



Outline

Planned topics for this lesson:

- What is Software?
YES, YOU PROBABLY KNOW WHAT IS A SOFTWARE — BUT HOW ABOUT COMMERCIAL SOFTWARE, OPEN-SOURCE SOFTWARE, FREWARE, SHAREWARE, SAAS
- Functional vs Non-functional requirements in software development
IT'S PIVOTAL TO KNOW THE DIFFERENCE BETWEEN THE TWO — THESE CONCEPTS COLLECTIVELY SHAPE THE FOUNDATION OF EFFECTIVE SOFTWARE ENGINEERING PRACTICES
- What is Software Engineering?
BECAUSE YOU NEED A JOB IN IT AS SOFTWARE ENGINEER? OR YOU DON'T WANT TO BLOW STUFFS LATER WHEN YOU ARE A SOFTWARE ENGINEER?
- What are (development) frameworks?
THERE'S A LOT TO UNPACK HERE (AND HARD TO KEEP-UP) — RUBY ON RAILS, DJANGO, REACT, ANGULAR, UNITY, FLASK, SPRING-BOOT, TENSOR-FLOW, PYTORCH, ANDRUID ... AND ON TOP OF THAT, WHAT IS BOOTSTRAPPING ???



What is Software?

- A set of instructions that tell your computer what to do !
- Textbook definition:
 - I) Instruction (computer programs) that when executed provide desired features, function and performance
 - II) Data structures (Arrays, Object, List, Dictionary, Map) that enable programs to manipulate information
 - III) Descriptive information in both Hard Copy and virtual format describing the operation and use



Software refers to a set of instructions, data, and programs that are designed to control, operate, and interact with computer hardware to perform specific tasks or functions. It is a collection of computer programs, algorithms, and data that enable a computer system to execute various operations and provide desired outcomes.



DESIGN

Adobe Photoshop

Top graphic design/editing tool

PRODUCTIVITY

Gmail

Top mailing client

PRODUCTIVITY

Google Chrome

Most popular web browser

PRODUCTIVITY

Microsoft Office Excel

Top Spreadsheet tool

PRODUCTIVITY

Microsoft Office PowerPoint

Top Presentation Program

COLLABORATION

JIRA

Top Project Management tool



What is Software?

<pre> 7 main: 8 .LFB971: 9 .cfi_startproc <u>for_loop.s</u> 10 pushl %ebp 11 .cfi_def_cfa_offset 8 12 .cfi_offset 5, -8 13 movl %esp, %ebp 14 .cfi_def_cfa_register 5 15 pushl %ebx 16 andl \$-16, %esp 17 subl \$240, %esp 18 <u>.cfi_offset 3, -12</u> 19 movl %gs:20, %eax 20 movl %eax, 236(%esp) 21 xorl %eax, %eax 22 movl \$0, 28(%esp) 23 jmp .L2 24 25 .L3: 26 movl 28(%esp), %eax 27 movl \$99, %edx 28 subl %eax, %edx 29 movl %edx, %eax 30 leal 36(%esp), %ecx 31 movl 28(%esp), %edx 32 addl %ecx, %edx 33 movb %al, (%edx) 34 addl \$1, 28(%esp) 35 36 .L2: 37 cmpl \$99, 28(%esp) 38 jle .L3 39 movl \$0, 32(%esp) 40 jmp .L4 41 42 .L5: 43 leal 36(%esp), %edx 44 movl 32(%esp), %eax 45 addl %edx, %eax 46 movzbl (%eax), %eax 47 leal 136(%esp), %ecx 48 movl 32(%esp), %edx 49 addl %ecx, %edx 50 movb %al, (%edx) 51 addl \$1, 32(%esp) 52 53 .L4: 54 cmpl \$99, 32(%esp) 55 jle .L5 56 leal 136(%esp), %eax 57 movl %eax, 4(%esp) 58 movl \$_ZSt4cout, (%esp) 59 call _ZStlsISt11char_traitsIcEERSt13basic_ostreamIcT_ES5_PKc 60 movl \$0, %eax 61 movl 236(%esp), %ebx </pre>	<pre> 1 using namespace std; 2 #include <iostream> 3 4 const int array_length = 100; 5 int main() 6 { 7 char source[array_length]; 8 for(int i=0;i<=array_length-1;i++) 9 { 10 source[i] = array_length-1-i; 11 } 12 char destination[array_length]; 13 for(int i=0;i<=array_length-1;i++) 14 { 15 destination[i] = source[i]; 16 } 17 cout << destination; 18 return 0; 19 } </pre>
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Mapping of Assembly File to Source Code
 M. J. Hohnka, et al. (2019)

Evaluation of Computer Induced Vulnerabilities
 Journal of Aerospace Information Systems



What is Software?

