Digital Design and Verification Training

Getting Started

Agenda

- Introductions
- Course Overview
- Administrative Information
- Basics of C

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Trainee's Introduction

- Now it's your turn

Training Overview

- Training objectives
  - Develop a strong foundation in digital design principles and computer architecture
  - Bridge the gap between academic knowledge and industry requirements
  - Cultivate practical skills in digital design tools and methodologies
  - Foster teamwork and communication skills essential for professional engineering environments

What you can Expect

- 1 month of coaching ~ 10k a month
  - Week-1: Productivity Tools
  - Week-2: Digital Systems Design
  - Week-3: Computer Architecture
  - Week-4: Digital Systems Verification
- Hands on Projects ~ 10k a month
  - Complex datapaths and controllers
  - RISCV Microprocessor System Design
  - Verification
  - Software
  - Just like you’re working in a company

What is Expected of You

- Attendance
- Performance in Multiple Evaluations
    - Knowledge
    - Skill
    - Speed

What is Expected of You

- Top-notch Communications
  - Daily Updates
    - What you have done today.
    - What you’re going to do tomorrow.
    - Are there any roadblocks?
  - Clarity and Accuracy
    - Spoken and Written
- Independence
  - Task assignment to task completion
  - Doesn’t stop you from collaboration

Timings

- Monday to Friday, 09.00 am to 04.00 PM
- Coaching
  - 09.00 am to 12.00 pm
  - Will include a couple of small breaks.
  - May end earlier than the allocated time.
- Hands on Lab Sessions
  - 12.00 pm to 04.00 pm

What's Next

- Internship - 30k to 40k a month
    - Xcelerium’s Proprietary Projects
- Full-Time Job - 130k to 150k a month

Administrative Information

- Reporting procedure
- Slack information
- https://join.slack.com/t/xceleriumdigi-t6v9440/shared_invite/zt-3bif7sic2-YyHNbEca0DAqMuGnqK86iQ

Linux Shell Scripting

Digital Design and
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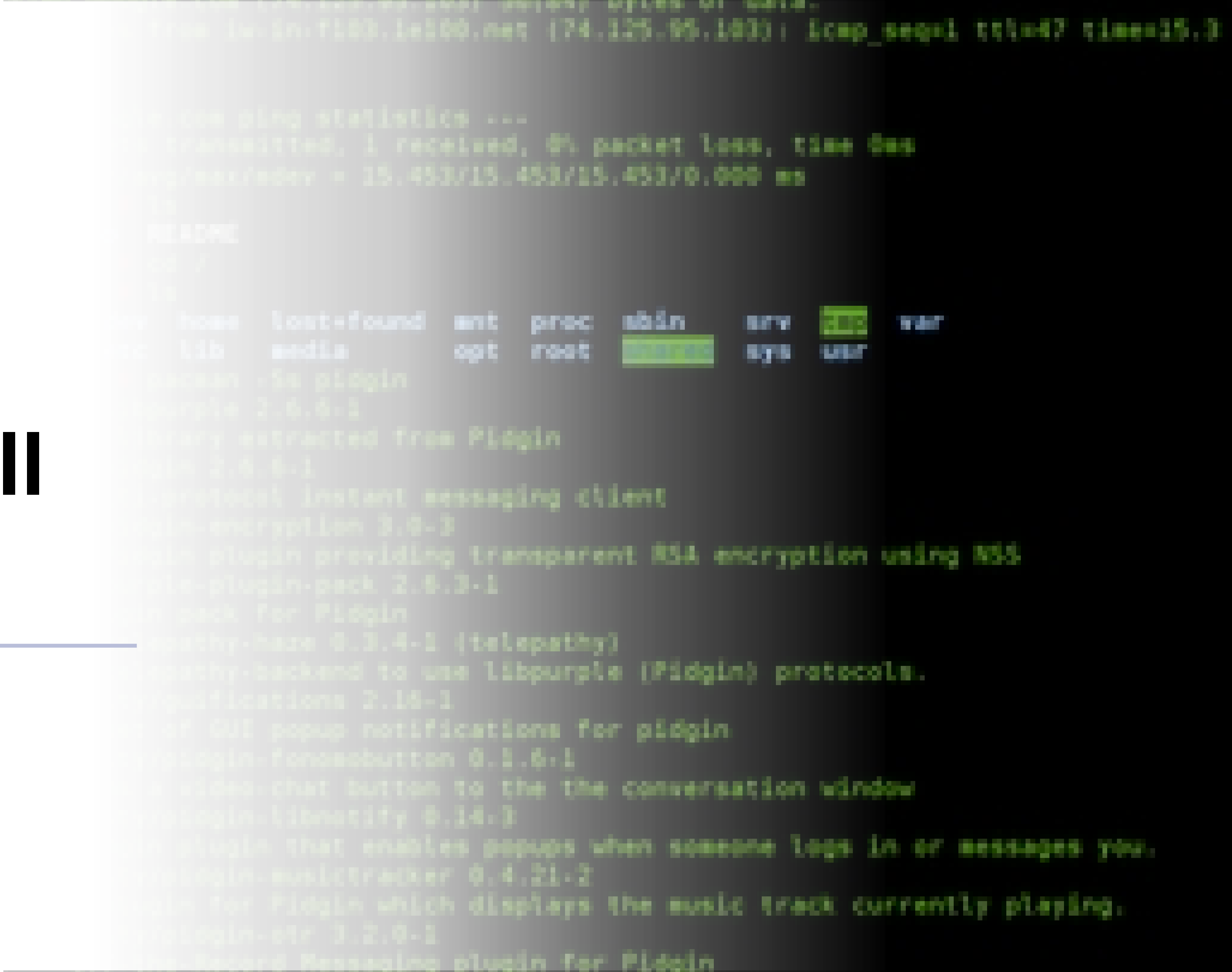

