Capstone Project
Smart Menu Solution

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- Introduction
- Hardware and Software
- Yakindu
- Conclusion

- Idea's Origin
- Existing System
- Idea's Evaluating
- Scope
- Product Overview
- Principle
- Feature
- Risk

Idea's Origin

Idea's Origin

Existing Systems

iMENU

- Bach Hop Company (BICWeb.VN)
- Choosing dishes thought IPAD, tablet

- A system is installed on server
- Application runs on Ipad/Tablet (Client) thought server

Existing Systems

ezMenu

http://vienphuc.com/ezmproduct.htm

Introduction

Idea's Evaluating

- **Actual needs:**
  - *Lost time for waiting to note orders.*
  - *Have errors and lead to debate later when notes by papers.*
  - *High expense and hard to control a lots waiter.*
- **None of the existing system is widely applied in Viet Nam because:**
  - *Price,*
  - *Functionality,*
  - *Usability, etc.*

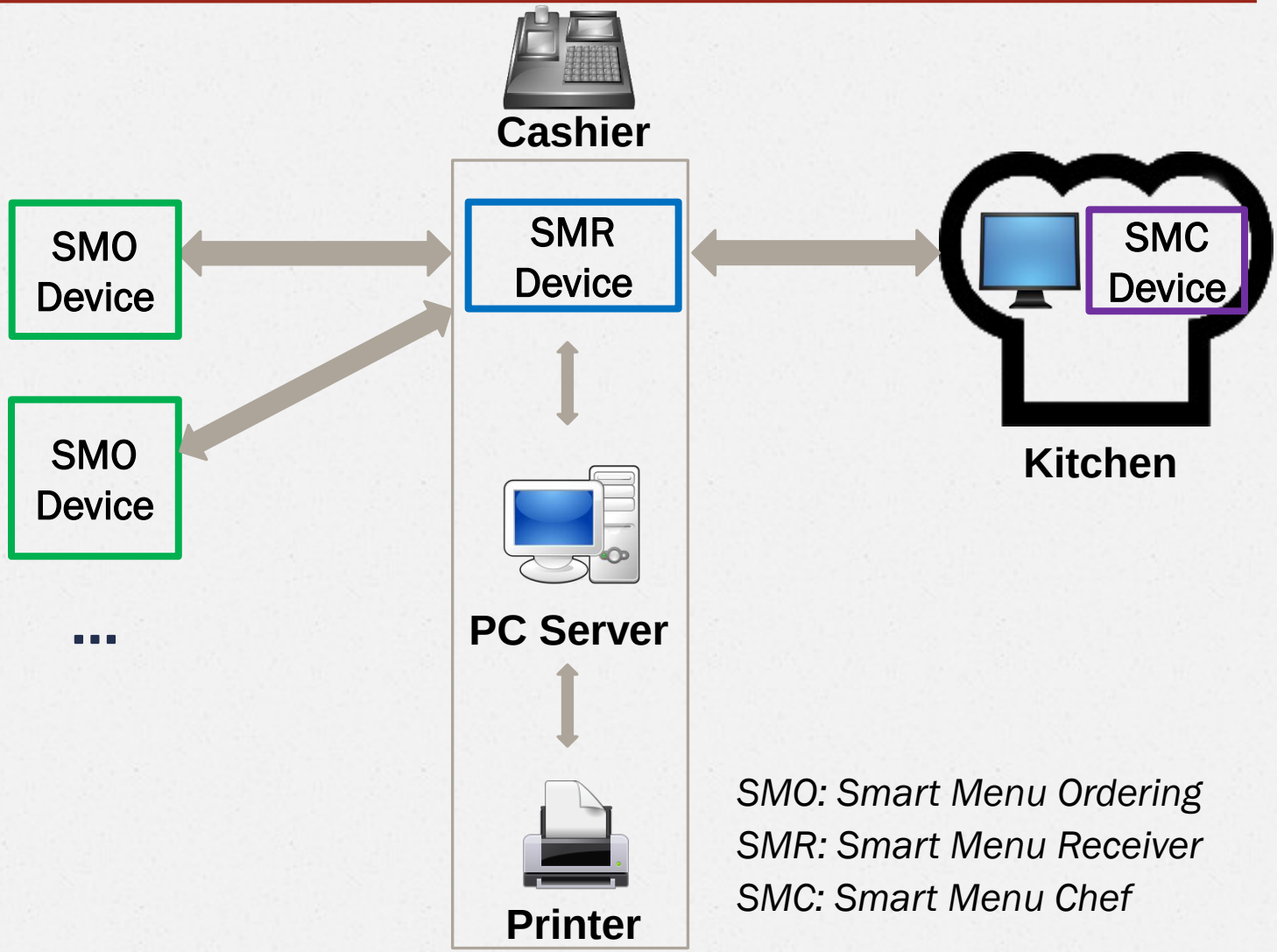
→ **The market is still available for our product.**

Introduction

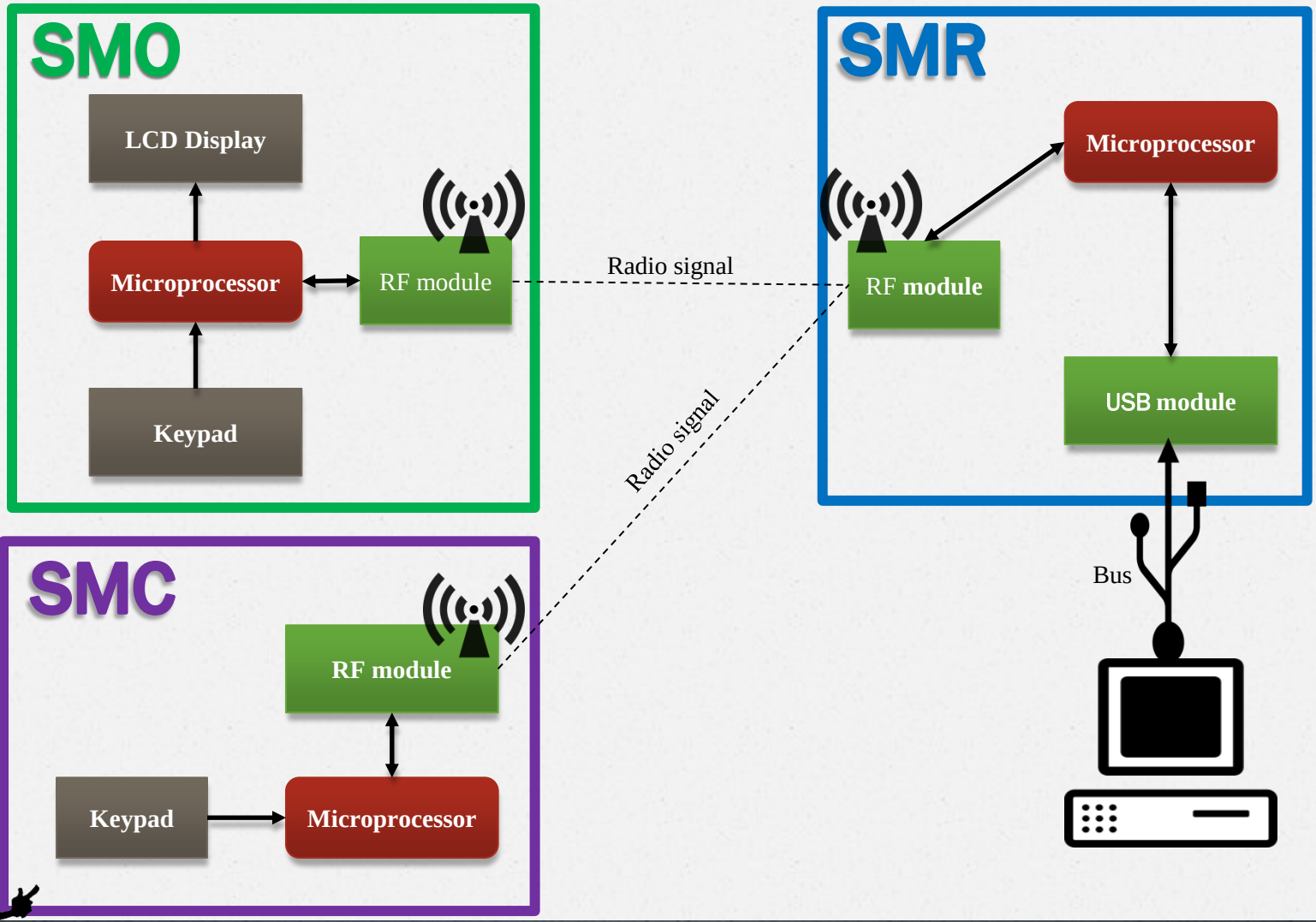
Scope

- Provide the basic functions:
  - ***Ordering:*** *Provide a new electric device replace a traditional ways in ordering dishes.*
  - ***Management:*** *Provide a window management software to manage orders, billing, statistic and automatically distribute dishes to chef.*
- Research & apply formal methods development (Yakindu) into executable embedded system.
- Provide a long-term stable system.
- Have acceptable price.

