Advances in Computational Technologies in Sciences and Engineering

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Edited by

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CHAPTER 1

BUILDING ERP SOFTWARE USING ORACLE APEX 19.1: WEB AND MOBILE APPLICATION

MOHD ARIF[1], DEEPSHIKHA AGARWAL[2]

Abstract

Oracle Application Express, also known as APEX, is a Rapid Application Development (RAD) tool utilised for developing web applications. In this project, I have developed several ERP modules designed for use in the banking sector. All the project modules are thoroughly described below. I utilised Oracle APEX (Application Express) software version 19.1 for this purpose. A concise description of each module is provided.

Keywords: Oracle APEX, Web Applications, ERP.

1. Introduction

APEX was created by Mike Hichwa, an engineer at Oracle, after his previous venture, Web DB, started to deviate from his original vision [2]. Despite APEX sharing some functionality with Web DB, it was built from scratch, and there is no upgrade path from Web DB to APEX [1]. When entrusted with designing an internal web schedule, Hichwa enlisted the assistance of Joel Kallman and started development on a project called Flows. Hichwa and Kallman co-developed the Web Calendar and Flows, adding features to Flows as needed to develop the schedule [3]. Early versions of Flows had no front-end, so all changes to an application had to be made in SQL*Plus through inserts, updates, and deletes.

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Oracle uses APEX internally to build some of its support sites (Ashwin Agarwal, 2015). The AskTom knowledge base and online store are both still running on APEX. The Metalink support site ran on APEX for quite some time before eventually being replaced by an Oracle ADF solution [2]. Since APEX was initially promoted as a RAD tool, this transition is a logical one. APEX allows for the easy construction of web applications with no code. While APEX has existed since 2004 in some form, it has recently been included in the new category of application development platforms called Low Code.

2. Features of Oracle Apex

A. REST ENABLED SQL SUPPORT:

Oracle ORDS (Oracle REST Data Services) is a technology that allows the execution of SQL queries in remote Oracle databases via HTTP and REST [2]. You can submit SQL statements to the service, and it will then process the SQL statement against the Oracle database and return the result to the client in a JSON format.

B. VERSATILE UI:

APEX 19.1 introduces several new UI components to facilitate the creation of user-friendly applications. Three new fragment types, List View, Column Toggle, and Re-flow Report are integral parts that can be utilized within the Universal Theme and are commonly employed in responsive applications. Finally, APEX 19.1 includes comprehensive support for touch-based interactions such as tap and double-tap, press, swipe, and pan, enabling the development of feature-rich and user-friendly mobile applications [3].

C. WEB SOURCE MODULES:

APEX currently supports accessing data from a variety of REST endpoints, including standard REST data services, REST Services from Oracle REST Data Services, and Oracle Cloud Applications REST Services [1]. In addition to supporting intelligent caching mechanisms for remote REST data, APEX also offers the unique ability to directly manipulate the results of REST data sources using industry-standard SQL. The data representation engine of Oracle Application Express is powered by Oracle JET (JavaScript Extension Toolkit) [2].

3. Terms to Understand

Before delving into the topic, we need to understand some important terms that will be used later. Below are descriptions of some of the important terms:

A. ORACLE DATABASE 10G:

Oracle Database 10g is the primary database designed for large business framework computing [4]. It reduces the costs of management while providing the highest possible level of service. Despite numerous quality and performance improvements, Oracle Database 10g significantly reduces the costs of managing the IT environment, with an improved installation, substantially reduced configuration and requirements, automatic performance detection, and SQL tuning. These and other automated capabilities help to enhance DBA and developer productivity and efficiency.

B. DYNAMIC ACTIONS:

In APEX, Dynamic Actions provide designers with a way to define client-side behavior definitively without the need to know JavaScript [1]. Using a simple wizard, designers can select a page item, a condition, enter a value, and choose an action (for example, Show, Hide, Enable, and Disable). These actions are for client-side conditions [3].

Dynamic actions reside on the client-side and enable the user to change the look, feel, or content of a page. In most cases, they achieve this without the application needing to interact with the server or the database. Everything happens in the background without requiring a page reload, providing a seamless user experience [2].