- Software is a logical rather than physical component of computer based systems
- You can't touch it or taste it, or throw it under a bus
- What else does it mean?
 - **SOFTWARE IS DEVELOPED OR ENGINEERED — IT IS NOT MANUFACTURED IN THE TRADITIONAL SENSE**
 - **SOFTWARE DOESN'T WEAR-OUT — THERE IS NO PHYSICAL MATERIALS TO DEGRADE (AND THIS IS NOT THE MATRIX)**
 - **SOFTWARE IS "CONSTRUCTED" USING ABSTRACT NOTIONS OF LOGIC (PROGRAMS / INSTRUCTIONS)**
 - **"GOOD" SOFTWARE HAS TO MEET ALL SPECIFIC FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS**





What is Software?

Need for resilient and functionally correct software: e.g., Ariane 5 Rocket





What is Software?

The lesson of this 🤯 event :

- The software had tried to cram a 64-bit number into a 16-bit space. The resulting overflow conditions crashed both the primary and backup computers (which are both running the exact same software)
- The Ariane 5 had cost nearly \$8b to develop, and was carrying a \$500m satellite payload when it exploded.
- The software was originally developed for Ariane 4 rocket — where it worked !





Functional vs Non-Functional Requirement

Functional Requirement	Non-Functional Requirement
Product features	Product property
Describes the actions with which the user's work is concerned	Describes the experience of the user while doing the work
A feature or function that can be captured in use-cases	A global constraint and as such difficult to capture in use-cases
A behaviour that can be analysed via sequence diagrams or state machines	A software quality
Can be usually traced back to a single module / class / function	Usually cannot be implemented in a single module or even program

** Typical non-functional requirements include: Availability, maintainability, **performance**, privacy, **reliability**, scalability, and **security**



What is Software Engineering?

- Textbook definition:
 - I) Software Engineering is the field of computer science that deals with the building of software systems that are so large or so complex that they are built by a team or teams of engineers (Ghezzi et al. 2003)
 - II) Software Engineering encompasses a process, a collection of methods and an array of tools that allow professionals to build high quality computer software (Pressman)

**WHAT ABOUT DEVOPS?
IS IT SOFTWARE
ENGINEERING?**

→ **WELL, DEVOPS OUTLINES A SOFTWARE DEVELOPMENT PROCESS THAT INCREASES THE DELIVERY OF HIGHER QUALITY SOFTWARE BY INTEGRATING THE EFFORTS OF THE DEVELOPMENT AND IT OPERATION TEAMS**

