Selected Topics from Intelligent Engineering Systems

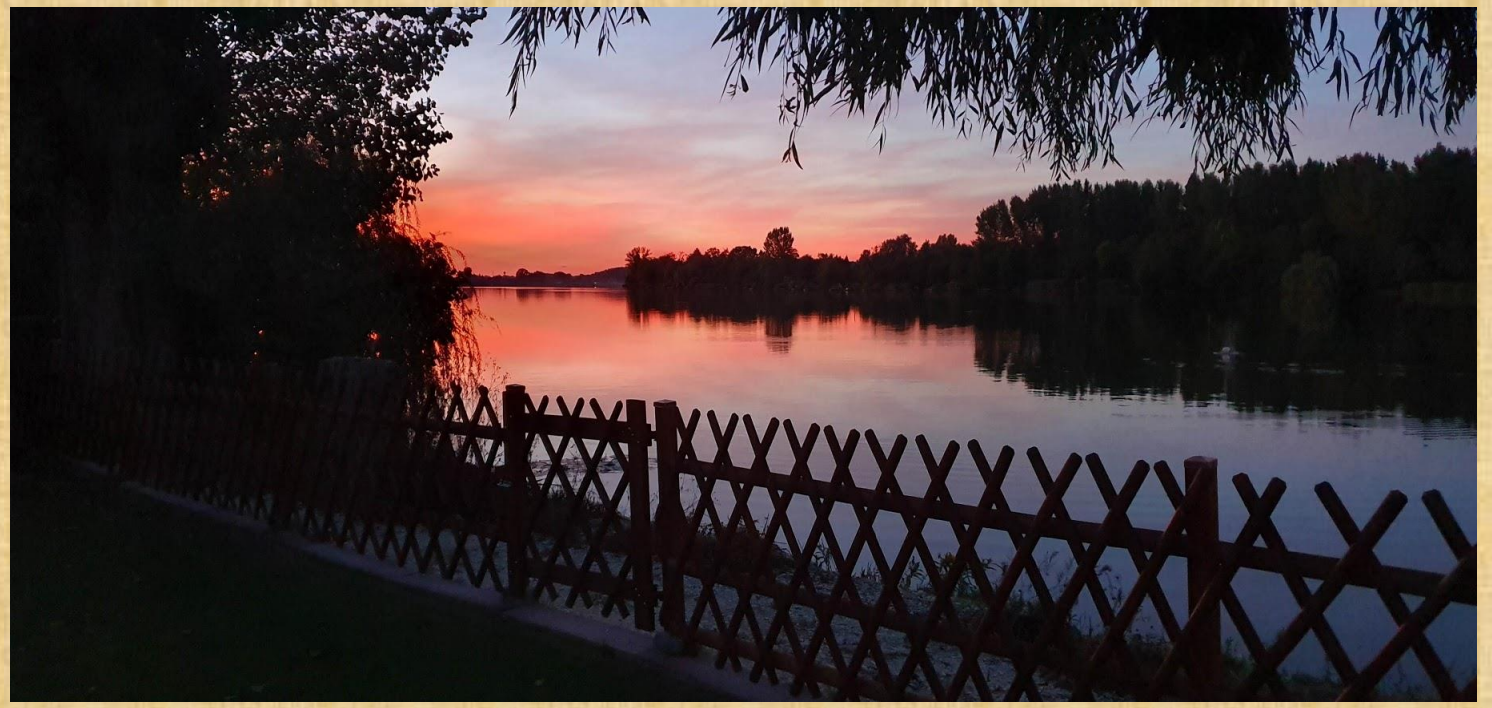
Imre J. Rudas

My original plan for the beginning of November Part I.

Relaxing

Óbudai Egyetem
Pro Scientia et Futuro

My original plan for the beginning of November Part II.



Fishing

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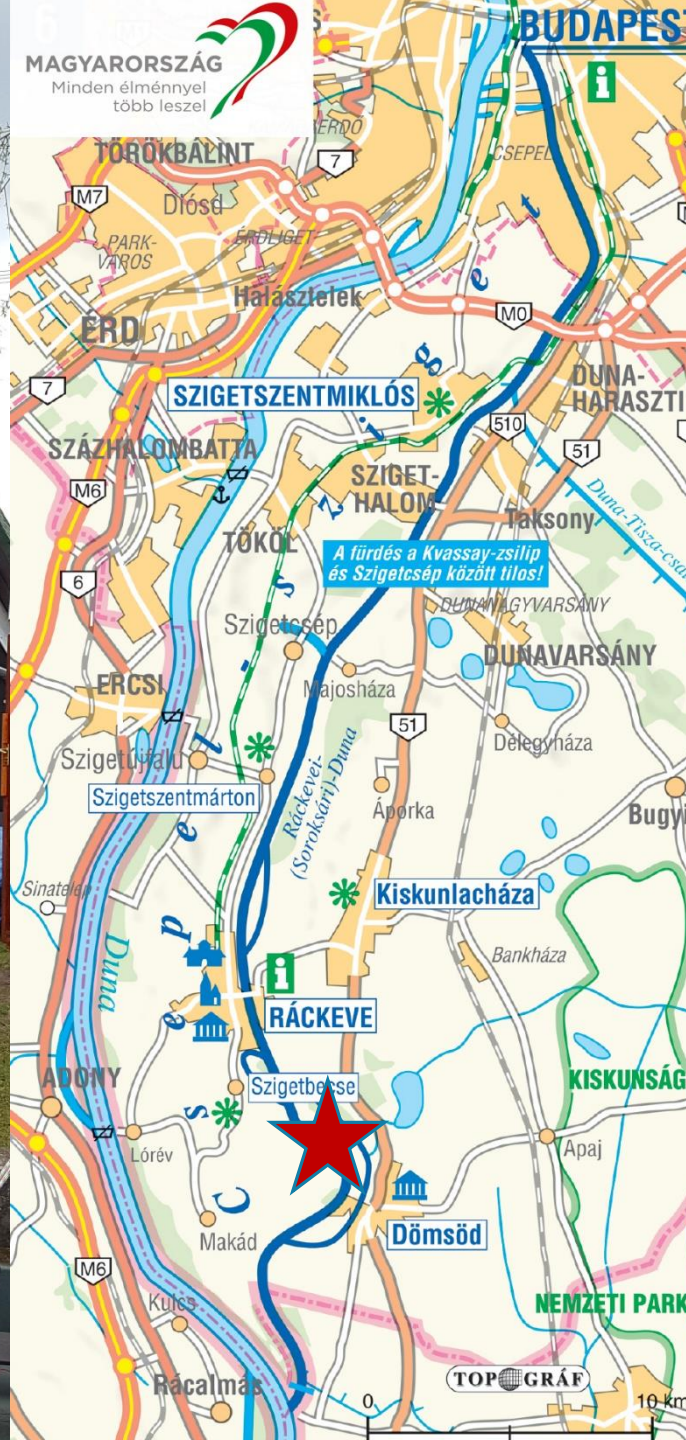
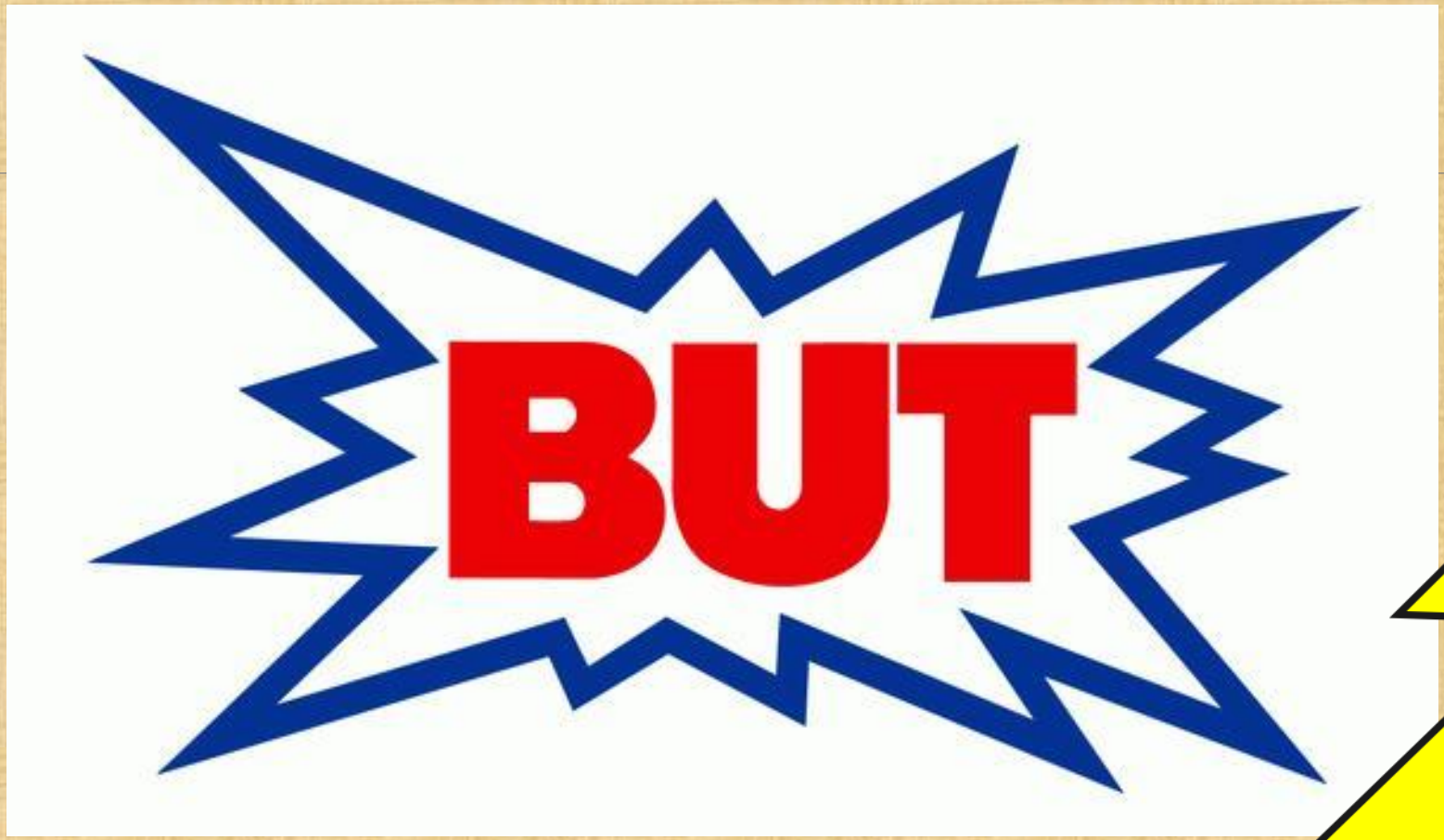
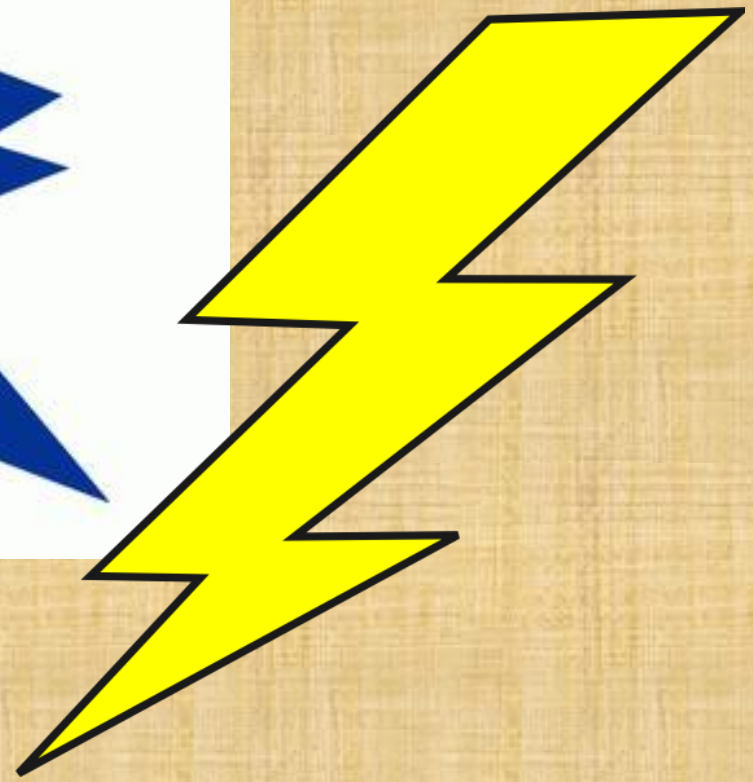

MAGYARORSZÁG
Minden élménnyel több leszel
BUDAPEST
TÖRÖKBÁLINT
Diósd
PARK-VÁROS
ÉRDLIGET
Halászlelek
ÉRD
SZIGETSZENTMIKLÓS
SZÁZHALOMBATTA
SZIGET-HALOM
TÖKÖL
Taksony
DUNA-HARASZTI
A fürdés a Kvassay-zsilip és Szigetcsép között tilos!
DUNAVARSÁNY
Szigetcsép
ERCSI
Majosháza
Szigetújfalu
Szigetszentmárton
Áporka
Délegyháza
Bugy
Kiskunlacháza
Bankháza
RÁCKEVE
Szigetbecse
ADONY
KISKUNSÁG
Lórév
Apaj
Makád
Dömsöd
Kulcs
NEMZETI PARK
Rácalmás
TOPOGRÁF
0
10 km

A MAGYAR TUDOMÁNY ÜNNEPE

MAGYAR TUDOMÁNYOS AKADÉMIA · 1825 ·





Óbudai Egyetem
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You were elected as

Rector Emeritus

of Óbuda University

2019. november 4-22.

Helyszín: Óbudai Egyetem

Cím: 1034 Budapest, Bécsi út 96/b

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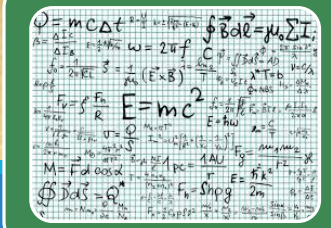
Pro Scientia et Futuro

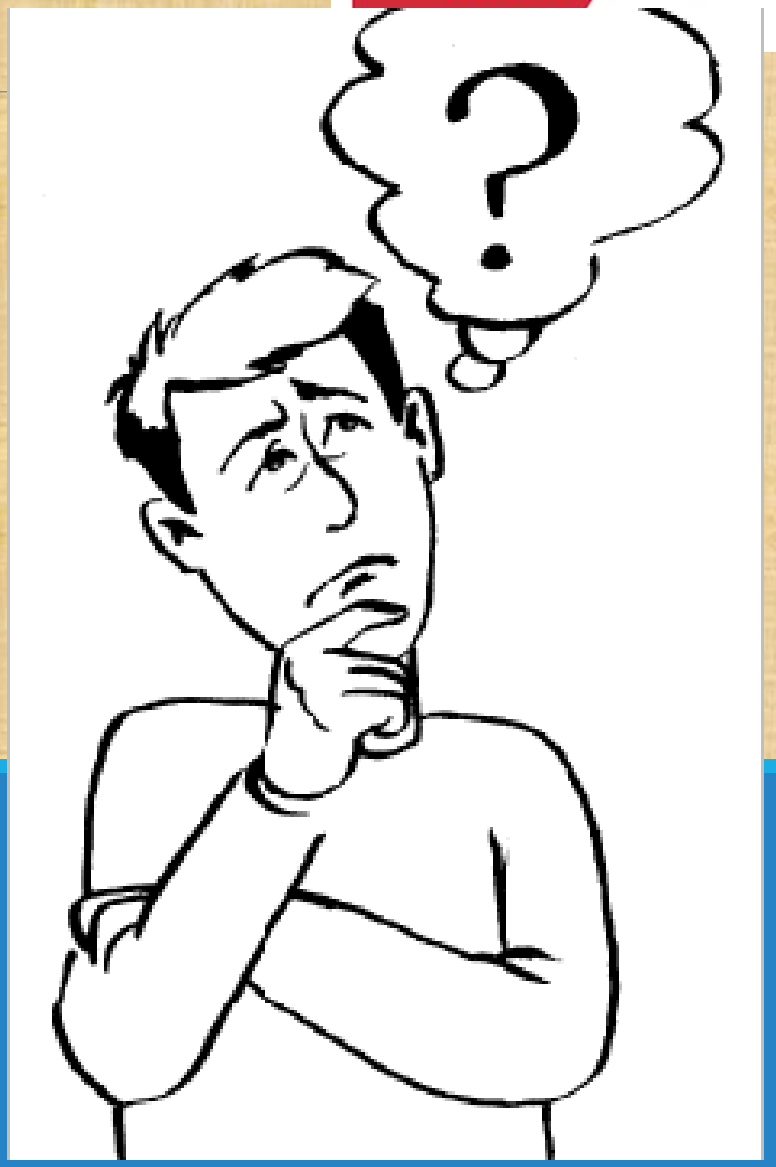
Accept!

It is a great honor !

After receiving the final program

Oh! My talk is at 2:00 PM! Right after lunch!





