From academic results to a deeptech startup in France

Valérian Giesz

CEO - Cofounder

Photonics is at the core of the Quantum Revolution

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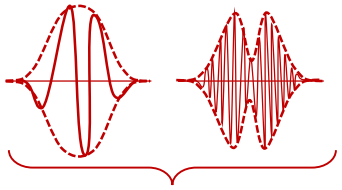
Optical Quantum Computers

Quantum Internet

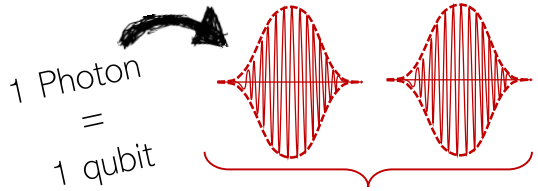
A new generation of light emitter is the key challenge

« Key challenges will be the realization of **high-efficiency sources of indistinguishable single photons**, low-loss, scalable optical circuits, high-efficiency single-photon detectors, and low-loss interfacing of these components. »

Prof. Jeremy O'Brien, cofounder of PsiQ



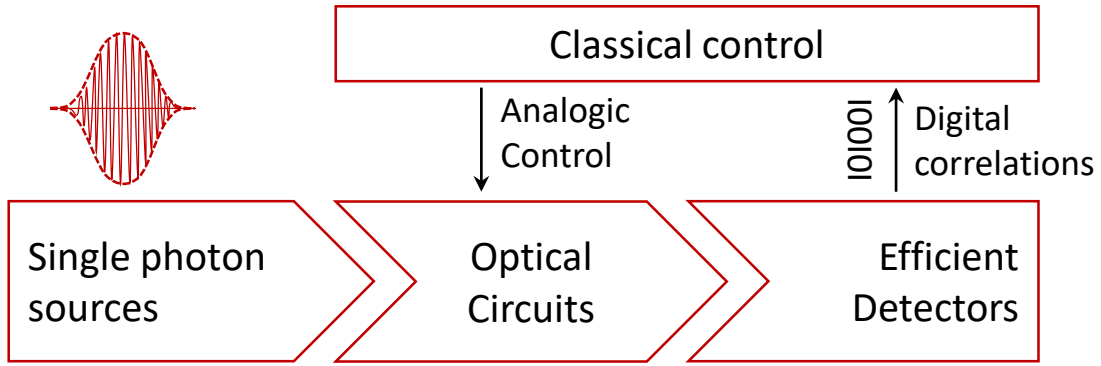
Distinguishable Photons



Indistinguishable Photons

A new generation of light emitter is the key challenge

Optical quantum computer



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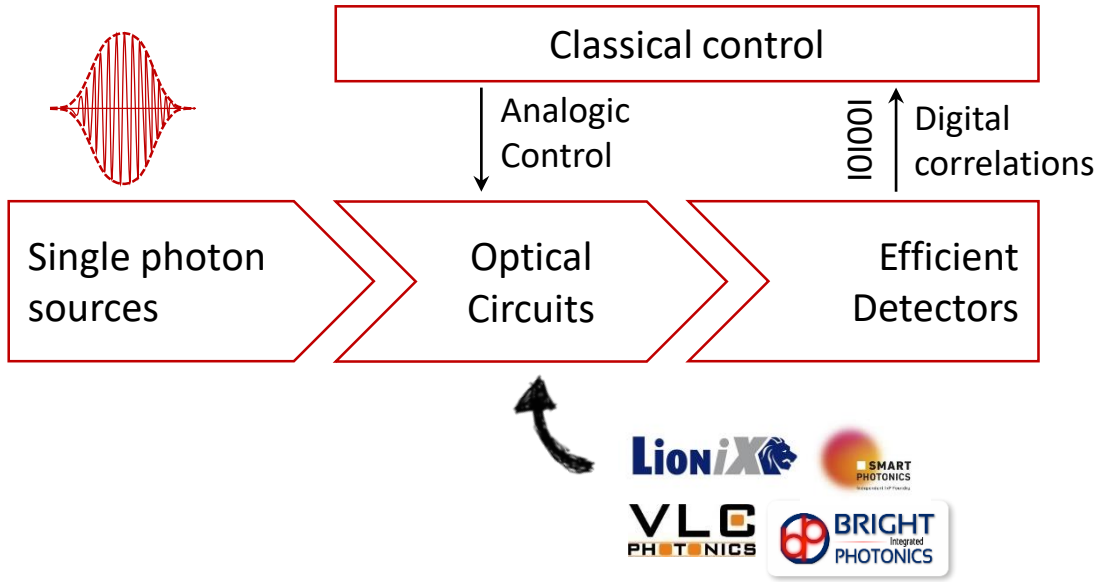
Optical quantum computer



