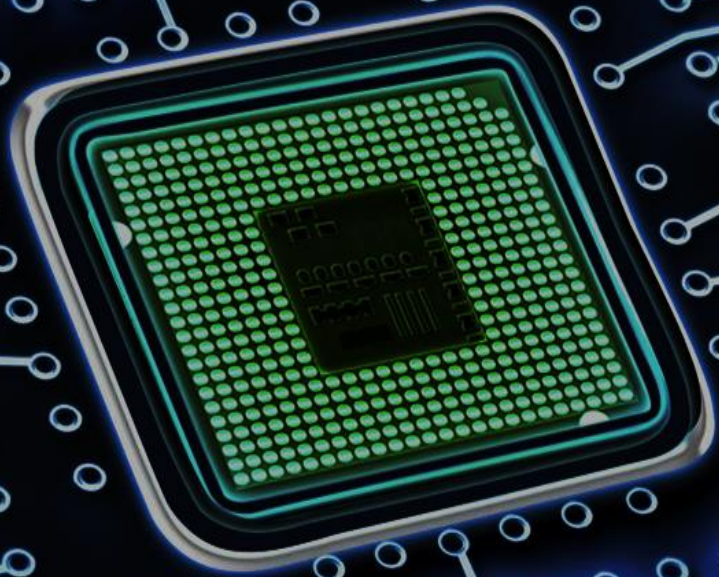


# آشنایی با مهندسی برق - الکترونیک

حوزه های تخصصی و کاربردها



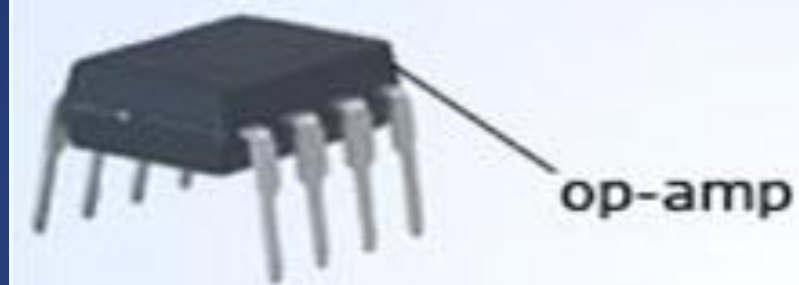
بابک برنوش - پاییز ۱۳۹۷

# معارفه

- میزان آشنایی با کدنویسی نرم افزاری (مثلا C++)؟
- تجربه کار عملی در زمینه نرم افزار یا الکترونیک؟
- هدف از تحصیلات دانشگاهی؟

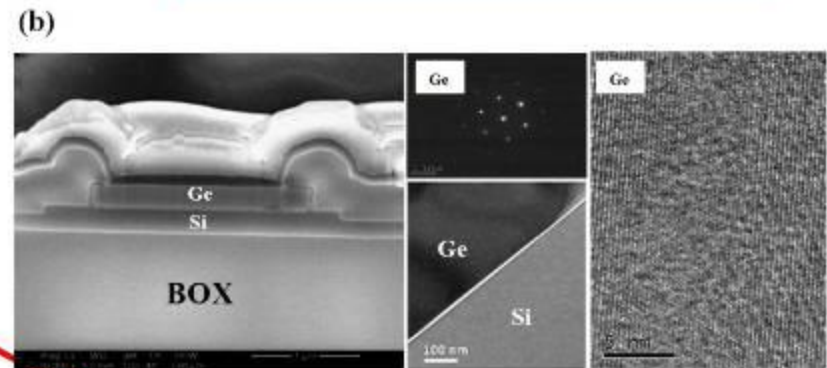
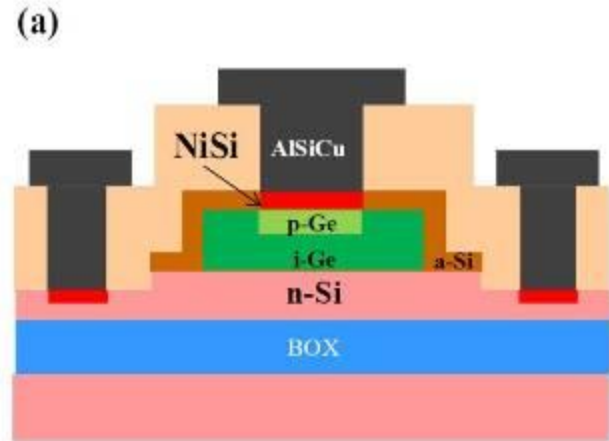
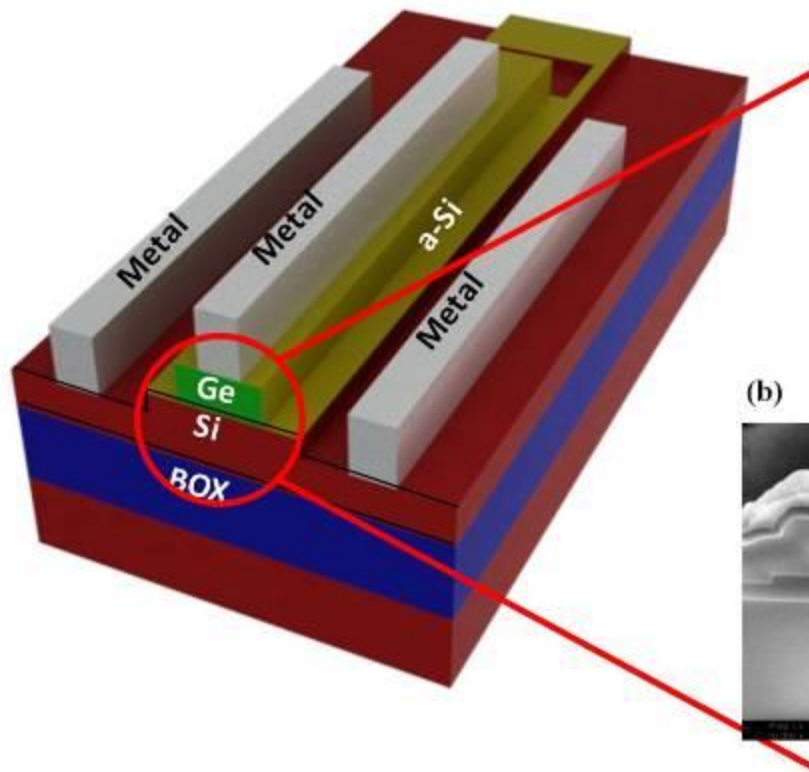