DEVOPS = SOFTWARE ENGINEERING + IT OPERATIONS

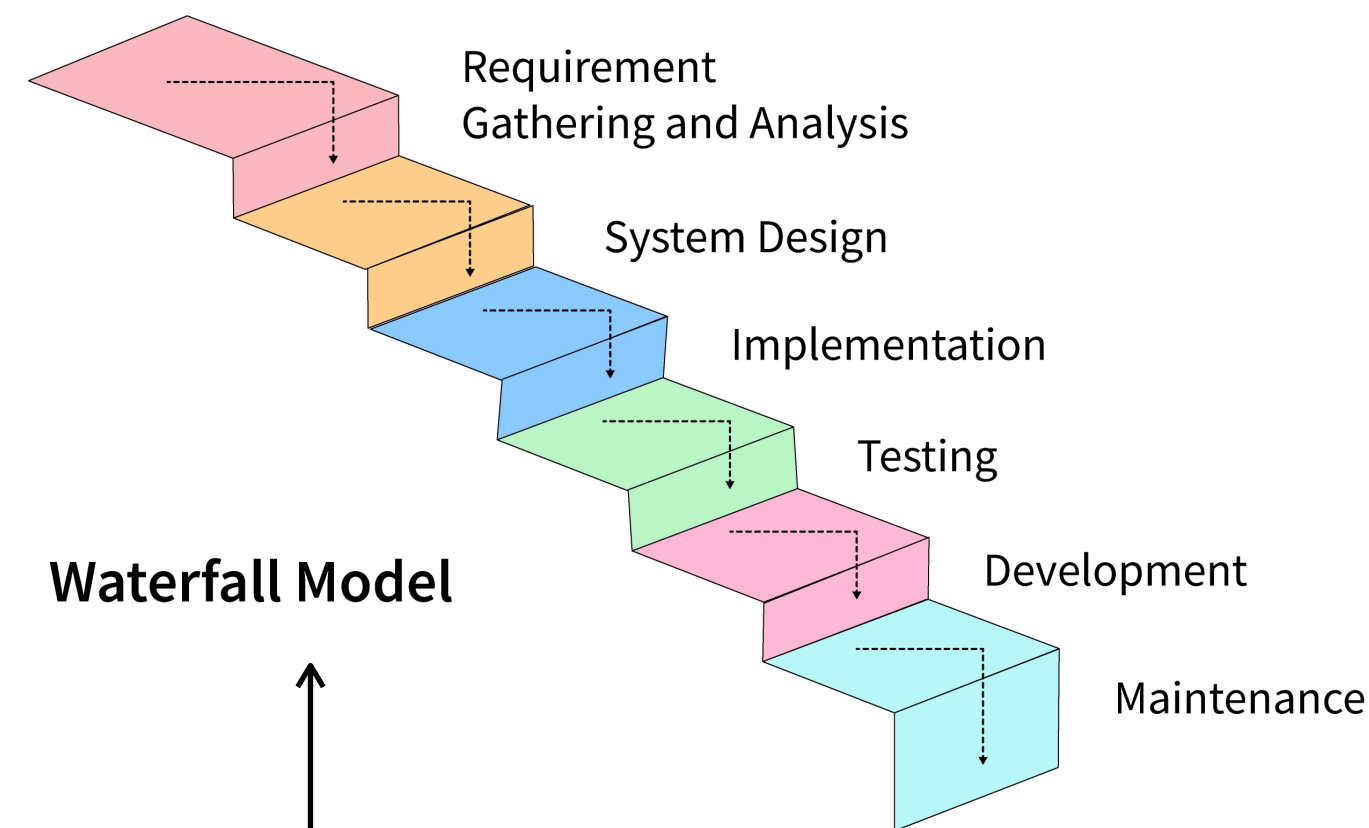
**WILL I GET MORE MONEY
AS A DEVOPS ENGINEER?**

→ **YES, YOU WOULD (ACCORDING TO GLASSDOOR AND INDEED), BUT YOUR ENTRY POINT IS NORMALLY SOFTWARE ENGINEERING ROLE**



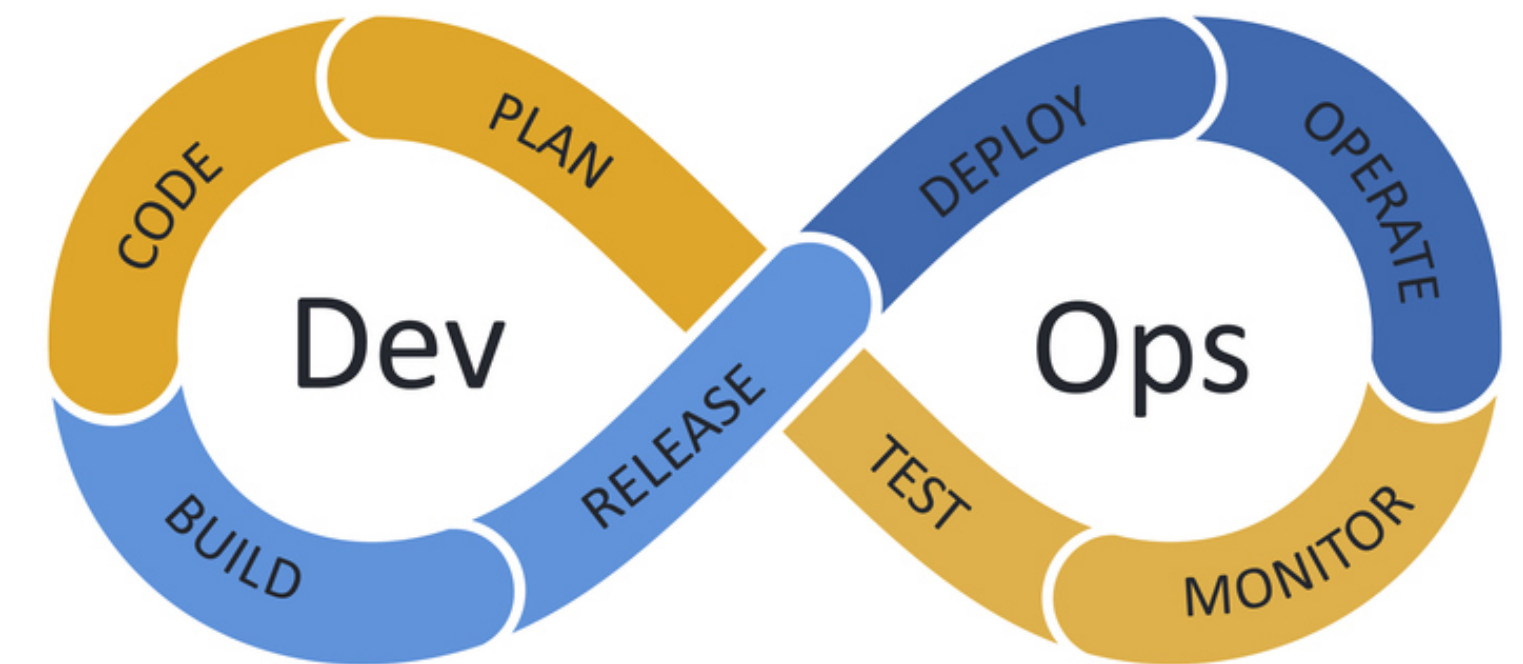
What are Software Development Life Cycles?

- SDLC refers to a process used by software engineers to design, develop, and test software.
- Each approach focuses on a different aspect of development, from planning to continuous improvement.



Waterfall Model

THIS "USED" TO BE THE WAY - BUT STILL APPLICABLE, OR COOL ?!