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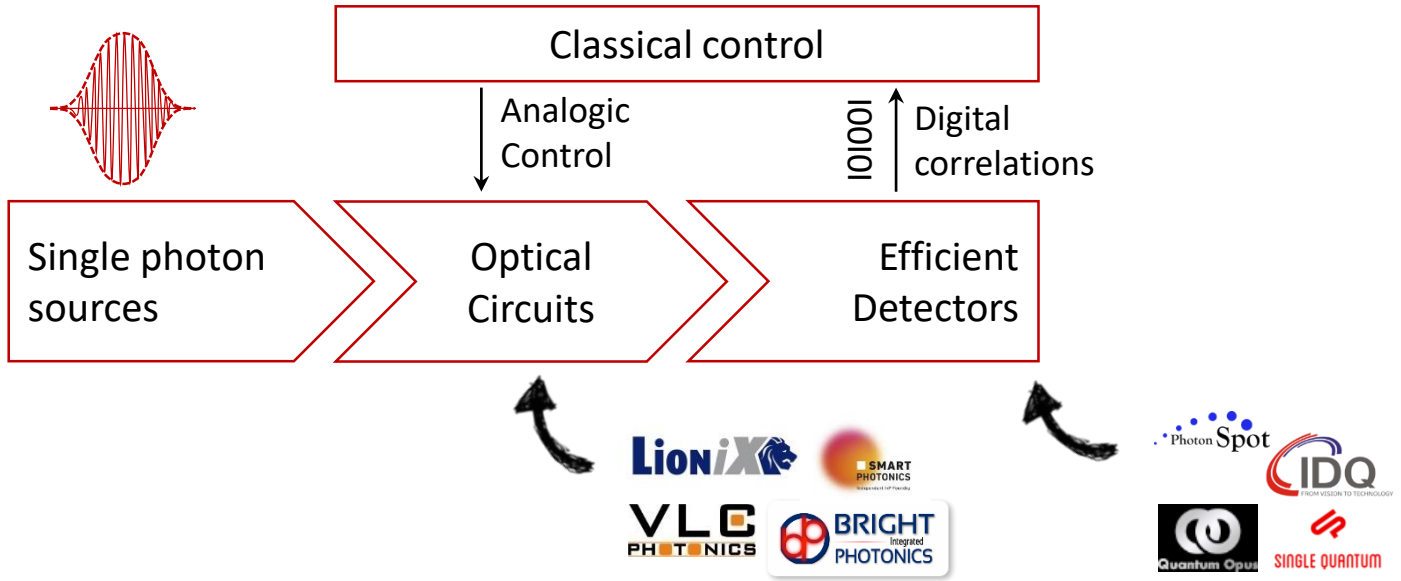
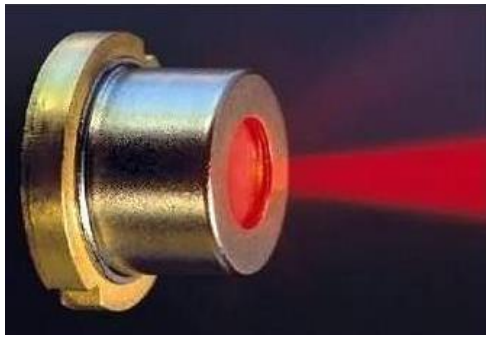


Current sources are too inefficient

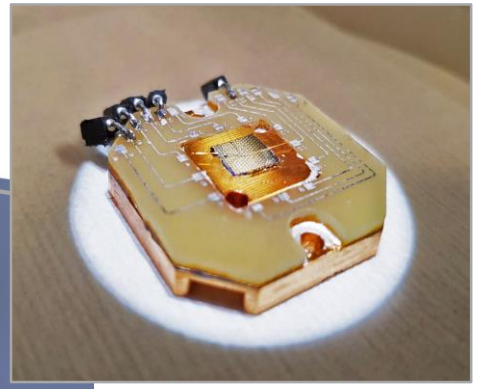


Laser

61% of researchers in QIP think that the **low brightness** of current single photon sources is the **main bottleneck for the development of a optical quantum computer.**

Market study funded by the CNRS“prematuration” program

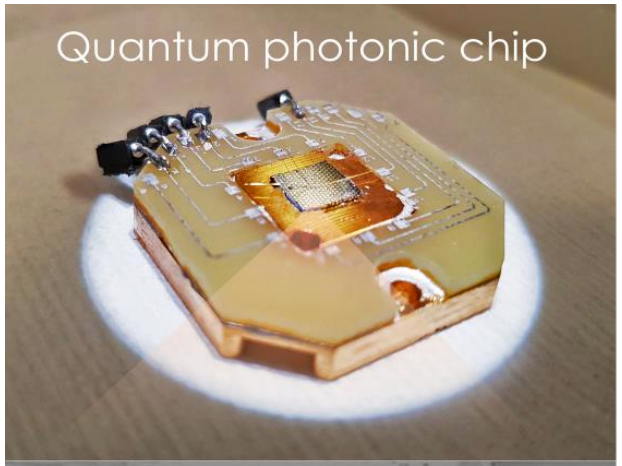
Cryodelight

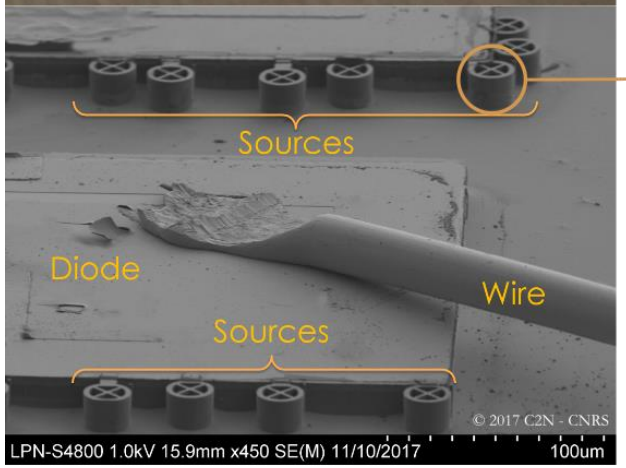


eDelight

The brightest sources of light for Quantum Technologies

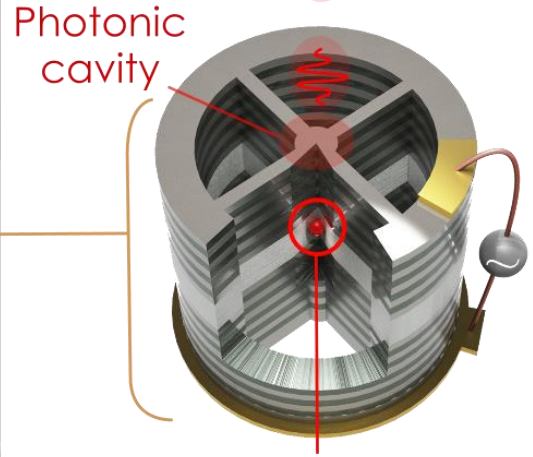
Disruptive architecture to extract the light from a Quantum Dot





