Literature Review of Related Work

Chapter-2

Literature Review of Related Work

The literature review process is undertaken after procuring peer reviewed research papers on different related dimensions surrounding this work. The reviews are cited for each paper separately and their after the reviews are summarized as review findings. The review findings have laid to the formulation of research problem. The solution design of the formulated research problem is detail in the form of logical as well as physical design for implementation in **Chapter-4.**

2.1 Resource Management and Mapping, Tasks Management Techniques and algorithm in Multiprocessors and Run-Time MP-SoC

Brockmeyer et al. [1] have associated with memory estimation and define the problem for memory mapping and dynamic management in memory ,mapping techniques in all types of of memories when more than one resources on MP-SoC.

Apurva et al [2] have focused the analysis that the criteria Success Ratio & Effective CPU Utilization Time are of prime focus in overLoaded condition. the Criteria Success Ratio is to control the deadline meet in real time System & The Criteria Effective CPU Utilization Time to control the Performance efficiency of the Processors.

Moshe PEELEH [3] his given focused the analysis on priority of tasks and manage the Highest priority simulations results of HAD algorithm with EDF, LST are useful to defined the hypothesis of proposed research work . the deadline meet in real time System & The Criteria Effective CPU Utilization Time to control the Performance efficiency of the Processors.

Ch. Ykman-Couvreur[4] et al have   described the content of MP-SoC Architecture , tasks assignment ,tasks management, resource management in design –time MP-SoC and Run-time MP-SoC . resource utilization at design time is important in MP-SoC because of satisfying all user and process constraints are real challenge in MP-SoC so paper focus on design-time application exploration which includes the utilization of resources for developing embedded software development. in case of an embedded platform, while for a general purpose platform, minimized the cost of component. Programming effort can be implemented and defined as the

design effort necessary to get a wide variety of applications running within specifications on the MP-SoC platform. Custom design for a single product or application is not much feasible and available for longer time.

Wolf [5] has surveys the state-of-the-art and awaiting challenges in MPSoC design. Standards in multimedia, communications, networking, and other areas encourage the development of high-performance and required platforms that can support a range of implementations of the standard. A multiprocessor system-on chip includes embedded processors, controllers, digital logic, and combination into a heterogeneous multiprocessor. This mix of technologies creates a major challenge and issues for MP-SoC design teams. The input needs for embedded MP-SoC platforms are flexibility, scalability, predictability and real-time behaviour. MP-SoC platforms require low power consumption, while providing a large amount of processing power.

Grant Martin [6] in his paper , he has reviewed the design challenges and issues faced by MP-SoC developers in market in all stages like hardware and software applications .Application development is a need for programming models and intercommunication Application programming interfaces(APIs) use to allow software applications to be without difficulty of communication and configured for many different available architectures without repetitive rewriting, while at the same time ensuring well-organized production code. Paper focus on Synchronization and control of tasks scheduling may be used by RToS(Real time Operating System) or other scheduling methods, and the selection of programming and threading models, there is some lacking either in symmetric model or asymmetric model, has a high risk on how best optimal control tasks or thread running. To find out the bug in Multiprocessors system for the difficult embedded software developer becomes a much more compound tasks, when comparative analysis of traditional single-processor debug, or the debug of simple Multiprocessor systems which have seen in loosely coupled. The interaction between the multiprocessor system, software applications, application interface , and processor or Hardware configuration, adds a new direction or dimension to the problem space.

M. A. A. Faruque et al [7] have focus on Application and management of a Network-on-Chip (NoC) in an high potential and efficient way is a complex and challenging tasks. To Accomplish , the operating system required to work with the capabilities and the requirements of the NoC. Only by creating a strong and efficient interaction can system combine the necessary °flexibility with the required efficiency. This paper give the examples such communication by detailing

the management of interaction resources in a system which associated with a packet-switched NoC .

O. J. Kuiken et al [8] have analyzed the result of the analysis, specification and implementation of prototype of Socrates, which work on communicated ,configurable and integrated platform for System-on-chip Multiprocessor   for real-time applications. The implementation and design of System-on-a-Chip (SoC) is today speedily increasing due to high compound and not effective and efficient   tools for development and verification. The paper focus on all the functionality one a singl chip which highly indicated that the system becomes tiny, faster in execution , and but increasing the problems and complexity in system.

R. Kumar et al [9] have represented the state of the art report introduces basic SoC terminology and practice with deeper analysis in three architectural components: the CPU, the interconnection, and memory hierarchy. A short historical view is presented before going into todays trends in SoC architecture and development. The SoC concept is not new, but there are challenges that has to be met to satisfy customer demands for faster, smaller, cheaper, and less power consuming products today and in the future.

Pablo G. Del et al [10], have analyzed that increasing complexity in various embedded products and the   stability and improvements in process technology, Multi-Processor System-On-Chip (MP-SoC) architectures have become ubiquities . paper provide the motivation to embedded developer to develop much efficient mechanism , method or software applications to these system which required real time system because day to day technology become more advance and complex .

