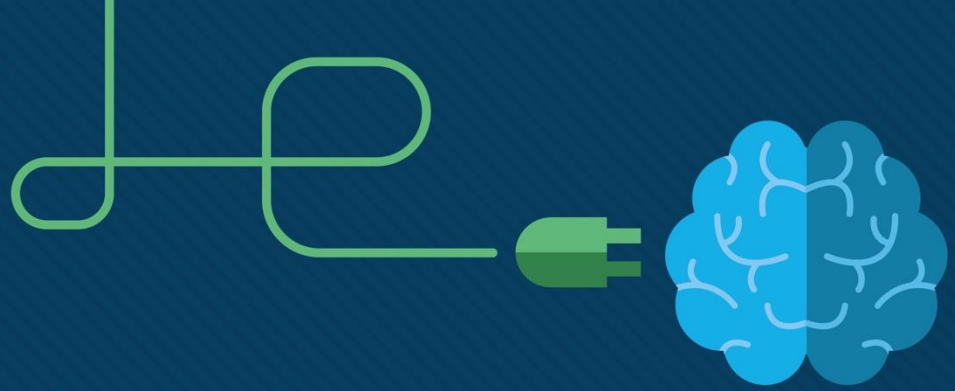


Workshop: Arduino Advanced

Cisco Networking Academy

Ann Møgeltoft Andersen & Sudhir Kumar Raj Ethiraj

TdI, LMU München, Juli 2017

Agenda

1. Introduktion: Cisco Networking Academy
2. Online Lernmaterialien zum Thema Industrie 4.0
3. NetSpace Live! Kleine Aktivität…
4. Beispiel: Hardware
5. Beispiel: Software
6. Wie kann es weitergehen?
7. Multidisziplinären Kompetenzen zur Erstellung eines Prototyps

Introduktion: Cisco Networking Academy

Cisco Systems

Was macht das Unternehmen?
Wofür ist es bekannt?

Cisco Networking Academy…

ist ein weltweites **Ausbildungsprogramm** im Bereich Netzwerktechnologie

und besteht aus einer cloud-basierte Lernplattform, unterstützt **Blended Learning**

Wir…

arbeiten seit 1998 mit öffentlichen und privaten Partnereinrichtungen in ganz Deutschland zusammen

und betreuen jetzt mehr als 460 aktive Akademien

Es geht darum…

allgemeine **IT- Kompetenzen** bis hin zu Expertenwissen auf Industriezertifizierungsniveau zu vermitteln

und verursacht keine Kosten!

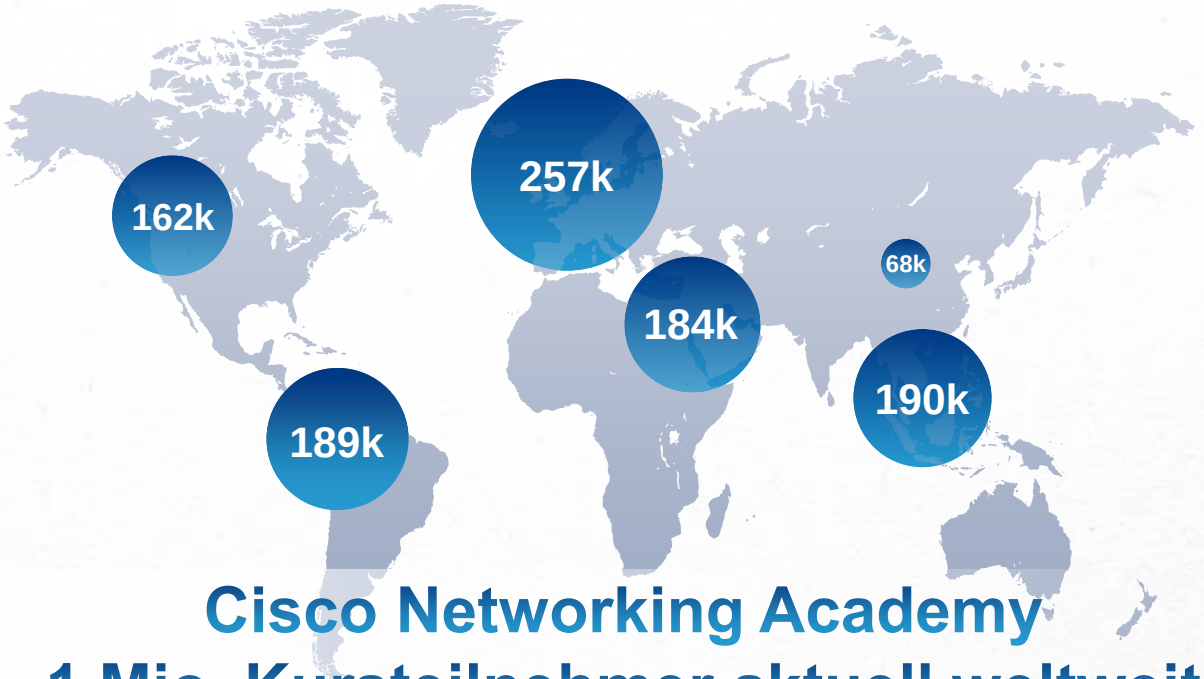
Cisco: weltweit führend in **IT**

+10.000
Akademien

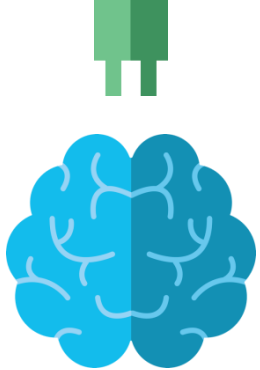
+170
Länder

+6.0M
TeilnehmerInnen gesamt

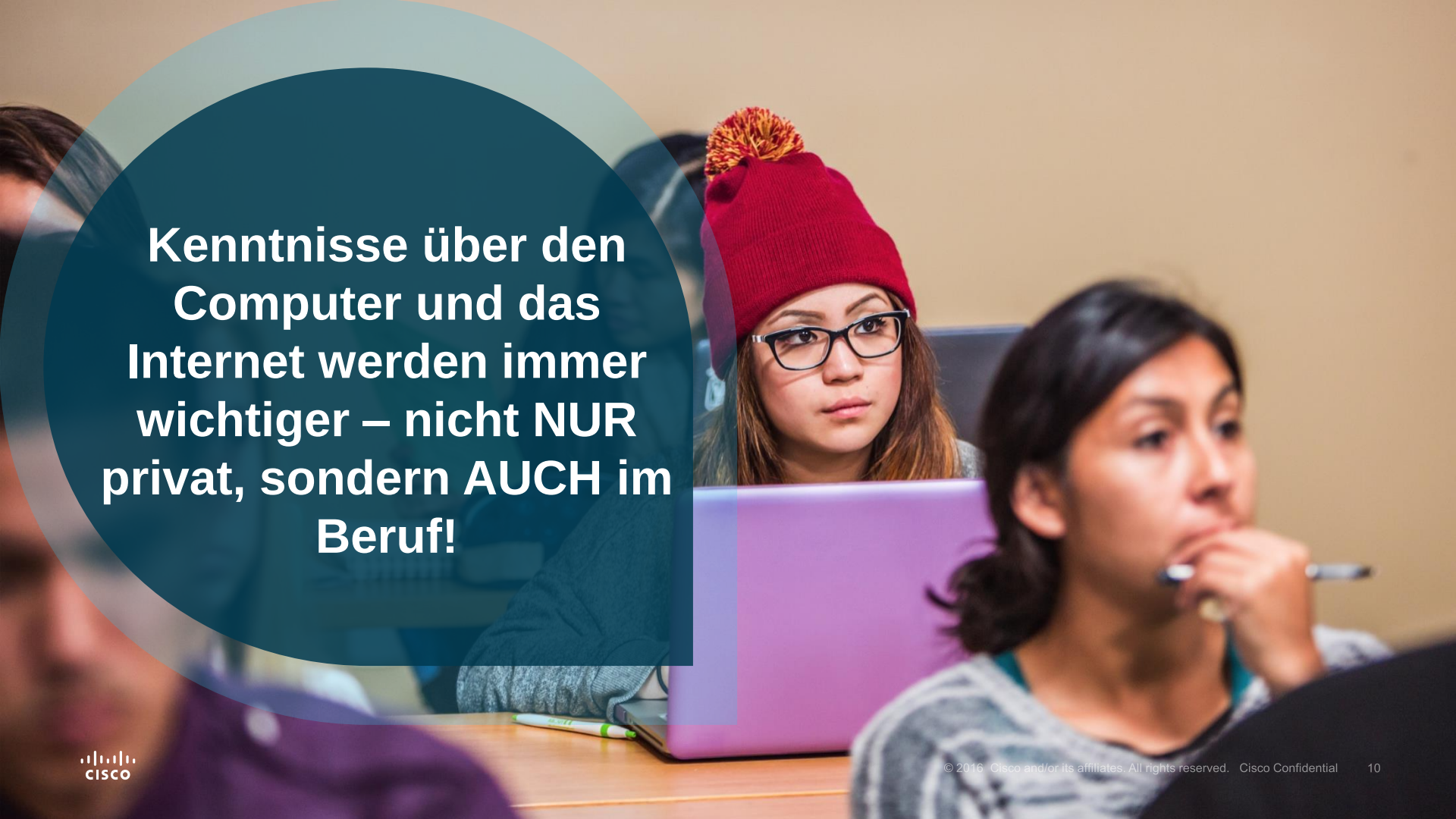
+20K
InstruktorInnen



Cisco Networking Academy
1 Mio. Kursteilnehmer aktuell weltweit
bereitet Menschen seit 1997 auf Karrieren im IT-Bereich vor



