AWK Script

Bachelor of Technology
Computer Science and Engineering

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1. Introduction

In the realm of computer programming and data manipulation, AWK scripting has emerged as a versatile and powerful tool for processing and analyzing text-based data. Developed in the 1970s by Alfred Aho, Peter Weinberger, and Brian Kernighan, the name "AWK" itself is derived from the initials of its creators. AWK scripting offers a unique blend of simplicity and efficiency, making it an indispensable asset for various tasks ranging from data extraction, transformation, and reporting to more complex text manipulation tasks.

AWK operates primarily in the domain of text processing, where it excels in handling structured and unstructured data alike. It is particularly renowned for its prowess in scanning files, extracting specific patterns, and performing associated actions based on those patterns. This distinctive approach has granted AWK a firm footing in the world of data processing, especially when dealing with large datasets where traditional programming languages might prove less efficient.

This report delves into the fundamental concepts, features, and applications of AWK scripting. It outlines the key components that constitute an AWK script, including pattern matching, actions, variables, and control structures. By exploring various use cases and real-world examples, this report aims to provide a comprehensive understanding of how AWK scripts can be employed to streamline data processing workflows, automate repetitive tasks, and unveil insights hidden within raw text data.

Furthermore, this report will also highlight the practical implications of AWK scripting in different scenarios, showcasing its adaptability in fields like log analysis, data extraction from structured documents, and report generation. By examining the strengths and limitations of AWK, readers will gain insights into when and how to leverage its capabilities effectively, alongside potential considerations for more complex data manipulation tasks.

In the subsequent sections, we will unravel the core components of AWK scripting, elaborate on its syntax and usage, and showcase its application through practical examples. As AWK continues to hold its ground as a valuable asset in the programmer's toolkit, understanding its intricacies can open doors to enhanced text processing and data analysis, contributing to more efficient and insightful programming practices.

Like sed, awk doesn’t belong to the do-one-thing-well family of UNIX commands. It combines features of several filters, but it has two unique features. First, it can identify and manipulate

individual fields in a line. Second, awk is one of the few UNIX filters (bc is another) that can perform computation.

2. Body

2.1. Preliminaries

AWK scripting stands as a vital tool in the realm of text processing and data manipulation, renowned for its simplicity and efficiency in handling structured and unstructured data. Developed by Alfred Aho, Peter Weinberger, and Brian Kernighan in the 1970s, AWK derives its name from the initials of its creators. This report introduces the foundational aspects of AWK scripting, shedding light on its key components and illustrating its relevance through real-world applications.

AWK Basics: At its core, AWK operates by processing input line by line, matching specified patterns, and executing associated actions. A typical AWK script consists of pattern-action pairs, where a pattern defines a condition to be met, and an action defines the task to be performed upon meeting that condition. The script is executed for each line of input, and the patterns are evaluated in sequence against the input lines.

Patterns and Actions: Patterns in AWK can be regular expressions, comparisons, or special keywords. They provide the criteria for selecting lines for further processing. Actions, on the other hand, are sequences of statements enclosed within curly braces. These statements define what happens when a line matches a given pattern. AWK's strength lies in its ability to extract and manipulate data from text files based on these patterns and actions.

Variables and Built-in Functions: AWK introduces various built-in variables that facilitate data manipulation. The most commonly used variables include $0 (the entire input line), $1, $2, ... $NF (individual fields of the input line), and NR (the current record number). Additionally, AWK offers a range of built-in functions for string manipulation, arithmetic operations, and more. These tools equip programmers with the means to perform complex tasks efficiently.

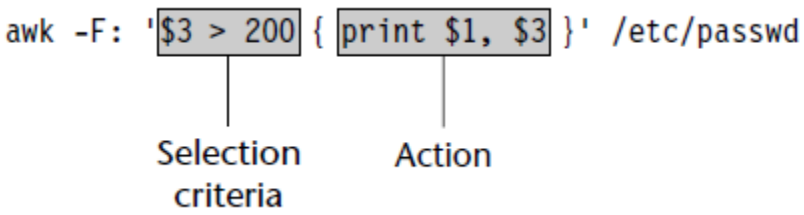
Usage Scenarios: AWK finds applications in diverse scenarios. It excels in log analysis, where it can sift through extensive log files and extract pertinent information. Data extraction from structured documents, such as CSV files, is another forte of AWK scripting. Moreover, AWK's simplicity makes it suitable for quick data transformations and report generation.

