# Embedded Systems Software Training Center Featured by OTSL/DSR

## What we'll be teaching

DSR
Skilled, *Trusted* Software Development

OTSL

2017

# Instructor Introduction

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Senior software developer,

DSR corp.

# Agenda

- Challenges for Graduating Students
- Embedded System Training Center (ESTC) history
- What are the Embedded Systems?
- What are Wireless Technologies?
- Embedded System Development Specifics
- Why Software Engineering?
- ESTC curriculum
- Requirements to Students


# Challenges for Graduating Students

**Graduating students have the good knowledge in computer science**

- *Mathematics*
- *Computer Science*
- *Programming languages*

**But! They don't have sufficient skills and experience in**

- *Specific software development domains*
- *Software development process*

# Solution for Students

**Embedded System Training Center**

- Specific software development domain
  - Embedded software
  - Wireless technologies
  - Agile-based development process
- Specific software development proces
  - Software engineering in Japan and USA
  - Quality assurance methodologies

# ESTC HISTORY

- Founded in 2011
- Initiative of OTSL, Inc. and DSR Corporation
- Supported by VSU CS department
- Group of 15-20 students signed up for the course every year
- Specialized lectures provided by leading specialists of Japan IPA and Nagoya University

# OTSL, Inc. (Japan, Nagoya)

- Founded in 2003, Nagoya Japan
- Headquarter in Nagoya
- Offices in Tokyo, Okayama, Miyazaki
- Specialized in wireless communication



# DSR Corporation

- Founded in 1998 in USA, Denver, CO
- Have the development branch in Voronezh, Russia from 2004
- 100+ engineers, getting bigger continuously
- Active clients: Fortune 500, Global 2000, small &medium size companies, and startups
- Successful global engagements in USA, Europe, Australia, Japan, and Taiwan
- Senior level Associates: 60% Engineers hold Masters or PhDs in Math or Computer Science
- Directions of software development:
  - Embedded systems, Wireless networks, IoT solutions
  - Enterprise systems (Java, .NET)
  - Big data
  - Mobile applications
  - Web applications

DSR

Skilled, *Trusted* Software Development

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# DSR Areas of Expertise

# Some of Our Clients





















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# What are the embedded systems?

## Embedded systems:

- Computer system designed to do one or a few dedicated and/or specific functions often with real-time constraints.
- *Embedded* as part of a complete device often including hardware and mechanical parts