2019

A special year

Óbudai Egyetem
Pro Scientia et Futuro

INES 2019

Home Committees General Info Paper Submission Accommodation Registration Final Program Contact

23rd IEEE International Conference on Intelligent Engineering Systems 2019

Gödöllő, Hungary

April 25-27, 2019

VENUE

Gödöllő Royal Palace

GÖDÖLLŐI KIRÁLYI KASTÉLY

Address: Grassalkovich Palace
H-2100 Gödöllő, Hungary

Distance from BUD airport: 28,8 km (25 min)

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Óbudai Egyetem

WELCOME TO INES 2019!

Authors are welcome to submit original and
International Conference on Intelligent Engi
on April 25-27, 2019 in Gödöllő, Hungary.

INES 2019 Call for Papers

CELEBRATION

INES 2019 is dedicated to the 70th birthday of Prof. Imre J. Rudas.

INES 2019

Welcome to

INES 2019

23rd IEEE International Conference on Intelligent Engineering Systems

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http://www.ines-conf.org

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ies

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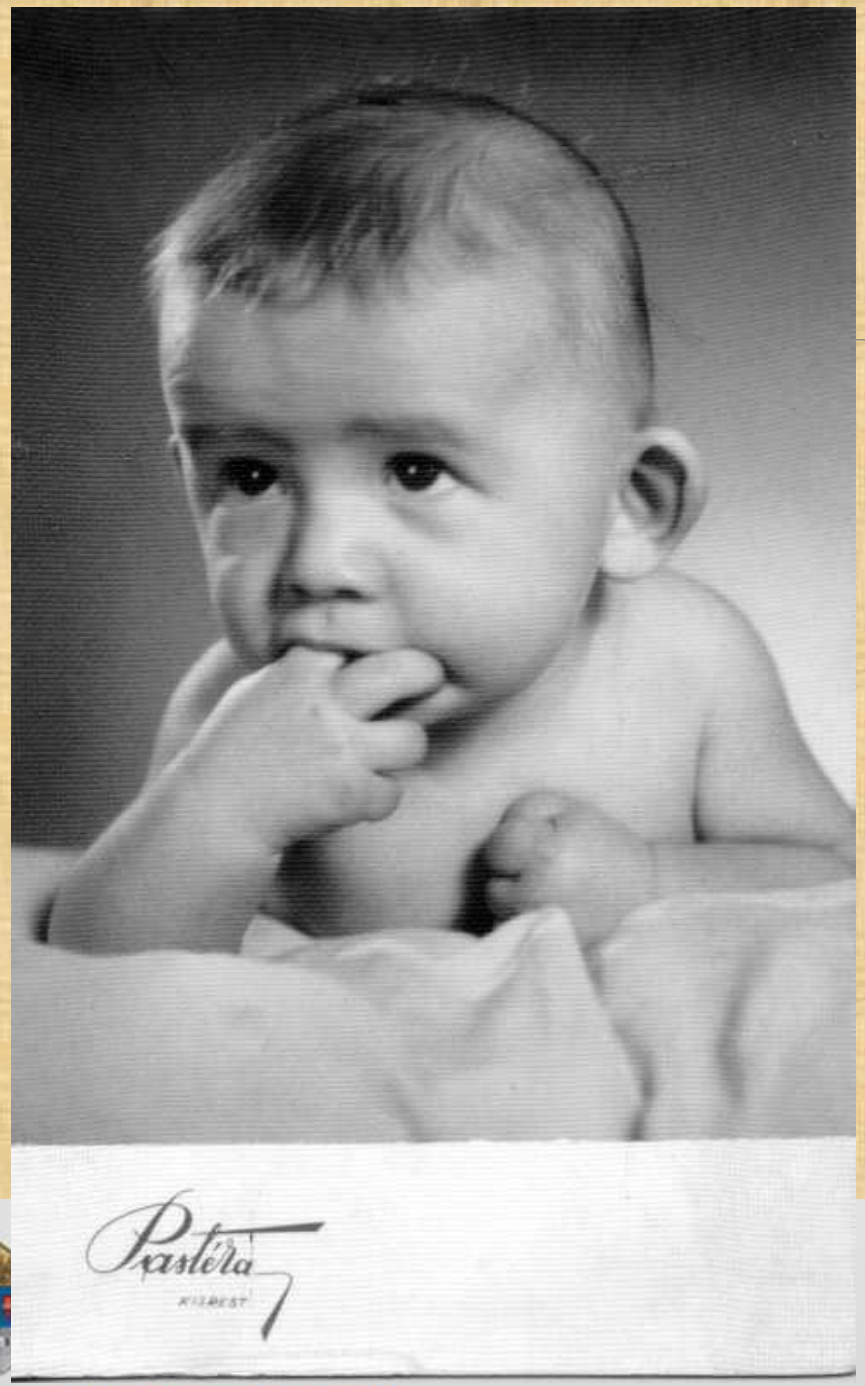
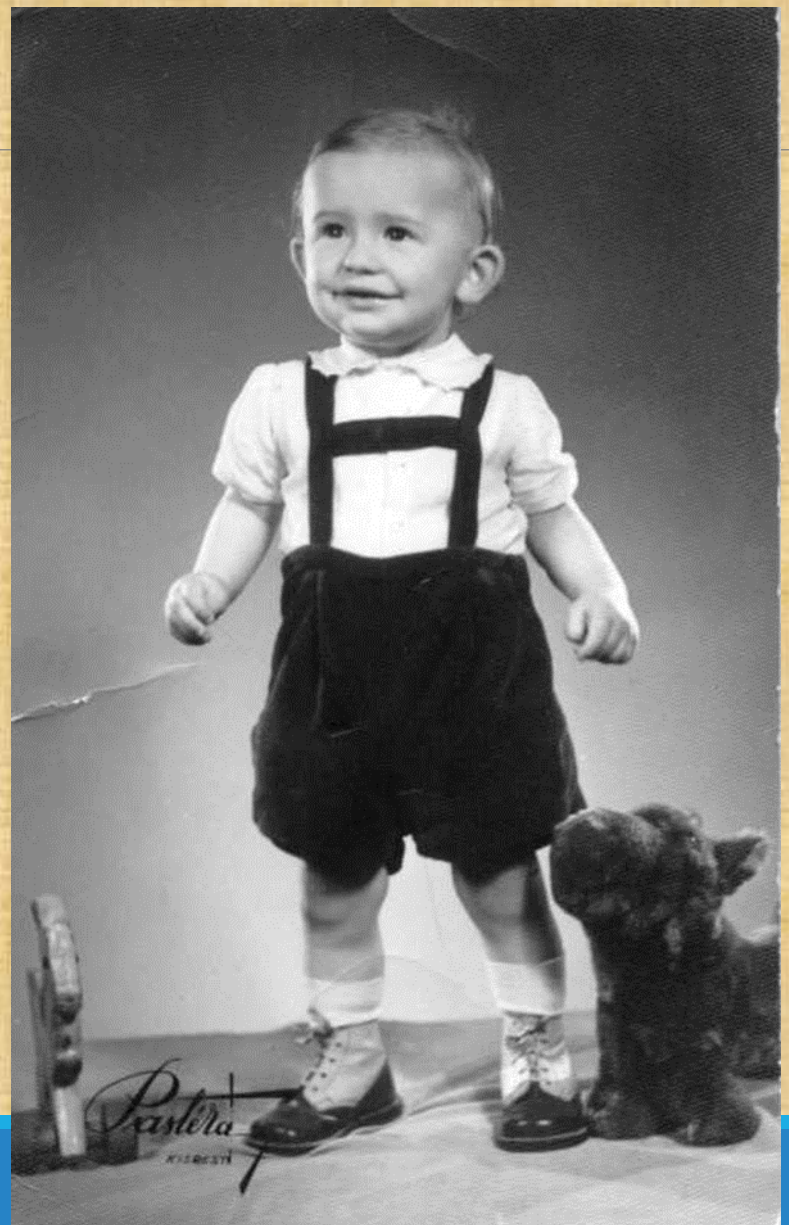
Lotfi A. Zadeh†, USA

INES 2019 FOUNDING HONORARY CHAIR

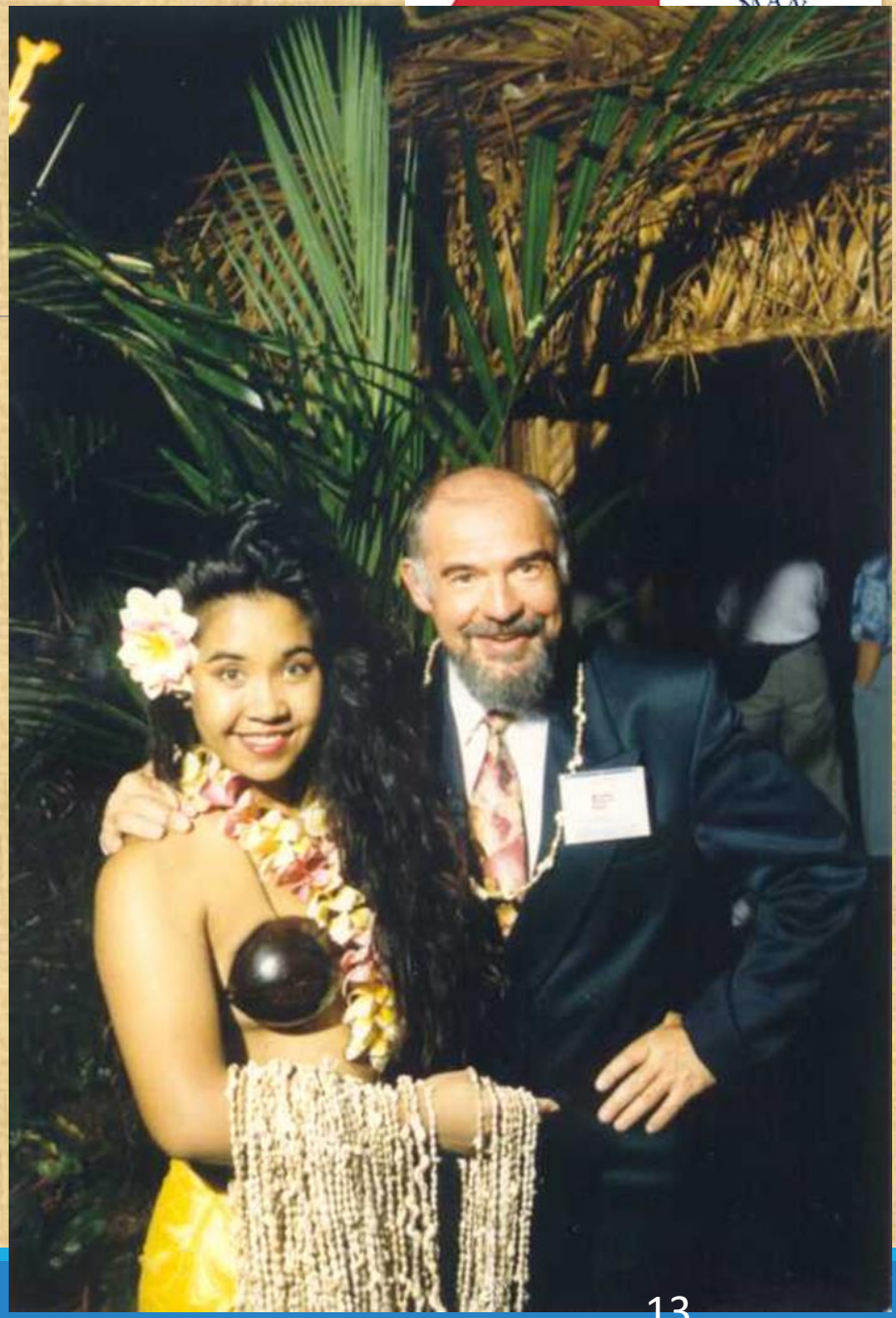
Grassalkovich Royal Palace, Gödöllő

The beginning





Around 40 in Hawaii



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In Japan

President of Hungary

INES 2019

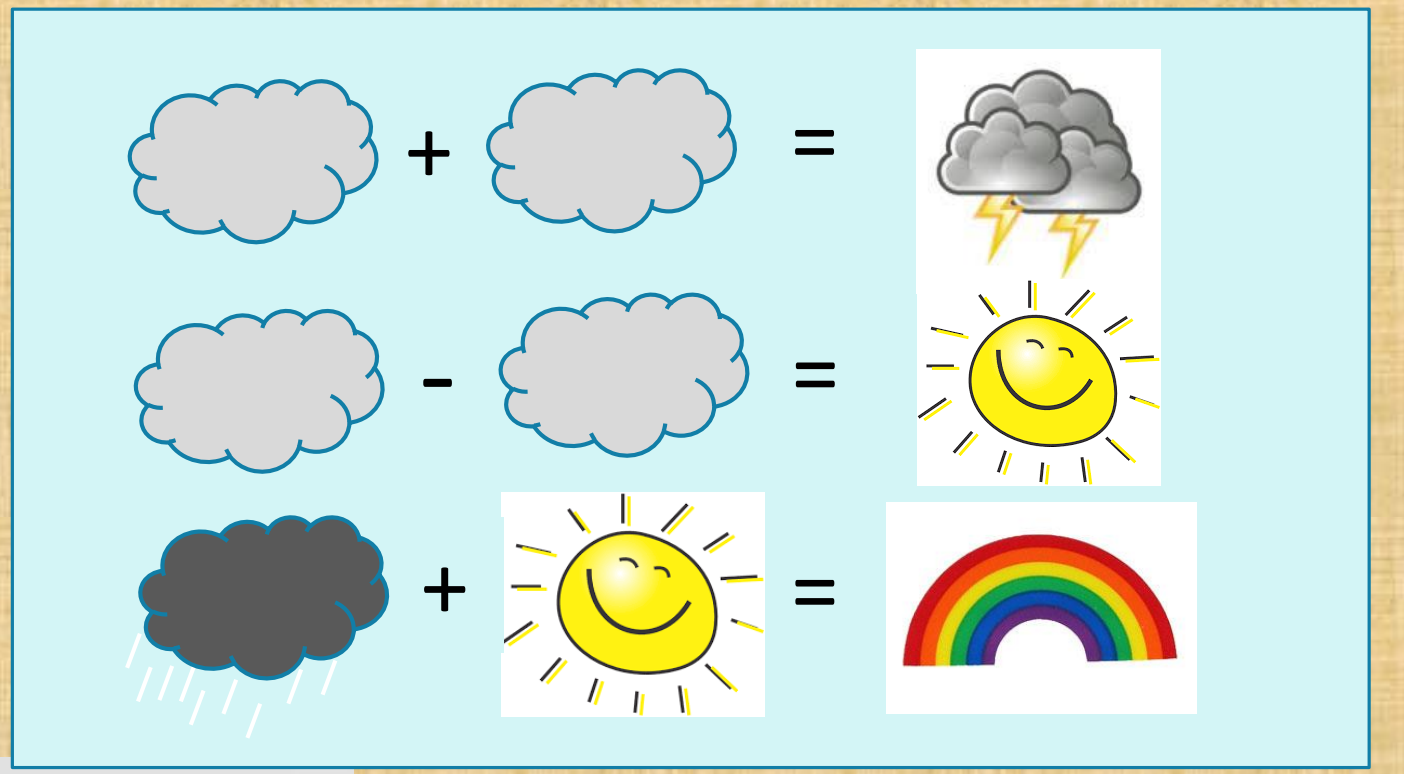
Selected Topics

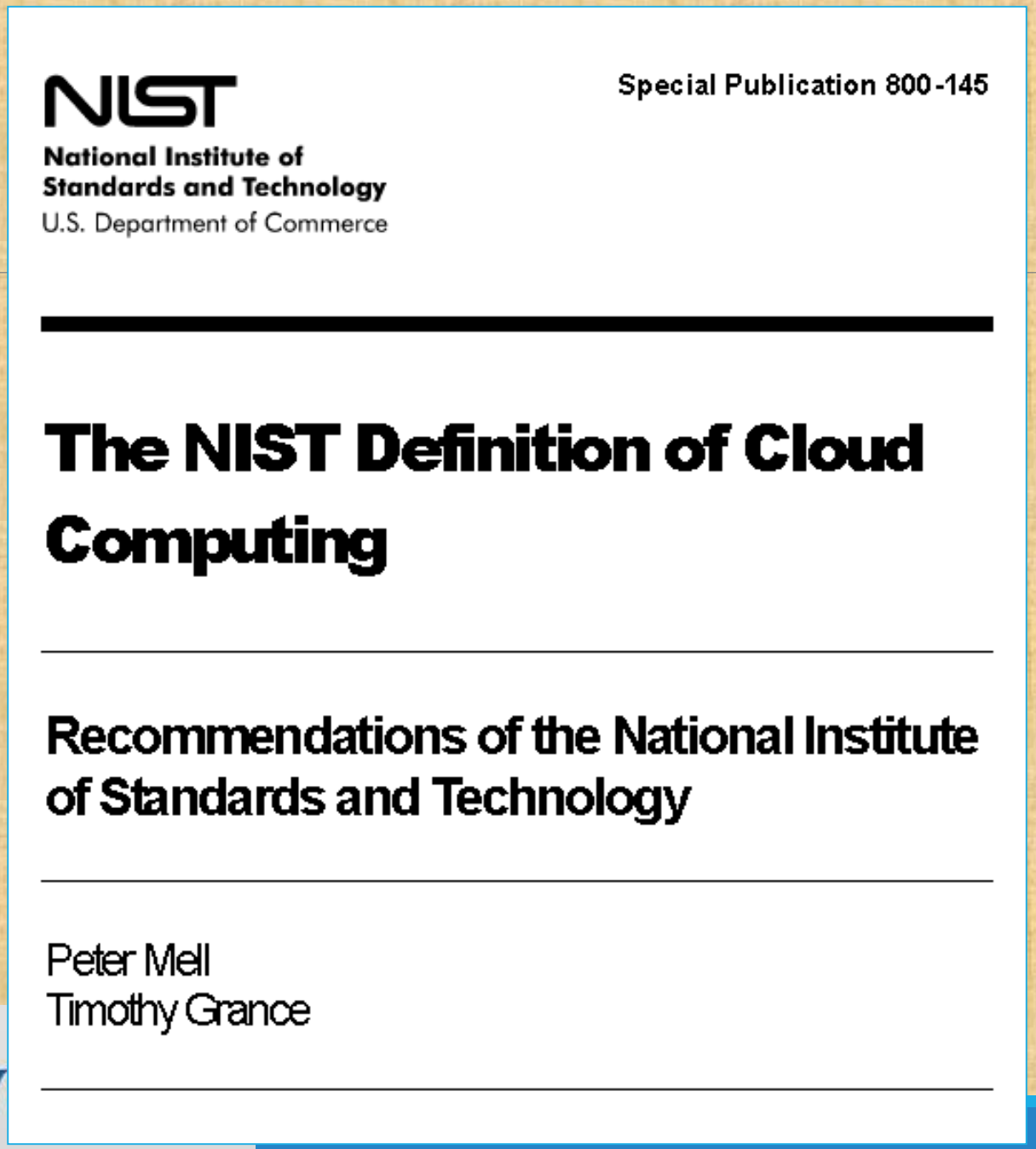
- Cloud Technology
- Internet of Anything
- System of Systems
- Cyber Physical Systems of Systems
  - Blockchain
- Our everyday life has been changing
  - Industry 4.1. Generation

Cloud Technology

What is cloud computing?

