



# Security Challenges in Emerging Technologies IoT & Wearables

# WHAT IS THE INTERNET OF THINGS?

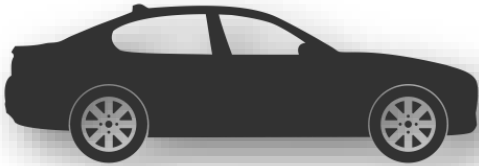
A **CONNECTED** network of **HETEROGENEOUS** components that

- I. **SENSE** data and
- II. **TRANSMIT** it for
- III. **ANALYSIS** and
- IV. appropriate **ACTION**

# INTELLIGENT AUTOMATION

# WHAT THIS COULD MEAN

- Car Accident



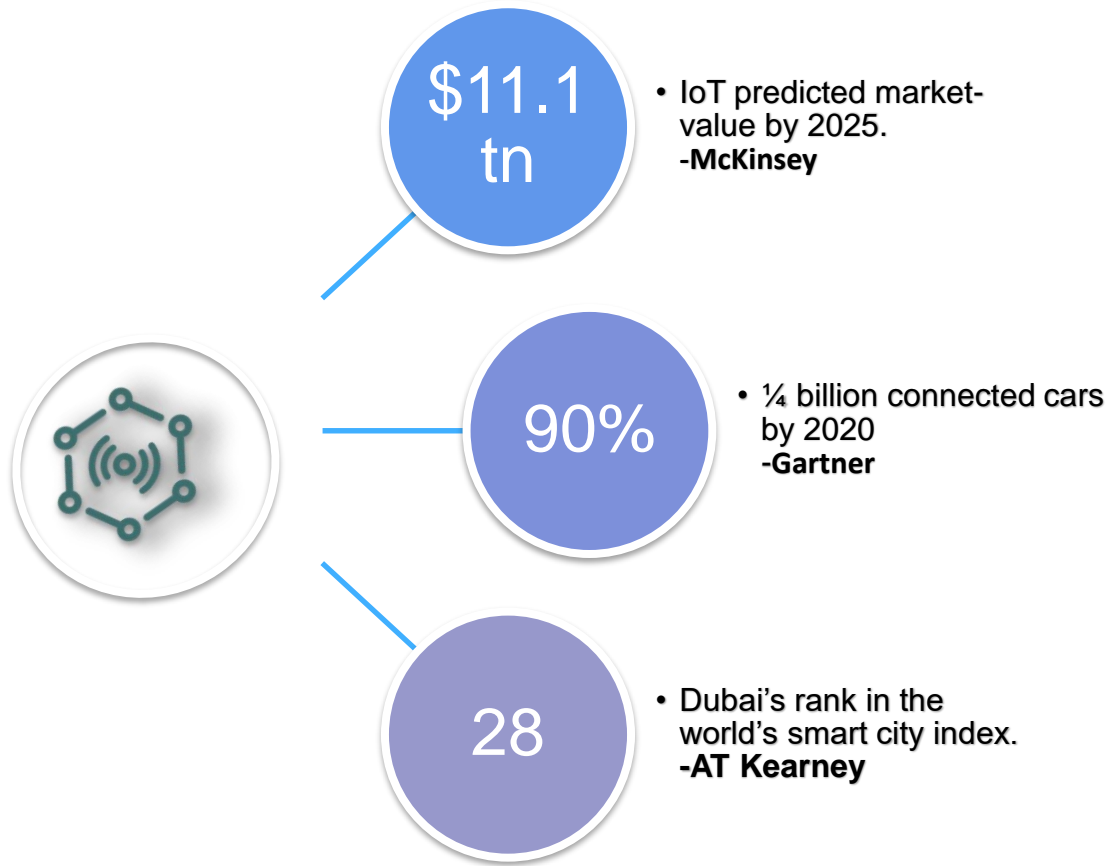
- **Sensor's on the driver's wearable device**
- **Sensors in the car synched with the driver's mobile phone**
- Sensors in smart street lights installed on the road