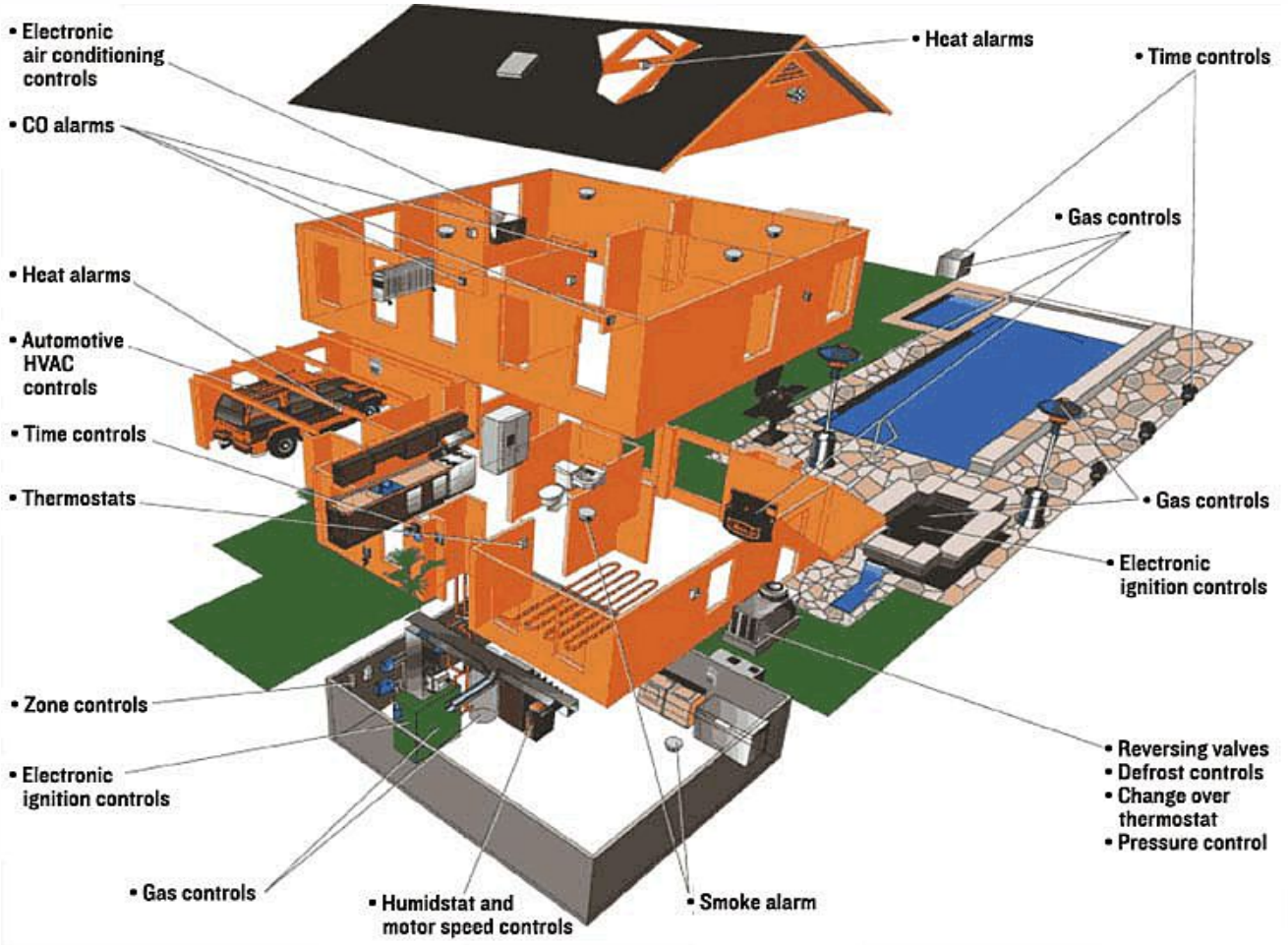
## Embedded software:

- Software for embedded systems
- Equipment (hardware) and software part of the product shall be considered together with equipment

