Digital Camera

Applied Embedded Systems Project

Haifeng Gao, Li Le, Marco Taubmann, Farid Rosli

Architektur eingebetteter Systeme
Institut für Informatik und Mikroelektoronik
Fak.IV-Elektrotechnik und Informatik
Technische Universität Berlin

- **Introduction**
  - Motivation
  - Overview
- **System Design**
  - Development Environments
  - Graphic User Interface
  - Server-Client Communication
  - Core Implementation
- **Progress & TODO**

Agenda

Motivation

Applications

- Mobile Phones
- GPS
- Game Console
- Medical Imaging

Introduction

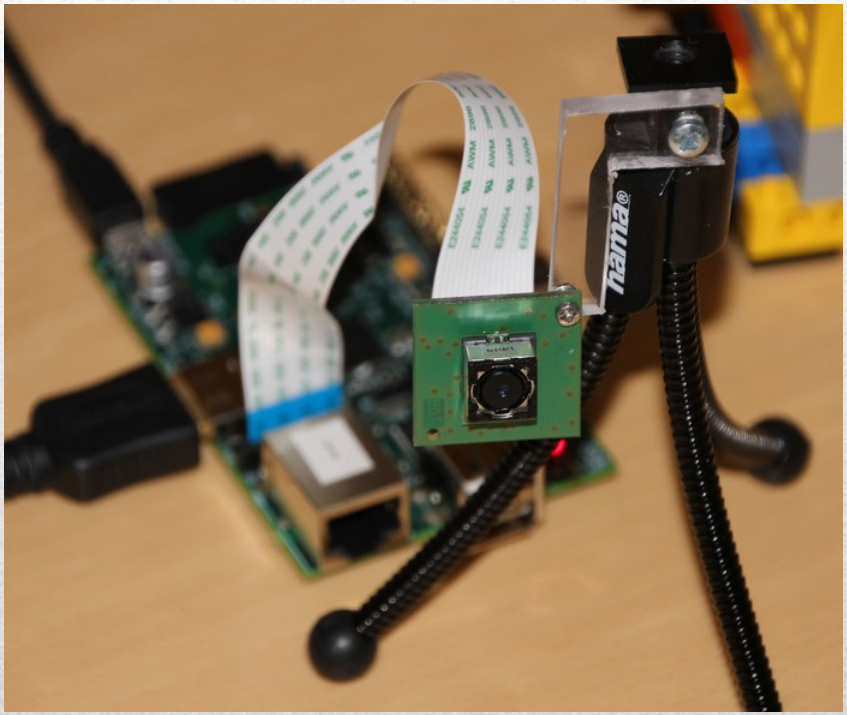
Motivation

Applications

- Mobile Phones
- GPS
- Game Console
- Medical imaging

FPGA+Camera

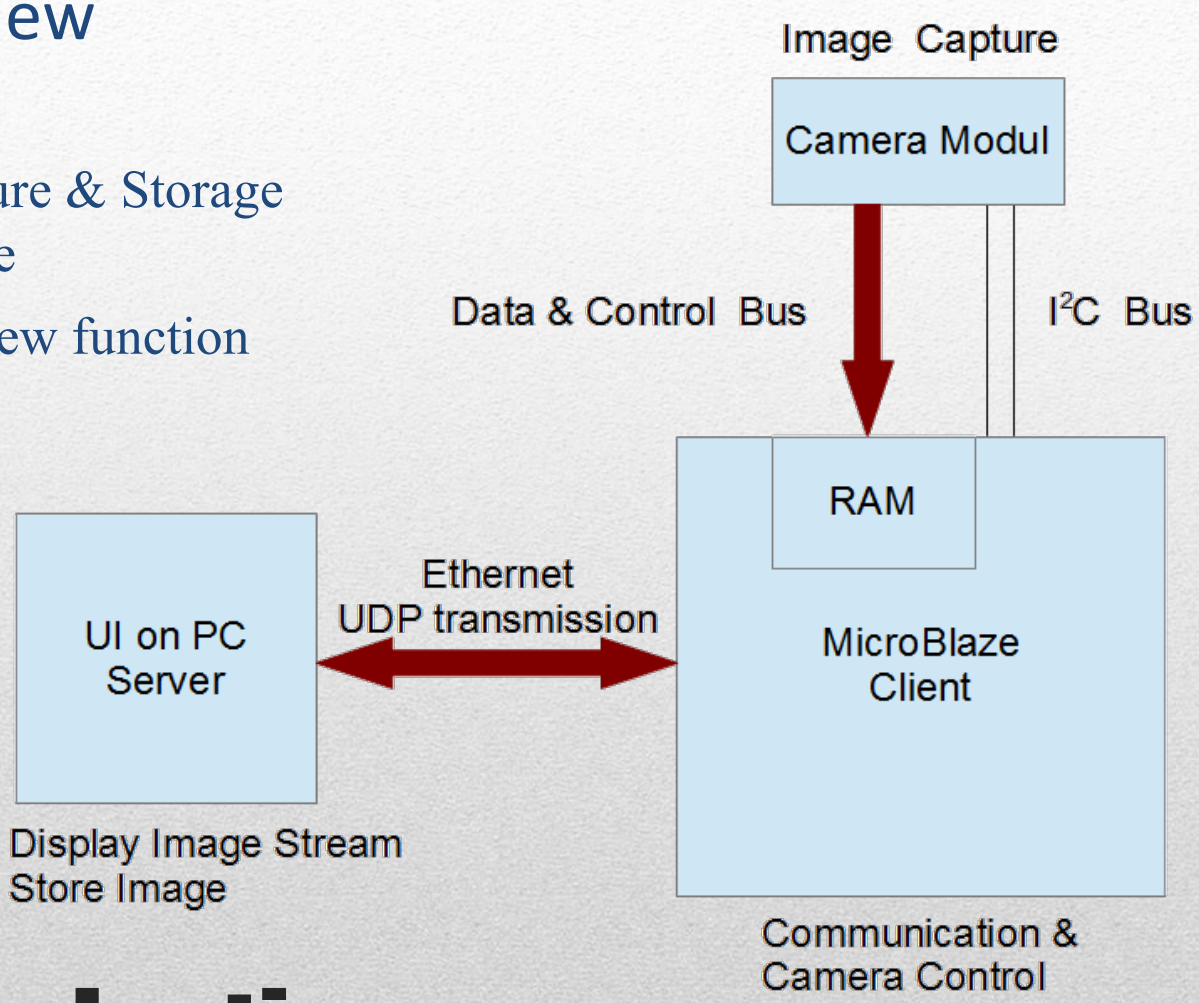
- Image Capture
- Object Detection
- Remote control



Camera board on Raspberry Pi
Quelle: www.raspberrypi.org

Overview

- Capture & Storage Image
- Preview function



Introduction

Develop Environments

Hardware

- Xilinx Spartan 3E Starter Development Kit
- VmodCAM MT9D112 2-megapixel CMOS Digital Image Sensors