These: Die Digitalisierung verändert wie wir leben!

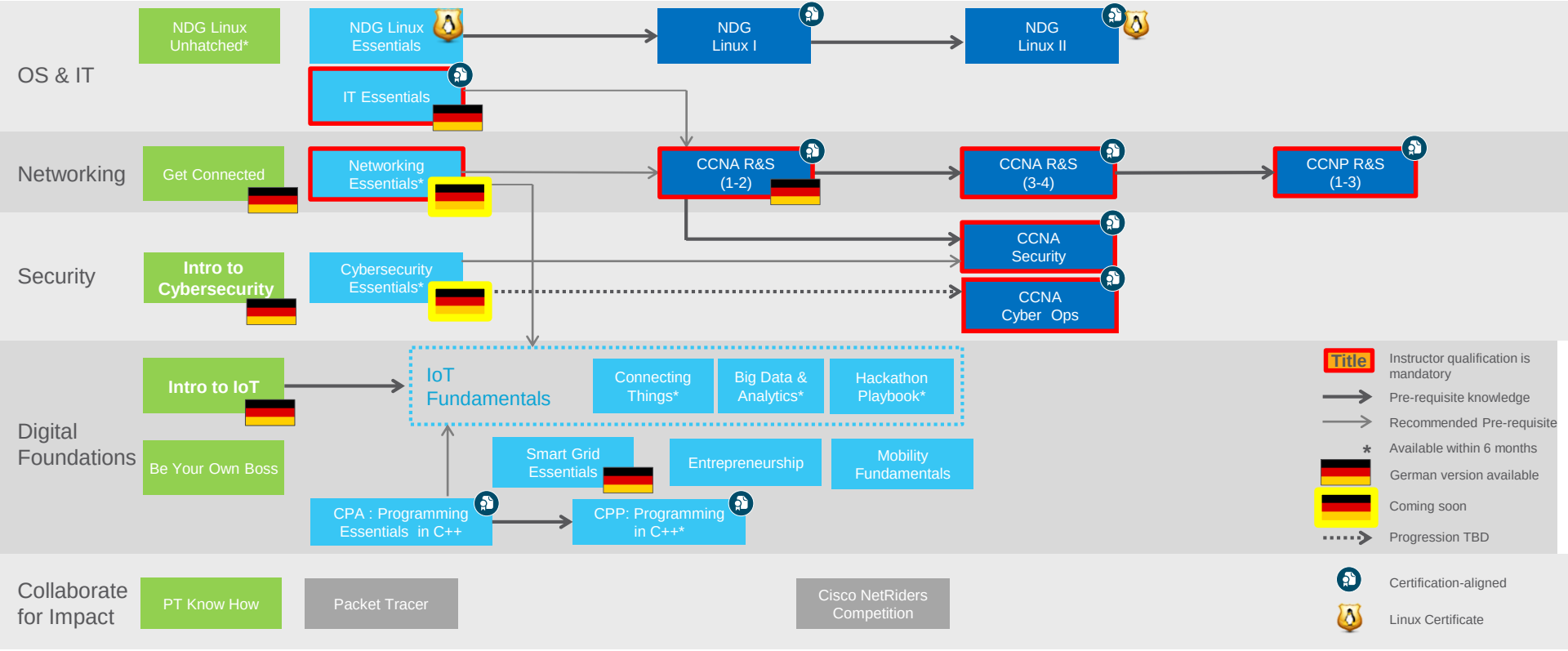


Online Lernmaterialien zum Thema Industrie 4.0

Cisco Networking Academy Portfolio, März 2017

Sample Job Titles

- Technical Support
- IT Field Service Technician
- Help Desk Technician
- Mobile Application Support
- Network Support Technician
- Network Analyst
- Network Technician
- Support Engineer
- Network Administrator
- Entry-Level Network Engineer
- Linux Administrator
- Cyber Ops Analyst
- Level II Network Engineer
- Network Designer
- Security, Voice or Wireless Engineer

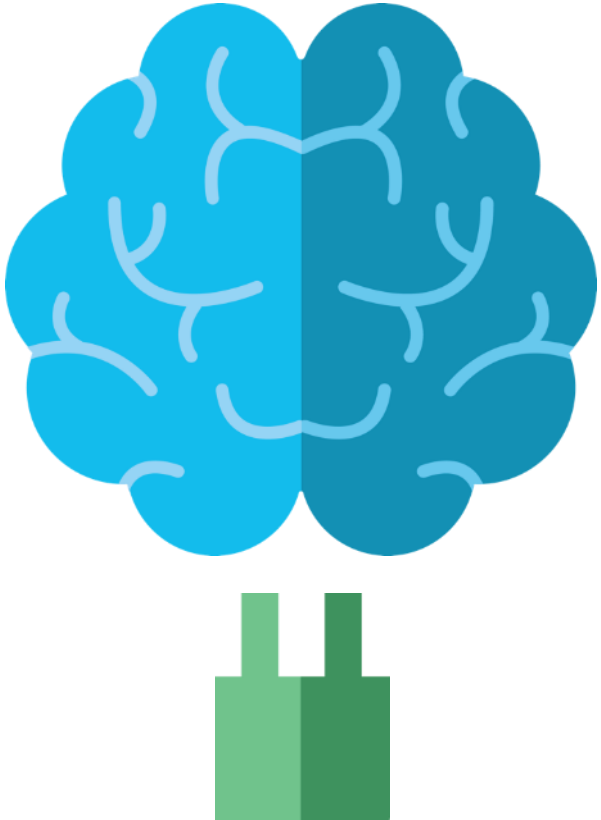


Arrows represent assumed prerequisite knowledge in the depicted learning paths. There are actually many learning pathways possible to achieve desired learning outcomes.

IoT lernen

Exploratory

Introduction to IoT



Foundational

Connecting Things

Big Data & Analytics

Introduction to IoT

Course Overview

The Introduction to IoT (Internet of Things) course introduces learners to the technologies that support IoT, and the career and social opportunities created by the growing number of networked connections between people, processes, data, and things.

Benefits

For students seeking an overview of trends, technologies, and career opportunities in the Internet of Things.

Learning Components

- 5 modules of interactive content featuring IoT experts
- Activities, videos, and simulations to enhance the learning experience
- Pre-test, module quizzes, and a final exam

Features

Target Audience: General audience

Prerequisites: None

Instructor Training Required: No

Languages: Arabic, Chinese-S, Chinese-T, English, French, German, Italian, Japanese, Korean, Portuguese-BR, Russian, Spanish

Course Delivery: Instructor-led or Self-paced

Estimated Time to Complete: 20 hours

Recommended Next Course: IT Essentials or IoT Fundamentals: Connecting Things*

IoT Fundamentals: Connecting Things

Course Overview

Students learn how to securely interconnect sensors, actuators, microcontrollers, single-board computers, and cloud services over IP networks to create an end-to-end IoT system.

Benefits

Students will develop multi-disciplinary skillsets required to prototype an IoT solution for a specific business case with a strong focus on the security considerations for emerging technologies.

