Investing in Superconductive Electronics

European Conference on Applied Superconductivity
Geneva, Switzerland
September 19, 2017

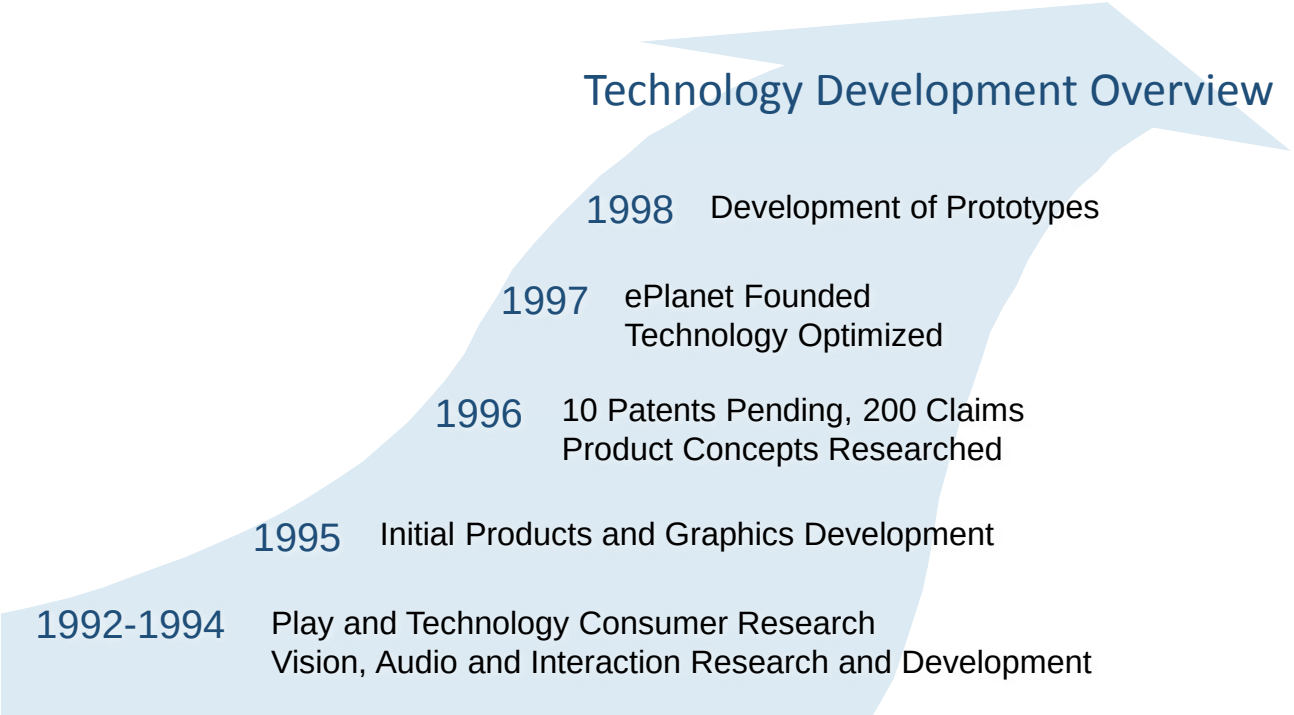
John Levy
Chairman, Hypres Corp.