Product Overview

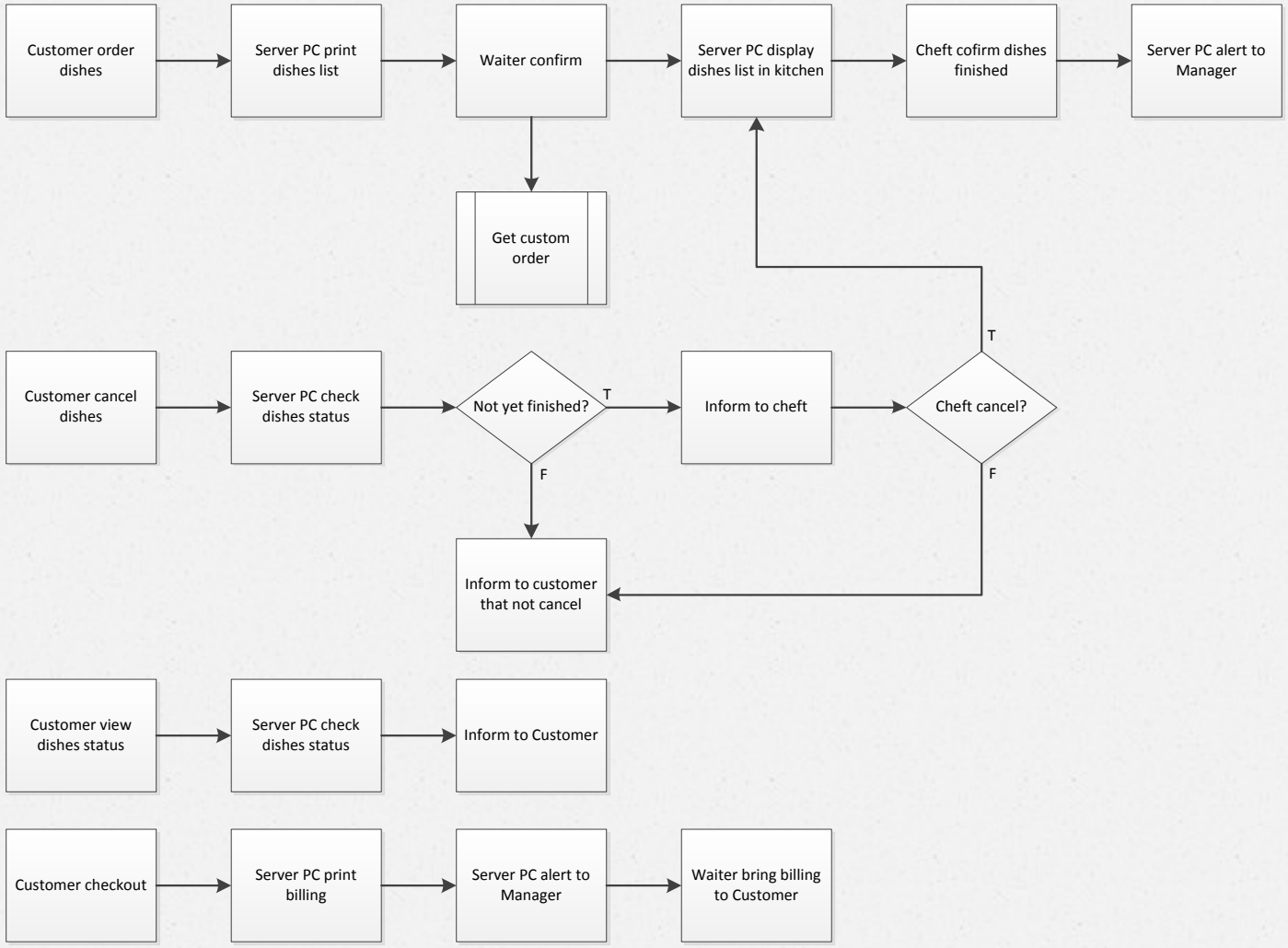


Product Overview (cont)



Introduction

Priciple



Introduction

Feature

- Using SMO to select menu.
- Support two languages: English or Vietnam
- View dishes' status: not done, doing or done.
- May cancel dishes if it haven’t been done yet.
- Call waiter for additional or unusual request.
- Automatic distribute orders to kitchen.
- Quick billing.
- Develop using “Yakindu” for easy maintain and update.

Risk

- Half of project team members do not have experiences working in real project.
- The team leader lack of project management skill, experiences.
- None of the project team members has been work as tester position.
- The facilitation for developing the project maybe the risk (like places, equipment , etc…)
- Lack of experiences of estimating time and budget for developing project.

Content

- Introduction
- Hardware and Software
- Yakindu
- Test
- Limitation
- Conclusion

- Hardware
  - List
  - Device
- Software
  - Model
  - Entity Framework
- Demo

Hardware List

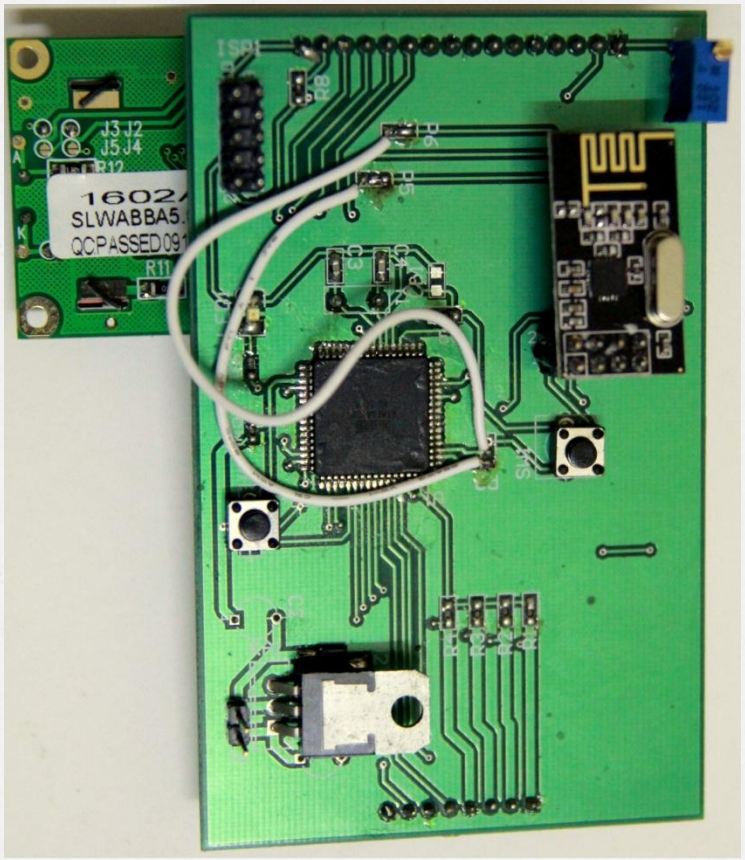
Equipment's Name	Quantity
Atmega128A	3
nRF24L01	3
USB to RS232 Converter Cable	1
LM7805	3
74HC245D	3
MAX232	3
PL2303-HX SSOP28 USB to UART	5
AVR STK500 - Programing Kit	2
9V/1A Power Adaptor	3
8 MHz HC-49S Crystal	5

Hardware

Device

Main Device (Front)

Main Device (Back)

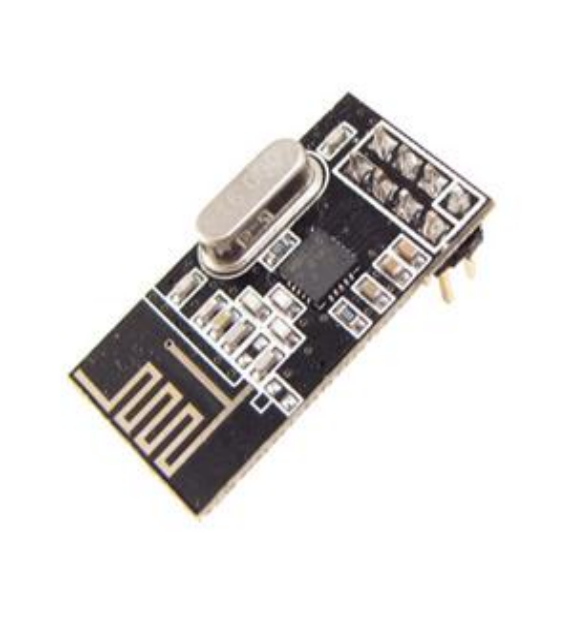


Device (cont)