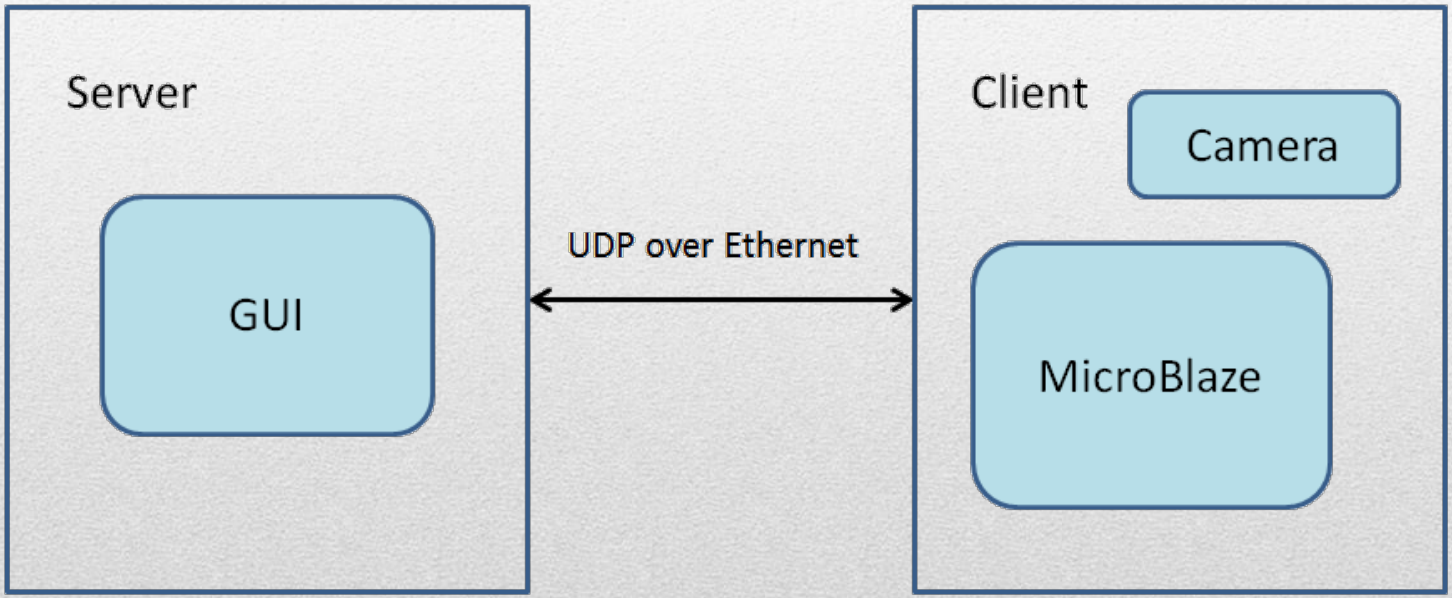
Software

- Xilinx SDK for C
- Xilinx ISE for VHDL
- Eclipse for Java

System Design

Communicating over Network

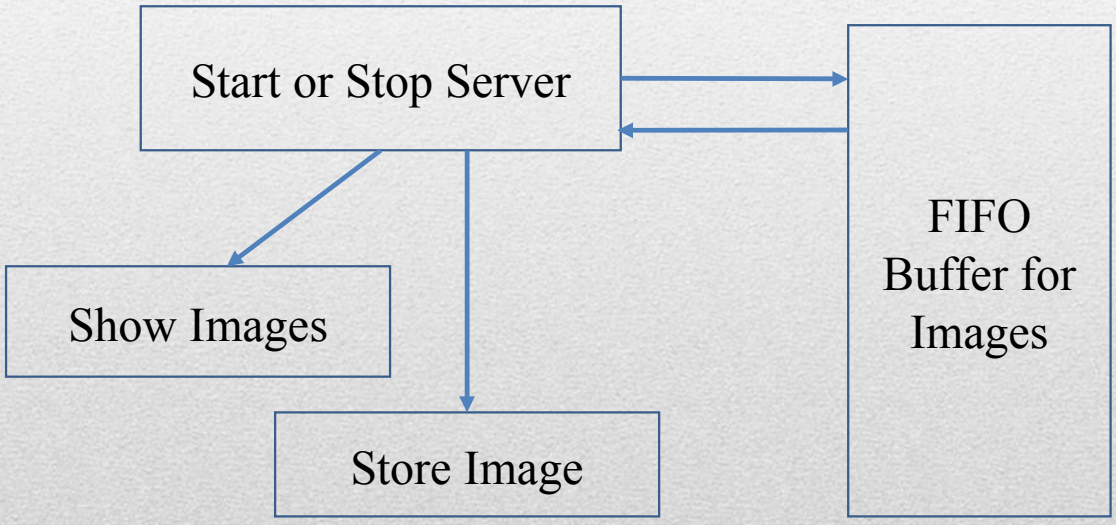
- Server and Client
- UDP Protocol



System Design

Server Side

- Written in Java: system independent