What is cloud computing?





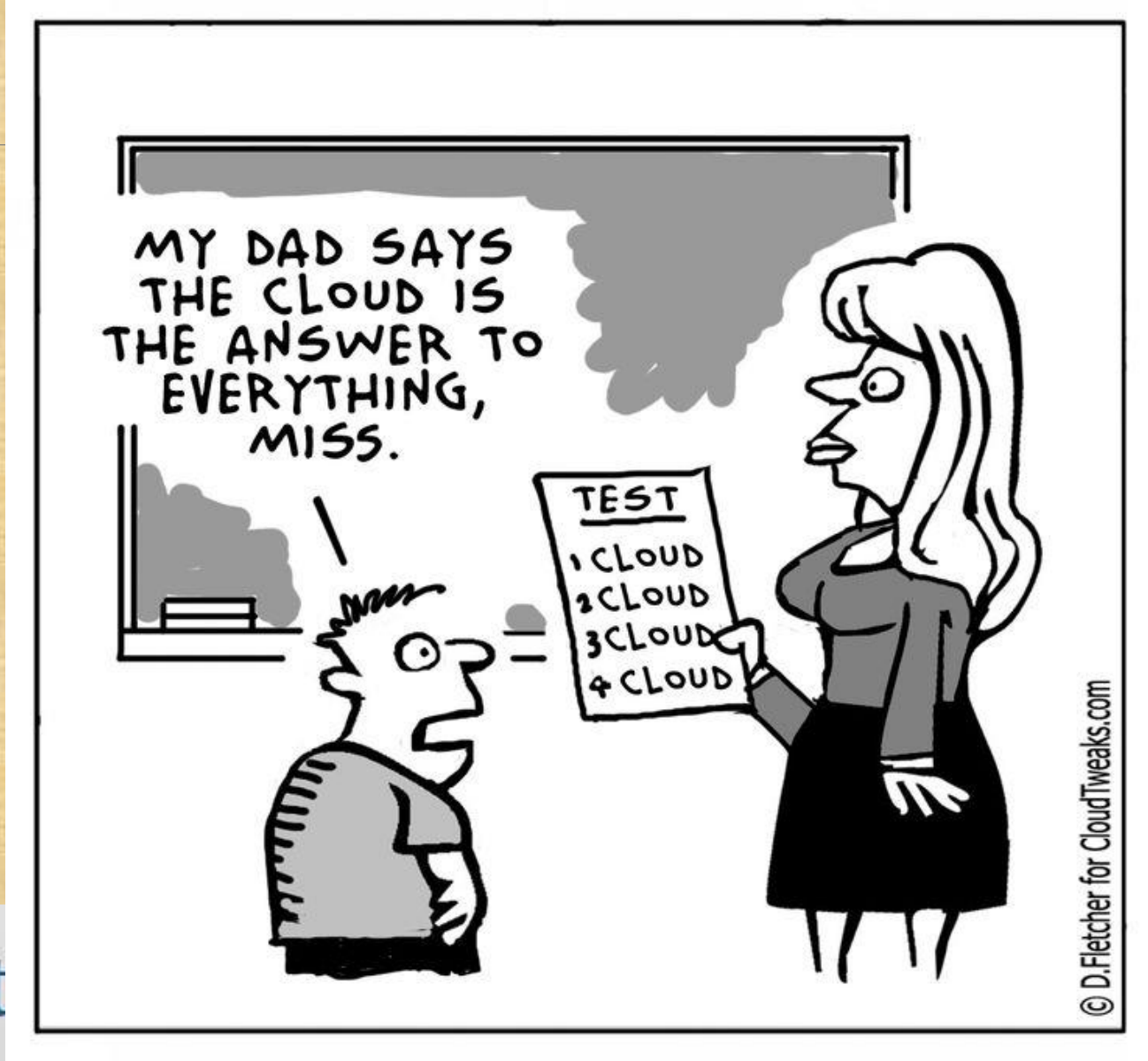
Cloud computing

Cloud computing is a model for enabling

- **ubiquitous,**
- **convenient,**
- **on-demand**

network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Cloud in every day life



A MAGYAR TUDOMÁNY ÜNNEPE

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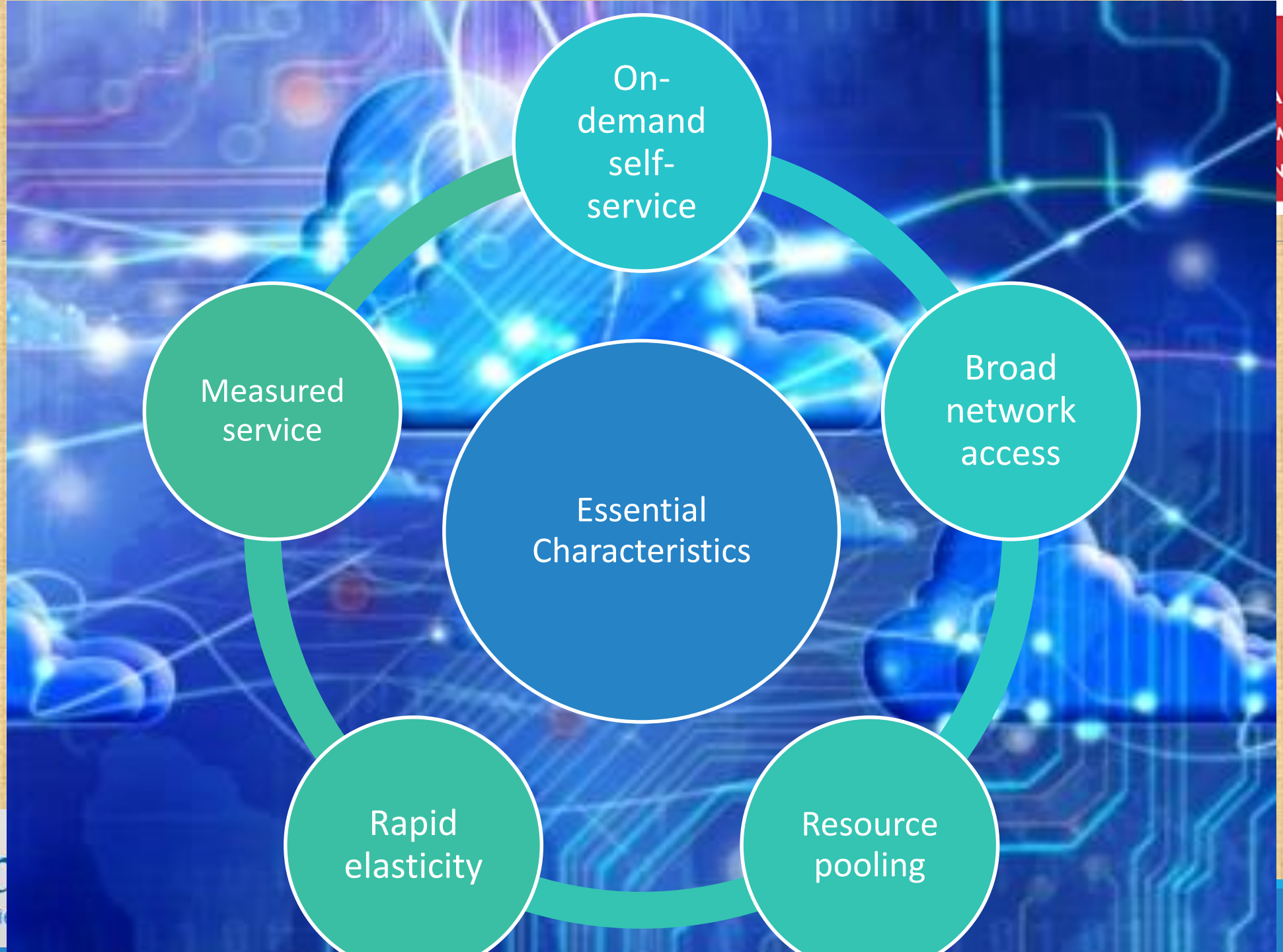
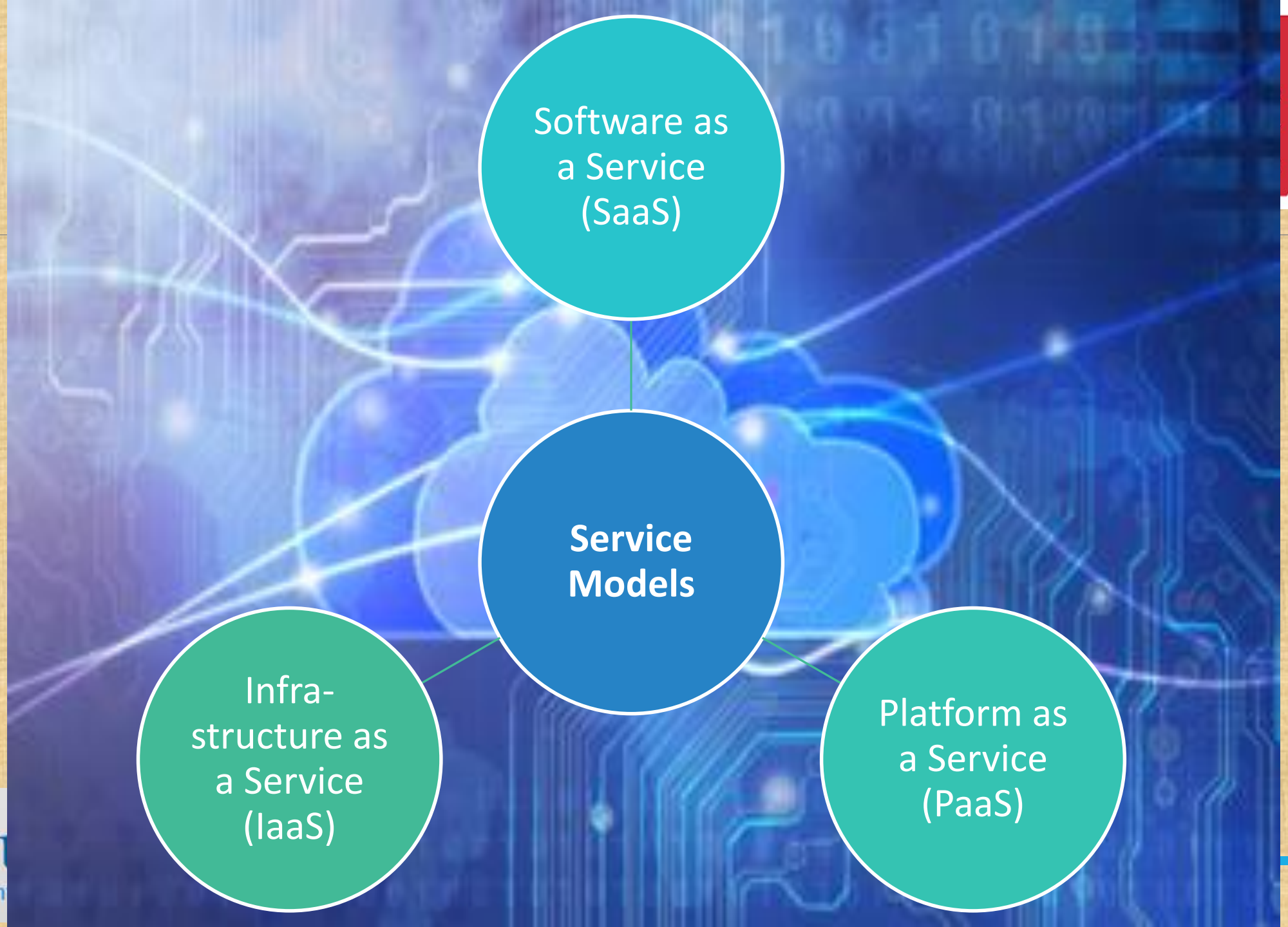
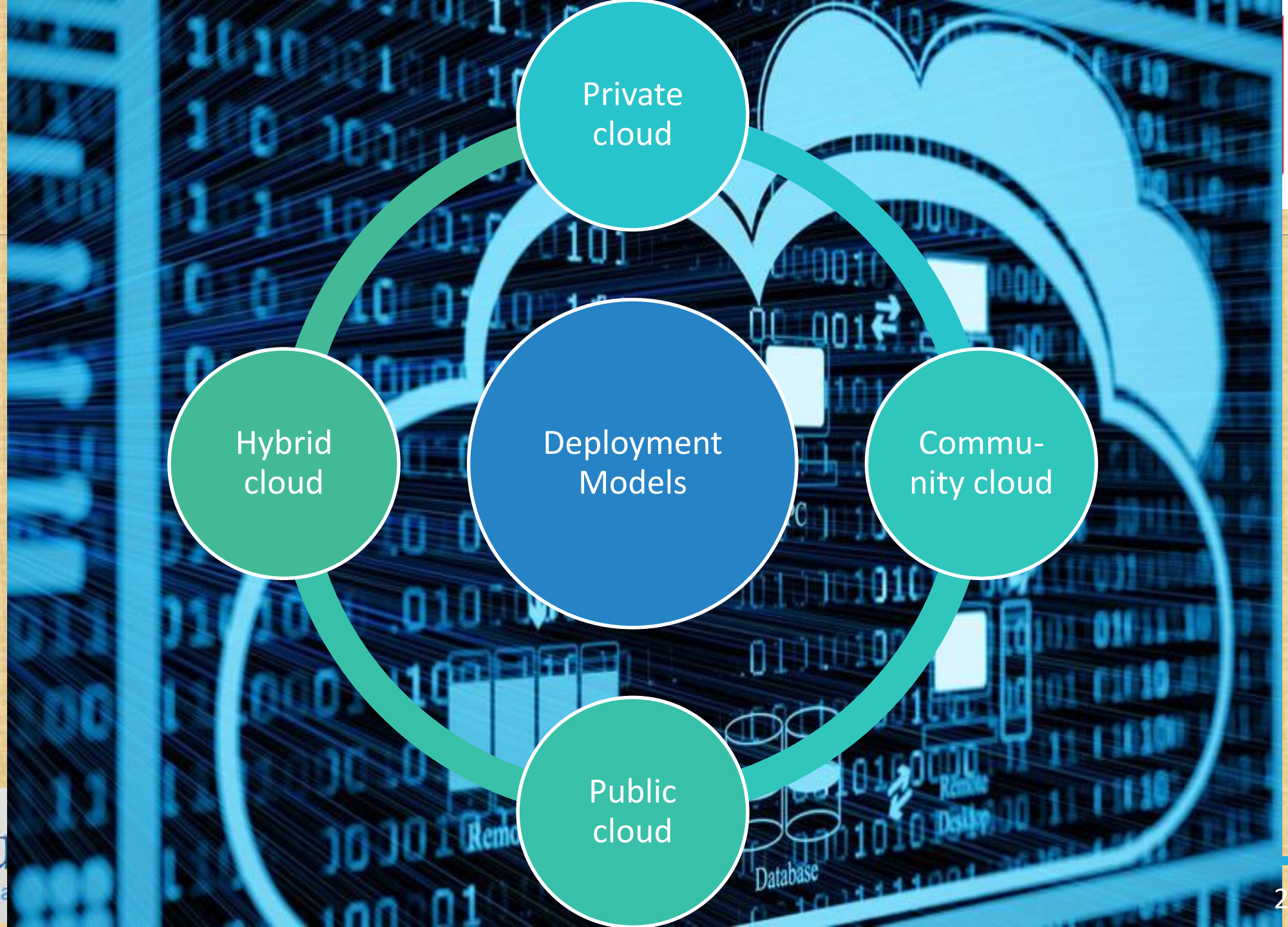
The cloud model is composed of

- five essential characteristics
- three service models
- four deployment models


On-demand self-service
Broad network access
Resource pooling
Rapid elasticity
Measured service
Essential Characteristics


Software as a Service (SaaS)
Service Models
Infra-structure as a Service (IaaS)
Platform as a Service (PaaS)

Cloud in every day life


Private cloud
Hybrid cloud
Deployment Models
Commu-nity cloud
Public cloud
Database

"It was much nicer before people started storing all their personal information in the cloud."