Learning Components

- Understand and explain the concepts, opportunities and challenges of digital transformation using IoT.
- Interconnect sensors/actuators, microcontrollers (Arduino), Single Board Computers (Raspberry Pi) and cloud services (Cisco Spark restful API) to create an end-to-end IoT system.
- Understand the relevant aspects of cybersecurity and privacy for an IoT solution.
- Understand how digitalization is changing vertical markets such as manufacturing, energy, and smart cars.
- Use simulation tools (Packet Tracer) to create end-to-end IoT system.

Features

Target Audience: Secondary, Vocational, 2-year and 4-year College, 4-Year University students

Prerequisites: Basic programming, networking and electronics

Languages: English

Course Delivery: Instructor-led

Estimated Time to Complete: 40-50 hours

Recommended Next Course: IoT Fundamentals: Big Data & Analytics or Hackathon Playbook

Instructor Training: Required, Fast Track options available

Aktivität: NetSpace Live!

IoT machen!

Getting hands on..

- Arduino Hardware + Software Demo – **Music keyboard** :

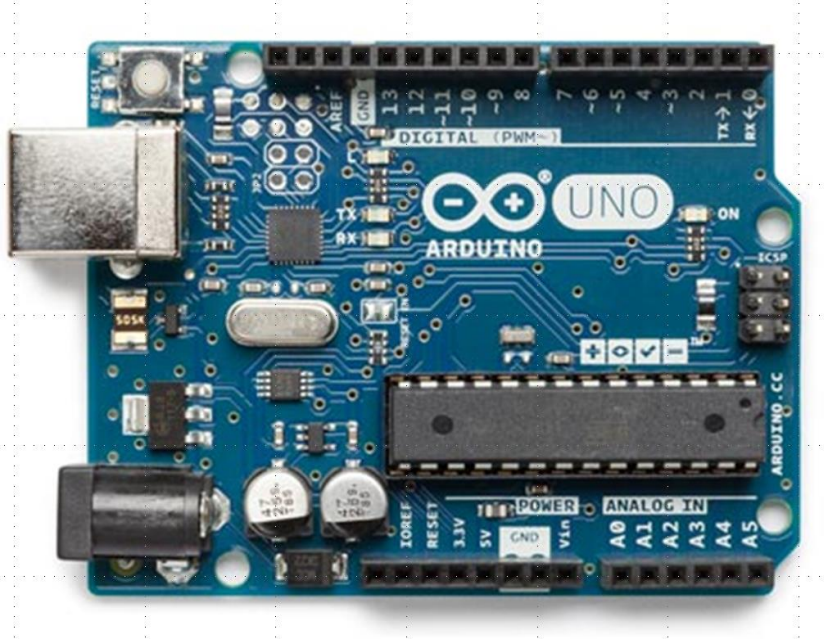
Components introduction, hardware assembly, software programming.

- Software simulation on **packet tracer**

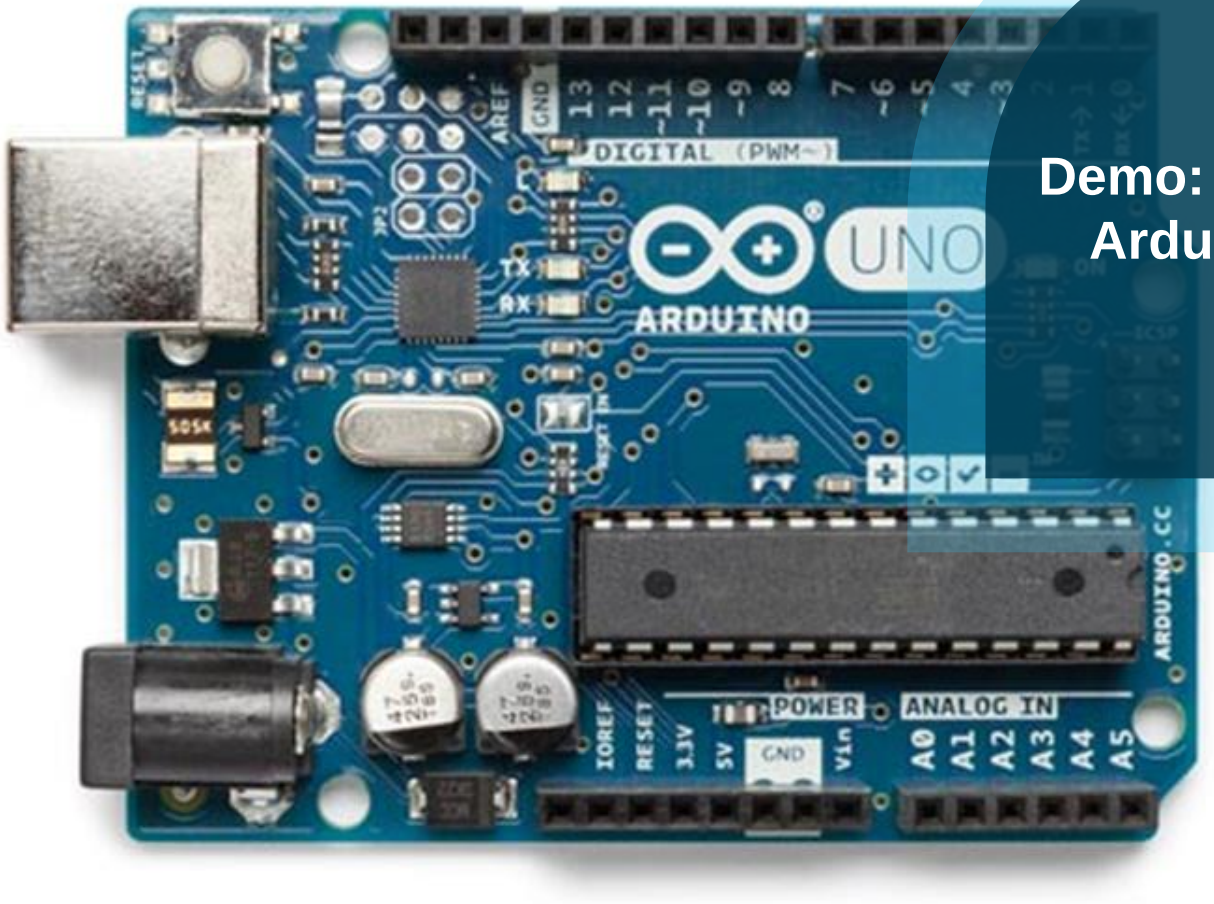
IoT connecting things with sensors and home appliances.

Arduino – the Open Source prototyping platform

- Open source prototyping platform
- Contains both hardware and software
- Good for starters and intermediate levels