- Consists of four modules



System Design

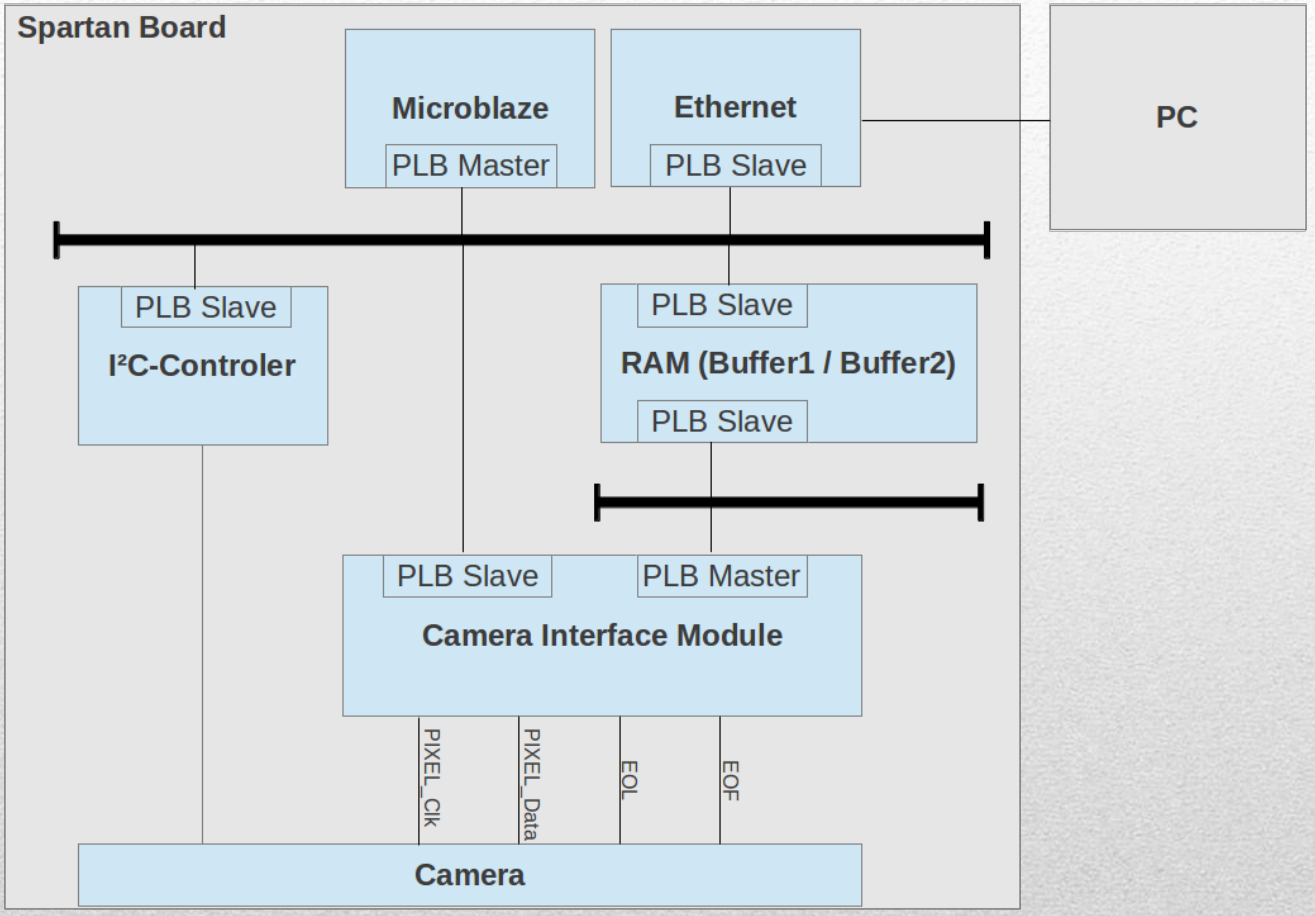
Client Side

- Use Lib <xemaclite.h>
- Define UDP Packet Structure
- Set Mac and IP Address

  Source & Destination
- Initialize the Ethernet driver
- Check the signal from MicroBlaze
- Send the Image to Server with UDP Packet