Single photon source

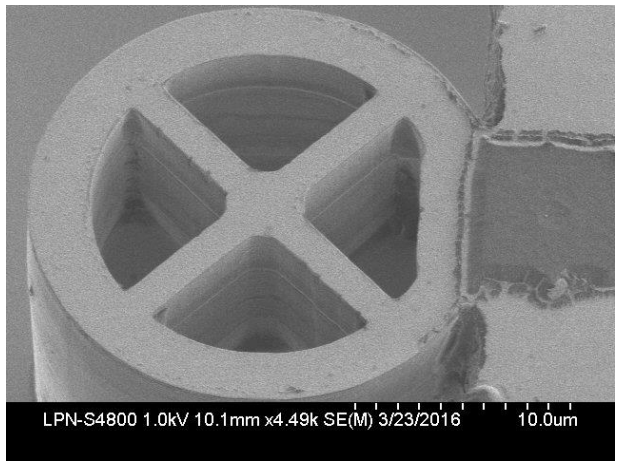
Single & identical photons

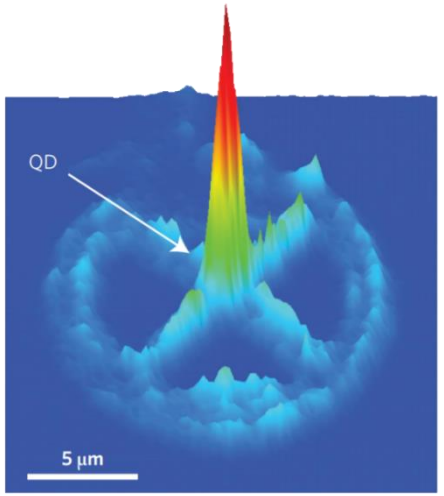


nature photonics
ARTICLES
PUBLISHED ONLINE: 7 MARCH 2016 | DOI: 10.1038/NPHOTON.2016.23

Near-optimal single-photon sources in the solid state

N. Somaschi[†‡], V. Giesz[†‡], L. De Santis[1,2†], J. C. Loredo[3], M. P. Almeida[3], G. Hornecker[4,5], S. L. Portalupi[1], T. Grange[4,5], C. Antón[1], J. Demory[1], C. Gómez[1], I. Sagnes[1], N. D. Lanzillotti-Kimura[1], A. Lemaître[1], A. Auffeves[4,5], A. G. White[3], L. Lanco[1,6] and P. Senellart[1,7*]





First solid-state emitter of single and indistinguishable photons

Developed at the Center for Nanoscience and Nanotechnology

Pascale Senellart

Aristide Lemaître

Isabelle Sagnes

Xavier Lafosse

Loic Lanco

Abdelmounaim Harouri

Quandela cofounders

Valérian Giesz
PhD from 2012 - 2015

Niccolo Somaschi
Postdoc from 2013 - 2016

Pascale Senellart
CSO

And a lot of other researchers, engineers, postdoc, students,…

Strong politics for the development of innovation issued from fundamental science

Unique performances

Quantum computer

	State-of-the-art laser sources (from Optica Vol.5, issue 5, p. 514-517 – 2018) Indistinguishability = 90%	**eDelight** Indistinguishability > 90%	
Single photon rate	1.3 MHz	> 25 MHz	X 20

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Three-photon rate	55 Hz	9 kHz	X 160
Eight - photon rate	10^{-8} Hz	0.5 mHz	X 50 000

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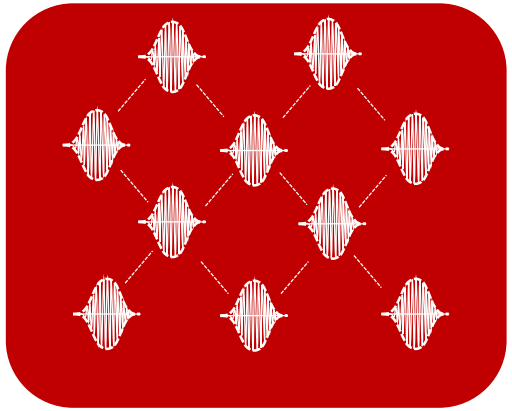
Happy customer ☺

« Quandela represents the **world-leading solution** in terms of brightness, indistinguishability and reliability as a photon gun source. Its technology enables **order-of-magnitude improvements** in the observed repetition rates of multiphoton experiments : **we are now entering in a new and unexplored regime.** »

