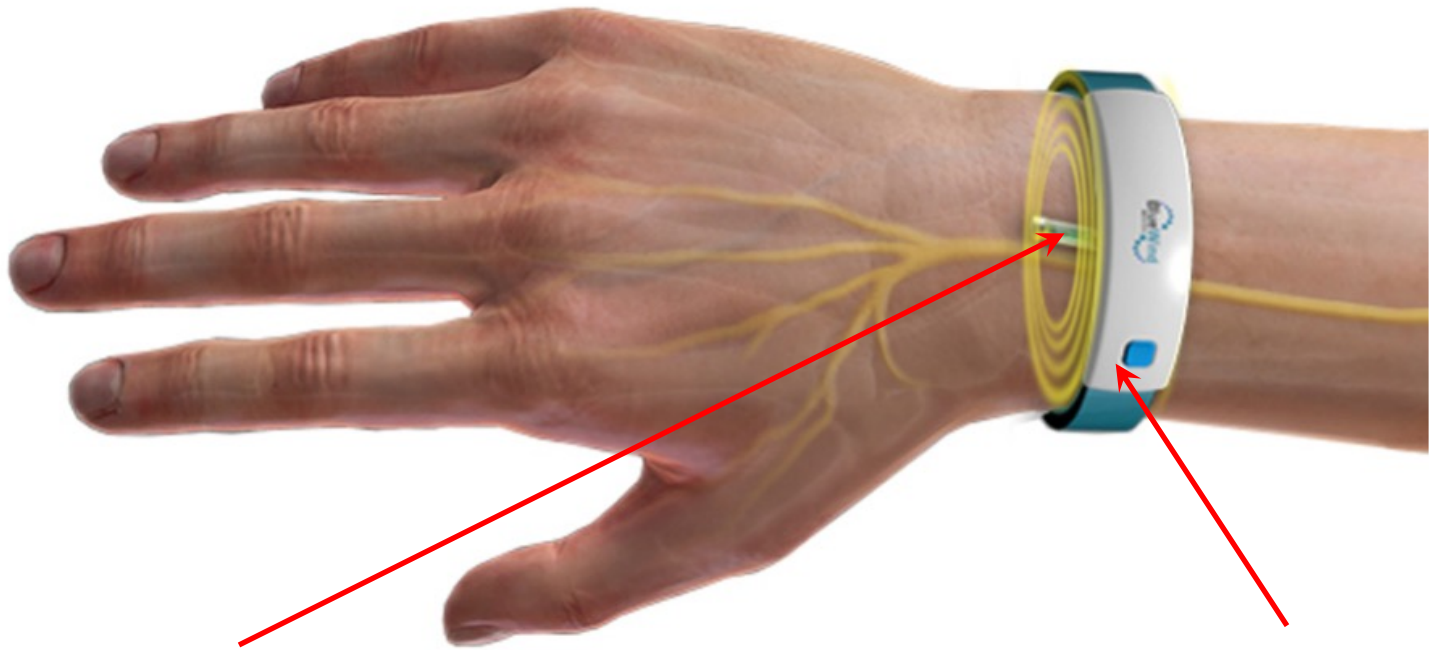
Semiconductors for modern medicine

Implantable neurostimulators and health monitoring devices

Project introduction

New technological objective

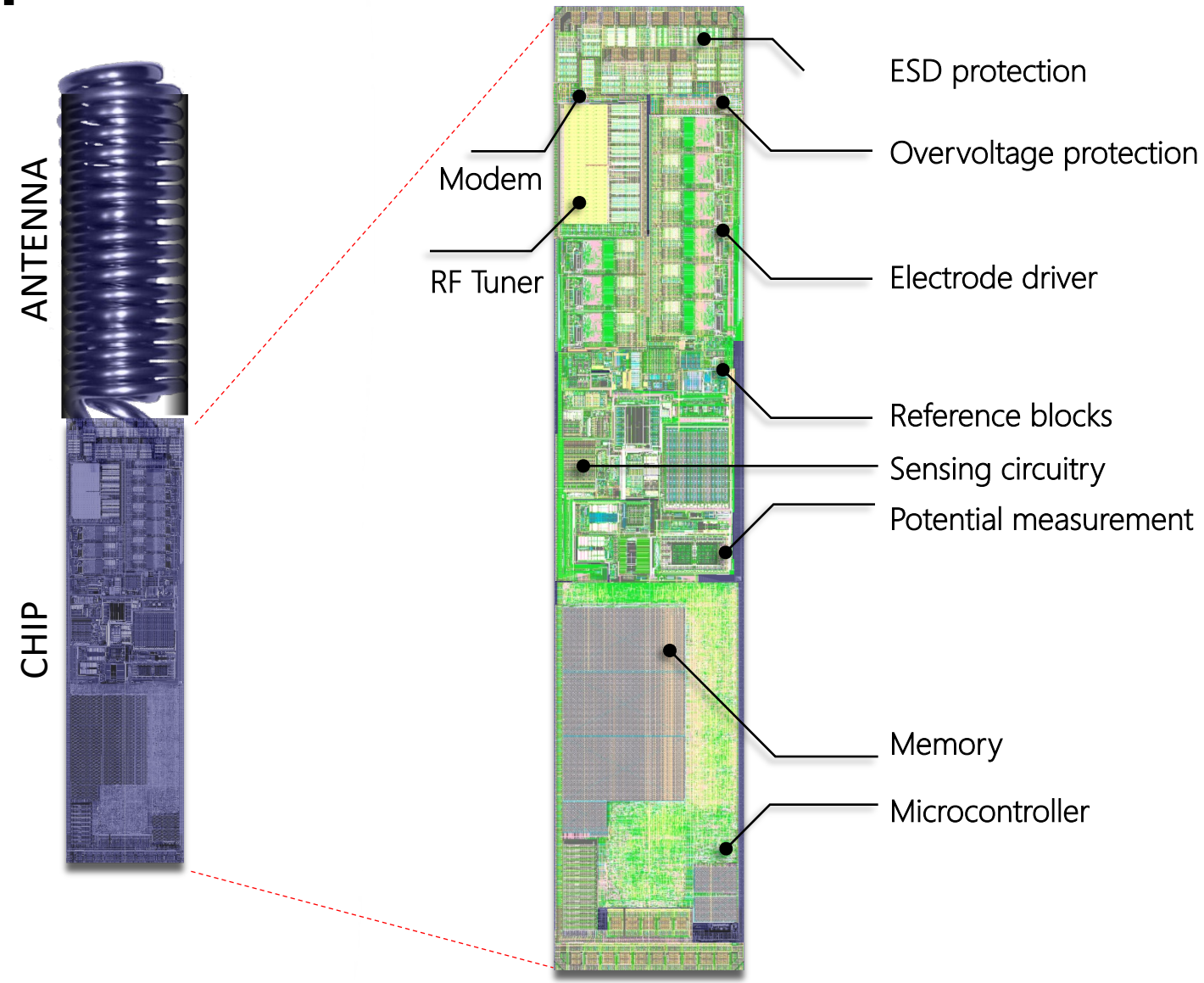
- To create a device insertable via needle, without a surgery
- To eliminate necessity of implant replacement due to battery run-out