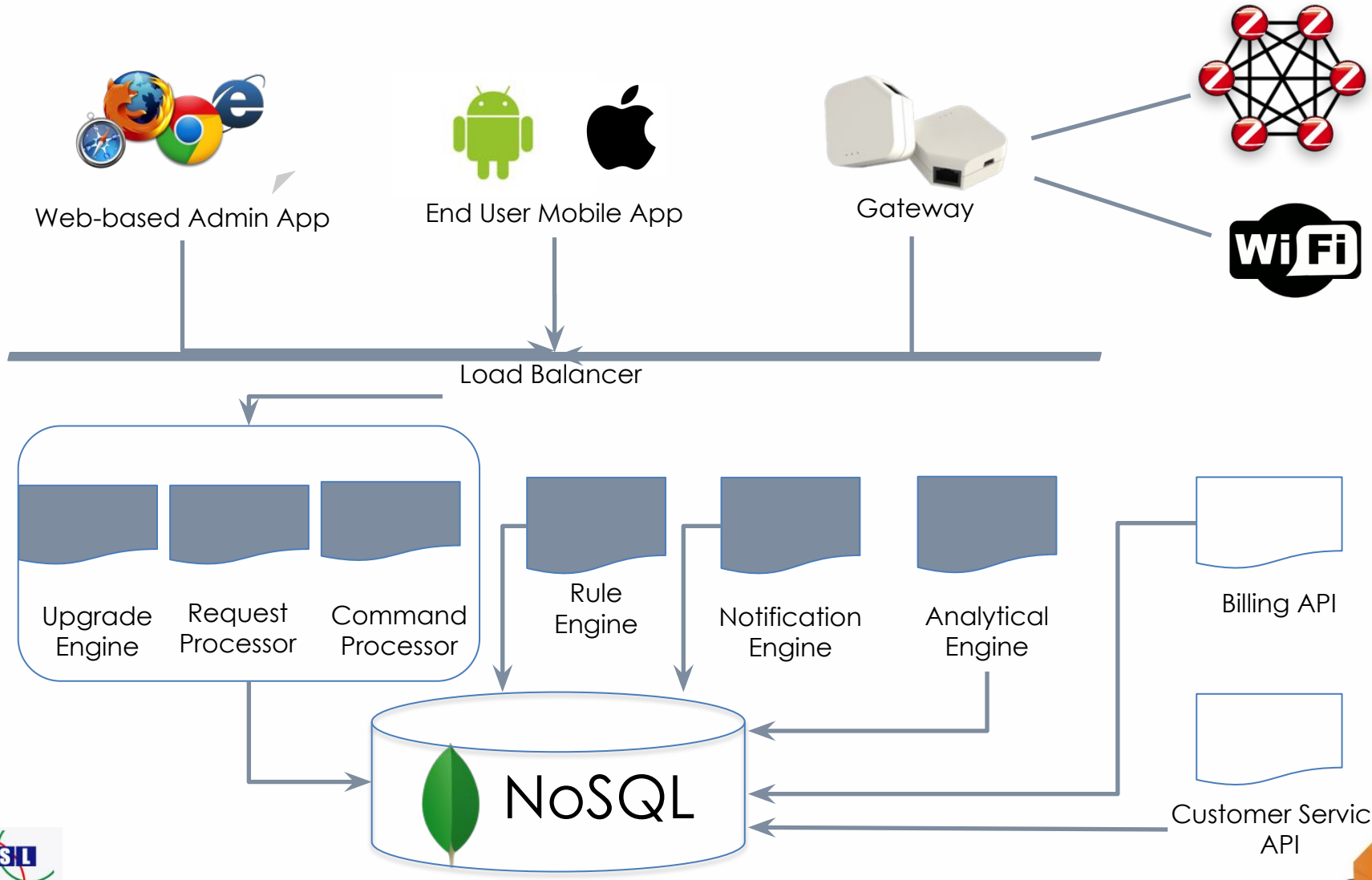
# APPLICATION OF EMBEDDED SYSTEM DEVICES

- There are some embedded systems in every electric and mechanical systems.
  - Automobiles, Train(Shinkansen), Aircraft, Digital Camera, Digital TV, Air-conditioner, Robot, Mobile phone, etc.