Dynamic Actions are a way to help designers enable more complex client-side behavior. They can assist beginner developers who are not familiar with JavaScript to incorporate greater functionality into their pages. They are also beneficial for back-end developers, who can use them to enhance usability on the front-end when required.

C. PROCESS:

The process takes place an action at a predetermined point during the rendering or submission of the page. For instance, you can create a page process to execute a logic or to make a call to the Application Express

engine [1]. A page process is a unit of events that is executed when a specific event occurs, such as loading or submitting a page. The difference between these two process types is where the process is defined, that is, at the page-level or at the application level.

D. VALIDATIONS:

A validation is a server-side condition or check. Page items are specific validations for a single item. Validations that apply to a whole page will be page validations [2]. Validations for forbidden structures specific to a solitary section are section-level validations. Validations for forbidden structures that don't apply to a single section are global. You can precisely define a validation by selecting a validation method. You enter the actual validation custom check in the Validation Messages field. If a validation fails, subsequent page processes or calculations won't occur. Also, remember that the validation you enter must be consistent with the validation type you selected.

4. The Project

The main idea behind this framework is that the institute acknowledges the students and then works on different processes, such as enrolling them, assigning them hostels, providing them with adequate study material through the library, and managing their feedback into the institution. To make all these processes easy and readily available without compromising their efficiency or approach, we developed four modules on the Oracle Apex Cloud and combined them to create a Mobile Application [2].

The Administrator can easily read and modify the content of the database using this application, and any user can use it to store their data on the cloud, which is beneficial to the institute. Since the Administrator has the ability to modify the content, he can remove unwanted entries from the registration module if some mischievous individuals attempt to tamper with the workings of the system. Now, I will discuss each module in detail. The modules are described as follows:

A. MODULE 1: REGISTRATION OF TRAINEES:

The very first module of our framework is the "Enrolment of Trainees." This module can be accessed and edited by both users and administrators. This module consists of three pages—information about the student, information about the training, and hostel allocation. The students can fill

in the form providing their details and submit it [4,5]. It includes: trainee information; training details; and hostel allocation.

B. MODULE 2: LIBRARY MANAGEMENT SYSTEM:

This module consists of three pages that, together, provide the Institute with a well-established, sophisticated, and accurate library system on the cloud server of our system [2]. This module aims to cover all aspects of a library system and its maintenance, endeavoring to incorporate as many features as possible so that the user does not need to access any other software or portal for library management [1]. One significant feature of this module is that it is accessible only by the admin. For instance, all the pages of this module are accessible exclusively by the admin, and the learners cannot, in any way, access any of the three pages. The three pages include registering a new book, issuing a book, and returning a book.

C. MODULE 3: HELPDESK:

This module consists of three distinct pages and provides a neat, efficient, and user-friendly complaint handling portal [2]. It incorporates both the complaint registration interface and the complaint status tracking interface. The three pages are: lodging a complaint, problem resolution, and status of your problem.

D. MODULE 4: FEEDBACK:

The fourth and final module of our framework is the Feedback Module, which the learner utilizes after their training group sessions are completed or about to be completed [4]. It provides a simple, clean, well-organized, and accurate feedback system for the learners, where they can clearly understand what is being asked and what they need to do according to their assessment. It is the only module in our framework that is accessed entirely by the learners, and the administrator cannot fill out the form for anyone. This feature sets it apart from the other three modules [2]. This module consists of only one page - Feedback Response.

The procedures for this module are as follows:

➢ Step 1: The learner accesses the main page of this module from the Home Screen of our Mobile Application and enters the form.

➢ Step 2: The learner reads each section title (which is the parameter) and selects the appropriate Radio Button against it to provide a score according to their view.

➢ Step 3: (if necessary) the student writes their suggestion if, in any section, the lowest scoring Radio Button is selected by them. This suggestion is a must, and the form will not be submitted with an invalid suggestion field.

➢ Step 4: The submit button is pressed, and the form is finally submitted, displaying a Success Message acknowledging the page's submission along with a Thank You note to the student.