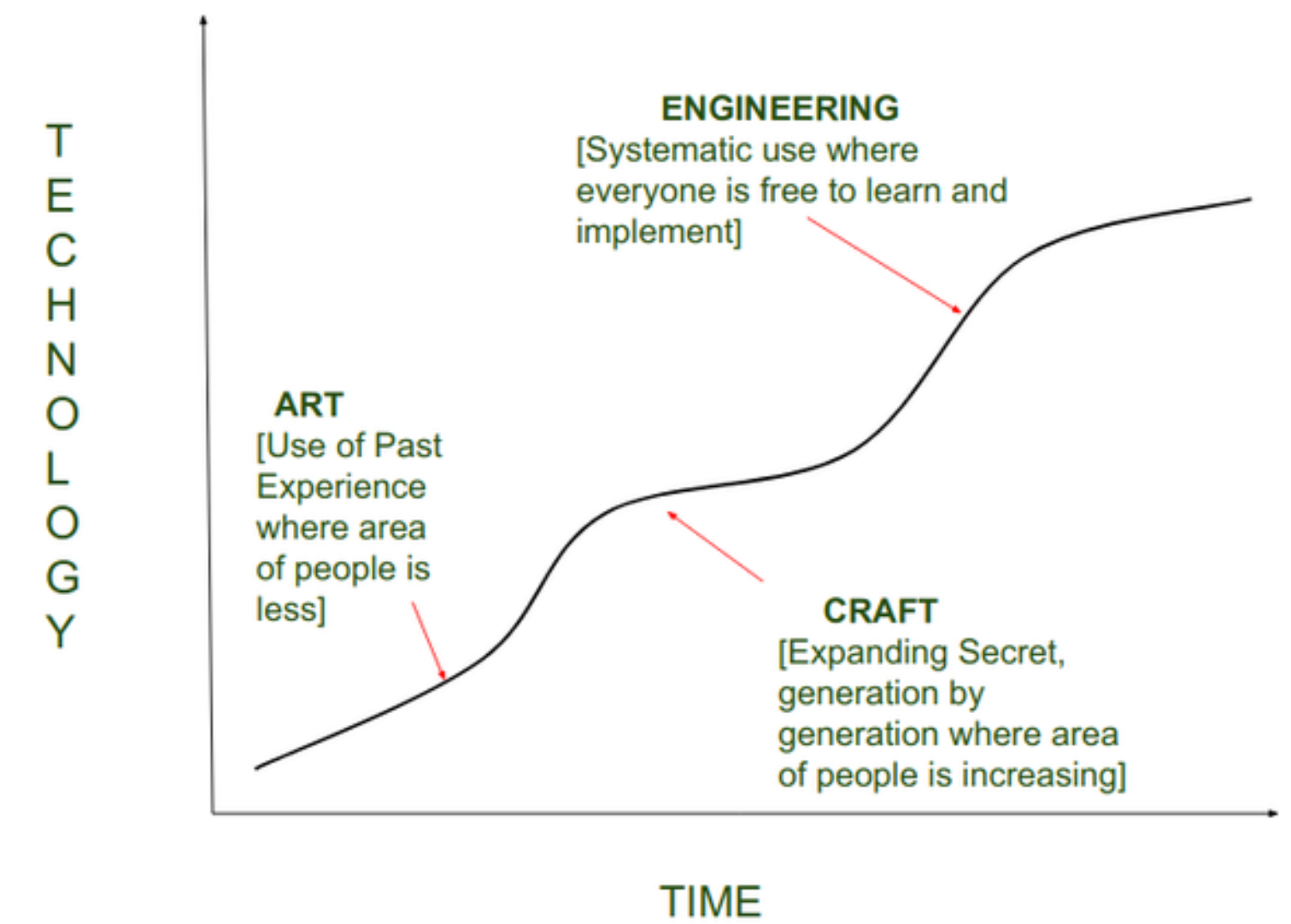


THIS IS THE WAY !





Software Engineering has Evolved

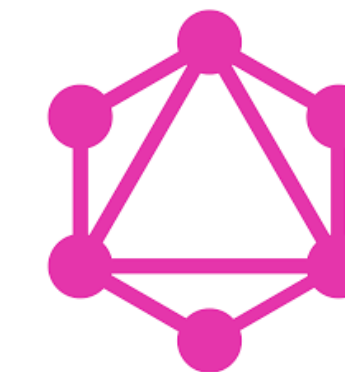
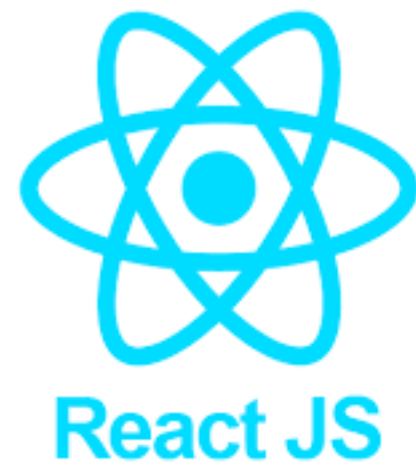


The emergence of trends in Agile software development, based on the first relevant publications in the IEEE and ACM digital libraries



Framework

Software engineers are spending more time configuring frameworks that writing codes !