Limitations and Considerations: While AWK's simplicity is an asset, it may not be the best choice for more intricate programming tasks. Complex data manipulation involving multiple levels of nesting or intricate control flow might be better suited for languages like Python or Perl.

Additionally, AWK's focus on text processing may limit its utility in scenarios requiring advanced data analysis or manipulation of binary data.
Even though we haven't seen relational tests in command syntax before, selection criteria in awk are not limited to a simple comparison. They can be a regular expression to search for, one- or two-line addresses, or a conditional expression. Here are some examples:

```
awk '/negroponte/ { print }' foo                    #Lines containing negroponte
awk '$2 ~ /^negroponte$/ { print }' foo             #Tests for exact match on second field
awk 'NR == 1, NR == 5 { print }' foo                #Lines 1 to 5
awk '$6 > 2000 { print }' foo                       #Sixth field greater than 2000
```

That awk also uses regular expressions as patterns is evident from the second example, which shows the use of ^ and $ in anchoring the pattern. The third example uses awk's built-in variable, NR, to represent the record number. The term record is new in this text. By default, awk identifies a single line as a record, but a record in awk can also comprise multiple contiguous lines.



2.2. Using print and printf

One of the fundamental aspects of AWK scripting is its capability to display output. This is achieved primarily through the use of the print and printf functions. These functions play a crucial role in not only conveying processed information but also in formatting the output for readability and clarity. In this section, we'll explore the usage of print and printf in AWK scripting, accompanied by relevant examples that highlight their practical applications.

The print function in AWK serves as a straightforward method to output data to the screen or a file. It takes one or more expressions as arguments, which can be strings, variables, or combinations of these. The expressions are concatenated and separated by a space by default. Here's a simple example illustrating the usage of the print function:

Example 1: Using print to display text and variable value

```
awk '{ name = $1; age = $2; print "Name:", name, "- Age:", age; }' input.txt
```

In this example, the print function combines the text strings "Name:" and "Age:" with the values of the name and age variables extracted from the input file, resulting in a formatted output.

The printf function in AWK offers more precise control over formatting the output. It resembles the printf function in C programming. It uses format specifiers to define the layout of the output, allowing the programmer to specify the width, precision, alignment, and data type. Here's an example demonstrating the usage of the printf function:

Example 2: Using printf to format and display numbers

awk '{ total = $2 + $3 + $4; avg = total / 3; printf "Total: %d\tAverage: %.2f\n", total, avg; }' scores.txt

2.3. Number processing

AWK scripting extends beyond mere text manipulation; it excels in processing numerical data as well. This capability makes AWK a versatile tool for tasks involving calculations, aggregations, and analysis of numeric information. In this section, we'll delve into the world of number processing in AWK scripting, accompanied by relevant examples that showcase its practical applications.

Numeric Calculations: AWK treats numbers much like other programming languages, allowing for arithmetic operations such as addition, subtraction, multiplication, and division. Numeric values can be extracted from input data and manipulated using variables and expressions. Let's explore a basic example:

Example 1: Calculating and displaying the sum of numbers in a column

awk '{ sum += $1; } END { print "Sum:", sum; }' data.txt

In this instance, AWK accumulates the values from the first column and calculates their sum, demonstrating the ease with which numeric data can be processed.

Conditional Number Processing: AWK also enables conditional operations on numeric data. Conditional statements can be employed to analyze numeric values and perform actions based on specific criteria. Here's an example that highlights this aspect:

Example 2: Counting the number of values above a certain threshold

awk '{ if ($1 > 50) count++; } END { print "Values above 50:", count; }' scores.txt

In this case, AWK checks each value in the input data and increments the count variable if the value is greater than 50, showcasing how numeric data can be evaluated conditionally.