# Case Example: Home Automation

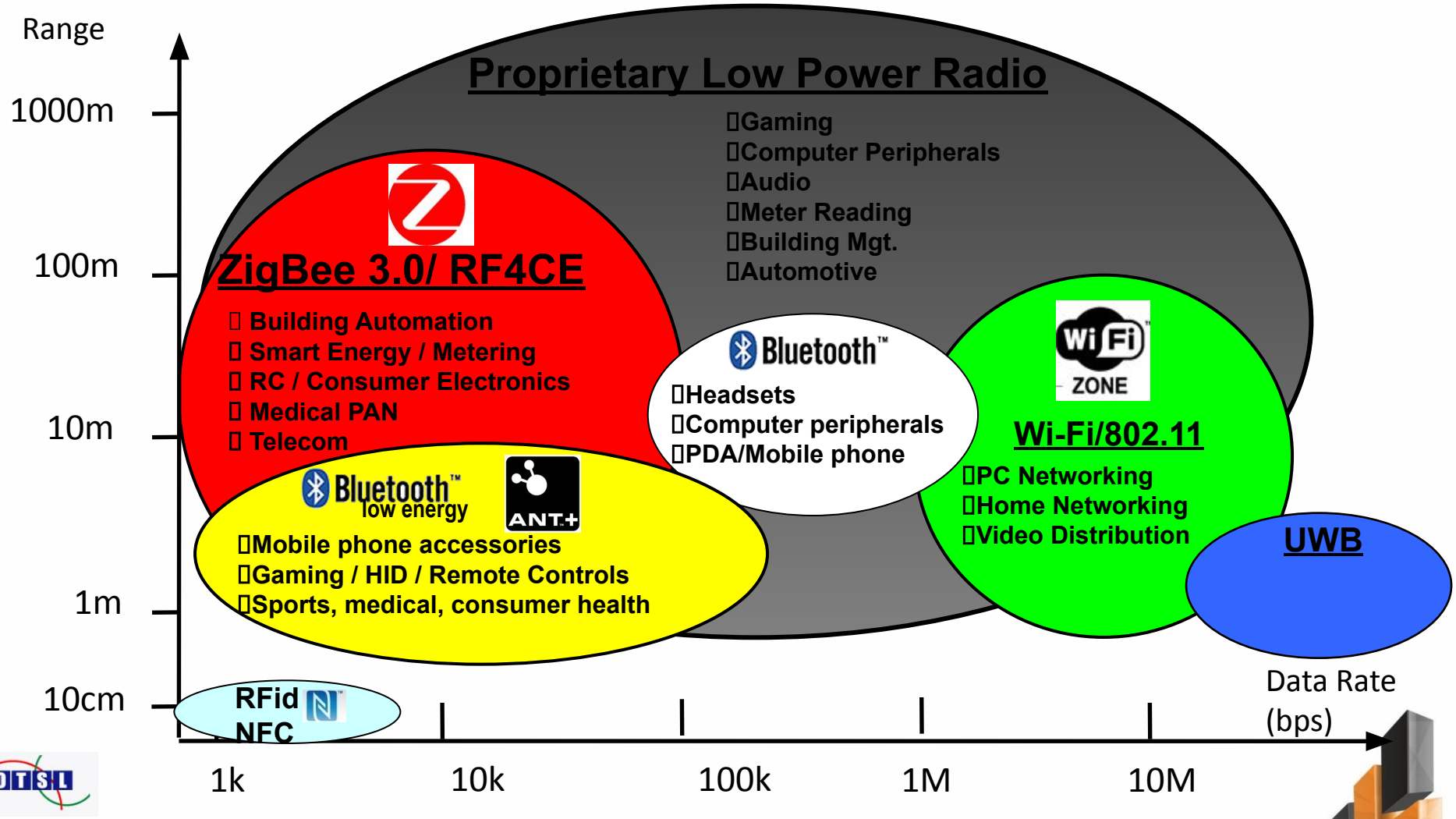


# DSR IoT Framework



# Ecosystem of Sensors

# What are wireless technologies?

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# Embedded Software Development Specifics

## Resource constraints

- Cost limitations especially for the mass products
- Low RAM, CPU usage
- Time constrains (real time response).
- Low power consumption, operating environment ( temperature), weight

→ ***Real Time OS are used or OS-less solutions***

## Quality and Reliability

- Malfunction of the equipment directly related to system malfunction
- Higher cost of recovery system
- Customer expectations for equipment reliability


# Fun of Embedded Software Development

- Purely algorithmic programming
- Direct work with hardware and OS entities, allows to understand deeply how your device works – phone, gadget, computer
- Our target is not tiny assembler written code, it can be even RDBMS for small devices
- Kind of hacking sometimes
- Allows to work on variety of platforms

  (hardware, OS)

