# News release

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## European project in cardiology for chronic patients

### Speed test for emergency scenario of the cardiac telemedicine system

**Heidelberg, 17th of December 2018** - Under the TRIANGLE consortium the CAST team had the opportunity to test the whole communication chain, from the hardware to the server over the mobile network and benchmark the system under different conditions. The team measured the communication speed (network latency) between the t-shirt and cloud system, specifically when in motion through the city and with different network loads. These are the relevant KPIs for a secure and reliable e-health application that will effectively intends to help cardiac patients in need. Other relevant KPIs are the reliable 4G communication handoff when the patient is in motion, data corruption of discontinuity of ECG due to this motion, benchmarking and performance of communication speed and network latency maps, measure battery-life. With the testbed provided by TRIANGLE it was possible for the CAST development team to have the system fully tested and validated before its commercialization. Comparative analyses of acquired data enable us to check the Quality of Service (QoS) and Quality of Experience (QoE) KPIs that the users of our wearable solution can expect.
The tests were done on the following scenarios: “Ideal”, “Urban pedestrian”, “Traffic jam”, “Shopping busy hours” and “Tunnel”. Each scenario was tested considering a low and a high data rate, and can be summarized in the following graphs:

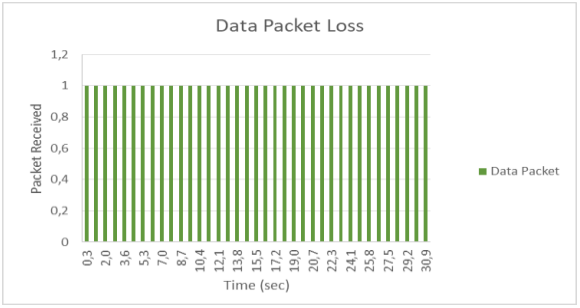



*Figure 1 - High data rate- Ideal – Data packet loss*

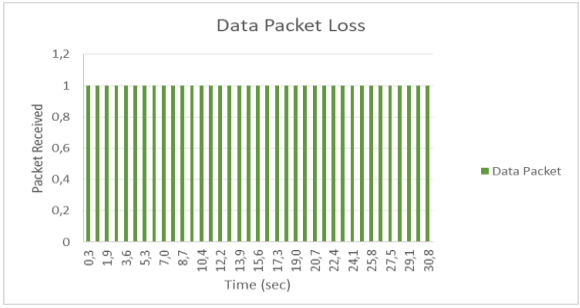



*Figure 2 - High data rate- Urban Pedestrian – Data packet loss*

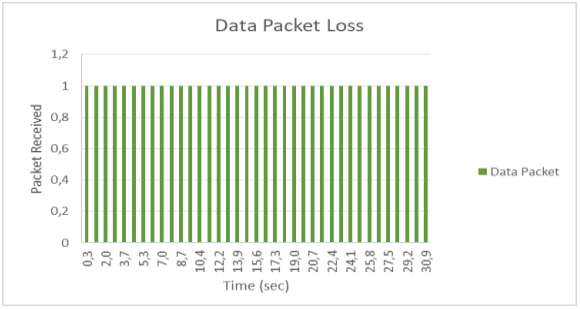



*Figure 3 - High data rate- Traffic Jam – Data packet loss*

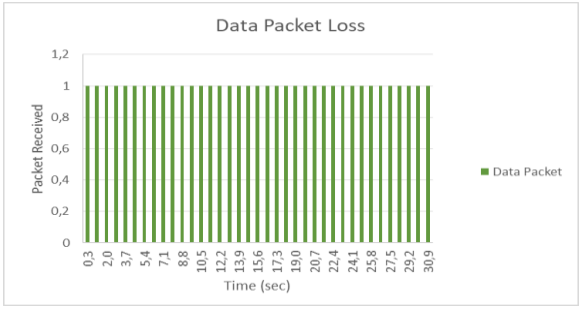



*Figure 4 - High data rate- Shopping busy hours – Data packet loss*

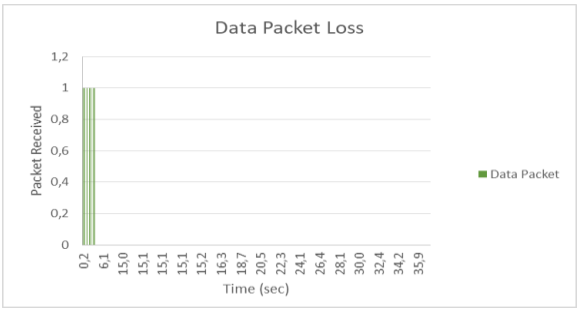



*Figure 5 - High data rate- Tunnel (1 seconds) – Data packet loss*

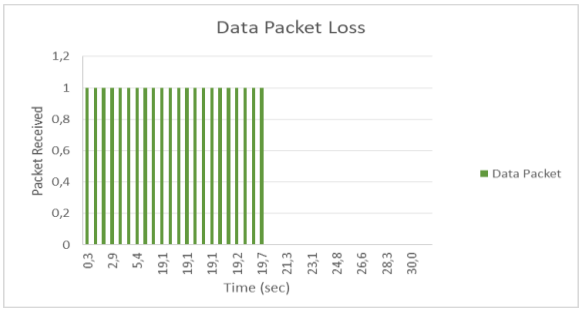
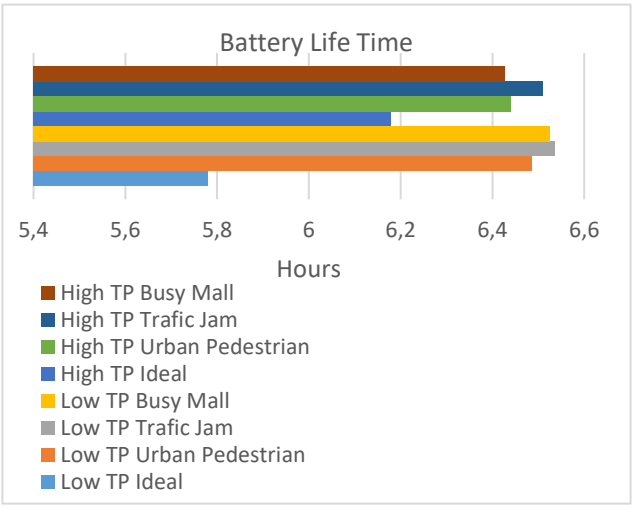



*Figure 6 - High data rate- Tunnel (5 seconds) – Data packet loss*




