



# SNS COLLEGE OF TECHNOLOGY

Coimbatore-35  
An Autonomous Institution



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

### 19ECT312 – EMBEDDED SYSTEM DESIGN

III YEAR/ VI SEMESTER

3/30/2025

#### UNIT 1 – INTRODUCTION TO EMBEDDED SYSTEMS

#### TOPIC 2 –1.4 System design using general purpose processor

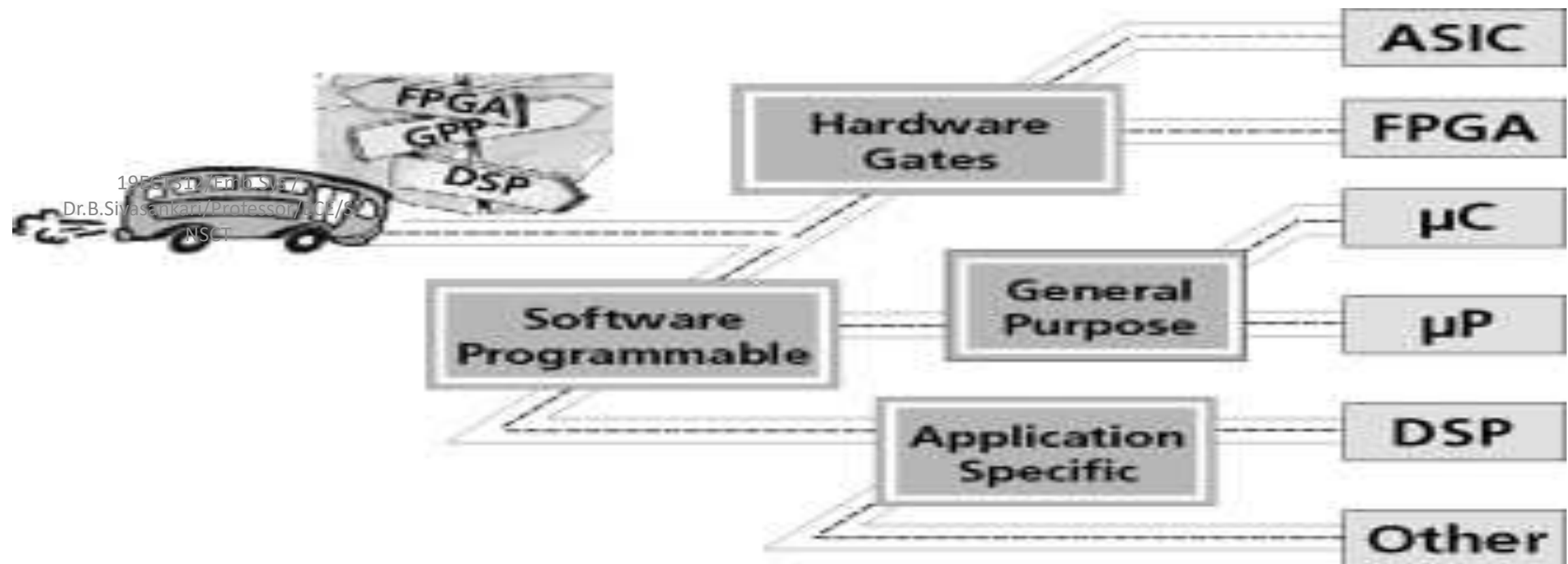


# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



General-purpose processors are the target processors that probably first come to mind to anyone writing a computer program.

GPPs are the processors that power desktop computers and are at the centre of the computer revolution that began in the 1970s.





# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



What is a general purpose processor in embedded system?

General Purpose Processor (GPP): GPP is **used for processing signal from input to output by controlling the operation of system bus, address bus and data bus inside** an embedded system.

General purpose microprocessors make use of **Von Neumann architecture** .

