Introduction

Software Development in Global environment has changed from a rudimentary computational methods to complex methods enabling super computing needs with each area becoming an area for research to improvise computing in all dimensions across value chain. From mid 1980’s until date, with the flow of time and innovations in computing technologies catering to ever expanding human needs of computing, the landscape of Software Product Development has seen computers performing few hundred instructions to Teraflop instructions and beyond.

With ever changing scenario of the perpetually increasing computing requirements, technology enabled solutions are engineered, however with proportional effect of power consumption.

As the abstraction level increases from the binary instruction execution, to next gen computations using the 5th Generation Languages the level of power consumption assumes many a dimension.

There has been a research conducted on the lifecycle development of computational systems in terms of impact on the power or energy consumption to develop, run and retire such systems. As we consider the current technical advancements and research conducted in the energy consumption by Software Products it goes by “Moore’s law of power consumption: power consumption of nodes doubles every 18 months”. This would in turn demand cooling systems that would consume power again. Therefore it is necessary that there should be an effort to engineer energy efficient software systems that will tend to consume lesser power proportional to the amount of computing that is required and generated. The solution path has two dimensions one being Engineering Solution and other Management Solution that exists in the ecosystem. One of such management solutions could be Enterprise Computing Concept enabled by different technologies that would meet the end user needs and manage lowering power consumption. . Suggested estimates from different reports indicate that Cloud Computing/ Grid Computing would enable companies to save several billion dollars off their energy bills. That translates into carbon emission savings of over a hundred million metric tons per year by 2020.
At this juncture it is necessary to introduce a known concept of Green Computing to take this topic further on solutions space in engineering domain. The Challenge of Moore’s law on power, which is slowly fading away, can be accelerated to oblivion, by innovative sustainable initiatives in the conduct of Software Development Life Cycle stages, paving way to new frameworks for Green Computing in consonance with collaborative Energy Management systems designed and deployed in the ecosystem.

This initiative of research study will focus on Software Products Development Life Cycle stages with a fundamental objective of bringing out innovative ways of aligning the software development life cycle activities to conform to practices that enable sustainable development by reducing carbon foot print.

These include below stages in the value chain,
1. Conceptualization of the Product
2. Proof of Concept Development
3. Development of the Product
4. Use of the product: Distribution and Deployment
5. Deactivation
6. Disposal

**Importance of the Proposed Research Work:**

In Software Product Life Cycle, at the early stage of Conceptualization of Products, it is needed to align the activities to effect reduction of carbon foot print. Since the solution needs to be implemented at enterprise level, it is necessary to consider impact power consumption of similar systems co-deployed in such environments. This is to ensure that Conceptualization considering the energy consumption aspect is in tandem with other deployed solutions.

Driving the Software Product Development Life Cycle activities, to be aligned to, Sustainable practices is fraught with several risks. Firstly, the system may become inefficient with over burden of the process (overheads). Secondly, the system may not meet the intended product objective. Thirdly, the affordability of such software even though it meets the objective of sustainability may not be cost effective; in such cases sustainability of the product would be in question.

As we intend to support the quick assimilation of the of technology innovations to produce software products, with a lean on the sustainability, it becomes imperative that the process and activities that support the product
development, need change, at micro levels, that cumulatively add to carbon footprint. This directly relates to the energy consumption. Thus this research will focus on unit level activity of (engineering) optimization of the software development activities. Referring to a postulate proposed by Professor Jonathan Koomey "At a fixed computing load, the amount of battery you need will fall by a factor of two every year and a half." More mobile computing and sensing applications become possible, as energy efficiency continues its steady improvement.

This research draws encouragement from the reports generated by Prof Koomey, that shows, that the electricity used in data centers worldwide increased by about 56 percent from 2005 to 2010—a much lower rate than the doubling that was observed from 2000 to 2005, this data demonstrates that we need to research in this direction.

This research study demonstrates that new methodologies will need to be derived with intent to reduce the carbon footprint by synthesizing the Software Product Development Processes and the Energy footprint for such development.