Atmega128A

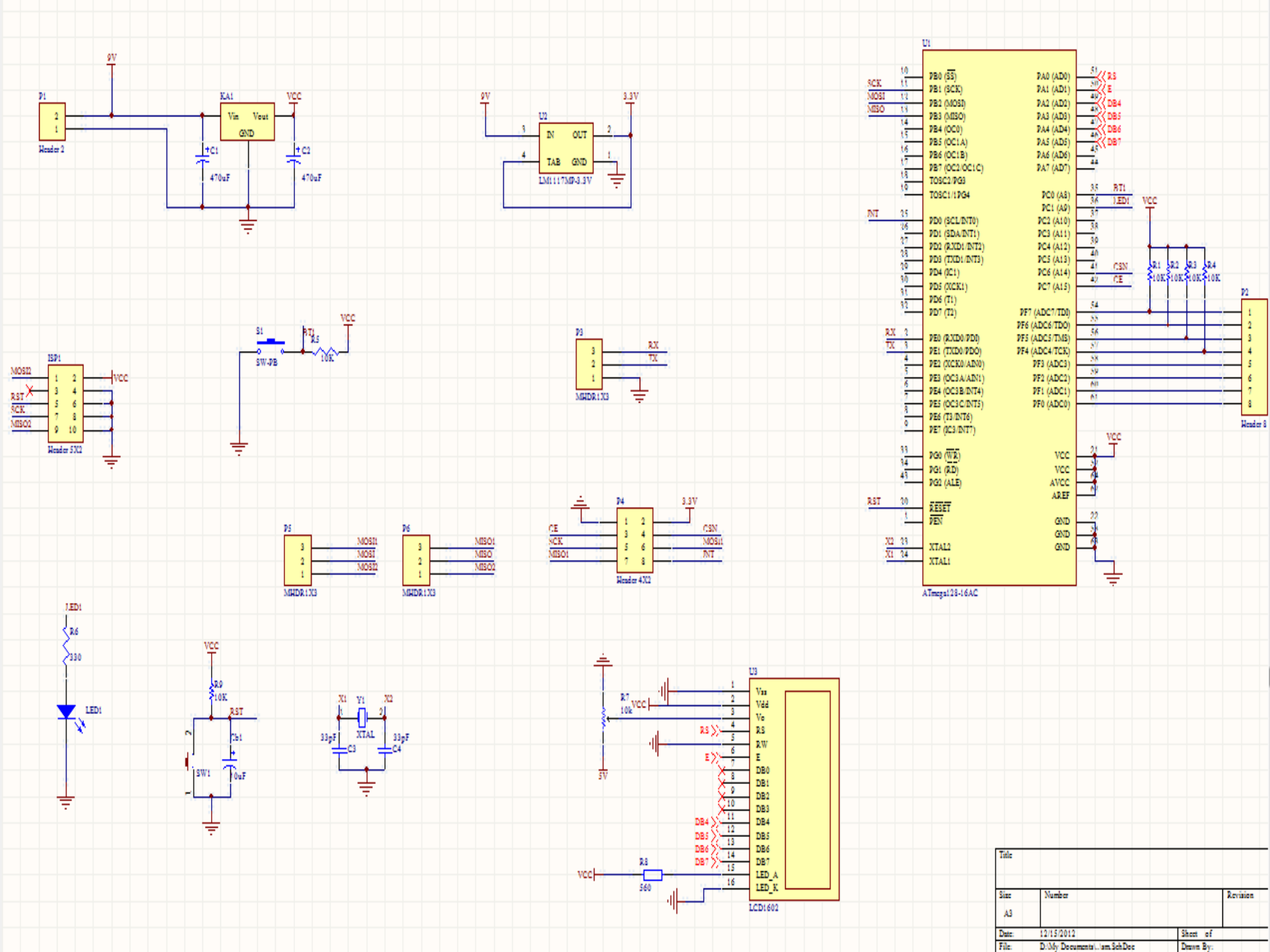
- High-performance, Low-power AVR® 8-bit Microcontroller
- High Endurance Non-volatile Memory segments
- JTAG (IEEE std. 1149.1 Compliant) Interface
- Peripheral Features
- Special Microcontroller Features
- I/O and Packages
- Operating Voltages: 4.5 - 5.5V
- Speed Grades: 0 - 16 MHz

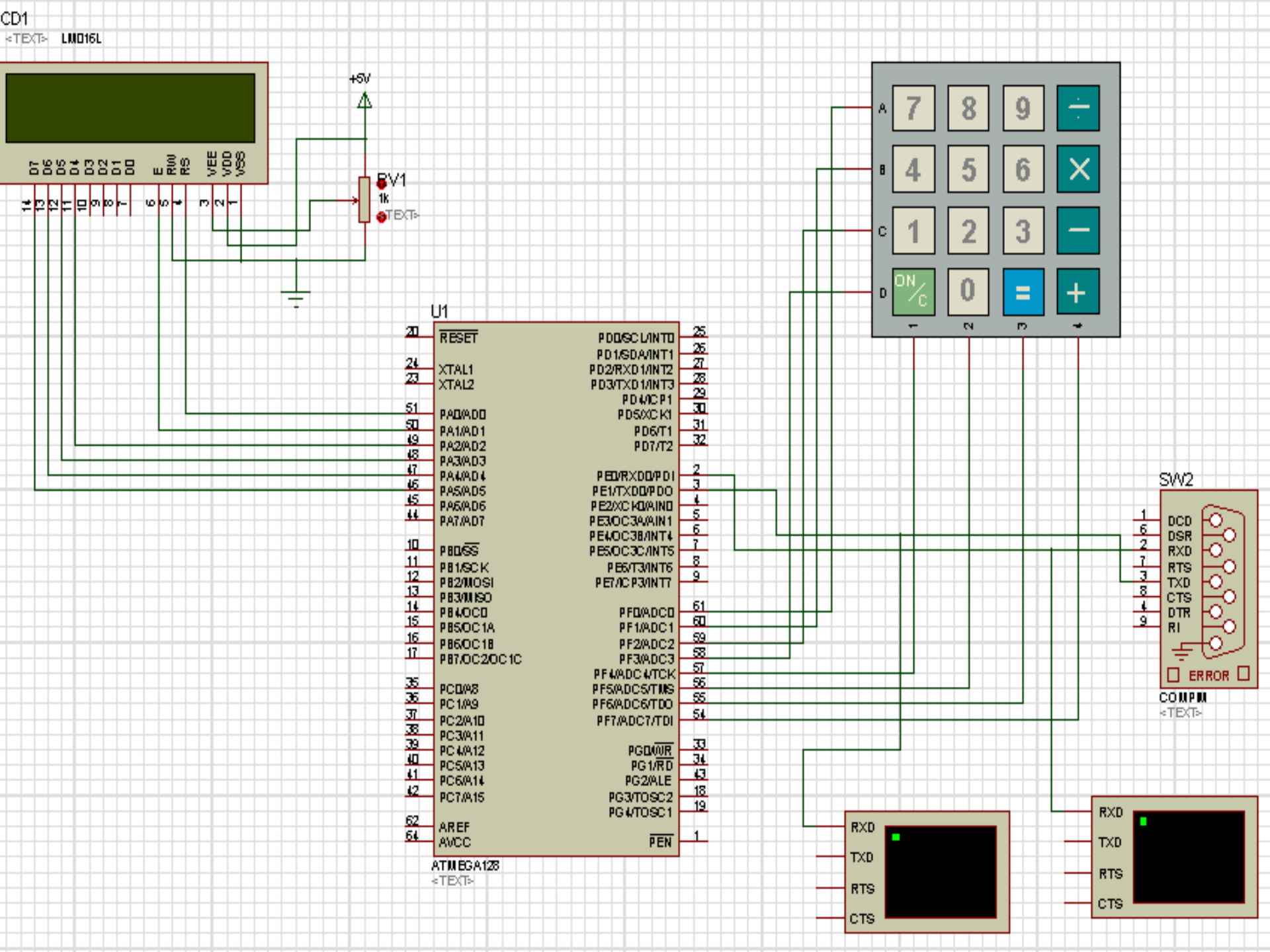
Device (cont)