Cloud Technology

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Cloud Technology is a model for enabling

- **ubiquitous,**
- **convenient,**
- **on-demand**

(network) access to a shared pool of (configurable) resources that can be provisioned and released with minimal management effort or service provider interaction.

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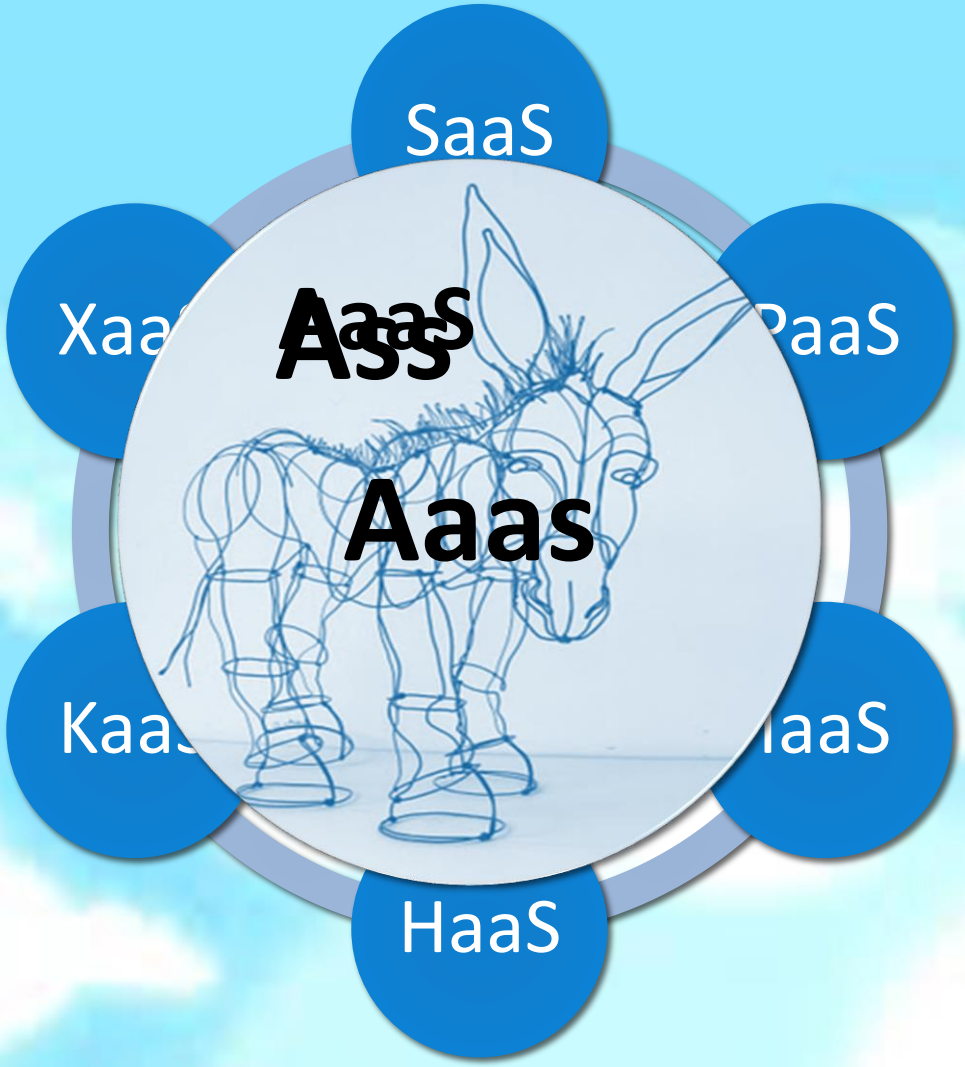
The Service Models

Anything as a Service (AaaS)

SaaS	• Software as a Service
PaaS	• Platform as a Service
IaaS	• Infrastructure as a Service
KaaS	• Knowledge as a Service
HaaS	• Hardware as a Service
VaaS	• Virtualization as a Services
XaaS	• X as a Service

AaaS Services



System of Systems

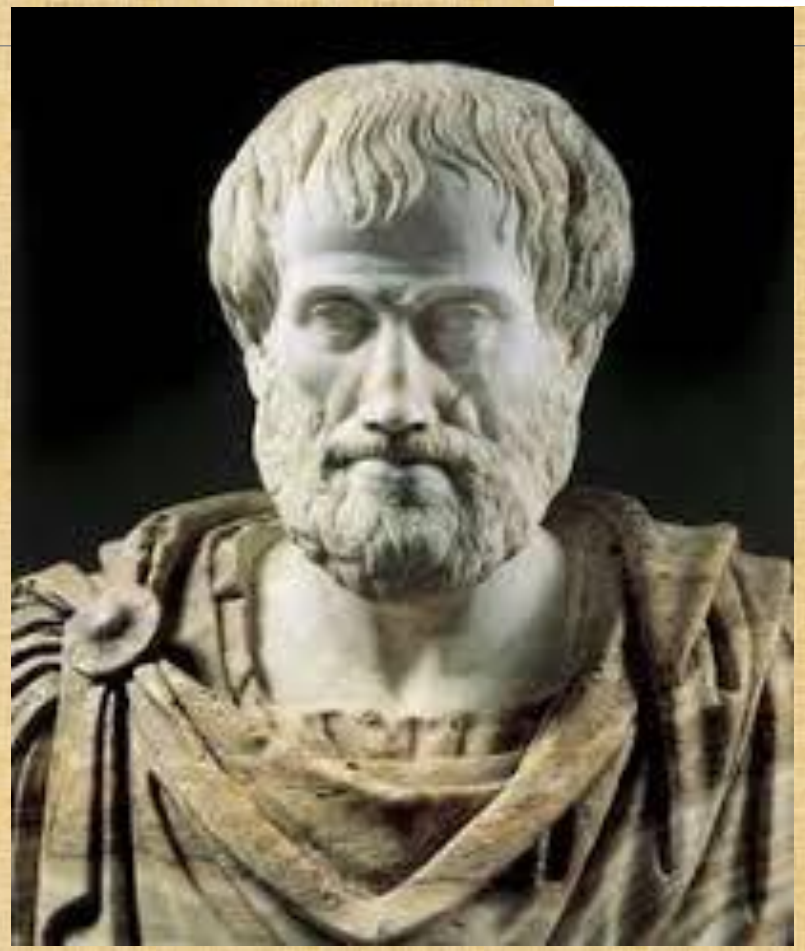
Outsiders' opinion I.

System of Systems is simply a merge of subsystems

Aristotle: The whole is more than the sum of its parts

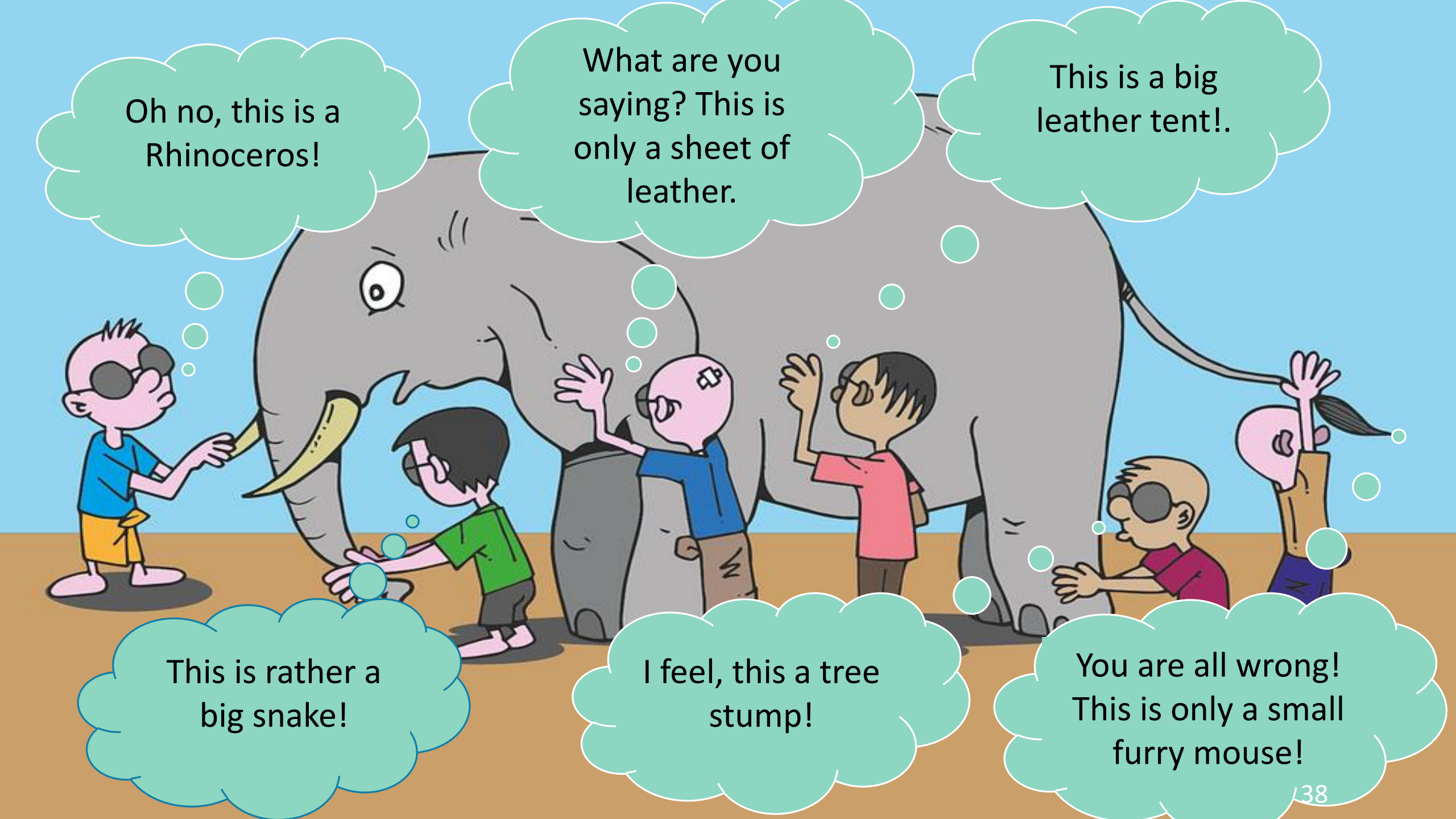
Aristotle, *Metaphysics* 8.6 [=1045a]

…many things have a plurality of parts and are not merely a **complete aggregate** but instead **some kind of a whole beyond its parts…**

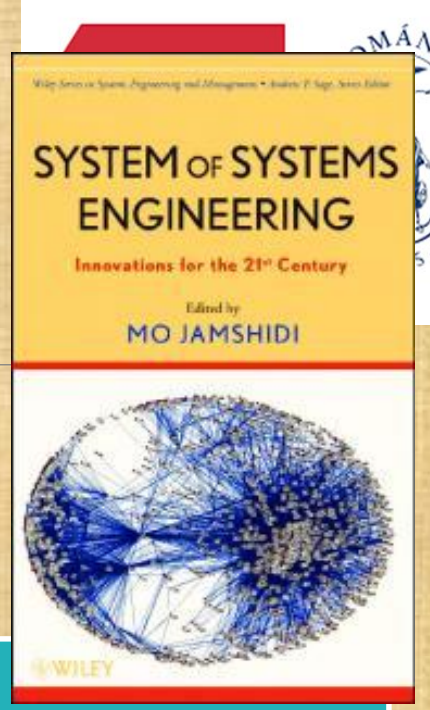


Outsiders' opinion II.

If we know the subsystems we know everything about the whole system


Oh no, this is a Rhinoceros!
What are you saying? This is only a sheet of leather.
This is a big leather tent!.
This is rather a big snake!
I feel, this a tree stump!
You are all wrong! This is only a small furry mouse!

System of Systems (Jamshidi)



System of systems is an integration of a finite number of constituent systems which are independent and operable, and which are networked together for a period of time to achieve a certain higher goal.

i Egyetem

System of Systems

System of systems is a collection of task-oriented or dedicated systems that

pool their resources and capabilities together

to create a new, more complex system

which offers more functionality and performance than simply the sum of the constituent systems.

Industry 4.0

Industry 1.0

- End of 18th Century
- Using water or steam power
- Mechanization

Industry 2.0

- Beginning of 20th Century
- Using electric power
- Mass production

Industry 3.0

- Beginning of 1970s
- Using electronics and IT
- Automation

Industry 4.0

- Beginning of 2010s
- Cyber-Physical Systems

Industry 4.0

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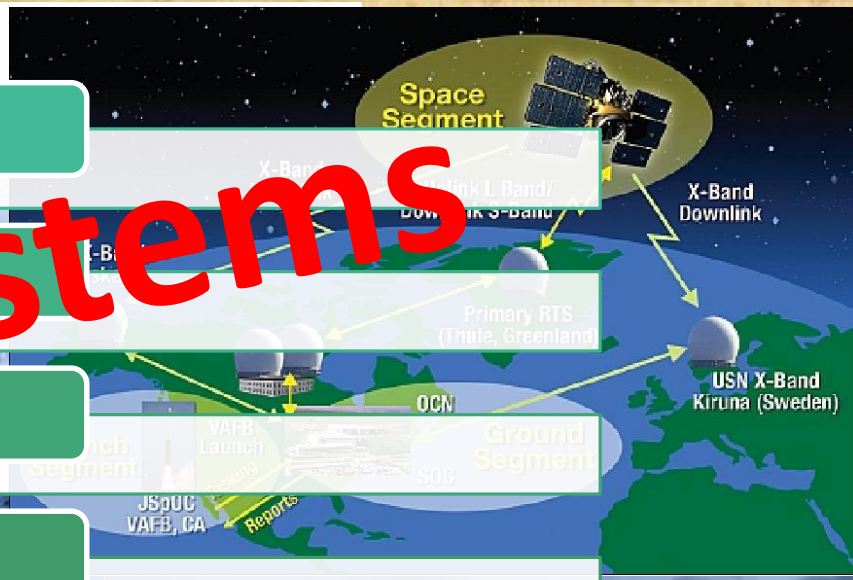
- Medical monitoring systems
- Distributed robotic systems
- Process control systems
- Wireless sensor networks
- Autonomous automotive systems
- Robot pilot