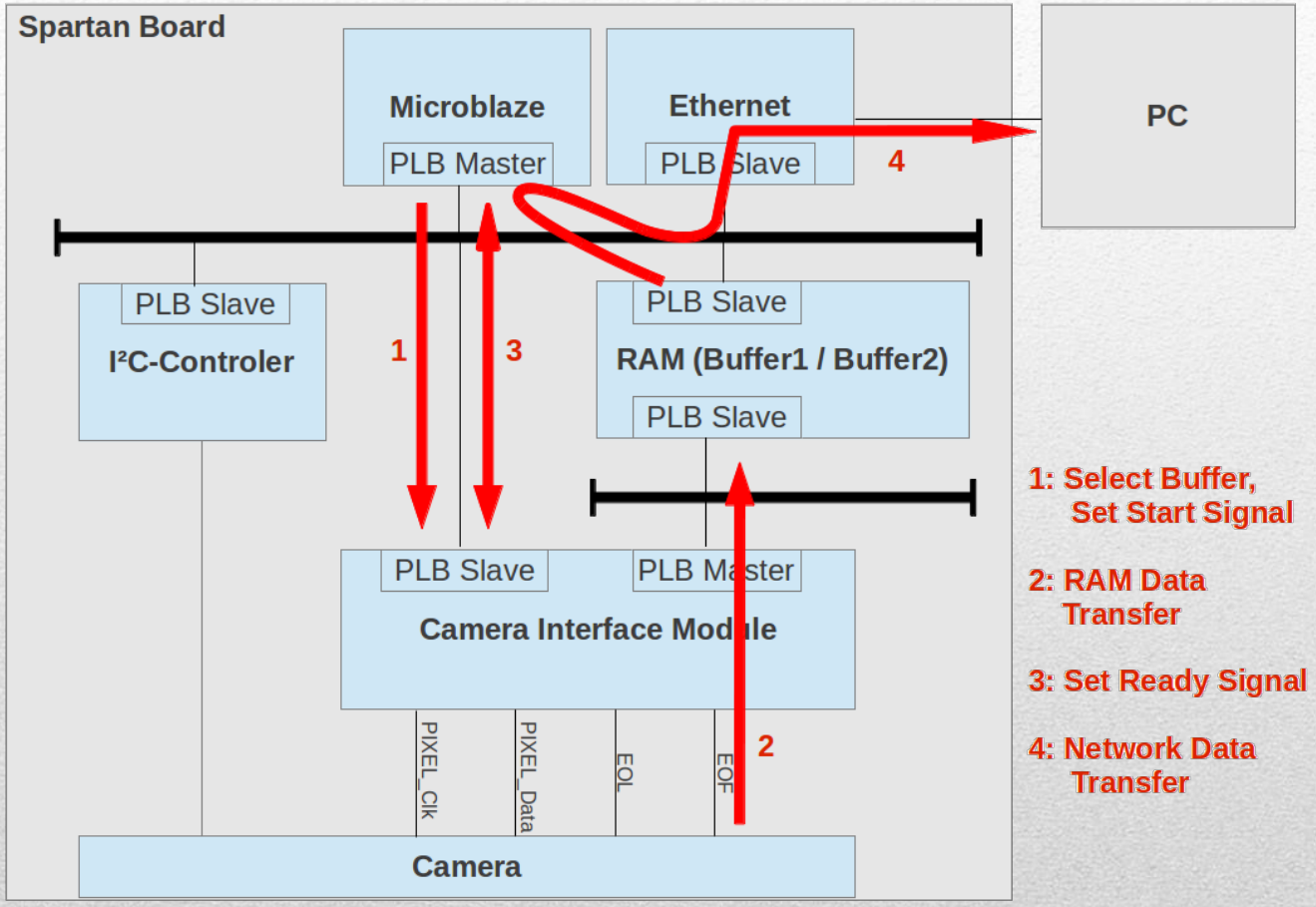
System Design

System Overview



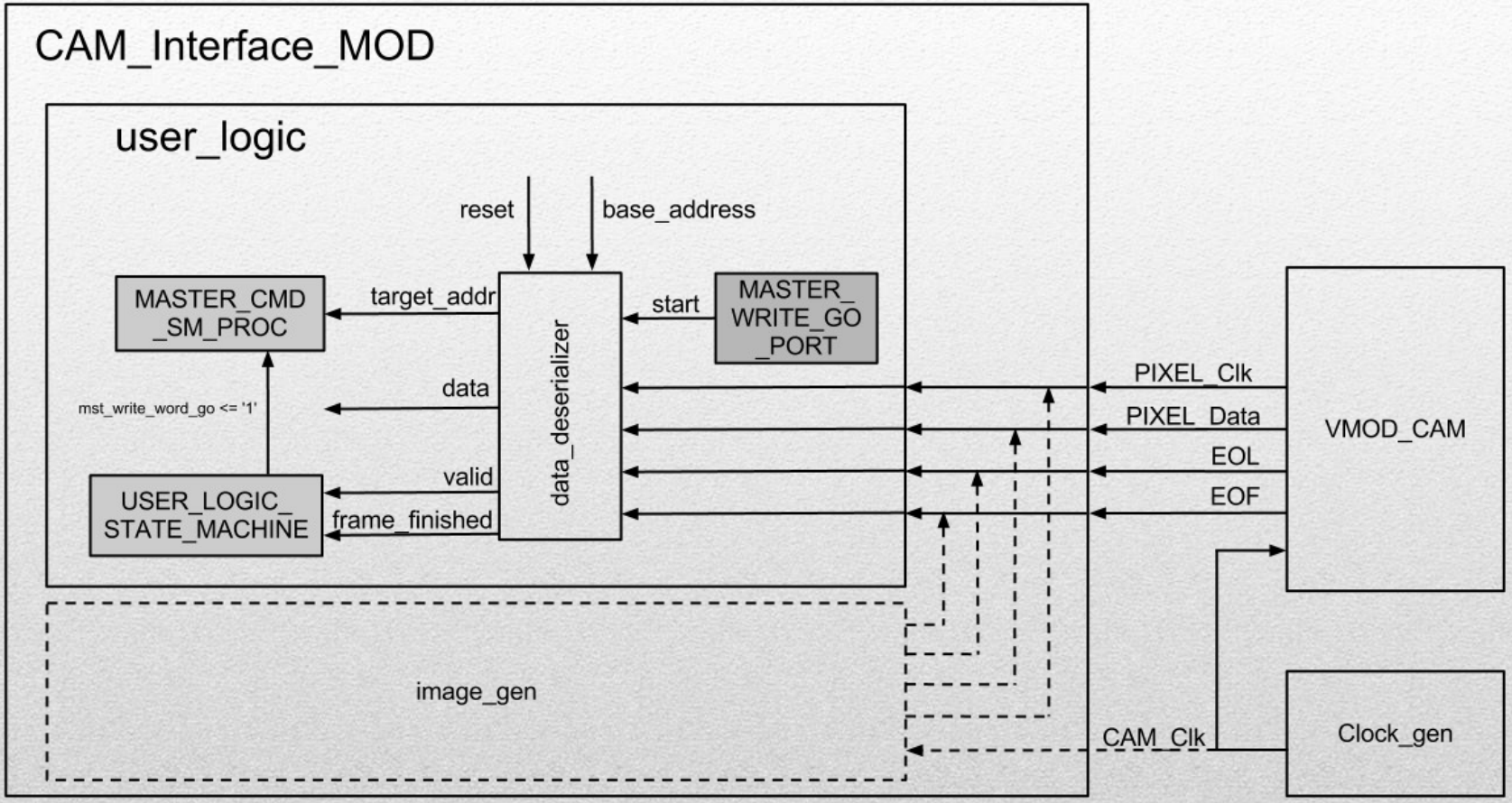
System Design

System Overview