# Semiconductor Devices

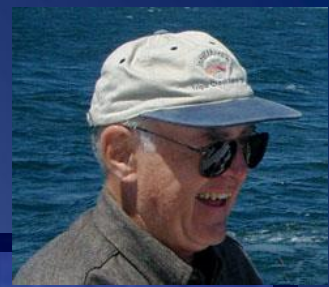




# CMOS Technology



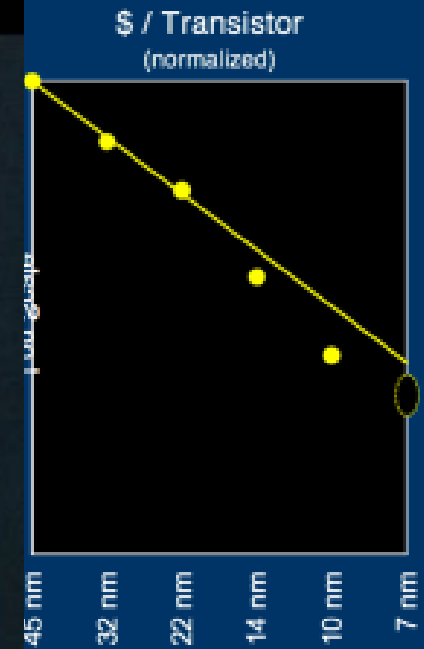
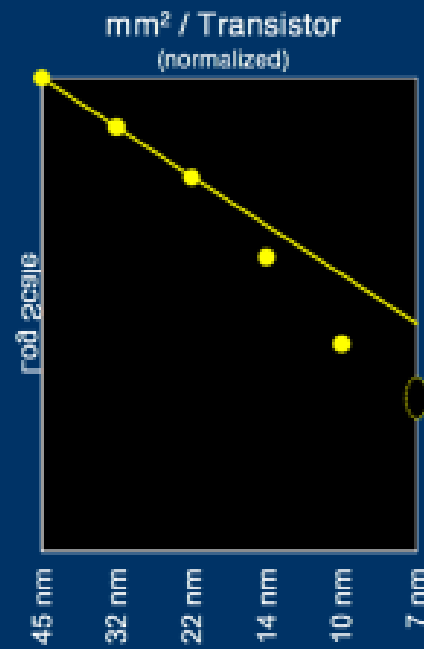
# CMOS Technology Trend



1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010

# CMOS Technology Acceleration

20 years later and all of these things fit in your pocket.



Hyper scale

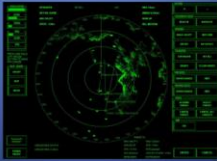
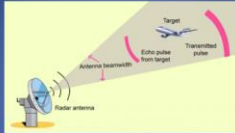
low CPT





# Electronics Related Fields

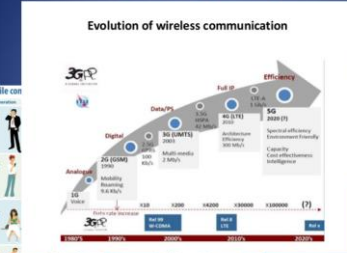
## Electronics and Electronic Warfare



## Electronics and Power



## Electronics and Communications



## Electronics and Bioelectric



# Electronics

## Electronics and Artificial Intelligence



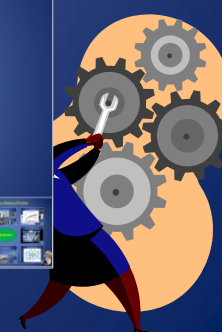
## Electronics and Networking



## Electronics and Control



## Internet of Things (IOT)

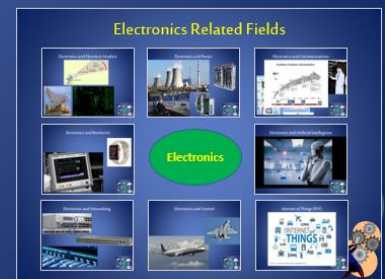


# Electronics and Power



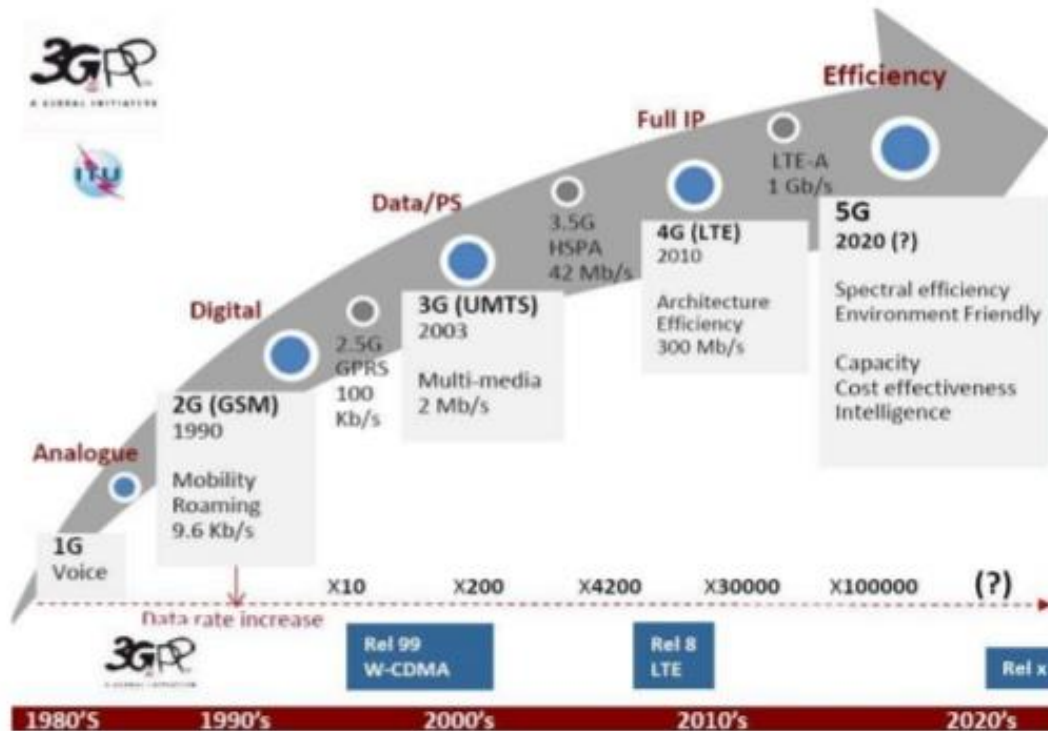


# Electronics and Control



# Electronics and Communications

## Evolution of wireless communication



### Mobile con

Generation

1G



2G



3G



4G



Year 2010  
 Standards: 4G, LTE Advanced  
 Technology: digital  
 Bandwidth: Mobile Broad Band  
 Data rates: 4G-like experience  
 1 hr HD movie in 6 minutes

