Project-Based Customer Relationship Management in Virtual Enterprises

Christian Breu, Norbert Meckl, Johannes Sametinger

Universität Regensburg

Lehrstuhl für Wirtschaftsinformatik

D-93040 Regensburg, Germany

(christian.breu | norbert.meckl | johannes.sametinger)@wiwi.uni-regensburg.de

ABSTRACT

The Internet has revolutionized communication among companies and clients. New possibilities for global collaboration among companies on a project basis are possible with virtual enterprises. Virtual enterprises enable new ways of collaboration with clients and their participation in creative and inventive activities of individual products. Furthermore project work with clients allows tight bonds to them and goes beyond traditional forms of customer relationship management.

In this paper we start with an overview of some basic concepts. We then present our approach of web-based project management that can be used for various forms of collaborative activities over the Internet, including customer relationship management. We have successfully used our approach for projects of a digital photography and a middle-class marketing agency. Currently, we are working on an extended platform for virtual enterprises in the area of facility management with many customers as well as sub-contractors.

Keywords

virtual enterprise, customer relationship management, collaborative systems & applications, web & Internet tools & applications, project management

1. Introduction

The Internet allows new ways of communication among companies as well as between clients and companies, e.g., business-to-business (b2b) market places. New ways of collaboration make virtual enterprises possible. Customer relationship management includes relations of companies to their clients and activities for the consequent support of client and service processes. Today's communication and collaboration facilities allow clients to participate in the creative and inventive development of individual products. This opens up new doors for effective CRM on a project basis, since the key factors of successful CRM are interaction

with and identification of the customer. Both is guaranteed in modern project management platforms, linked with the voluntary cooperation of the client and his ambition to design a customized product.

In this paper we describe a web-based project management system that enables companies to plan and execute business processes both with other companies and with clients. In Section 2 we describe basic concepts. Section 3 outlines our approach of web-based project management. In Sections 4 and 5, we introduce customer relationship management and depict consequences to virtual enterprises, respectively. In Section 6, we describe new collaborative CRM approaches. An example is presented in Section 7. In Section 8 we describe a prototype. In Section 9, we draw conclusions and outline future work.

2. Basic Concepts

Office communication, groupware and workflow management comprise the basic foundation of our web-based approach to project management and CRM. They will briefly be described subsequently.

Office Communication. There are many different software concepts in company-wide networks to support activities like writing letters or notes, administrating and finding documents, creating, forwarding and exchanging information [19]. Office communication systems have to provide a variety of functionality and support users with many activities. They are supposed to increase the productivity of end users, to shorten office operations, to reduce media breaks, and to integrate and combine information of various sources. Systems that provide solutions for these goals are distributed, have homogenous user interfaces with components like text processing, data administration, and presentation software.

Groupware. Computer supported cooperative work supports the collaboration of groups with common tasks without providing any control for these tasks [10, 19]. Groupware systems have to support cooperation in an unstructured, ad-hoc manner, to provide information for all members of the group under a variety of access points, to allow the possibility of simple data exchange, and to allow various ways of collaboration.

Workflow Management. Workflow management systems have to control the workflow among all members of a group that are involved in a certain business process. They are based on available procedures and, thus, only qualified for activities that are well structured and standardized, i.e., routine activities with high manual effort. Workflow comprises a chain of processing steps that belong together and have to be taken care of within a certain period of

time, across departments, according to well-defined rules with known information needs, and by people with certain abilities [10].

Office communication, groupware, and workflow management concepts are being applied within companies in various domains and departments. What we still lack is the utilization of these concepts across companies. Information and communication systems based on open and platform-independent architectures are able to overcome geographic boundaries of workplaces.

