The Implementation of Geo-Cloud SaaS System for Supporting the Civil Engineering Design Using BRMS Open Software

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Abstract — This project developed the civil computational design supporting platform and mobile application software which will be used in civil engineering area. This system was developed based on geographic information system (GIS), global position system technology, OGC software technology and expert software system. These kinds of software will be uploaded to private cloud system. This system, called CEDP (Civil Engineering Design support SaaS cloud Platform), can be used in the design phase of civil engineering where either a 3G or a LTE telecommunication are available. CEDP can identify the geographic position of the land, survey the position of land correctly and calculate the surveying result especially in civil construction area. Territory development plan of specific area will be surveyed and obtained by CEDP also. To implement the self design rule selection, BRMS (Business Rule Management System) is used. This software will be helpful to automate the numerous repetitive works when we design civil engineering products. In this paper, the software architecture of CEDP and its output examples are presented.

Keywords—BRMS; Geo-cloud; Civil Engineering; GIS; SaaS

I. INTRODUCTION

Computerized tools and techniques are important in construction. Before work starts, precise mapping and planning is critical. Engineers use surveying and spatial data to ensure that structures are built to fit and in the right place, as well as providing control points to monitor movement in structures once construction is complete. Moreover, there are many restricts when we use the land by preventing unprincipled land development. Before the design, the engineer should inspect the confirmation of land utilization plan. The integration of GIS and Cloud computing system is happening in commercial worldwide services, however this is the first harmonized application service platform in mixing civil engineering and cloud computing area. Civil engineering is all about improving and protecting the world we inhabit. It involves the planning, design and construction of facilities that we require for everyday living, industry and transport. It offers a challenging and wide-ranging career which can include the development of airports, offshore oil platforms, bridges, roads, railways and water supply systems.

II. CIVIL ENGINEERING AND CLOUD PLATFORM

Civil engineering is the process of preparing for forming things(dam, building etc.). Construction starts with planning, design, and financing and continues until the structure is ready for occupancy. These are needed various kinds of documentations and measuring. A cloud SaaS solution can be kept huge information from various steps and change these documentations to support following construction steps.

- Inspection: Inspect the affordability of land utilization
- Land Surveying: technique of accurately determining the terrestrial or three-dimensional position of points and the distances and angels between them. These points are usually on the surface of the Earth, and they are often used to establish land maps and boundaries for ownership, locations or other governmental required or civil law purpose
- Civil engineering design is a multidisciplinary process involving detailed analysis, judgment, and experience aimed at producing construction drawings, technical specifications, and bid schedules required to allow contractors to bid and construct physical projects[1].
  - Conceptual Design: The conceptual design is a study phase in which ideas and alternatives are evaluated. This phase results in a basic process concept, a preliminary schedule and a rough cost estimate. [2]
  - Basic Design: The basic design is the elaboration of the conceptual design into a package, defining the process requirements and the associated equipment and project facilities.
  - Detail Design: A phase of the Development Process wherein the top level definition and

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design of a Target of Evaluation is refined and expanded to a level of detail that can be used as a basis for implementation.

- Procurement and Construction: Before the foundation can be buried, contractors are typically required to verify and have existing utility lines marked on land surveying step. This lesson the likelihood of damage to the existing electrical, water, sewage, phone, and cable facilities, which could cause outages and potentially hazardous situations. Once construction is complete and a final inspection has been passed, an occupancy permit may be issued.

Fig. 1. Civil Engineering steps and cloud platform.

All kinds of output templates of every civil engineering steps are supported by the Geo-cloud platform in figure 1.

A. Inspections

To execute civil construction, we have to know about the permit usage of the land. Therefore, designers must survey the All kinds of output templates of every civil engineering steps are supported by the Geo-cloud platform in figure 1. As a result the following results in figure 2 are recorded in the cloud platform database.

Fig. 2. Civil Engineering Geo-cloud platform Output Results.

B. The function of BRMS software in SaaS Cloud Systems

Using BRMS: Many design firms and agencies have their own drafting standards and specification formats and styles that they’ve developed through many years of use and refinement. For the practitioners of civil design, particularly those that are directly involved with production of the drawings and specifications, this software users are expected to use their own judgment and experience to decide what is and what is not acceptable automatically by using BRSM technology. Many kinds of Civil Engineering design rules are stored by the simple software executions. If an engineer is survey the field, the basic design documents are produced by automatically. The following picture shows the example SW architecture of drawing line algorithm.

Fig. 3. Automatical draw line algorithm between survey points.

C. The function of Smart Devices

The convergence of Geo-cloud technology and GPS creates opportunity for other industry. The appearance of smart devices with high performance CPU and its many multimedia censors creates the opportunity to make converging GIS and GPS based services available. Moreover, newly designed GPS devices are combined with smart devices and receive the result on time for high accuracy within 0.3m. When a field researcher just pass the field environment with smart device and click the surveying type of that things, the information of that situation is transmit the platform automatically. We use Note-Pad as a smart device.

III. Conclusion and Further Development

We have briefly described real-time field survey and send it to the remote Geo-cloud platform. The collected information is analyzed by the Expert software to draw the Civil Engineering survey line automatically in the CEDP platform. After that the basic design drawings are drawn. This result is transferred to the GIS map on time. Therefore we can see the future view of the civil construction product within a day. The GIS, high accuracy GPS device technology, smart device technology are fused and result in making a new platform which make the work environment smartly, easily and economically in civil engineering area. In the future, we will add the simulation software to get the adequate civil construction products images which are harmonized with natural environment.

REFERENCES

[1] Introduction to Civil Design, MIT OPEN COURSEWORK