- Emergency Services



# IoT STATS



# SCOPE



- WEARABLE DEVICES
  - SMART WATCH
  - FITNESS BAND



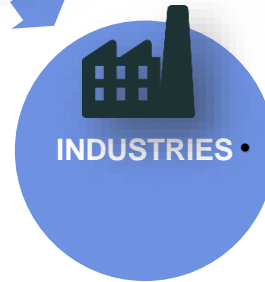
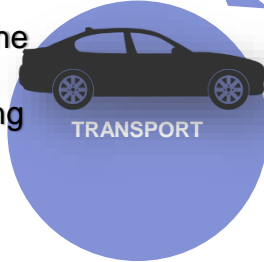
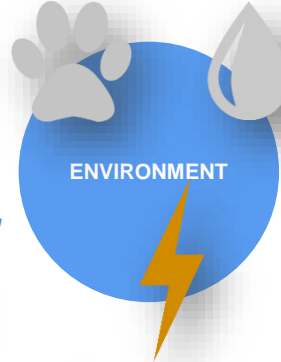
- HOME AUTOMATION SYSTEMS
- SMART APPLIANCES
- SMART LIGHTING
- CONNECTED HOME SECURITY SYSTEM



- GOVERNANCE
- TRANSPORT
- ENERGY
- WASTE MANAGEMENT
- ENVIRONMENT
- EDUCATION
- HEALTHCARE
- LAW ENFORCEMENT
- INDUSTRIES

# IoT ENABLED SMART CITY

- USAID's smart 'band aid' helps doctors in Africa monitor Ebola patients' vital stats without having to enter the "hot zone".



- Smart wrist bands consolidate citizens' access to public utilities, whilst simplifying government efforts towards administration, identity validation across sectors, etc.

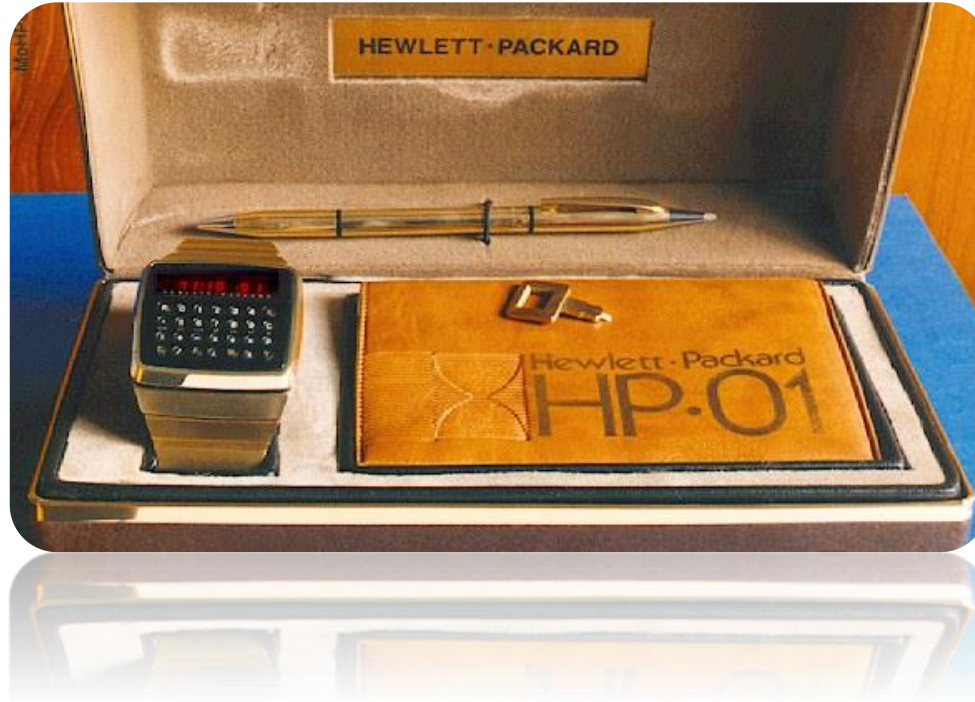
- Wildlife conservationists in the UAE are using connected drones called "Wadi" to consolidate images of wildlife taken by more than 120 camera traps in the Wadi Wurayah National Park (RAK).
- The Agricultural sector in UAE, which consumes 75% of the annual water supply is deploying smart irrigation techniques. Water supply is optimized by soil moisture content amongst other factors.

- Industrial IoT is said to be worth USD 3.8 trillion. Honeywell Pulse, an app that lets plant managers monitor the status of critical equipment at all times in their plants. Real-time anomaly detection and response is conducted.