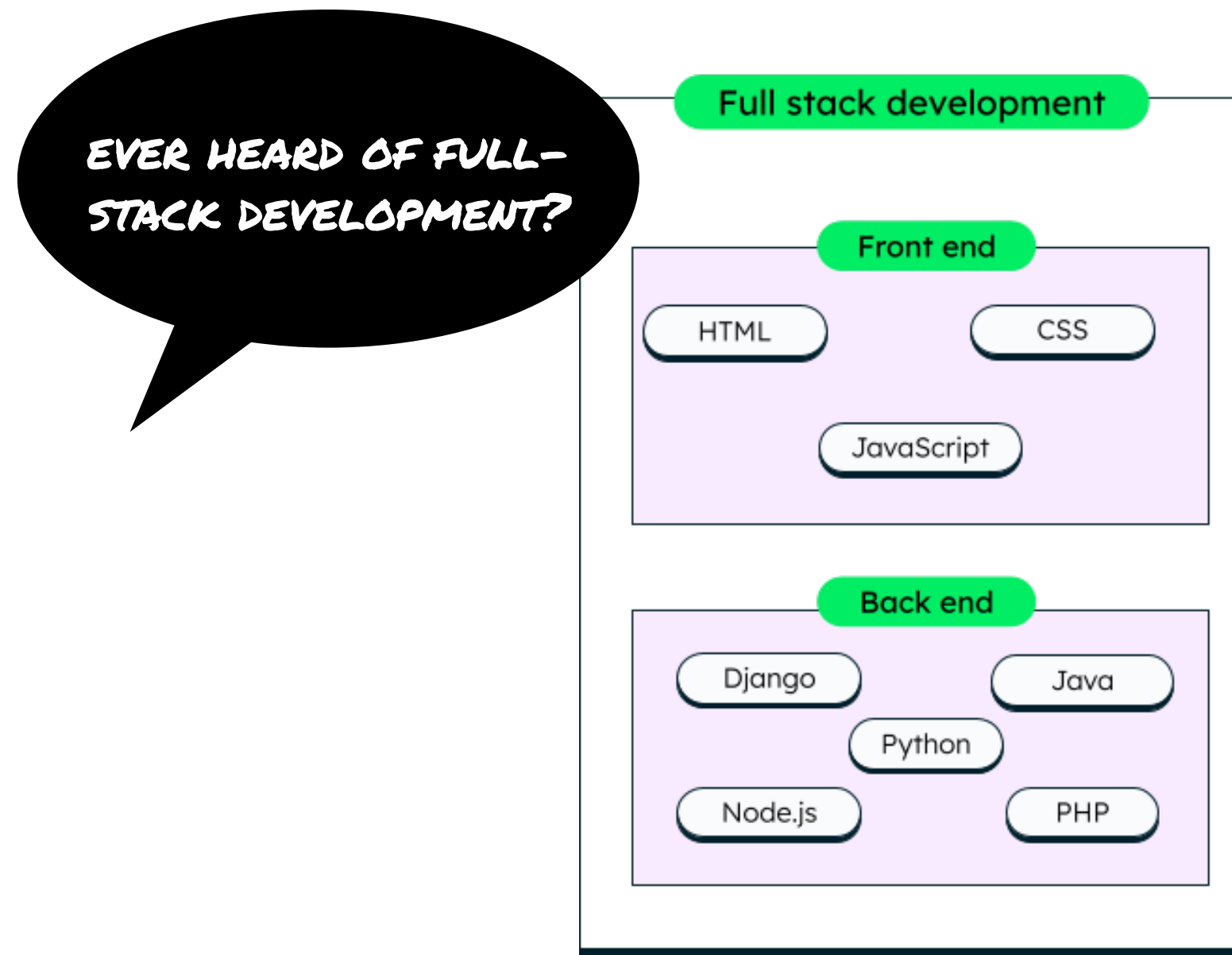




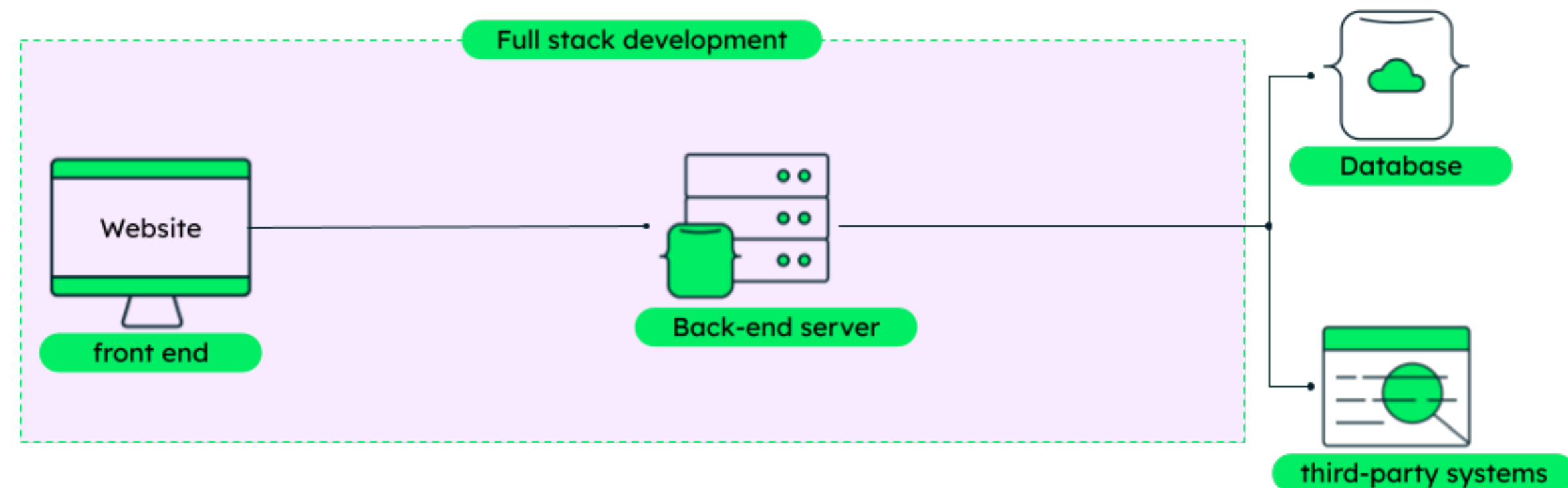
What is a Framework ?

- Software framework (in computer programming) is an abstraction in which common code providing generic functionality can be selectively overridden or specialise by user code providing specific functionality

OR SIMPLY, A SOFTWARE DEVELOPMENT TOOL WHERE ALL THE HARD WORK HAS BEEN DONE FOR YOU 😊