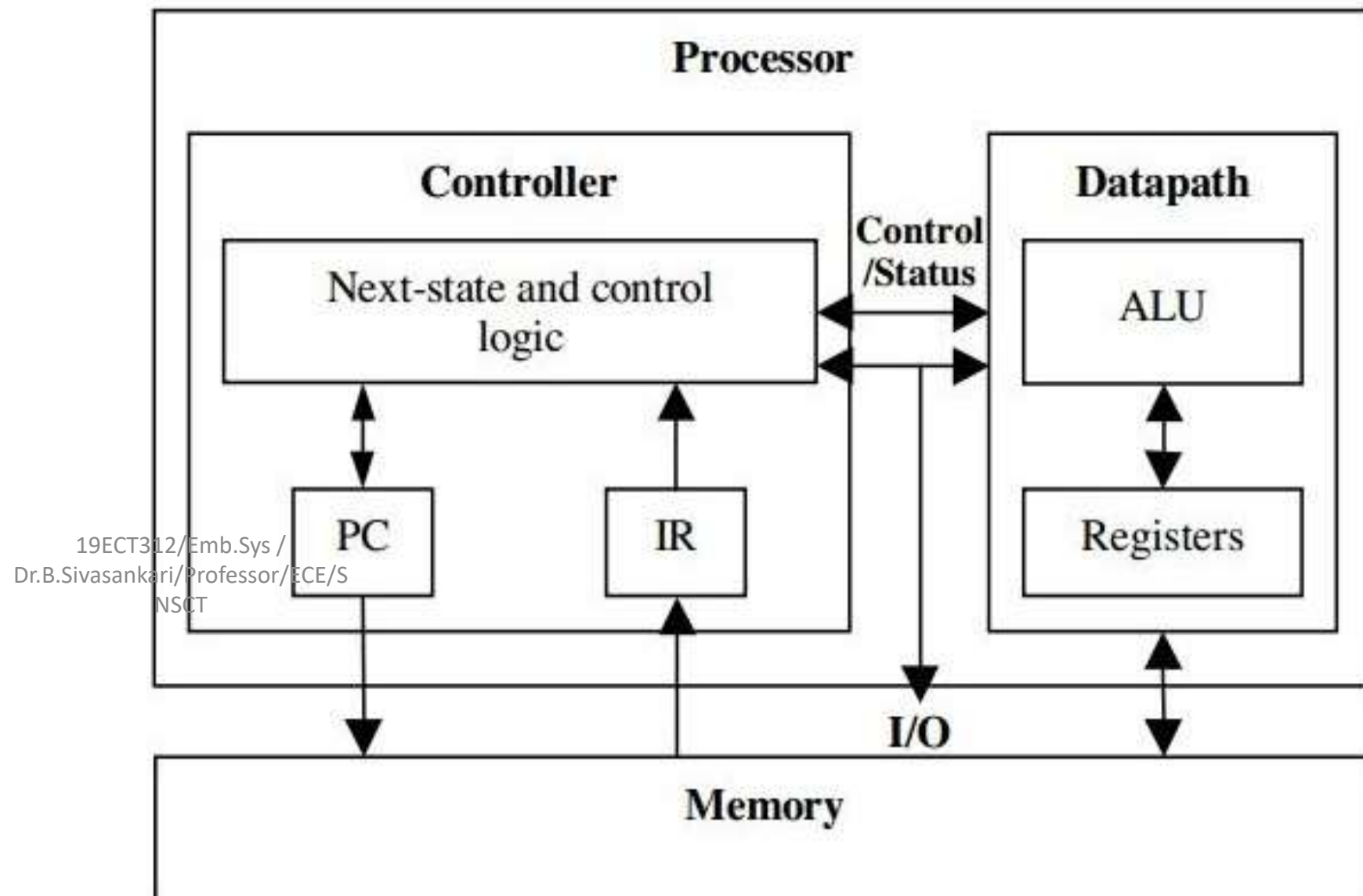
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# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



Figure : General-purpose processor basic architecture.



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# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



## Four General Embedded System Types

### ◆ General Computing

- Applications similar to desktop computing, but in an embedded package
- Video games, set-top boxes, wearable computers, automatic tellers

### ◆ Control Systems

- Closed-loop feedback control of real-time system
- Vehicle engines, chemical processes, nuclear power, flight control