Linux Shell Scripting

- A shell is a program that commands the operating system to perform actions.
- You can enter commands in a console on your computer and run the commands directly, or you can use scripts to run batches of commands.
- Shells like PowerShell and Bash give system administrators the power and precision they need for fine-tuned control of the computers they're responsible for.

Shell Commands

- The full syntax for a Bash command is:

```
command [options] [arguments]
```

- Which options and arguments varies from command to command. To learn about the options for a command, use the man (for "manual") command.

```
man <command>
```

File and Directory Commands

- Make directory
  - `mkdir <name>`
- Navigating – `cd <option>`
  - `cd ~`
  - `cd ..`
- List Contents
  - `ls <name>`
- Removing directory
  - if empty – `rmdir <name>`
  - Not empty – `rm –r <name>`
- Copy files or directories
  - `cp <source> <dest>`
- Move or rename files or directories
  - `mv <source> <dest>`

Text Processing and File Commands

- Creating
  - `touch <file-name>`
- Concatenate and display file content
  - `cat <file-name>`
- Search text using patterns
  - `grep <pattern>`
- Replace Text in a file:
  - `sed <text.to.replace> <file_name>`

System Information

- Print system information: `uname`
- Display Linux processes: `top`
- Report a snapshot of the current processes: `ps`

Copy command – cp

- Copy files and directories

```
cp <name-to-be-copied> <name-of-the-copy>
```

  - if you use the -i (for "interactive") flag, Bash warns you before deleting existing files.

```
cp -i hello.txt bye.txt
```

  - copy all the files in the current directory to a subdirectory subdir1

```
cp * subdir1
```

  - To copy all the files in a subdirectory named subdir1 into a subdirectory named subdir2

```
cp subdir1/* subdir2
```

Basics of C Language

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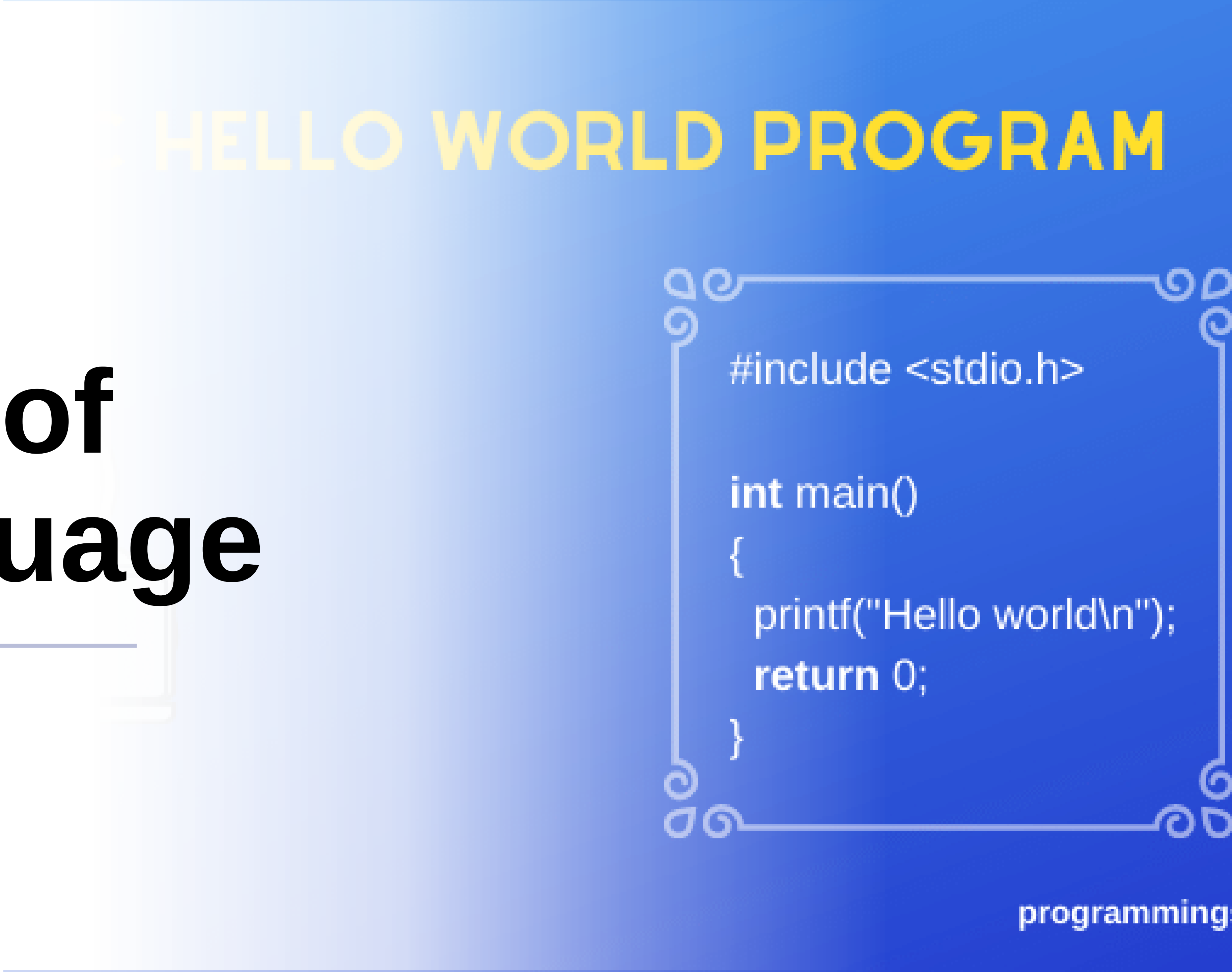

```
#include <stdio.h>

int main()
{
  printf("Hello world\n");
  return 0;
}
```