Demo: Hardware Arduino Uno



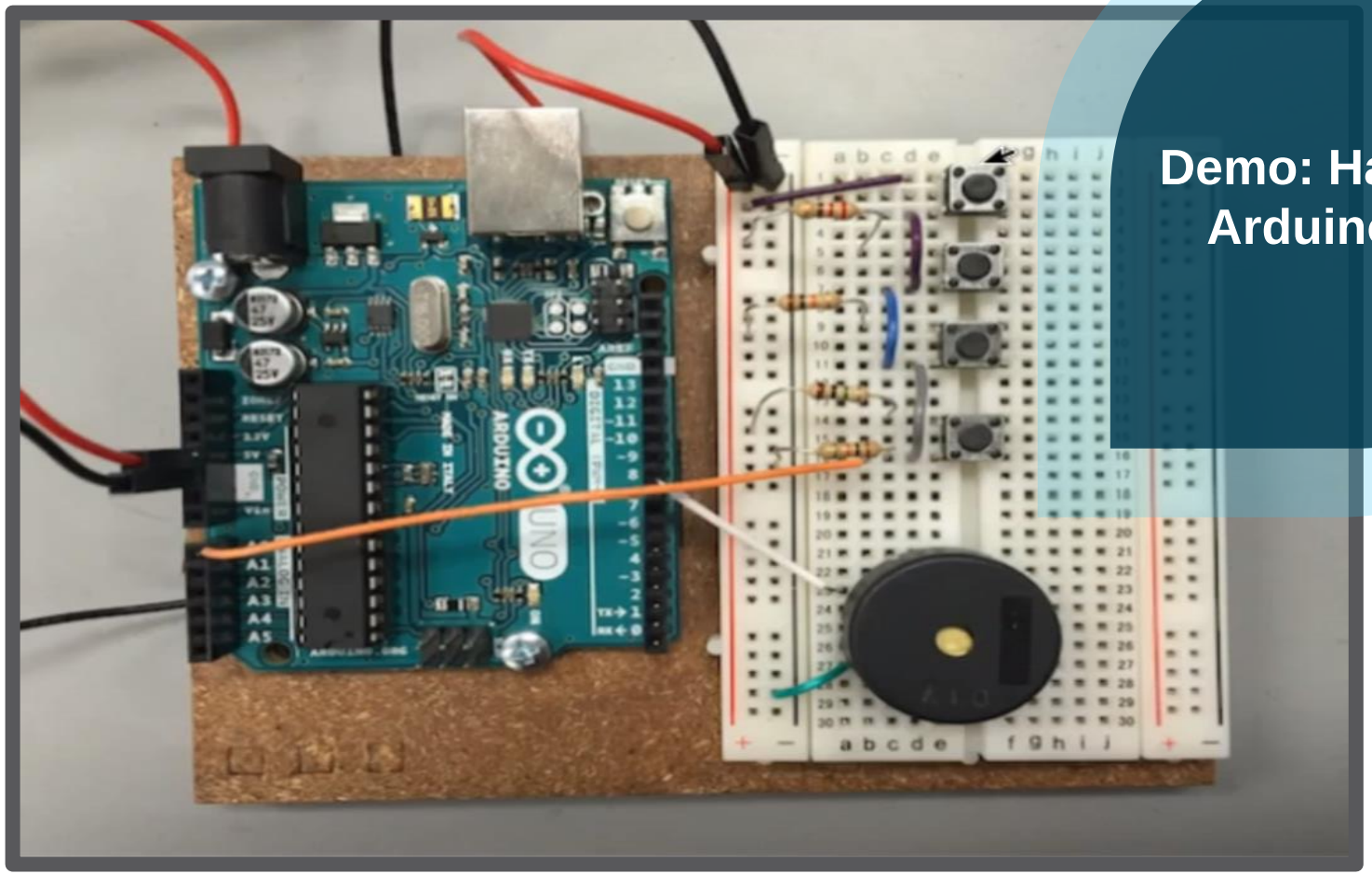
Types of Arduino

ENTRY LEVEL	UNO, LEONARDO, 101, ROBOT, ESPLORA, MICRO, NANO, MINI MKR2UNO ADAPTER, STARTER KIT, BASIC KIT, LCD SCREEN
ENHANCED FEATURES	MEGA, ZERO, DUE, MEGA ADK, PRO, M0, M0 PRO, MKRZERO, PRO MINI MOTOR SHIELD, USB HOST SHIELD, PROTO SHIELD, MKR PROTO SHIELD, 4 RELAYS SHIELD MEGA PROTO SHIELD, MKR RELAY PROTO SHIELD, ISP, USB2SERIAL MICRO USB2SERIAL CONVERTER
INTERNET OF THINGS	YÚN, ETHERNET, TIAN, INDUSTRIAL 101, LEONARDO ETH, MKRFOX 1200, MKR1000 YUN MINI, WIFI SHIELD, WIFI 101 SHIELD, YÚN SHIELD, WIRELESS SD SHIELD WIRELESS PROTO SHIELD, ETHERNET SHIELD V2, GSM SHIELD V2, MKR1000 BUNDLE

Types of Arduino

EDUCATION	CTC 101
WEARABLE	GEMMA LILYPAD ARDUINO USB LILYPAD ARDUINO MAIN BOARD LILYPAD ARDUINO SIMPLE LILYPAD ARDUINO SIMPLE SNAP
3D PRINTING	MATERIA 101

Demo: Hardware Arduino Uno



Blink | Arduino 1.8.3

File Edit Sketch Tools Help

```
int notes[] ={262, 294, 330 ,349};

void setup(){
  Serial.begin(9600);
}

void loop(){
  int keyVal = analogRead(A0);
  Serial.println(keyVal);
  if(keyVal == 1023){
     tone(8, notes[0]);
  }
  else if(keyVal >= 990 && keyVal <= 1010){
    tone(8, notes[1]);

  }
  else if(keyVal >= 505 && keyVal <=515){
    tone(8, notes[2]);
  }
  else if(keyVal >= 5 && keyVal <=10){
    tone(8, notes[3]);
  }
  else{
    noTone(8);
  }
}
```

Done compiling.

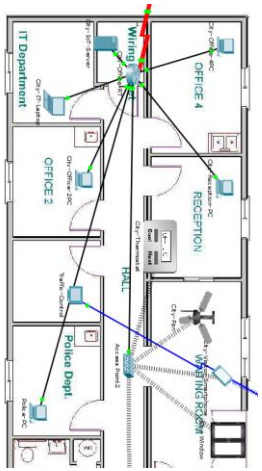
```
Sketch uses 3488 bytes (10%) of program storage space. Maximum is 32256 bytes.
Global variables use 209 bytes (10%) of dynamic memory, leaving 1839 bytes for local variables. Maximum is 2048 bytes.
```

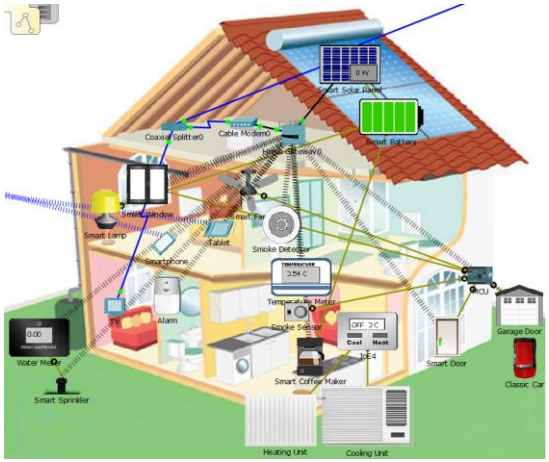
Software for the "Brain"

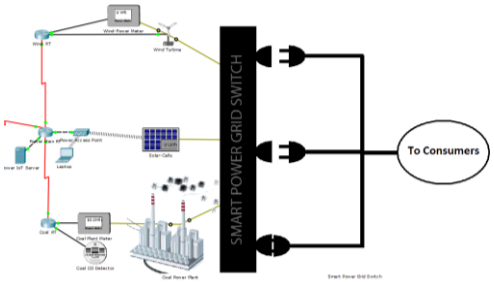
Demo Software: Packet Tracer 7.0

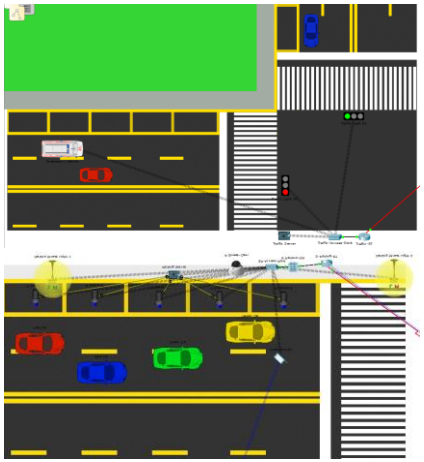
Neu in Packet Tracer Version 7.0

- Physical Environments
- Smart devices, sensors and actuators
- Smart Home, Smart City, Industrial, Power Grid
- Edit existing or program your own devices
- Python, Javascript, Blockly
- SBC and MCU
- Home Gateway
- Rules for devices to work together
- Routers 819 and 829





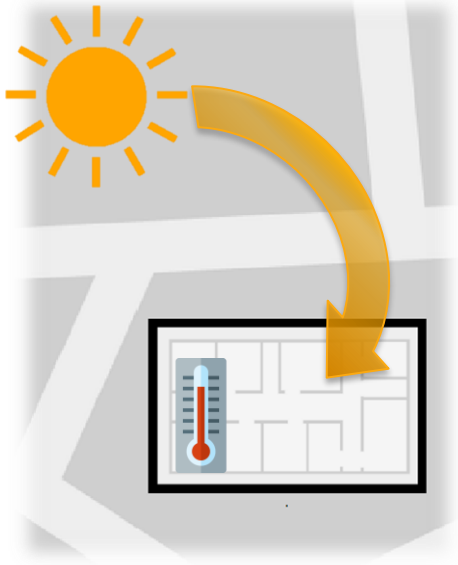


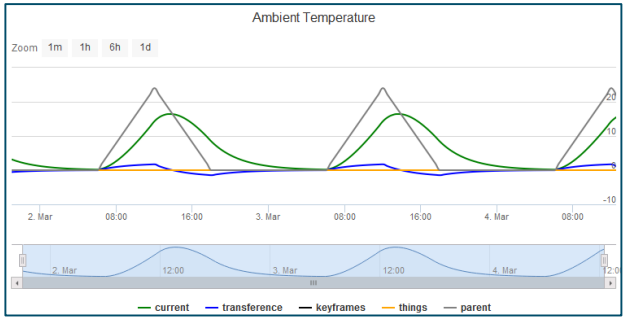


Physical Environment

- Generic Container Creator
- Volume control for containers
- Many environmental parameters are simulated
- Environment constantly changes in daily cycles
- Transference between containers

