Top 10 Tips for Selecting a Cellular Radio

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The primary goal of cellular radio systems — providing communication services to a large number of wireless data, video and mobile users — has become increasingly challenging in light of the rapidly evolving demand for these services and the resulting call for higher bandwidths and data rates in backhaul telecommunications systems, all at lower costs.

To meet these demands efficiently, it is important to carefully consider an array of factors when choosing the cellular radio that best suits your needs. The following “top 10” tips are based on Richardson RFPD’s deep technical expertise supporting the latest products from the leading suppliers in cellular radio technology. The tips are discussed at a level of detail appropriate for new cellular radio designers as well as more experienced designers who are either presented with a unique design challenge or are simply looking for a way to standardize a decision-making checklist.

Tip 1: Determine required data speeds: 2G, 3G, 4G?
This is a fundamental decision that will affect not only the functionality of the embedded processor, but the associated costs and longevity of the ultimate device. It’s important, in many cases, to design for the fastest speeds. In fact, many carriers are moving to the faster data speeds sooner than expected. AT&T, for example, is already phasing out 2G in New York City because the network became so rapidly congested, and for the same space, the carrier can have twenty-five 3G users for every one 2G user. On the other hand, designing for the newer technology, in this case the faster data speed, will also mean higher associated costs.

Tip 2: Choose your network technology: CDMA or GSM?
Understanding the differences between CDMA (Code Division Multiple Access) and GSM (Global System for Mobile Communications) is integral to choosing the right network technology for your needs. Generally speaking, CDMA is well-established, uses better technology, is more efficient, offers cheaper data plans (at this point), has better throughput, and is less susceptible to noise. Possible downsides, depending on your needs, include its geographic limitations (U.S. and Canada, only) and more expensive hardware. GSM basically covers everywhere else in the world, though GSM networks continue to make inroads in the U.S.

Tip 3: Pick your interface: connectorized, surface mount, Mini PCIe?
The PCI Express Mini Card (Mini PCIe) is about as industry-standard as you can get. They’re on tablets, laptops, routers, you name it, and it’s the easiest integration option. Surface mount, at the other extreme, requires laying out the entire PCB around the module that you are trying to integrate. A connectorized (proprietary) interface is somewhere in the middle. You do not have to lay out the entire board, but you do have to lay out the specific connector.

Tip 4: Keep an eye on production volume when deciding between modules and modems.
Are you deploying so many units that it make sense to pay for development and certification? If so, a module would make sense. Or do you want simplicity and a ready-to-go solution? In that case, think modem. As a general rule of thumb, if you will be deploying fewer than 3,000 units, a modem is a better choice than a module, because the modem is fully integrated with hardware and fully certified. If you choose a module, the final device has to be certified (that’s industry and carrier certifications), which can run $20K and up — a decision which makes sense at higher quantities where you will recoup your certification and hardware development costs.

Tip 5: If choosing a modem, plan your peripheral needs.
So you’ve decided on a modem, now it’s time to think about the peripherals. What will be needed? What kind of software requirements does the customer have? Modems can have expansion cards, and you have choices: USB, WiFi transceiver, Ethernet port, etc. What will your application need? The more choices you make now, the smoother your design process will

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be — and the easier it will be to control costs.

Tip 6: Match your carrier choice to your application and market needs.
Each carrier has its own nuances that make it unique in the market, and it pays to take note of existing carrier features and trends. For example, in the U.S., AT&T is doing away with its 2G coverage in favor of 3G, while Verizon and Sprint are attempting to capitalize by promising longevity in their 2G offerings. In Canada, Rogers is mirroring AT&T’s move away from 2G. And while Bell Canada and Telus Networks may be picking up the slack there, it is simultaneously true that nearly all carriers in both countries are moving their 4G offerings toward LTE. Whether LTE will live up to the hype and promises that surround it is yet to be seen.

Tip 7: Consider who will be providing the data plans for the deployment.
MVNOs (Mobile Virtual Network Operators) are smaller companies that buy wholesale minutes and/or plans from the bigger carriers and then redistribute them to M2M customers. MVNOs exist to serve the M2M space in ways that the big carriers do not (yet) — making it easy for customers to deploy their M2M products by pooling data plans for cost savings and offering easy internet platforms that monitor SMS/data usage.

Tip 8: Identify the necessary professional services: who will produce or assist in the software and/or hardware development?
If you’ve chosen a module (vs. a modem, see Tip 4), you’ll need to consider both software and hardware development, as well as factors like electromagnetic interference (EMI), proper RF channel for a well-situated antenna, software developments, and application programming interfaces (APIs). With modems, you only have to consider the software development. A “smart” modem has an integrated operating system that allows customization similar to a home router; whereas a “dumb” modem needs a host’s OS platform, so you will still have to customize software to integrate the modem with the OS.

Tip 9: Map out supply logistics.
A company that offers extensive worldwide logistics services that amount to a total supply chain solution can greatly simplify things for you. Look for features like same day shipments to domestic customers, extended hours “on call” support, ship scheduling to meet JIT (Just In Time) or future planned need dates, consolidated shipments to domestic and international locations, special packaging options, freight carrier coordination, and special product testing or acting as the 3rd party logistics provider.

Tip 10: Don’t forget about accessories.
When planning out your accessories, pay special attention to the antenna — it plays an important role, particularly in relation to types of modules, and is often a crucial component to successful certification and deployment. Other accessories to consider include: data cables like the RS-232; cable assemblies such as the U.FL to SMA, or SMA to SMA extension; and signal boosters in low coverage areas.

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