Car-to-car communication

5G is about Communication, Storage, Processing...



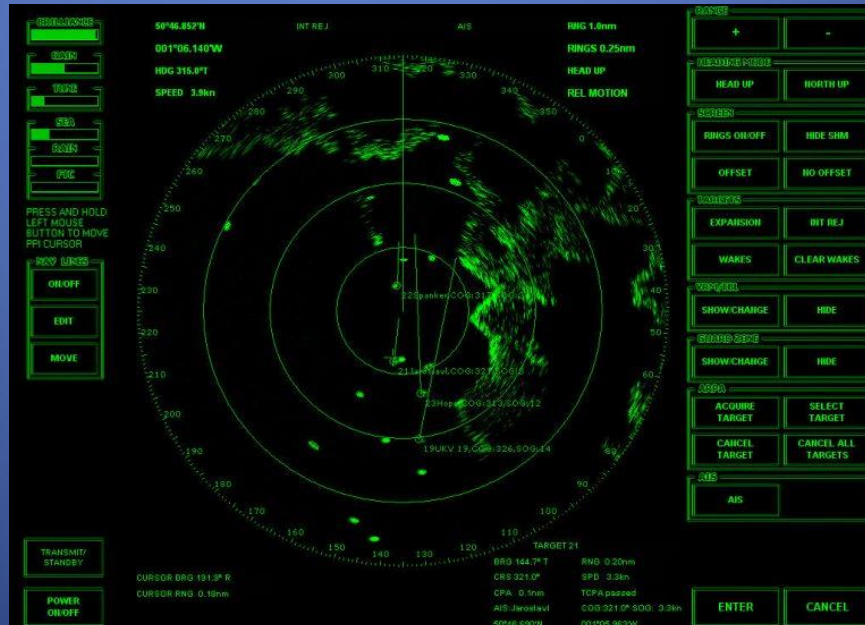
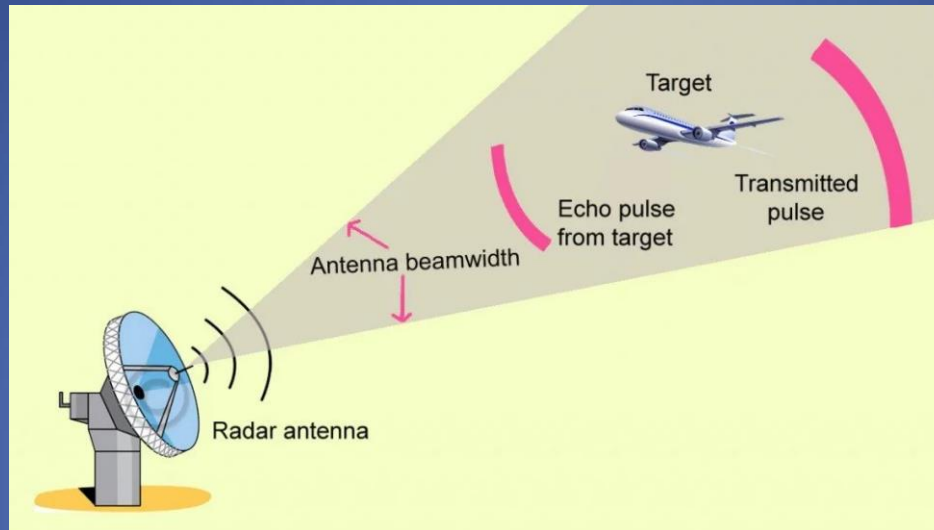
### Electronics Related Fields



