

With us, you will always have peace of mind knowing that you are partnering with industry specialists, who have proven track records and a wealth of skills, resources and experience.

## Product R&D Consulting:

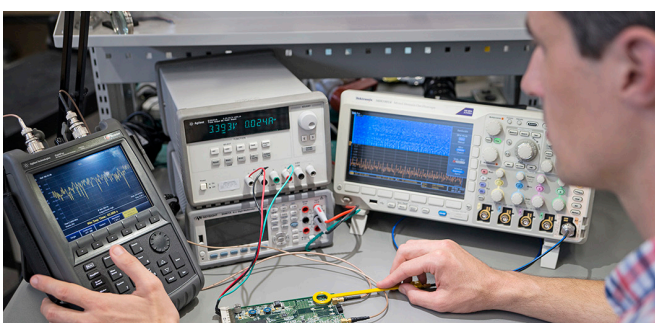
- Design reviews
- System architecture design
- Feasibility studies
- Requirements documentation and management
- Project risk assessment
- Project management
- Cost reduction analysis
- Failure mode and effects analysis (FMEA)

## Prototyping:

- Proof-of-concept prototypes
- Form factor and/or visual prototypes
- Functional prototypes
- Pre-production prototypes
- Fast turnaround time

## Manufacturing Production:

- **Low Volume Production**
  - In-house low volume production
  - Low setup costs
  - Rapid turnaround time
- **High Volume Production**
  - Outsourced high volume production
  - ISO9001 accredited manufacturers
  - Start to end facilitation
- **Final Assembly and Testing**
  - Firmware programming
  - Quality control testing
  - Component database management
- **Product Guarantees**
  - Warranties
  - Product repair and/or replacement



## Firmware / Software Design:

- **Overall System Design**  
Architecture and development of firmware systems using C, C++, Assembly and other languages.
- **Microcontroller Firmware/RTOS**  
8-bit, 16-bit, 32-bit Systems; Embedded Linux; Android; Real Time Operating Systems (RTOS); State-machine Operating Systems; Driver development.
  - ARM, ARM Cortex M0 - M4
  - 8051
  - Cypress PSoc 3,4,5
  - Zynq (Cortex A9/ FPGA)
  - Atmel AVR
  - Microchip PIC
  - Freescale
  - ...Plus many more
- **Communications Firmware**  
Wireless - Bluetooth®, Bluetooth® Smart (BLE), ZigBee®/802.15.4, Wi-Fi, GPS, LoRA, Cellular 2G, 3G ...  
Wired - Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I2C), Universal Synchronous/Asynchronous Receiver/Transmitter (USART), UART, Controller Area Network (CAN), 1-Wire, RS-232, RS-422, RS-485, Highway Addressable Remote Transducer (HART).
- **Microcontroller Applications**  
Real time Operating systems; State Machine design; Memory management; Hardware drivers; Low power operation; Display controllers; Touch screens; Capacitive touch interfaces; Over the air updates (OTA); Bootloaders; Internet of things (IoT); Mesh networks; Time of flight (ToF); Motor control; Sensors - Flow, Accelerometers, Magnetometers, Temperature, Pressure, Capacitance, Inductance.
- **FPGA Firmware**  
Xilinx, Vivado, Virtex, Spartan.
- **Algorithms**  
Mathematical modelling and code translation.
- **Signal Processing**  
Over and under sampling; Signal mixing; Filtering; Modulation - Frequency Division (FDM), Quadrature Amplitude (QAM, 16-QAM...), Phase (PM), Pulse-Amplitude (PAM).
- **Image Processing**  
Compression; Edge detection; Convolution, Filtering; Transforms; Dithering; Contrast, Sharpening, Blurring.
- **PC Software Platforms**  
Scripting Languages: Perl, Python, tcl.  
Application Development: Visual studio (C++, C#, .); IntelliJ IDEA (Java); Qt (GUI design).  
Networking: Node.js.