nRF24L01

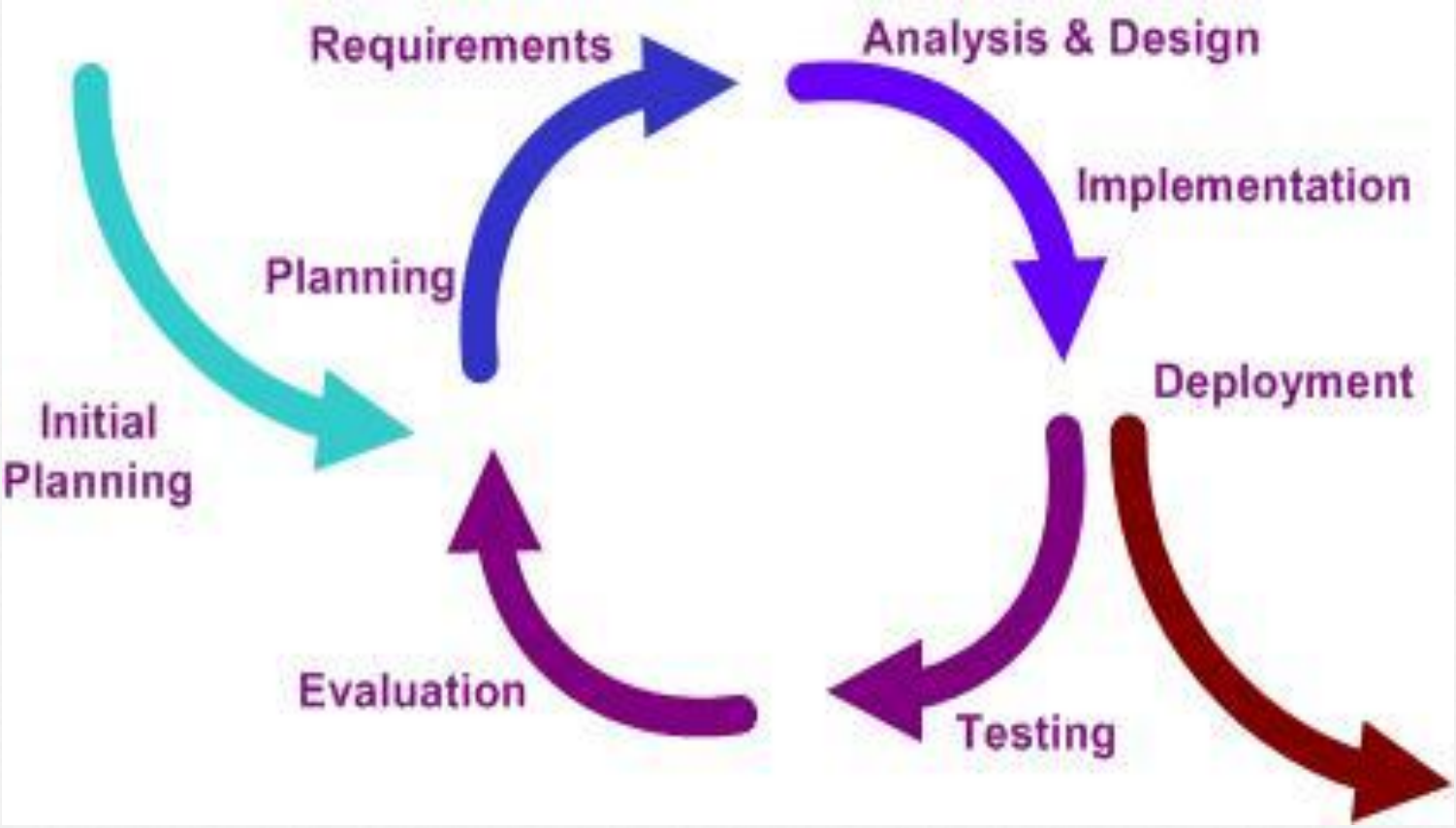
- Low cost single-chip 2.4GHz GFSK RF transceiver IC
- Worldwide license-free 2.4GHz ISM band operation
- 1Mbps and 2Mbps on-air data-rate
- Enhanced ShockBurst™ hardware protocol accelerator
- Ultra low power consumption – months to years of battery lifetime


9V
P1
Header 2
KA1
Vin
Vout
GND
VCC
C1
470uF
C2
470uF
9V
U2
IN
OUT
TAB
GND
LM1117MP-3.3V
3.3V
U1
ATmega128-16AC
PB0 (SS)
PB1 (SCK)
PB2 (MOSI)
PB3 (MISO)
PB4 (OC0)
PB5 (OC1A)
PB6 (OC1B)
PB7 (OC2/OC1C)
TOSC2/PG3
TOSC1/PG4
PD0 (SCL/INT0)
PD1 (SDA/INT1)
PD2 (RXD1/INT2)
PD3 (TXD1/INT3)
PD4 (IC1)
PD5 (XCK1)
PD6 (T1)
PD7 (T2)
PE0 (RXD0/PDI)
PE1 (TXD0/PDO)
PE2 (XCK0/AIN0)
PE3 (OC3A/AIN1)
PE4 (OC3B/INT4)
PE5 (OC3C/INT5)
PE6 (T3/INT6)
PE7 (IC3/INT7)
PG0 (WR)
PG1 (RD)
PG2 (ALE)
RESET
PEN
XTAL2
XTAL1
PA0 (AD0)
PA1 (AD1)
PA2 (AD2)
PA3 (AD3)
PA4 (AD4)
PA5 (AD5)
PA6 (AD6)
PA7 (AD7)
PC0 (A8)
PC1 (A9)
PC2 (A10)
PC3 (A11)
PC4 (A12)
PC5 (A13)
PC6 (A14)
PC7 (A15)
PF7 (ADC7/TDI)
PF6 (ADC6/TDO)
PF5 (ADC5/TMS)
PF4 (ADC4/TCK)
PF3 (ADC3)
PF2 (ADC2)
PF1 (ADC1)
PF0 (ADC0)
VCC
VCC
AVCC
AREF
GND
GND
GND
SCK
MOSI
MISO
INT
RX
TX
RST
RS
E
DB4
DB5
DB6
DB7
RT1
LED1
CSN
CE
R1 10K
R2 10K
R3 10K
R4 10K
P2
Header 8
ISP1
Header 5X2
MOSI2
RST
SCK
MISO2
S1
SW-PB
RT1
R5
10K
P3
MHDR1X3
P5
MHDR1X3
P6
MHDR1X3
P4
Header 4X2
CE
SCK
MISO1
CSN
MOSI1
INT
LED1
R6
330
LED1
R9
10K
RST
C6
0.1uF
SW1
10uF
X1
Y1
X2
33pF
C3
XTAL
33pF
C4
U3
LCD1602
Vss
Vdd
Vo
RS
RW
E
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
LED_A
LED_K
R7
10K
5V
R8
560
Title
Size
A3
Number
Revision
Date:
12/15/2012
Sheet of
File:
D:\My Documents\...\am.SchDoc
Drawn By:

