A Study on Electronic Bidding System

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Abstract:
In procurement procedures of public works, public requires transparency. Public organization requires efficiency. Bid participant requires fairness. Previously, procurement procedures had been carried out in the paper-based. Bid participants went to the government building in order to see the bid announcement. In addition, they went to the government building in order to apply and bid. For bidders who live in remote locations, travel time and travel cost had become a burden. For the public, bid opening because that had been carried out in a closed space, it was not able to confirm what has been fairly conducted. In order to solve these problems, the government has planned the electronic bidding. JACIC has designed and made a development of electronic bidding system. Then we improved function, multiple OS support, multiple middleware support, gave a security enhancement. Currently, ministries, prefectures, ordinance-designated cities, municipalities, and public organizations, 700 organizations who use the electronic bidding system.

Keywords: electronic bidding, the Electronic Bidding Core System, JACIC

1. INTRODUCTION
Electronic bidding system is intended to achieve a bidding process using a PC and Internet. In this system, a mechanism to prevent spoofing and falsification of documents will be required. Electronic bidding system has the following advantages.

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement in competition</td>
<td>Since those who meet the requirement for participation can participate, competitiveness increases.</td>
</tr>
<tr>
<td>Cost curtailment</td>
<td>Reduction of tender's personnel expenses and move cost leads to construction cost curtailment.</td>
</tr>
<tr>
<td>Increasing efficiency of office work</td>
<td>Increasing efficiency of business by computerizing bidding information, and submission of technical proposal document, and opening bid.</td>
</tr>
<tr>
<td>Securing reliability, fairness, transparency of bidding procedure</td>
<td>Since the bidder can check the schedule for order, an advertisement for bidding and progress of bidding on internet, reliability, fairness, and transparency of bidding procedure are secured.</td>
</tr>
</tbody>
</table>

In public works procurement, Electronic bidding Core System has won a lot of market share. On the other hand in goods procurement, many systems exist, in accordance with government common platform policy, ministries and agencies are moving to GEPS system which was provided by Ministry of Internal Affairs and Communications.

2. ELECTRONIC BIDDING CORE SYSTEM
JACIC developed the Electronic Bidding Core System as widely used software for public contracting organizations, and aimed at standardization of the electronic bidding system. 766 organizations (6 central ministries, 19 public corporations and organizations, 46 prefectures, 19 ordinance-designated city, 676 cities(including joint use), etc.) have adopted this system at present (the end of July, 2015), and evaluate this system as a standard electronic bidding application.

2.1 Advantages
The electronic bidding core system has following Advantages.

<table>
<thead>
<tr>
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</tr>
</thead>
</table>
Flexibility | Reflecting the needs of the public contracting organizations which adopted in the electronic bidding core system.  
High Functionality | Reflecting the needs of the public contracting organizations which adopted in the electronic bidding core system.  
Reliability | Public contracting organizations, such as national and local governments, have adopted this system.  
Security | Advanced security technology is employed.  
Progressiveness, Neutrality | The Japanese leading IT vendor, also a regular member of the electronic bidding core system development consortium is reviewing the system specification etc.  
Simplicity | Advanced security technology is employed.  

2.2 Bidding Method

The electronic bidding core system supports bidding method, from public works to material procurement.

Table 3. Bidding Method

<table>
<thead>
<tr>
<th>Related Construction Work</th>
<th>Bidding Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Open competitive bidding, Publicly-invited, designated competitive bidding, Work-specified designated competitive bidding, Optional contract</td>
</tr>
<tr>
<td>Related Operation Work</td>
<td>Designated competitive bidding, Publicly-invited competitive bidding, Publicly-invited proposal, Standard proposal, Optional contract</td>
</tr>
<tr>
<td>Related Goods</td>
<td>Open competitive bidding, Designated competitive bidding, Optional contract</td>
</tr>
</tbody>
</table>

2.3 Applicable Works

The electronic bidding core system supports a series of procedures from registration of bidding project to disclosure of bidding results.

