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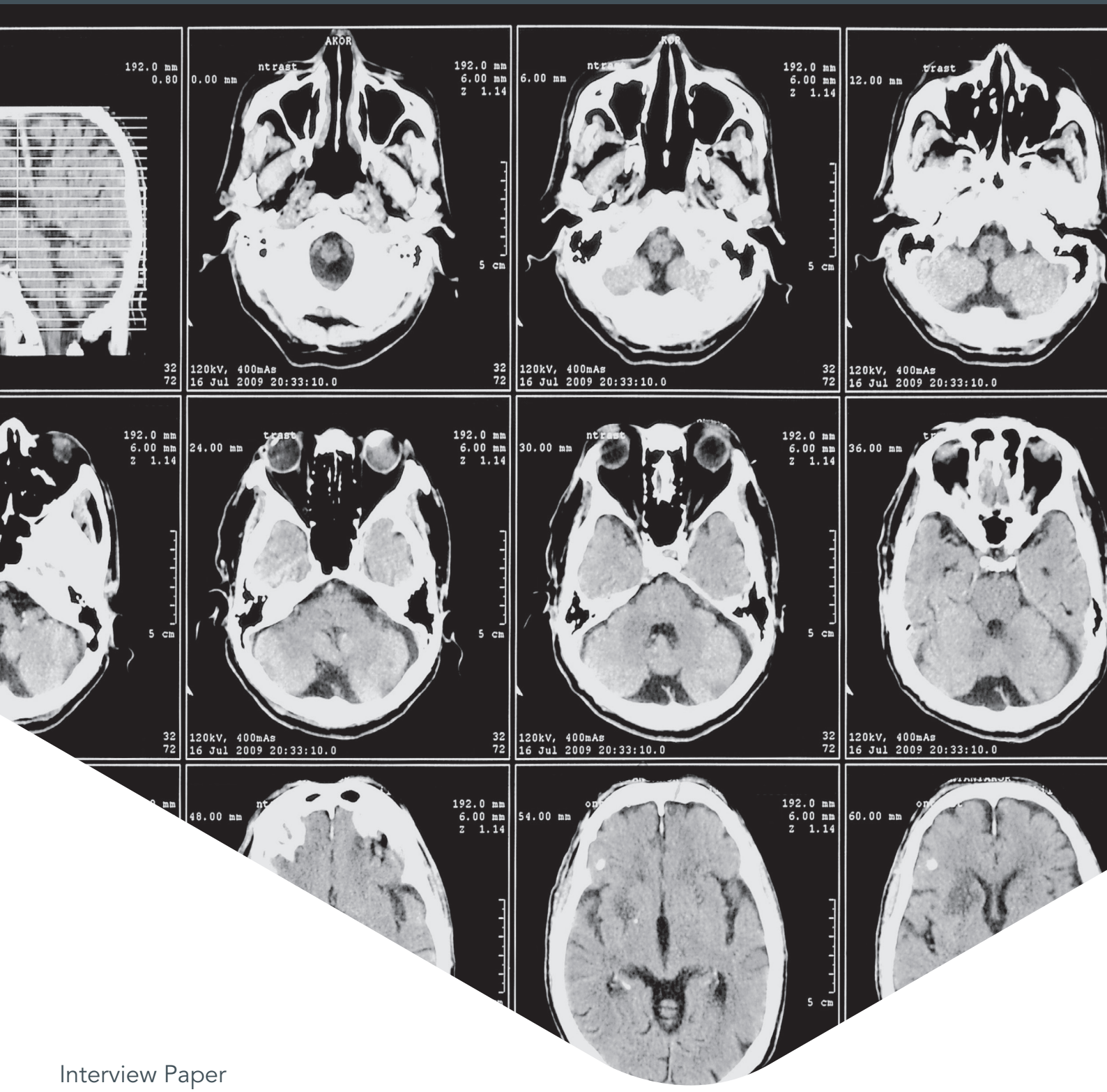

Interview Paper

congatec COM-Express with 8th generation Intel® Core™ processors

Medical Interview

Interview with Christian Eder, Director Marketing, congatec.