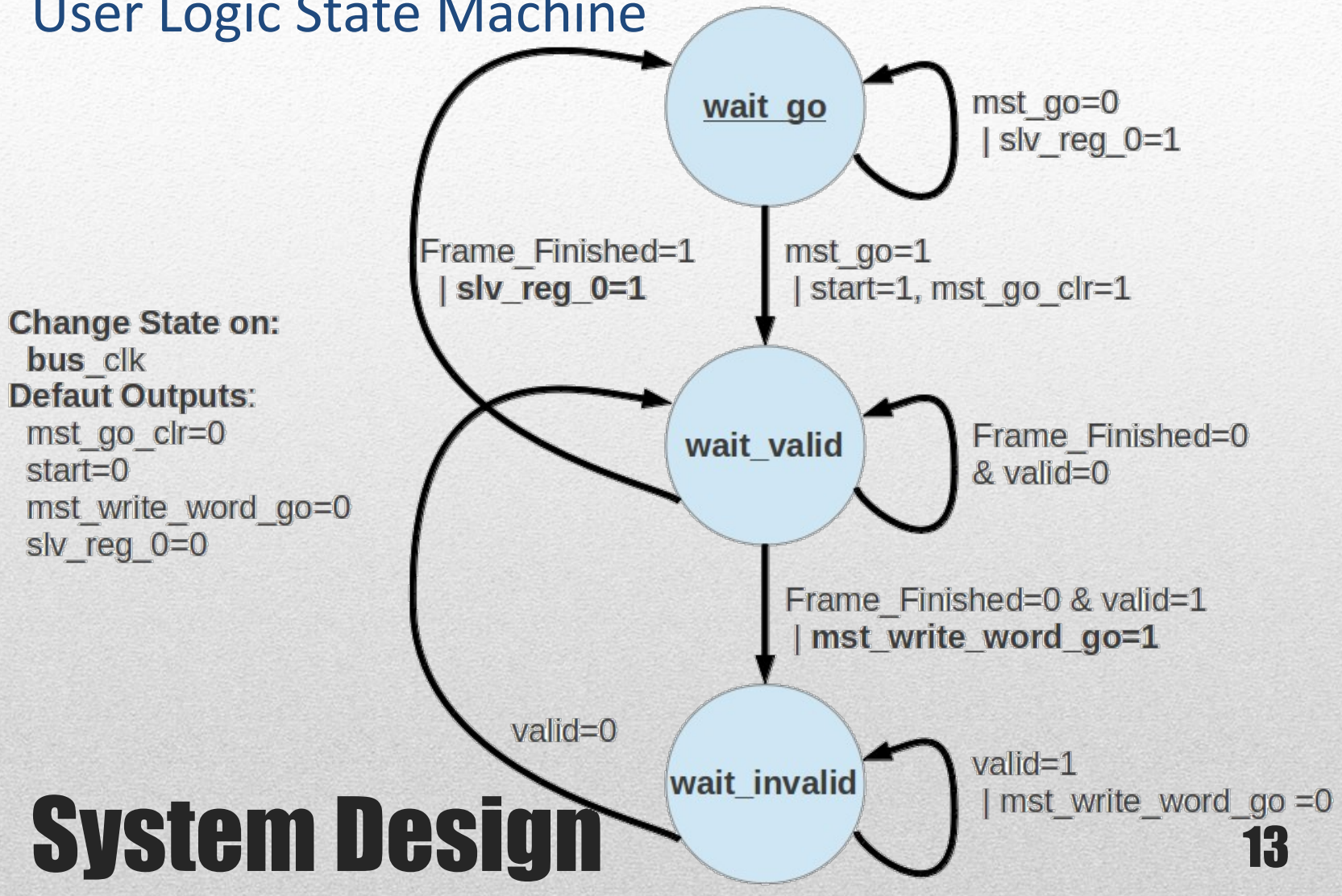
System Design

Core Implementation



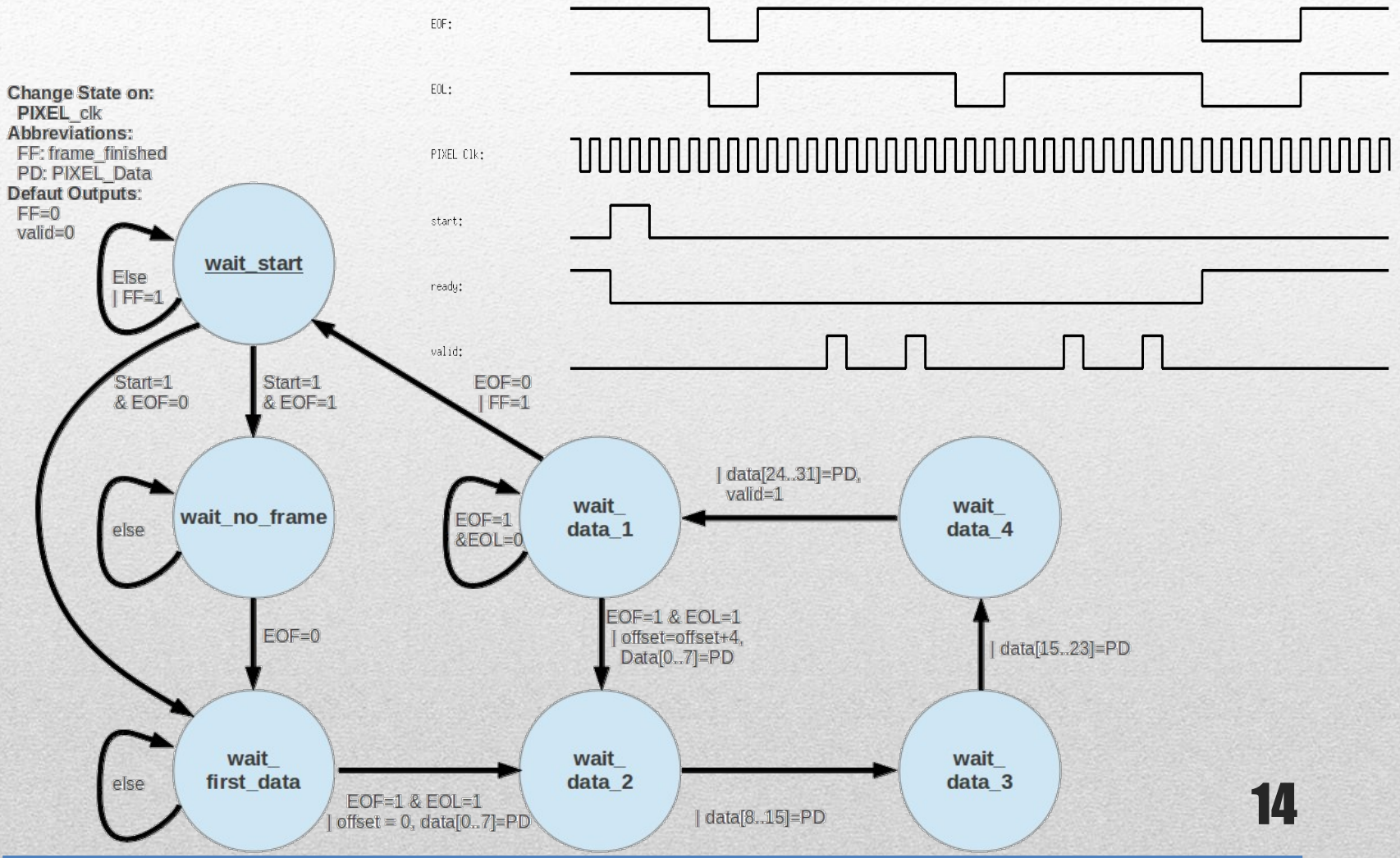
System Design

User Logic State Machine



System Design