Oliver Arnold et al [11] have analyzed to design and implement a new heterogeneous multiprocessor system which associated with two features like (1) dynamic memory and (2) power management for high performance and power consumption is described.

O. Moreira et al [12] have   descried and analyzed on two basic models for the on-chip memory which are classified as   (1) hardware-managed coherent caches and (2) software-managed streaming memory. This paper   analyze   two models and return the comparative analysis and design of the two models under the same set of criteria about recent technology, work area, speed, power consumption and computational efficiency.

Wayne Wolf [13] in his paper , he has briefly introduced the architecture of multiprocessor system-on-chip (MP-SoC) uses multiple CPUs , memories and processors. This paper surveys the history of MP-SoCs to described that the architecture of MP-SoC is much efficient and unique in category of computer architecture. System observed and derived some of the technological system trends that have followed the design of MPSoCs. System also survey and analyze the CAD(computer-aided design problems) which associated with design issues of MPSoCs.

H. Nikolov et al [14] have focused on real time operating system architecture with microkernel implementations of chips used for embedded system. Paper imitate the implementation of microkernel in programming language of C and C++.

M. Horowitz et al [15] Literature paper described the real-challenges in dynamic mapping when system become overLoaded and satisfies with tasks management , resource management and process management. Literature article focus on real challenge of scheduling policies in MP-SoC

D. A. Patterson et al [16] literature paper he briefly introduced on the architecture of Operating system which includes the single processor scheduling policies , multiprocessor scheduling policies , deadlock detection ,deadlock avoidance , challenges in real time operating system . book focus on the basic architecture of operating system like process management , memory management, file and disk management.

TImon D Braak[17] he has defined a run-time resource manager which focus on the demand of resources in heterogeneous environment and has to match the resource demand of applications with the resource provision of a platform. Which resources are available and demanded during its execution should be specified per application. This application specification can be used to allocate sufficient platform resources to the application.

C.L.Liu [18] he has described the characteristics of fixed priority scheduling . The dispatcher give the highest priority to the executed tasks and fixed the priority with appropriate resource. The dispatcher suspended low priority tasks .A medium tasks when occur at that time dispatcher will leave it and focus on the highest priority tasks. Paper also analyze the types of priority scheduling either it is preemptive or non-preemptive . in this types scheduling when process arrives in pool of queue, scheduler check the priority of process.

Michal kutil [19] have focused on TORSCHE Toolbox which used in MATLAB. It works on monoprocessor scheduling, dedicated processor scheduling, parallel processors scheduling and multiprocessors scheduling. It supports the DSP algorithms, pipelined arithmetic, graph algorithms. Some of the simulation results defined here for Fixed priority scheduling with weight property and without weight (priority)

A.M Devices [20] have focused on the area of modeling MPSoC in connection with analyses in different design phases can be roughly divided up into simulation-based approaches and more formal approaches. Simulation provide the actual feedback in design and implement of process. Research focus to implement the formal model and verification which describe that day to day scenario of MP-SoC is increased and arises in market.

M. H. Wiggers [21] have analyzed the hard real-time systems ,measure the significant disparity between EDF- based Scheduling policy and pfair scheduling policy. Paper focus on wide range of soft real -time applications to be scheduled.

C.L. Chou et al [22] have found an analysis of the problems presented by different application requirements and characteristics. **A** scheduling algorithm for real-time systems to be implemented on multiprocessors is proposed. a new heterogeneous multiprocessor system with dynamic memory and power management for improved performance and power consumption is presented. Increased data locality is automatically revealed leading to enhanced memory access capabilities.

Pareto [23] has defined a rule when in his country economics go down , observing that twenty percent of the people owned eighty percent of the wealth, which is used to utilize efficient resources and system is able to solve 80 percent problem with 20% resources .

Imec [24] **described** the speedup the design process to meet the market deadline, overall structure of system from an abstract point of view must be considered. The research and prototype is depends on the different parallelism . Massive Parallelism which is used to achieve low power consumption. Three ways of achieving massive parallelism as under with a certain degree of parallelism. In a multiprocessor system, toa achieve the application of parallelism, satisfied and efficient communication and memory management are highly needed. The recent trends and developments in the partial and dynamic Reconfigurable Computing (RC) field require correct ways to manage tasks running and execution concurrently. In this Environment , Operating System (OS) provides set of services like process scheduling, process placement,

inter-tasks communication have been developed to make such platforms easy and independed. In this paper focused on the run-time communication service and dynamic memory management in the Reconfigurable System-on- Chips (RSoCs).

Dr.Jeraaya [25] has introduced the basic architecture of MP-Soc with resources of CPU's, Controllers, Multiprocessors , ALU and memory. Co-design is also the part of embedded application and scheduling policies which are the real challenges in MP-SoC.