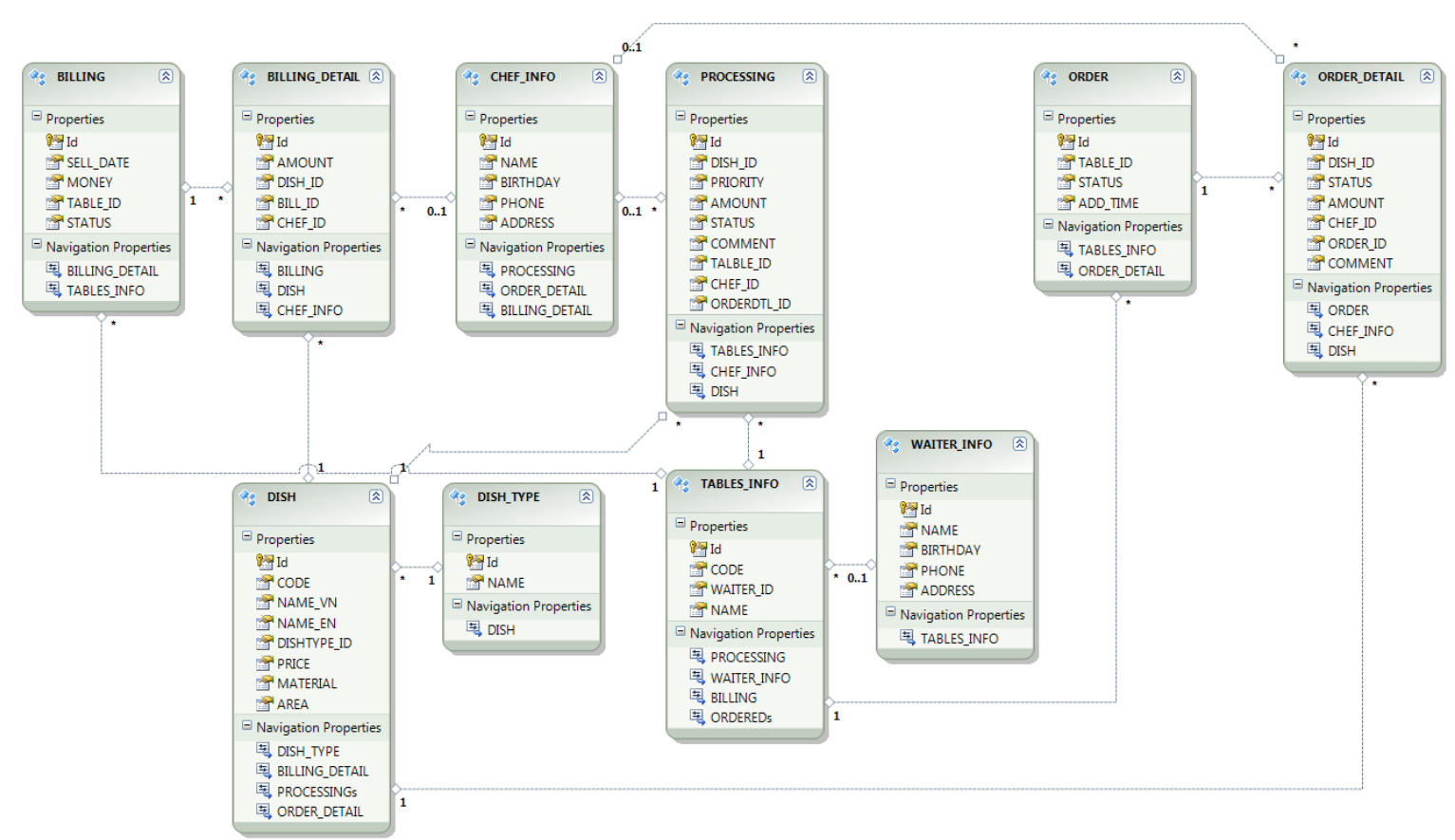

CD1
<TEXT>
LM016L
D7 D6 D5 D4 D3 D2 D1 D0 E RW RS VEE VDD VSS
14 13 12 11 10 9 8 7 6 5 4 3 2 1
+5V
RV1
1k
<TEXT>
U1
RESET
XTAL1
XTAL2
PA0/AD0
PA1/AD1
PA2/AD2
PA3/AD3
PA4/AD4
PA5/AD5
PA6/AD6
PA7/AD7
PB0/SS
PB1/SCK
PB2/MOSI
PB3/MISO
PB4/OC0
PB5/OC1A
PB6/OC1B
PB7/OC2/OC1C
PC0/A8
PC1/A9
PC2/A10
PC3/A11
PC4/A12
PC5/A13
PC6/A14
PC7/A15
AREF
AVCC
PD0/SCL/INT0
PD1/SDA/INT1
PD2/RXD1/INT2
PD3/TXD1/INT3
PD4/ICP1
PD5/XCK1
PD6/T1
PD7/T2
PE0/RXD0/PDI
PE1/TXD0/PDO
PE2/XCK0/AIN0
PE3/OC3A/AIN1
PE4/OC3B/INT4
PE5/OC3C/INT5
PE6/T3/INT6
PE7/ICP3/INT7
PF0/ADC0
PF1/ADC1
PF2/ADC2
PF3/ADC3
PF4/ADC4/TCK
PF5/ADC5/TMS
PF6/ADC6/TDO
PF7/ADC7/TDI
PG0/WR
PG1/RD
PG2/ALE
PG3/TOSC2
PG4/TOSC1
PEN
ATMEGA128
<TEXT>
A 7 8 9 ÷
B 4 5 6 ×
C 1 2 3 −
D ON/C 0 = +
1 2 3 4
SW2
DCD DSR RXD RTS TXD CTS DTR RI
ERROR
COMPIM
<TEXT>
RXD TXD RTS CTS
RXD TXD RTS CTS

Sofware Model

Iterative development model



Sofware Entity Framework



Demo

DEMO

Content

- Introduction
- Hardware and Software
- Yakindu
- Test
- Limitation
- Conclusion

- Introduction
- State chart Tools
- Editing
- Simulation
- Code generation
- Demo

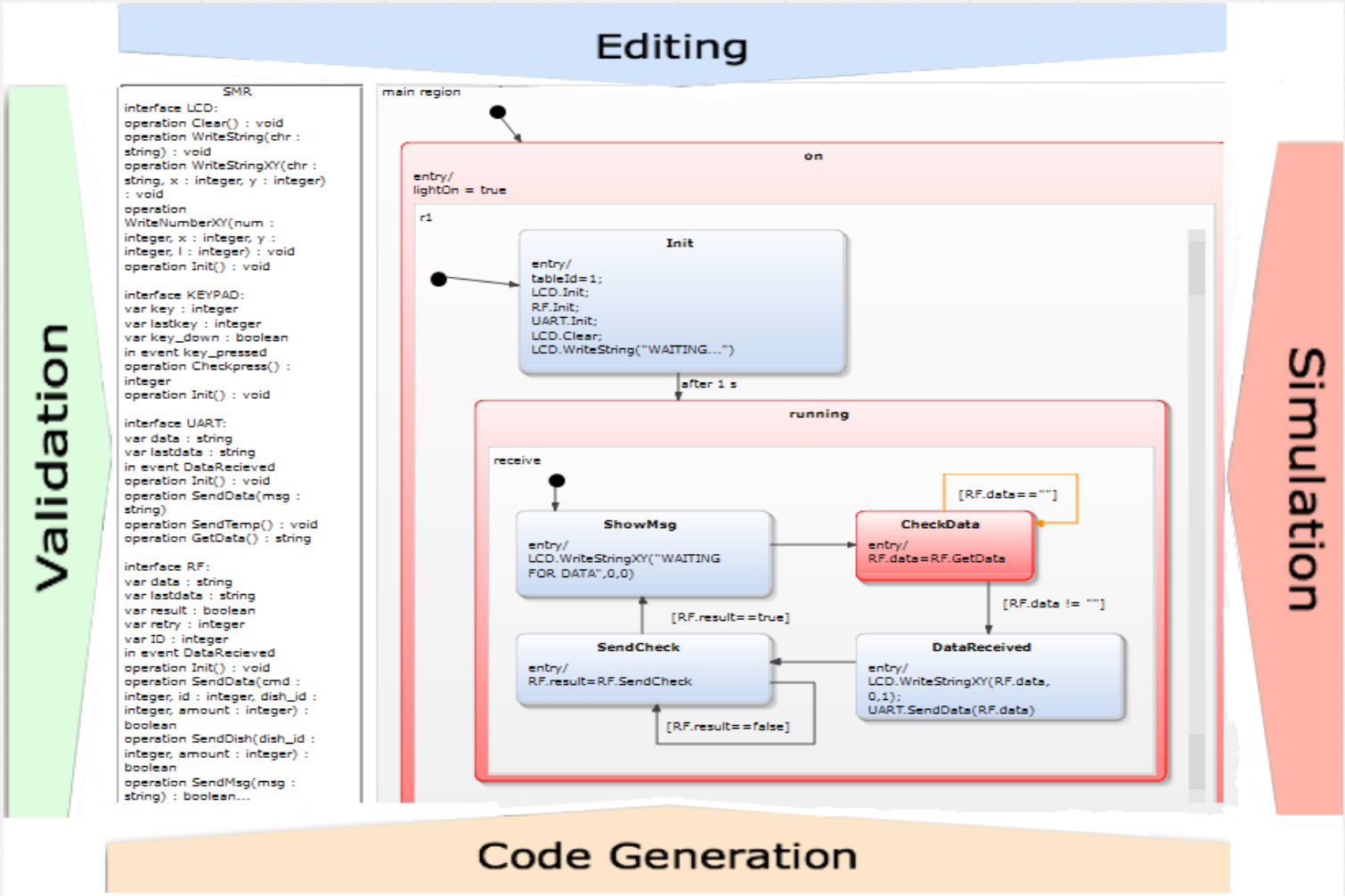
Introduction

YAKINDU
is a modular toolkit
for model-based development
(of embedded systems)

- built on Eclipse
- open source
- available at Eclipse Labs

http://statecharts.org

Yakindu Statechart Tools (SCT)

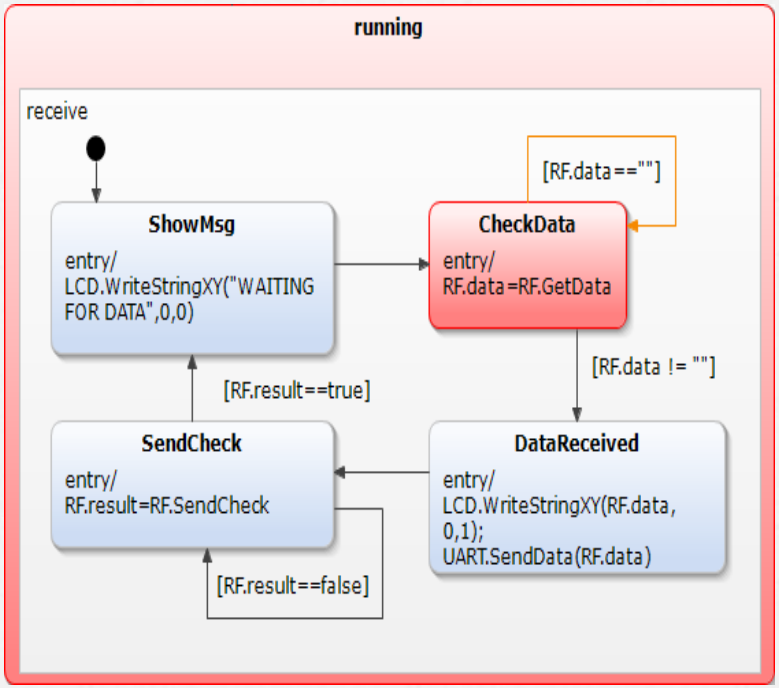


Yakindu Statechart Tools (SCT)