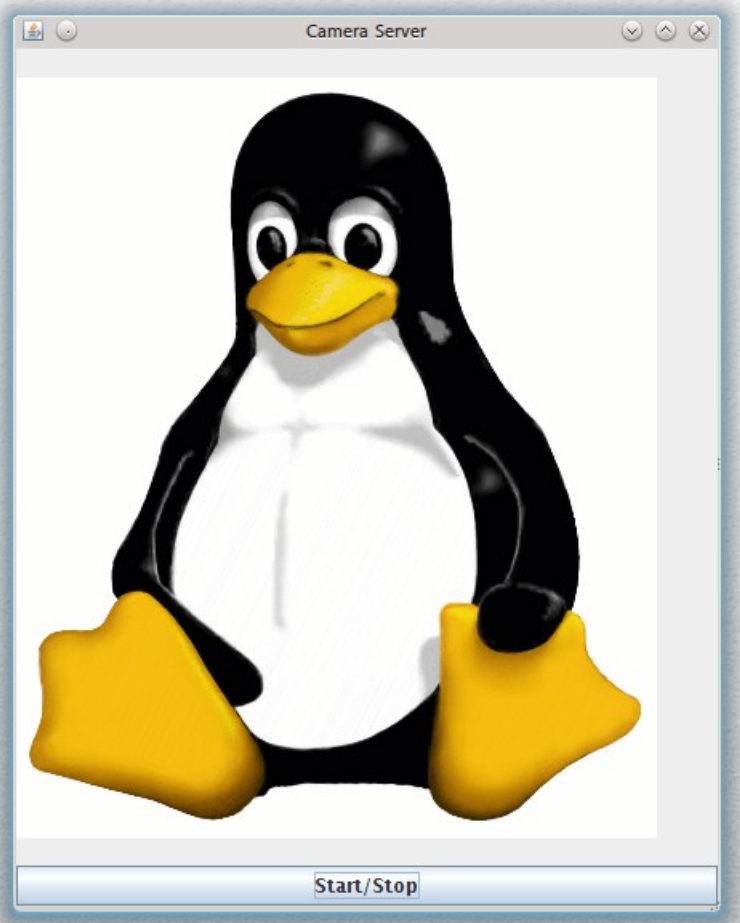
Deserializer State Machine



Progress

Camera interface module:

- Stream image from camera
- Store image data in DRAM
- Basic GUI



TODO

- Camera configuration over I2C
- UDP Communication
- Improve GUI
- Test with image generator and camera

- Questions?

- Thank you for your attention!