This module is highly significant as it is the last module in the framework and serves as a departure point for a particular batch. The information stored in this module is of high value to the institution, and it is the data that is assessed later on to better understand what the institution provides effectively and where it needs to improvise. It allows the institute to see the students' perspectives regarding various aspects ranging from the organization's structure to the quality of training provided in accommodations and meals, etc. [1]. These insights help the institution improve plans for future batches wherever there is a need for improvement and maintain the quality of service where students have expressed satisfaction. Hence, this module provides valuable data for future internal studies and reviews of the institute. As the last module, it is not invoked elsewhere.

5. Conclusion

As stated, the working of each module has been explained in all four modules, which are well described in this report. The working of each module is also explained. Oracle APEX is a method of developing a Web application, sorting data on the Web, and running reports on the Web, but you may not need much knowledge of the Web. From a technical standpoint, APEX is exceptionally well-suited to bringing your FORM applications into the twenty-first century [2]. However, if you don't manage change management appropriately, this is for nothing. Honestly, we've never experienced a technical issue we couldn't solve. Virtually, all the issues we've faced have concerned people's ability to adapt to a new way of doing things. This is why change management is so significant.

References

This project was made by gaining knowledge from various sources, such as, research papers, training center (PNBIIT), YouTube videos, etc. Some of the references are given below:

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[4] https://apex.oracle.com/pls/apex/f?p=411:13
[5] https://apex.oracle.com/en/learn/tutorials/
[6] https://www.oracle.com/technetwork/articles/apex/index.htm

CHAPTER 2

DESIGN OF MULTICAST CROSS BAR SWITCH ELEMENTS USING QUANTUM DOT CELLULAR AUTOMATA

AMITA ASTHANA[1], ANIL KUMAR[1],
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Abstract

Applications involving a single sender and multiple users, such as audio, video, Internet Protocol television, and teleconferencing, supported by the Internet, have heightened the essential need for a high-speed switch matrix [1]. This paper proposes a digital cross-connect switch architecture to facilitate various multicasting modes using quantum cellular automata (QCA) within the framework of the United Kingdom format.

The digital cross-connect switch represents a crossbar architecture, known for its cost-effectiveness and low power consumption, particularly when implemented through QCA technology. The multicast switch matrix can be devised using 2x1 multiplexers. The design's scope can be expanded through the integration of reversible logic in QCA, enhancing adaptability and flexibility [2].

Keywords: QCA; multicast mode; crossbar architecture.

1. Introduction

Significant multicast switching applications across the Internet have led to an escalation in traffic loads, necessitating the implementation of high-

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speed switches to efficiently manage such substantial multicast application loads. These switches are essential for facilitating point-to-point communication.

The Digital Cross-Connect Switch (DCS) finds diverse applications, including mobile communication switching networks, Local Area Network connections, and internet hubs, among others. Various switch architectures have been proposed for deployment at different hubs, routers, and data communication nodes.

The switch architecture outlined in this paper offers heightened flexibility at a reduced cost for handling datagrams destined for multiple destinations. The DCS proposed in this study boasts the capability to support diverse applications, including information dissemination, teleconferencing, access to distributed databases, video and audio transmission, and distance learning.

Quantum Dot Cellular Automata (QCA), a nanoscale technology, calculates the Coulombic repulsion between two quantum dots. QCA technology boasts primary advantages such as reduced power consumption and significantly smaller physical footprint when compared to Cadence. Circuit components designed using quantum dots are nano-sized, contributing to area minimization.

2. Quantum Dot Cellular Automata

Quantum dot cellular automata (QCA) represent an alternative technology to CMOS VLSI circuits. QCA offers several advantages, including a smaller physical footprint, rapid switching speeds, and low power requirements. This technology refrains from utilizing transistors in logical computations, focusing instead on the propagation and processing of digital information [3].

In a QCA cell, four quantum dots are positioned at the corners of a square. The operation of a QCA device doesn't require a current source for logic computations; it relies on the inherent charge properties of electrons. These devices are designed with precise placement of QCA cells to create a diverse array of digital circuits. Each quantum dot acts as a potential well capable of trapping electrons, which necessitate a substantial amount of energy to exit the well. Fig. 1 illustrates a QCA cell consisting of four quantum dots.