## Electronics and PCB Design:

- **Overall System Design**  
High-level architecture development; Technology analysis; Block diagrams and Standards conformity.
- **Circuit Design**  
Analog and digital; RF; RF amplifiers; Schematics; ADC; DAC; Mains and battery power; Low-power; Solar power and Energy harvesting; Low-noise design; FPGAs; CPLDs; Audio and Video; Linear, charge pump, and switch mode power supplies (SMPS); Micro-controllers and DSPs; RAM (volatile), EEPROM (non-volatile), and Flash (non-volatile) memory; LEDs, OLEDs, LCDs and touchscreen displays; Motor and automation control systems; Peltier heating/cooling systems; Heat management; Connectors; EMC immunity and emission control; Data loggers; Buttons and switches; Design for Low cost; Design for Miniaturisation.
- **Circuit Design**  
Wireless - Bluetooth®, Bluetooth® Smart (BLE), ZigBee®/802.15.4, Wi-Fi, GPS, LoRA, Cellular 2G, 3G ...  
Wired - Serial Peripheral Interface (SPI), Inter-Integrated Circuit (I2C), Universal Synchronous/Asynchronous Receiver/Transmitter (USART), UART, Controller Area Network (CAN), 1-Wire, RS-232, RS-422, RS-485, Highway Addressable Remote Transducer (HART).
- **CAD Tools**  
Altium Designer (very latest version); Component Database (Altium Vault); SPICE circuit simulation software.
- **PCB Layouts**  
Single and multi-layer design; BGA and fine pitch; Flex and rigid-flex circuits; Through hole and surface mount (SMT); 3D PCB modeling; Motherboard, Daughterboard and Riser board design.
- **Programmable Logic Devices**  
Xilinx FPGA and CPLD design and development; Hardware description programming in VHDL, Handel-C, Verilog.
- **Communications**  
Wireless: Cellular, Satellite, Wifi, Bluetooth (BLE, Audio), RF, Zigbee, LoRa.  
Wired: USB host and slave, Serial, RS232, RS422, RS485, 1 Wire, SPI, I2C, PCI Express, Ethernet, CAN, LON or LonWorks.
- **Sensors**  
Temperature, Pressure, Capacitive, Inductive, Magnetic, Time-Of-Flight, Lidar, Radar, Cameras, UV, Infrared, RF, Liquid flow, Barometric, Compass, Magnetometer, Ambient light, RGB, Hall effect, Vibration, Accelerometer, Proximity, Ultrasonic, Touch, Sound, GPS, Air flow, Angular or linear position encoder, Velocity, Force, Pressure, Weight, Water, Voltage, Current, Power, Gyroscope, Yaw rate, Displacement, Tilt, Tachometer, Motion, Stretch, Heartbeat, Time of flight.
- **Component Selection**  
Evaluation, sourcing, procurement, pricing analysis, and specifications for complete-off-the-shelf (COTS) and custom components.
- **Compliance**  
Circuit design to conform to national and international standards such as: EMC, Radio (C-tick, FCC, CE etc), and Product Electrical Safety Certification such as Explosive Atmospheres (AS/NZS 60079), Information Technology Equipment (AS/NZS 60950), Power Supply Safety (AS/NZS 61558), Household Electronics Switches (AS/NZS 60669), and General Electrical Equipment requirements (AS/NZS 3100). Product conformance testing coordination.
- **Design Validation & Testing**  
In-house prototype production; Functional testing; Integration testing; Power and signal integrity testing; Frequency response analysis; In-circuit logic testing; Debugging; Fault Tree analysis; Durability and endurance testing.
- **Design for Manufacturing**  
Creepage and clearance considerations; BOMs; Professional schematics; Versioning and traceability; Manufacture and supply line; Documentation; Factory programming and test equipment.

## Electro-Mechanical Design:

- **Part Design**  
PCB enclosure design; Injection moulded plastic; Low pressure over-molding; Formed and welded metals; Materials selection; Laser, Waterjet, Plasma component design.
- **CAD Tools**  
Solidworks; Visio; PDM (Product Data Base Management).
- **Overall System Design**  
Mechanical requirements and architecture development.
- **PCB integration**  
PCB enclosure design including: Injection molding, Low quantity 3D printed enclosures, Off the shelf enclosure integration.
- **Waterproofing**  
Electronics waterproofing including: Cable gland design, Venting Glands, Sealing gaskets and adhesives, Low Pressure Overmolding.
- **Electro-mechanical Interfaces**  
Components including: Electric motors, Solenoids, Pumps, Cabling, Connectors and Sensors.
- **Design for Manufacturing**  
Assembly documentation; Low cost and efficient assembly; Manufacturing jigs; Versioning and Traceability; Supplier and Manufacture sourcing.
- **Documentation**  
BOMs; Engineering drawings; Installation guides.
- **Testing and Design Verification**  
Load testing; Finite Element Analysis (FEA) Simulation; Environmental testing.
- **Prototype Models**  
Fast in-house 3D (FDM) printer prototype iteration; outsourced (via our trusted supplier network) of: SLA & SLS 3D printing, CNC machine and Cast components; Laser, Waterjet and Plasma components.

## Product Experience:

Over the past several years, the team at Beta Solutions have undertaken a large number of innovative projects in the following areas:

- **Scientific Instrumentation**  
NMR; Magnetic field mapping; Biosensors; High speed signal processing; QCM.
- **Sensors**  
Wireless sensors; Level monitoring; Location tracking; Low power; Image processing; Time-of-flight (TOF).
- **Internet-Of-Things (IoT)**  
Cellular and satellite gateways.
- **Industrial Automation**  
Motor and actuator control. Industrial sensors and communications.
- **Industrial Lighting**  
LED (UV, Visible, Infrared); Lighting switches.
- **Robotics**  
3D cartesian robots; Large scale motor rigs.
- **Solar / Low power and energy harvesting**  
Low power wireless sensors; Solar maximum power point tracking (MPPT); Battery power primary and secondary (rechargeable).
- **Transportation**  
Inventory tracking; GPS tracking products.
- **Audio / Video**  
Analogue and Digital; USB audio; Audio mixing; Small signal amplification.
- **Computer peripherals**  
PCIe card; USB sound cards; USB sensor interfaces.