Prof. Fabio Sciarrino

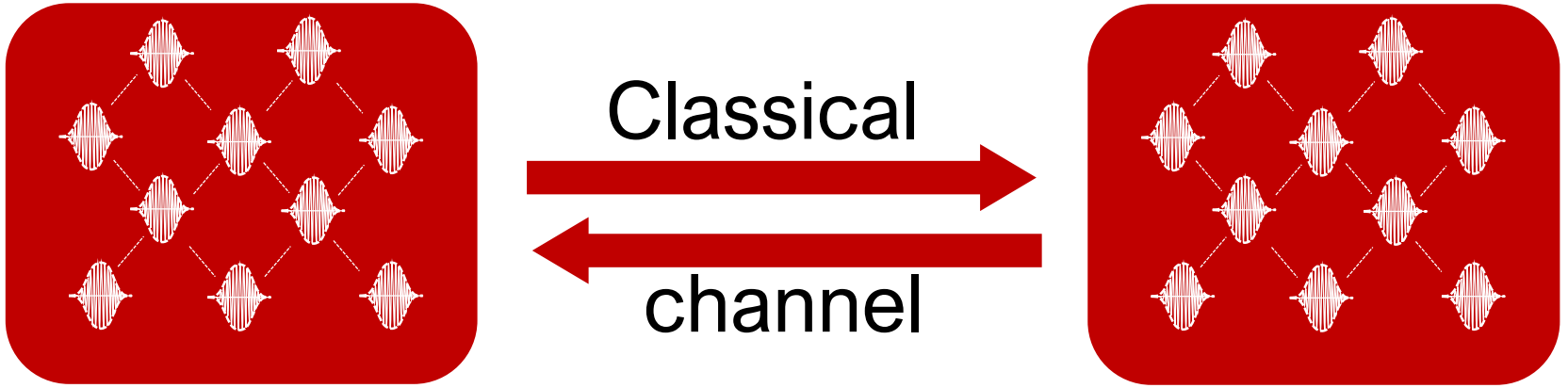
Toward a distributed quantum computer



10 Qubits

2^{10} states

Toward a distributed quantum computer

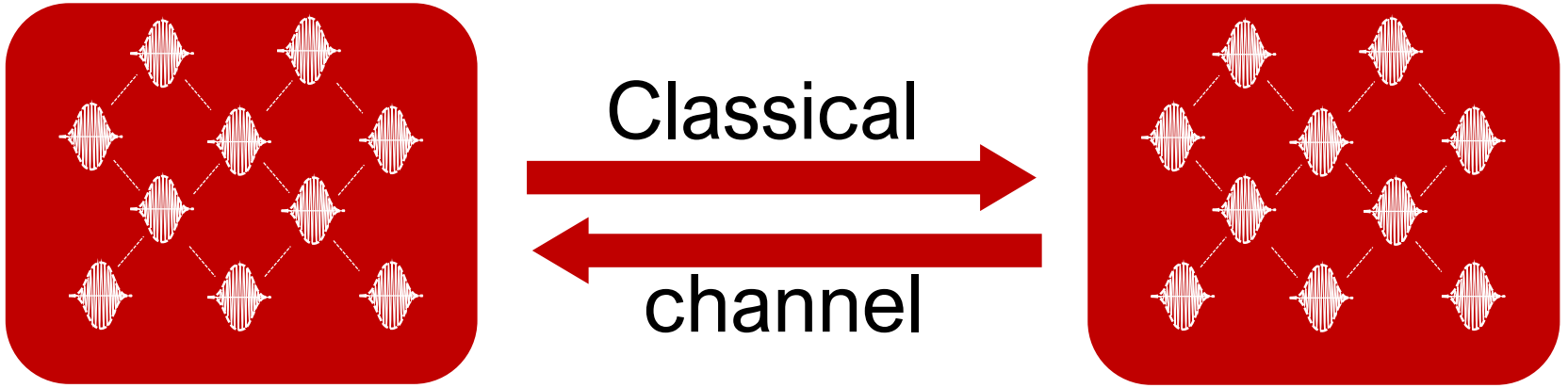


10 Qubits

10 Qubits

Toward a distributed quantum computer

$2x\ 2^{10} =$
2^{11} states



10 Qubits

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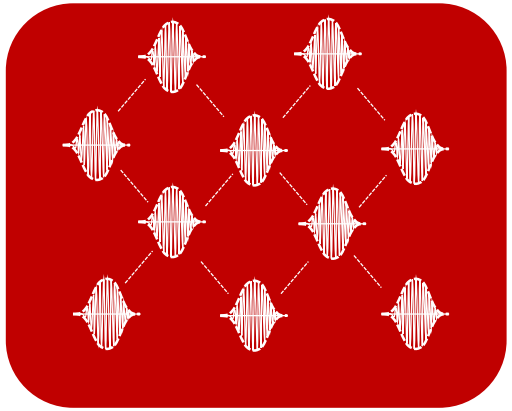
Toward a distributed quantum computer