CO_2	0.0360 %
He	0.0005240 %
H	0.00050 %
Methane	0.000150 %
Nitrogen	78.0840 %
O_2	20.9460 %
◢ Gravity	
Gravity	9.80 m/s^2
◢ Light (Sun)	
Electromagnetic Radiation	83.33 %
Infrared	45.83 %
Radiant Heat	83.33 %
Sunlight	83.33 %
Ultraviolet	2.50 %
Visible	35.00 %
◢ Other	
Atmospheric Pressure	101.3250 kPa
◢ Temperature	
Ambient Temperature	20.00 C
◢ Water	
Clouds	9.58 %
Humidity	70.83 %
Rain	0.92 cm
Snow	0.00 cm
◢ Wind	





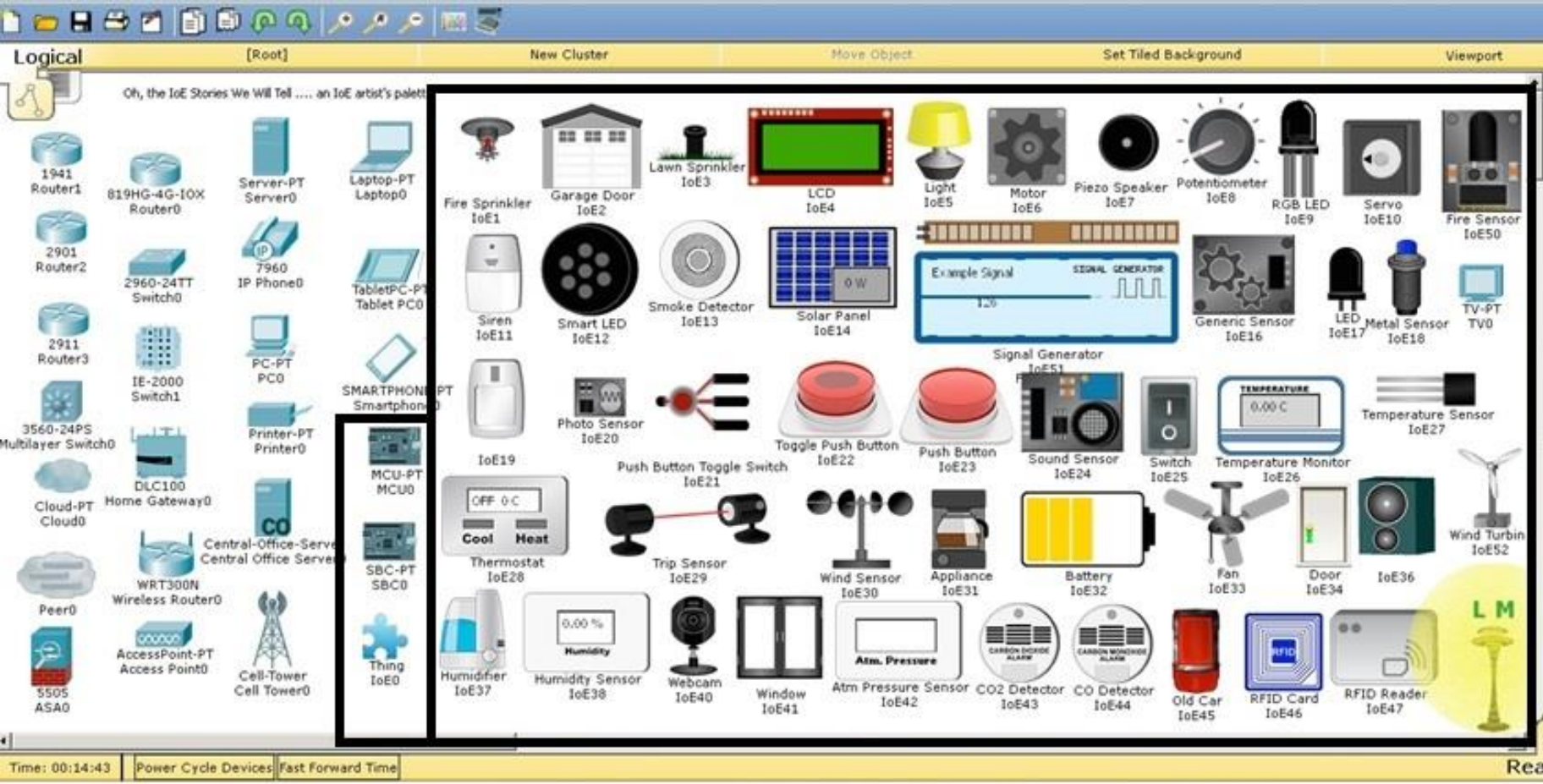
New IoT Devices

Home

Industry

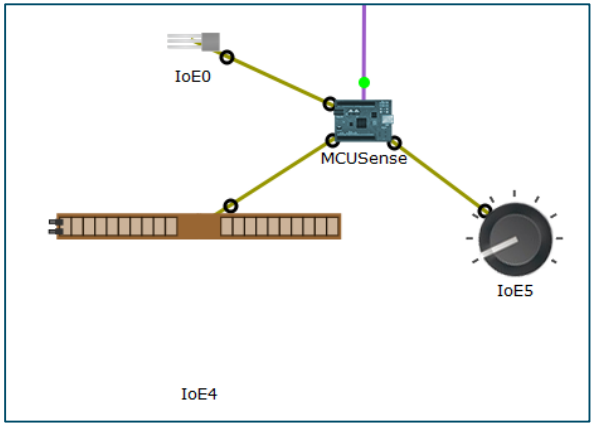
City

Power



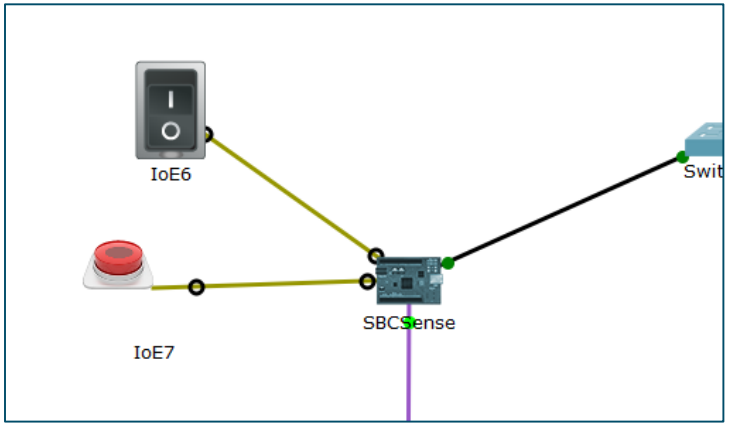
All devices that are inside the boxes are completely new in PT7.0

