GRINN

GRINN IoT design house
Services

PRODUCT DEVELOPMENT WORKFLOW

IDEA 1

2 .... ● **RESEARCH**

FEASIBILITY STUDY ● 3

4 .... ● **SPECIFICATION**

PROOF-OF-CONCEPT ● ... 5

6 .... ● **DEVELOPMENT**

PROTOTYPING ● 7

8 .... ● **TESTING**

CERTIFICATION ● 9

10 .... ● **PRODUCTION MANAGEMENT**
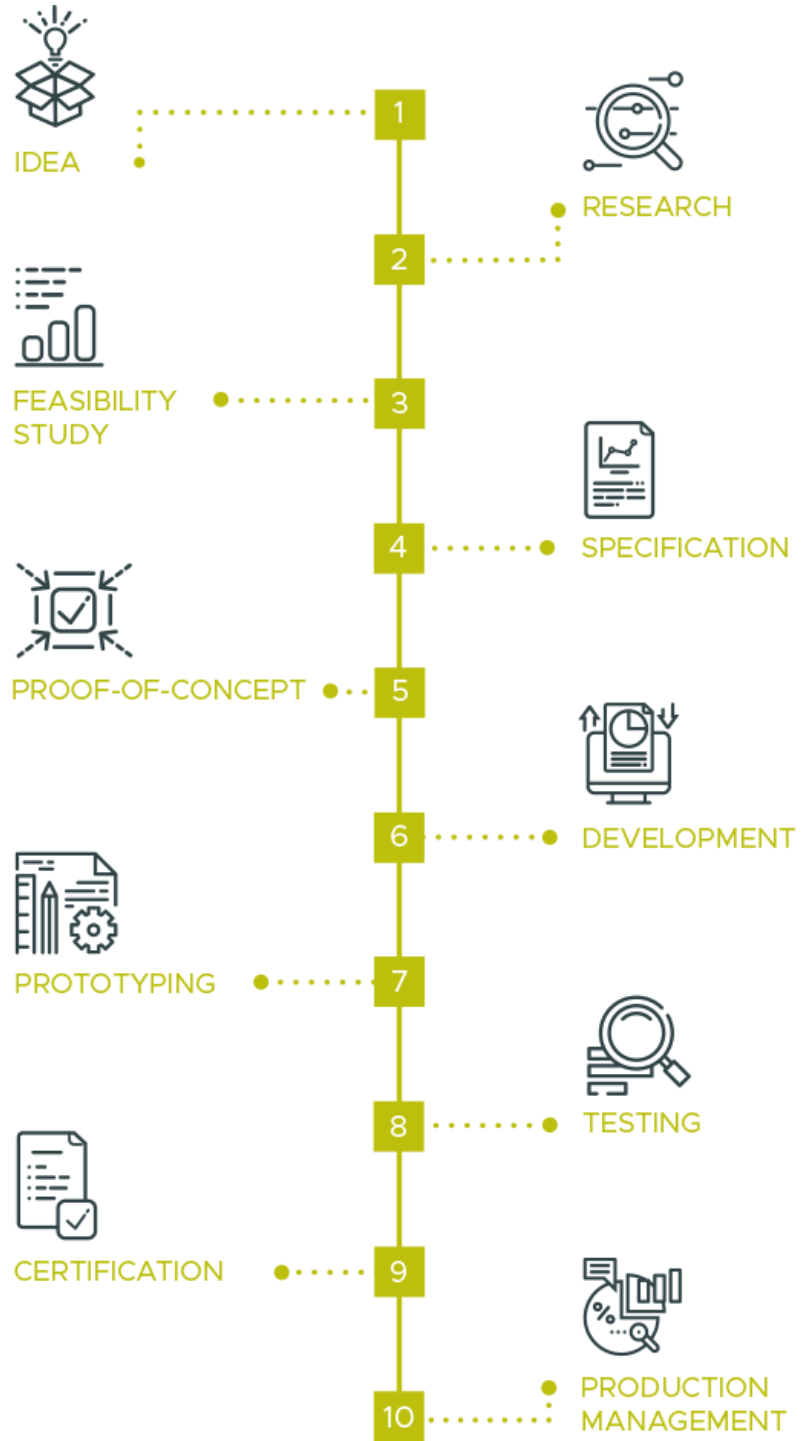
ELECTRONICS DESIGN

- **PCB layout:**
    - compex high density and high speed design
    - standard multilayer, HDI, flex or rigid-flex
    - blind/buried via
    - impedance controlled

- **Analog electronics:**
    - sensor interface: temperature, pressure, humidity, acceleration, PIR
    - ADC analog front-end, DAC output buffer
    - passive and active filter design
    - power circuits: AC/DC, DC/DC, PoE, LED driver
    - RF circuits: antenna design, antenna tuning, impedance matching, filter design
    - low power battery powered application
    - Li-Ion, Li-Poly, NiMH, NiCd and lead-acid battery charging
    - wireless charging
    - energy harvesting

- **Digital electronics**
    - microcontrollers, microprocessors, CPLD, FPGA
    - communication interface: USB, SDIO, CAN, Ethernet, I2C, I2S, SPI, PCIe, HDMI, MIPI, RS232, RS485, Modbus, DALI
    - memory interface: SDRAM, DDR2, DDR3, LPDDR2, LPDDR3, NAND, SD, eMMC
    - high speed design: TTL, CMOS, SSTL, LVDS, TMDS