To achieve this challenging goal, capsule should be made using a specially designed chip

Proposed solution

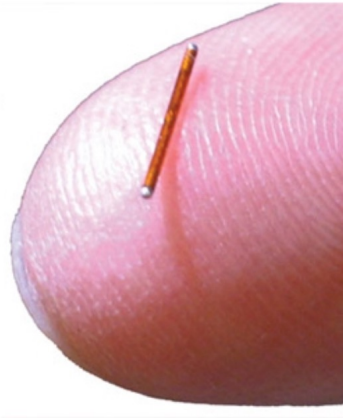
Implantable capsule contains specially designed chip and antenna. Two opposite sides of a capsule are electrodes
Chip converts electromagnetic energy of radio-waves into electrical power (energy harvesting)



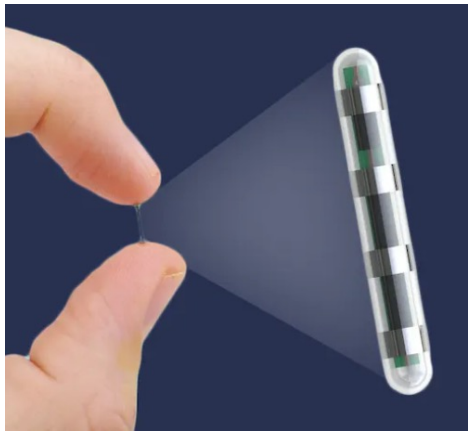
Battery-less implants: competition landscape

