Transnational Information Sharing, Event Notification, Rule Enforcement and Process Coordination

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ABSTRACT

Solutions to global problems such as disease detection and control, terrorism, immigration and border control, and illicit drug trafficking require sharing and coordinating information and collaboration among government agencies within a country and across national boundaries. This paper presents an approach to achieve information sharing, event notification, enforcement of policies, constraints, regulations, security and privacy rules, and process coordination. The proposed system, designed in collaboration with stakeholders and end users in two Latin American countries, achieves the desired capabilities by integrating a distributed query processor (DQP) that provides form-based and conversational user interfaces, a language translation system, an event server for event filtering and notification, and an event-trigger-rule server. The Web-services infrastructure is used to achieve the interoperability of these heterogeneous component systems. A prototype of the integrated transnational information system is described.

Keywords: digital government; distributed database; event and rule management; e-government; information infrastructure; information sharing; natural language translation; process coordination

INTRODUCTION

All countries in the world are facing global problems such as disease detection and control, terrorism, immigration and border control, illicit drug trafficking, and others. The solutions to these complex problems requires, among other things, information sharing, close communication, coordination, and collaboration among government agencies in many countries. There is an urgent need for developing and inte-
grating advanced information technologies to enable government agencies to share information and work together within a country as well as across national boundaries. Solving these complex problems in the transnational setting presents many new technological challenges. We list some of them below and point out the technologies needed to meet these challenges.

1. **Data heterogeneity**: Data collected by different agencies in different countries have structural and semantic differences. An integrated, global conceptual schema needs to be constructed by integrating the heterogeneous data to provide users with a uniform view of the distributed data, and a DQP system is needed to access and manipulate the data. The global conceptual schema should be presented in different natural languages used by users.

2. **Language heterogeneity**: Collaborating countries may use different natural languages. Data and documents in an unfamiliar language cannot be used readily by agencies in other countries. Automated natural language translation is needed to achieve information sharing.

3. **Heterogeneity in people and working environments**: Government agency employees have varying proficiencies in the use of information technologies; their requirements for interaction with these systems can be quite different. A choice of user-friendly interfaces is needed to suit a spectrum of users. Working environments also can be quite different. In some environments, there is full access to the Internet and other computing facilities, whereas in others, particularly in developing countries, Internet access may be unreliable or altogether lacking. It is important for a transnational information system to provide different means of communication (e.g., communication by e-mail, short messages via cell phones, paging, telephone, etc.).

4. **Heterogeneity in government policies, regulations, constraints, and security, and privacy rules**: The provision of local autonomy is of paramount importance to foster international cooperation and collaboration, because each country may have its own policies, regulations, constraints, and rules regarding what information can be accessed by whom, and when and how information can be used. These policies, regulations, and so forth may change with time, so they definitely should not be hard-coded into a transnational information system. A powerful, high-level rule specification language and an efficient rule processing system are needed to define and enforce them, respectively.

5. **Difficulties in inter-agency and inter-government communication and coordination**: At the present time, agencies within a country often have great difficulty keeping close communication and coordination among themselves. Communication and coordination among collaborating countries are even more difficult. Collaborating countries can benefit from each other by keeping one another informed of important events (e.g., the outbreak of a disease, a terrorist’s movements, etc.) by automatically delivering relevant information and by activating operations and manual and/or automated processes in response to the occurrence of events. Tools and mechanisms for supporting event publication, subscription, filtering, and notification, and for performing event and rule-based triggering of operations and processes are needed.
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