Aggregate Statistics: AWK proves exceptionally useful in generating aggregate statistics from numeric data. It can calculate metrics such as averages, maximums, and minimums, providing valuable insights into data trends. Consider the following example:

```
# Example 3: Computing average and maximum of a numeric column

awk '{ total += $1; if ($1 > max) max = $1; } END { avg = total / NR; print "Average:", avg, "- Maximum:", max; }' dataset.txt
```

In this example, AWK computes the average and maximum values from the first column, illustrating its proficiency in deriving aggregate information.

2.4. Variables and Expressions

Variables and expressions are the backbone of any programming language, providing the means to store, manipulate, and compute data. AWK scripting, renowned for its text processing capabilities, also boasts a robust system for handling variables and expressions. This section explores the fundamentals of variables and expressions in AWK, supplemented by relevant examples that illustrate their usage and significance.

Variables in AWK: Variables in AWK serve as containers for storing data values. They don't require explicit declaration; they come into existence when first assigned a value. Variable names are case-sensitive and can consist of letters, digits, and underscores. AWK provides a variety of built-in variables, such as NF (number of fields in the current record), NR (current record number), and $1, $2, ..., $NF (individual fields of the current record). Additionally, custom variables can be defined to store intermediate results and facilitate data manipulation.

```
# Using built-in variables

awk '{ print "Line:", NR, "- Fields:", NF; }' data.txt
```

In this example, the built-in variables NR and NF are utilized to display the line number and the number of fields in each line of the input file.

Expressions in AWK: Expressions in AWK are combinations of values, variables, and operators that result in a new value. AWK supports a range of arithmetic, relational, and logical operators to perform various calculations and comparisons. Expressions can be used in assignments, conditions, and other contexts where a value is expected.

```
# Using expressions to calculate average

awk '{ total += $1; count++; } END { avg = total / count; print "Average:", avg; }' scores.txt
```

In this example, an expression total / count is used to calculate the average of numeric values in the input file.

String Concatenation: AWK seamlessly handles both numeric and string data. String concatenation is achieved using the concatenation operator (""). This allows for combining text and variables in meaningful ways.

Concatenating strings and variables

awk '{ fullName = $1 " " $2; print "Full Name:", fullName; }' names.txt

Here, the variables $1 and $2 are concatenated with a space in between to form the full name.

2.5. Comparison and Logical Operators

Comparison and logical operators are essential tools in programming for making decisions, evaluating conditions, and controlling the flow of operations. AWK scripting, known for its versatile text processing capabilities, incorporates a comprehensive set of comparison and logical operators. This section delves into the intricacies of these operators within AWK, accompanied by original examples to showcase their functionality and significance.

AWK supports a range of comparison operators that allow programmers to compare values and make decisions based on their relationships. These operators include:

2.5.1. == (equal to)
2.5.2. != (not equal to)
2.5.3. < (less than)
2.5.4. > (greater than)
2.5.5. <= (less than or equal to)
2.5.6. >= (greater than or equal to)

Using comparison operators to filter data

awk '$3 >= 70 { print $1, "passed"; }' grades.txt

In this example, the comparison operator >= is employed to filter and display student names who scored 70 or more in their exams.

Logical operators in AWK allow for combining multiple conditions and creating more complex expressions. The logical operators include:

2.5.7. && (logical AND)
2.5.8. || (logical OR)

2.5.9. ! (logical NOT)

```
# Using logical operators to filter data with multiple conditions

awk '$2 >= 50 && $3 >= 50 { print $1, "passed"; }' exam_scores.txt
```

Here, the logical AND operator && is used to filter and display student names who scored 50 or more in both of the specified exams.

The power of AWK scripting lies in its ability to combine comparison and logical operators to create intricate conditions.

```
# Combining comparison and logical operators to filter data

awk '($2 == "Math" || $2 == "Science") && $3 >= 80 { print $1, "excellent"; }' subjects.txt
```

In this case, the logical OR operator || is employed alongside the comparison operator >= to filter and display student names who scored 80 or more in either Math or Science.