BlueWind (Israel) RENOVA iStim™ - clinical study stage

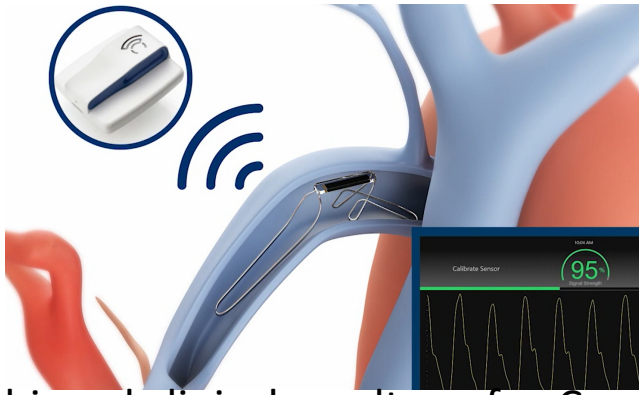
StimWave (USA) – FDA cleared for some models



Capri Medical (Ireland) Luna-Air – prototype in 2021



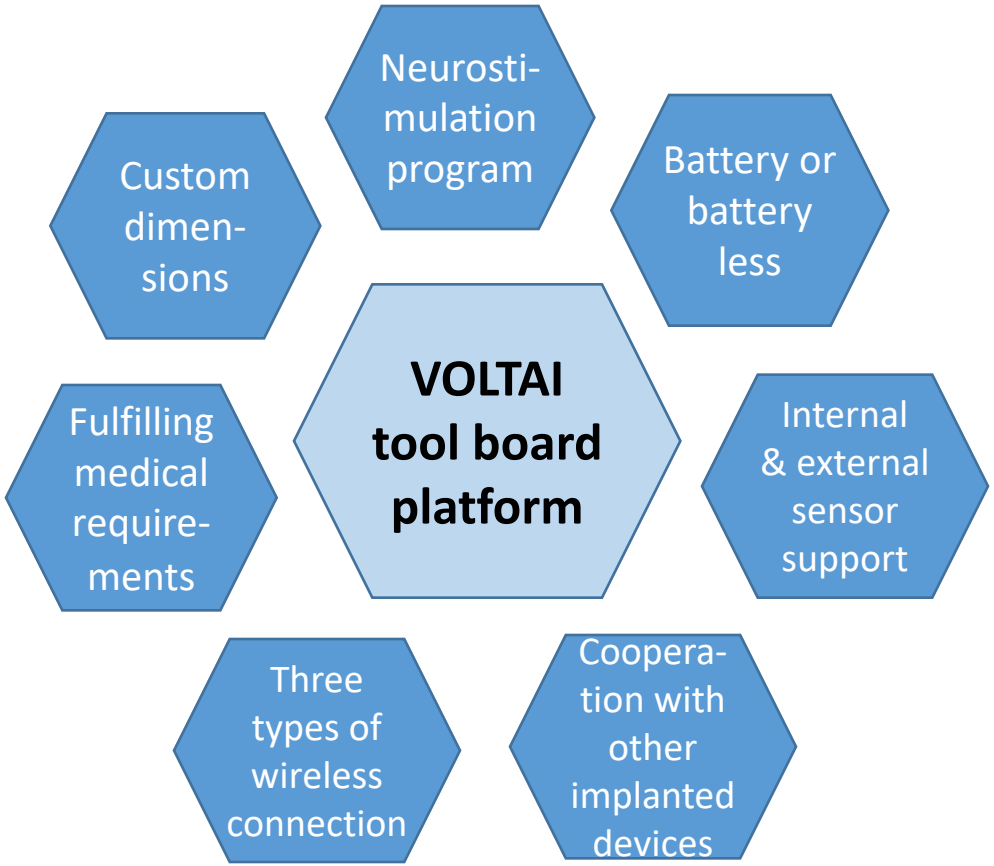
Endotronix (USA), St. Jude Medical (USA), Vectorious Medical (Israel) – Cordella implantable sensor



A bunch of companies worldwide started R&D on the subject, but only few achieved clinical results so far. Competition pace continues, major stakeholders are USA, Israel, Western Europe, China

ASSP (Application Specific Standard Product) instead Custom Product

ASSP Proposed solution – VOLTAI, an universal tool board platform for use in design of implantable neurostimulation devices and/or sensors for custom applications