### ◆ Signal Processing

- Computations involving large data streams
- Radar, Sonar, video compression

### ◆ Communication & Networking

- Switching and information transmission
- Telephone system, Internet

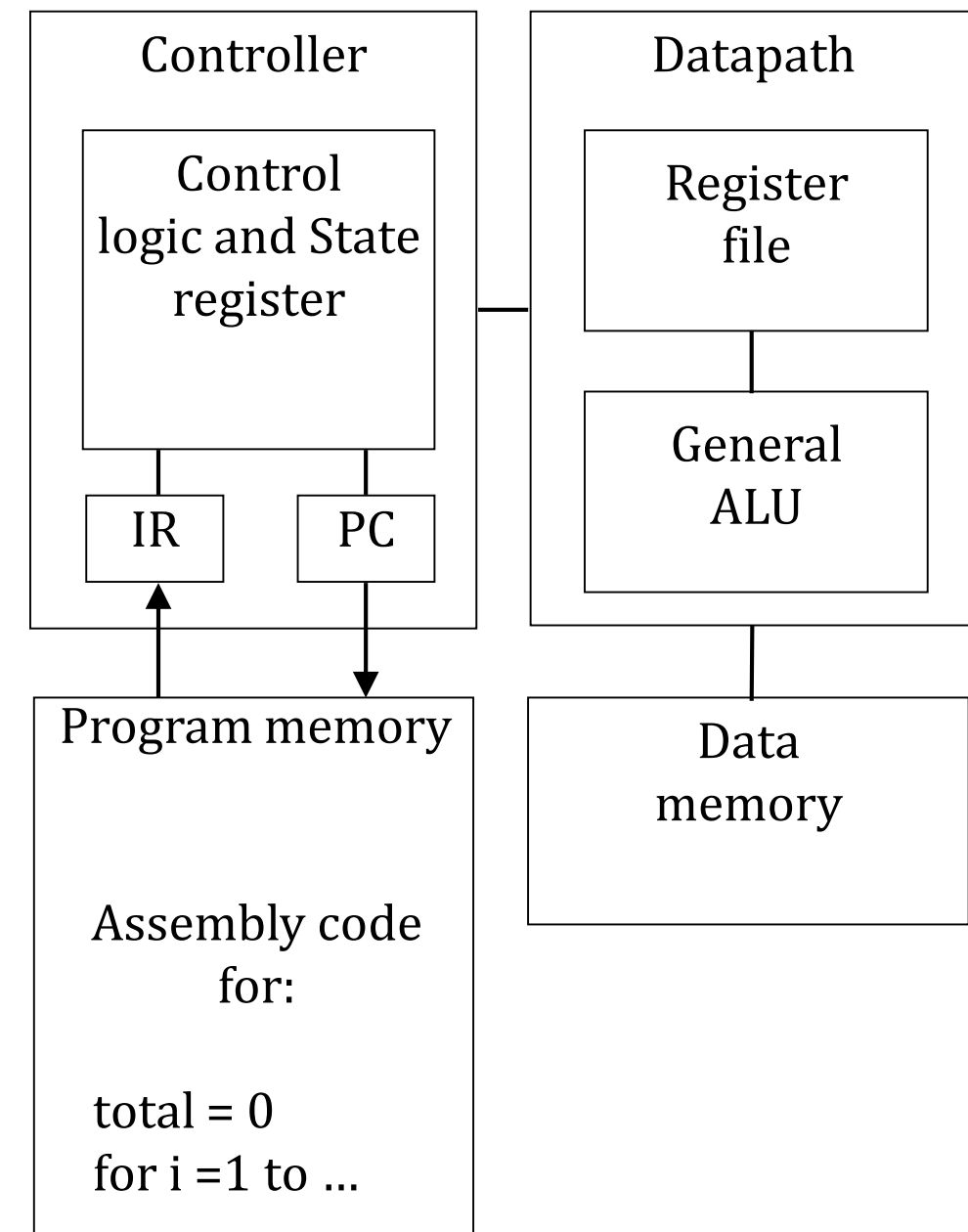




# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



- Programmable device used in a variety of applications
  - Also known as “microprocessor”
- Features
  - Program memory
  - General datapath with large register file and general ALU
- User benefits
  - Low time-to-market and NRE costs
  - High flexibility
- “Pentium” the most well-known, but there are hundreds of others