By using the TRIANGLE Testbench we were able to reach the following conclusions early in our development:

- At low data rate transfer (round 5,9kbps), there is no behaviour differences between scenarios. There is no effect in our device;

- At high data rate transfer (our need, round 40kbps), there is no behaviour differences between scenarios. There is no effect in our device;

- In term of bandwidth, we will have, supposedly, no limitations from network. Our maximum data rate has still been below than the network offers on the worst-case scenario.

- Between the two performed experiences sets there were two differences: in the first one we sent round 70bytes of data ten times per second and the second one sends round 4kbytes of data two times per second. Comparing download data rate for both cases, we can see there is a decrease on the second experience. As we have no need to download data, the data flow which we can see must be related with network handling. Concluding, as much as possible we should send more data in less packets to reduce undesirable download traffic.

- Regarding the experiment in the tunnel scenario, we saw cases where data loss was found. Our device continuously sends data packets for 4G modem with no buffering. The 4G modem has a limited data buffer to hold data while it is not sent. Only on cases with connection lost for short period of time this buffer can handle it. The learnt lesson is that should be implemented a larger buffer within the device to avoid data loss and poor QoS.

- Analysing the device consumption data, we estimated our battery time life. Looking only for data in normal scenarios of usage (no tunnel scenario) in both experiences, we can see a power consumption between 207 and 233 mA per hour. Concerning our battery choice (1500mA/h) it is expectable to have between 5h42m and 6h30m of battery life time.

These conclusions of our work done so far further supports our use-case and helps the development team to design the final product better, plan for contingencies and implement additional need supports. In short, we recommend that each development team make use of such a testbench early in their development to correct for wrong assumptions and validate their developments before committing numerous field prototypes with heavy production costs.