Cyber-Physical Systems

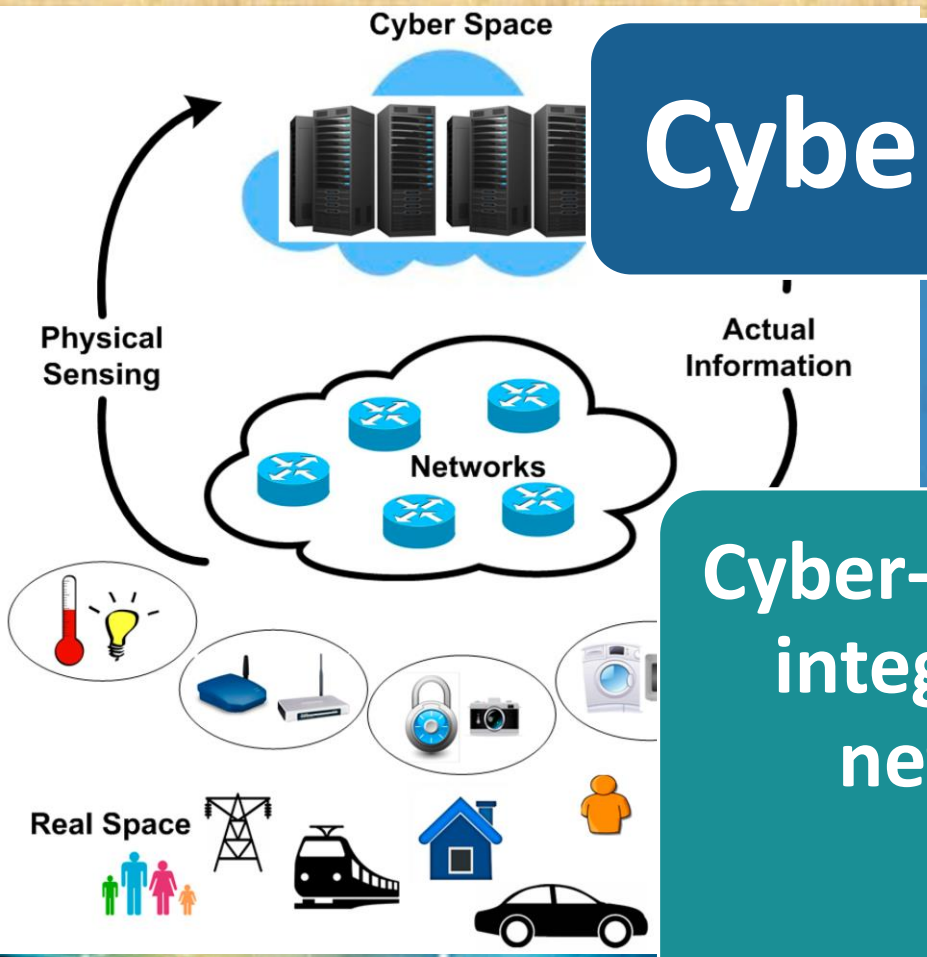


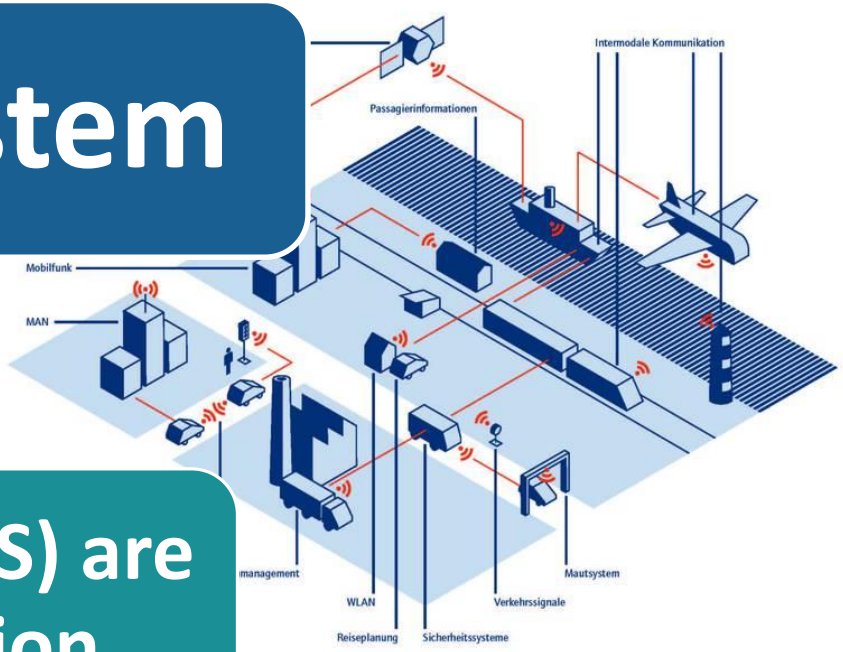
Cyber-Physical Systems (NIST)

CPS are smart systems that include engineered interacting networks of physical and computational components.

National Institute of Standard and Technology (NIST), US. CPS Public Working Group

Cyber-Physical System





Cyber-Physical Systems (CPS) are integrations of computation, networking, and physical processes

Internet of Anything

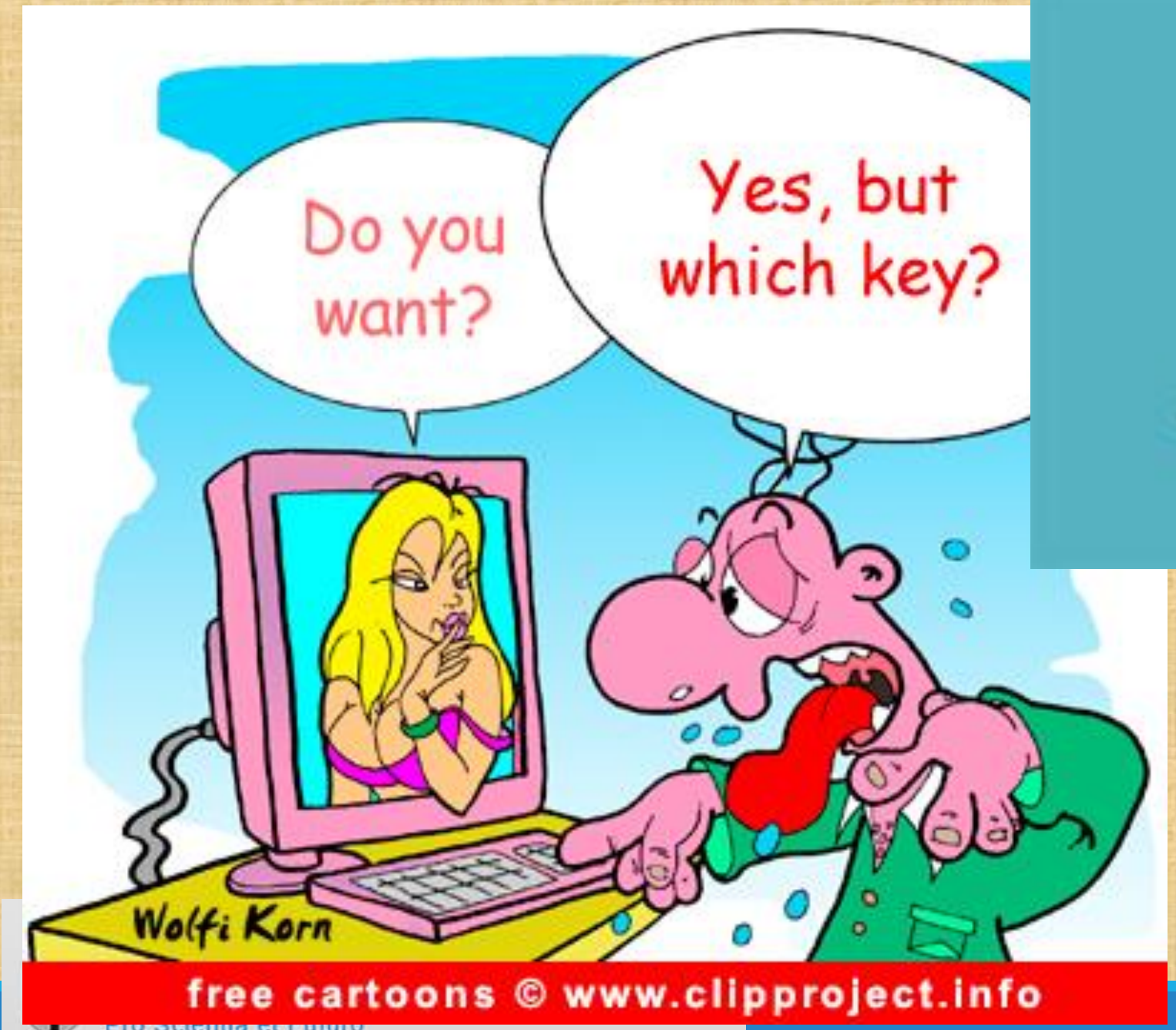
Internet of Things

THE TERM WAS COINED BY KEVIN ASHTON IN 1999

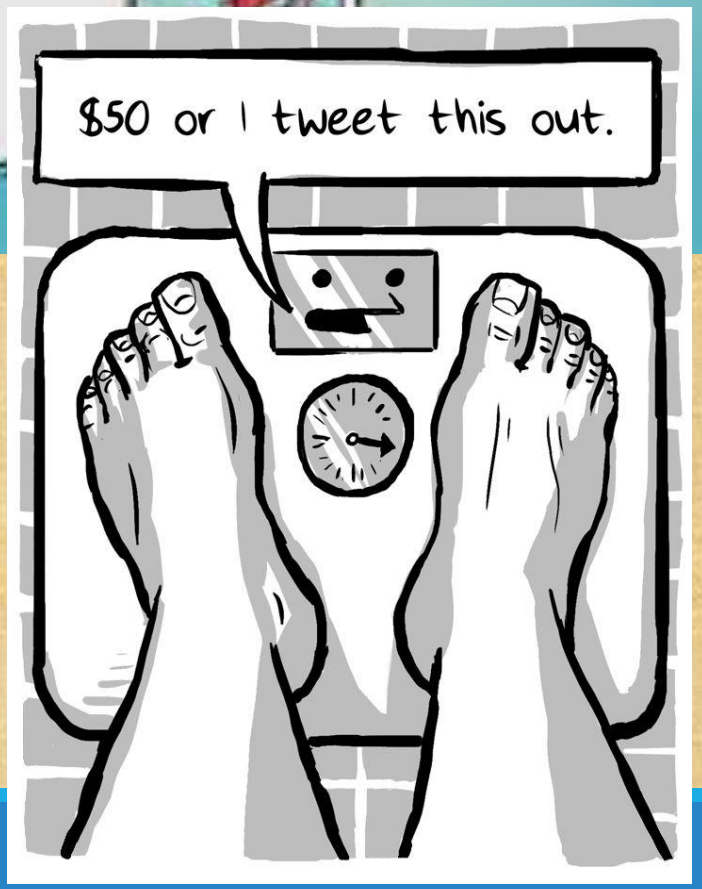
IT WAS THE TITLE OF HIS PRESENTATION GIVEN AT PROCTER & GAMBLE.

Internet of Things

Internet of Things is the interconnection of devices, systems within the existing Internet infrastructure.


Do you want?
Yes, but which key?
Wolfi Korn
free cartoons © www.clipproject.info


Don't forget to buy milk!


$50 or I tweet this out.


In Cyberworld there is a need to connect anything, like a superhighway.
Internet of Anything!

IoA

Internet of Anything

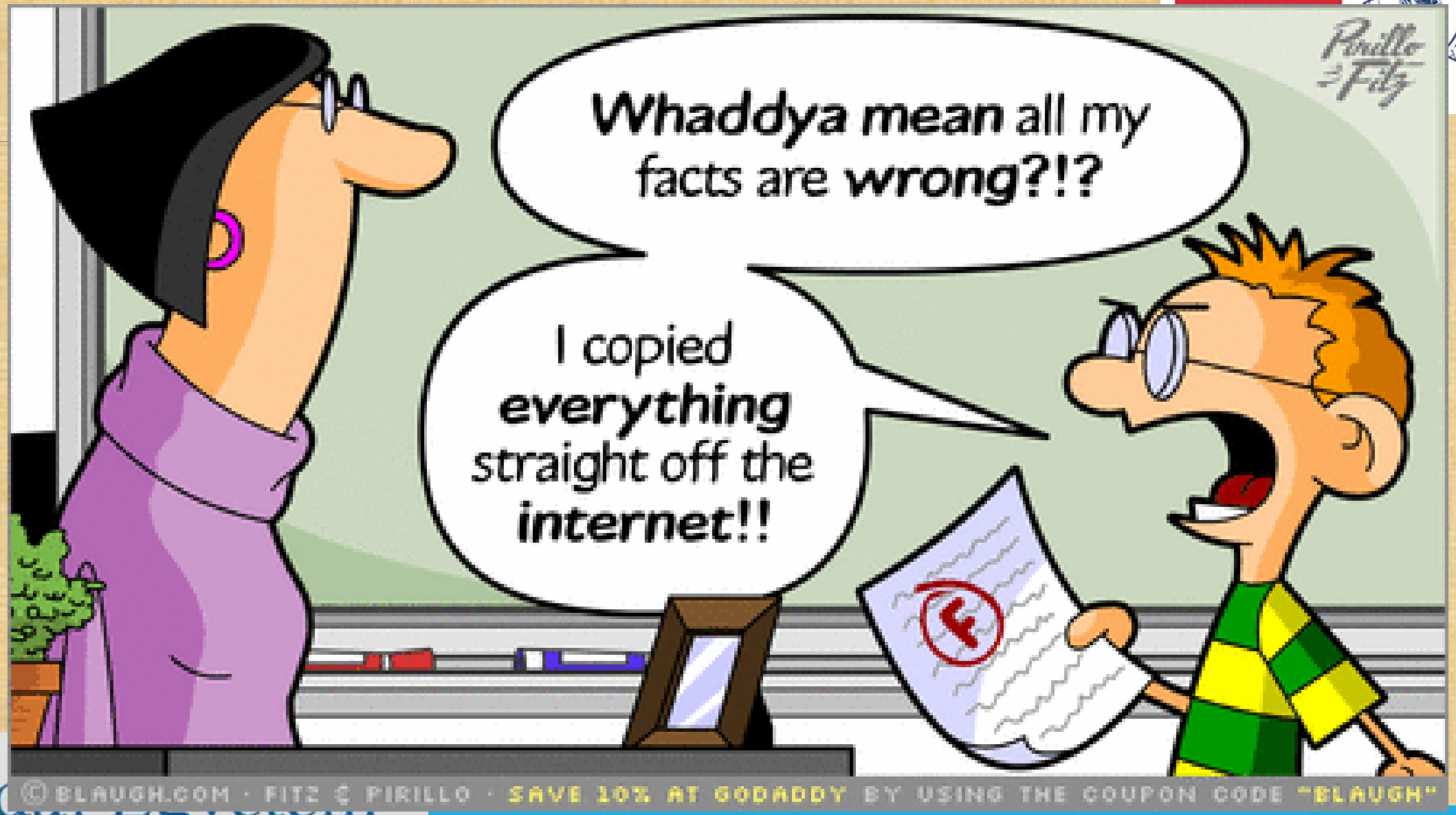
Anywhere

Anything

Internet of Anything

Anyone

Anytime


Whaddya mean all my facts are wrong?!?
I copied everything straight off the internet!!
Pirillo & Fitz
©BLAUGH.COM · FITZ & PIRILLO · SAVE 10% AT GODADDY BY USING THE COUPON CODE "BLAUGH"