2.6. Storing awk programs in file

AWK scripting offers a powerful way to manipulate and process text data, often involving intricate logic and operations. As AWK programs grow in complexity, it becomes beneficial to store them in separate files. This not only enhances code organization but also promotes reusability and maintainability. This section explores the practice of storing AWK programs in files, providing insights and examples that demonstrate the advantages of this approach.

Storing AWK programs in separate files is a straightforward process. AWK scripts are typically saved with the .awk extension, although this isn't a strict requirement. These files contain the AWK code without the need for a shebang line (e.g., #!/bin/awk). The code within the file follows the same syntax and structure as inline AWK code.

Example 1: Saving an AWK program in a file named process.awk

```
# File: process.awk

{
   if ($2 > 50) {
      print $1, "passed";
   } else {
```

```
        print $1, "failed";
    }
}
```

Running the AWK program from the file

```
awk -f process.awk exam_scores.txt
```

Advantages of Storing AWK Programs in Files:

- Code Reusability: Storing AWK programs in files promotes code reuse. A well-defined function or logic in a separate file can be used across multiple projects without duplicating code.
- Code Organization: As AWK programs become more complex, maintaining code readability and organization is crucial. Storing code in separate files helps keep scripts concise and focused.
- Collaboration: Separate files allow teams to collaborate more effectively. Team members can work on different parts of a project simultaneously and integrate their contributions seamlessly.
- Version Control: Storing AWK programs in files enables version control using tools like Git. This ensures that changes are tracked and can be reverted if necessary.
- Error Isolation: Isolating code in files simplifies the process of identifying and rectifying errors. This reduces the chances of introducing bugs while modifying existing code.
- Clear Interfaces: Storing code in separate files enforces a clearer separation between program logic and data processing, making the codebase more modular and maintainable.

Example 2: Using a Function Defined in a Separate File

File: functions.awk

```
# A function to calculate the square of a number
function square(x) {
    return x * x;
}
```

File: main.awk

```
# Using the square function from functions.awk

@include "functions.awk"

BEGIN {

   num = 5;

   result = square(num);

   print "The square of", num, "is", result;

}
```

Running the main AWK program

```
awk -f main.awk
```

Storing AWK programs in separate files offers numerous benefits, including code reusability, organization, collaboration, version control, and error isolation. By adopting this practice, AWK script developers can maintain efficient, modular, and maintainable codebases, ensuring their scripts are effective and adaptable for various data processing tasks.

2.7. BEGIN and END sections

AWK scripting provides two special sections, BEGIN and END, that allow programmers to execute code before processing input data and after processing is complete, respectively. These sections offer a powerful way to initialize variables, perform setup operations, and generate summaries. In this section, we'll delve into the usage of the BEGIN and END sections in AWK scripting, accompanied by original examples that illustrate their importance and functionality.

The BEGIN section is executed once before processing any input data. It's often used for initialization tasks, such as setting up variables, defining functions, or printing headers.

```
# Initializing a variable in the BEGIN section

BEGIN {

   total = 0;

}

{

   total += $1;
```

```
}

END {

   print "Total:", total;

}
```

In this example, the total variable is initialized to zero in the BEGIN section. It's then updated and used in subsequent input lines.

The END section is executed once after processing all input data. It's particularly useful for generating summaries, displaying results, or performing cleanup operations.

```
# Calculating average using the END section

{

   sum += $1;

   count++;

}

END {

   avg = sum / count;

   print "Average:", avg;

}
```

In this example, the sum and count variables accumulate values from the input data. The average is then calculated and displayed in the END section.

The combination of BEGIN and END sections allows for comprehensive data processing, initialization, and reporting.

```
# Reporting summary using BEGIN and END sections

BEGIN {

   print "Student\tScore";

   print "-----------------";

}
```

```
{
    sum += $2;
    count++;
    print $1, "\t", $2;
}
END {
    avg = sum / count;
    print "-----------------";
    print "Average\t", avg;
}
```

In this instance, the BEGIN section prints a header. The input data is processed, scores are accumulated, and each student's information is printed. Finally, the END section displays the average score.