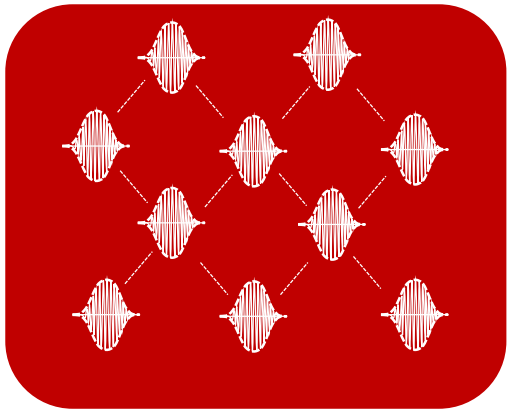
$2x\ 2^{10} = 2^{11}$ states



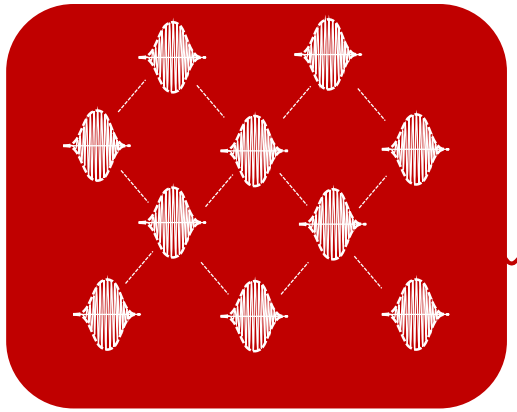
10 Qubits

Classical

channel

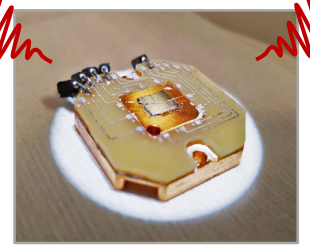


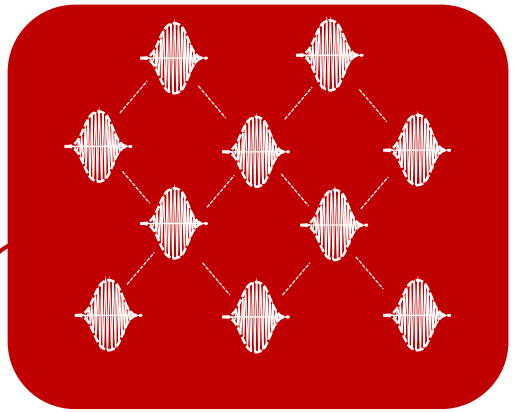
10 Qubits



10 Qubits

Quantum channel

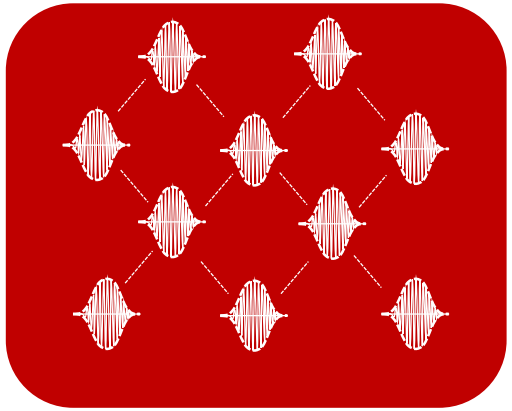




10 Qubits

Toward a distributed quantum computer

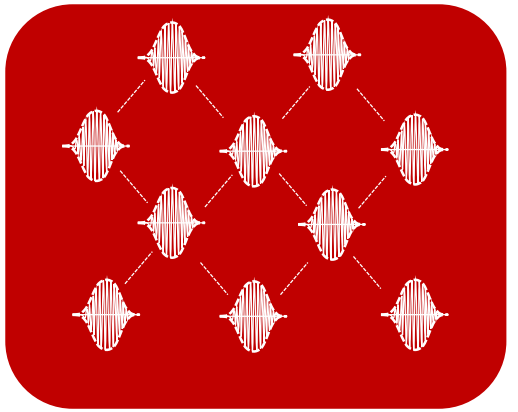
$2x\ 2^{10} = 2^{11}$ states



10 Qubits

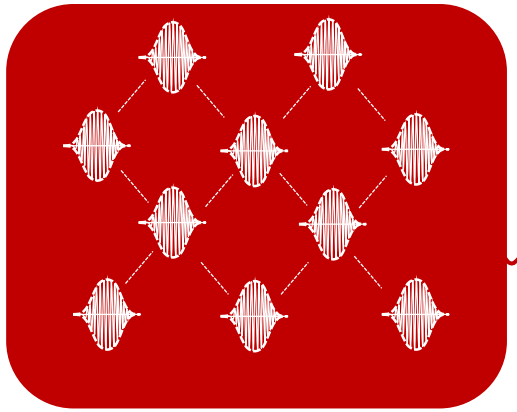
Classical

channel



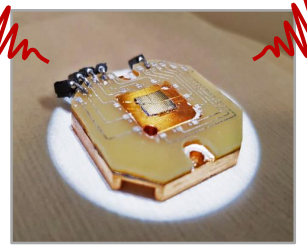
10 Qubits

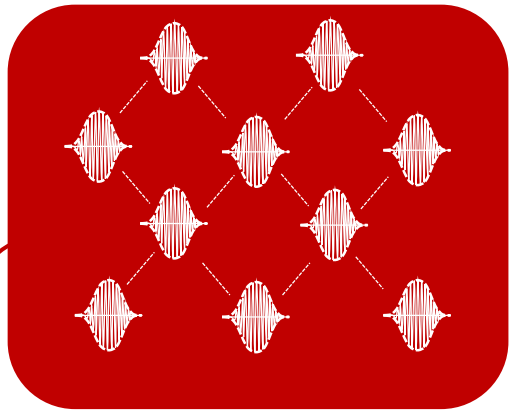
$2^{10\text{-}1} \times 2^{10\text{-}1} = 2^{18}$ states