Evolution of Internet

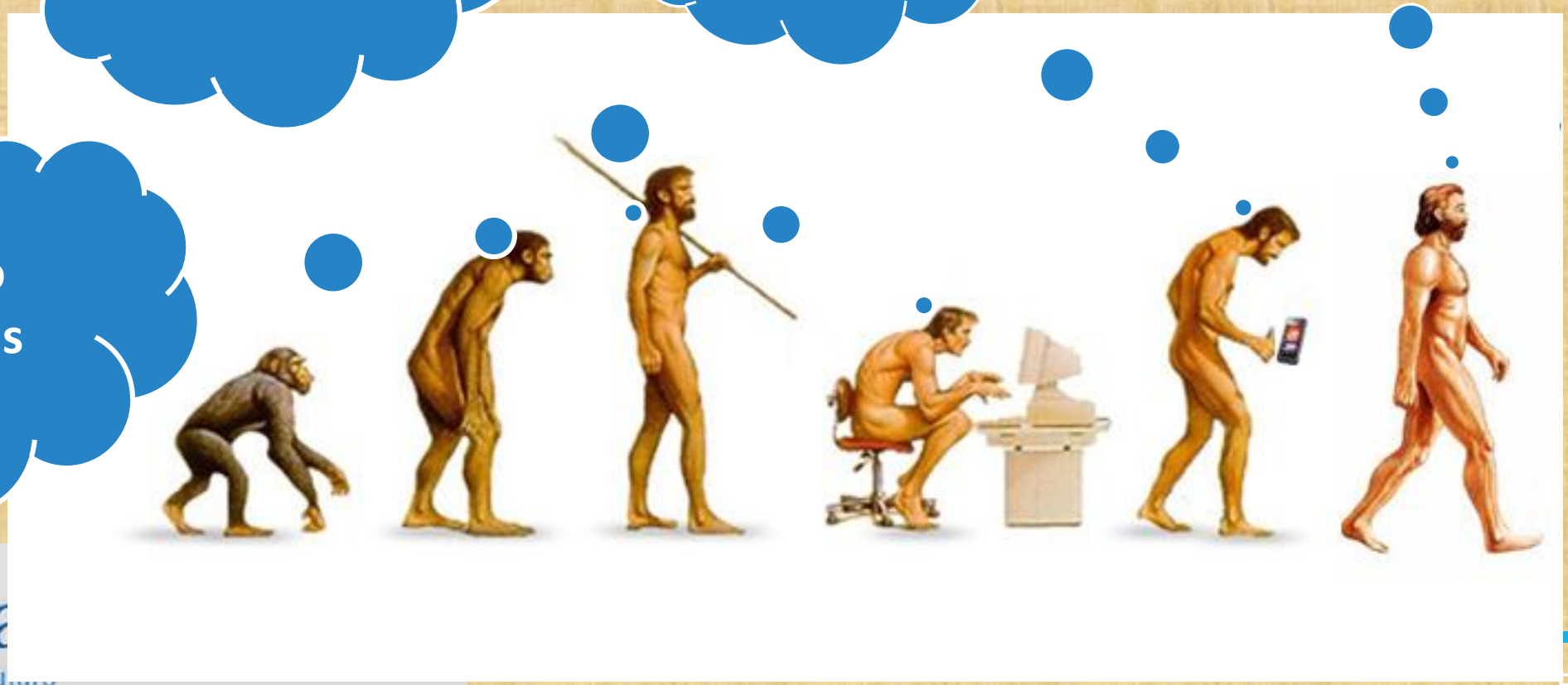
Evolution

Homo Sapiens

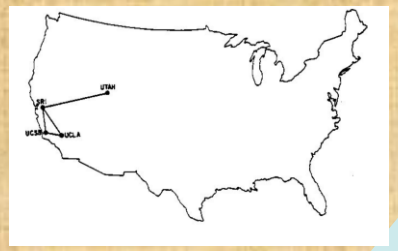
Homo Computeros

Homo Mobilos

Homo Internetos



Evolution of Internet



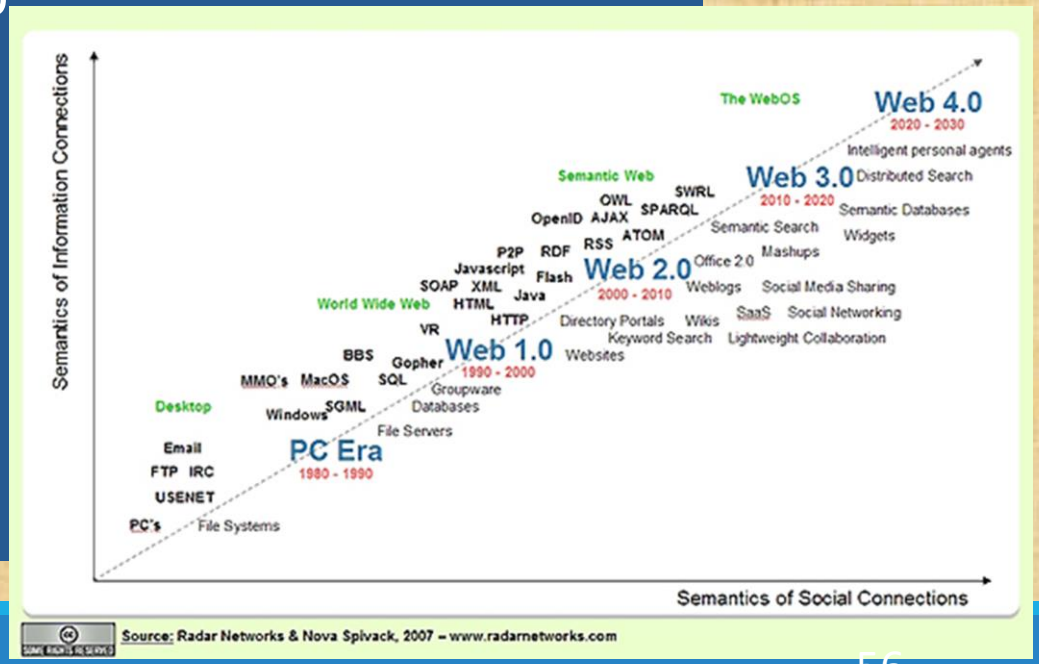
2015 IoA

2008-09
IoT

1999 Web
2.0

1990
WWW

1969
ARPANET



Transform Manufacturing with Internet of Things

INTEL

The Internet of Things

Smart manufacturing

Internet of Health (IoH)

Internet of Health is the interconnection of medical devices, systems via Internet.


Une Docteur

Healthcare

No, the doctor cannot see you! Send your symptoms to Med-Center and he will contact you.

"It's a pacemaker for your heart.
Plus, you can download apps for your liver,
kidneys, lungs, and pancreas!"

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IoT and System of Systems

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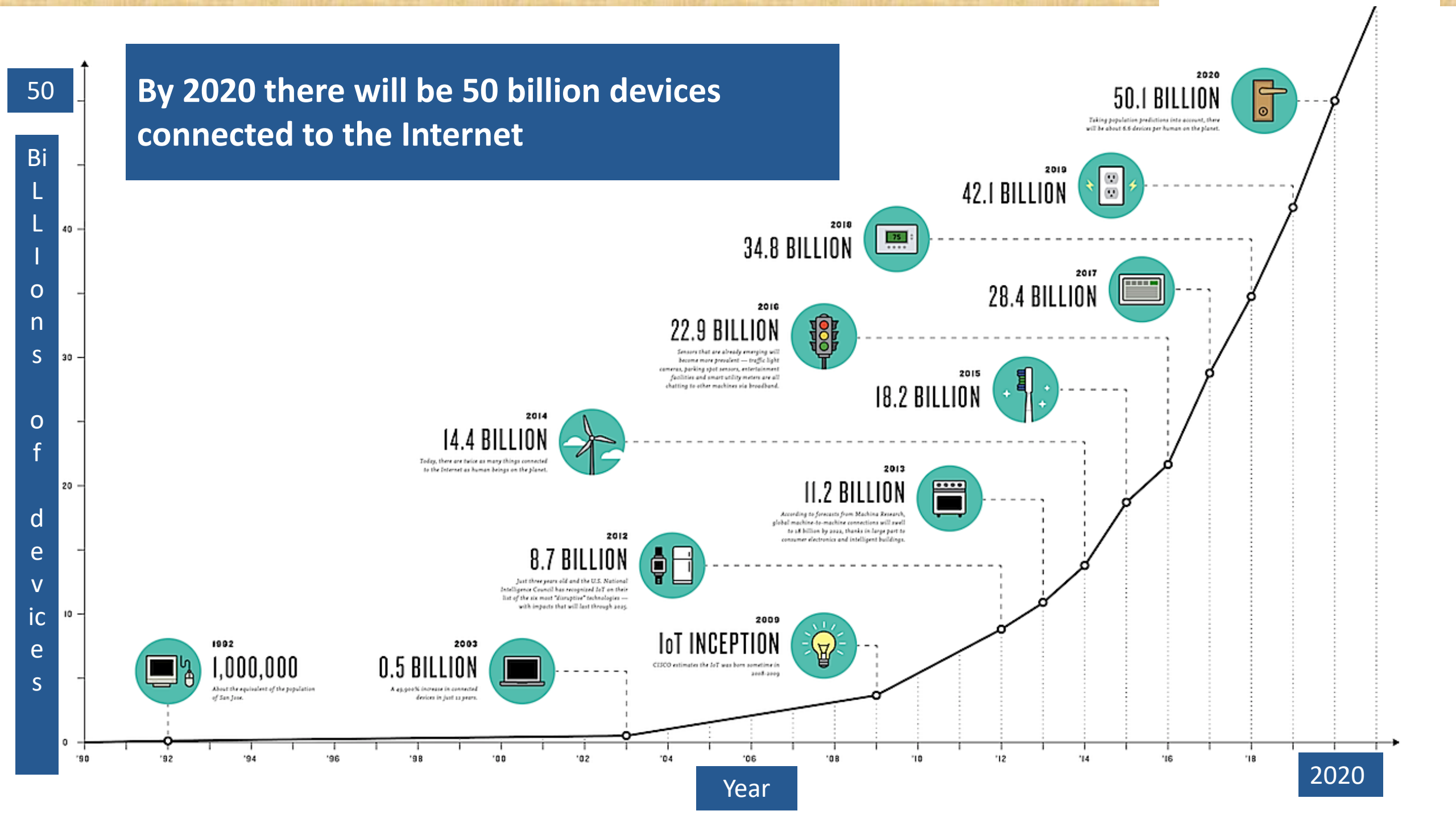
By 2020 there will be 50 billion devices connected to the Internet



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IoT

50 billion connected devices by 2020

Cyber Physical Systems

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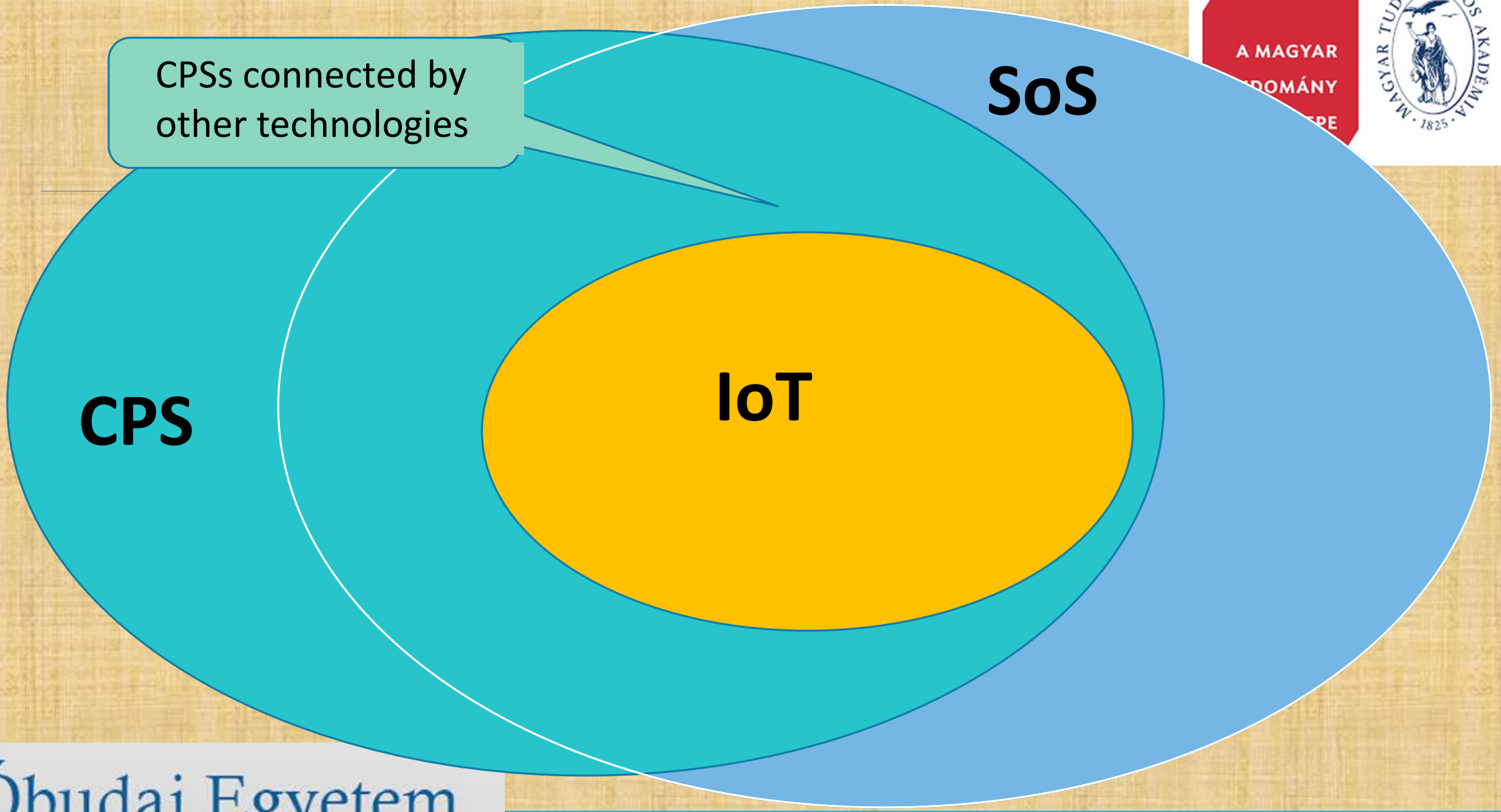

CPSs connected by other technologies
SoS
CPS
IoT

Cyber Physical Systems of Systems

Cyber-Physical Systems of Systems (CPSoS)

Cyber-Physical System of Systems is an integration of self-contained CPSs that provides services that go beyond the services of any of its isolated CPSs.

Cyber-Physical Systems of Systems (CPsoS)

Cyber-physical Systems of Systems are cyber-physical systems which exhibit the features of systems of systems

Cyber-physical Systems of Systems…Sebastian Engell Working Paper of the Support Action CPSoS

Features

- Large, often spatially distributed physical systems with complex dynamics
- Distributed control, supervision and management
- Partial autonomy of the subsystems
- Dynamic reconfiguration of the overall system on different time-scales
- Continuous evolution of the overall system during its operation