Target Customers (Users)

- Medical-engineering companies
- Medical researches / scientists
- Start-ups
- Medical centers

VOLTAI TOOL BOARD (PLATFORM) Key Innovations

- Based on a specialized microchip with all the necessary functions:
  - power supply;
  - neurostimulation;
  - wireless collection;
- Miniature size and smallest weight;
- Minimally invasive;
- Battery less or battery power supply;
- Support of wide range sensors;
- A choice of necessary options;
- Combine with other implanted devices

VOLTAI TOOL BOARD (PLATFORM) Versatility

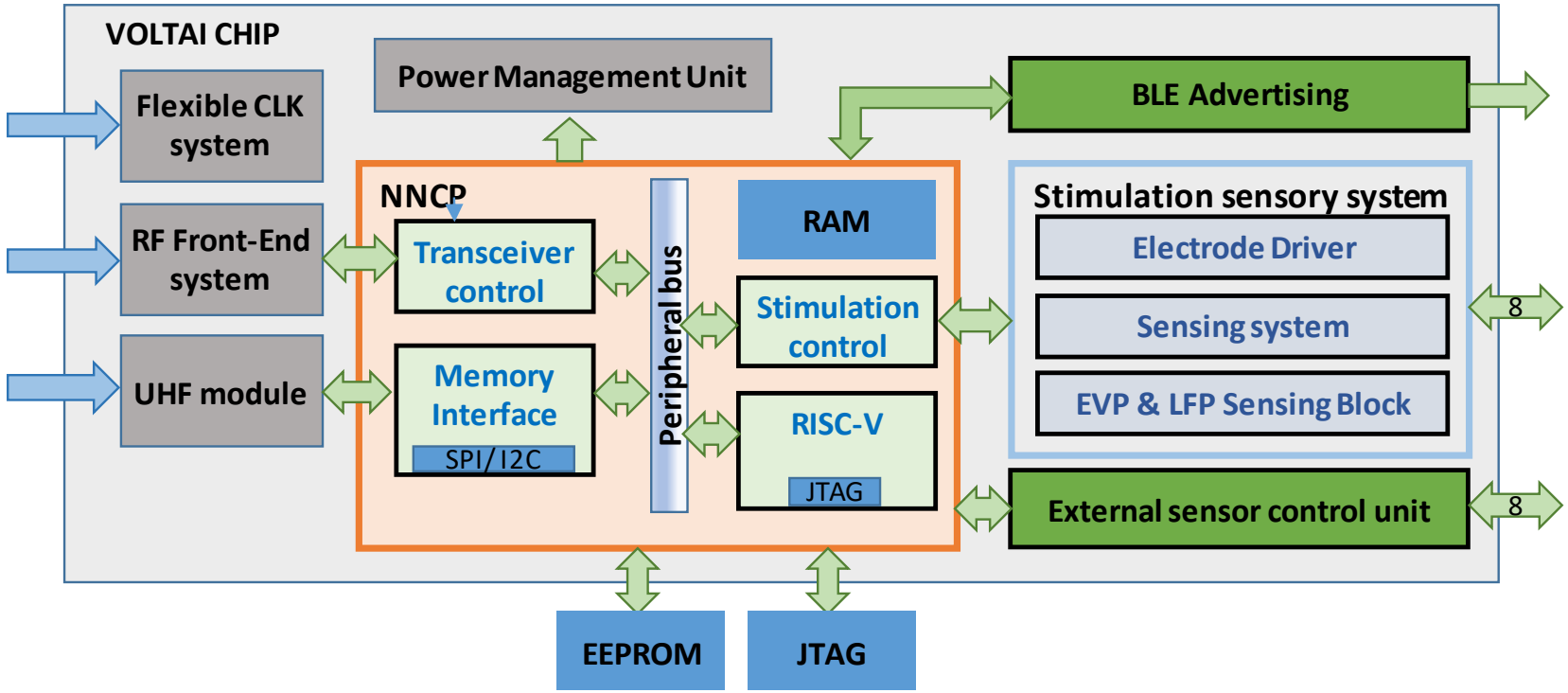
- ***Both in PNS & CNS system :***

- treat a wide range of neurological disorders;
- control of separate nerves;
- changing the stimulation parameters in the process;
- patient individual stimulation procedure

- ***Possible to control an internal and external sensors*** *(nerve potential sensor, temperature sensor, blood pressure sensor, pulse sensor, respiratory rate monitoring sensor, sensors for cardiovascular system indicators monitoring, blood glucose monitoring, blood oxygen levels monitoring etc.)*
  as well as receive and process information from them.