MCU and SBC



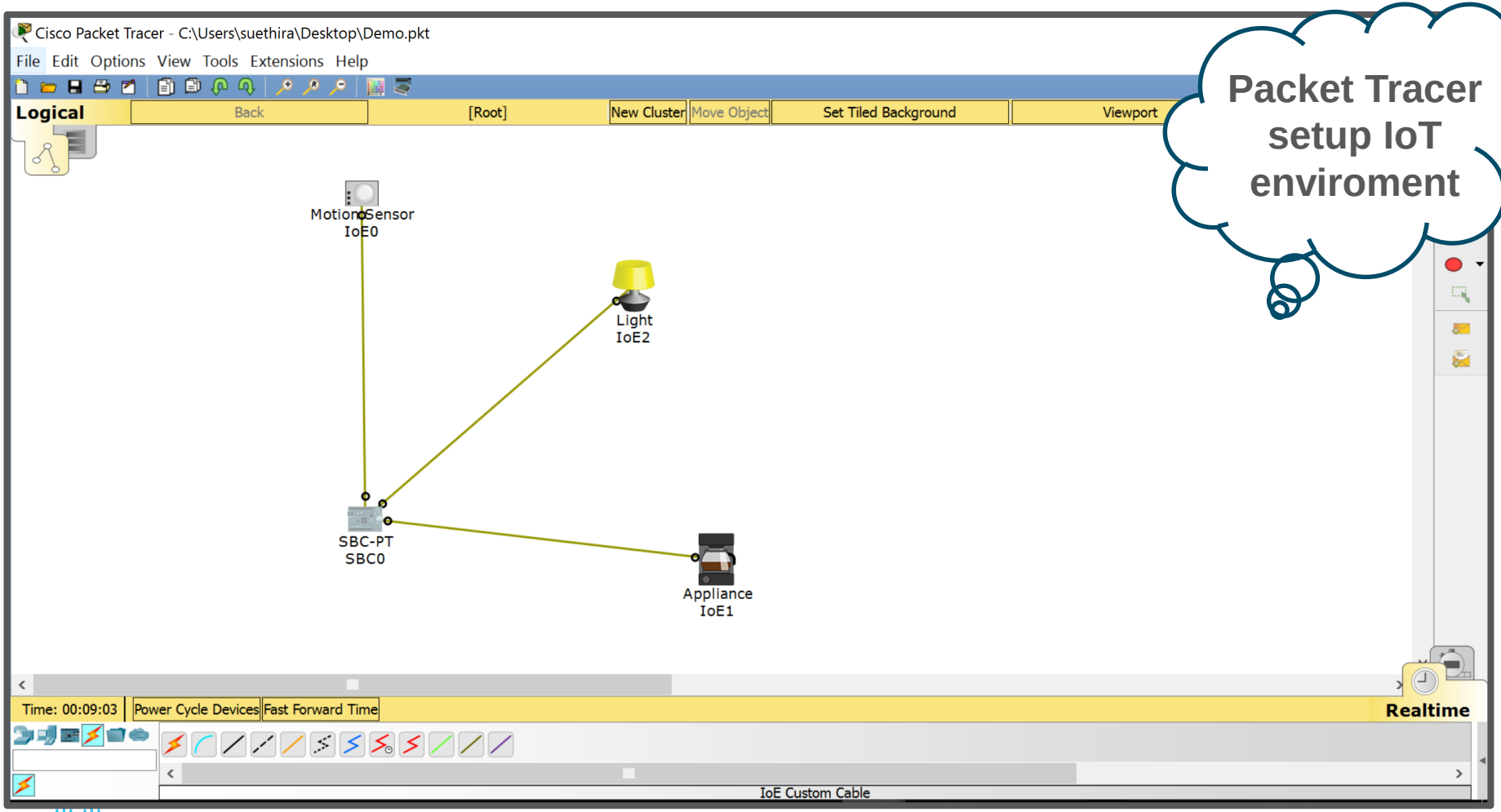
- Digital and analog I/O
- Works with simple sensors and actuators
- Limited processing power
- No OS, no file system, no “Desktop”

- It’s like… Arduino!

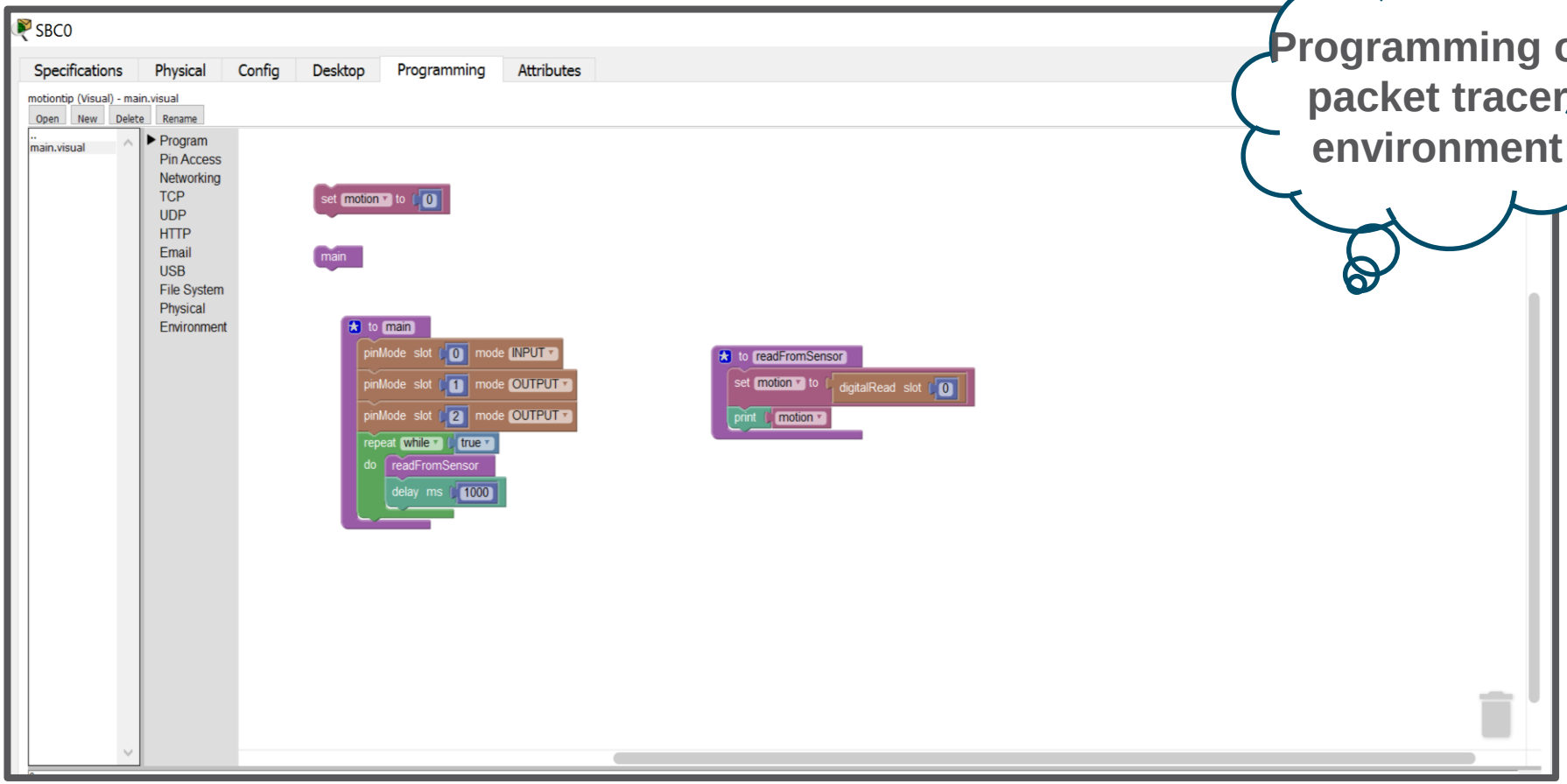


- Digital I/O, no analog input
- Can’t work with simplest sensors
- Higher processing power
- Has OS and file system, has “Desktop”

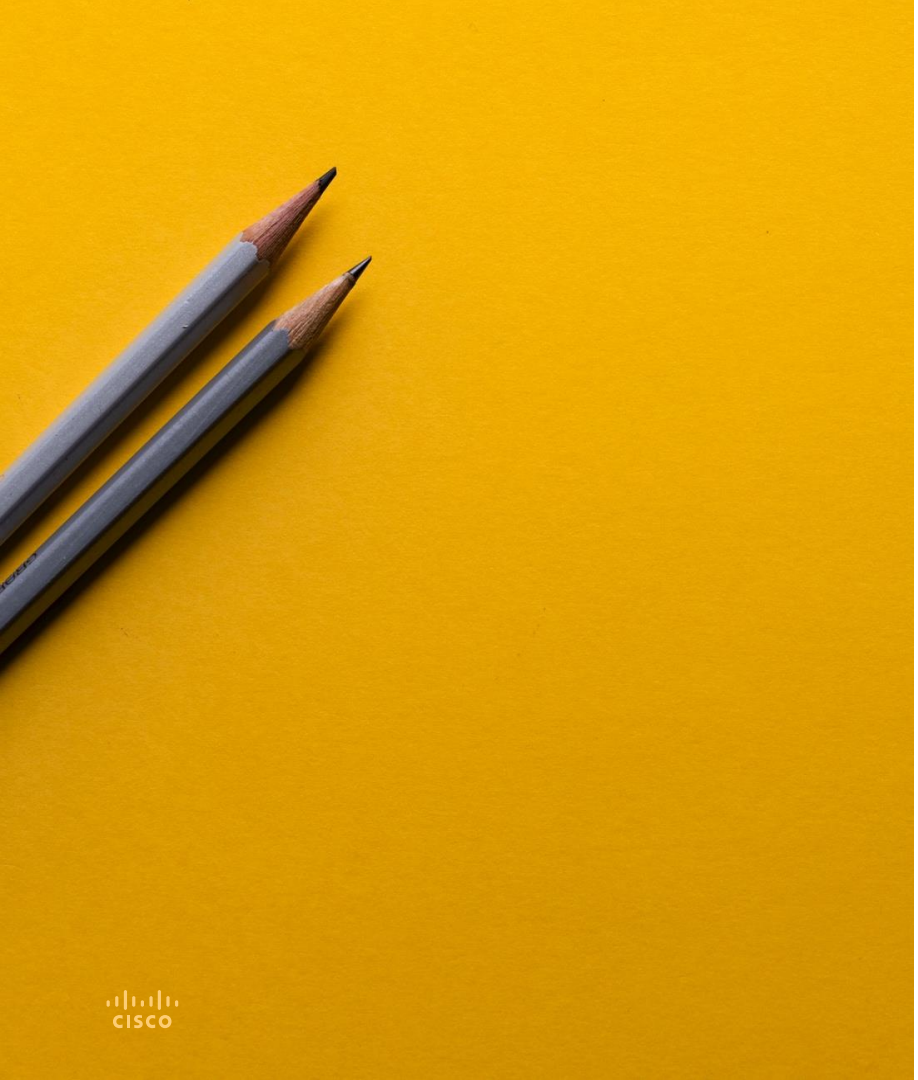
- It’s like… Raspberry Pi!