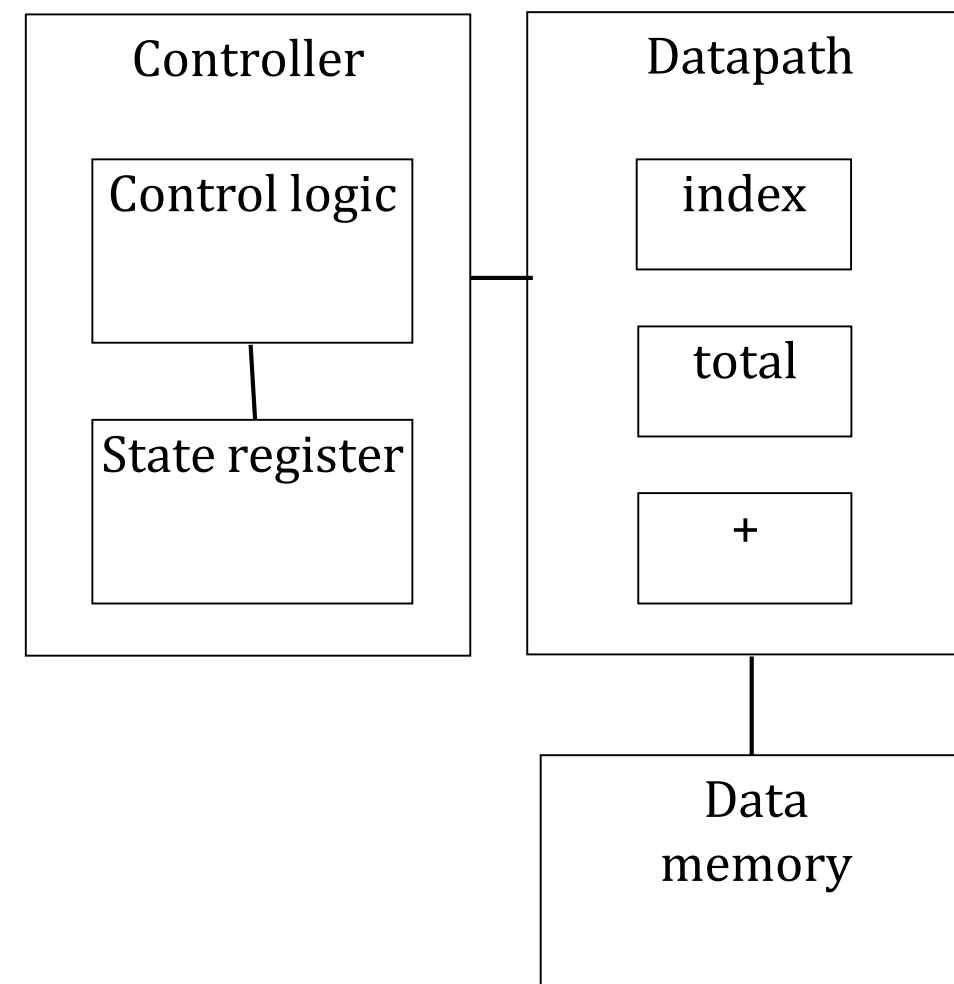


# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



## Single-purpose processors

- Digital circuit designed to execute exactly one program
  - a.k.a. coprocessor, accelerator or peripheral
- Features
  - Contains only the components needed to execute a single program
  - No program memory
- Benefits
  - Fast
  - Low power
  - Small size





# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



## ACTIVITY

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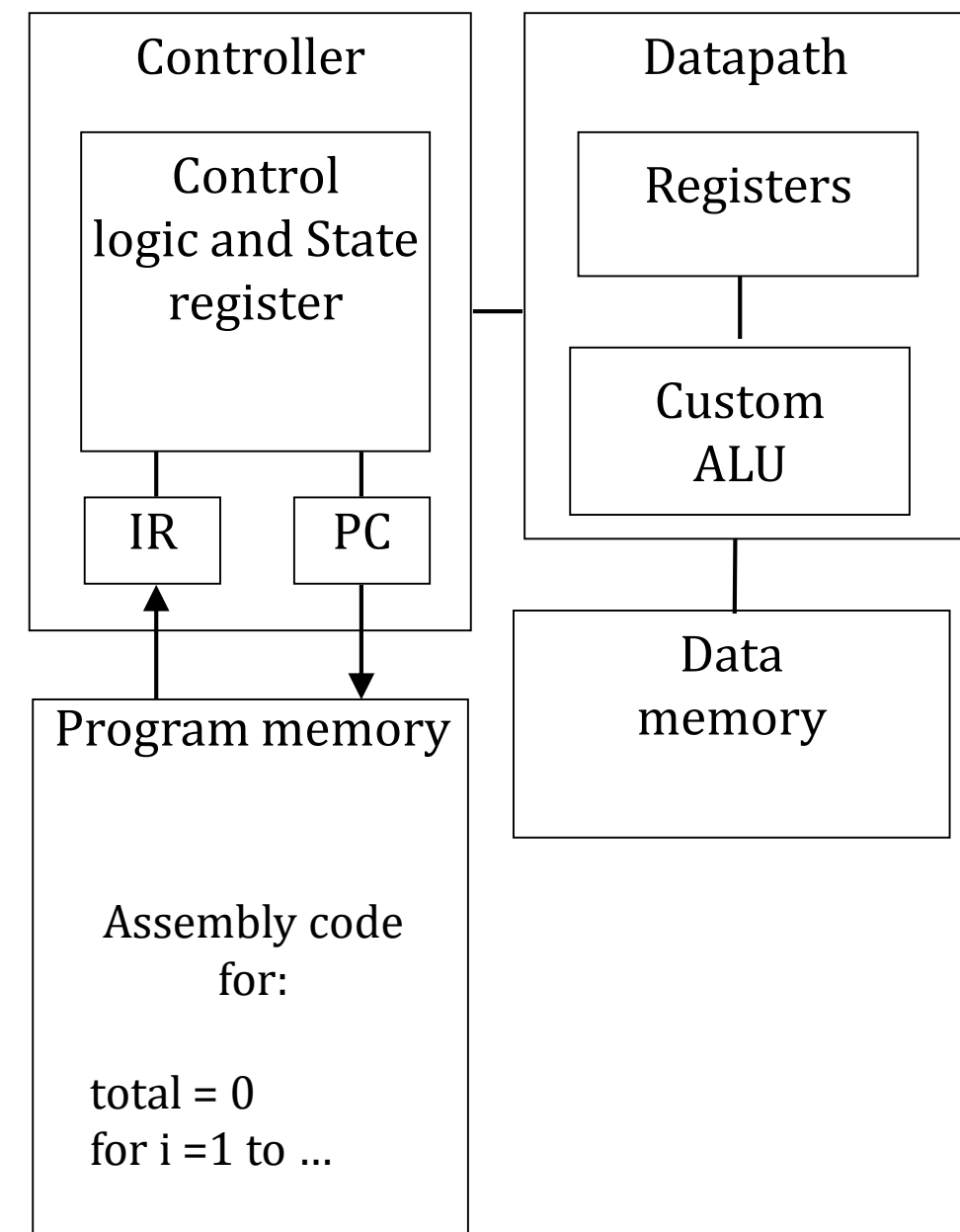


# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



## Application-specific processors

- Programmable processor optimized for a particular class of applications having common characteristics
  - Compromise between general-purpose and single-purpose processors
- Features
  - Program memory
  - Optimized datapath
  - Special functional units
- Benefits
  - Some flexibility, good performance, size and power
- DSP

