COMPARING SDR APPLICATIONS AND ARCHITECTURES

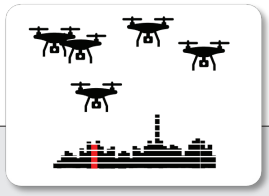
A key attribute of Software Defined Radios (SDRs) is their flexibility, which allows them to be applied to a wide range of different applications. The advent of highly integrated System-on-Chip (SoC) semiconductor devices increase the design options available but are only one part of the successful implementation of an SDR to a specific application. This note looks at a couple of defense applications that place very different priorities onto the SDR. One places the biggest emphasis on outright RF performance and throughput. The other prioritizes size, weight, power and cost (SWaP-C) above everything else, enabling RF capabilities to be squeezed onto platforms that have either never been able to fit it on at all, or certainly not with the capabilities now available. In both cases the objective is to provide the end user with as much situational awareness as possible. The two examples are shown in **Figure 1**. High performance platforms are often airborne, but can also be land or sea-based. Low-SWaP platforms can be unmanned systems, man-packs or similar.

As you might expect, these different scenarios place very different constraints on the SDR design. Using an SoC as the heart of two hypothetical implementations, **Figure 2** shows some of the differences and similarities in two block diagrams.

For the more straightforward RF environment of the low SWaP application, it might be acceptable to put very little in front of the SoC other than some pre-selection filtering to give the front end some assistance, and being rewarded with smaller size, weight and power as a consequence. Similarly, the processing power, channel count and overall throughput expectations can be lower. As shown on the left in the upper part of Figure 2, the product that results can be tiny, with power consumption of a couple of Watts and weight of a few grams.

Priorities are very different in high performance applications. While the RF performance of many SoC devices is surprisingly good, they need considerable help in loud, crowded and overwhelming spectral environments. This can be achieved by putting extremely well engineered super-heterodyne signal chains in front of the chip which cope better with overload and picking out weak signals of interest. Typically such systems have major throughput expectations placed on them and are architected with many Digital Down Converters (DDCs) to examine slices of spectrum in detail and then very big data-pipes to pass the digitized results on to following systems. Luckily, the platforms that need these capabilities have less constraints on power consumption and weight. The package sizes can be larger, but the capability per cubic inch demanded are usually high, with as many channels as possible squeezed in. Open architecture modular systems are increasingly common.

In both of these extremes, the SDR designer has their



Metric	High Performance Platforms	Low SWaP Platforms
Key Use Cases	Long range and high standoff Linearity dominated applications	Short range & tactical Noise dominated applications
RF Environment	Very congested Multiple strong signals in and out of band	Targeted signal set
SWaP vs. Performance	Performance dominated	SWaP dominated
Integrated Processing	Large FPGAs and CPUs Multiple parallel channelizers	Defined by available SWaP
Domains	Airborne/ Maritime/ Land	Dismounted/ Unmanned/ Attritable
Standard form factors	1U Rack Mounted, 3U & 6U VPX	M.2, VNX+, Mod Payload

Figure 1: Comparison of differing needs between high performance platforms and the most SWaP-critical applications