Electronics

THINGS

# Electronics and Electronic Warfare

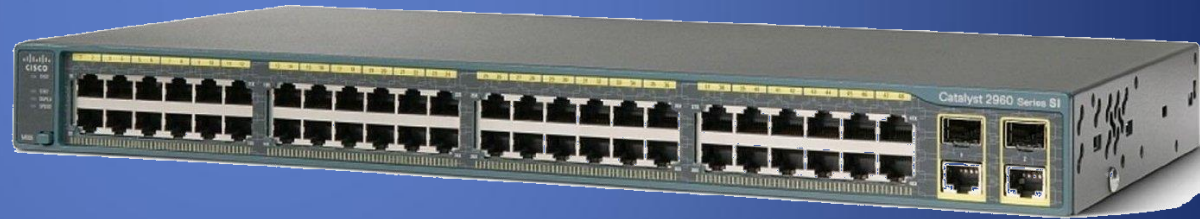




# Electronics and Bioelectric



# Electronics and Networking

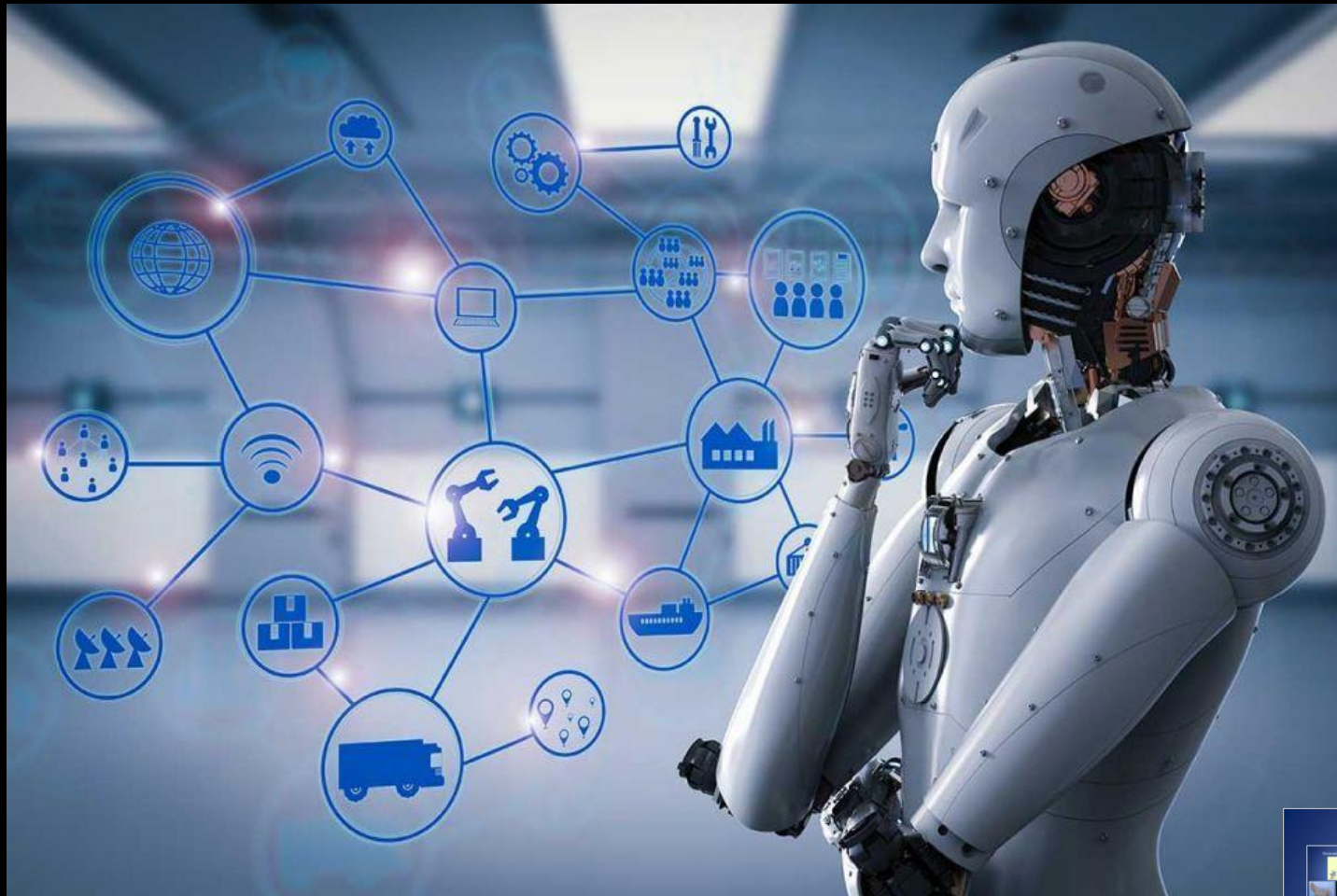


Electronics Related Fields

The image shows a grid of 12 small icons representing different electronics-related fields. The central icon, labeled "Electronics", is highlighted with a green circle. The other icons include: a computer monitor, a circuit board, a person working at a desk, a person in a lab coat, a person in a hard hat, a person in a uniform, a person in a suit, a person in a lab coat, a person in a hard hat, a person in a uniform, a person in a suit, and a person in a lab coat. The text "THINGS" is visible in the bottom right corner of the grid.



# Electronics and Artificial Intelligence



Electronics Related Fields

	<b>Electronics</b>	

THINGS



# Internet of Things (IOT)



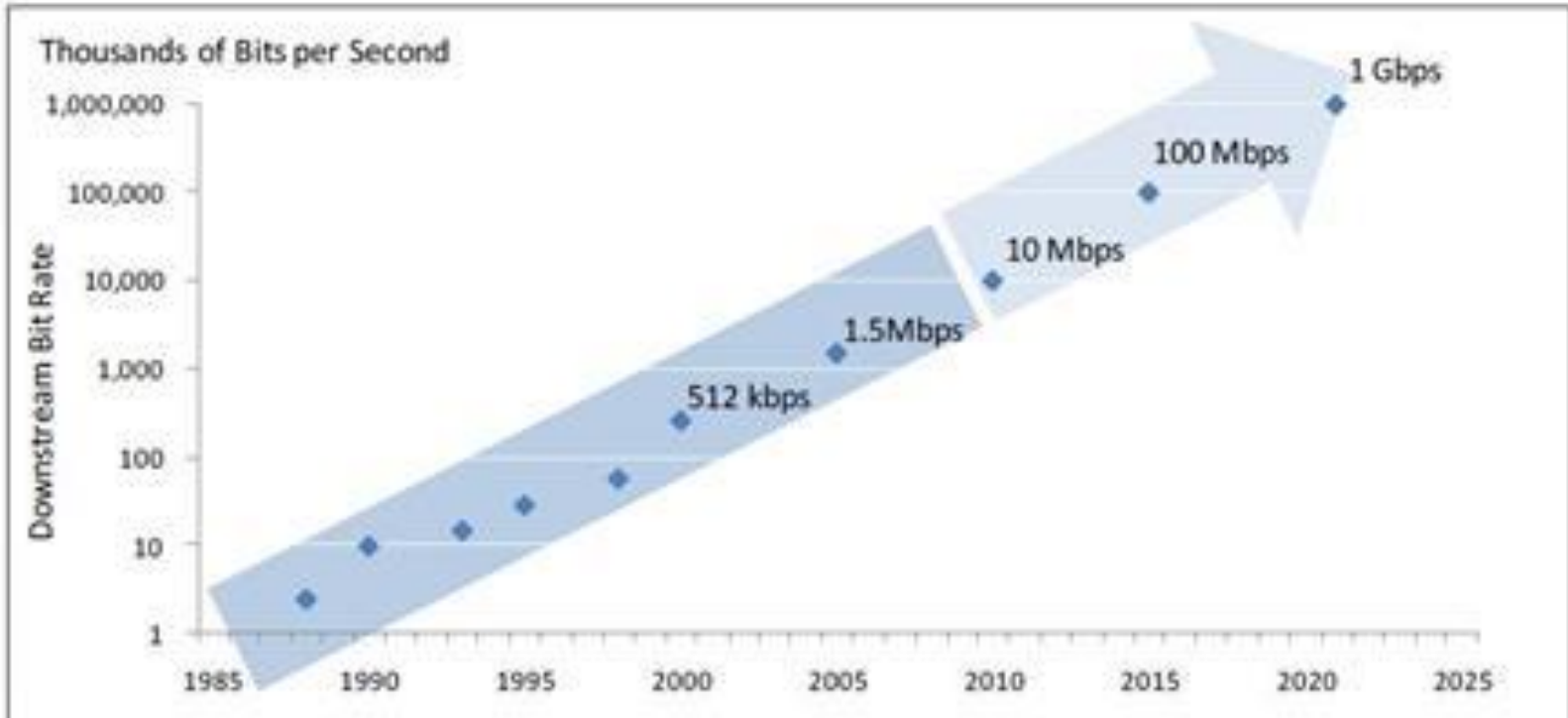
*Kuva 1. Internet of Things. Lähde: Huffington Post*

