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Training Day - 7 Report:

Regular Expressions (Regex) in Bash

Regular Expressions (Regex) are essential tools for anyone working with text processing in Bash. By mastering Regex, you can efficiently search, match, and manipulate text in ways that would otherwise be difficult or time-consuming. This guide covers the fundamentals of Regex in Bash, with examples and techniques to help you apply Regex to real-world scenarios.

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1. Introduction to Regex

Regular Expressions (Regex) are used for searching, filtering, and manipulating text. They provide a way to define patterns that can be used to match strings of characters such as specific words, numbers, or any desired pattern. Bash supports regular expressions and allows you to incorporate them in shell scripts for tasks like file searching and text manipulation.

2. Basic Regex Patterns

Character Matching

- **.** : Matches any single character (except newline)
- ***** : Matches zero or more of the preceding character
- **+** : Matches one or more of the preceding character
- **?** : Matches zero or one of the preceding character

Examples:

Match any three-character word

```
echo "cat dog bat" | grep '...'

# Match words starting with 'c'
echo "cat dog car bat" | grep '^c'
```

3. Regex Special Characters

Character Classes

- **[abc]** : Matches any single character in the set (a, b, or c)
- **[^abc]** : Matches any single character NOT in the set
- **[0-9]** : Matches any digit
- **[a-zA-Z]** : Matches any letter (lowercase or uppercase)

Anchors

- ^ : Start of line
- **$** : End of line
- **\b** : Word boundary

4. Bash Regex Operators

In Bash, you can use regular expressions with operators in conditional statements to perform pattern matching.

Comparison Operators

- =~ : Regex match operator in Bash (use this in conditional tests)
- == : Pattern matching with globbing (not Regex)

Example Script:

```
#!/bin/bash
string="Hello123World"

# Check if the string contains digits
if [[ $string =~ [0-9]+ ]]; then
   echo "Contains numbers"
fi
```

In this script, =~ is used to check if the variable $string contains one or more digits.

5. Practical Regex Examples

Email Validation:

Use a regular expression to validate email formats.

regex="^[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Z|a-z]{2,}$"

This regular expression ensures that the input matches a valid email format (e.g., user@example.com).

IP Address Matching:

Validate if a string is a valid IP address.

ip_regex="^([0-9]{1,3}\.){3}[0-9]{1,3}$"

This regex matches an IPv4 address in the format xxx.xxx.xxx.xxx, where each xxx is a number between 0 and 255.

6. Advanced Regex Techniques

Grouping and Capturing

- **()** : Create capture groups to extract specific parts of a match
- **\1, \2** : Reference captured groups

Example:

```
# Extract first and last name
echo "John Doe" | sed -E 's/([A-Za-z]+) ([A-Za-z]+)/Last: \2, First: \1/'
```

In this example, the first name and last name are captured in groups, then rearranged and printed.

Lookahead and Lookbehind

- **(?=...)** : Positive lookahead (ensures something is ahead in the string)
- **(?!...)** : Negative lookahead (ensures something is not ahead)

These features allow more advanced conditional matching and are supported in extended Regex implementations.

7. Common Regex Pitfalls and Best Practices

Best Practices

- **Quote your Regex patterns**: Always quote your regular expressions to prevent unwanted expansion by the shell.
- **Be specific**: Avoid overly broad patterns that can match unexpected results.
- **Test thoroughly**: Regular expressions can behave differently in different environments, so test your patterns before using them in scripts.

Common Mistakes

- **Overcomplicating patterns**: Simple patterns often work best. Avoid adding unnecessary complexity.
- **Not escaping special characters**: Remember to escape characters like . or ? when using them as literals.
- **Ignoring performance**: Overly complex Regex patterns can slow down scripts, especially with large datasets.

Bonus: Regex Cheat Sheet

Symbol	Meaning	Example
`.`	Any character	`a.c` matches `abc`, `adc`
`*`	Zero or more	`ab*c` matches `ac`, `abc`, `abbc`
`+`	One or more	`ab+c` matches `abc`, `abbc`
`?`	Zero or one	`colou?r` matches `color`, `colour`
`^`	Start of line	`^Hello` matches lines starting with Hello
`$`	End of line	`world$` matches lines ending with world