RT SDC

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For real-time communication in dynamically interconnected medical device theatres

The challenge

Surgical devices which emit energy, such as HF electrosurgical units or power systems, pose particular challenges regarding the timing and reliability of control data. Delays during energy transfer or switch-off are unacceptable. The timing requirements are defined by the standards governing the application in question, but also by the complexity of the application. They must be adhered to in all circumstances, including when the network is at full capacity. During the wireless triggering of e.g. an HF electrosurgical unit, the time delay of the transmission path must also be taken into account. In addition, other application cases also require real-time communication, such as closed-loop control or waveform synchronisation.

The solution

Since SDC in combination with standard ethernet cannot fulfil the requirements deterministically, a favourable option is to combine the IEEE 11073 (SDC) family of standards with the advantages of the Time Sensitive Networking (TSN) family of standards to Real-Time SDC (RT-SDC). Here the same level of interoperability can of course be achieved as with SDC, but hard real-time requirements can also be met. Using standard Quality of Service (QoS) or TSN and RT-SDC, time restrictions are complied with even when the network is at full capacity.

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The use case

The use case shows how the steute universal foot switch controls different surgical devices in accordance with the current standards and customer requirements. Critical functions, such as speed control or triggering of the HF electrosurgical unit, are performed with RT-SDC. Less critical functions, such as zoom or video camera control, are performed with standard SDC. Pedals can be assigned to the various functions via a portable web-based GUI. Of course, assignment is governed by different rules. For example, the motor can only be controlled using the left analogous pedal, or coagulation only assigned to the blue pedal.

Partners

The partners jointly developed the concept and of the application case. The application case consists of two devices from Aesculap: a motor control system (Elan 4) and an HF generator (Caiman®). There are also two Erbe devices: The HF electrosurgical unit (Erbe VIO® 3) and the endoscopy system (VIRON 1 System). These devices are controlled by the Steute universal footswitch with SDC and RT-SDC. The TSN network infrastructure runs on the KSwitch D10 MMT Series from Kontron. The deployed SDC communication library is the sdcX-Library from SurgiTAIX, with extensions developed by steute based on the current status of the discussion within the RT-SDC group of OR.NET e.V. This means the RT-SDC communication functionality is directly integrated in the sdcX library as an optional extension.

Technical background

The RT-SDC functionality is to be viewed as a real-time extension to the SDC family of standards. Standard functions, such as Discovery, device descriptions (MDIB), exchange of parameters and the controlling of less critical functions, occur via SDC.

Critical functions, such as speed control or the triggering of an HF electrosurgical unit are managed by RT-SDC. Other constituent parts of RT-SDC are the querying and setting of parameters, as well as eventing.

The performance when triggering operations via SDC depends on the particular device and the times are also strongly dependent on the network load. With RT-SDC, the performance is better, also depending on the device, but independent of the network load.

Standards and approval

In order to realise safe interoperable operation, steute is supporting work on multiple standards in the IEEE 11073 family, especially the "External Control PKP" and "Basic User Interaction ModSpec/DevSpec". Moreover, standardisation of RT-SDC is planned as an extension of SDC in combination with QoS or TSN. steute is currently discussing with its partners within the RT-SDC group of OR.NET e.V. the necessary requirements and draft protocols.

For more information, individual service or interest in a job, please contact us. You can also find detailed information at: www.steute-meditec.com

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