Quick Revision - C Language Essentials

- Basic syntax and structure
- Data types and variables
- Operators and expressions
- Control structures (if, switch, loops)
- Functions
- Arrays and strings

Basic Syntax and Structure

- Structure of a C program:

```
#include <stdio.h> // Preprocessor directive
int main()
{ // Main function
// Your code here
return 0; }
```

Basic Syntax and Structure

- Basic data types

```
int age = 25;
float pi = 3.14;
double precise_pi = 3.14159265359;
char grade = 'A';
```

- Size of data types

```
printf("Size of int: %zu bytes\n", sizeof(int));
printf("Size of float: %zu bytes\n", sizeof(float));
printf("Size of double: %zu bytes\n", sizeof(double));
printf("Size of char: %zu bytes\n", sizeof(char));
```

Basic Syntax and Structure

- Operators and Expressions

```
int a = 10, b = 3;
printf("Sum: %d\n", a + b); // 13
printf("Difference: %d\n", a - b); // 7
printf("Product: %d\n", a * b); // 30
printf("Quotient: %d\n", a / b); // 3
printf("Remainder: %d\n", a % b); // 1
```

- Increment/Decrement

```
int x = 5;
printf("x: %d\n", x++); // Prints 5, then x becomes 6
printf("x: %d\n", ++x); // x becomes 7, then prints 7
```

Basic Syntax and Structure

- If-else example

```
int score = 95;
if (score >= 90)  { printf("Grade: A\n"); }
else if (score >= 80) { printf("Grade: B\n"); }
else if (score >= 70) { printf("Grade: C\n"); }
else { printf("Grade: F\n"); }
```

Basic Syntax and Structure

- Switch example

```
char grade = 'B';
switch (grade) {
case 'A':
    printf("Excellent!\n");
   break;
case 'B':
   printf("Good job!\n");
   break;
```

```
case 'C':
   printf("Average
performance.\n");
   break;
default:
    printf("Need
improvement.\n"); }
```

Basic Syntax and Structure

- For loop

```
for (int i = 0; i < 5; i++)
{ printf("%d ", i); } // Output: 0 1 2 3 4
```

- While loop

```
int n = 1;
while (n <= 5) {
printf("%d ", n * n);
n++; } // Output: 1 4 9 16 25
```

Basic Syntax and Structure

- Function definition and call:

```
int square(int x)
{ return x * x; }
int main() {
int num = 4;
printf("Square of %d is %d\n", num, square(num));
return 0;
}
```

Basic Syntax and Structure

- Array initialization and access

```
int numbers[] = {1, 2, 3, 4, 5};
for (int i = 0; i < 5; i++)
{ printf("%d ", numbers[i]); }
```

Basic Syntax and Structure

- String operations

```
char str1[20] = "Hello";
char str2[] = " World";
strcat(str1, str2);
printf("Concatenated string: %s\n", str1);
printf("Length: %zu\n", strlen(str1));
```

Basic Demo

`#include <stdio.h>`
`#include <string.h>`
`#define MAX_NAME_LENGTH 50`
`void greet(char* name)`
`{ printf("Hello, %s!\n", name); }`
`int main() {`
`char name[MAX_NAME_LENGTH];`
`printf("Enter your name: ");`
	`fgets(name, MAX_NAME_LENGTH, stdin);`
	`name[strcspn(name, "\n")] = 0; // Remove newline`
	`greet(name);`
	`printf("Let's count to 5:\n");`
	`for (int i = 1; i <= 5; i++)`
	`{ printf("%d ", i); }`
	`printf("\n");`
	`return 0; }`