

Chapter 8

Cloud-Based Design and Manufacturing

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ABSTRACT

Cloud-based manufacturing is a computing and service-oriented model developed from existing advanced manufacturing models and enterprise technologies with the support of cloud computing, IOT, and virtualization. In this chapter, various definitions of cloud manufacturing are discussed. New service models other than the existing cloud computing service models are being discussed elaborately. Cloud-based design manufacturing is also being discussed. A comparison of cloud manufacturing and cloud-based design manufacturing is elaborately discussed. Key technologies and challenges in cloud manufacturing are highlighted.

INTRODUCTION

The National Institute of Standards and Technology (NIST) offers the following definition of Cloud Computing (Mell, P. & Grance, T., 2011). According to them, Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Many authors proposed definitions of Cloud Manufacturing. Li, B.H., Zhang, L.,...&Jiang, X.D., 2010 proposed a first definition of Cloud Manufacturing. According to them, Cloud manufacturing is a computing and service-oriented manufacturing model developed from existing advanced manufacturing models (e.g. ASP, AM, NM, MGrid) and enterprise information technologies under the support of cloud computing, IoT, virtualization and service-oriented technologies, and advanced computing technologies. It transforms manufacturing resources and manufacturing capabilities into manufacturing services, which can be managed and operated in an intelligent and unified way to enable the full sharing and circulating of manufacturing resources and manufacturing capabilities. CM can provide safe and reliable, high quality, cheap and on-demand manufacturing services for the whole lifecycle of manufacturing. The concept of manufacturing here refers to big manufacturing that includes the whole lifecycle of a product (e.g. design, simulation, production, test, maintenance). Cloud manufacturing is a type of parallel, networked, and distributed system consisting of an integrated and inter-connected virtualized service pool (manufacturing cloud) of manufacturing resources and capabilities as well as capabilities of intelligent management and on-demand use of services to provide solutions for all kinds of users involved in the whole lifecycle of manufacturing.

Xu, X., 2011 defines Cloud Manufacturing as a set of distributed resources which are encapsulated into cloud services and managed in a centralized way. Clients can use cloud services according to their requirements. Cloud users can request services ranging from product design, manufacturing, testing, management, and all other stages of a product life cycle.

Giriraj, S. & Muthu, S., 2012 investigated the guaranteeing assembly process information flow in real time, enterprise wide, from assembly station sensors directly to the industry policy making offices, is the true solution for improving productivity competence, reducing losses and greater than ever profits. In fact, the ideal production lies on the real machine or assembly capabilities of working non-stop at maximum speed, lacking downtimes or inactivity and assembled goods reject

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