C Rusu et al [26] have focused on the   user constraints like energy . they have implemented methodlogy and techniques for real time applications. They have also introduce the real problem in constraint satisfaction in resources. They have implemented computing methods for maximizing reward and dynamic data management in process and resources.

Jorge hortiz [27] has analyzed and represented Embedded systems can not take more duration on independent hardware or software desired solutions to real time   challenges which are strongly associated with   upgradeability , efficiency, flexibility, cost,   and development time. Paper analyzed System designers are focused on hardware/software co-design which supports time capabilities while manage resources to support increasing compound real time system.

Samih M. Mostafa et al [28] focused on the round robin algorithm to find out the quantum and they have analyzed   time quantum is fixed and after this processes are successfully scheduled and executed and reported that some process not get CPU time. If time quantum value is to large than response time of the processes is very high and it's indicated that tolerated in active environment. If time quantum is smaller value , it causes meaningless switch leading to more overheads in simulating resulting in less throughput. a paper focused on a method approach integer programming to find out and solve equations that decide a value that is neither too large nor too small.

Hitesh P. Daulani et al [29] have analyzed that real-time systems tasks associated and interacted with each others to complete common system goals, which implemented precedence relation along with tasks. Each tasks take imitative for the output of system in some well organized manner and it contributed of each tasks should be taken into account. On the other side processing on well defined platform market is raising with multiprocessors and various method and techniques are leapfrog for utilizing processing power of each core potentially and

efficiently. This paper presented the scheduling algorithm for real-time tasks management which derived precedence association among tasks.

M.kaldevi et al [30] have analyzed , described and interact with real time Operating System (RTOS) based applications that get deadlines to facilitated and provided logically correct results. Paper focused on multitasking operating system features and application which work on time deadlines and functioning in real time constraints. To achieve the real-time constraints in RTS (Real time system) for scheduling the tasks, different scheduling algorithms were used. paper analyzed designed of RTS using priority based preemptive scheduling and the execution of high priority tasks. The main objective of this paper is to comparative simulation results of two efficient and important tasks schedulers such as Earliest DeadLine First (EDF) scheduler and Ant Colony Optimization Based (ACO) scheduler. It also presented and implemented a system that can be schedule multiple independent tasks.

Jashweeni Nandanwar et al [31] have focused on time constraint. Time constraint is the main factor in real time operating system. Different scheduling algorithm is used to schedule the tasks. The Earliest Deadline First and Ant Colony Optimization is a dynamic scheduling algorithm used in a real time system and it is most beneficial scheduling algorithm for single processor real-time operating systems when the systems are preemptive and under Loaded. The main problem in EDF algorithm is that the performance of the system decreases because of overLoad condition. To solve this problem ACO (Ant Colony Optimization) based scheduling algorithm for real-time operating system is used which assures the overLoaded condition. But the ACO algorithm takes more time for completing the tasks.

2.2 Literature Review Analysis and findings

The summary of above cited reviews have filtered of a set of issues of research interest. These issues are listed underneath.

- Wanting direction for embedded software developer for Dynamic Management and Mapping policies for Run-Time MP-SoC[4][6].
- No integrated scheduling policies for resources of MP-SoC in overLoaded Condition. [1][2].
- Traditional Scheduling polices solve the tasks management problems and issues and not incorporate with resource management ,memory management in MP-SoC[2][8].
- Mickro kernel development required in MP-SoC using RToS application[8].
- Real-Time scheduling policies for dynamic data management on chip.[11][13].

- Requirement of prototype designing tool for Run-Time MP-SoC.[25].

- Need to design sign the algorithm for implementation for only independent tasks not for periodic tasks and it designs only on homogeneous Environment not on MPSoC[3].

- Need to formulate algorithmic steps that are for implementation for only Periodic tasks. An adaptive algorithm is proposed with combination of ACO based and EDF. Under this algorithmic procedural, when the switching takes place from ACO to EDF, the missing ratio of deadline is increased which degrades tasks performance taking more time to complete the tasks.[5][9].

2.3 Problem Formulation

Embedded software developer have deep challenges in the development of the run-time management software module to manage the dynamicity of embedded software which justifies the capabilities of resource management, tasks/process management , generating independent and periodic tasks , provision of RTOS features , comparative analysis of simulation results on various scheduling policies to provide justifiable solution to improved level of Load balancing of resources. It further takes dynamic software driven care of efficient and effective utilization of processors [7][12].

2.4 Research Design

Research design is concentrated on (I) the development scheduling policies for resource management and process management and (II) the provision of information resource vital to the embedded system developer for development of application that satisfies constraints as well as manages the trade-off between resources and dynamic data management. [1][2][9].The scope of PDDMM is to integrate resource management, tasks management, user and tasks constraints satisfaction. PDDMM is designed to support RTOS features with implementation of process control box (PCB) management , Inter Process Communication, Load computation of each resources , tasks set generation, memory management in run-time MP-SoC. Run-Time platform manager works as intermediate interface between resource management and software application for dynamic management [3].