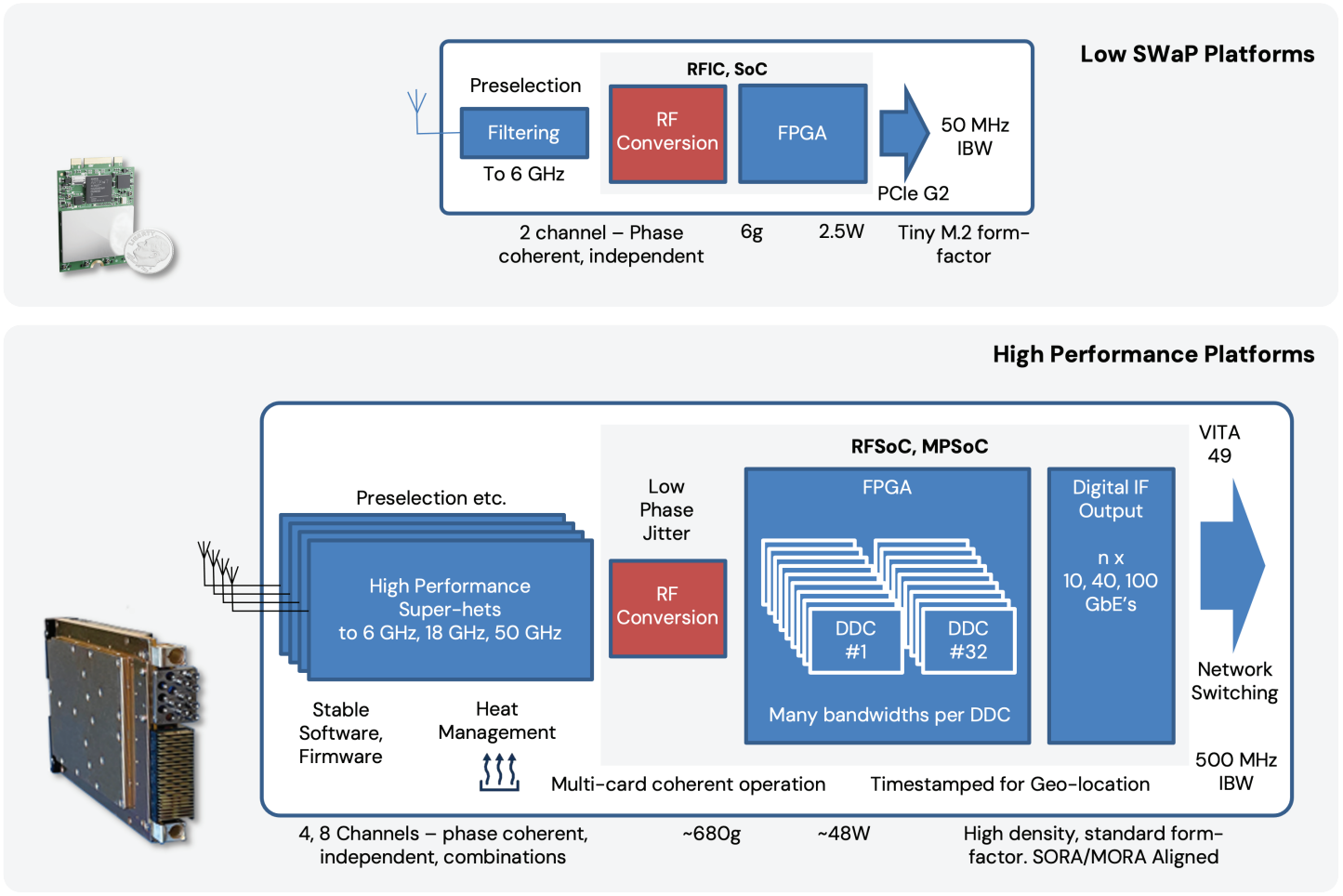


Figure 2: Applying the latest integrated System-On-Chip (SoC) components to achieve very different objectives.

work cut out for them, but for different reasons.

Epiq recently welcomed the high performance radio division from G3 Technologies as a new part of the family. They have successfully served the highest performance part of the SDR market such as airborne surveillance programs of record. This perfectly compliments Epiq's focus on the most exacting low-SWaP applications. A very simplistic overview of some of the combined products is shown in **Figure 3**.

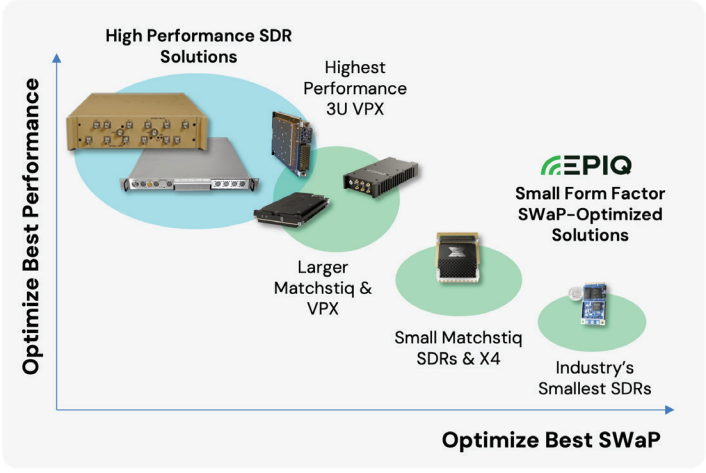


Figure 3: Epiq supplies a wide range of SDR solutions.

To learn more about how SDRs are applied in different applications or to learn more about specific products that might be employed, **contact us** or visit **our website**.

ABOUT EPIQ

Epiq Solutions develops cutting edge tools for engineering teams and government-focused organizations requiring situational awareness and detailed insight into their RF environments in order to identify and act against wireless threats.

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