# Why Software Engineering?

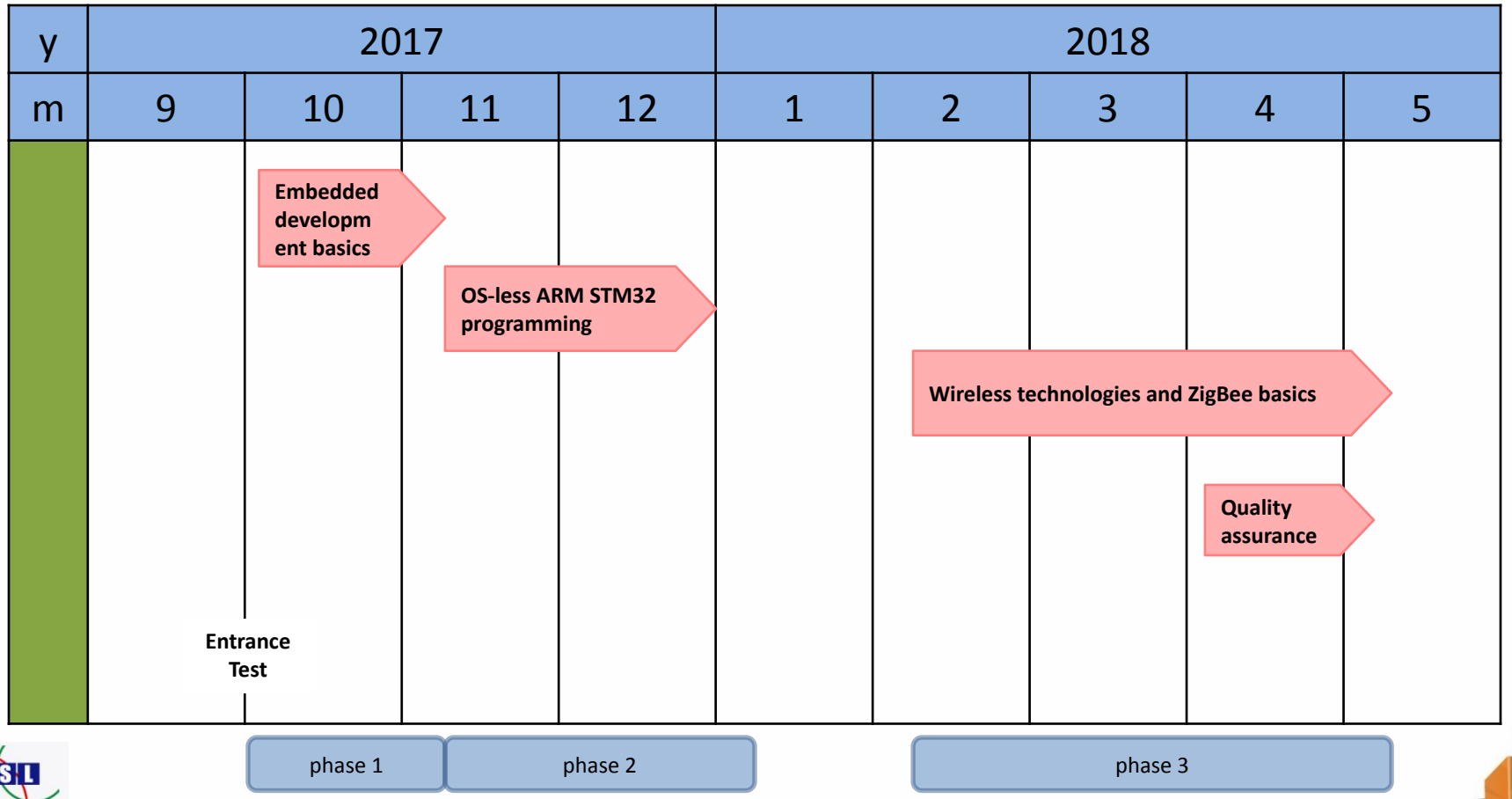
- Challenges
  - High quality requirements
  - High level of collaboration
  - Budget and time limitation
- Solution
  - Application of Software Engineering processes
  - Quality Assurance
  - Project Management processes
    - Everyone is a Project Team member

# ESTC Curriculum

- Entrance test
  - Check C programming skills
  - Form group of 15-20 students
- Embedded Systems development basics
  - Project management basics
  - Introduction to the development environment
- OS-less software development
  - ARM Cortex- M4 programming
- Wireless software development
  - Zigbee basics
  - Development of the IoT device

# ESTC Schedule

## Schedule



# ESTC Resources

Stakeholders

- OTSL, Inc. (Japan, Nagoya)
- DSR Corporation (USA, Denver, CO)
- CS department of VSU

Teachers

- Lead engineers of DSR corporation
- Lead specialists in Japanese and European embedded software engineering industry

Workshops

- Embedded software development kits
- Dedicated wireless software and hardware
- Real tasks examples

# ESTC Learned Embedded Envirnoment

- HW
  - STM32F4Discovery
  - ARM Cortex-M4
  - MOD-MRF24J40 radio
- Development tools
  - Linux virtual machine
  - Editors (Vim, Emacs)
  - gcc, gdb, makefiles
  - arm-gcc toolchain


# ESTC Groups

- All who wants invited to pass the entrance test
- Group of 15-20 people will be formed according to the test results.

# Requirements to Students

- Computer science basics
- Linux basics
- C language
  - Pointers
  - Dynamic memory allocation
  - Data structures
- English basics
- Desire for learning

# ESTC Application

Students applications

- email: **estc@dsr-company.com**

- *Personal info*

  1. *Name (ФИО)*
  2. *Department (Факультет)*
  3. *Major (Специализация)*
  4. *Academic year (Курс)*
  5. *Average grades (средний балл)*
  6. *Email*

- *Course site:* **estc.dsr-company.com**


# What Students will Obtain

- Useful knowledge and experience
- Certificate of the Training center
- Ability to be employed in DSR
- Grants for the best students

# *Welcome!*