

INTERNET OF THINGS (IOT) AS A GROWTH DRIVER

HRVATSKI TELEKOM JOSIP KAŠTELAN OCTOBER 2018

LIFE IS FOR SHARING.

WHAT IS IOT?

M2M



- Focused on the communication between machines and applications using a network
- Monitoring, controlling or managing certain machines
- Acts automatically or on request
- Smart home equipment, connected cars, fitness gadgets, etc.

loT



- Broader concept
- Exchange of information between not only machines, but also social media services, ERP application, etc.
- Focused on the information gathered by the ecosystem of multiple assets and the usage of this information

Source: Comarch

"When wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole." **Nikola Tesla, 1926**

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WHAT IS IOT?

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THE INTERNET OF THINGS (IOT) IS THE NETWORK OF PHYSICAL OBJECTS THAT CONTAIN EMBEDDED TECHNOLOGY TO COMMUNICATE AND SENSE OR INTERACT WITH THEIR INTERNAL STATES OR THE EXTERNAL ENVIRONMENT.

GARTNER

IoT is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect, collect and exchange data, creating opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions.

OF

INTERNET

THINGS

WHAT IS IOT?

IOT IS DRIVEN BY A COMBINATION OF:

SENSORS & ACTUATORS	CONNECTIVITY	PEOPLE & PROCESSES		
We are giving our world a digital nervous		Networked inputs are combined into bi-		
system (GPS sensors, cameras,	These inputs are digitized and placed onto	directional systems that integrate data		
microphones, temperature and pressure	networks	people, processes and systems for better		
sensors,)		decision making		
Acceleration / Tit Acceleration / Velocity / Displacement Temperature Acoustic / Magnetic Acoustic / Sound / Vibration Acoustic / Sound / Vibration Acoustic / Sound / Vibration Coustic / Sound / Vibration		Customer Relationship Analytics & Cloud/API Upgrades & Configurations Upgrades & Configurations Remote Monitoring / Maintenance Concrol & Automation Supply Chain Management Supply Chain Management		

The interactions between these entities (SENSORS + CONNECTIVITY + PEOPLE + PROCESSES) are creating new types of smart applications and services

Source: Postscapes; Harbor Research

	Areas	Description	Usecases	
X) Smart Factory	 Remote services & manufacturing, Predictive Maintenance 	Instantly influence the manufacturing processMaintenance performed when a failure is predicted based on real-time performance	
6.	Smart Logistics/Tracking	 Tracking of Packages, Containers, Delivery services and Pets 	Localize (Accuracy etc), measure temperature, humidity, etcReal time routes and alerts of delays	
) Smart Entertainment	 Sports, Games, Video, Music 	 Smart ball provides additional performance statistics Media control & remote control Cellular media streaming /Download 	
Ô) Smart Health	 Hospital, Nurse, Midwife, Organizations, Self care customers, Athletes 	Evaluation and interpretation of patients data to help doctors taking valid decisionsRemote monitoring and treatment of patients/athletes	
) Smart Retail	 Store, eCommerce, POS Drive in (Fast food chains, Fuel stations,), Vending machines 	 Customer tracking & steering at POS Contactless payment through autonomous identification of customer Security tag control 	
) Smart City	 Traffic control, Parking, Lighting, Waste management, Safety, Utilities automation 	 Traffic control to reduce traffic jams, parking guidance Smart Metering: Automatic energy management leads to cost reducing & transparency 	
	Smart Property	 Safety, Automation, Comfort/lightning, access, smart home for movables 	 Tracking & status of movables & secondary residences (boats, caravans, holiday flat/house) Enhancement for smart home solutions: control of sensors and actors 	

Things get interesting when these **connected devices and services** start **creating COMPOUND APPLICATIONS**

within their own verticals and across industries



TRANSPORTATION

SMART CITIES



In Downtown San Francisco 20-30% of all traffic congestion is caused by people hunting for a parking spot.

- San Francisco Municipal Transportation Agency (SFMTA)

HEALTHCARE 🛟

SMART HOME



40 million adults age 65 and over will be living alone in the U.S, Canada and Europe.

- U.S. Department of Health and Human Services: Administration for Community Living (ACL)

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Source: Postscapes; Harbor Research

activity is detected.

SMART BUILDINGS

MOBILITY



Anna is being pressured to reduce her company's expenses for their new corporate office.



After speaking with experts she decides to install sensors to automate energy usage according to building occupancy, people flow, temperature, and other ambient conditions -- improving the building's overall efficiency.

Energy used by commercial and industrial buildings in the US creates nearly 50% of our national emissions of greenhouse gases.

- United States Environmental Protection Agency

REAL-TIME SERVICE NETWORKS

REAL-TIME SERVICE NETWORKS Appliance Monitoring

Predictive Maintenance Service Technician / CRM Waste Management /

Recycling



R Hotel Denver, Industrial Washer #GHS40-2608

Location: ID: FC-RM#00243 Manufacturer: Appliance Park Louisville, KY ID: #45205343

Materials: FC/SUS Sensor: Vibration Connectivity: Wireless LAN

Connor, the Lead Maintenance Manager at the R Hotel in Denver, receives a sensor notification that the pump body O-ring #6 on washing machine #230243 is starting to fail in the housekeeping laundry room.