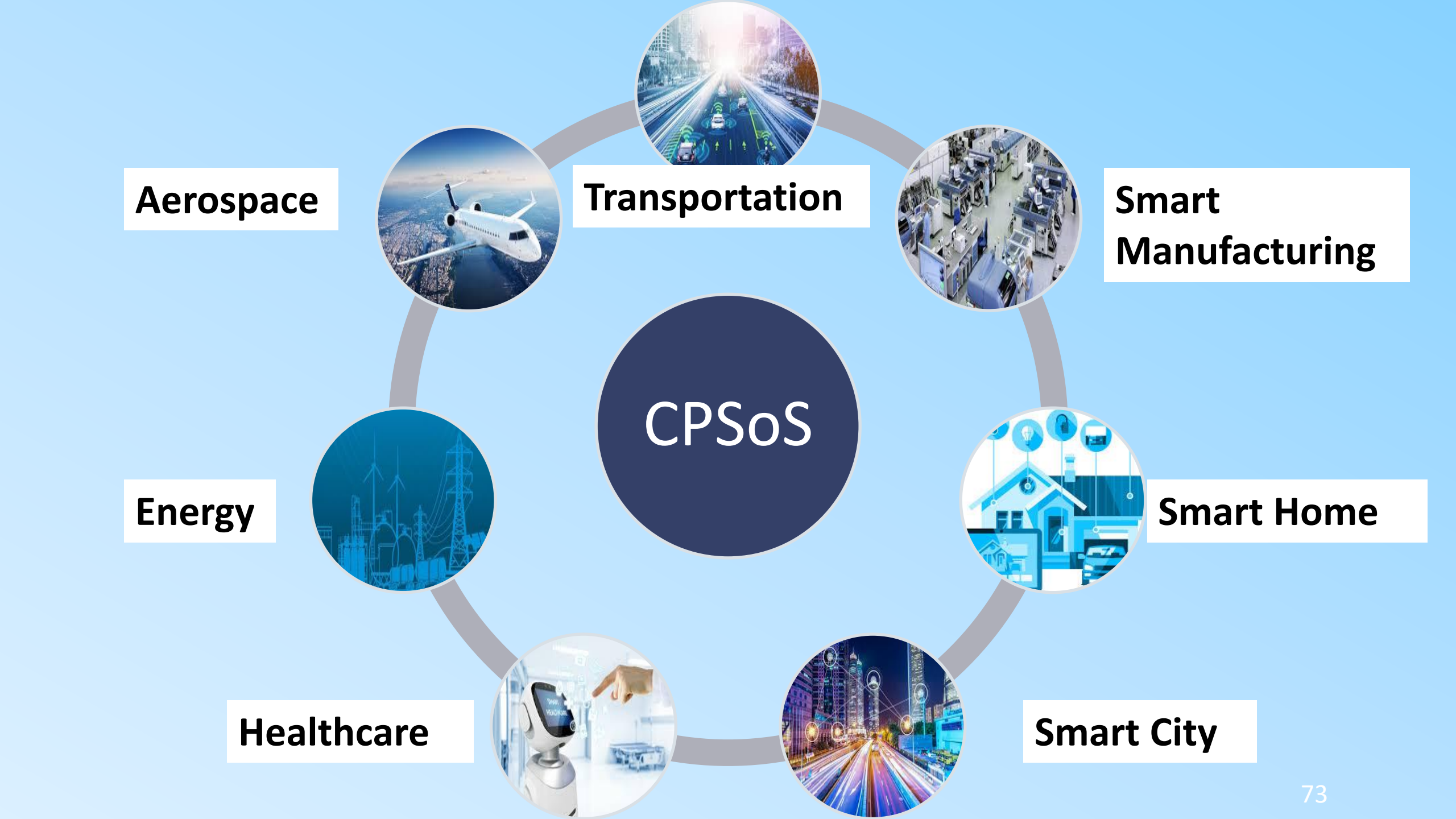
Industry 4.1

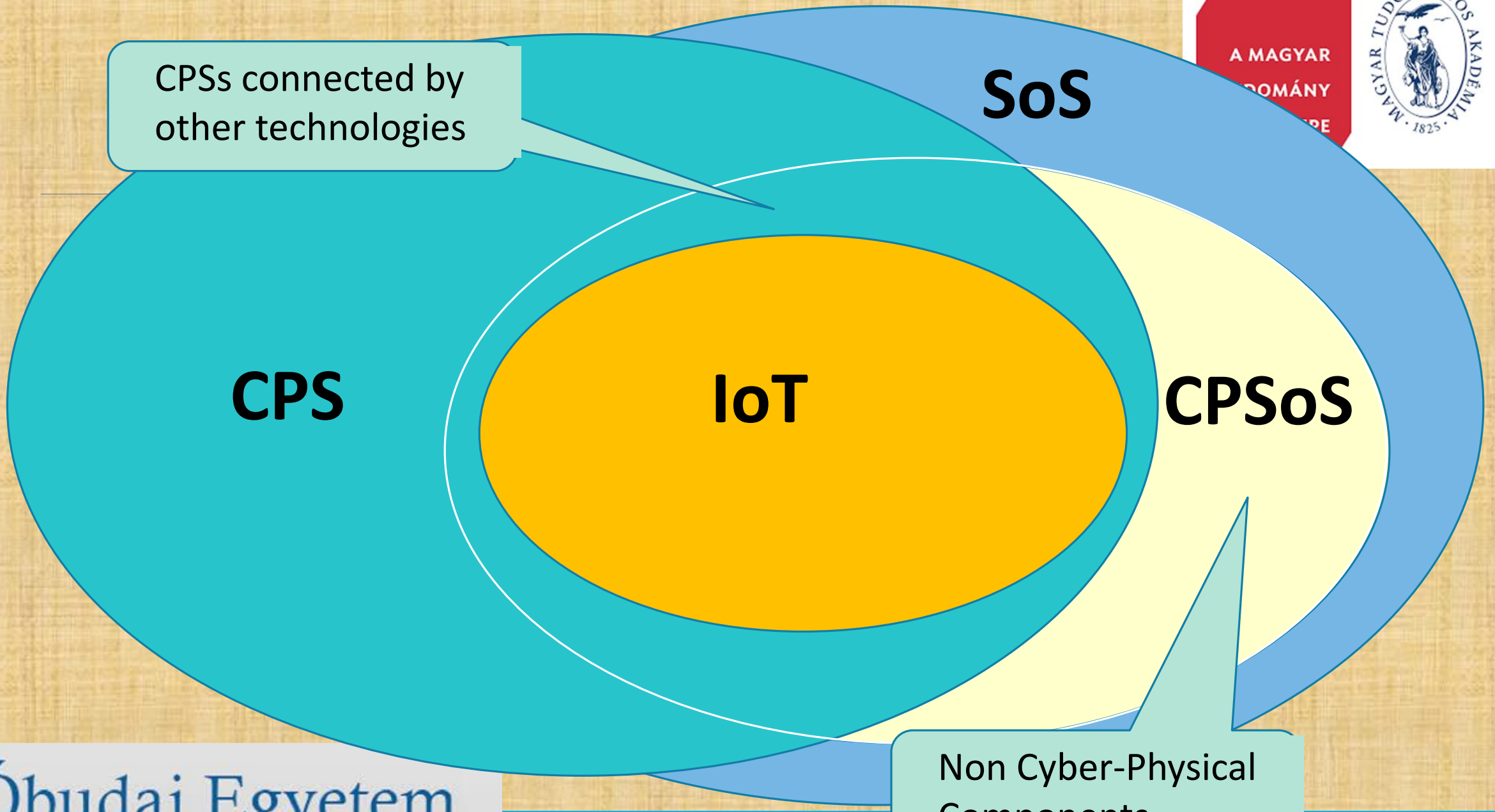
Industry 4.0

- Beginning of 2010
- Cyber-Physical Systems

Industry 4.1

- Cyber-Physical Systems of Systems

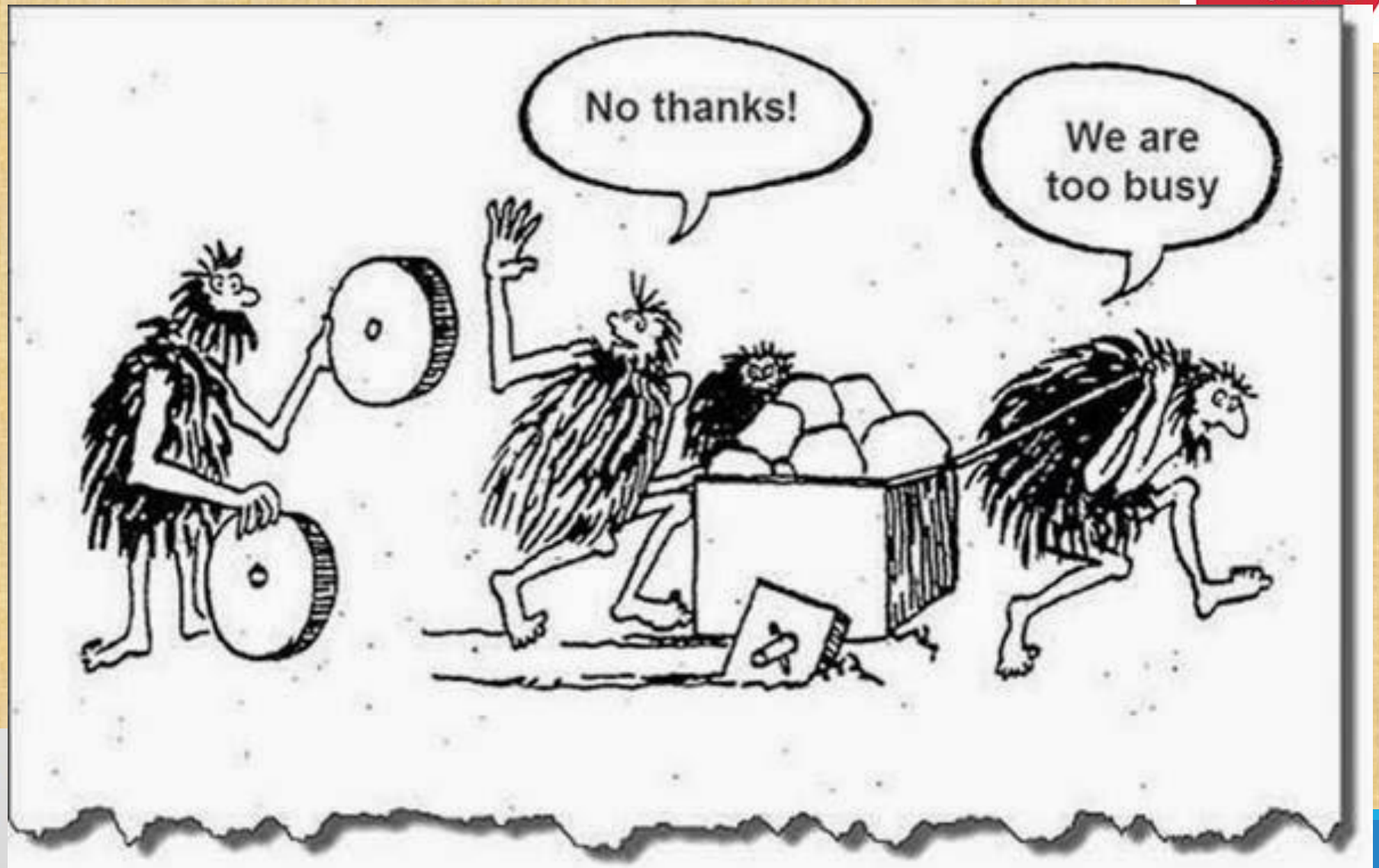

Aerospace
Transportation
Smart Manufacturing
CPSoS
Energy
Smart Home
Healthcare
Smart City


CPSs connected by other technologies
SoS
CPS
IoT
CPSoS
Non Cyber-Physical Components

Industry 4.1 technologies that changed the game

- Blockchain
- Data Distribution Service
- Message Queuing Telemetry Transport (MQTT)

But sometimes the game does not want to be changed



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Blockchain

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Blockchain

Blockchain started with Bitcoin, first appeared in 2009, and during the last years has been widely used.

We have arrived to the stage of applications in Cyber Systems, Cyber Physical Systems and Systems of Systems.

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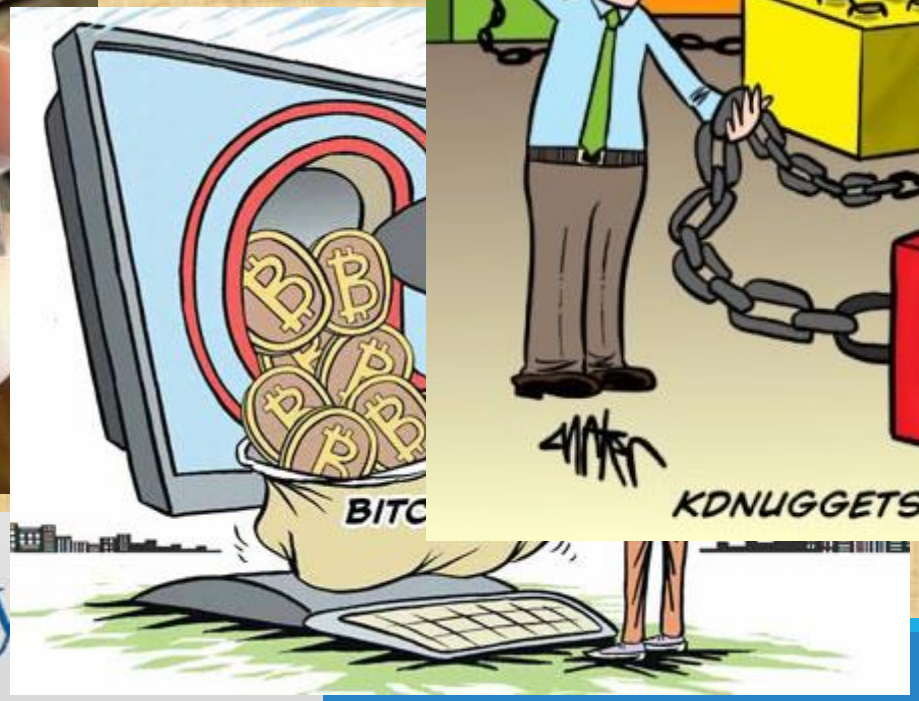
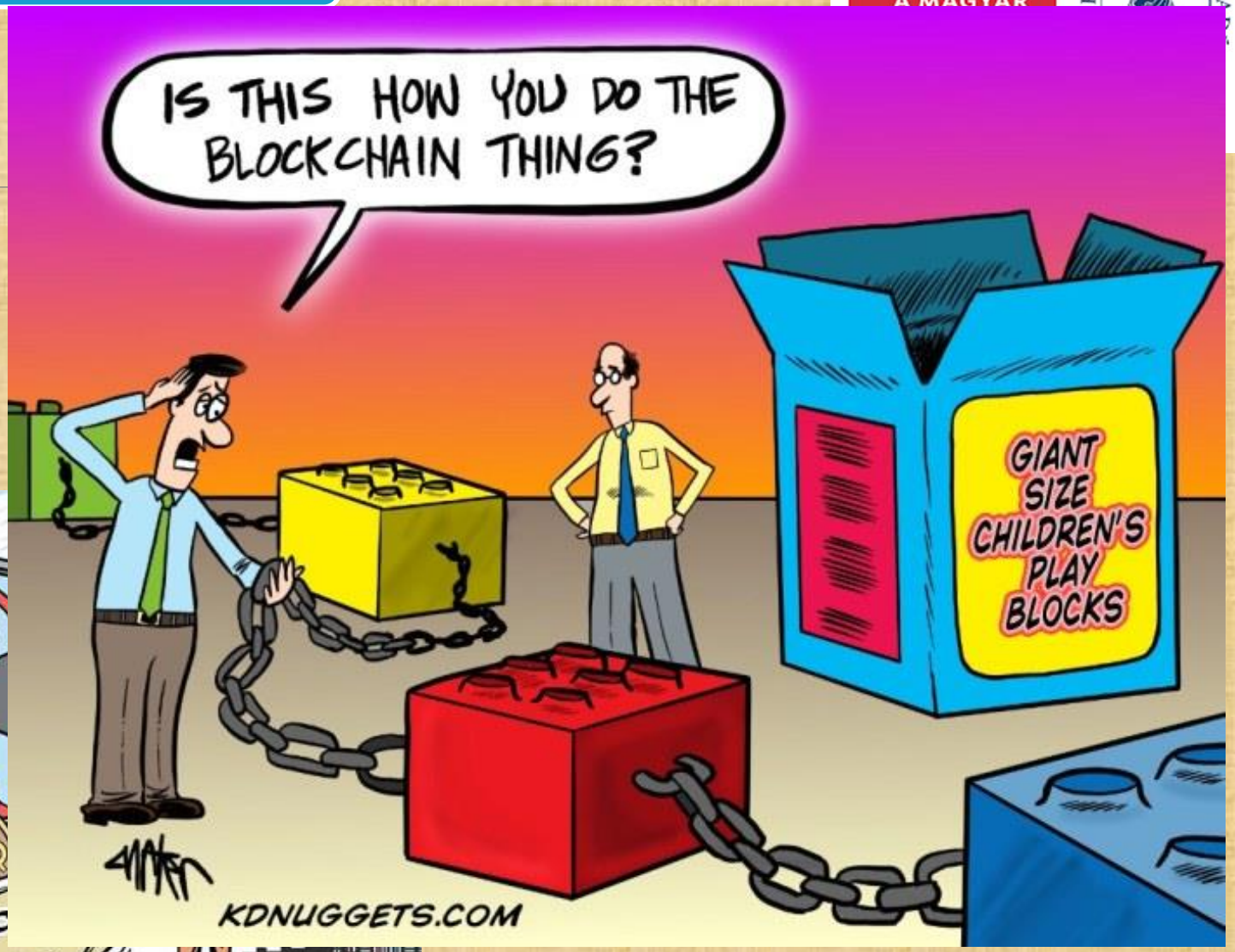
What is bitcoin and blockchain?





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Conventional bank transaction

Sender's account

Bank (Keeps entry on register of transactions. The entry needs to be updated on both, receiver and sender, account)

Receiver's account

Entries of transactions can be manipulated!

Blockchain is designed to avoid this problem.

Óbuda
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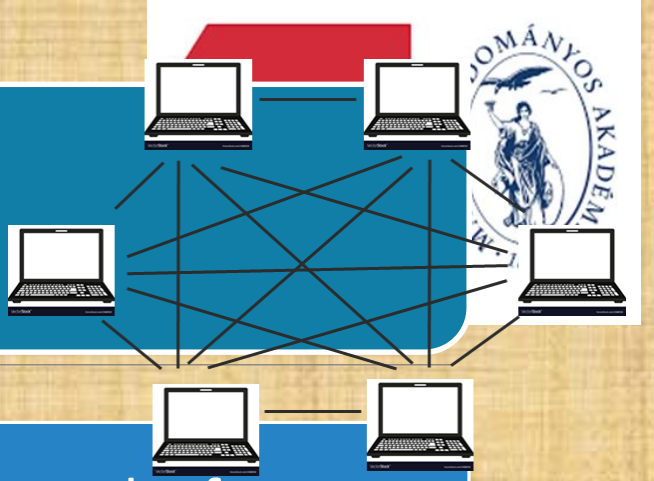
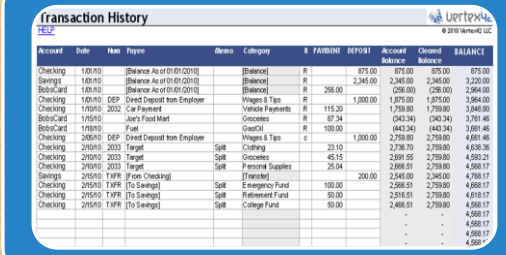
What is blockchain?



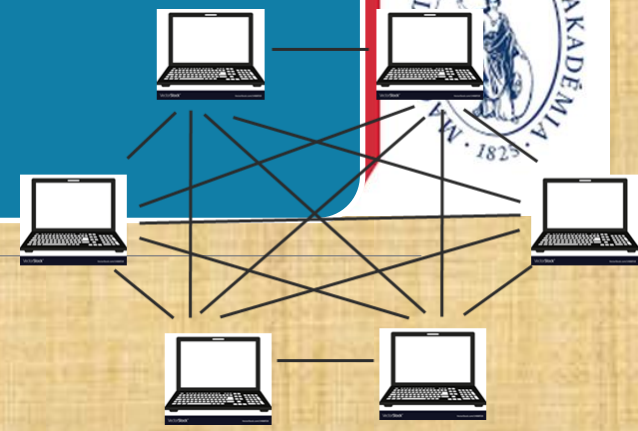


Suppose that an Excel spreadsheet is shared in a network of computer, where each of them has copy of it. The spreadsheet contains information of the transactions committed by real people.

Anyone can access that spreadsheet but no one can edit it.

This is the basic idea of Blockchain.

What is blockchain?



Blockchain works with Blocks, while a spreadsheet works with “rows” and “columns”.

A block in a blockchain is a collection of data. The data is added to the block by connecting it with other blocks creating a chain of blocks linked together.

A node starts a transaction

The requested transaction is broadcasted to a P2P network

The nodes validate the transaction

Approved transaction is represented as a block.