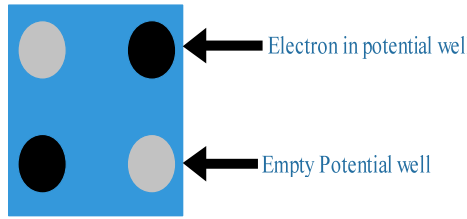

Figure 1. Cell structure QCA

The polarization of the cells is determined by the Coulombic repulsion among the quantum dots, as depicted in Fig. 2 [5].

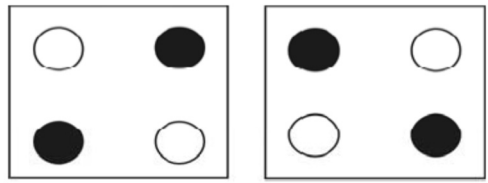

Figure 2. QCA cell polarization – right alignment for representation of binary '0' & and left binary '1'

The Majority Voter (MV) gate stands as a critical and potent logical device in quantum computing. The MV gate's operation (MV(X, Y, Z) = XY+YZ+Z) of a three-input gate can be accomplished using only five QCA cells. QCA employs a four-phase clocking scheme, namely switch, hold, release, and relax [4].

3. Proposed DCS

A Digital Cross-Connect System (DCS or DXC) constitutes a component of circuit-switched network equipment capable of interconnecting low-level DS0 bit streams with DS1 bit streams using the Time Division Multiplexing technique. DCS units are extensively accessible and can function with legacy T-carrier and E-carrier bit streams. Additionally, these switches can also accommodate SONET/SDH bit streams [1].

(A) MULTICAST MODE:

Defining Data Communication networks involves multicasting, wherein a single source communicates with a group of destinations [5][6]. This communication pattern primarily entails one-to-many or many-to-many data transmission. The multicast router is capable of sending duplicate copies of the same datagram through multiple interfaces. Consequently, within this form of group communication, datagrams traverse diverse routes. This concept is applicable to both multicast and network-assisted multicast scenarios, enabling the efficient transmission of information from one point within the group to various points in a single transmission [7].

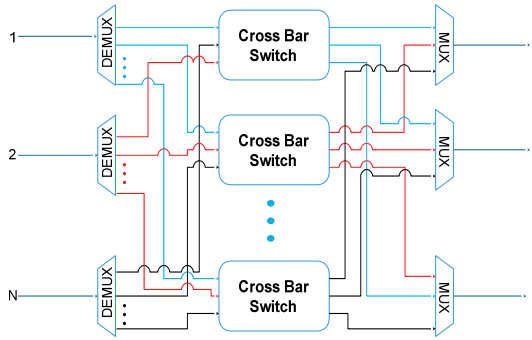

Figure 3. The design of the multicast crossbar switch

In Fig. 3 block diagram of the multicast x-bar switch, there is M number of DE multiplexers and N no. of multiplexers [8].

(B) 2:1 MUX:

The Multiplexer, also referred to as a data selector digital switch, features multiple input lines, a single output line, and more than one select line. Depending on the input to the select lines, the input lines are chosen and the selected input transmits information to the output line. Figure 4 illustrates two input lines and one output line, with the select line designated as S0, responsible for determining which input line's data is transmitted to the output.

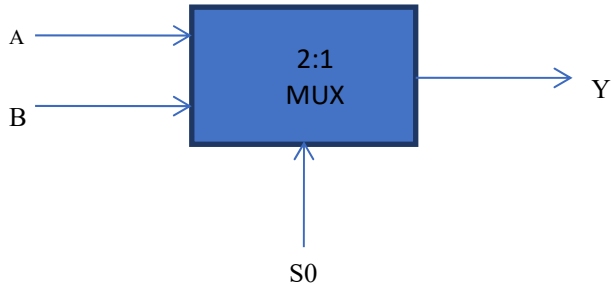

Figure 4. Design of 2:1 Mux

Figure 5 showcases the design of a 2:1 Multiplexer using quantum cellular automata (QCA) technology. This QCA-based design is executed to assess the area and power consumption of the 2:1 MUX. The quantum-dot circuit realization of the 2:1 Multiplexer is depicted in Fig. 5. Within Quantum-Dot technology, the 2:1 MUX is implemented, and simulation results are presented in Fig. 6. This implementation yields an area of 23,495.6568 nm^2, with a power consumption of 29.37 * 10^{-9} Watts. By implementing the circuit at the gate level using Quantum Dot technology, significantly reduced values are achieved in terms of both area and power. Opting for the realization of the 2:1 Multiplexer on QCA proves superior to the CMOS approach.