On his mobile, Connor prompts the machine to order a new part. This action triggers a bidding opportunity for local service technicians within the product's authorized maintenance network.

The request lays out: - Pricing parameters - Part specs - Timing requirements - Machine history

- Predictive sensor measurements & alerts

Tom from IA Appliances bids on the service request and receives a notification a few moments later that his bid was accepted.

Within 1.5 hours, a service technician from IA Appliances is on site (Using a temporary facility access code for the wireless door lock) to replace the water pump. Connor sends a brief note on the service guality and IA Appliances releases a bid request for the part's raw materials to local recycling centers.

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Note: IoT Analytics 2018 Global overview of 1600 enterprise IoT use cases (not incl. consumer IoT projects, e.g. Wearables, Smart Home) Source: IoT Analytics, Jan 2018

IOT VALUE CHAIN



If you provide things - Can you manage how third parties use the information collected by your "things"?

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IOT INDUSTRY EXPECTATIONS

CONNECTED DEVICES

GLOBAL IOT MARKET FORECAST



Note: Non-IoT includes all mobile phones, tablets, PCs, laptops and fixed line phones. IoT includes all consumer and B2B devices connected Source: IoT Analytics Research 2018



Note: Market defined as total spend of end-users on IoT solutions Source: IoT Analytics Research 2018

IOT INDUSTRY EXPECTATIONS

IOT REVENUE OPPORTUNITY



Source: Infoma Telecoms & Media

IOT AS A GROWTH DRIVER

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GROWTH DRIVER

BUSINESS BENEFITS

IOT AS A GROWTH DRIVER

Information within IoT creates value in a never-ending value loop consisting of 5 stages

IOT AS A GROWTH DRIVER

IoT DRIVERS

Reducing costs and improving business processes are the **top loT drivers**, but a solid 1/3 of respondents also placed high priority on using IoT to improve competitiveness or customer experience.

Building new revenue streams from IoT is also important.

More aspirational goals include:

- Develop new revenue streams
- Build up ongoing data collection to leverage for future use
- Shift to as-a-service or usage-based business model
- Better use of environmental or energy resources (sustainability)

Note: n=1343; percentage indicates % of enterprise respondents selecting goal as one of their top 3 (multiple response questions) Source: Ovum IoT survey

KEY IOT TRENDS

Key trends in IoT:

- Quality, security and reliability of the IoT infrastructure and communication
- New business models

CONNECTING DEVICES: OLD HAT?

Today, devices are usually connected via the GSM mobile network:
 Transmission technology expensive and service-intensive (battery change)
 Unnecessary functions (SMS, voice, high data rate) increase costs

NarrowBand IoT (NB-IoT) is a new technology for connecting devices, making new use cases economically viable for the mass market!

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CUSTOMER VOICES

Our millions of devices require **long battery lifetime** to avoid costly replacements.

Poor **connectivity within buildings** prevents us from realizing new use cases.

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We currently need to manage numerous local networks, but would prefer **direct mobile connectivity** instead of gateways.

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In my business every cent counts, therefore I need to minimize the **total costs for being connected.**

"

THE "DNA" OF NARROWBAND IOT (NB-IOT)

Billions of devices	Low energy consumption	Deep indoor penetration	Low cost
Up to 100x more devices per cell (compared to GSM)	Up to 10 years of battery-powered operation ¹	+20dB link budget (compared to GSM)	Radio module <\$5 (industry target) Lower total cost of ownership
Low data volume	Plug & Play	High security	Worldwide standard
Bidirectional, infrequent transmission of low data volumes. Data rates 600b/s - 250kbit/s ²	Direct connectivity of the sensor. (No installation and maintenance of local networks/gateways required)	Proven LTE-based security mechanisms	Worldwide 3GPP industry standard on operator-managed networks in licensed spectrum

NB-IoT - The M2M network for simple, highly scalable applications: low cost of ownership, low energy consumption, deep indoor penetrated network coverage in the licensed mobile spectrum according to a worldwide industry standard

1) Assuming equivalent of 2 AA batteries and typical traffic pattern

2) Dependent on network utilization and signal strength

NB-IOT - INFINITE USE CASE POSSIBILITIES

Smart Parking Finding the next vacant parking

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Smart Waste Management Emptying of containers based on their fill level

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Smart Buildings Access control, monitoring and alarm systems

> Asset Tracking Reliable locating of objects

Smart Lighting Intelligent management of street lighting

Construction Equipment Monitoring Localization and maintenance of machines

Smart Metering Automatic remote reading of utility meters

NB-IOT IN CROATIA

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NB-IOT AVAILABLE IN CROATIA FROM MAY 2ND 2018!

HT launched the 1st NB-loT network in Croatia and the region

Dedicated NB-IoT tariff launched

HT PORTFOLIO OF NB-IOT ENABLED SOLUTIONS:

Smart Parking Waste management Air quality monitoring

IOT/M2M @ HRVATSKI TELEKOM