Table 4. Open Competitive Bidding Process

<table>
<thead>
<tr>
<th>Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Prior Applicant Registration, Project Search/Reference, Sending of Application Form, Checking Notice, Sending Bid Form, Checking the Notice of Re-bidding, Checking the Successful Bidding Result</td>
</tr>
<tr>
<td>Purchaser Stuff Registration, User Registration, Registration of Procurement Project, Receiving Application Form, Issuing Notice, Receiving Bid Form, Registration of Estimated price, Bid Opening Execution, Registration of Opening Result, Issuing Notice of Re-bidding, Issuing Notice of Successful Bidding Result, Bidding Result Disclosure</td>
</tr>
</tbody>
</table>

2.4 Configuration

The electronic bidding core system consists of the Core Area, center of the electronic bidding core system, and a Customizable Area, for public purchasers to customize. Public purchasers can easily construct a work-linked electronic bidding system by customizing the Customizable Area as necessary and adding linkage functions to related systems.

2.5 Support for Multiplatform
Customization and expansion of core system functions are simple. This is because the system is layered into two parts: a customizable area and a core area. In the customizable area, screen and account book designs can be customized. In the core area, bidding-specific program components and a public key infrastructure are included. And since the system is developed with Java, program codes can be unified and efficiency in development and maintenance management can be improved. By operating the system in a Java execution environment which is implemented on a number of OSs such as UNIX, Windows, and Linux, it is possible to construct a system that is independent of configurations. This system also supports a variety of DBMSs such as Oracle.

2.6 Linkage to Related Systems

By using the API system, the Core System can obtain or pass on shared information that is related to bidding. Systems can work together seamlessly by editing each other's information. If there are not enough information items to pass on to a related system, it is possible to use a separate user database and link this database to the system.

2.7 Security

In Japan, when building the information system of government organizations, adopting the algorithm written in the “digital government recommendation code list” published by “Cryptography Research and Evaluation Committees” (CRYPTREC) is recommended.

(1) Encryption and Decryption

In the electronic bidding core system, the following algorithm was used before cryptographic algorithm transition in accordance with the digital government recommendation code list.

(2) Electronic Signature

The electronic bidding core system was using the following algorithm for the electronic signature before cryptographic algorithm transition.

2.8 Authentication

In the bidding form of the electronic bidding core system, the tenderer needs to sign the digital certificate. A document maker has to create a signature and has to prove it is not fabricated. There are some conditions among the digital certificates used in the electronic bidding core system. The 1st; uniqueness of a secret key should be guaranteed. The 2nd; digital certificate should be stored in the IC card. And the 3rd, no problem occurs in an operation check with JACIC. Key infrastructures and private certificate authorities publish digital certificates, and manage its validity.

(1) Government Public Key Infrastructure (GPKI)

An applicant submits an application to a governmental agency safely on the Internet, and a governmental agency notifies an applicant of the result. The purpose of GPKI is to offer the paperless system which realizes this procedure safely. This system proves that the person making digital sign truly created the application or the result notification, or that the contents are not fabricated.

<table>
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<tr>
<th>Algorithm</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Common key cryptosystem algorithm</td>
<td>Advanced Encryption Standard (AES)</td>
</tr>
<tr>
<td>Public key cryptosystem algorithm</td>
<td>Rivest Shamir Adleman (RSA)2048</td>
</tr>
<tr>
<td>Digest algorithm</td>
<td>Secure Hash Algorithm(SHA2)</td>
</tr>
</tbody>
</table>

(2) Local Government Public Key Infrastructure (LGPKI)

In documentation procedure between the local government and residents and companies in the region or among local governments, this system prevents tapping, fabrication, spoofing, and the threat of denial. Moreover, this system identifies the person who made the document.