What sort of processing requirements are you seeing today in medical imaging applications, and what is driving these requirements?

In the medical imaging arena we experience an increasingly broadening range of processing demands. The processing power has to increase exponentially to create viewable images out of the generated raw data from the imaging sensors, ideally in real-time with ever increasing resolutions and higher frame rates. To efficiently handle these increasing workloads, imaging applications today rely on parallel computing leveraging the multi-core capabilities of the CPU as well as the compute units of the graphics processing units as a GPGPU. Due to their massive parallelized compute units the Intel UHD Graphics 630 can be used as a GPGPU and has also the capability to replace proprietary and therefore complex FPGA/ASICS based designs.

On top of that customers want to integrate artificial intelligence into the applications to support the medical professionals' decision basis. This artificial intelligence can be used to detect anomalies in medical images, for voice control in the operating theatre or to check the patient's anamnesis for any objections in current medication or medical treatment.

Finally, medical images also have to be displayed in highest resolution. Today hi-resolution displays with up to 4k and 10 bit color depth are common. Therefore rich graphics capabilities with DirectX and OpenGL support are also required. The need for more cores is also driven by medical IoT, leveraging virtual machines on dedicated CPU cores for real-time control and offering on top also a secure medical IoT connectivity without the need of external gateways which finally safes hardware costs.

What are the usual limitations of medical imaging systems, such as size or power consumption or thermal dissipation, that are at odds with these increasing requirements?

The medical imaging market is always keen on any new performance improvement. Therefore engineers are always looking for the highest performance they can get in an envelope with lowest size, weight and power and at best cost, too. To bring it down to some numbers: For battery powered, fanless and completely sealed and thus highly hygienic designs a TDP envelope of up 15 Watts is optimal. Cart based designs like ultra sonic devices and stationary all-in-one imaging devices can go with a maximum TDP between 35 W to 50 W. It is exactly this segment that has the broadest spread in the medical arena being used in hospitals, doctor's practices and ambulances. Because of the high competiveness in this large segment every increase in computing power is transformed into product innovations. Computer-on-Modules (COM) with the 8th gen Intel® Xeon® and Core™ processors provide for such designs significant benefits: They offer the computing core on a small form factor as an application ready super component. The application specific components are integrated via carrier boards, that are in comparison much simpler to design. Such a COM based approach also enables to instantly integrate the increased computing power by a simple swap of the module. The overall carrier board and module combination can have a footprint as small as the COM itself, meaning for COM Express Basic dimensions of only 95 mm x 115 mm. For comparison: A Mini-ITX motherboard requires almost three times as much space with a foot print of 170 mm x 170 mm. In larger applications such as stationary MRI scanners and CTs only the computing power counts. These systems call for massive computing power with an array of several GPGPUs. But still, a powerful embedded computing core with the latest 8th generation Intel Core and Xeon processors is demanded to orchestrate these GPGPUs.

How does multi-threading support in 8th generation Intel® Core™ processors assist in executing graphics workloads, such as those developed in OpenCL/GL? What role does Intel® Smart Cache play here?

The multi-threading support in 8th generation Intel® Core™ processors doubles the throughput of parallel processes on CPU level. So multi-threading is one important lever to increase performance. But multi-threading is also beneficial if you think of virtualized systems, where you consolidate different applications on one single hardware platform. With multi-threading on a six core processor you can for example define one eight-thread compute instance on four cores and use the the remaining two cores in a virtualized real-time environments based on for example the RTS Hypervisor for 4 parallel threads of an Industry 4.0 real time TSN machine, HMI IoT-gateway as well as firewall and virus scanner.

A powerful cache system like the Intel® Smart Cache that works on the CPU as well as the GPU is decisive to optimize the data flow. It helps to accelerate the data exchange from memory to the CPU and the GPU and if the same data is processed by both – the CPU and GPGPU – it can drastically accelerate the computing process, as the data stays within the SoC and has not to be written and retrieved from the slower main memory. Another unique feature to mention is the support for Intel® Optane™ memory based on 3D XPoint technology which is unique to Intel processor technology. Compared to NAND SSDs, it offers significantly lower latency yet is capable of handling the same size of data packets. With a latency of just 10 µs – about a thousand times lower than that of standard HDDs – the boundaries between main memory and storage are becoming fluent. This is especially suited for medical imaging applications which use high-performance computing and virtualization as well as big data analytics as well as artificial intelligence by deep learning.