Electronics Related Fields



# Internet Speed Grow

Exhibit 2.12: Download Speeds since 1985



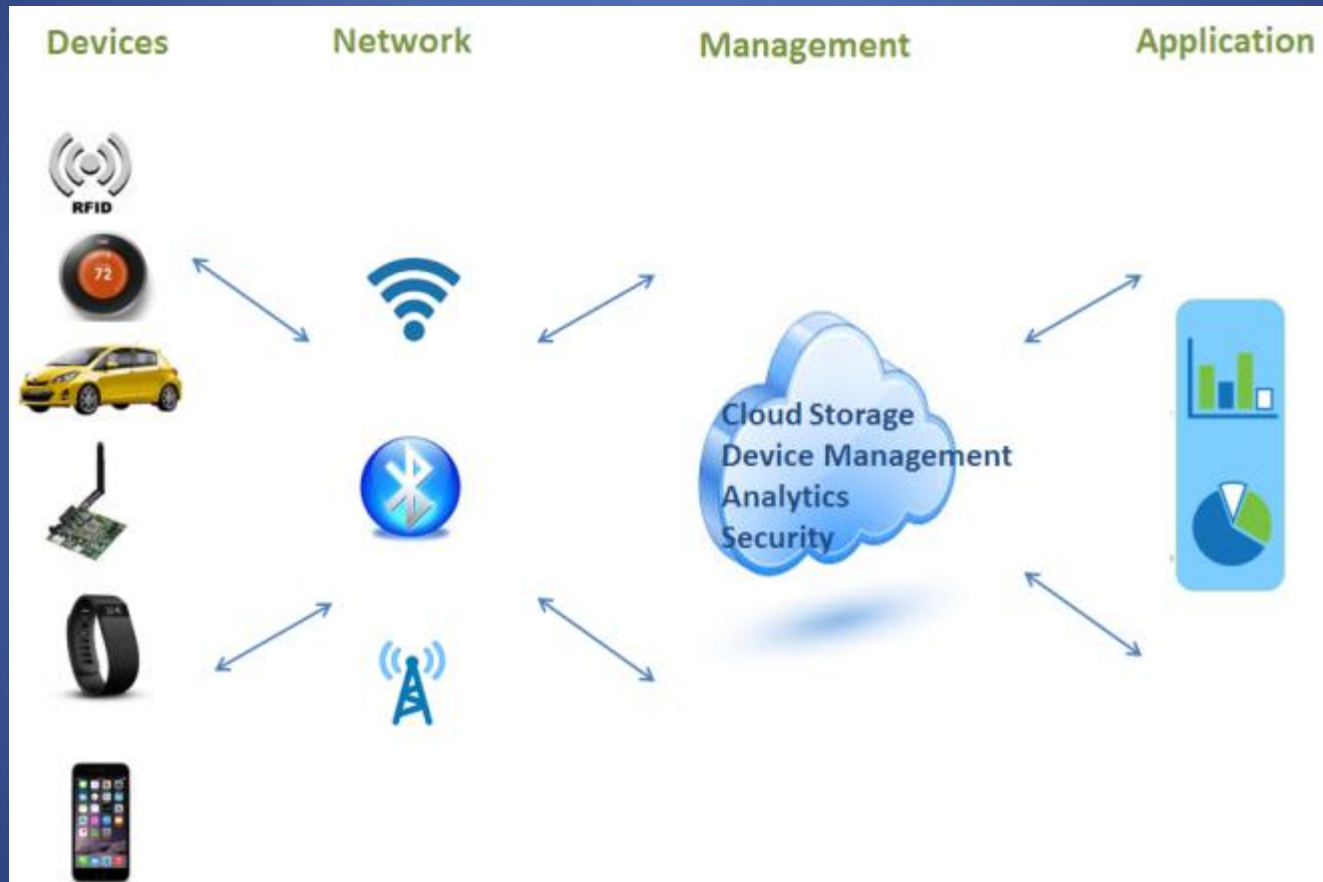
Source: NBN Co, Alcatel-Lucent (refer Exhibit 9.21)

Electronics Related Fields

The grid contains 12 small images representing various electronics-related fields. A central green circle is labeled "Electronics". The images include:

- Microprocessors
- Printed Circuit Boards (PCBs)
- Power Electronics
- RFID
- MEMS
- Optoelectronics
- Automotive Electronics
- Medical Electronics
- Consumer Electronics
- Industrial Electronics
- Space Electronics
- Smart Things

# IOT Architecture



Electronics Related Fields





# Building Management System (BMS)

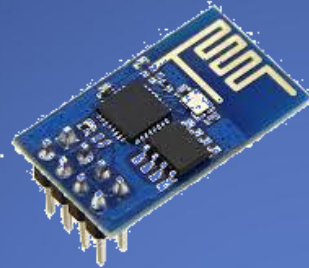


| SMART HOME |

SMART  
TOM SANAT  
When Excellence Matters



# IOT Modules





Used in over 50 countries  
[stefan@four-faith.com](mailto:stefan@four-faith.com)



**LoRa SX1278**  
 433MHz / -140dBm / 3500m






**By 2022, NB-IoT will be the winner due to the ability of its MNOs to deliver reliability and coverage**

Combined FY 2016 revenues of public MNO partners, and their combined fixed line or cellular coverage



NB-IoT has the most tier-one MNO partners – these types of partners have time and time again demonstrated the ability to deploy broad, reliable networks. In 2016, NB-IoT MNO partners had a combined revenue of \$578 billion, larger than the combined revenue of the partners for the other LPWANs combined, and had active network deployments (non-NB-IoT) in at least 79 countries (while LoRaWAN and Sigfox partners were active in 36 combined). Many of these MNOs have roaming agreements, with companies like Verizon and AT&T covering over 200 countries each through roaming. These tier-ones may also have working relationships with LPWAN customers in their other product lines.