Transaction is completed

The new block is added to the blockchain (public ledger)

Enterprises Which Are Implementing Blockchain Tec

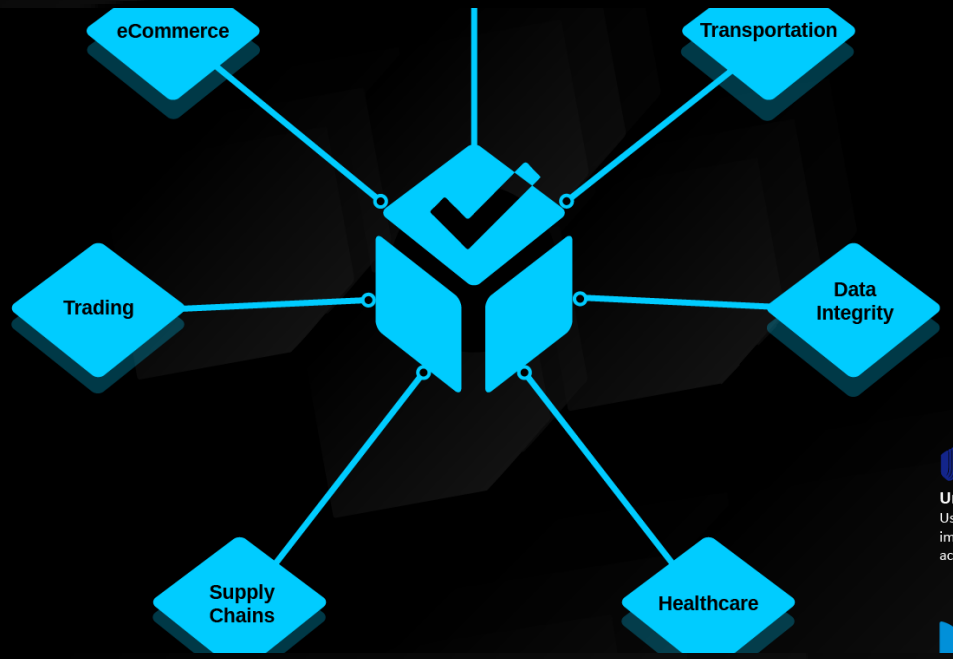
Apple
Patented blockchain
tec
sta

Facebook
Exploring the use of blockchain to enhance data security and users privacy.

Google
Exploring the use of blockchain technology to enhance cloud service security and for data protection.

Ford
Leveraging blockchain technology to enhance the mobility of technologies.

Alibaba
Using blockchain technology to track luxury goods in its e-commerce platforms.



Prudential
Unveils a blockchain powered trading platform for small and medium-sized enterprises.

BHP Billiton
Leveraging blockchain technology for supply chains management.

Toyota
Planning to use blockchain technology to

UnitedHealthcare
Using blockchain technology to improve doctors directories to enable accurate insurance claim fillings.

Nes
Usin
in su
track baby food products.

Maersk
Blockchain system for tracking movement of shipments between ports.

UPS
Blockchain powered logistics monitoring and management solution.

Samsung
Intends to use blockchain technology enhance supply chain management when it comes to electronics shipmen

Metlife
Using blockchain technology for storing patients medical records for insurance purposes.

Our everyday life has been changing

The Industry 4.1 generation

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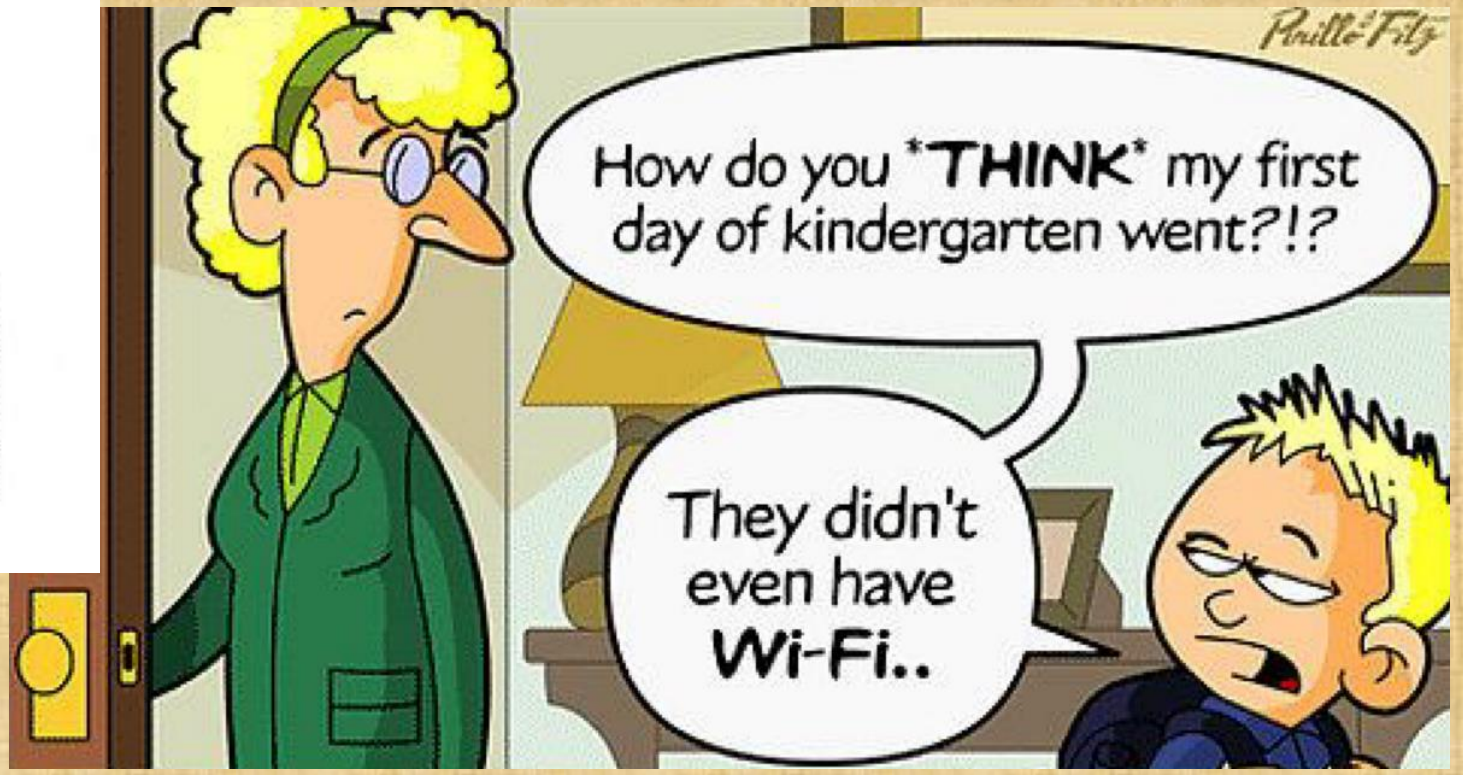

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MAGYAR TUDOMÁNYOS AKADÉMIA · 1825 ·

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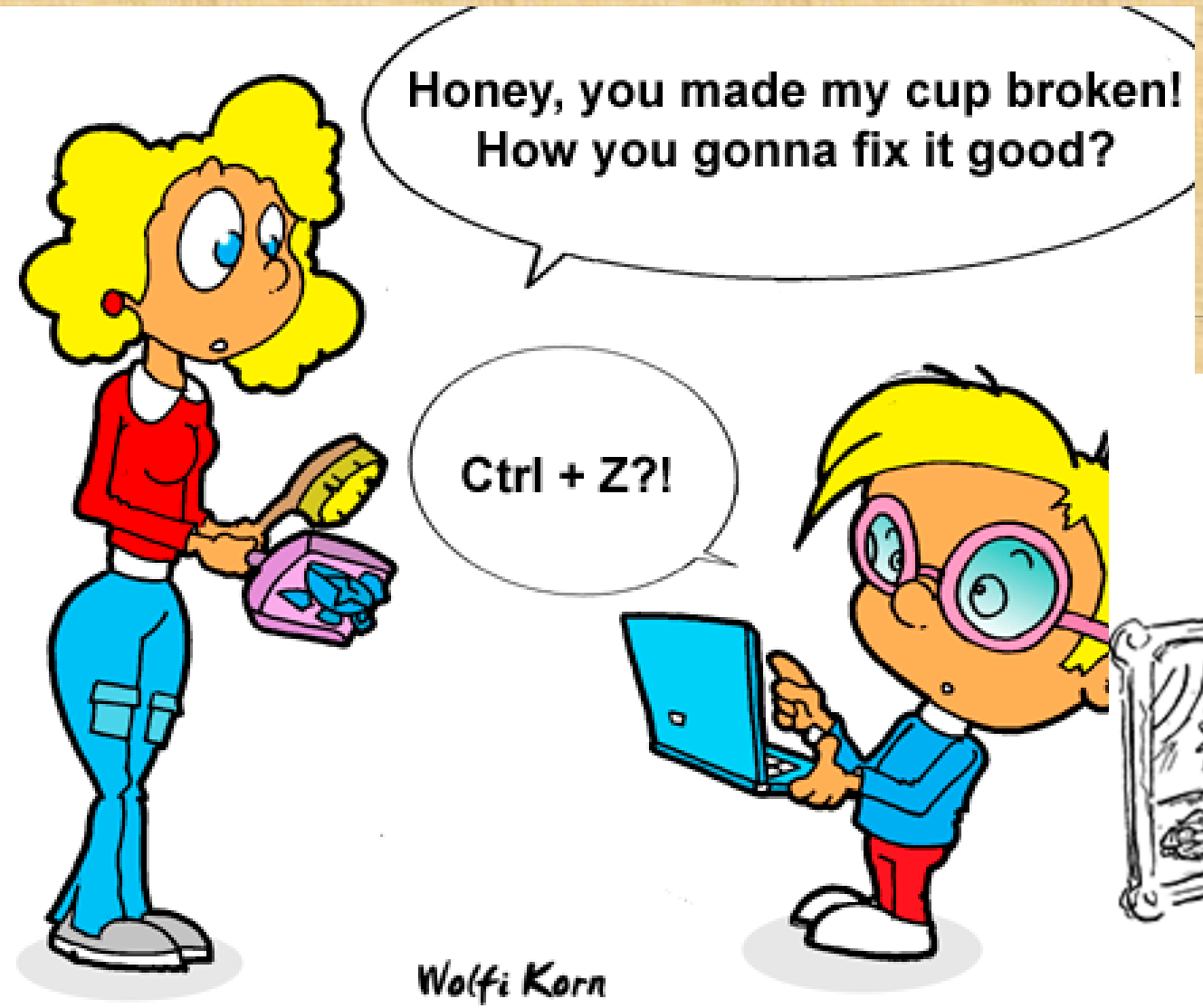
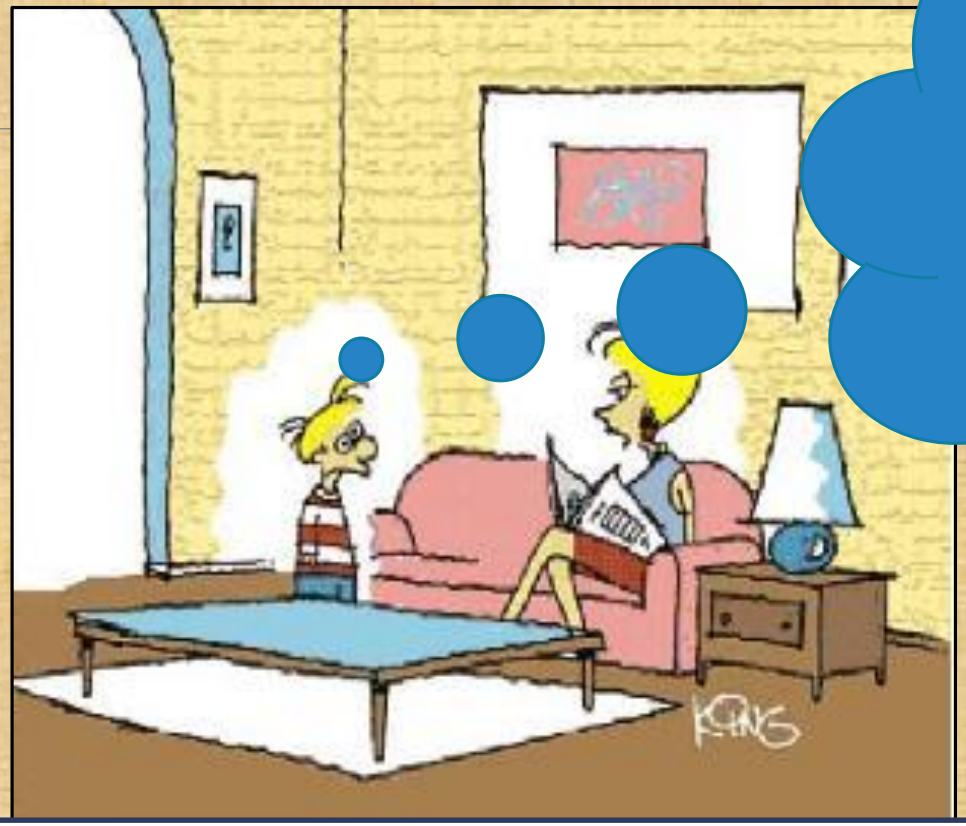


It is an audio guide honey, not a remote controller.

Mom! How do babies born?

They are downloaded from the Cloud by using IoA!



Mom! Did the Stork offered free shipping when I was born?

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off the mark.com
by Mark Parisi
OH, COME ON! THE STICK IS RIGHT THERE!
GPS
MARK PARISI
offthemark.com
MarkParisi@aol.com 1-3
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I DON'T CARE IF YOUR FRIEND HAS A FLIGHT SIMULATOR. YOU'RE GOING TO LEARN TO FLY ON YOUR OWN.

I have shown to my grandson an old floppy disc

He said!

Wow!

You have 3D printed the save icon!

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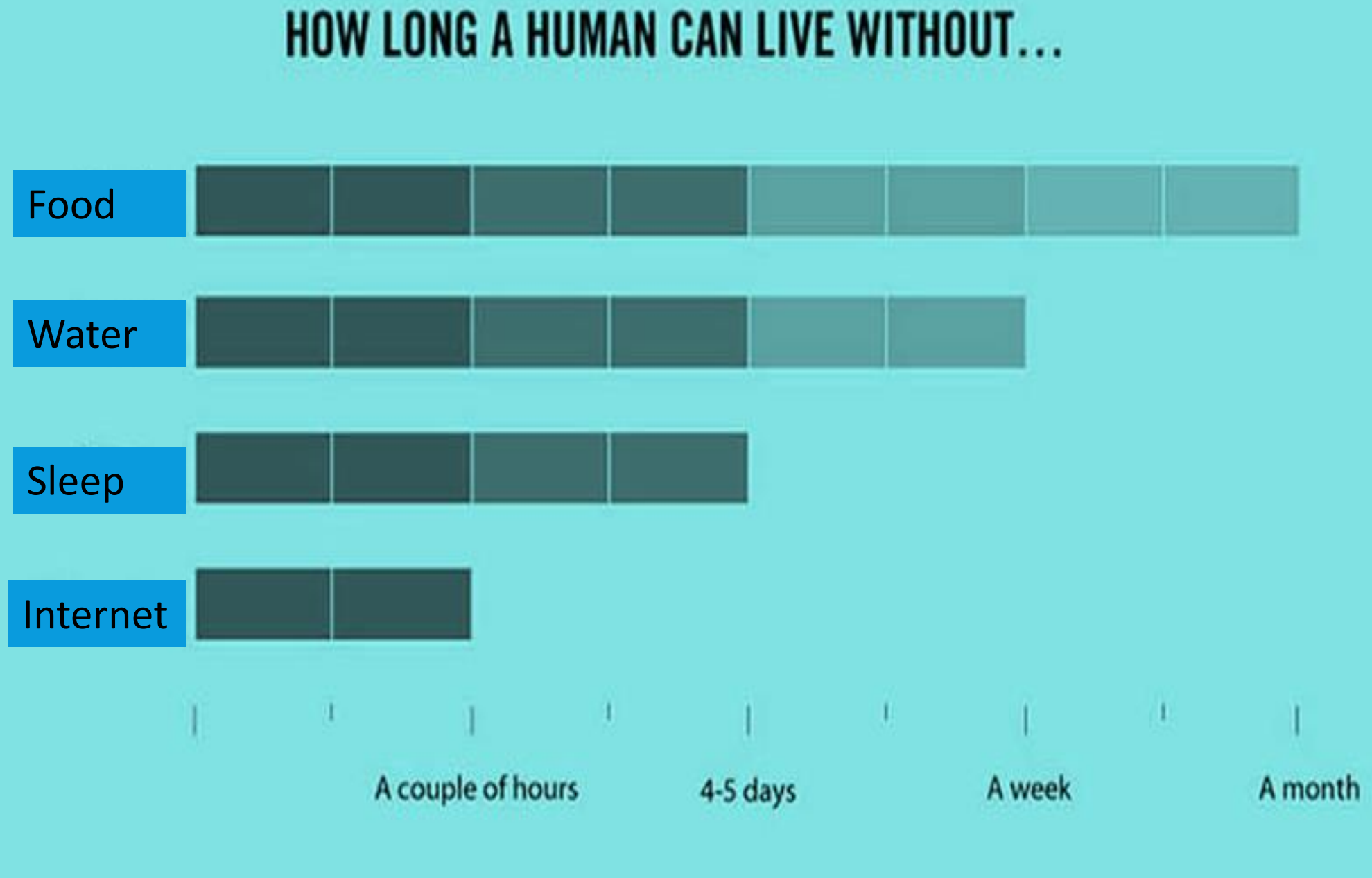
Born for the Internet


HOW LONG A HUMAN CAN LIVE WITHOUT...
Food
Water
Sleep
Internet
A couple of hours
4-5 days
A week
A month
truthfacts.com

Future Plans

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Thank you for your attention!

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