TIMING IS EVERYTHING

SOMETIMES, OPPORTUNITIES AND PROBLEMS CATCH UP WITH TECHNOLOGY

ePlanet

Our computer vision technology has been under development since 1992



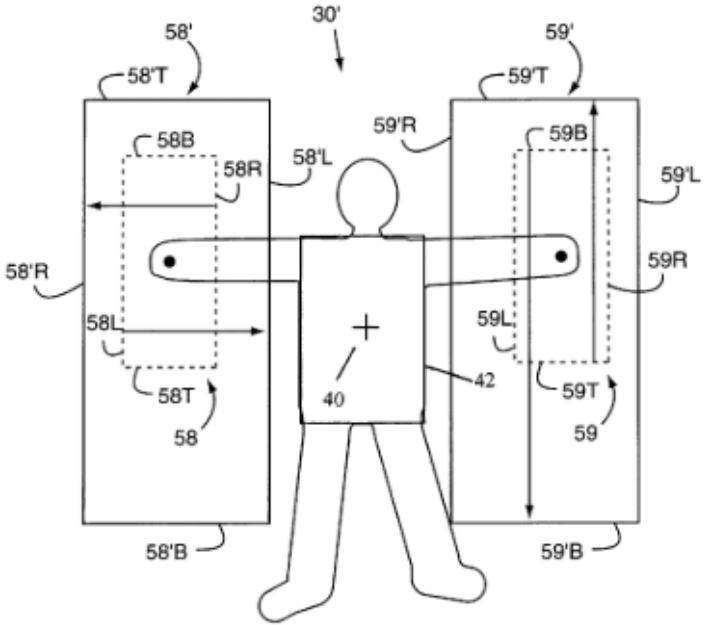
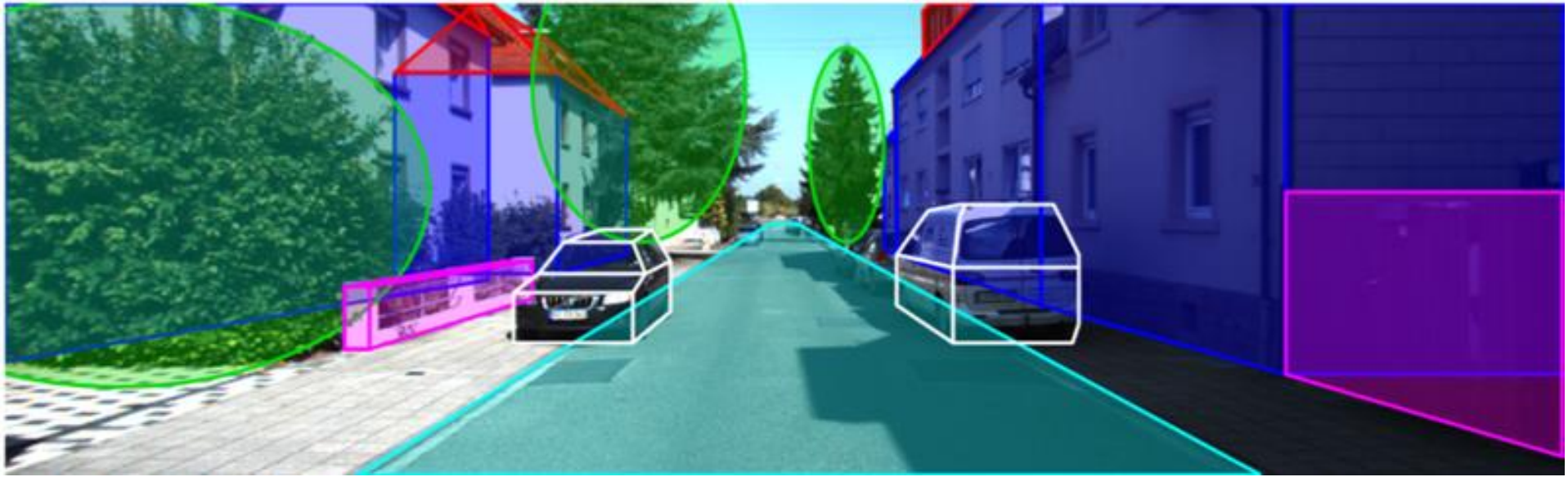
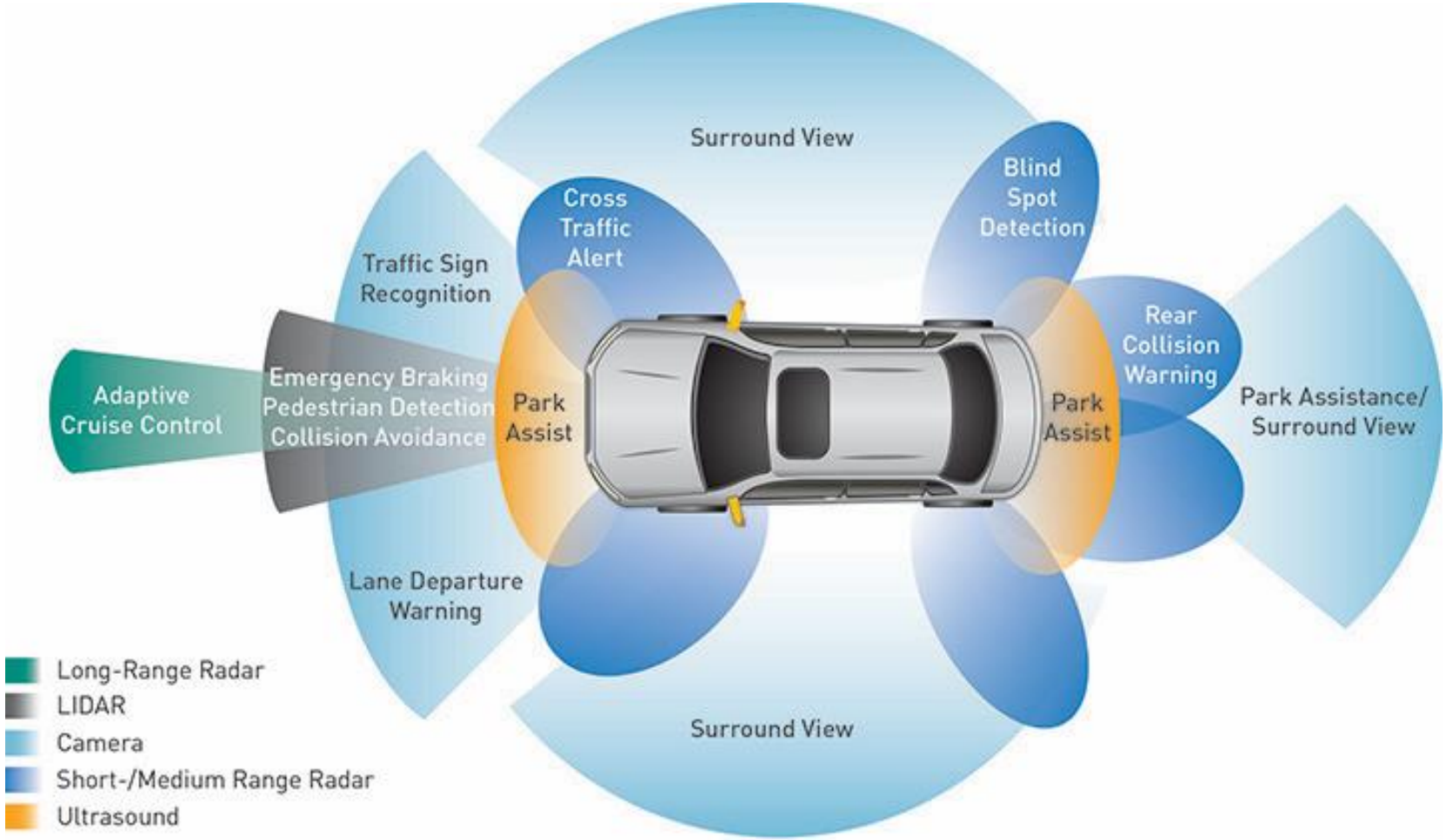