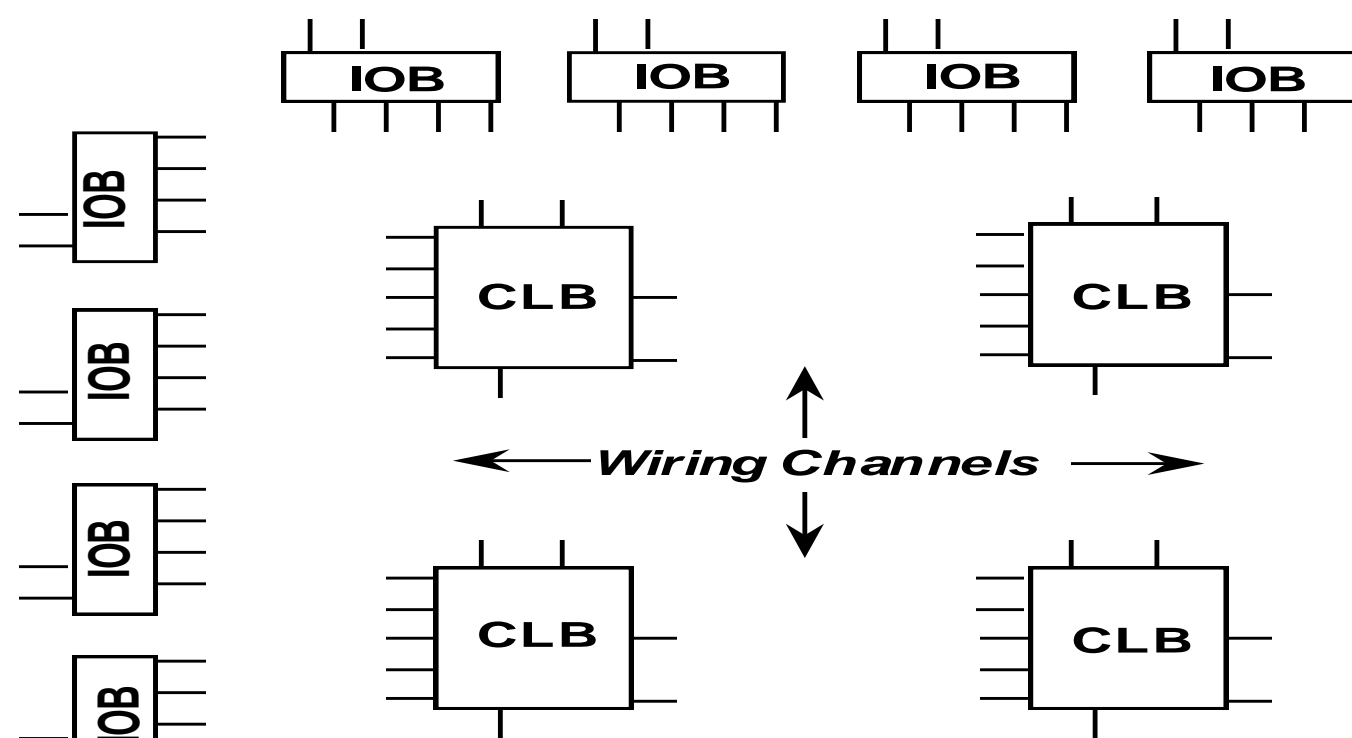




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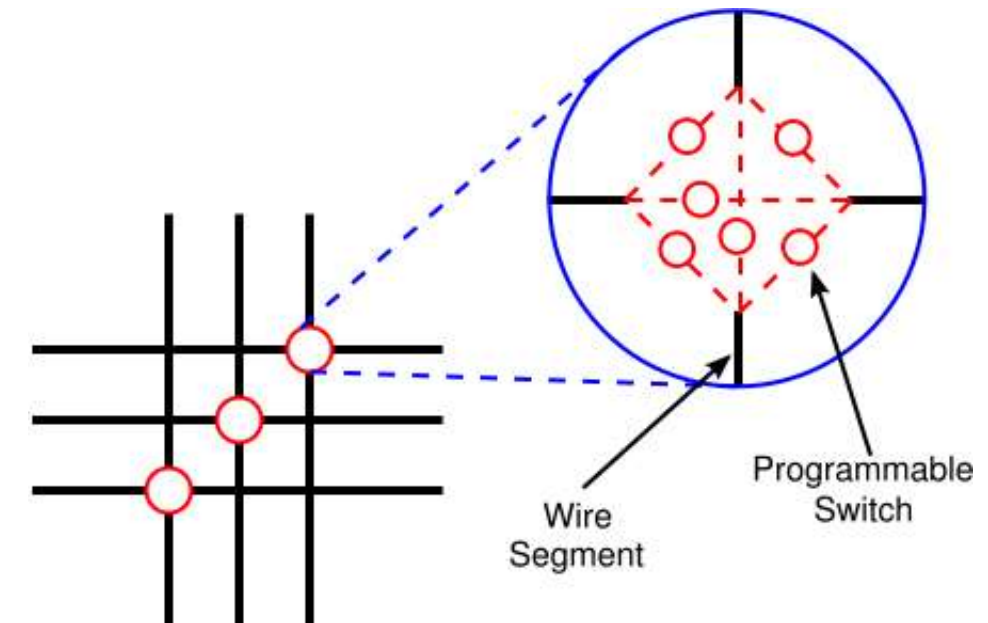
## FPGA Architecture



