Chapter 6
Green Enterprise Architecture
Using Environmental Intelligence

Bhuvan Unhelkar
University of Western Sydney, Australia

ABSTRACT
This paper discusses Green Enterprise Architecture (GEA), which is an extension and application of Enterprise Architecture in the environmental domain. A GEA makes strategic use of the green IT systems otherwise also known as CEMS – Carbon Emission Management Software – that results in an all-encompassing approach to the greening effort that incorporates carbon data, information, processes, and knowledge in the organization’s decision making. This paper highlights the significance of such a strategic approach to carbon control in practice. The challenges associated with implementing Green IT in organizations can be handled through a carefully construed green IT systems architecture that will not only enable implementation of dedicated system for carbon measures but also facilitate upgrade and integration of existing suite of ERP applications that incorporate carbon measures.

INTRODUCTION
A Green Enterprise Architecture is an all encompassing strategic approach to Green IT within and across an organization. This architecture-based approach is considered strategic as it takes a long-term view that considers multiple areas of an organization such as people, processes, return-on-investments, economy and technology. This approach is different to the tactical, operational approach that focuses on, for example, switching-off of computers when not in use and replacing existing CRT monitors with green monitors. Green IT systems (otherwise also known as CEMS – Carbon Emission Management Software) play a significant role in this strategic approach to the greening of an organization. Through a well construed architecture and design, these green IT
systems facilitate an all encompassing approach to the greening efforts of an organization. These systems evolve from the basic use of carbon data, through to its analysis, correlations to create new knowledge insights and supporting the intelligence in green decision making. This comprehensive use of Green IT systems enables an organization to transcend the populist approach that, for the most part, equates green IT to switching-off desktop machines and saving paper through double-sided printing. This paper further discusses the architecture and design of such carbon management systems in practice. This paper further describes a green IT portal that would enable consumption and dissemination of green enterprise information. This paper concludes with some thoughts on the issues and challenges associated with green IT systems.

Green Enterprise Architecture

Researchers have discussed the value of such an architectural-based approach in the adoption of sustainability in an integrated way throughout an enterprise. Such enterprise-level architecture provides the basis for a long-term, strategic approach to green IT that updates existing systems, enables procurement of new CEMS, facilitates their integration and capitalizes on the business intelligence.

A Green Enterprise Architecture (GEA) considers the multiple existing systems and packages used by an organization in running its business. A GEA also provides basis for defining, assessing, measuring, analyzing, reporting, and monitoring the green IT systems and processes. Furthermore, a GEA results in the development of common terminologies that bring clarity, understanding, and consistency to the green enterprise initiative.

Following are the activities resulting from a green enterprise architecture for green information systems in an organization:

- Integration of the new CEMS with existing organizational systems (typically ERP packages, CRM) using SOA-Web Services interfaces
- Modification of existing data structures to accommodate new carbon data elements and related contents
- Data conversion to enable use of that data in calculating carbon emissions
- Populating parts of data and systems with external carbon data (such as regulatory requirements/standards/benchmarks)
- Evolution of carbon data through to information, knowledge and environmental intelligence
- Evolution of existing decision support and knowledge management systems to environmentally intelligent systems
- Creation of a suite of green services using service oriented architecture (SOA) and Web Services (WS)
- Application of mobile technologies to provide location-independence and personalization to the green information portals that facilitate collaboration.
- Quality assurance and testing of Green IT systems

FROM GREEN DATA TO ENVIRONMENTAL INTELLIGENCE

Green IT systems start with the capture and storage of carbon-specific data. This stored data is analysed and correlated to provide knowledge and insight. The journey to arrive at this new green correlations, knowledge and insights is called Environmental Intelligence (EI) (Unhelkar & Tiwary, 2010).

EI systems require upgrading existing BI systems to incorporate environmental data, information, processes and knowledge; and, analyzing, designing, developing and deploying systems that are specific to the environmental needs of