30'
58'
58'T
58B
58R
58'L
58'R
58L
58T
58
58'B
59'
59'T
59'R
59B
59'L
59R
59L
59T
59
59'B
40
42

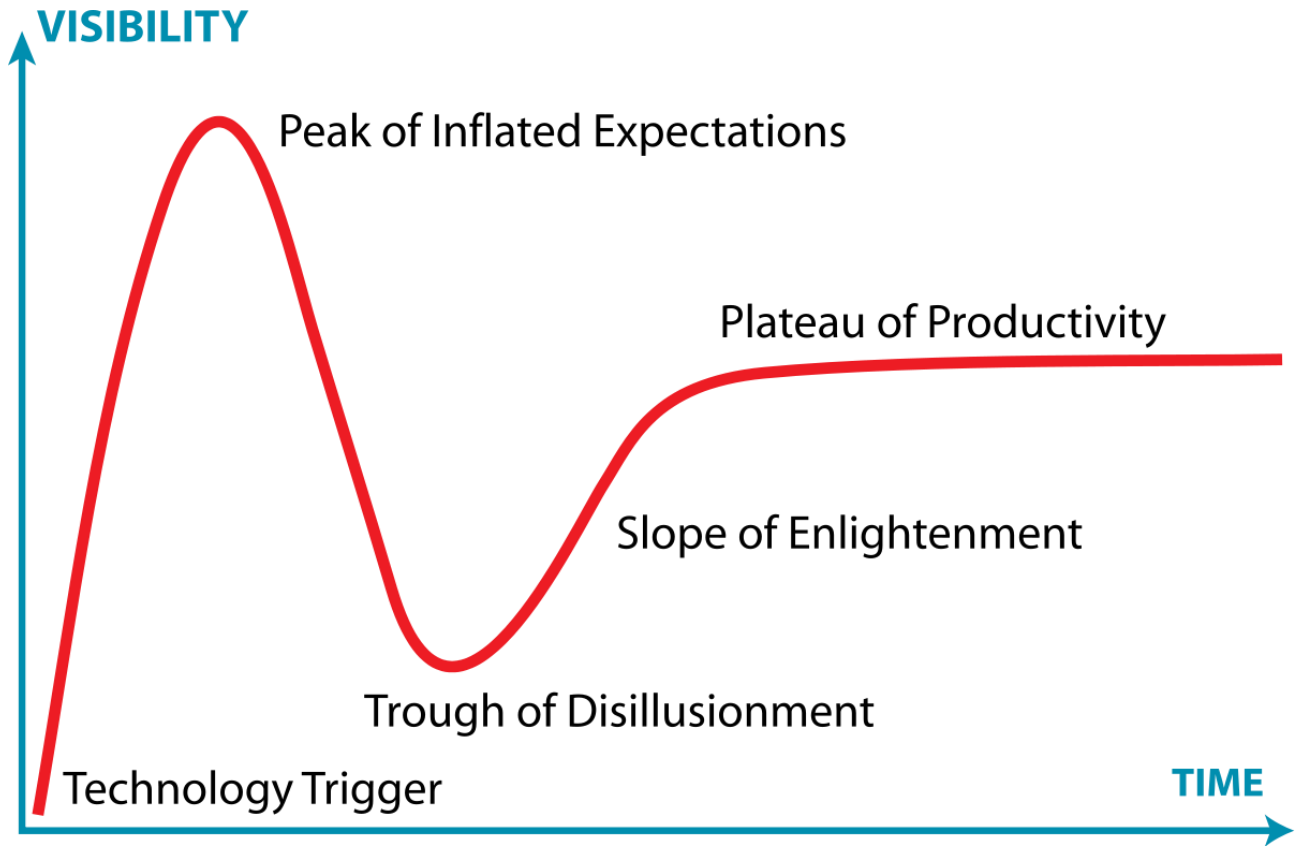
Figure 8

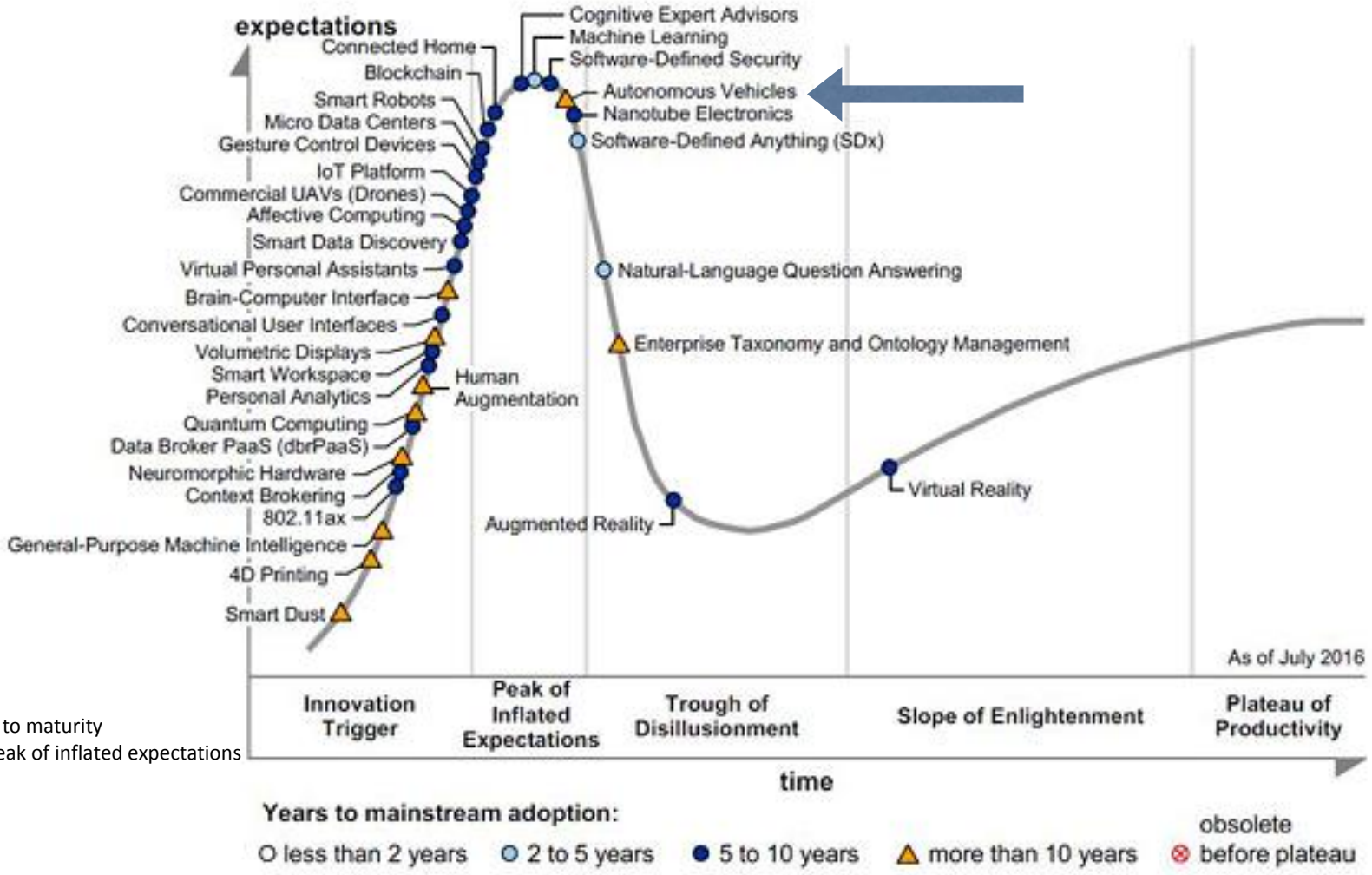
20 YEARS LATER…




Surround View
Blind Spot Detection
Cross Traffic Alert
Traffic Sign Recognition
Rear Collision Warning
Park Assistance/ Surround View
Adaptive Cruise Control
Emergency Braking Pedestrian Detection Collision Avoidance
Park Assist
Park Assist
Lane Departure Warning
Surround View
Long-Range Radar
LIDAR
Camera
Short-/Medium Range Radar
Ultrasound