Source: Lux Research report, Connecting the Dots – Determining the Winner in Low-Power Wide-Area Networks



Electronics Related Fields





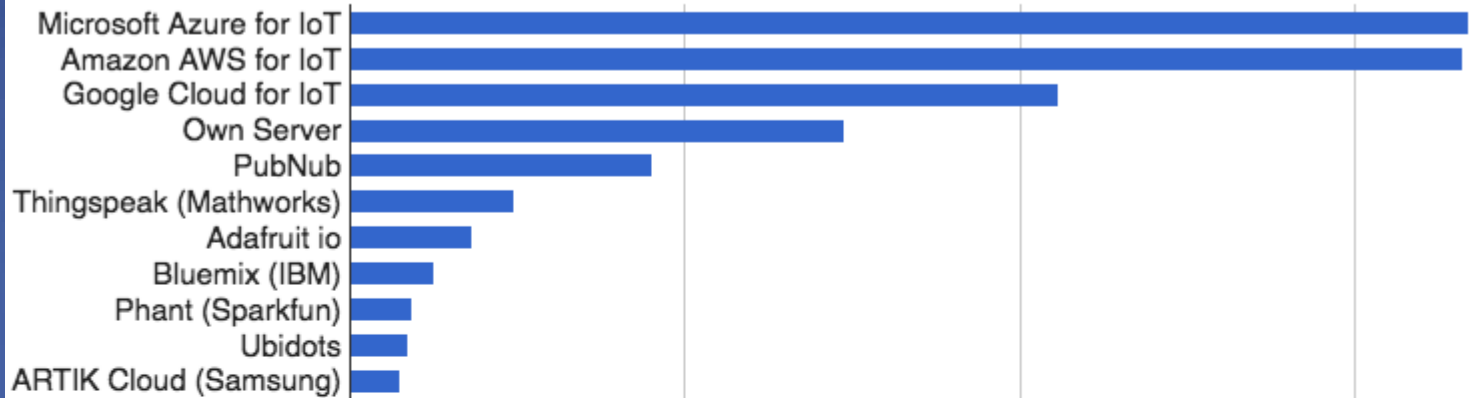







# IOT Platforms

Top IoT Platforms 2016 - The Largest Maker Survey



ARMmbed

Cumulocity

Microsoft

SIERRA WIRELESS

amazon web services

devicepilot

Particle

SiteWhere

axonize

friendly technologies

Telit

BOSCH  
Invented for life

ptc

WIND RIVER

15.00%

22.50%

cloudofthings

HUAWEI

relayr.

