minute matters little if the local telco cannot accept them, so the system should allow for "throttling back" call initiation.

Throttling governs the call-initiation rate. When the system receives fast-busy signals indicating that all outbound circuits are busy, it should be configurable to manage congestion at the point of initiation, or to hang up and try the call again.

Multiple/Unlimited Contact Points

As described above, it is an advantage for a notification system to accommodate multiple phone numbers and other contact points per family – including e-mail addresses – to deliver notifications to as many kinds of device as possible. When a message can travel over different networks, it is more likely to avoid the bottleneck at the tandem switch.

Furthermore, if recipients can control which messages reach which contact points, they can avoid the annoyance of, for example, a soccer announcement interrupting a business meeting.

Proven Performance in a Range of School District Sizes

Handling a wide range of message delivery environments is another key to success. A notification vendor should be able to demonstrate experience delivering notifications in a range of client sizes, including the nation's largest school systems (150,000 or more students) and smaller, rural school systems. This diversity of experience should include success in all regions and most states throughout the U.S.

System Reporting

Schools and school districts that depend on a notification system also depend on the reports they receive from them. The system's reports should include:

- Details of broadcasts
- Delivery ratios and times
- Names of families not contacted
- General system performance over time

Conclusion

In notification systems, high call-initiation capacity does not always imply high call-delivery capacity. The delivery bottleneck usually lies close to the destination of the call, in the tandem switches that link the nationwide carrier's network and the local telcos; thus, no supplier can guarantee exact call-delivery rates.

Although these tandem switches are capacity-constrained and beyond the control of the notification system, schools can reduce the risk of uncompleted or delayed calls by selecting a system with such top-tier characteristics as built-in redundancy, robust infrastructure and geographically dispersed points of entry to the networks of nationwide carriers.

For more information about call initiation, call delivery and selection criteria for notification systems, visit www.xancom.com or contact Xancom at 866-555-0235.