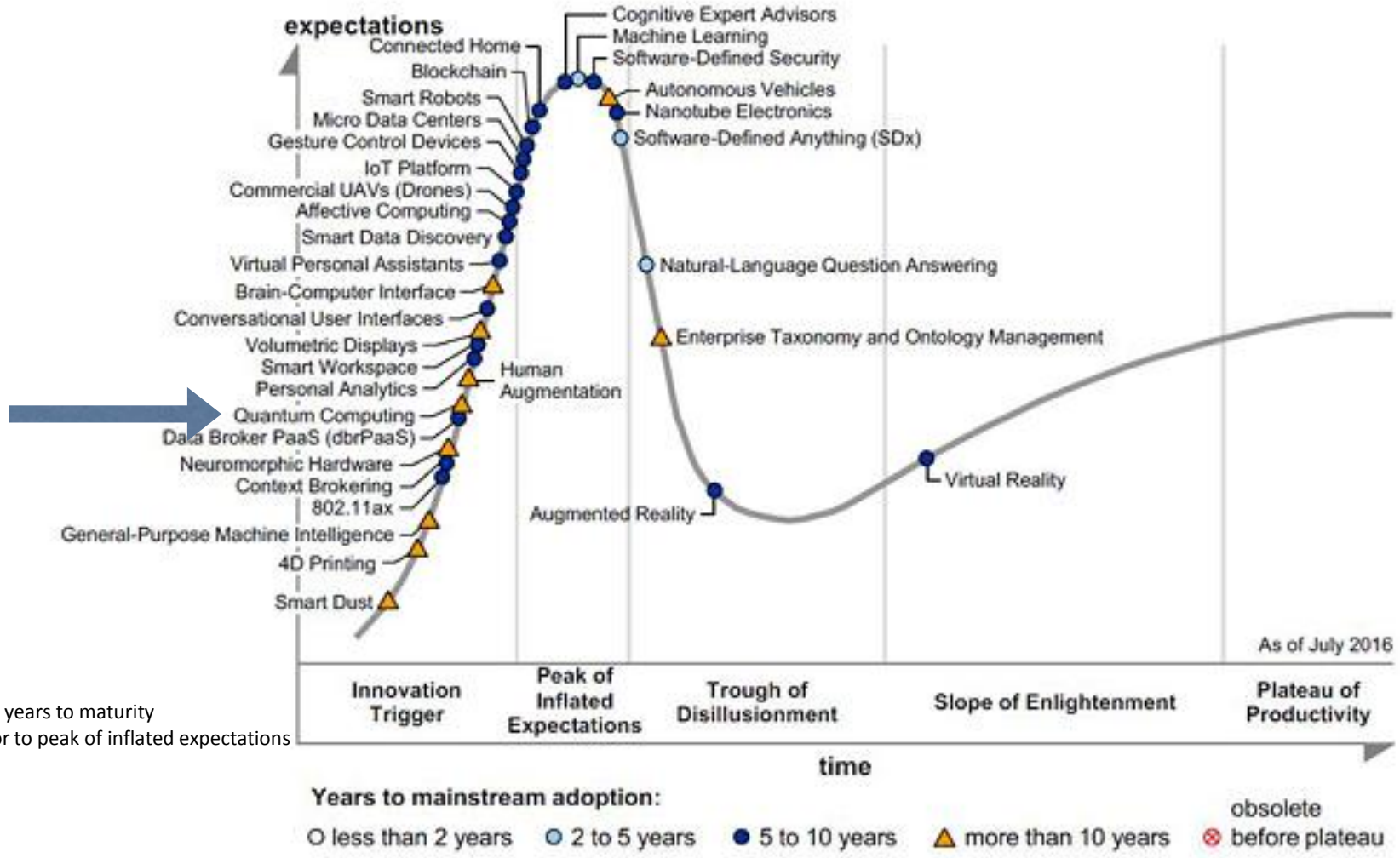

Google


VISIBILITY
Peak of Inflated Expectations
Plateau of Productivity
Slope of Enlightenment
Trough of Disillusionment
Technology Trigger
TIME



>10 years to maturity
Prior to peak of inflated expectations

Source: Gartner (July 2016)



>10 years to maturity
Prior to peak of inflated expectations

Source: Gartner (July 2016)

Data Centers: Facebook Data Center

Supercomputers: K-Computer (Japan)

Luleå, Sweden

Copyright Facebook

- 2014 completion target
- Cost: ~760 M$
- Nearby Lule River generates 9% of Sweden's electricity (~4.23 GW)
- Average annual temperature: 1.3 °C

	Specifications
Performance*	27-51 PFLOP/s
Memory*	21-27 PB RAM 1900-6800 PB disk
Power	84 MW avg* (120 MW max)
Space	290,000 ft² (27,000 m²)
Cooling*	~1.07 PUE

* estimated

IEEE Advancing Technology

Data Centers:
- Cloud computing
- Banking
- Shopping
- Social Networks
- Search Engines....

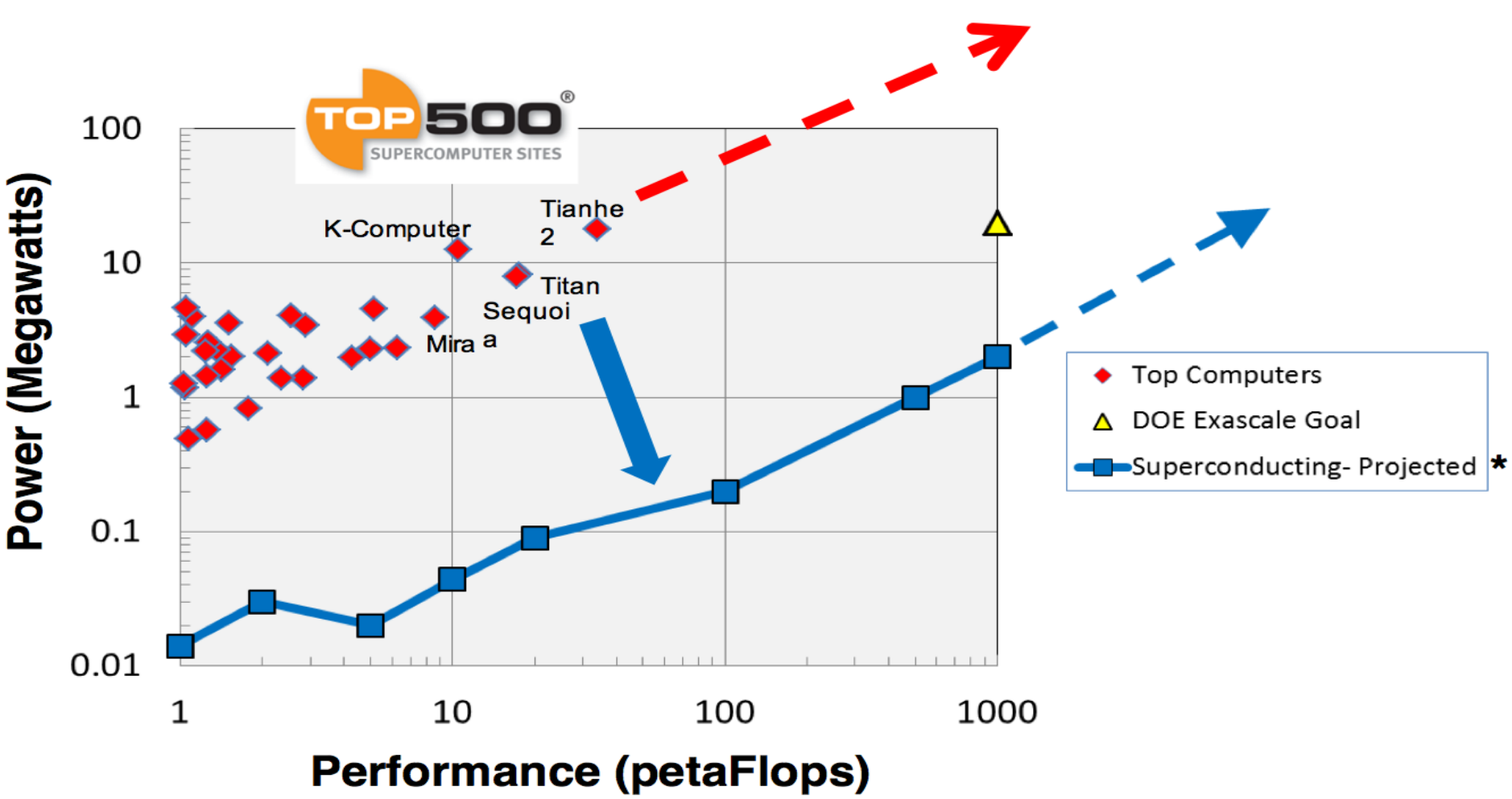
Lulea data center: 120 MW (max power)