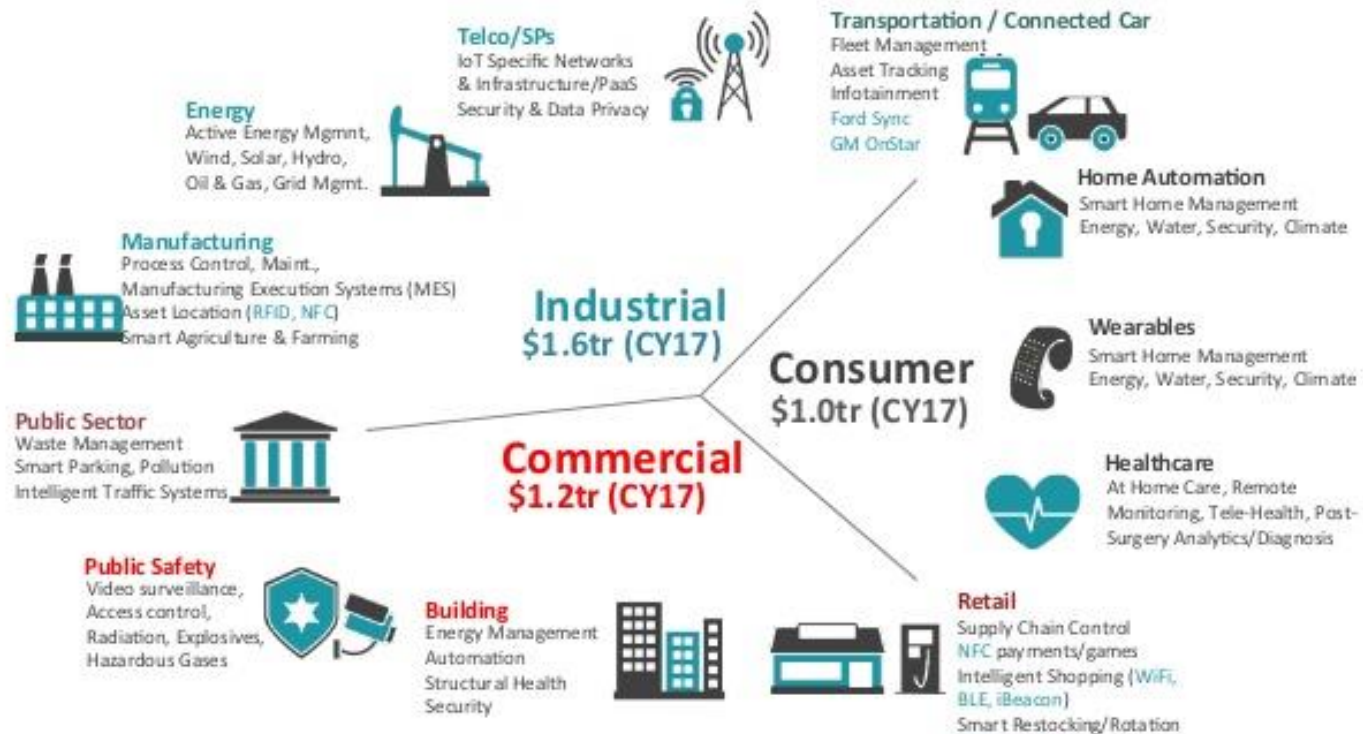
thingsboard.io





# IOT Market

## Demystifying IoT Market



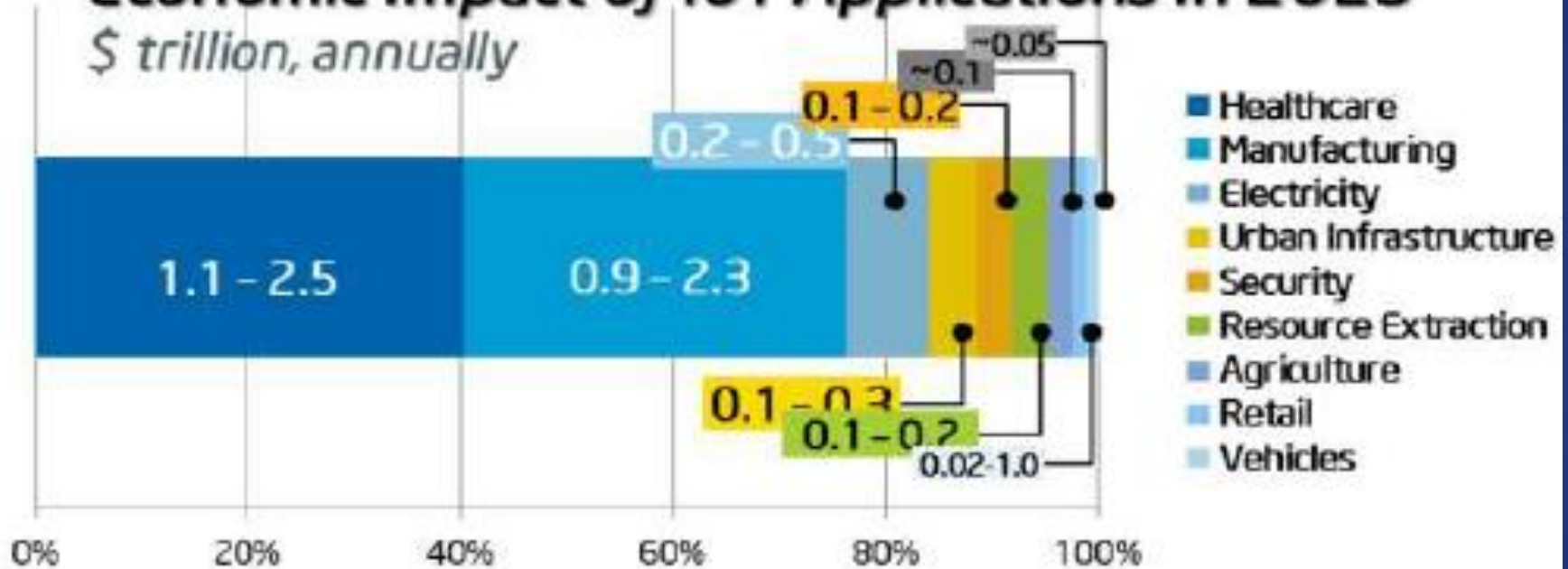
Source: IDC Internet of Things Spending Guide by Vertical Market 2014



# IOT Healthcare Market

## Economic Impact of IoT Applications in 2025\*

\$ trillion, annually



Source: McKinsey Global Institute analysis

[Market Research](#)