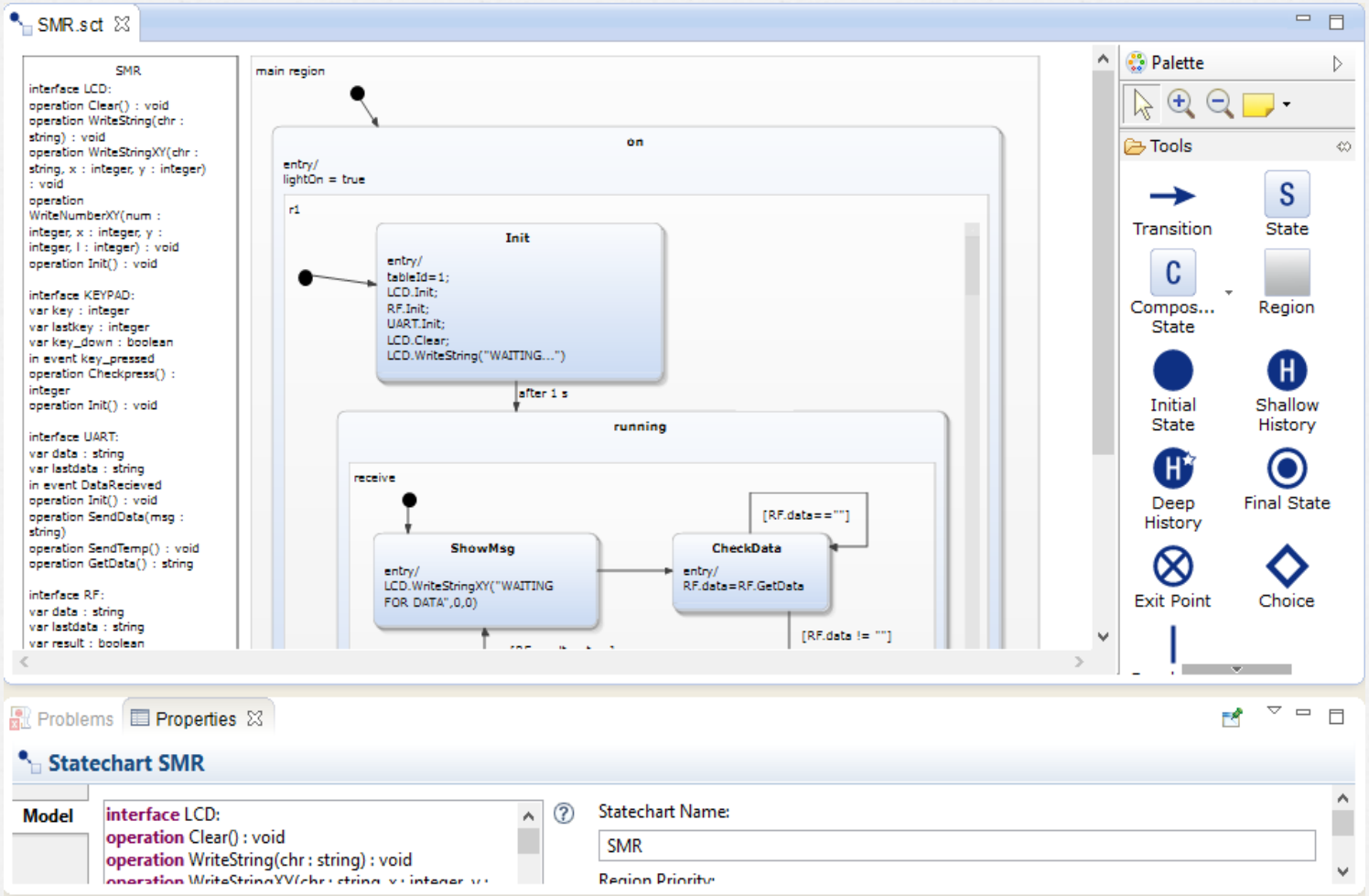
Formalism similar to **state machines** as defined by David Harel, but:

- **self-contained** with a well defined interface
- with a cycle-based execution semantics

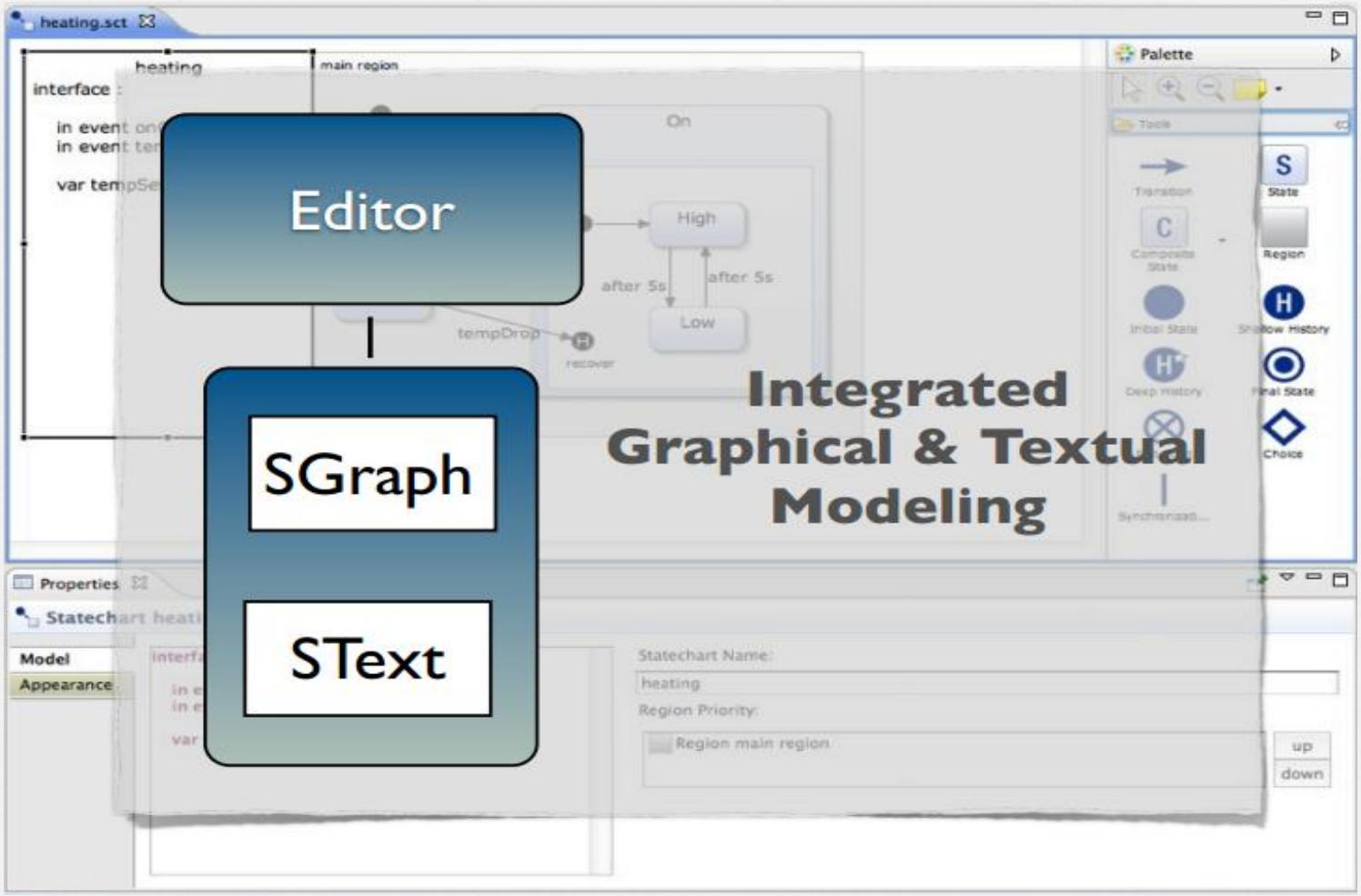
- allows processing concurrent events
- event-driven behavior can be defined on top
- time control is delegated to the environment