Top500 No. 5 supercomputer: K-computer (Japan): 10.51 petaflop/s, 12.7 MW

TOP500 SUPERCOMPUTER SITES

www.top500.org

rating updated in June 2016


TOP500
SUPERCOMPUTER SITES
K-Computer
Tianhe 2
Titan
Sequoia
Mira
Power (Megawatts)
100
10
1
0.1
0.01
1
10
100
1000
Performance (petaFlops)
Top Computers
DOE Exascale Goal
Superconducting- Projected *

IT’S WHAT’S INSIDE THAT COUNTS, OR IS IT?

PIZZA

PAPA JOHN'S

Better Ingredients.
Better Pizza.


PIZZA
PAPA JOHN'S
Better Ingredients.
Better Pizza.

UBER

EVERYONE'S PRIVATE DRIVER™


Better Technology.
Better Products.
Better Companies.

IS YOUR SOLUTION A:

FEATURE,
APPLICATION,
PLATFORM,
OR
COMPANY?

WHAT'S THE BIG IDEA?

Great idea

Great founder

Great management team

Capable and value-added venture capitalist

Capable and supportive board

Absence of too many companies/other start-up’s in the same space

Reasonable going-in pricing environment

Ability to attract and retain great technical talent

Who is customer?

What problem are you solving?

How significant and urgent is solving this problem to the customer?

What alternatives does the customer have?

Is the solution unique or proprietary?

How much is it worth to the customer?

How much of that value will the customer be willing to pay?

How many customers are there?

How much of your product do they need?

Do they have sufficient money to buy your product?

Are you the right person to execute this?

Who else do you need to be successful?

Can you recruit?

Can you build and manage a cohesive team?

Is there a market for your solution?

Does your solution scale?

What, if anything, is proprietary?

Is there a major competitor?

What is your business model?

Is it capitally efficient?

Can you raise capital?

How can you verify any of this?

HBS Venture Capital Research (2016)

- **Team**
  - **Ability**
  - **Industry experience**
  - **Passion**
  - **Entrepreneurial experience**
  - **Teamwork**
- **Timing**
- **Luck**
- **Technology**
- **Business model**
- **Industry**

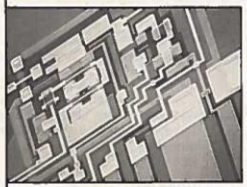
Source: Harvard Business School, 2016, Prof. Hardymon, Lerner, Leamon et al


VINTAGE FIRST CUSTOMER SHIP
SEPTEMBER 1987
Champagne Hypre
APPELATION ELMSFORD DEWAR CONTROLÉE
An aggressive presentation of bold sensibility
and delicate egos brought together to produce
A Product of Excellence
FROM THE HEART OF NIOBIUM VALLEY
WE WILL SHIP NO SYSTEM BEFORE ITS TIME

THE DAWN OF A NEW ERA IN ELECTRONICS...
HYPRES IS MAKING SUPERCONDUCTING TECHNOLOGY A REALITY

Everybody else follows the crowd and goes with conventional technology except this talented and courageous team which has the vision that superconducting electronics is where the action is in performance, opportunity for growth and contributions to the frontier of picosecond domain electronics.

At HYPRES, talented engineers find challenges in picosecond and subpicosecond domain circuits, packages, connectors and systems. Their inventions are destined to advance the state of science and technology.



HYPRES possesses the only self-sufficient microfabrication facility making its proprietary picosecond integrated circuit chips for unique ultra-high performance systems.

AFTER THIS, THE STATE OF SCIENCE AND TECHNOLOGY WILL NEVER BE THE SAME.

Talented engineers and engineering managers: Participate in a major historic event. Be with the first to introduce the revolutionary technology to market, explore opportunities in the following areas:

- Design of High-Speed Circuits (GaAs, Bipolar, CMOS, JJ)
- Microwave, Millimeter Wave, or Hybrid Integrated Circuits
- Cryogenics, Closed Cycle Refrigerators, and Vacuum Systems
- Thin Film and Lithographic Processes, Vacuum Deposition
- Bit Slice or Micro-Code
- Signal Processing System Development
- Applications Engineering, Test & Measurement Instrumentation
- Solid State Physics, Material Science
- Software Development (16 Bit, Assembler, Pascal, C)

HYPRES is located in the beautiful suburbs of Westchester County. It offers attractive compensation packages for those who aspire to the highest standards of excellence and want this nation to continue to lead.