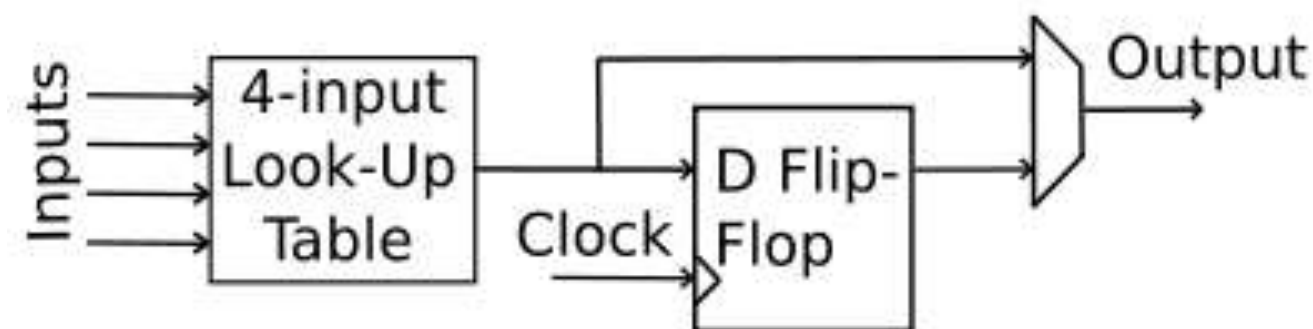
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FPGA layout with Configurable Logic Blocks (CLB) and I/O Blocks (IOB) (credit: Katz's Contemporary Logic Design)



Programmable switch at wiring intersection  
(credit: [www.wikipedia.com](http://www.wikipedia.com))





# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



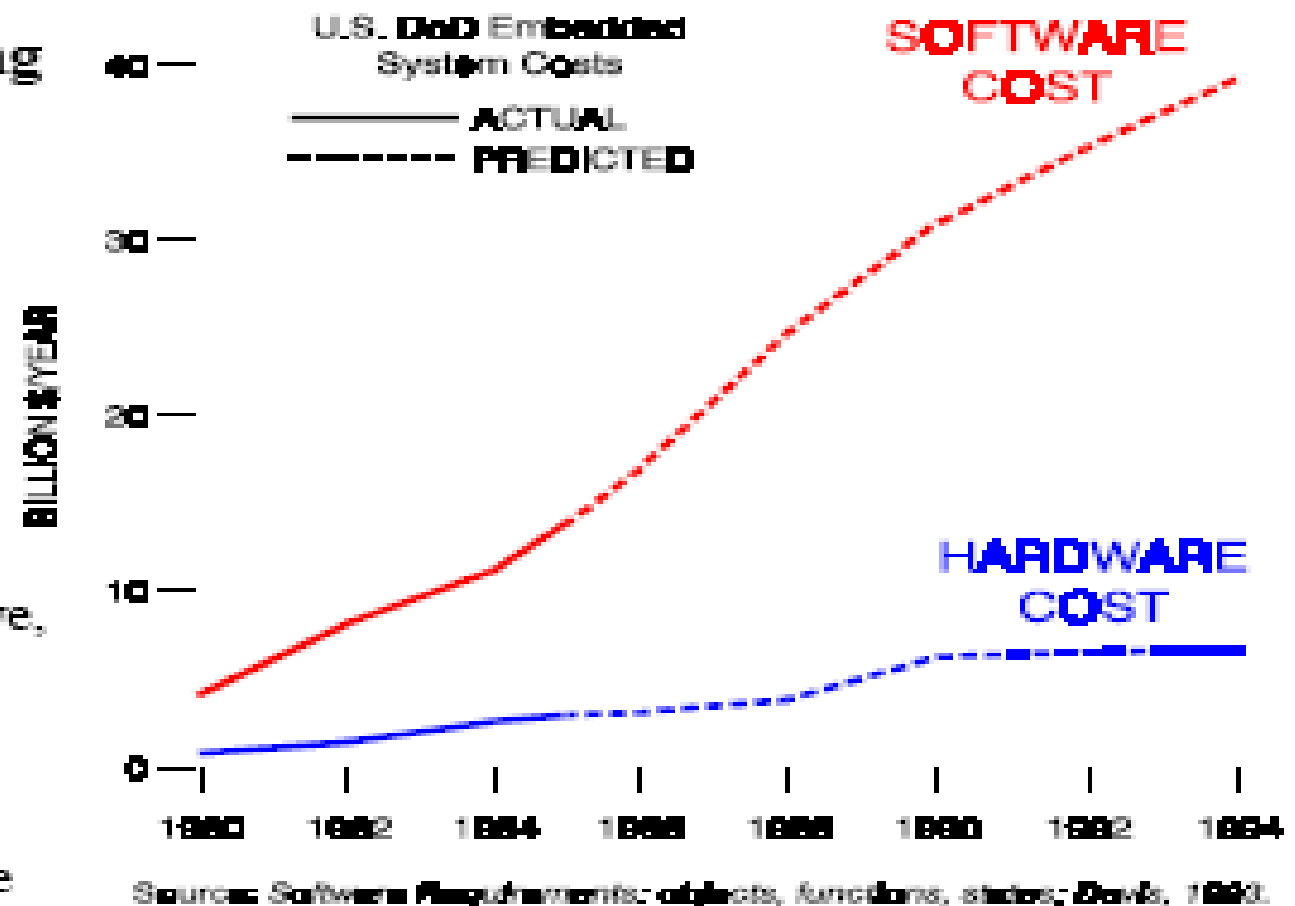
- Highly constrained products tend to use application specific processors
  - Many mobile phones (power & size constrained) contain ARM chips
  - Hi-Fi (high performance & time constrained) contain DSP chips