### Electronics Related Fields

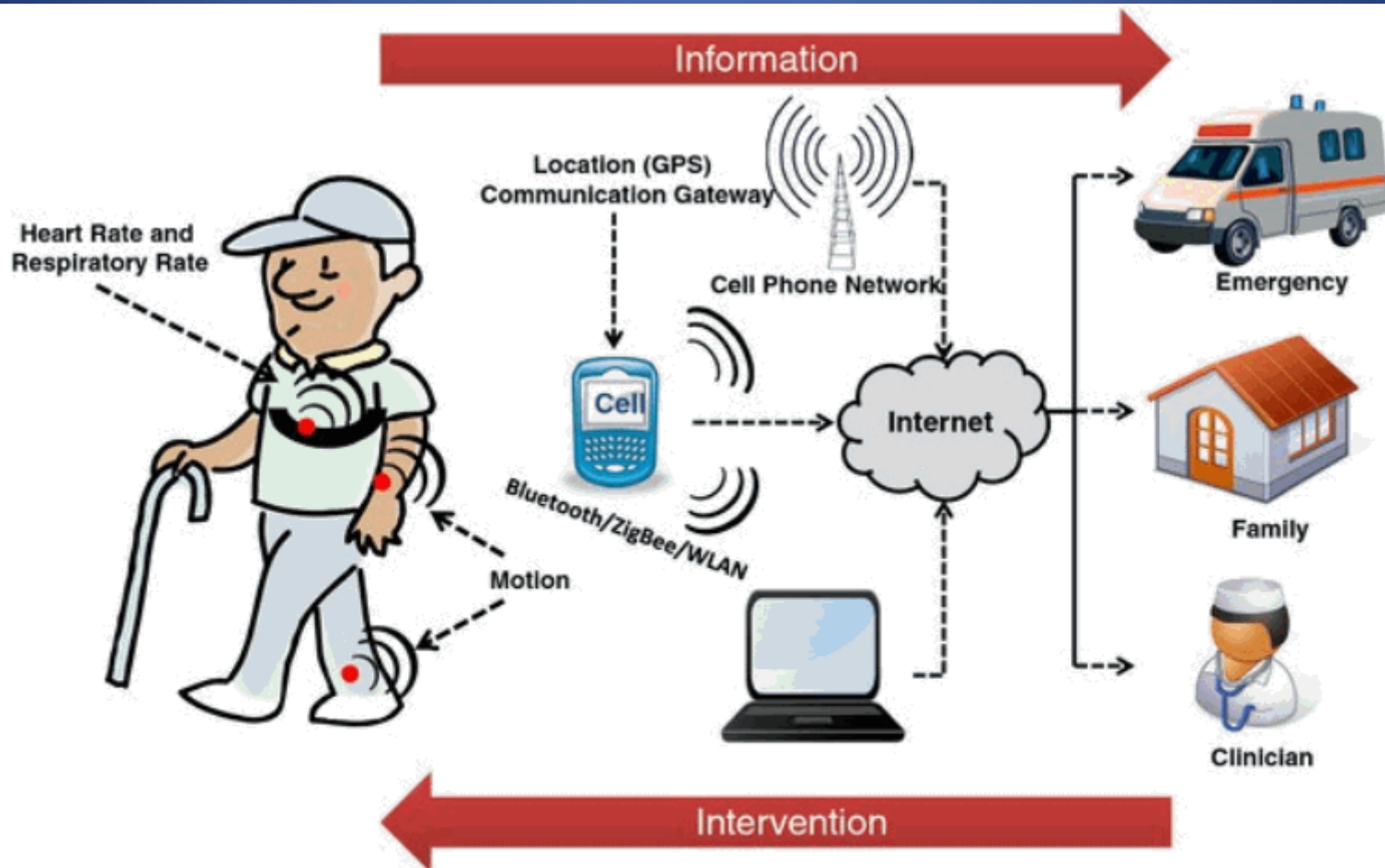


# IOT Healthcare





# IOT Healthcare



IoT in Remote Health Monitoring

ated Fields



# Remote Surgery

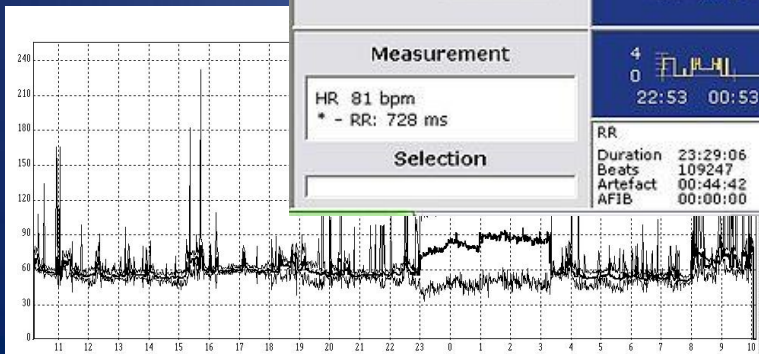
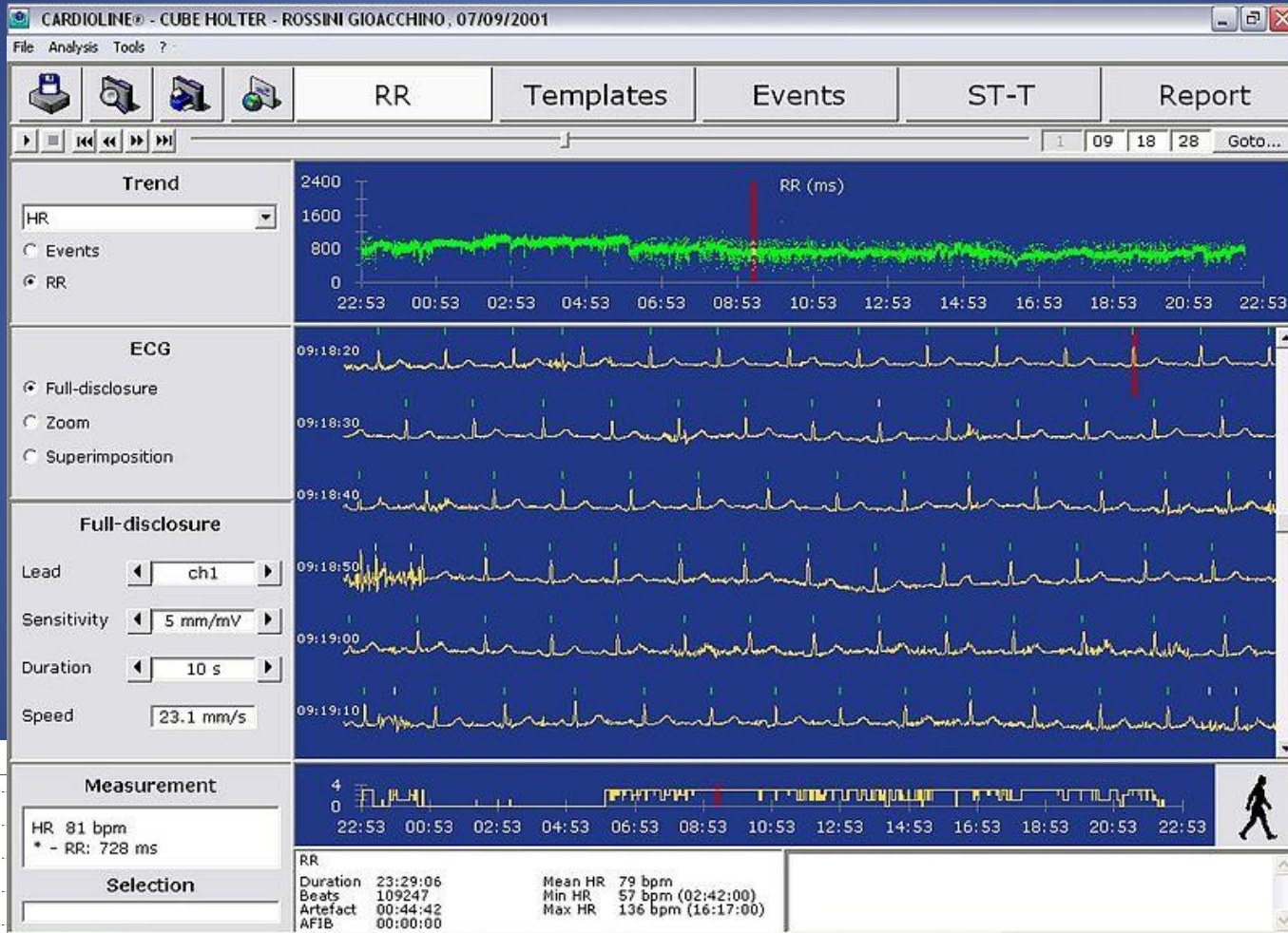
How remote surgery might work



Electronics Related Fields

	<b>Electronics</b>	

# Holter Monitor



Electronics Related Fields

