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Convergence POS Bandwidth and Internet (WAN) Connectivity Considerations

The Convergence Platform has integrated Box Office POS capability and Food/Beverage/Retail (FBR) POS capability. Although they share many common functions, such as scanning for cash control, ticket redemption, membership processing, and group sales check-in, our Box Office POS supports donations, adoption sales, education program registrations, and complex membership sales that our FBR POS currently does not. These additional Box Office features are important to our cultural attraction clients such as zoos, museums and aquariums.

Due to this, in any given peak hour, our Box Office transactions have a higher average time of transaction and higher average data received via the internet versus the FBR average transaction (which is typically shorter and less data transferred). Also, not all POS page loads in each transaction have similar data requirements; in fact, there is usually one page related to presenting products to the cashier that has significantly higher data requirements than the rest of the pages in the POS transaction flow. We identify this peak loading page as the **'Products Page'.**

Having sufficient bandwidth (BW) connection to the WAN for our Cloud-delivered Platform is obviously important for the quality of POS experience for cashiers and indirectly for guest convenience at the POS station. Client network WAN BW must be sufficient to satisfy three different performance metrics – both of which are important to the POS experience.

1. WAN BW must exceed aggregate required BW across all POS stations, regardless of type, during a peak period of use (we typically measure this for one hour, and assume 3 seconds between transactions for the next person/group to move up to the POS station and begin the POS transaction with the cashier at a POS station or at a unattended Kiosk station).
2. WAN BW must exceed the required aggregate BW across POS stations independently but simultaneously loading the peak 'Products Page' in a reasonable time. We assume 50% of the stations (since even during peak periods each POS station is likely to be at a different page in the POS transaction and even idle as the cashier converses with the customer). We also assume a 2 second page load for the Products Page (3 sec including server delay) is satisfactory for a smooth cashier POS experience during peak times.
3. Most clients do not have the liberty of having separate WAN connections for the POS network segment vs other client use of the WAN which can include Convergence Management Portal use, unrelated business system use, and even unauthorized staff internet use (especially music or video streaming). For this reason, we recommend that the client's total WAN BW is at least double or triple the Convergence POS estimated maximum BW (ie for headroom).

We have measured our POS BW usage for typical transactions in our latest release as of January 2018 and can provide the following guidelines to medium-sized clients. In the table below, we estimate 10 Box Office Stations and 20 FBR Stations which should be on the 'high side' to be conservative. We have found the BW requirement for simultaneous 'Products Page' peak loading is the most important BW calculation and is shown in the table below. Requirements for total BW can be estimated higher or lower based on station count, average transaction time, and time between transactions in a peak hour.

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POS	Total Stations	Ave Trans Time	Peak Page Data (Products Page)	Transaction Ave Total Data	BW PER Station (Peak Page Load)	Aggregate BW for All Stns (80%)
Box Office	10	60 – 180 secs	120 – 150 Kb	400 – 800 Kb	60 – 75 Kb/sec	480– 600 Kb/sec
FBR	20	60 – 120 secs	80 - 120 Kb	120 – 200 Kb	30 – 50 Kb/sec	480 – 800 Kb/sec

Although it might appear that a 2MB WAN connection might be sufficient for the 30 Station example calculation above, with our recommendation of 2:1 or 3:1 ratio of total WAN BW to peak POS BW, this above example would indicate a 5 Mb WAN connection would give good performance during peak times while allowing significant other non POS WAN use. Some ISP's also have 'burstable' plans which allow the client to exceed the stated BW with an overage charge. With 10 Mb and 100Mb connections now widely available at increasingly attractive rates, we also recommend getting the as much BW as practical for your location and budget.

As POS systems are mission critical for our clients, we do recommend an internet connection that has a 'dual' WAN connection. These dual WAN routers have become commonly used and are inexpensive. They support a secondary WAN connection as a 'hot' backup WAN connection in case the primary WAN connection goes down. Note that the secondary 'failover' connection can have a lower BW (and therefor cost) since it is not frequently used and some reduced performance is likely acceptable by the client. It is also becoming common for Dual WAN Routers with load balancing to have 2 active internet connections (such as a two 10Mb WAN connection). This can be effectively used to double the bandwidth if high BW providers are not available.

In addition, for security and performance, we recommend that the POS stations be in a segmented LAN. Please refer to the segmented client network with internet and network equipment redundancy below.