Full stack development refers to the end-to-end application software development, including the front end and back end.





What is a Framework ?

New in v5.3 Color mode support, expanded color palette, and more!




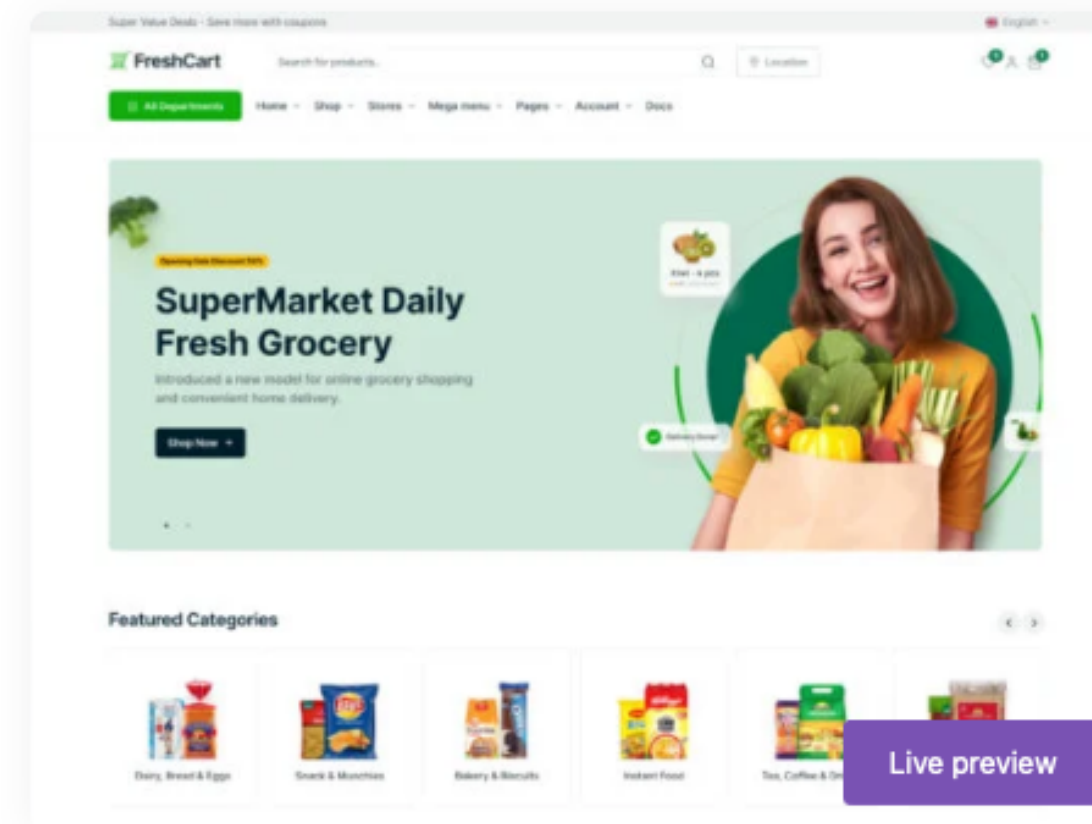
Build fast, responsive sites with Bootstrap

Powerful, extensible, and feature-packed frontend toolkit. Build and customize with Sass, utilize prebuilt grid system and components, and bring projects to life with powerful JavaScript plugins.