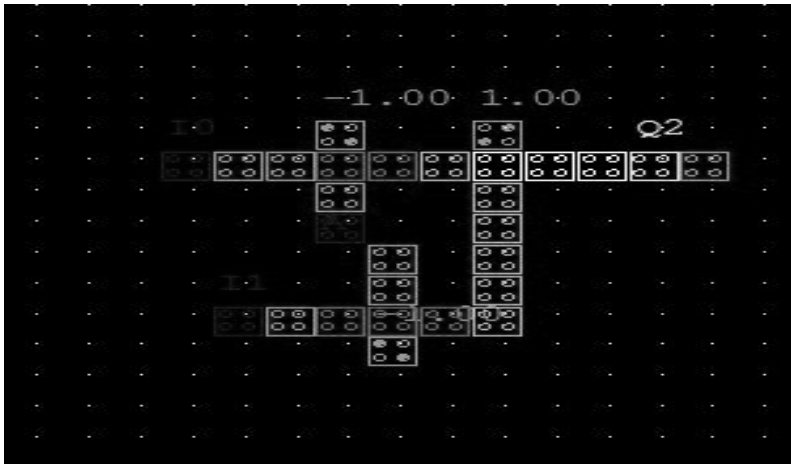

Figure 5. The layout of 2:1 MUX

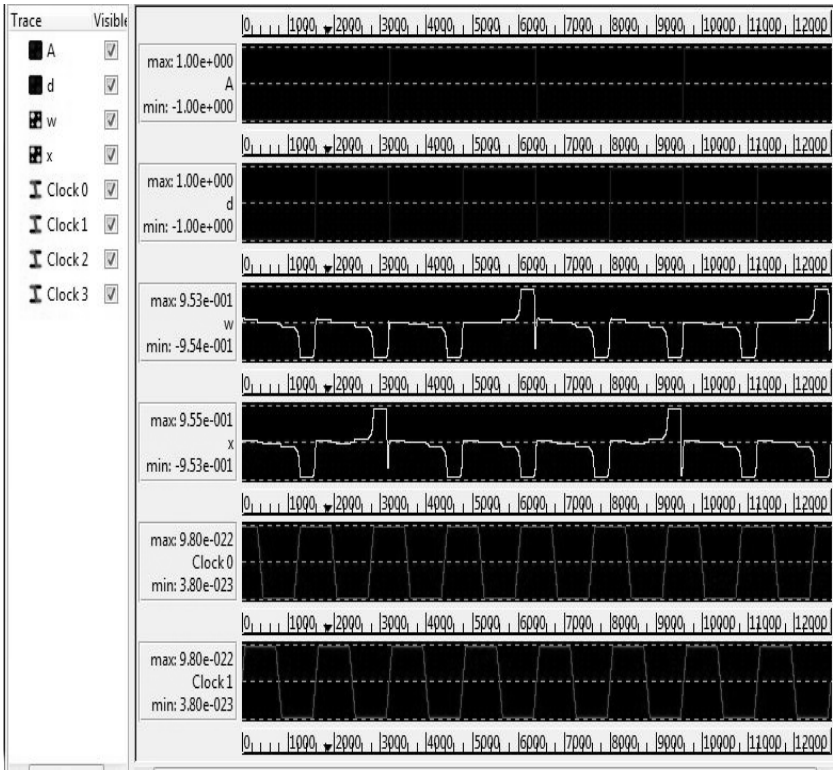

Figure 6. Simulation result of 2:1 Mux

The implementation employs a four-phase clocking scheme, comprising the switch phase, hold phase, release phase, and relax phase. These four phases are separated by 90 degrees. Polarization solely occurs during the switching phase, with the polarization state sustained during the hold phase and subsequently released during the release phase.

