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### **Calculating Trunk Requirements**

By Penny Reynolds, The Call Center School

#### **Introduction**

In getting the optimal call center resource plan in place, there are two resources that must be calculated. The first most important one is the number of staff, since that's where the call center spends most of its budget. The other resource that must be determined is the number of telephone trunks needed to bring the calls into the call center. This is a critical part of the overall design of the center.

Just as in a staffing design, the first step in calculating network resources is to define workload. The same forecast call volume used to calculate staff requirements is typically used to calculate telephone trunk requirements too. The difference in workload then, is the handle time of the contact. As stated earlier, while an agent's handle time is made up of talk time plus after-call work, the handle time associated with the telephone trunk is made up of ring time, delay or queue time, and the talk time.

		Staff	Staff
Ring	Delay	Talk	After-call work
Trunk	Trunk	Trunk	

#### **Staffing and Trunking Relationship**

Many call centers make the mistake of applying an arbitrary ratio of trunks to staff in their resource design. Some assume a one-to-one ratio and have an equivalent number of trunks to match the bodies in chairs. While this may be appropriate for some centers, it will be a mismatch for others.

Consider the two call center scenarios illustrated in Exhibit 9.3. Both centers have an average conversation time of 240 seconds per call and both centers answer the call after the first ring. The first call center has staffed so that its average speed of answer is 30 seconds and the agents have a significant amount of after-call work (60 seconds) to complete after each call. In this case, the trunk handle time of 276 seconds is less than the staff handle time of 300 seconds per call. In this case, fewer trunks than staff would be required. More staff are needed since one-fifth of handle time is spent in after-call work, with no trunk being occupied.

Consider now the case of the second call center. It also answers calls after one ring and has an average talk time of 240 seconds. However, its speed of answer is double that of the first center, and its agents spend only half as much time in after-call work activity. For this call center, the trunk handle time of 306 seconds is higher than the staff handle time of 270 seconds. In this scenario, more trunks than staff would be needed.

	Ring	Delay	Talk	After-call work
Call Center A	6 sec	30 sec	240 sec	60 sec
Call Center B	6 sec	60 sec	240 sec	30 sec

The right match of staffing to trunking is essential for proper resource planning. The number of trunks in place on the flow of calls that will be routed to the staff and therefore has a major impact on attainment of service goals. An likewise, the number of staff in place will affect delay times in queue and trunking requirements.

Care should be taken to ensure that there are enough trunks in place to provide a good level of service to callers. It is natural to assume that a call center might over-trunk to make sure enough inbound facilities are available to callers that a minimal number reach a busy signal, especially since the cost of a trunk is so much less than the cost of an agent. However, adding too many trunks without corresponding additions in staff is like increasing the size of a doctor's waiting room without adding more doctors. More people can enter the lobby (the call center queue), but everyone there will wait longer to be served. And since there are costs associated with this delay time if the call center is using toll-free services, the call center will be paying additional dollars for the longer wait time.

In making the decision about how many calls to accept versus limiting the number that come into the queue, it is important to consider how important it is to capture the call or not. In a sales situation, the call center will most likely want to let every call in, since responding with a busy signal might lose a potential customer. On the other hand, if the callers represent more of a "captive audience," it may benefit the center to allow in only the number of calls that can be handled in a reasonable amount of time with the assumption that the blocked callers will call back to be handled later.

### Trunking Models

While Erlang C is the model of choice to determine staffing needs, other models are used to replicate what happens with callers on telephone trunks. The most common traffic engineering model used in calculating trunk requirements is Erlang B. Erlang B assumes that if a call attempts a set of trunks and none are available, then the call simply goes away. Erlang B is fine to use in cases where there is very little blockage, but in cases where a significant portion of callers will retry the call instead of going away, Erlang B will underestimate the need for trunks.

For situations where a significant number of callers will retry their calls if blocked, a derivation of Erlang B is used that takes retry behaviors into account. This technique, called Extended Erlang B, takes the percentage of retry into account, as well as the speed of the retries.

Assume that a call center expects to receive 200 calls in an hour and each call takes 360 seconds of trunk handle (12 seconds of ringing, 48 seconds of delay, and 300 seconds of talk time) for a total of 20 hours or erlangs of workload. The call center wishes to block no less than two percent of inbound calls, and it assumes that about half the callers who are blocked will re-try within the same hour. In this example, 30 trunks would be needed to provide desired service according to the Extended Erlang B model.

### Trunking Requirements for 20 Hours of Workload

Calls per Hour	Handle Time	Workload (In erlangs)	Number of Trunks	Blockage Level
200	360 sec	20	27	4.3%
200	360 sec	20	28	3.0%
200	360 sec	20	29	2.0%
200	360 sec	20	30	1.4%

Sometimes the duty of calculating telephone facilities falls outside the realm of the call center and is the job of the telecommunications or IT department. Even if not directly responsible for the provisioning of these resources, how it is important for the call center to work closely with the group that has this responsibility. The number of facilities in place can affect the staffing requirements. Likewise, the call center's staffing design will have an impact on delay times, trunk workload, and overall telephone line requirements, so the two areas should work together closely to ensure an appropriate mix of telephone resources and staff are in place.

Note: An Extended Erlang B trunking model is available as part of the Quikstaff software tool, available as a free

download from The Call Center School's web site at [www.thecallcenterschool.com](http://www.thecallcenterschool.com).

Penny Reynolds is a Founding Partner of The Call Center School, a company that provides a wide range of educational offerings for call center professionals. Penny is a popular industry speaker and is the author of numerous call center management books, including *Call Center Staffing: The Complete, Practical Guide to Workforce Management* and *Call Center Supervision: The Complete Guide for Managing Frontline Staff*. She can be reached at 615-812-8410 or by email at: [penny.reynolds@thecallcenterschool.com](mailto:penny.reynolds@thecallcenterschool.com).

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