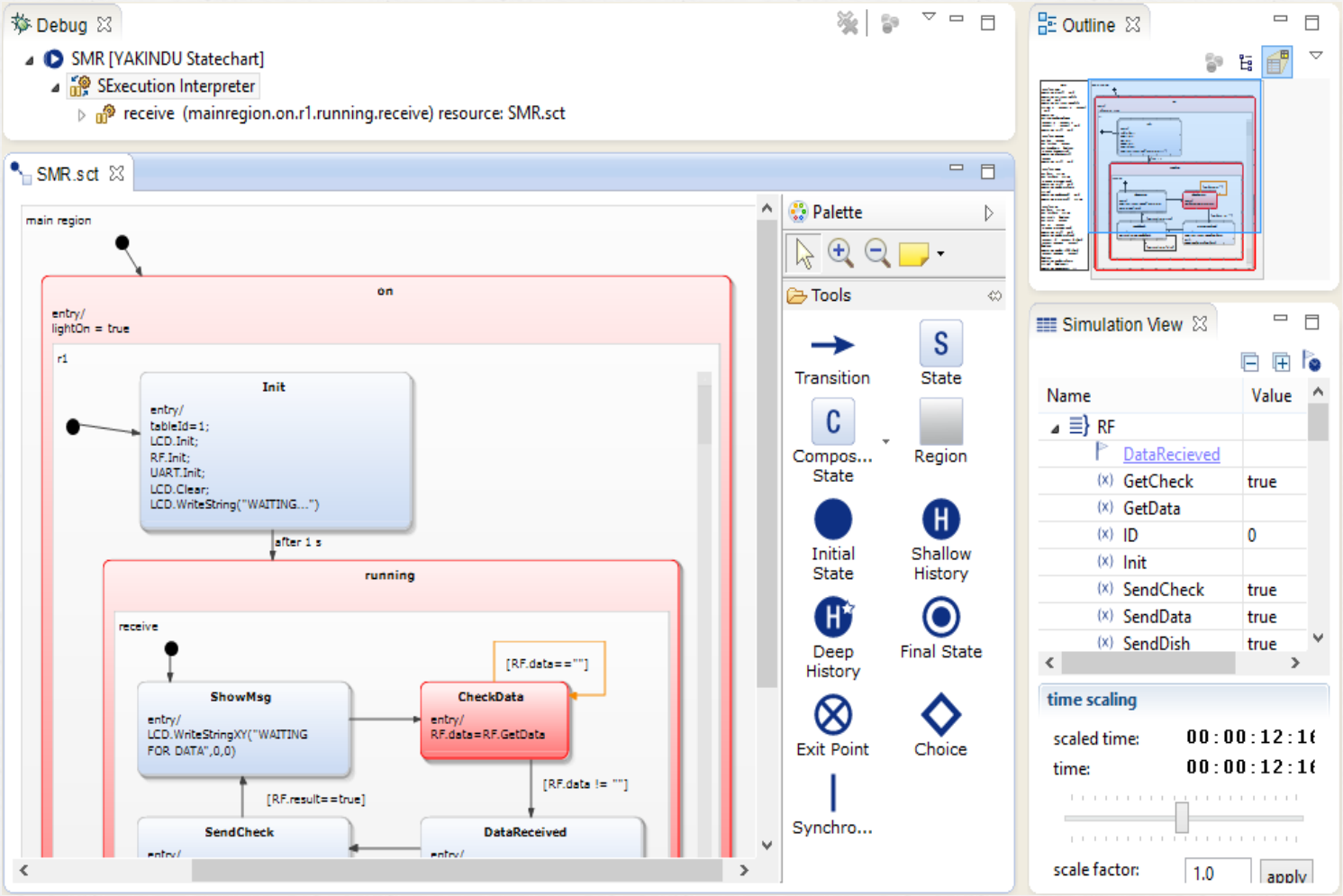
Yakindu Editing



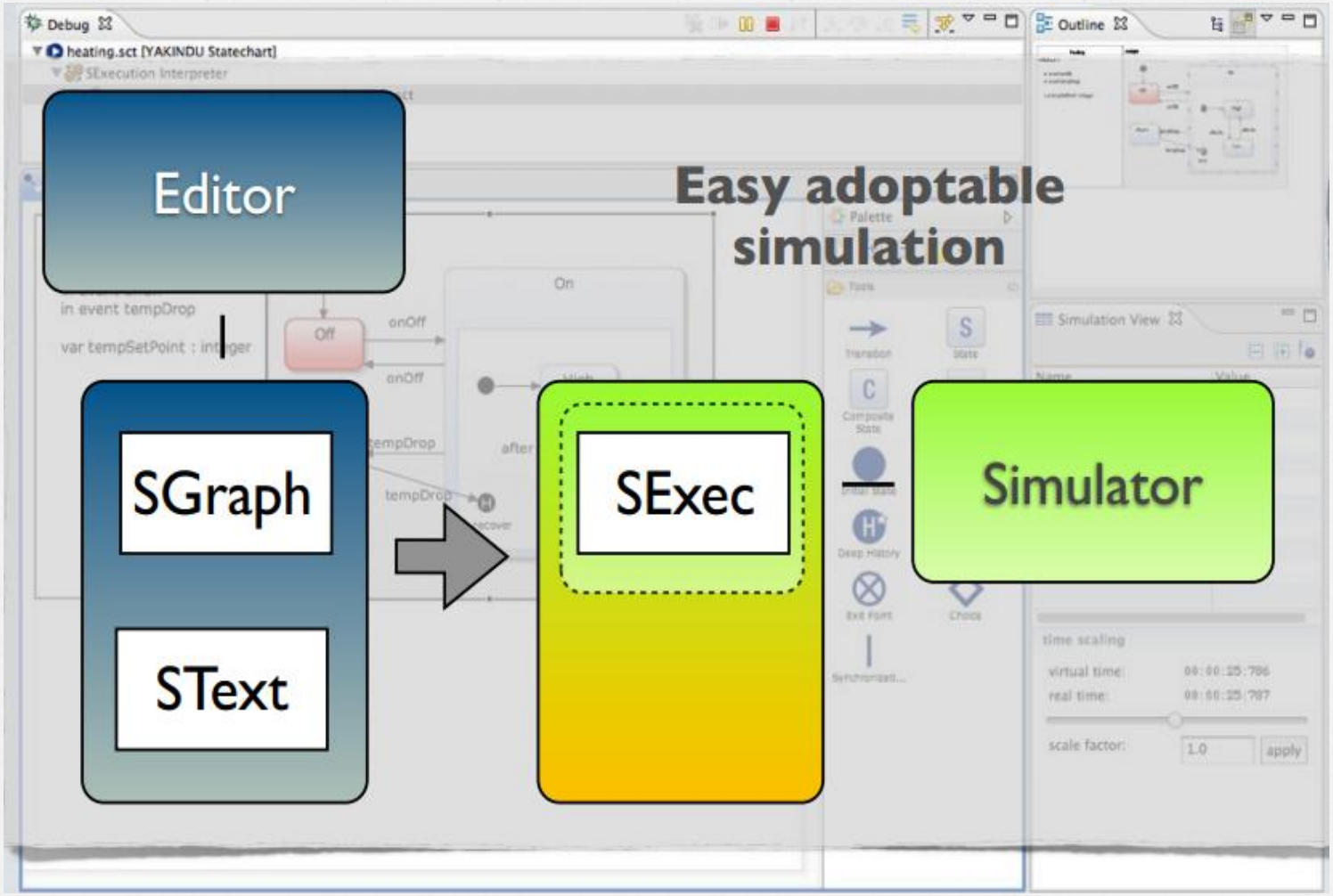
Yakindu Editing



Yakindu Simulation



Yakindu Simulation



Code generation

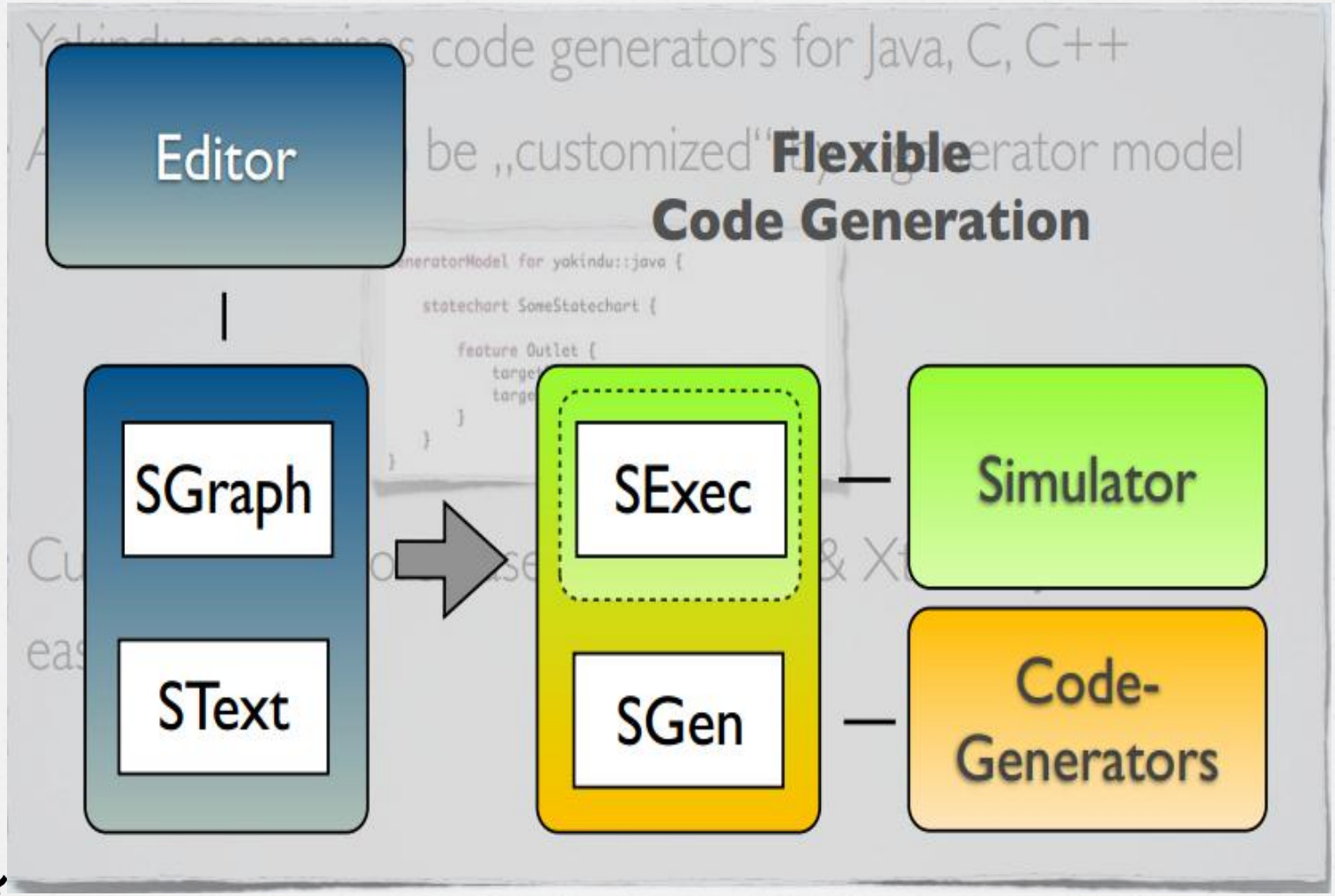
- Yakindu comprises code generators for Java, C, C++
- All generators can be customized by a generator model

```
GeneratorModel for yakindu::c {

    statechart SMO {

        feature Outlet {
            targetProject = "SmartMenuSolution"
            targetFolder = "SMO"
        }
    }
}
```