Packet Tracer setup IoT enviroment



Programming on packet tracer environment



So kann es weitergehen…

Weitere Module in den Kursen ‚IoE' und ‚Connecting Things' durcharbeiten.
Sie können diese Login-Daten die nächsten drei Monate verwenden

Möchten Sie selber die Plattform und Kursmaterialien benutzen? Möchten Sie Teil unserer Cisco-Community sein? Gründen Sie jetzt eine Akademie HIER


CISCO

Multidisziplinären Kompetenzen zur Erstellung eines Prototyps: Lernkonzept eines Hackathons

IoT machen

Workshops[1]

Creathons[2]

Packathons[2]

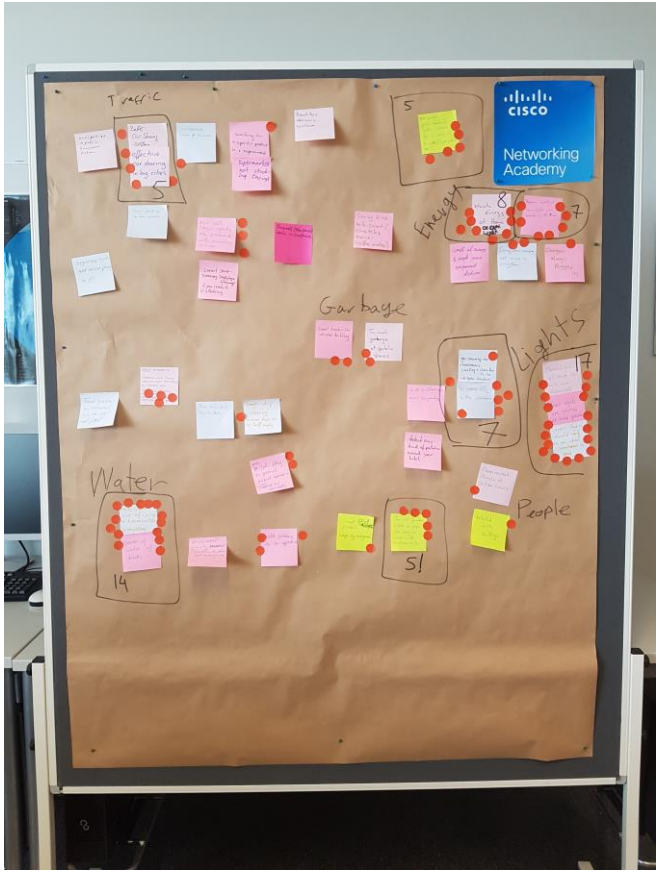
Hackathons[1,2]

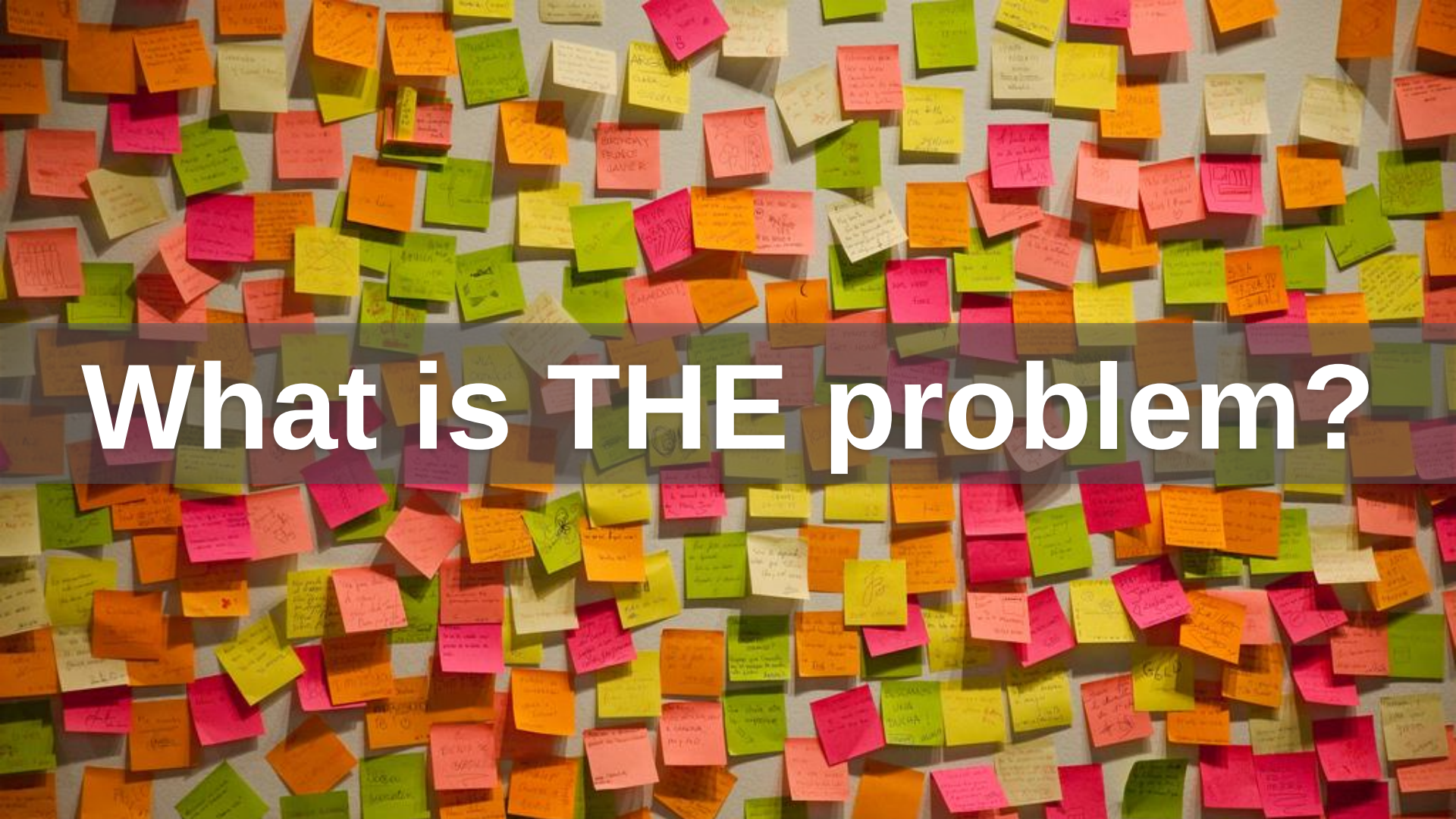
1 May use Prototyping Lab App
2 Based on the Hackathon Playbook