- Smart street lights in Sentosa, Singapore, alert a central monitoring team in the event of a lamp failure. This eliminates the need for periodic physical checks.
- Lights can be made motion-based leading to energy savings by up to 80%
- Dubai metro uses GPS to update commuters on "Next Train" times.
- Cities in UK use GPS data to update commuters on bus wait-times at bus stops

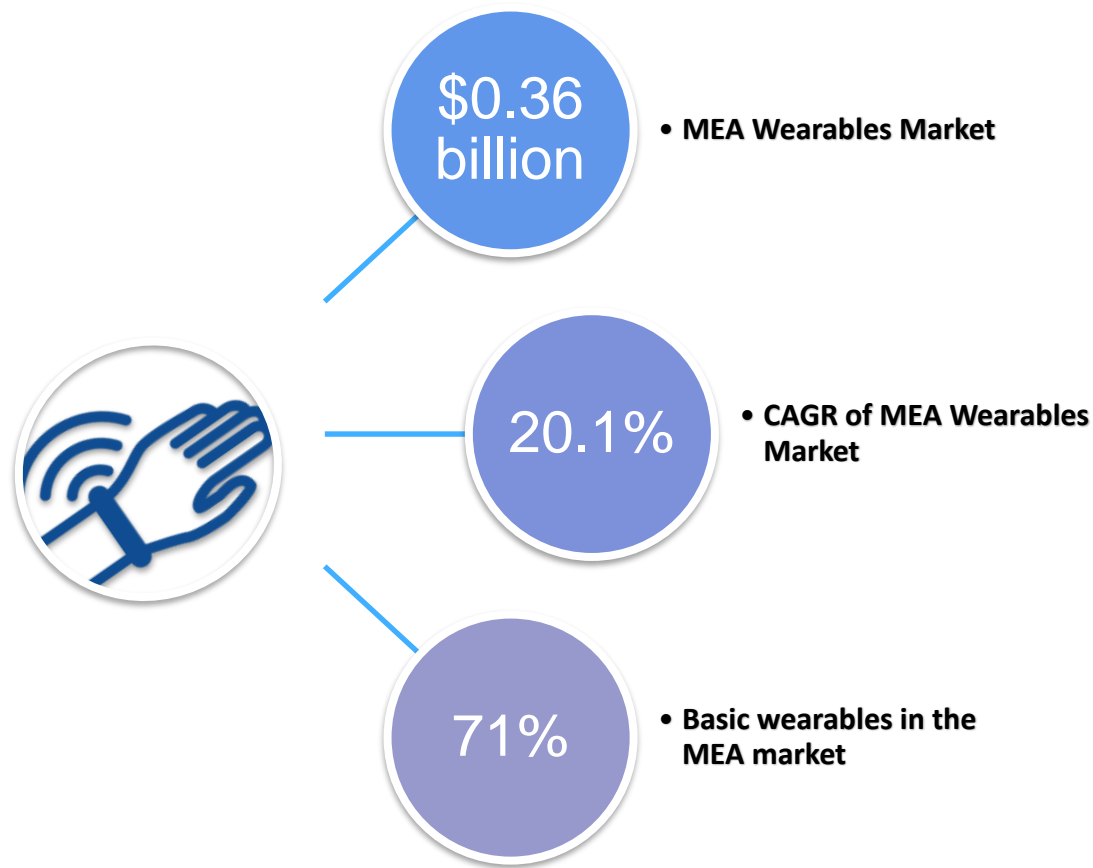
# Wearables

# ONE OF THE FIRST WEARABLE COMPUTERS





# WEARABLES IN THE MEA REGION



Source: IDC

# THE WEARABLES ECOSYSTEM

## SIMILARITIES

- CARRIED ON/INSIDE USER'S BODY
- COMPUTING POWER
- ALWAYS CONNECTED
- ALWAYS
  - SENSING
  - COLLECTING
  - ANALYZING DATA

## DIFFERENCES

### FUNCTIONALITY

1. FITNESS
  - Fitness Tracker
  - Posture Coach
2. SMART WATCHES
3. ALTERNATIVE REALITY
  - Smart Glasses
  - VR Headsets
4. HEALTHCARE
  - Ingestibles
  - Implantables
5. GAMING
  - Smart suits
  - Gloves