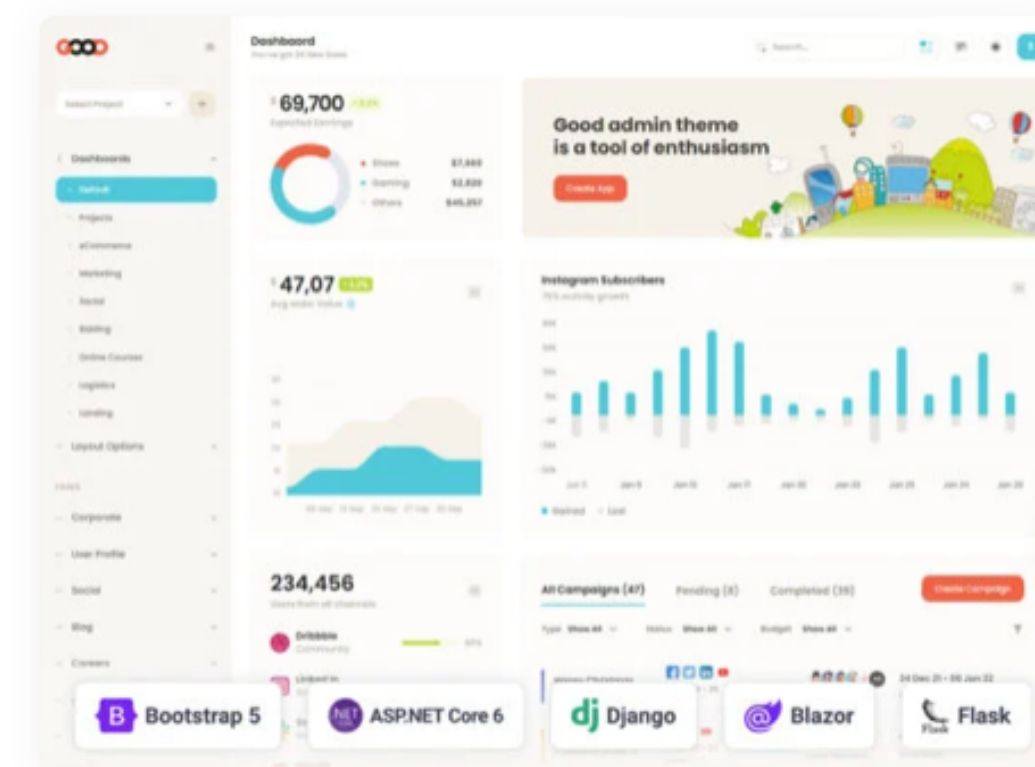
`$ npm i bootstrap@5.3.1` [Read the docs](#)

Currently v5.3.1 · [Download](#) · [All releases](#)

 Your new development career awaits. Check out the latest listings. ads via Carbon



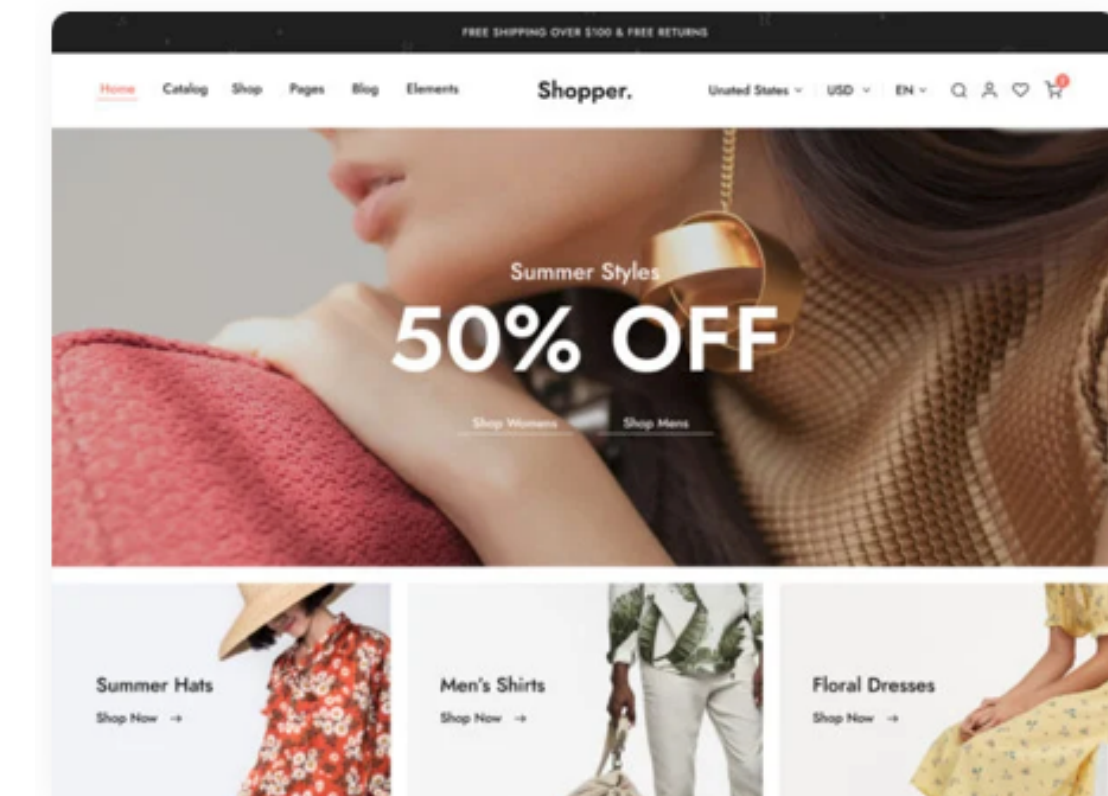
FreshCart – eCommerce HTML Template \$49.00
E-Commerce & Retail ★★★★★