Hackathon

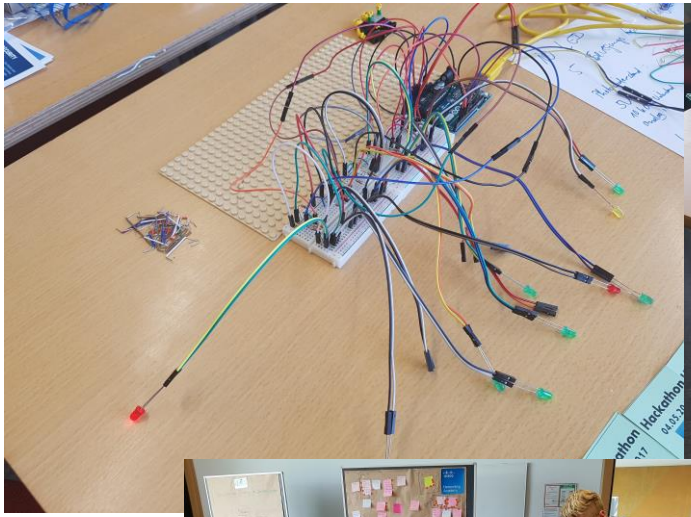
	BS Info	BS Info	BS Info
Tag	**Mittwoch, 03.05**	**Donnerstag, 04.05**	**Freitag, 05.05.**
Zielstellung des Tages	**Start and ideation phase**	**Prototyping**	**Finalize prototype and pitch preparations**
08.00	Aufbau	Prototyping session (Arbeiten am Prototypen)	Prototyping session
09:00	Aufbau	Prototyping session	Expert checkpoint
10:00	Inspiration	Expert checkpoint	Prototyping session
11:00	Ideen finden und Gruppen bilden	Prototyping session	Preparation presentations (Präsentationstraining)
12:00		Prototyping session	Preparation presentations (Präsentationstraining)
1h	**Break/Lunch (Pause/Mittagessen)**	**Break/Lunch**	**Break/Lunch**
13:00	Ideation phase (Ideen und Lösungsansätze finden)	Prototyping session	Final Pitch (finale Präsentation)
14:00	Ideation phase	Prototyping session	Gruppenfoto
15:00	Expert checkpoint	Expert checkpoint	
16:00	Ideation phase	Prototyping session	
17:00	open hours	open hours	

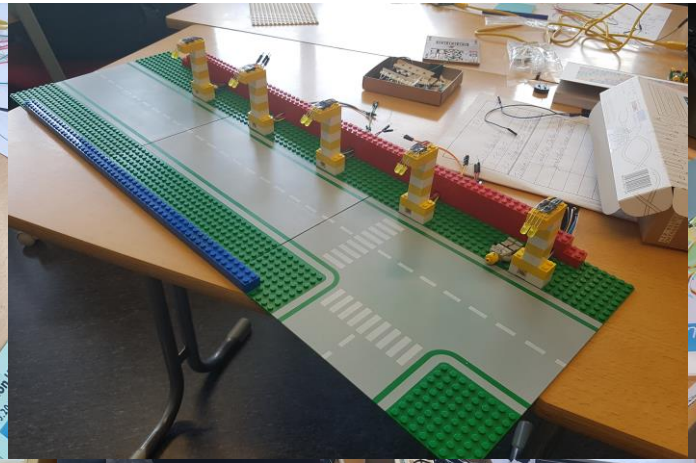
Hackathon – Ideation Phase

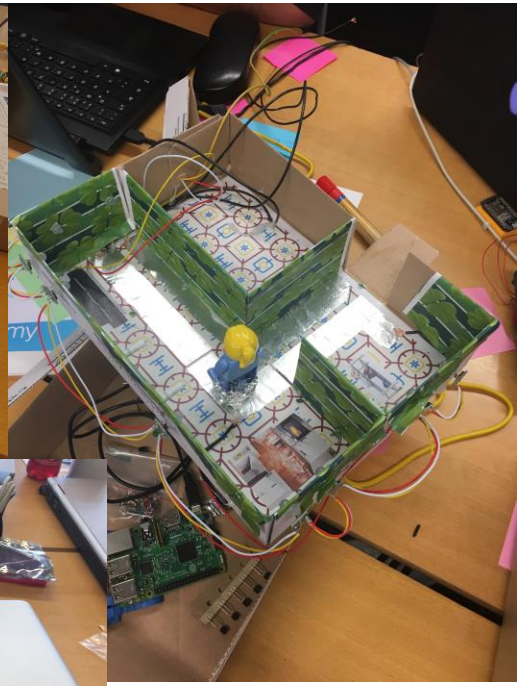


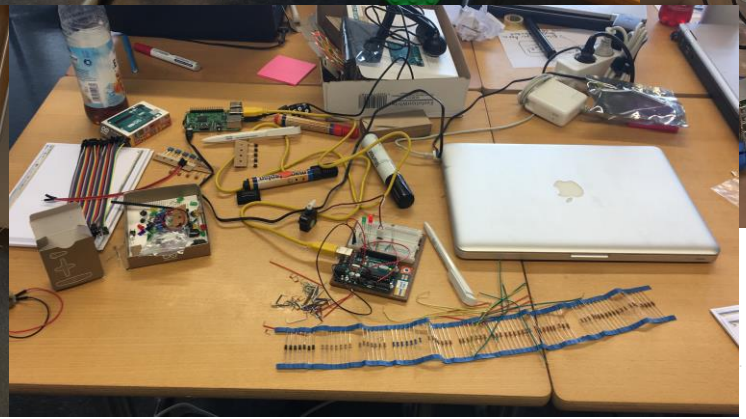

What is THE problem?

Hackathon – Prototyping



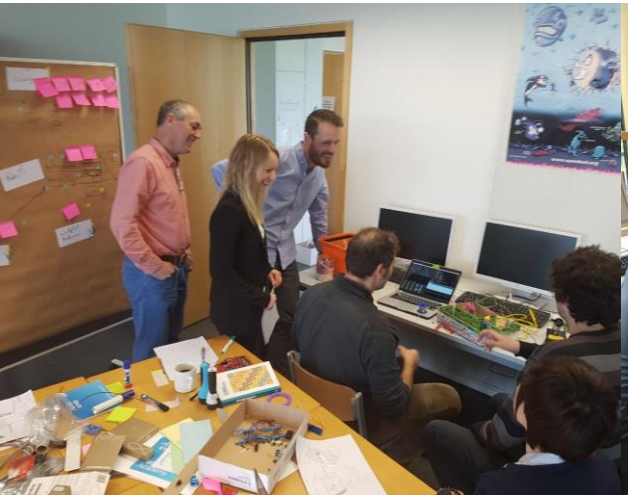






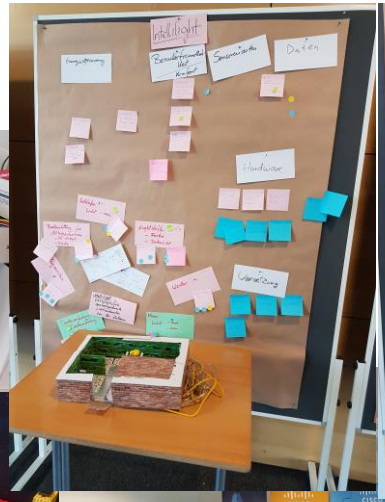

What is your solution?

Hackathon – Expert Checkpoints



2-5 Experten kommen dazu und geben die Gruppen Feedback…

Hackathon – Final Pitch




CISCO
www.netacad.com

IoT Fundamentals: Hackathon Playbook

Course Overview

The Hackathon Playbook is a comprehensive framework of tools and templates to prepare and run a Hackathon as a result of best practices and lessons-learned collected from the global execution of IoT Hackathons within Networking Academy and by other organizers.

Benefits

Student reinforce and deepen their multidisciplinary IoT and data skills by defining, designing, prototyping and presenting an IoT solution to a panel of industry experts and peers.

Learning Components

- Inspiration: understand, select and present the problem to be solved to recruit fellow partners.
- Ideation: invent a concept that doesn't already exist to solve a social issue. Learn how to present the solution to experts who will mentor students.
- Prototyping: create a prototyping action plan, including objects and visuals to illustrate their plan and will help an expert understand the concept and prototyping needs.
- Testing: present the concept and validate the prototype with a second expert, including user experience and enhancements.
- Presentation: present the solution and demo the prototypes to an expert panel.

Features

Target Audience: Secondary, Vocational, 2-year and 4-year College, 4-Year University students

Prerequisites: IoT Fundamentals: Connecting Things and/or Big Data and Analytics

Languages: English

Course Delivery: Instructor-led

Estimated Time to Complete: 20-30 hours

Recommended Next Course: any Career-Ready offering from Cisco or an industry IoT training program

Instructor Training: Required, Fast Track options available

Internet of Things

is

the **next big thing**!