What sort of regulatory concerns must engineers consider when developing medical imaging systems?

The market for medical devices is among the segments that have to fulfill the highest range of national and international regulations and standard. The regulatory requirements are complex and vary between the regions. When we look at the computing part, there are demands that concern the hardware and peripherals, like the Ethernet interfaces which have to be specifically isolated in the patient's near environment to avoid potentially endangering currents and voltages. Production has to be documented on top for traceability of each lot.

Then there is the application part, which has influence on the hardware and the software but starts with a look at the software options: Here developers can simplify their task by separating the applications and functions that needs to be certified from applications and functions that don't need certification. A very suitable way for that is from a software point of view the utilization of virtual machines. Once the software in a virtual machine has been certified, the migration to any new hardware platform is much easier. They even don't have to use different hardware platforms for each function but instead benefit from a cost efficient solution that consolidates all applications on one hardware platform. This is also beneficial for any upgrade demand, as they only have to focus on the certifiable virtualized machine.

This leads us to the next important topic: the long term availability of the medical computing technology. Due to the complex development circles and the certification demands it can take usually one or more years from design to market roll-out. Therefore the embedded computing components have to be available for many years to avoid re-designs with costly certifications just because the

computing core has become obsolescent. A perfect choice here is a Computer-on-Module and Carrier Board approach as engineers can easily upgrade the module while the certified carrier board remains unchanged. If engineers utilize standards such as COM Express, they benefit from an extensive documentation of the standard as well which is certified already in many medical applications making the design-in and certification process an easier task compared to any full custom design.

What features of the conga-TS370 make it stand out in meeting all of the system requirements you addressed in questions one through four?

To be honest, it is not so much the module itself that separates us from competing products in the same form factor, because it is the aim of the COM Express specification to have interchangeable products. It is equipped with the 8th gen Intel Xeon® and Intel Core™ processors from Intel's embedded roadmap and therefore features all the performance and power advantages they provide. What predestines our conga-TS370 for medical device vendors are our accompanying additional values we provide to simplify the use of our modules in medical applications. First of all let's have a look at the basics. We offer a reliable roadmap with 10+ years of long term availability. Our modules come with a comprehensive documentation, which is a valuable basis for any certification. Additionally we offer an extensive range of accessories including evaluation kits, carrier boards and high-performance cooling solutions. But providing the hardware is only one side of the medal, support for the design is highly valuable and is in high demand. Therefore we offer our medical customers a worldwide personal integration support. With this service medical device vendors have one personal contact person who knows their project from the beginning to the roll-out, streamlining any issue solving task. Moreover, many vendors have specific demands therefore they may be better served with a customized solution. We offer these too for all our standardized products if project quantities are given. Medical customers can get their individual carrier board from us or we do all required testing of their boards at our local Technical Service Centers including signal integrity testing, schematics review and layout review to make their project a success right from the start. We can also handle all required certifications processes form them if demanded. The sum of these services is, what separates our conga-TS370 from many competing products – and all that is provided – of course –at a competitive price.

About congatec AG

congatec is a leading supplier of industrial computer modules using the standard form factors COM Express, Qseven and SMARC as well as single board computers and customizing services. congatec's products can be used in a variety of industries and applications, such as industrial automation, medical, entertainment, transportation, telecommunication, test & measurement and point-of-sale. Core knowledge and technical know-how includes unique extended BIOS features as well as comprehensive driver and board support packages. Following the design-in phase, customers are given support via extensive product lifecycle management. The company's products are manufactured by specialist service providers in accordance with modern quality standards. Headquartered in Deggendorf, Germany, congatec currently has entities in USA, Taiwan, China, Japan and Australia as well as United Kingdom, France, and the Czech Republic. More information is available on our website at www.congatec.com or via LinkedIn, YouTube and Twitter.

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