### FEATURES

- TYPE OF SENSOR
- CAMERA
- VOICE/VIDEO CALLING
- ACCESS TO BODY'S VITAL STATS

# 1. FITNESS



STEPS



DIET



HEARTRATE



SLEEP



LOCATION

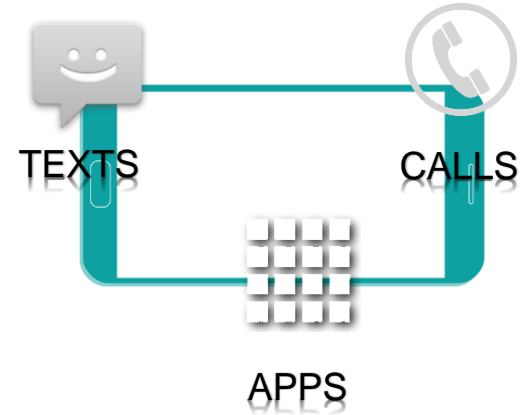
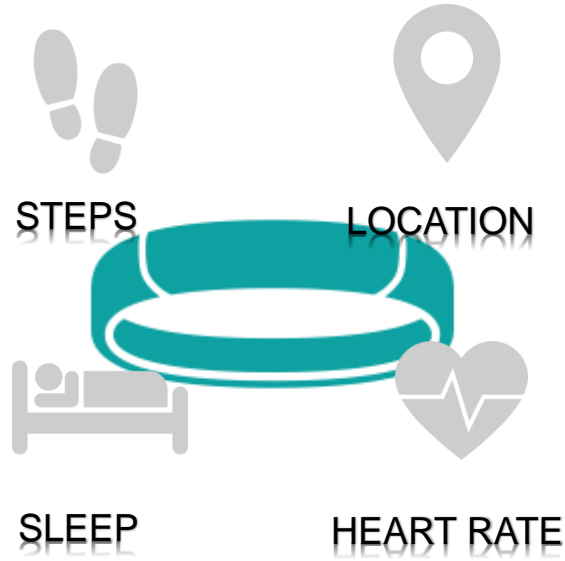