The BEGIN and END sections in AWK scripting offer a structured approach to initialize variables, perform setup tasks, and generate summaries. These sections enhance the flexibility and efficiency of AWK scripts by allowing programmers to execute specific actions at the beginning and end of data processing. By skillfully leveraging the BEGIN and END sections, AWK script developers can create organized, informative, and powerful data processing solutions.

2.8. Positional parameters

Positional parameters in AWK scripting enable the passing of values from the command line to an AWK script during its execution. These parameters allow for dynamic customization of script behavior without modifying the script itself. This feature enhances the versatility and adaptability of AWK scripts for various data processing tasks. In this section, we'll delve into the intricacies of positional parameters in AWK scripting, supported by original examples that illustrate their significance and application.

Positional parameters are typically accessed using the variables ARGV and ARGC within an AWK script. ARGV is an array that holds command-line arguments, while ARGC stores the count of command-line arguments.

Example 1: Accessing Positional Parameters

Suppose you have an AWK script named process.awk and you want to pass a filename as a positional parameter:

```
# File: process.awk

BEGIN {
   if (ARGC != 2) {
      print "Usage: awk -f process.awk <filename>";
      exit 1;
   }
   filename = ARGV[1];
   print "Processing file:", filename;
}

{
   # Your data processing logic here
}
```

Running the AWK script with a positional parameter

```
awk -f process.awk data.txt
```

In this example, the script checks if the number of arguments (ARGC) is exactly 2 (the script name and the filename). If not, it prints a usage message and exits. It then accesses the filename from ARGV[1] and processes the data accordingly.

Passing Multiple Positional Parameters:

AWK scripts can accept multiple positional parameters, enabling a higher degree of customization.

Example 2: Accepting Multiple Positional Parameters

```
# File: report.awk

BEGIN {
   if (ARGC < 4) {
```

```
        print "Usage: awk -f report.awk <year> <month> <filename>";
        exit 1;
    }
    year = ARGV[1];
    month = ARGV[2];
    filename = ARGV[3];
    print "Generating report for", month, year, "from file:", filename;
}
{
    # Your report generation logic here
}
```

Running the AWK script with multiple positional parameters

awk -f report.awk 2023 August data.txt

In this case, the script requires three positional parameters: year, month, and filename. It accesses these parameters from ARGV and generates a customized report.

Positional parameters in AWK scripting enable the dynamic customization of script behavior by allowing values to be passed from the command line. This feature enhances the adaptability and versatility of AWK scripts, making them capable of handling various data processing scenarios. By adeptly utilizing positional parameters, AWK script developers can create solutions that cater to specific requirements without the need for script modification, fostering efficient and flexible data processing workflows.

2.9. Arrays

Arrays are a fundamental data structure in programming that allow you to store multiple values under a single variable name. AWK scripting, renowned for its text processing capabilities, includes support for arrays, enhancing its ability to handle and manipulate data efficiently. In this section, we'll explore the usage of arrays in AWK scripting, supported by original examples that illustrate their functionality and utility.

In AWK, arrays are indexed by strings or numbers. They are not declared with a fixed size; you can simply start using an array by assigning values to its indices.

```
# Counting occurrences of words using arrays
{
    for (i = 1; i <= NF; i++) {
        wordCount[$i]++;
    }
}
END {
    for (word in wordCount) {
        print "Word:", word, "- Count:", wordCount[word];
    }
}
```

In this example, as the script processes each line, it counts the occurrences of individual words using an array named wordCount.

AWK allows for both numeric and string indexes for arrays.

```
# Using arrays with numeric and string indexes
{
    scores[$1] = $2;
    subjects["Math"] = scores[$1];
    subjects["Science"] = $3;
}
END {
    print "Math Score:", subjects["Math"];
    print "Science Score:", subjects["Science"];
}
```

In this script, the array scores uses numeric student IDs as indexes, while the array subjects uses string subject names as indexes.

AWK supports multi-dimensional arrays, where you can have arrays within arrays.

```
# Using multi-dimensional arrays

{

   scores[$1]["Math"] = $2;

   scores[$1]["Science"] = $3;

}

END {

   for (student in scores) {

      print "Student:", student, "- Math Score:", scores[student]["Math"], "- Science Score:", scores[student]["Science"];

   }

}
```

In this example, the script uses a multi-dimensional array to store scores for different subjects for each student.

