

# Management of Non-uniform Data Transfer in Cardiac Monitoring Systems with Adaptive Interpretation

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Our research concerns the problem of data queuing in telemedical non-uniformly reporting surveillance systems, recently introduced to cardiology. In adaptive systems, sampling rates are individually set for each diagnostic parameter, what requires implementation of a reservation procedure managing the content of every packet in order to proper data delivery.

The reservation procedure considers changes in the data flow caused by time-variable requirements for the update rate of values in particular diagnostic data series. Automatic scheduling of reports was achieved with taking into consideration of two auxiliary data attributes in the information structure: the validity period and the priority, set individually for each ECG diagnostic measurement. The patient-side recorder-interpreter works in one of two reporting modes: in the immediate mode diagnostic packets are transmitted as promptly as implied by sampling requirements, while in the delayed mode the transmission is deferred until packets are filled with valid data. Switching between these modes allows the telediagnostic system to respond in short time in case of emergency, and to limit the usage of data carrier and energy for long-time regular reporting.

Data stream volume using rigid and adaptive reporting

component	volume [b]	interval [s]	rigid [bps]	adaptive [bps]
heart rate	1	0,3		
arrhythmia	5	3	181,5	65,67
ST segment	24	30		

The prototype is designed for cardiology-based surveillance of patients in motion and uses a star-shaped topology managed by the central server over a bi-directional digital data link. In the delayed reporting mode, the packet size limit was set to 20kB (6 minutes of recording). The wireless transfer session lasts for up to 10 seconds depending on the speed of data transfer (16kbps). The module is thus operating for 18s (including the management time) out of 360s reporting interval. The average energy is reduced below 3mA, i.e. to 6% of the value necessary for a seamless operation. In the immediate reporting mode, the minimum packet size of 256 bytes is collected within 4.63 seconds, which results in system response slightly worse than the delay in the interpretation process (typically 2s), but still acceptable as real time monitoring.