BODY  
COMPOSITION



POSTURE

## 2. SMART WATCHES



# 3. ALTERNATIVE REALITY

## VIRTUAL REALITY

- ISOLATED FROM PHYSICAL WORLD



Ref: Samsung

## AUGMENTED REALITY

- BUILDS ON THE PHYSICAL WORLD



Ref: Microsoft

# 3. ALTERNATIVE REALITY –APPLICATIONS



MEDICAL TRAINING



CONSTRUCTION

Ref: Bentley Systems



AUTOMOTIVE

Ref: BMW

# 4. HEALTHCARE

## INGESTIBLES



Ref: Proteus



BLOOD  
PRESSURE



HEART RATE



BLOOD SUGAR



REACTION TO  
SPECIFIC  
DRUGS/DOSAGES



COMPLIANCE  
WITH MEDICATION  
PLAN

# Security In The IoT

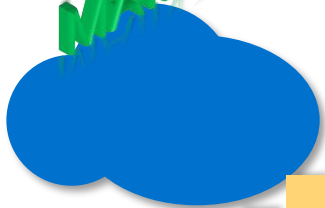


# THE STATE OF INFORMATION TECHNOLOGY

hyperloop | one



MAINSTREAM



EMERGENT



UPCOMING



# EVOLVING FOCUS OF INFORMATION TECHNOLOGY



- PERSONALITY
- PROFESSIONAL PROFILE
- PERSONAL INFORMATION



- FINANCIAL DATA



- COMMUNICATION DATA



- BIOMETRIC DATA



HUMAN  
LIFE

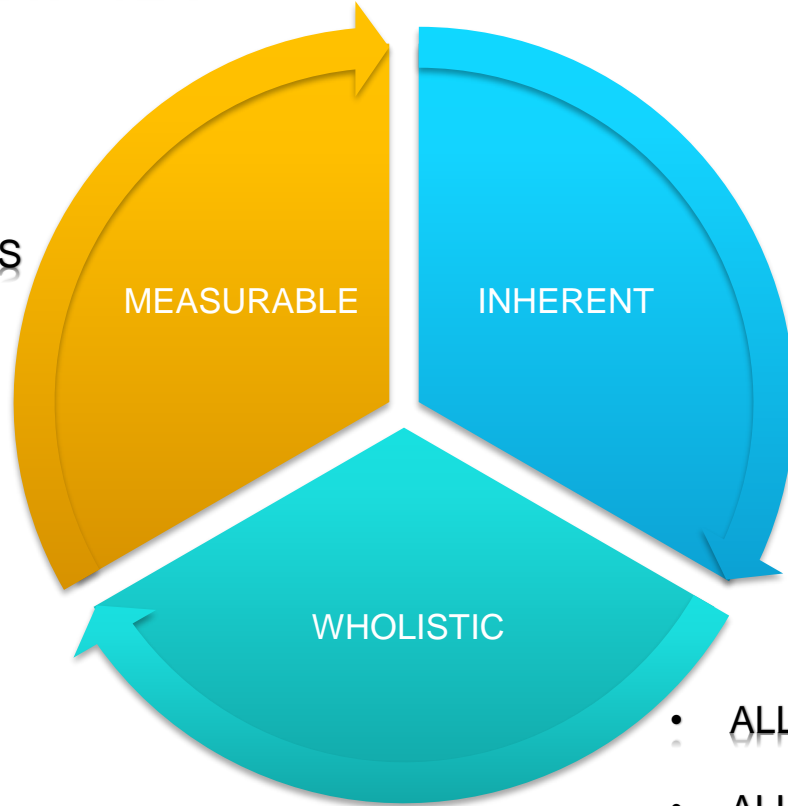
# SHIFTING FOCUS OF INFORMATION SECURITY



**HUMAN  
LIFE**

# SECURITY IN THE IoT

- UNIVERSAL STANDARDS
- COMPARABILITY
- REPEATABILITY



SECURITY BY DESIGN

- ALL COMPONENTS
- ALL LAYERS

# CONSIDER THE CASE OF A SELF-DRIVING CAR



- THE FUTURE OF MOBILITY IS SAID TO BE AUTONOMOUS AND ELECTRIC
- 25% OF ROAD TRIPS IN DUBAI TO BE DRIVERLESS BY 2030
- 200 TESLA TAXIS HAVE BEEN ACQUIRED BY RTA, DUBAI



LOCATION



SPEED



WEATHER  
CONDITIONS



SPATIAL AWARENESS

# INHERENT SECURITY IN A SELF-DRIVING CAR



- **SECURITY OVER FUNCTIONALITY**

*Default deny of any external code execution on the Electronic Control Unit (ECU).* INHERENT



- **SECURE APPLICATION DEVELOPMENT STANDARDS**

*Formal coding methodology, documented code review procedures, application vulnerability assessments*



- **PRINCIPLE OF LEAST PRIVILEGES AND NEED TO KNOW**

*Electronic Control Units of autonomous cars are interconnected. If a single ECU is compromised, it can lead to compromise of more critical ECUs.*



- **INPUT VALIDATION**

Malware is sent to autonomous cars to exploit vulnerabilities in application code. Input validation will promote protection levels against common coding attacks such as buffer overflow and injection attacks.



# WHOLISTIC SECURITY IN A SELF-DRIVING CAR

- HETEROGENEOUS UNIVERSE OF THINGS

- Each “Thing” is different from the other, and therefore is a new attack surface.
- Multiple “Things” from different vendors are built into a single autonomous car. They each bring varying levels of inherent security.
- Car makers are responsible for co-ordination across their parts suppliers and ensuring timely software updates, patches and fixes are released to customers.

- MONITORING

- How are false positives handled?
- How are security alerts responded to?
- How are security violations responded to?

## OWASP TOP 10 FOR IoT

Recommends a holistic approach that focusses not only on securing the Device, but also, the entire IoT ecosystem. It looks at:

- The Device
- The Cloud
- The Mobile Application
- Network Interfaces
- Software
- Use of Encryption
- Use of Authentication
- Physical Security
- USB Ports

WHOLISTIC

# MEASURABLE SECURITY

- **IoT SECURITY STANDARDS**
  - A universally accepted security standard for IoT is not available
- **COMPARABILITY and REPEATABILITY**
  - comparability of security postures across multiple ecosystems
  - repeatability of security efforts across periods of time





# PRIVACY

- Who owns the user's PII?
- Who approves the sharing of this data with third parties?
- Who ensures the user is notified if his/her data is breached?
- Right to be forgotten



***Thank You***