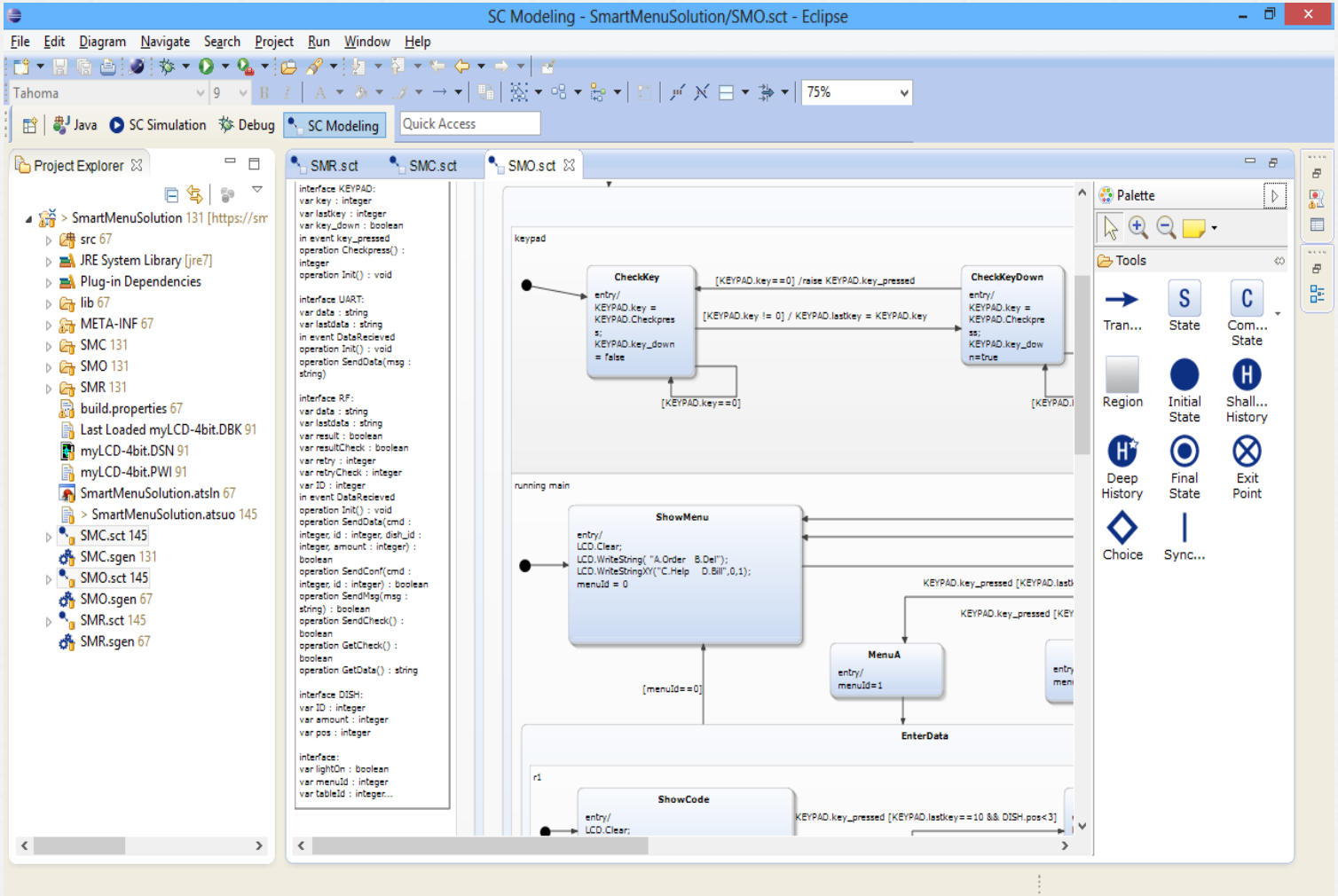
- Custom generators based on Xpand & Xtend2/Java can be easily integrated

Yakindu

Code generation



Yakindu Demo



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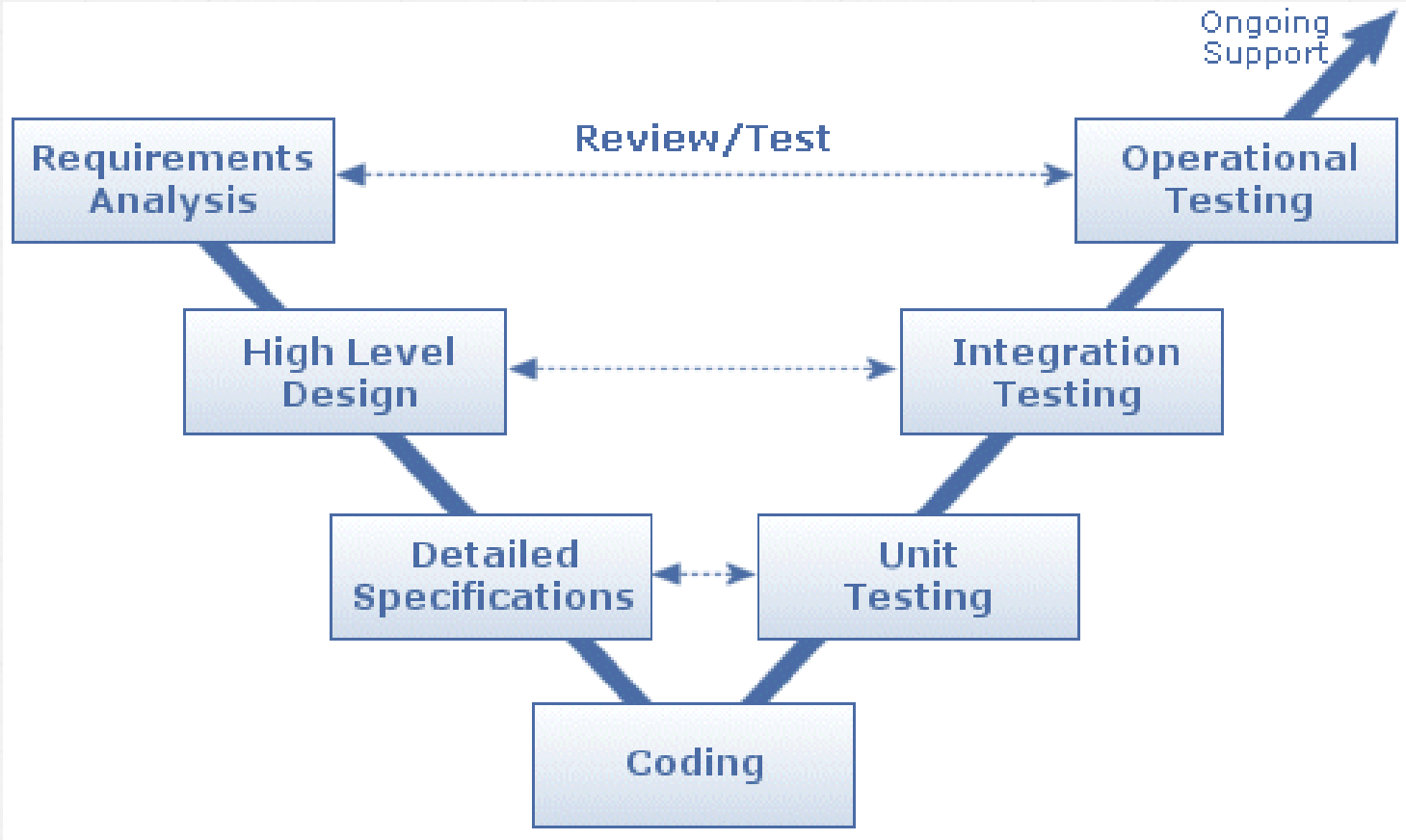
- Limitation
- Future Improvement

Conclusion Testing



V – Model Test Strategy

Testing (cont)

- **Embedded System Testing**
  - RS232 testing
  - Atmega128A testing
  - nRFL2401 testing
  - LCD display testing
  - Keyboard testing
  - Data transferring testing
- **Information System Testing**
  - GUI testing
  - Functions testing
  - Insert database testing
  - Connect COM port testing

Conclusion

Limitation

- Control software
  - Control software design is monotonous
  - Software didn't have many functions
  - Do not display all system operations
  - Database design is not in standard
  - Sometimes not operate reliability
  - Source code is quite complicated
- Counter printed board
  - Operate in 9V power only
  - Still cannot transfer data in a long distance (desire possible)
  - Design is not complete
  - Connection sometimes not reliability

Conclusion

Future Improvement

- Large restaurant
- Expensive price
- Provide software in tablet
- Have all basic function
- Can custom comment dishes
- No need paper menu

THANK YOU!