- **Signal and power integrity analysis**

- **EMC compliance**

- **Design for Manufacture**

- **Design for Testing, Automated Production Tests**

- **Toolset: Altium Designer, Spice**

WIRELESS CONNECTIVITY

- LoRa

- Bluetooth classic and LE

- WiFi

- IEEE 802.15.4, Zigbee, 6LoWPAN

- proprietary ISM radio (433MHz, 868MHz, 915MHz, 2.4GHz, 5GHz)

- Mobile 2G (GSM, GPRS), 3G (UMTS), 4G (LTE, Cat-M, NB-IoT)

- GNSS (GPS, GLONASS, BeiDou, Galileo), RTK

- RFID, NFC

- ADS-B mode S

FIRMWARE DEVELOPMENT

- Microcontrollers: ARM Cortex-M0/M0+/M1/M3/M4/M33, PIC8/16/32, AVR, MSP430, ESP32

- Application processors: Cortex-A5/A7/A8/A9/A32/A53/A72, Cortex-M7, ARM9, ARM11

- experience with following processor manufacturer TI, NXP, STMicroelectronics, Nordic, Espresiff, Microchip, Infineon, Cypress

- language included C/C++/Python/Lua/QML/JavaScript/Go

- with OS
    - FreeRTOS
    - Contiki
    - Riot OS
    - Zephyr Project
    - Linux

- bare metal

- commonly used in projects:
    - build systems: Buildroot, Yocto, Debian (multistrap)
    - Graphic libraries: Qt/QML/PyQt, TkInter
    - Audio: ALSA, Pulseaudio, Spotify SDK
    - firmware update: rauc, hawkBit
    - bootloaders: U-Boot, Barebox
    - CI&CT&CD: Jenkins, Docker, Google Test, Google Mock, Unity, Robot Framework, Nexus Repository OSS, Read the Docs
    - communication: Rest-API, MQTT, ZeroMQ, CoAP, Protocol Buffers, JSON, gRPC
    - libraries/frameworks: cURL, OpenSSL, Qt, SCXML, glibc, glibmm, ALSA, bluez, D-Bus, systemd, json-c, jsoncpp, SQLite, tslib, libVLC, FFmpeg, Libav, GStreamer, SQLite, libgpiod, ncurses, ConnMan, Network Manager, Modem Manager, openssh, oFono, mbed TLS, mcuboot, Swagger, OpenOCD, ppp, QEMU, Easylogging++, PyQtGraph, gpxpy, OpenVPN, LIVE555, LuaJIT, Turbo, Dnsmasq, SocketCAN

- **active contributors of: Linux, Barebox, U-Boot, Buildroot**

- **documentation: Sphinx, Doxygen, Latex**

- **other tools used during development: Docker, Node.js, Node-RED, Kibana, MongoDB, Python3**

FPGA

- **Xilinx**
    - Spartan-6, Spartan-7, Kintex-7, Artix-7, Virtex, Zynq-7000
- **Altera**
    - Cyclone IV, Cyclone V

- **HDL: VHDL, Verilog**

- **Interfaces: AXI-3, AXI-4, Wishbone, Avalon, PCIe 3.0, USB 3.1, 1G ETH, HDMI**

- **Soft CPU: Microblaze, Picoblaze, Nios II**

- Solutions: Highly Parallel Data Acquisition and Pre-processing, DSP
- Toolset: Vivado (Xilinx), Quartus (Altera)

TESTING AND CERTIFICATION

- functional tests

- environment tests

- design of production tests

- pre-compliance EMC, RED, FCC tests

- CE/UL/FCC approval support (including medical)

PROTOTYPING

- rapid prototyping
- small production series

PRODUCTION

- with proven partners (small batches in house)

MECHANICAL ENGINEERING

- 3D CAD design

- 2D drawings

- Converting conceptual sketches into 3D models or 2D documentation
- Designing fixtures for programming and testing of electronics

- Custom casing design

- **Prototype 3D printing**

- **Toolset: SolidWorks, Solid Edge, FDM 3D printing**

EQUIPMENT (AMONG OTHERS)

- **Test and Measurement**
  - Spectrum Analyzer (6GHz)
  - Vector Network Analyzer (6GHz)
  - High Bandwidth Oscilloscope (3GHz)
  - High Voltage Differential Oscilloscope Probe
  - Current Oscilloscope Probe
  - Logic Analyzer
  - Wireless Communication Tester (2G/3G mobile)
  - RF Digital Modulation Signal Generator
  - GPS Simulator
  - GTEM EMC chamber
  - Near Fleld Probes
  - LISN
  - ESD Simulator
  - Temperature chamber
  - Programmable Power Supply
  - Programmable Electronic Load
  - Arbitrary Signal Generator
  - Frequency Counter
  - High Accuracy 6.5 Digit Multimeter

- **Mechanics**
  - CNC milling machine (3-axis)
  - 3D printer

- **Prototype Production**
  - SMT Stencil printer
  - SMT Pick&Place machine
  - Soldering Reflow Oven

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OTHERS

- ISO9001:2015 (scope of certification: design of electronic systems and devices)

- official design house following companies TI, NXP, Microchip, Telit, Wurth Elektronik, Infineon

- BoM optimization

- Industrialization

- project management (Toolset: OpenProject)

WE LOOK FORWARD TO HEARING FROM YOU SOON

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