Contact our Recruiting Officer, Mary K. Barry
500 Executive Blvd.
Elmsford, New York 10523
(914) 592-1190

HYPRES, Inc.
Making Superconducting Electronics a Reality

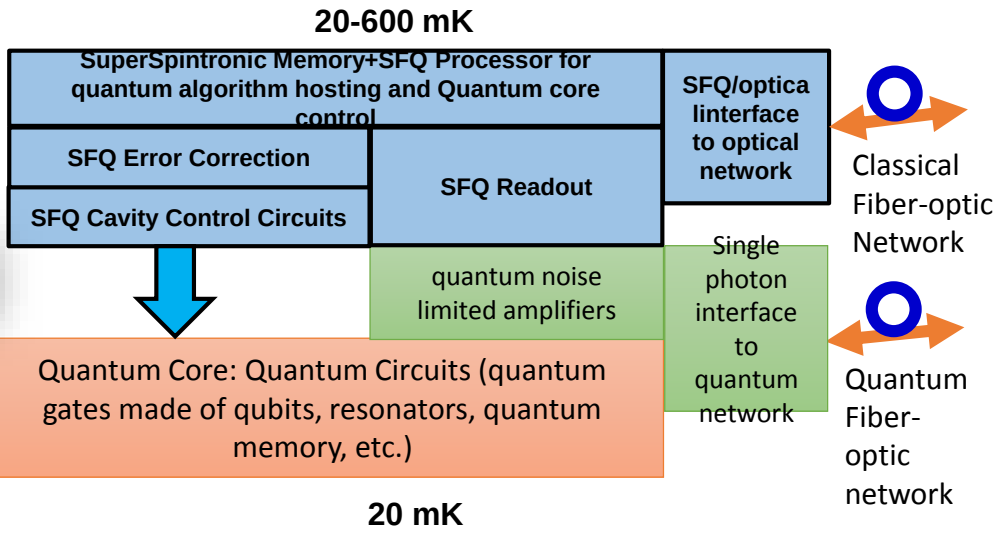
SEEQC

SUPERCONDUCTIVE ENERGY EFFICIENT QUANTUM COMPUTING

OPPORTUNITY

SCALABLE QUANTUM PROCESSORS PROCESSESS & SYSTEMS

Our Quantum Computing System



Features:

1. Low cost per qubit (<$100 at volume – multiple controller per chip and MCM)
2. Scalable to practical QC levels (1M qubits and beyond)
3. Very small ECF latency (delay between readout and control signal) – enables fault-tolerant computing

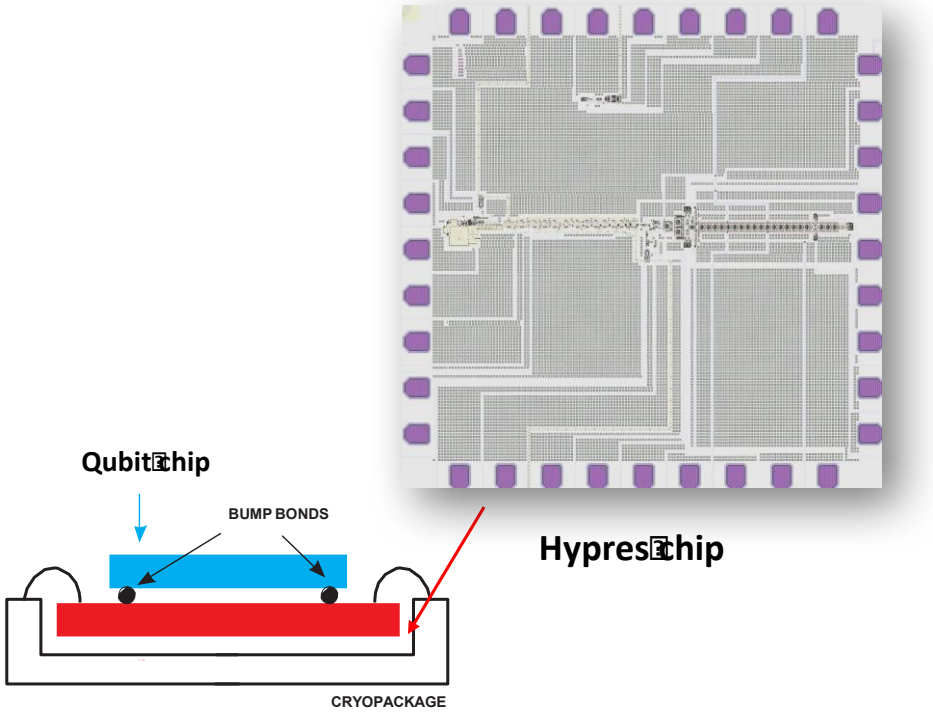
Enables fault-tolerant QC systems scalable to practical complexity levels

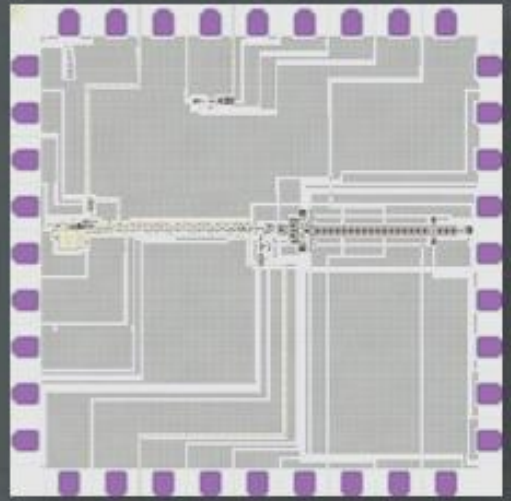
Single Flux Quantum Readout chip

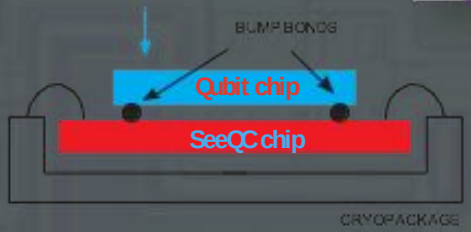
HYPRES Single Flux Quantum Qubit Readout (Quantum Readout chip)

Provides high-fidelity readout of qubits and data conversion to SFQ digital form

The SFQ generator will be coupled to the quantum chip in a flip-chip arrangement using bump bonds.







