Guidance to Estimation of Required Bandwidth with the INET Nordics ITCH Flow

The highest network load is imposed by the INET ITCH flow, and more specifically the ITCH service covering all markets. This ITCH service is provided both as an IP Multicast flow and as a session over TCP; the latter means “normal” IP unicast addressing. This document explains the considerations for estimating the bandwidth need, based on the two types of ITCH flows.

The following bandwidth demand is recommended as minimum:
- ITCH (all markets) sent out as IP Multicast flow: **20 Mbps**
- ITCH (all markets) session as a “normal” TCP/IP unicast flow: **12 Mbps**

The ITCH Multicast flow has been measured to exceed a bit over 15 Mbps. Bearing in mind the side effects (such as re-requests needed by the application and the time it takes to get all lost messages) when network congestion causes dropped messages, the above recommended value (20 Mbps) shall at least be used as bandwidth demand. To some extent, this value also considers that “microbursts” must be possible (ref. the Case I explanation further below).

For an ITCH session over “normal” unicast, the above 12 Mbps is a bit higher than the measured peak value. As there is other traffic also giving load, and dropped messages will be handled by TCP (which retransmits), this peak value could be used when adding all other sessions’ load to the total bandwidth demand for the unicast traffic.

The aspects of estimating the total needs before “subscribing” bandwidth from the telco provider is explained after the below picture.

![Diagram of ITCH flow](image-url)
For the sake of simplicity, only the INET ITCH flows are depicted (and only one site).

The telecommunications provider having been authorized as Extranet provider (i.e. having termination equipment peering with NASDAQ OMX’ equipment) is here below referred to as the “telco”.

“100 Mbps” in the picture just means that it is here assumed that the speed of the access link to the Customer Premises Equipment (the telco may use other wording) is 100Mbps. The total bandwidth need for all services must hence be within 100 Mbps.

Two symbols in the picture further explained:
- Blue colored denotes a “unicast bandwidth class”
- Red colored denotes a “bandwidth class for Multicast”

The telco’s net should provide segregated paths for all of its customers. And each customer should have agreed (subscribed to) a certain bandwidth demand. Furthermore, in the case a customer using Multicast, the Multicast flow should be set up as an own segregated path with its own bandwidth demand. We can thus say that the network provides two “bandwidth classes” to the customer, depicted as above. Each class has hence its own “Quality of Service”.

The depicted two customer cases are: case I (depicted to the right, using Multicast) and case II. These are further dealt with here below.

Case I – ITCH Multicast user

Production flow

The earlier mentioned recommended Multicast bandwidth demand to subscribe to is expressed in Mbps (Megabits per second). This does not necessarily mean that the telco commits to this load as expressed in Mbps. It may be so that the Mbps value is said to be committed if the load is more or less well distributed over the period of time (i.e. over the period being one second), but not if so-called microbursts occur during short intervals. This has to do with the likely fact that the telco has implemented a “shaper” to commit a certain load during a short interval (time slot), being a number of milliseconds. Thus, there is a committed load during this time slot, and that puts a limit to the overall throughput.

Let’s say, just as a calculation example, that there are 50 such time slots during a second, and that M is the recommended value in Mbps the customer is about to subscribe to. This in turn means that the telco’s network can cope with a microburst traffic load of \( \frac{M}{50} \) Megabits per time slot. If the ITCH Multicast flow generates a microburst load exceeding this value, packets will be dropped. There is however a buffer, so some traffic load exceeding the committed limit can be handled.

NASDAQ OMX cannot influence the way a telco chooses to configure its network. We advice that you request information from your telco regarding the committed load, and if the recommended Multicast bandwidth you intend to subscribed to is sufficient. The telco may advice a higher subscribed bandwidth if there already is experienced that a higher committed load should be configured. I.e. the telco has experienced from existing customers’ flow what really is required. Also, you should request the telco to monitor packet drops. If there are drop occurrences you should discuss with the telco if it is based on too low subscribed bandwidth.
Test flow

In parallel with the Production flow as discussed above (and depicted with the red symbol), the telco should also deliver the Test Multicast flow as a segregated path and with its own bandwidth demand. Thus also segregated from the Production flow whereby the Test flow cannot disturb the Production flow.

If however the telco does not segregate the two flows, the recommended bandwidth demand for the Test flow must be added to the Production flow for the “common class” bandwidth to subscribe.

Case II – ITCH over TCP

Production flow

This section deals with the Unicast bandwidth demand and is also of interest to a Multicast user, for two reasons:

- Sessions over TCP are used for other services, but a Multicast user also needs to consider the bandwidth for ITCH over TCP, if there are situations where it will be used.
- Re-request traffic for lost Multicast messages is over UDP, but is Unicast traffic. When the overall Unicast bandwidth is estimated as described here below, additional bandwidth should be considered so that re-requests do not give too much disturbance to the other Unicast traffic. On the other hand, as re-requests must be repeated when much data has been lost, the re-request procedure gives not a too big bandwidth demand; and furthermore, the longer the distance between client and server, the less bandwidth is consumed by re-request messages (based on the fact that the longer the distance, the longer the interval between each re-request).

The earlier mentioned recommended ITCH bandwidth demand over TCP is for a single session. It needs to be multiplied by the number of ITCH sessions assumed to be concurrently established.

The next step is to add all other services. Hence, the bandwidth for every other service and based on number of concurrent sessions. Every other service is here not only the other INET services, but also the ones based on the other systems such as GCF/TIP, CLICK etc.

The total sum for the Unicast bandwidth demand will be a value expressed in Mbps (Megabits per second). This does not necessarily mean that the telco commits to this Unicast load as expressed in Mbps. It may be so that the Mbps value is said to be committed if the load is more or less well distributed over the period of time (i.e. over the period being one second), but not if so-called microbursts occur during short intervals.

The likely fact behind this has been outlined under the Multicast section above. The Unicast case is a bit different though. You may have calculated that the total Unicast demand is 14 Mbps (just an example here) and the telco provides 16 Mbps as the nearest (upper) bandwidth to subscribe to, so in this case you will find it reasonable to subscribe to 16 Mbps for Unicast bandwidth.

Occasional packet drops for TCP traffic does not give the same impact as for Multicast, as TCP retransmits. You should agree though with the telco that the Unicast traffic is monitored, and if packet drops occur it may be a need for subscribing to a higher bandwidth demand.
Test flow

In parallel with the Production flow as discussed above (and depicted with the blue symbol), there is also the need for Test flow. But it may be contained in the same Unicast bandwidth class as Production. And if so, the sum of the recommended bandwidth demand for all Test traffic must be added to the Production bandwidth before a common Unicast bandwidth demand can be subscribed to. If Production and Test flows are segregated or not, is a matter between you and the telco.