10 Qubits

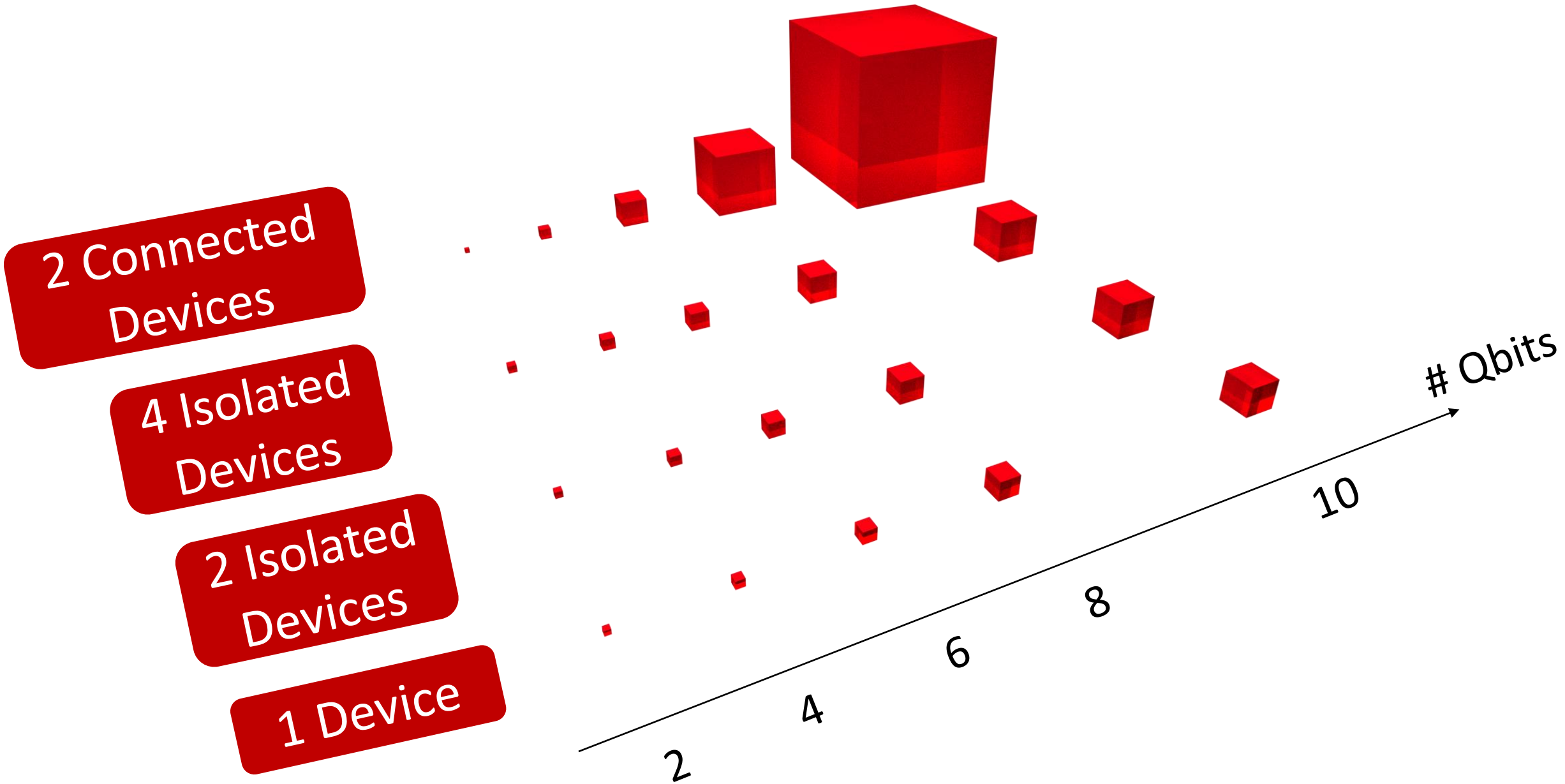
Quantum channel





10 Qubits

Key for an exponential increase of computational power




QUANDELA
2015
Scientific
Validation
2017
Creation
Quandela
Q2 2018
1st delivery
2019
Product
validation
4 sold
2020
First Turnkey
Quantum
source
2022
Sources for
Telecom
2023
Optical
10 Qbit
Computer
The light of Quantum
Technologies
valerian.giesz@quandela.com

Transformation of a scientific result into a product

Timeline

2015

Disruption

- Protect it **before** tell it (patent,…)
- Communication (article, conference,…)

2016-17

Maturation
(CNRS, CEA, SATT,…)

- Engineering dev if necessary
- First feasibility study (IP, market,…)
- Creation and training of the team
- Mentoring (Khaled Karrai)

We did the CNRS prematuration program

attocube

Some tips about the team

Quote from investors: “We prefer a middle technology with a solid team than a disruptive technology lead by a wrong team.”

→ The team is primordial

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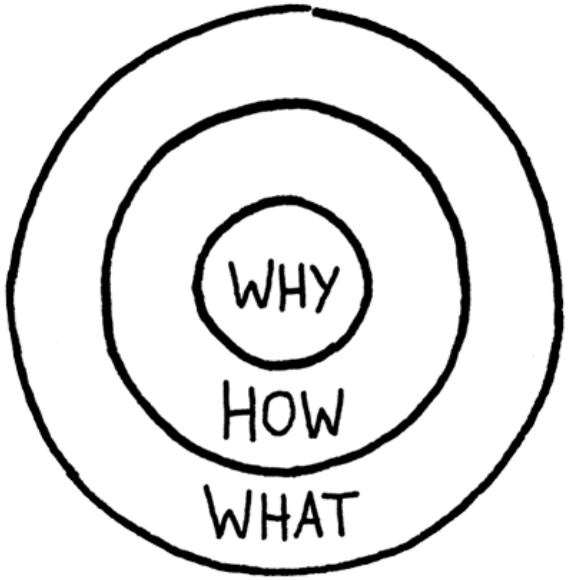
→ The team is primordial

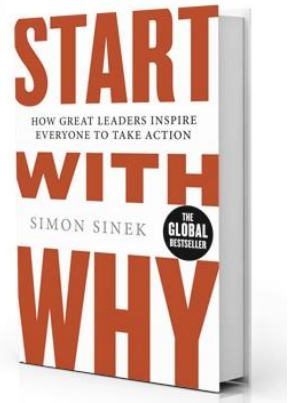
Share your personal objectives from the beginning.