SeeQC chip

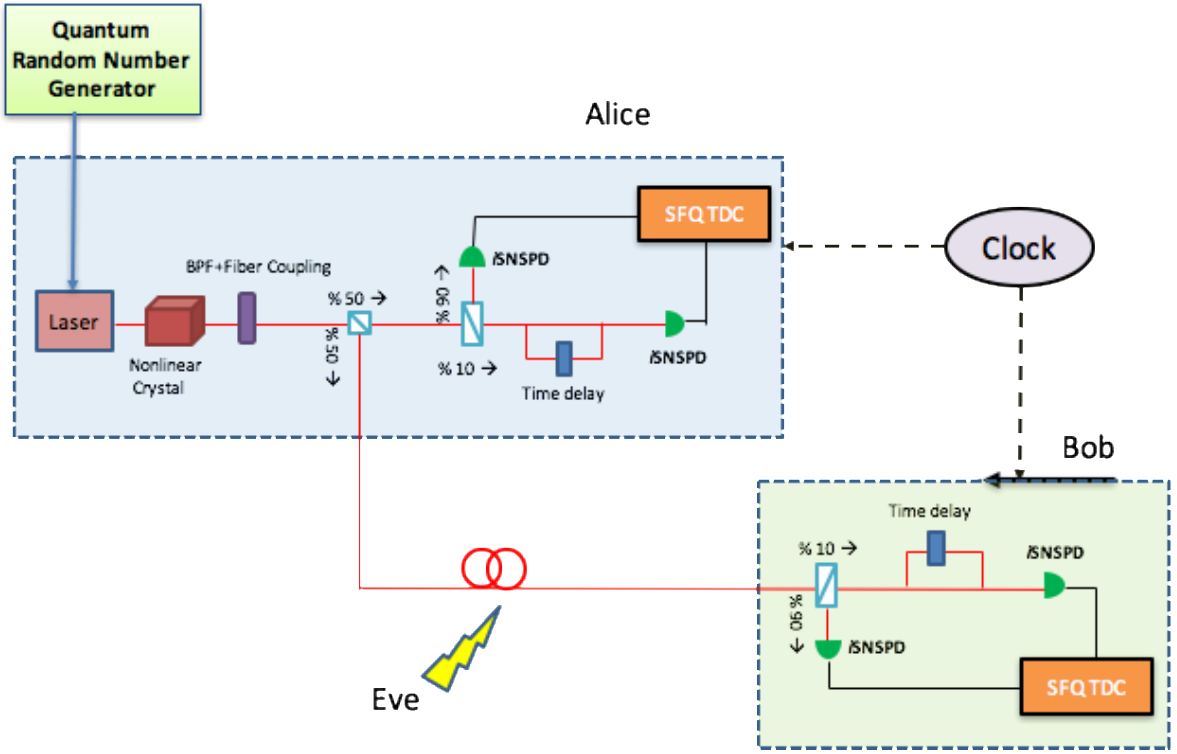
PROJECT

QUBIT ERROR CORRECTION & CONTROL

TECHNOLOGY TO ENABLE SCALABLE BUILD-OUT OF QUANTUM COMPUTERS

DATE 2017-2021

MARKET QUBIT DESIGNERS AND QC SYSTEMS



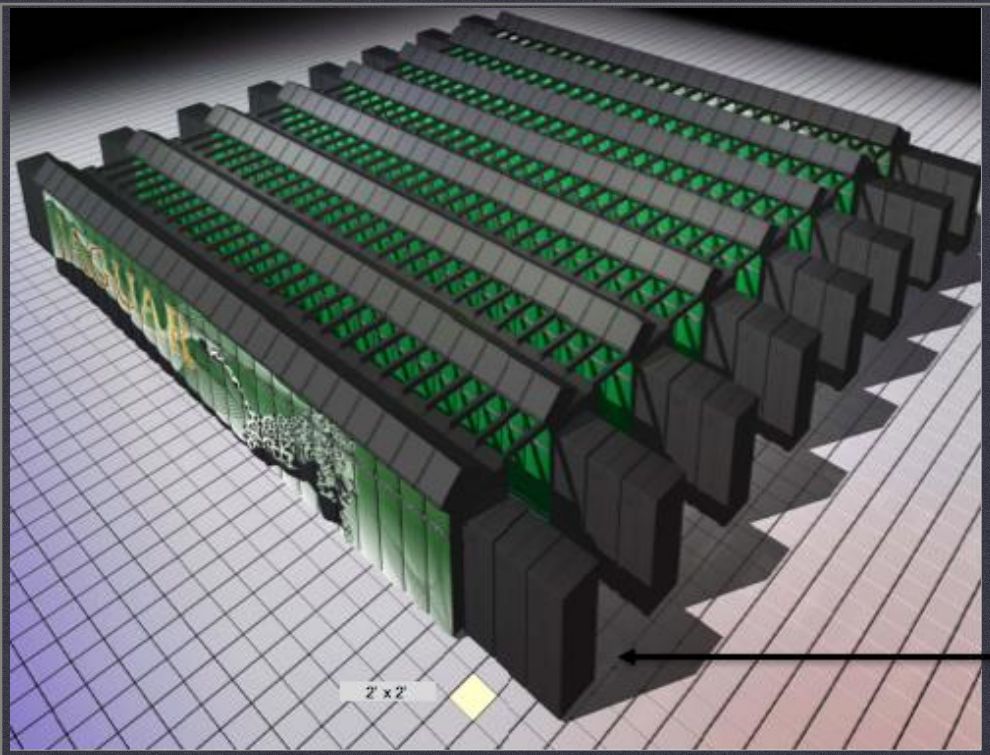
PROJECT

QUANTUM KEY DISTRIBUTION

ULTRA-SECURE COMMUNICATIONS

DATE 2018-2021

MARKET GOVERNMENT & LARGE ENTERPRISE



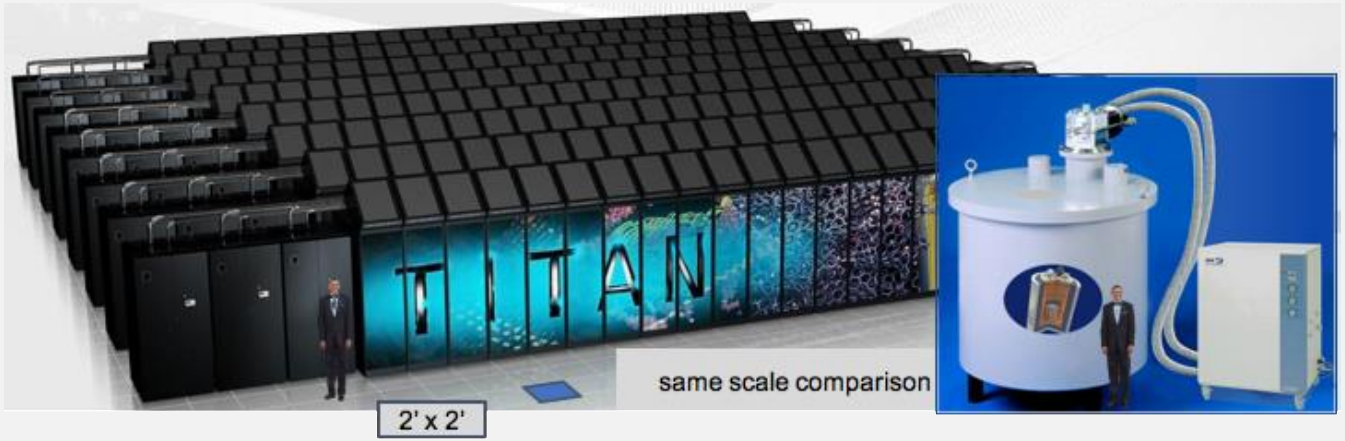
PROJECT

DATACENTER ACCELERATOR

SUPERCONDUCTOR BLADE BOOSTS TODAY'S CLOUD PROCESSORS

DATE **2017-2020**

MARKET **HYPER DATACENTERS**

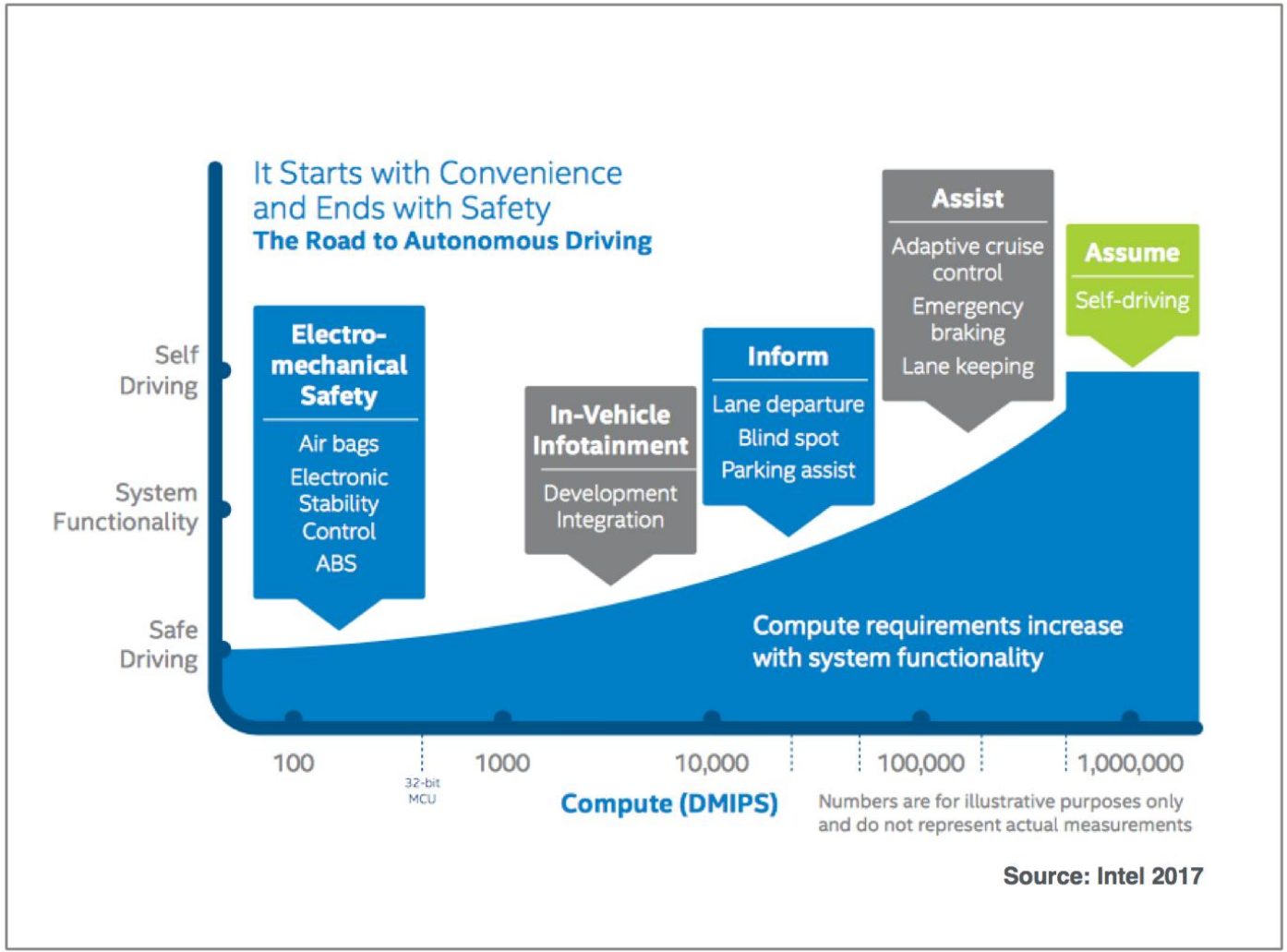


PROJECT

SCALABLE QUANTUM COMPUTER

BEYOND EXASCALE QUANTUM SYSTEM

DATE	MARKET
2020-2025	HIGH END COMPUTING


It Starts with Convenience and Ends with Safety
The Road to Autonomous Driving
Self Driving
System Functionality
Safe Driving
Electro-mechanical Safety
Air bags
Electronic Stability Control
ABS
In-Vehicle Infotainment
Development Integration
Inform
Lane departure
Blind spot
Parking assist
Assist
Adaptive cruise control
Emergency braking
Lane keeping
Assume
Self-driving
Compute requirements increase with system functionality
100
32-bit MCU
1000
10,000
100,000
1,000,000
Compute (DMIPS)
Numbers are for illustrative purposes only and do not represent actual measurements
Source: Intel 2017

SOURCES OF INVESTMENT

Dilutive to ownership

- **Institutional venture capital (financial & corporate)**