AWK provides various array-related functions, such as length(array), which returns the number of elements in an array, and delete array[index], which removes an element from an array.

```
# Using array functions

{

   subjects[$1] = $2;

}

END {

   print "Number of Subjects:", length(subjects);

   delete subjects["Math"];

   print "Subjects after deleting 'Math':";

   for (subject in subjects) {

      print subject;
```

```
    }
}
```

Arrays are a powerful tool in AWK scripting, allowing you to efficiently store and manipulate data. Their versatility extends to counting occurrences, indexing with numbers or strings, creating multi-dimensional structures, and utilizing array-related functions. By mastering the usage of arrays in AWK scripts, developers can create more sophisticated and effective data processing solutions, enhancing their ability to handle diverse text-based data.

2.10. Built-in Variables

AWK scripting comes equipped with a range of built-in variables that provide valuable information and context during data processing. These variables offer insights into the current record, fields, and execution environment. Leveraging these built-in variables enhances the flexibility and efficiency of AWK scripts, making them more adept at handling and manipulating text data. In this section, we'll delve into the details of these built-in variables in AWK scripting, supported by original examples that showcase their significance and applications.

NR - Record Number:

NR is a numeric built-in variable that represents the current record number being processed. It increments with each new line of input.

```
# Displaying record numbers alongside input lines
{
    print "Line " NR ": " $0;
}
```

In this script, NR is used to display the line number alongside each input line.

NF - Number of Fields:

NF is a numeric built-in variable that holds the number of fields in the current record. It's especially useful for handling records with varying numbers of fields.

```
# Processing variable field records using NF
{
    if (NF == 3) {
```

```
        print "Name:", $1, "Age:", $2, "Gender:", $3;
    } else {
        print "Invalid record:", $0;
    }
}
```

Here, the script processes records based on the number of fields. If there are three fields, it prints the name, age, and gender; otherwise, it marks the record as invalid.

$0, $1, $2, ... - Fields:

$0 represents the entire current record, while $1, $2, and so on represent individual fields within the record.

```
# Extracting and displaying fields from input
{
    print "First Name:", $1, "- Last Name:", $2;
}
```

This script extracts the first and second fields from each input line and displays them.

FILENAME - Current File Name:

FILENAME is a string built-in variable that holds the name of the current input file being processed.

```
# Displaying file name alongside lines
{
    print "File:", FILENAME, "- Line:", NR, "- Content:", $0;
}
```

Here, the script uses FILENAME and NR to display the file name, line number, and content of each line being processed.

FS - Field Separator:

FS is a string built-in variable that defines the field separator used to split records into fields. The default is whitespace.

```
# Using custom field separator to split fields

BEGIN {

   FS = ":";

}

{

   print "Name:", $1, "Age:", $2;

}
```

In this script, FS is set to ":" as a custom field separator, enabling the extraction of data from colon-separated fields.

Built-in variables in AWK scripting provide essential contextual information and enable dynamic data processing. They allow developers to extract, manipulate, and present data efficiently, contributing to the adaptability and power of AWK scripts. By mastering the usage of these variables, AWK script developers can create robust, insightful, and versatile solutions for processing diverse text-based data.

2.11. Functions

Functions play a crucial role in structuring code, promoting reusability, and enhancing the maintainability of any programming language. AWK scripting, renowned for its powerful text processing capabilities, supports user-defined functions that allow programmers to encapsulate logic, perform custom operations, and modularize their code. In this section, we'll explore the intricacies of functions in AWK scripting, accompanied by original examples that showcase their significance and practical applications.

AWK allows programmers to define their own functions using a syntax similar to C programming. Functions provide a way to group statements and execute them when the function is called.

```
# Defining and using a function to calculate the square of a number

function square(x) {

   return x * x;

}
```

```
BEGIN {
    num = 5;
    result = square(num);
    print "The square of", num, "is", result;
}
```

In this script, the square function calculates the square of a number. The function is then called in the BEGIN section to compute and display the square of num.