3. Web-based Project Management

A project is a nonrecurring, complex, and new intention with scarce resources and defined deadlines, that is performed under the participation of various departments or companies [12]. Project management includes continuous and goal oriented planning, supervision and control of all relevant project parameters [12, 16, 18, 19]. Projects can be viewed as a sequel of logically linked and time consuming procedures that result in state modifications. They can be divided into phases which are described by milestones at the beginning and at the end of a phase [3]. Web-based project management systems have to fulfill various requirements in order to integrate the concepts of groupware as well as workflow management and distributed project management:

- scalability, modularity and simplicity (for technical reasons and for reasons of acceptance)
- minimal requirements on clients, e.g., web browser, platform-independence (for mobile project monitoring and processing)
- simple exchange of various types of documents
- group communication, e.g., chat rooms, message boards and video conferences
- shared folders and notification functionality, unified messaging systems as well as Internet telephony and web cam presentations
- transparency of project deadlines and of project team compositions (assignments are temporary with possibly frequent changes over time)
- project specific access rights and identification of team members via login procedures (for security reasons)
- document management on the server (for the archiving of project relevant documents)
- reporting of logins and communication activities
- project calendars with individual adaptations (to avoid the missing of milestones)
- determination of project costs based on project calendars
- transparency with easy access of responsibilities of all project phases
- evaluation of projects

Additionally, simple interfaces for the integration of existing systems and state of the art security and encryption mechanisms are crucial. An open source tool for web-based project management has been described in [17].

We have implemented a web-based tool that supports master data, project structure, grouping of team members, digital documents, version management, resource management, message center, discussions, form editor, event agent, notification agents, workflow management, HTML editor, and a team calendar. The main focus of our tool has been on supporting middle-class marketing and photography agencies that both easily wanted to present their drafts and project progress to their customers and wanted to give them the opportunity to be integrated in the process of the project by providing feedback to the agency. The agency can restrict operations performed by their clients. Thus, the agency's view and the client's view provide different customized menus on the screen [4].

4. Customer-Relationship Management (CRM)

The term customer relationship management describes the holistic processing of relations of companies to their clients and contains all activities for the consequent support of client and service processes [1, 5, 6, 15]. Historically, CRM has been a result of the more flexible production process through the use of computers and robots of the 21st century, which enabled companies to satisfy customers' needs and whishes rather than just offering standardized products [9]. Therefore, CRM can be seen as is the implementation of marketing, sales, and service processes which are customer-focused rather than product-focused [9]. The indispensable prerequisites to implement this strategy are interaction with and identification of the customer.

New technologies, first of all the Internet, have broadened the possibilities of interaction and identification. This is the reason why CRM applications, next to supply chain management (SCM) applications, are seen as the most rapidly growing market in eCommerce software development. According to a research of IDC in June 2001, revenue from this industry will increase at a compound annual growth rate (CAGR) of 25%, from $61 billion in 2001 to $148 billion in 2005. This growth by far exceeds that of the overall IT services market, which shows a 2000-2005 CAGR of 12% [11]. CRM applications can be classified into three types of CRM technology, i.e., operational, analytical, and collaborative CRM [14].

- *Operational CRM:* deals with the primary business functions like billing/invoice, order management, and marketing automation.

- *Analytical CRM:* includes the acquiring, storage, extraction, processing, interpretation and reporting of customer data using various algorithms to analyze and interpret data.
- *Collaborative CRM:* serves as a communication center and acts as a bridge between customer and channels like voice and chat.

In the context of virtual enterprises and web-based project management, collaborative CRM will play the most important role. In the remote mass market of the net economy, businesses must strive to understand their customers and personalize their offerings. As the understanding of their customers changes for the better, the richness of the information and services being offered to them has to be improved also, adapting to their particular interests and reflecting the timeliness of their needs [7]. The area of service is most crucial when it comes to customer-relationship management. Therefore, CRM systems need to support communication to customers and capture customers' responses, i.e., support proactive as well as reactive communications [8].