- **Angel investment**
- **Private equity**

Non-dilutive to ownership

- **National and pan-national initiatives**
- **Research topics**
- **Grants**
- **Contracts to purchase goods/services**

VENTURE CAPITAL CIRCA 2017

2016 = 2nd highest year of investing (2015) in past 11 years; $69B

$112b committed to venture funds over past 3 years

Best fundraising year of the past decade = $42B across 253 funds

Continued trend of higher concentration

- **7 funds accounted for 23% of all investment**

Source: National Venture Capital Association Yearbook, 2016,

Venture Capital Circa 2017

Areas of tech focus:

- **AI and machine learning**
- **Robotics**
- **Drones**
- **IoT**

82% of VC-backed exits were corporate acquisitions

13% were PE buyouts; rest were IPO's

Median exit size = $84.5m,

- **59% of exit dollars were for companies >$500m (Jet, Dollar Shave Club)**

Source: National Venture Capital Association Yearbook, 2016,

HBS Venture Capital Research (2016)

- Team most significant variable
- Secondary: product/technology, business model, market, industry
- Investment sourcing
  - Only 10% come inbound
  - 90% from personal/professional networks, other investors and existing portfolio companies

Source: Harvard Business School, 2016, Prof. Prof. Hardymon, Lerner, Leamon et al

Thank you

jlevy@hypres.com

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