One must-read reference:

START WITH WHY, Simon Sinek



Book



TED Talk on Youtube

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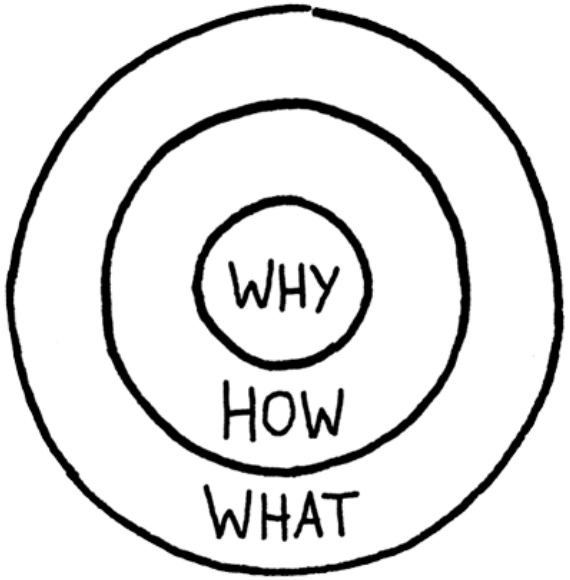

- Synergy of skills – even in a team of scientists

Tasks should be distributed *almost naturally*

Valérian Giesz
Optics, general administration,…

Niccolo Somaschi
Nanotech, clean room, international relations

Pascale Senellart
Vision, R&D advices, reputation

Training of the team

Because we are BLIND by our technology.

There is no favourable wind for who does not know where he is heading
Seneque

Training of the team

Go to HEC Challenge +

Dedicated to people without business background but with breakthrough innovations

What do we learn ?

Training of the team

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What do we learn ?

- To be rich ? No

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What do we learn ?

- To be rich ? No
- To seduce investors ? A bit

Training of the team

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Dedicated to people without business background but with breakthrough innovations

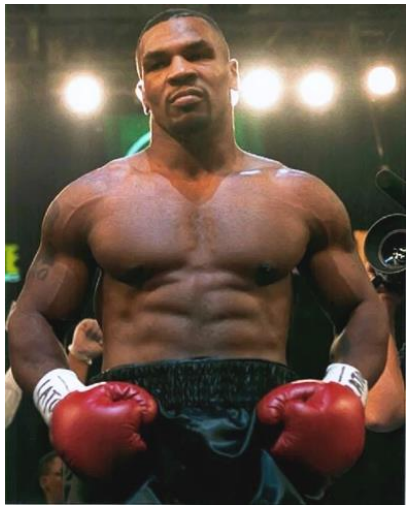
What do we learn ?

- To be rich ? No
- To seduce investors ? A bit
- To use Excel ? Yes but only to attract investors
- To sell at the good price ?? YES !!

Training of the team

Go to HEC Challenge +

Dedicated to people without business background but with breakthrough innovations



“Everybody has a plan until they get punched in the mouth”.
Mike Tyson

Training of the team

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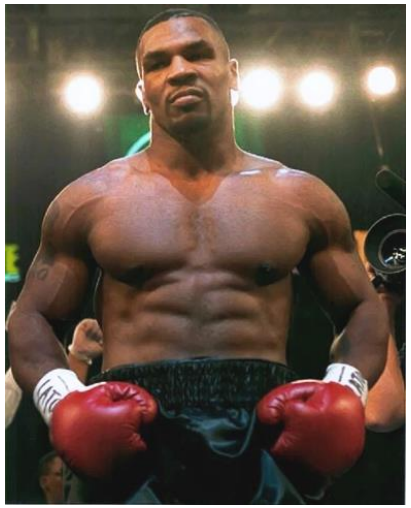
Job to be done

Perceived useful value by the consumer ?

IP Strategy

Lean Strategy

Cash Burn



“Everybody has a plan until they get punched in the mouth”.
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And what if the buyer is not the consumer ?