(C) 1:2 DEMUX:

The Demultiplexer (DEMUX) is a combinational logic circuit that receives information or data from a single input and directs it to a designated output line specified by the input to the select lines. If the A-line is set to 0, the data is directed to output line W; conversely, if the A-line is set to 1, the input data is routed to the X output line. Fig. 7

illustrates a 1:2 Demultiplexer, where data from input D is distributed to either the W or X output lines.

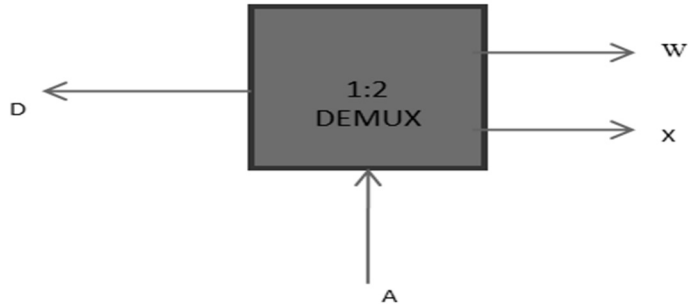

Figure 7. design of 1:2 DEMUX

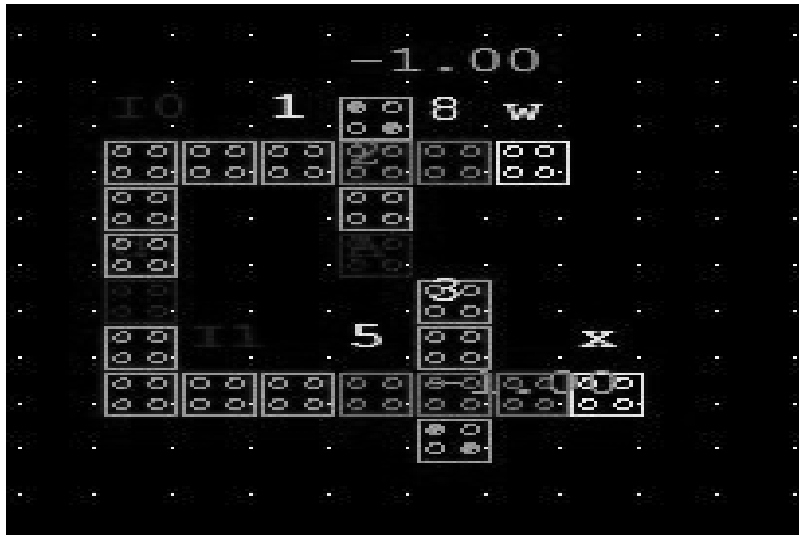

Figure 8. The layout of 1:2 DEMUX

The 1:2 Demultiplexer (D-mux) has been implemented using Quantum Cellular Automata (QCA), as depicted in Fig. 8. Simulation outcomes are presented in Fig. 9. From this implementation, an area of 148.9698 nm² is calculated, and the power consumption is measured at 35.762 * 10^{-9} W.