Good – Bootstrap 5 Admin Dashboard Template \$49.00
Admin & Dashboard ★★★★★



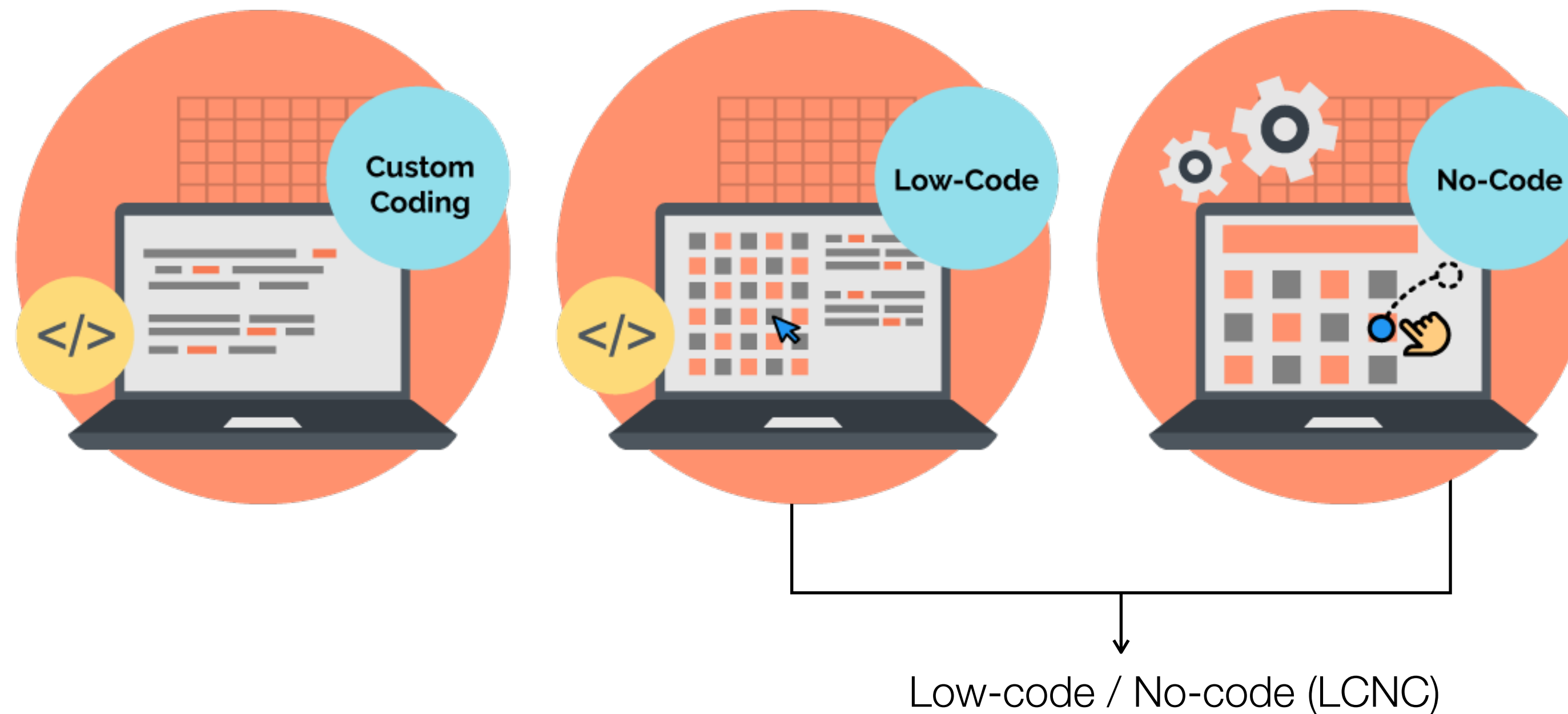
Social – Network, Community and Event Theme Application \$49.00
★★★★★



Shopper – Multipurpose E-Commerce Template \$49.00
E-Commerce & Retail ★★★★★



Software Development has Evolved



- I) Low-code is a method of designing and developing applications using intuitive GUI and embedded functionalities that reduce traditional pro-code writing requirements.
- II) Similar to Low-code, but for non-technical business users allowing them to develop softwares / applications without having to write a single line of code.