VOLTAI CHIP

VOLTAI CHIP Simplified Diagram



Features

- Build-in UHF RFID tag
- Battery-less solution
- Radio-wave power supply
- Up to 8 sensing facilities
- BLE Advertising on board
- Embedded RISC-V MCU
- Supply voltages:
  - Analog: ±9.0…18V, 5.0V
  - Digital core: 1.8V
  - Digital I/O: 3.3V

Project stages

Stage 1

Design a new chip (by re-using existing IP blocks)
Make chip samples and capsule samples
Make a prototype of a control device
Create a basic software for stimulation tuning

Expected result:

Extensive implantable battery-less or with battery neurostimulation set – a complete toolkit for medical scientists to learn, test and clarify technical requirements for each particular application

Partnership:

Select a partner for future commercialization

Expenses:

USD 200K (NTLab's own finances)

Timeline:

1..2 years

Stage 2

Collect feedback from medical scientists
Clarify technical requirements for each particular application
Create a linecard of capsules and control devices (by cutting unnecessary features of extensive prototype)
Arrange production
Apply for certification
Prepare for a clinical study

Expected result:

A linecard of capsules and control devices for medical market

Partnership:

Partner should cooperate with medical institutions and take care on certification/approvals

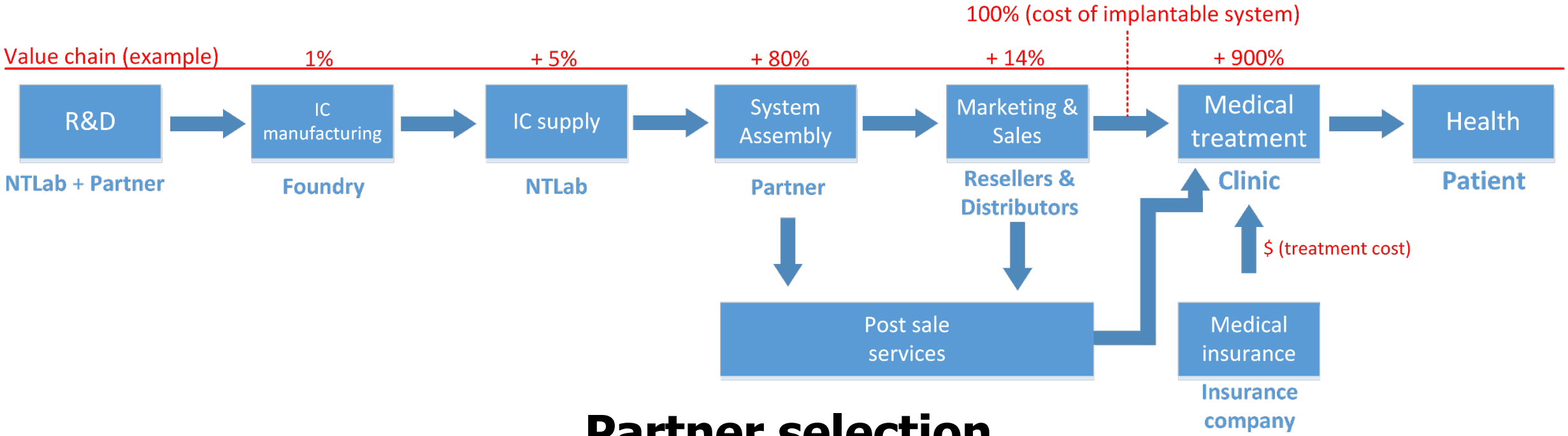
Expenses:

USD 2..5 mln (before clinical study)

Timeline:

2-3 years before a clinical study

Supply chain / value chain



Partner selection

NTLab responsibility in a project is a technical part – from specification to implementation, including manufacturing of a chip, capsule and control device.

Partner responsibilities:

- project funding
- cooperation with medical institutions to define stimulation parameters for each application
- product clinical testing and certification (using technical support from NTLab)
- product marketing and sales

THANKS FOR YOUR ATTENTION!

https://ntlab.lt/

info@ntlab.lt