AWK functions can accept parameters, which are values passed to the function when it's called. These parameters allow for dynamic processing and customization.

```
# Using a function with parameters to check if a number is even
function isEven(n) {
    return n % 2 == 0;
}


{
    if (isEven($1)) {
        print $1, "is even.";
    } else {
        print $1, "is odd.";
    }
}
```

In this example, the isEven function is defined to check whether a number is even or odd. The function is then used within the script to determine the nature of the numbers in the input.

AWK functions can return values using the return statement. The returned value can be used in various ways within the script.

```
# Function to find the maximum of two numbers
function max(a, b) {
    if (a > b) {
        return a;
    } else {
        return b;
    }
}

{
    max_value = max($1, $2);
    print "Maximum value:", max_value;
}
```

In this script, the max function returns the maximum of two numbers. The returned value is then assigned to max_value and displayed for each input line.

Functions in AWK scripting provide a structured way to encapsulate logic, promote code reuse, and enhance the clarity of code. By defining and utilizing functions, AWK script developers can create more modular, efficient, and adaptable data processing solutions. Whether it's performing custom calculations, applying specific operations, or implementing intricate algorithms, functions play a pivotal role in elevating the capabilities of AWK scripts for handling diverse text-based data.

2.12. Control Flow

Control flow structures are vital components of any programming language, as they determine the order in which statements are executed based on conditions. AWK scripting, renowned for its text processing capabilities, incorporates various control flow mechanisms that empower developers to make decisions, iterate over data, and execute code selectively. In this section, we'll delve into the intricacies of control flow in AWK scripting, accompanied by original examples that highlight their significance and application.

AWK supports conditional statements that allow you to execute code based on specific conditions. The if statement is a fundamental example of conditional execution.

```
# Using if statement to categorize scores

{

   if ($1 >= 90) {

      print "Excellent";

   } else if ($1 >= 70) {

      print "Good";

   } else {

      print "Average";

   }

}
```

In this script, the if statement evaluates the value of the first field and prints corresponding messages based on the score range.

AWK provides looping mechanisms for iterating over data multiple times. The for, while, and do...while loops are commonly used.

```
# Using for loop to calculate the sum of numbers

{

   for (i = 1; i <= NF; i++) {

      sum += $i;

   }

}

END {

   print "Sum:", sum;

}
```

Here, the for loop iterates through each field in the input record, accumulating their values in the sum variable.

```
# Using while loop to count lines containing a specific word

BEGIN {

   word = "apple";

}

{

   if ($0 ~ word) {

      count++;

   }

}

END {

   print "Lines containing", word, ":", count;

}
```

This script employs a while loop to count the occurrences of a specific word across the input lines.

AWK offers control statements to alter the flow of execution. The next statement skips the rest of the current rule and proceeds to the next line of input.

```
# Using next statement to skip processing certain lines

{

   if ($1 == "skip") {

      next;

   }

   print "Processed:", $1;

}
```

In this example, if the first field is "skip," the next statement is invoked, and the subsequent lines are skipped.

Control flow structures in AWK scripting, including conditional statements, looping mechanisms, and control statements, provide the means to make decisions, iterate over data, and customize the execution of code. By effectively utilizing these control flow mechanisms, AWK script developers can create dynamic, efficient, and adaptable data processing solutions that cater to various text-based data scenarios.

3. Conclusion

In conclusion, AWK scripting stands as a versatile and powerful tool for text processing and data manipulation tasks. Its unique combination of text pattern matching, data extraction, and calculation capabilities makes it well-suited for a wide range of applications. AWK's concise syntax, built-in functions, and support for regular expressions enable developers to efficiently handle complex data transformations. By leveraging features like built-in variables, functions, control flow structures, and arrays, AWK script developers can create efficient, flexible, and adaptable solutions for processing diverse text-based datasets. Whether for simple data parsing or complex data analysis, AWK scripting continues to be a valuable resource for programmers aiming to extract insights from textual information.

4. References

- Your UNIX/Linux The Ultimate Guide ~ Sumitabha Das
- Linux Command Line and Shell Scripting BIBLE ~ Richard Blum, Christine Bresnahan