Direct/indirect competition

Entry barriers

Segmentation

Blue Ocean

Training of the team

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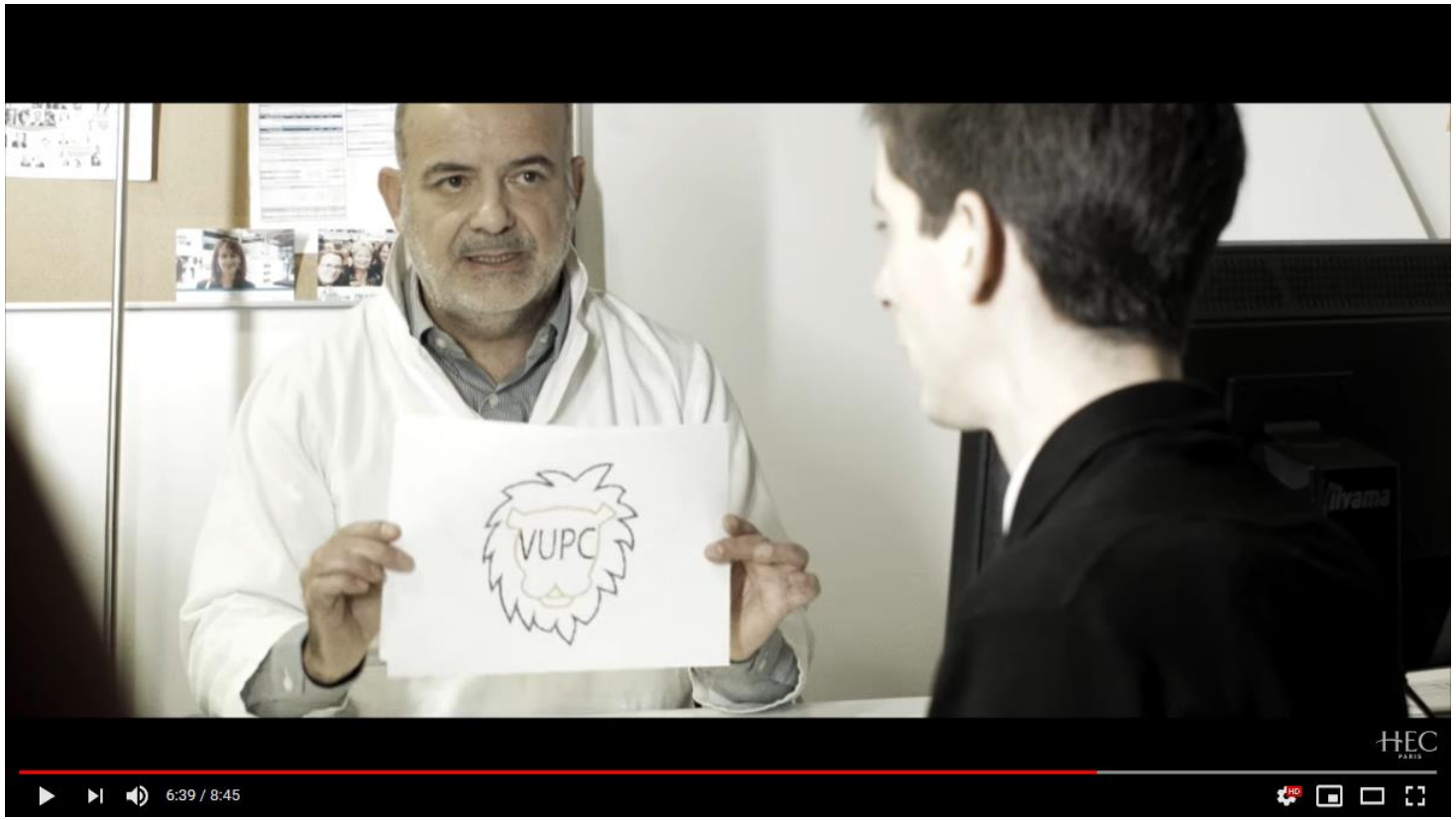

Timeline

2016-17

Maturation
(CNRS, SATT,…)

- Engineering dev if necessary
- First feasibility study (IP, market,…)
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2017

Creation
(Go/NoGo)

- IP Negotiation
- Start of the marketing op, sales ?
- Hunting the subsidies
- Pick investors up
- Hire people and structure teams

Creation

- Before:
  - Agree on the shares repartition: Important! **Make the difference between the past and the future !!**
    - →**The share repartition reflects the future ! Not the past.**
  - Work with a lawyer for the statuses and the shareholder's agreement.
- Administrative formalities:
  - Very simple. Drop the documents at *tribunal de Commerce*. Your lawyer or any administrative staff can do it for you.
  - Advice : Write the activity such as you are registered to CCI (in opposition with the *Chambre des Métiers et de l'Artisanat*)

IP Negotiation

First step, first punch !

- Don’t hope you will get it for free.
- It is a true negotiation between a seller and a buyer !
- Have a Business Plan ready and realistic. Don’t surestimate !
- Figures represent only 25% of the discussions…
- Expect between 6 months and 1 year of discussions

Subsidies

France is a paradise for start-ups

With good technics, you can get at least 1M€ of subsidies by France.

bpifrance WILCO La FRENCH TECH reseauentreprendre i-Lab îledeFrance

And some extra

DGA

When do we know that we succeeded ?

When do we know that we succeeded ?

Never… and always !

We are never sure that a company is viable

https://www.giroptic.com/

https://medium.com/partech-ventures-team-publications/good-bye-giroptic-eeb4893dcecc

I quickly found out he had assembled an incredible team of R&D, design and manufacturing engineers who had been working together for 6 years producing 360 surveillance videos for real estate and businesses. They were the only company capable of assembling multiple images from multiple sensors in near real time (a few milliseconds) on a chip, without distortion, discontinuity and perfect color balance, and to generate 360 videos out of the box without any required post-processing.
They soft-launched their first consumer product on Kickstarter in spring 2014 and collected $1.4M in pre-orders in just 45 days, crushing all previous French crowdfunding campaigns and a worldwide record for a consumer camera at the time.

We are never sure that a company is viable

https://www.giroptic.com/

https://medium.com/partech-ventures-team-publications/good-bye-giroptic-eeb4893dcecc

They won another award at CES 2017 for this camera and got spotted by Facebook for a secret partnership. That was Series B time, with existing and new investors FFP and BNP Development as well as other Angels.

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Then we quickly realized the market for 360 live videos was just not there yet.

So don’t forget…

… the most important is customers !

And it is not as easy as it looks like.