<table>
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<th>Algorithm</th>
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</tr>
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<tbody>
<tr>
<td>Signature Algorithm</td>
<td>SHA256withRSA</td>
</tr>
</tbody>
</table>

(3) Private certificate authority
This organization performs mutual recognition with GPKI, and checks whether the application or notification are used between companies and a governmental agencies would not be created by the person identifying herself / himself, or are not fabricated by others. At present, there are five private certificate authorities which have published the digital certificate which can be used in the electronic bidding core system.

2.9 Electronic Bidding Core System Development Consortium

JACIC and SCOPE (Service Center of Port Engineering) established the Consortium in order to support the smooth introduction of the electronic bidding system to a wide range of public purchasers including local government agencies. Through the Consortium, specifications and provision conditions for a flexible electronic bidding system will be considered based on the electronic bidding system of the Ministry of Land, Infrastructure, Transport and Tourism according to the needs of public purchasers and know-how of IT vendors. Based on this specification, JACIC and SCOPE will develop and provide the Electronic Bidding Core System.

(1) Maintenance System

JACIC and SCOPE have set up the Electronic Bidding Core System Service Center to support public purchasers that install the Electronic Bidding Core System and the development vendors that are contracted to construct systems using the Electronic Bidding Core System.

Table 7. Service of Service Center

<table>
<thead>
<tr>
<th>Service</th>
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</tr>
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<tbody>
<tr>
<td>Inquiry Service</td>
<td>This service is for answering inquiries about installation, functions and operation Inquiry Service of the Core System, and how to avoid problems.</td>
</tr>
<tr>
<td>Information Service</td>
<td>This service allows the user to freely view questions and answers about the Core System at any time.</td>
</tr>
</tbody>
</table>

(2) Members of the Consortium

Table 8. Members of the Consortium

<table>
<thead>
<tr>
<th>Member</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Members</td>
<td>Companies that are willing to use the Core System either to develop the ability to create electronic bidding systems or to develop electronic bidding systems for public purchasers.</td>
</tr>
<tr>
<td>Supporting Members</td>
<td>Companies that require information regarding development of the Electronic Bidding Core System.</td>
</tr>
<tr>
<td>Special Members</td>
<td>Public purchasers of public works that are willing to install the electronic bidding system.</td>
</tr>
</tbody>
</table>

2.10 Promotion Policies

(1) Promotion of Domestic Standardization

A large number of local government agencies including the central government offices, prefectures, and government-designated cities participate in the Core System Development Consortium. This Consortium has been reviewing system specifications while taking into consideration the needs of public purchasers. The Ministry of Land, Infrastructure, Transport and Tourism and numerous public purchasers (central government offices, public corporations, and local governments) already have plans to establish an electronic bidding system using the Core System.

(2) Conformity with the International Standardized Specifications

The project of UN/CEFACT was started from 2002. Japan will be responsible for the Core System and JACIC played the leading role in promotion of the project. This system will conform to the international standardized specifications of electronic bidding to be established by the UN/CEFACT.

(3) Expansion of Core System Functions

Including support for new public key infrastructures such as LGPKI and computerization of the contracting process between a successful bidder and a public purchaser, functions of the Core System will continued to...
3. TECHNICAL PROBLEMS AND SOLUTIONS

3.1 Vulnerability of Java Applet

The electronic bidding core system has been constructed on the java architecture. And client environment is dependent on the java applet function. Java applet has been pointed out vulnerabilities many times, and it is repeating the version-up frequently. So we have to begin to consider alternative function.

3.2 Java does not work with latest browser

Java does not work with Microsoft's latest browser, Windows Edge. And Google chrome has announced that it will exit support of java applet in 2015. So we have to begin to consider alternative browser.

4. CONCLUSION

For technical problems, we will solve in a consortium activities. For dissemination, we have completed up to ministries and prefectural level, so we will consider the dissemination of the small municipalities.

REFERENCES

CRYPTREC (Government recommended ciphers list)

Electronic Bidding Core System Development Consortium

GEPS (Ministry of Internal Affairs and Communications)

GPKI (Government Public Key Infrastructure)

JACIC (Japan Construction Information Center)

LGPKI (Local Government Public Key Infrastructure)