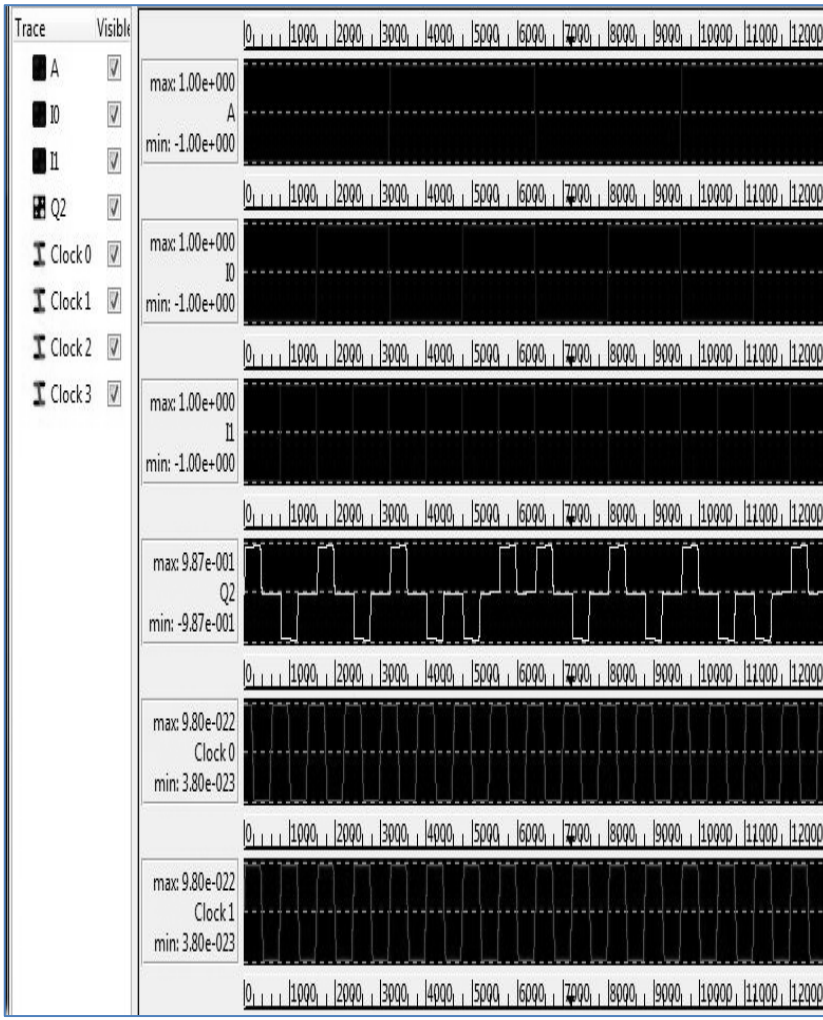

Figure 9. Simulation result of 1:2 DEMUX

4. Power and Energy Calculations

The power and energy can be calculated as demonstrated in equations (1) and (2) [10]:

$$Ediss \leq [\frac{2\check{Y}new}{Ek}\left(\frac{P0}{Pold}\check{Y}\text{old}\frac{\text{P0}}{\text{Pnew}}\check{Y}\text{new}\right) + \text{Ek}\frac{\text{Pnew}}{2} * (\text{P0} - \text{Pn})] \quad (1)$$

$$Ek = no\ of\ cells * kink\ energy \quad (2)$$

Where Kink energy=$1.811*10^{-29}$ Joules

P0 = Pn = 1,
Pold = -1,
Pnew = 1,
$\check{Y}$new = $9.8*10^{-23}$,
$\check{Y}$old= $3.8*10^{-23}$, Ek = $1510.374*10^{-29}$J
Edits < $0.9*10^{-18}$ J

5. Conclusion

The design proposed in this paper is founded on crossbar switch architecture. The DCS switch is proficient in managing multicast traffic loads. Simulation results indicate a power consumption of 35.762 * 10^(-9) W for a 1:2 Demultiplexer (DE MUX). QCA serves as a superior tool for crafting area and power-efficient reversible logic gates [9]. Additionally, the design can be translated into practical implementation using reversible logic within the QCA designer tool. This approach enhances flexibility and scalability, rendering it applicable to multimedia applications that frequently rely on multicasting.

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CHAPTER 3

DEMAGNETIZATION DETECTION OF PMSM MOTOR BY SIGNAL PROCESSING TECHNIQUE

KHADIM MOIN SIDDIQUI[1], AMIT DUBEY[2], RAJAN YADAV[3], AMAN ALAM ANSARI[4]

Abstract

Nowadays, the PMSM machines attain popularity in the industries because of its excellent dynamic performance. This motor is very suitable for automotive and high power traction applications. The main problem in this motor is magnetic demagnetization; if this problem is not detected in the early stages then drastic consequence is taken place in the industries due to motor failure. Therefore, in this paper, magnetic demagnetization has been detected in the early stages by advanced signal processing technique. The detailed signal associated with high frequency band of Wavelet transfigure has been cast off in early magnetic demagnetization culpability detection impetus. In the future, the proposed technique may be implemented for diagnosing of magnetic faults in the efficient way.

Keywords: Permanent Magnet Synchronous Motor (PMSM); Demagnetization Fault Identification; Time Domain Analysis; Advance Signal Processing Technique; Discrete Wavelet Algorithm

1. Introduction

The rotor employed in the Permanent Magnet Synchronous Motor (PMSM) comprises permanent magnetic material. This attribute simplifies and enhances the control of PMSM, resulting in improved power factor.

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