- ◆ **Hardware is mostly a recurring cost**

- Cost proportional to number of units manufactured

- ◆ **Software is a “one-time” non-recurring engineering design cost (NRE)**

- Paid for “only once”
  - But bug fixes may be expensive, or impossible
- Cost is related to complexity & number of functions
- Market pressures lead to feature creep
- **SOFTWARE Is Not FREE!!!!**

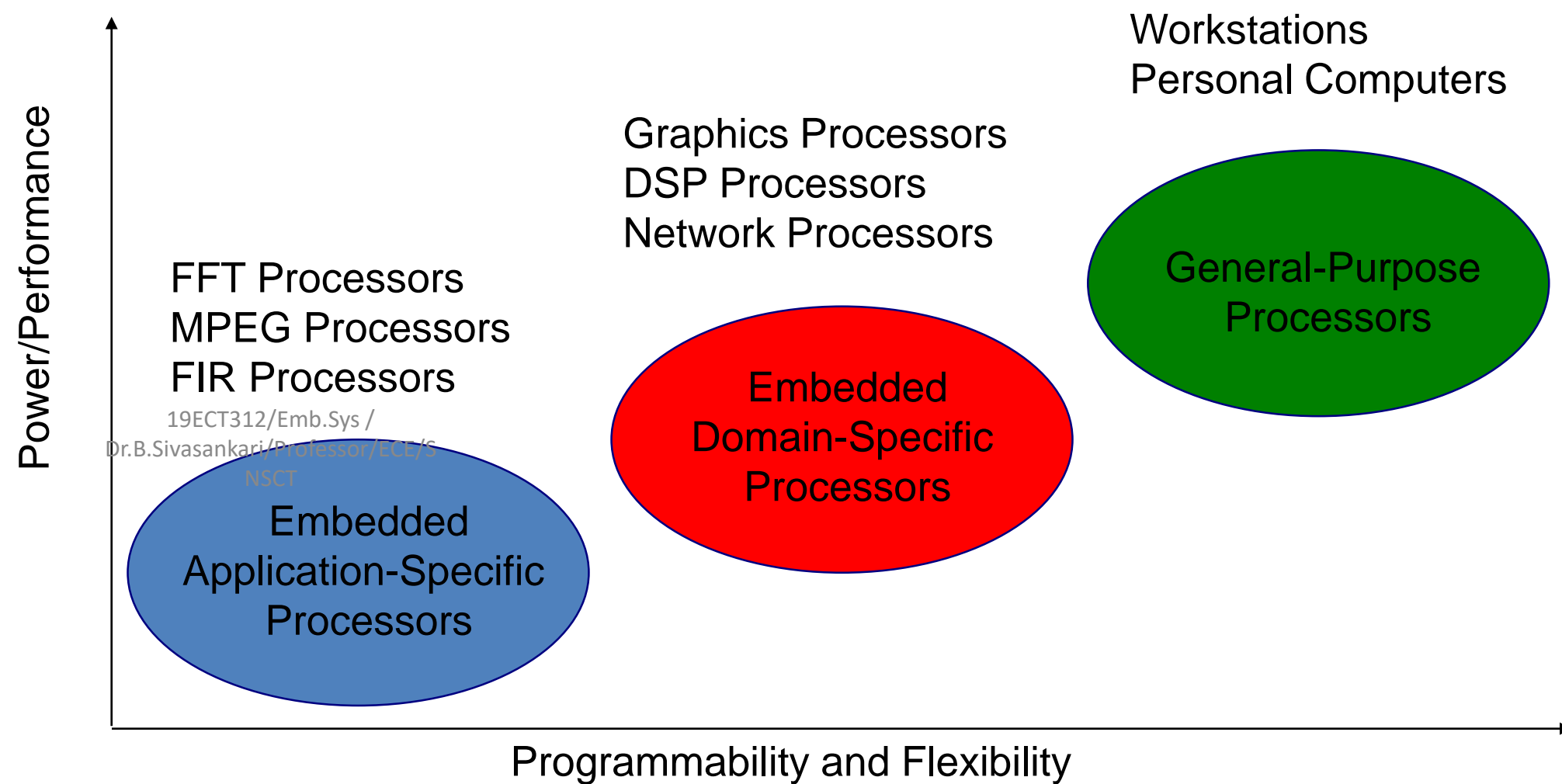




# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



## Hardware vs Software







# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



## Levels of Embedded System Design

- Specification
  - Design productivity increases with the level of abstraction
  - The task of functional verification is very difficult at low abstraction levels
- Implementation
  - Efficient implementations require to exploit the low-level features of the target architecture

