

1. Objective

The objective of this document is to provide the wireless downlink bandwidth requirements that are necessary for a proper use of VidyoMobile in the different use cases outlined below

2. Description

The results of the measurements will be given as a range of bandwidth which is recommended for a proper operation of the VidyoMobile applications. The minimum and maximum bandwidths that define the range are defined as follows:

- Min: the bandwidth where below it the conference is no longer able to sustain itself, hence the connection disconnects
- Max: the bandwidth where any incremental bandwidth above it doesn't improve the audio/video quality in a significant manner

TBD: an additional threshold is required which will specify the minimum bandwidth required for a decent audio and video experience.

3. Setup

Assumptions:

- bandwidth results have been recorded after allowing 30 seconds of stabilization
- a test clip has been used during all measurements which mimics an average conference behavior (a professor writing on a white board during a lecture)

4. Bandwidth requirement per device

Note: Number of participants refers to number of streams

I. iPhone 4S

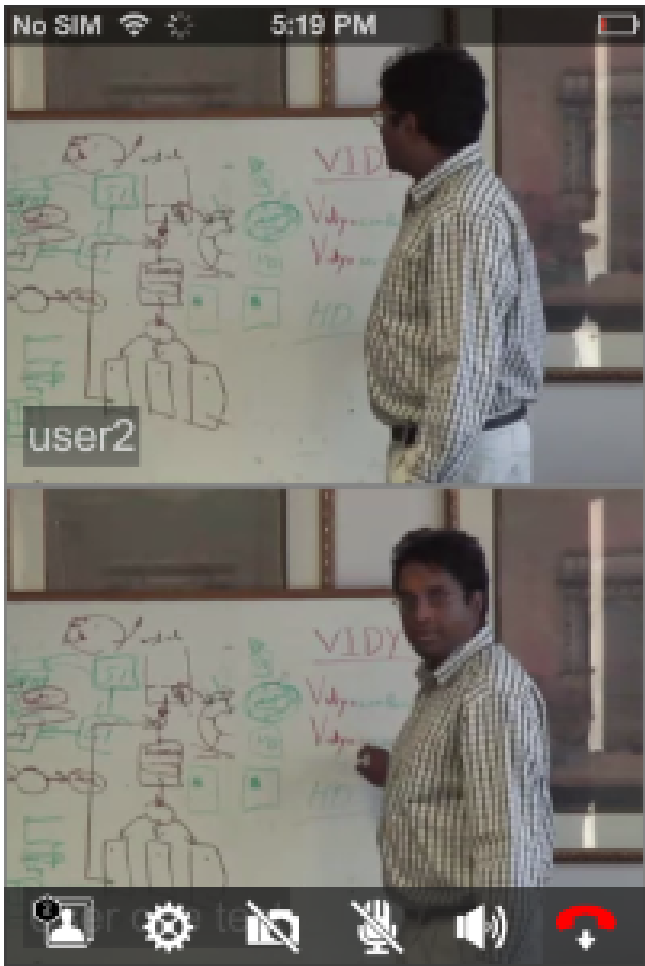
With one participant:

	Participant 1 (User one)	
Bandwidth	Resolution	Frame Rate
0.06 Mbps	320x180	3-4 fps
1.47 Mbps	1280x720	15-20 fps



With two participants:

	Participant 1 (User one)		Participant 2 (user2)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate
0.15 Mbps	320x180	3-4 fps	320x180	3-4 fps
1.62 Mbps	640X360	29-31 fps	640x360	29-31 fps



With three participants:

	Participant 1 (user3)		Participant 2 (User one)		Participant 3 (user2)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate
0.26 Mbps	320x180	4-6 fps	320x180	4-6 fps	320x180	4-6 fps
2.14 Mbps	640x360	29-31 fps	320x180	29-31 fps	320x180	14-16 fps



With four participants:

	Participant 1 (user4)		Participant 2 (user3)		Participant 3 (user2)		Participant 4 (user1)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate
0.26 Mbps	320x180	2-3 fps	320x180	2-3 fps	320x180	2-3 fps	320x180	2-3fps
2.39 Mbps	640x360	5-31 fps	640x360	5-31 fps	640x360	5-31	640x360	5-31



I. iPad 3

With one participant:

	Participant 1 (user2)	
Bandwidth	Resolution	Frame Rate
0.07 Mbps	320x180	5-7 fps
1.47 Mbps	1280x720	15-20 fps



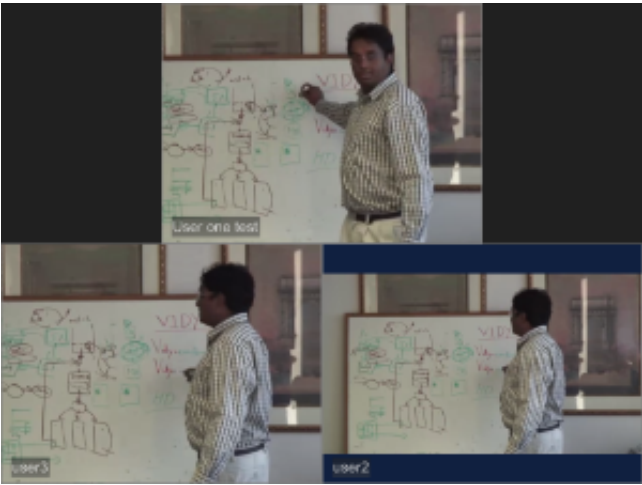
With two participants:

	Participant 1 (User one)		Participant 2 (user2)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate
0.13 Mbps	320x180	3-4 fps	320x180	3-4 fps
1.10 Mbps	640X360	29-31 fps	640x360	29-31 fps



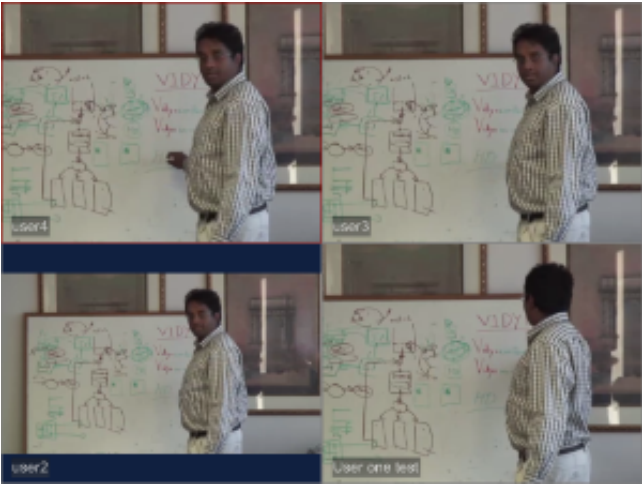
With three participants:

	Participant 1 (User one)		Participant 2 (user3)		Participant 3 (user2)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate
0.22 Mbps	320x180	2-4 fps	320x180	2-4 fps	320x180	2-4 fps
2.06 Mbps	640x360	29-31 fps	640x360	29-31 fps	640x360	14-16 fps



With Four Participants:

	Participant 1 (user4)		Participant 2 (user2)		Participant 3 (user3)		Participant 4 (User one)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate
0.22 Mbps	320x180	2-3 fps	320x180	2-3 fps	320x180	2-3 fps	320x180	2-3 fps
2.21 Mbps	640x360	29-31 fps	640x360	29-31 fps	640x360	14-16 fps	640x360	14-16 fps



I. iPad 2

	Participant 1	
Bandwidth	Resolution	Frame Rate

.14 Mbps	320x180	6-8 fps
1.47 Mbps	1280x720	15-20 fps

	Participant 1 (user4)		Participant 2 (user2)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate
.22 Mbps	320x180	4-6 fps	320x180	4-6 fps
1.18 Mbps	640x360	29-31	640x360	29-31

	Participant 1 (user4)		Participant 2 (user2)		Participant 3 (user3)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate
0.29 Mbps	320x180	3-5 fps	320x180	3-5 fps	320x180	3-5 fps
1.69 Mbps	640x360	29-31 fps	640x360	29-31 fps	640x360	14-16 fps

	Participant 1 (user4)		Participant 2 (user2)		Participant 3 (user3)		Participant 4 (User one)	
Bandwidth	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate	Resolution	Frame Rate
0.29 Mbps	320x180	3-5 fps	320x180	3-5 fps	320x180	3-5 fps	320x180	3-5 fps
2.21 Mbps	640x360	29-31 fps	640x360	29-31 fps	640x360	14-16 fps	640x360	14-16 fps