Bandwidth usage

1. Introduction:

The aim of this document is to help calculating the required bandwidth for installations using our access control systems.

Bandwidth or digital bandwidth is a rate of data transfer, bit rate, measured in bits per second or Kilobits per second, usually shortened to kbps or Kbps. The data transfer rate (DTR) is the amount of digital data that is moved from one place to another in a given time.

It is important to identify in which units the values are expressed:

For Data Transfer Rate, we are using the metric system as follows:

- 1 Mbps = 10^6 bits/s = 1,000,000 bits/s
- 1 Kbps = 10^3 bits/s = 1,000 bits/s

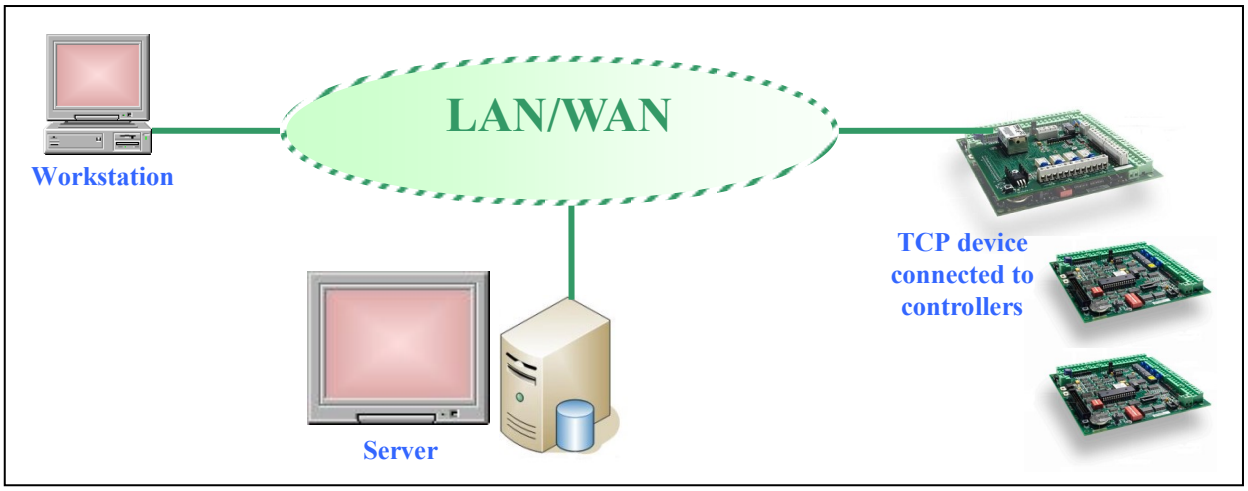
For data storage, we are using bytes as follows:

- 1 byte = 8 bits
- 1 kilobyte (KB) = 2^10 bytes = 1,024 bytes
- 1 megabyte (MB) = 2^20 bytes = 1,048,576 bytes

Kilobits per second is commonly used for measuring the amount of data that is transferred in a second between two telecommunication points. For example, a typical low-speed connection to the Internet may be 33.6 kilobits per second (Kbps).

Our access control systems can communicate over a network in two different ways simultaneously:

- Server communicating with its TCP/IP controllers.
- Server communicating with workstations.



For calculating the bandwidth used by the system, both types of communication, namely controllers & workstations, should be taken into consideration.

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2. Bandwidth usage between server and controllers

In normal operation, the server receives events by continuously asking (polling) the TCP controllers for events. If there are events, the 10 first transactions are uploaded to the PC before asking the next controller. If no events, the controller answers by an empty message and the application asks the next controller.
This communication uses 15kbps (1875bytes/sec) of bandwidth when no transaction is uploaded.
On the software, some communication parameters allow to optimize the communication with the controllers, like the polling Waiting Delay which helps to slow down the system so as to free the network and the PC (it is easily to see how changes in the Waiting Delay are applied by looking at the controller communication LEDs). The default value is 50 msec, which means that the polling rate is every 50ms, i.e., 20 times a second, allowing up to 200 transactions per second. With a Waiting Delay of 500msec, the bandwidth usage is 2.8kbps (350bytes/sec) when no transaction is uploaded. The user may set each controller network with a different 'Waiting Delay'.
Another communication parameter allows to optimize the communication with the controllers: the Communication Baudrate, the speed with which the data are sending, in bits per second (bps). The default value is 9600bps. With 38400bps and a Waiting Delay of 500msec, the bandwidth usage is 2.2kbps (275bytes/sec) when no transaction is uploaded and 3.3kbps (413bytes/sec) with 20 transactions per second.

Baudrate	Waiting Delay	Transactions/second	Bandwidth usage	
9600 bps	50 msec	0	15 kbps	1,875 bytes/sec
9600 bps	50 msec	20	8.4 kbps	1,050 bytes/sec
9600 bps	500 msec	0	2.8 kbps	350 bytes/sec
9600 bps	500 msec	20	6 kbps	750 bytes/sec
38400 bps	50 msec	0	15 kbps	1,875 bytes/sec
38400 bps	50 msec	20	4.3 kbps	538 bytes/sec
38400 bps	500 msec	0	2.2 kbps	275 bytes/sec
38400 bps	500 msec	20	3.3 kbps	413 bytes/sec

All the previous measures of bandwidth usage were realized on a controller network connected via TCP. These values are per controller network (practically, per IP address). When there are more networks, the required bandwidth should be multiplyed by the total number of TCP controller networks.
Note: the amount of controllers in each network is not relevant for the bandwidth since the application always communicates with only one controller from each network at any given time.

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3. Data transferred between server and workstation

When one or more workstation are running in addition to the server, they are using the 'Spread' application to send/receive messages across the LAN (on ports 4803 and 4804). In addition, the workstation also needs to access the database across the LAN. This data transfer across the LAN is only done following access/alarm events or during operations done by the users, and therefore it should not be calculated as a constant communication rate.

The time for transferring the data depends on the reserved bandwidth. Data are divided into packets following to the reserved bandwidth for them.

The following measures of data transferred across the LAN have been done on a 10,000 user database following to the most frequent user operations with both database types (Access and SQL):

Operation	Access type DB	SQL type DB
Loading access control software	464 kbytes	108 kbytes
Initializing one controller having 10,000 cards	3,900 kbytes	4,758 kbytes
Getting 100 events	895 kbytes	710 kbytes
Opening a screen	242 kbytes	157 kbytes
Creating new cardholder	461 kbytes	778 kbytes
Creating group of 100 cardholders	57,776 kbytes	25,927 kbytes
Importing 10 cardholders	229 kbytes	263 kbytes
Deleting existing cardholder	344 kbytes	184 kbytes
Editing a report of 25,000 events	353 kbytes	174 kbytes
Displaying video stream	65 kbytes	31 kbytes
Displaying photo	87 kbytes / event	42 kbytes / event
Saving database of 10,000 cardholders	3,813 kbytes	47 kbytes
Login/Logout	256 kbytes	72 kbytes

Note: These measures are for information only and should not be considered as standard values.

With these values, the time for receiving data can be easily estimated, if knowing the reserved bandwidth. For example, for initializing one controller having 10,000 cards, 3.9MB (= 3.9 x 1,048,576 x 8 ~ 33Mbit) of data should be transferred accross the LAN. If the network have 1Mbps of bandwidth, it will take about 33 seconds (=33Mbit / 1Mbps).