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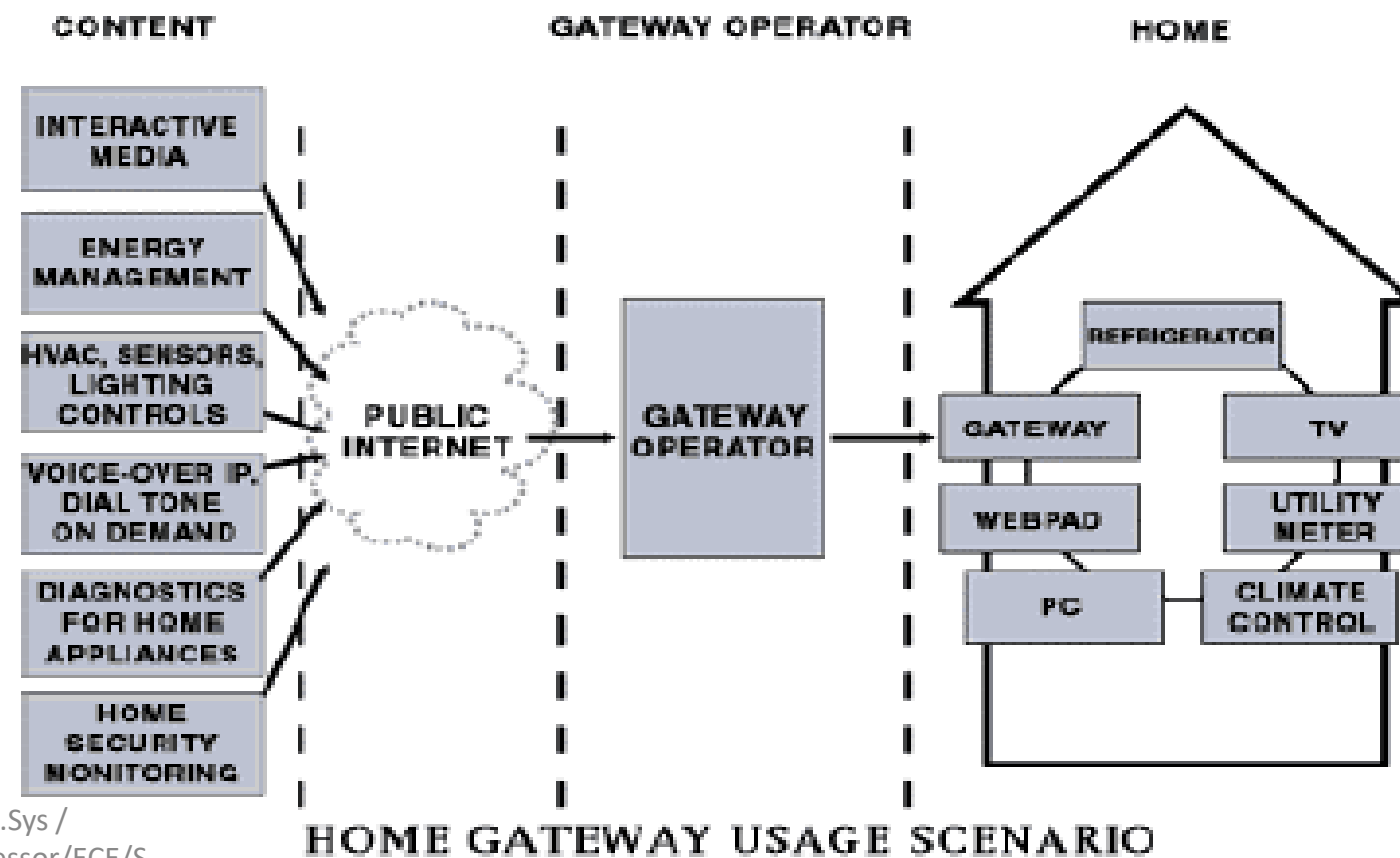




# SYSTEM DESIGN USING GENERAL PURPOSE PROCESSOR



## Future Embedded Systems



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- ◆ **Will people adopt this other than as a toy?**
  - Will the same people who can't set time on a VCR be able to debug their house?
- ◆ **If we can make the system readily accessible, reliable, affordable, ...the possibilities are almost endless**



# SUMMARY & THANK YOU

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