The service that is expected today goes beyond traditional telephone call centers. Today's call centers are evolving into contact centers handling an assortment of audiovisual communication media. Telephone interaction must be coordinated with email, fax, web, and any other communication media that the customer prefers to use. Self-service is a fast growing requirement, as more customers are making their way to the web and want to look up their order status, make queries via their browser or – in the case of web-based project management – want to check the current status and progress of their collaborative project efforts [13].

5. Virtual Enterprises

Virtual enterprises are temporary networks of independent companies, which cooperate on a short-term basis for a certain task (project) and are perceived to be a single unit from outside. Internally the companies act as partners and bring in their core competences in a synergetic way [19]. Virtual enterprises are characterized by a common business understanding, a common mission or project idea, the integration of core competences of all members, one face to the customer, the avoidance of an institutionalization of centralized functions, and coordination by a highly developed information infrastructure. Virtual enterprises need a system with open, platform-independent communication with different media, storage of documents and documentation of communication activities, as well as groupware and workflow concepts. As a basic principle, the creation of economically independent organizations to a virtual enterprise is done on a project basis. Thus, an information and

communication system is needed that allows distributed project management across various companies with project-based access rights.

The role of clients has changed over the last decades. Companies have not only recognized the importance of their clients and the relationship to them. Clients increasingly play a crucial factor in the production process. Thus, not a product and its quality but clients with their special needs and a product's individual benefit for them are the driving force. Clients do not always need best quality of products, they need individualized solutions and partners that help them in the process of finding and creating such solutions. This has lead to an evolution from economies of scale, to economies of scope, and to economies of information [2]. Additionally, we see an emergence of what we call economies of speed.

- *Economies of scale*: When mass production of goods had been introduced, customers were not involved in the production process. The price was the major criteria for purchase decisions.
- *Economies of scope*: When markets had been saturated, quality management had increasingly been used in order to outperform competitors' products. Besides the price, the quality of products was a major criteria for purchase decisions.
- *Economies of information*: As a next step, an increased number of product variants had been used to better satisfy different market segments. This has lead to increased product complexity with smaller numbers of identically produced items. Besides price and quality, suitability in certain contexts influenced purchase decisions. In order to determine and evaluate suitability, companies were forced to gain information about their clients, resulting in the management of customer relationships.
- *Economies of speed*: Make-to-order production has lead to shorter product life cycles as well as to demanded faithfulness to deadlines. In order to achieve short production processes of individualized products, clients have increasingly been involved in the production process. Purchase decisions have increasingly been influenced by short reaction times, flexibility, and adaptability.

The evolution from economies of scale via economies of scope, to economies of speed and to economies of information has resulted in requirements of more flexible and more individual planning- and production processes. Economies of speed have lead to the emergences of virtual enterprises. In many cases, traditionally structured companies have become too clumsy to deal with short product life cycles, small number of pieces in production series, and quickly varying production processes. Virtual enterprises have come onto the scene to close the gap.

Clients do not buy finished products from virtual enterprises, but they trust in their skills to individually create goods for the clients' special needs. Operational and analytical CRM become less important in this scenario. Customers are being integrated into the process of product creation. At this point, interaction is needed with complex communication mechanisms and new collaborative CRM approaches.

6. New Collaborative CRM Approaches

Various forms of project collaboration exist, e.g. business-to-consumer (b2c) between companies and clients, business-to-business (b2b) among companies organized, for example, as virtual enterprises, and vertical hierarchic b2b between a prime contractor and its legally independent subcontractors.

The pure act of commercial transaction in typical b2c markets is short. Communication is usually reduced to filling out online forms. In the context of projects, where the product is particularly designed for the client, the need for exchange of information is considerably higher. Possible fields of applications in this area include all forms of digital products. The clients can be interactively integrated in the product development cycle via the Internet, due to its foremost characteristics like availability, low costs, speed, audio and visual capabilities and ease of use. The agency will publish its work to their clients, whereas the clients just contribute to the process by giving comments and proposals, see Fig. 1. Agencies state that they do not want the clients to change drafts by themselves, but rather want the clients to submit change proposals.

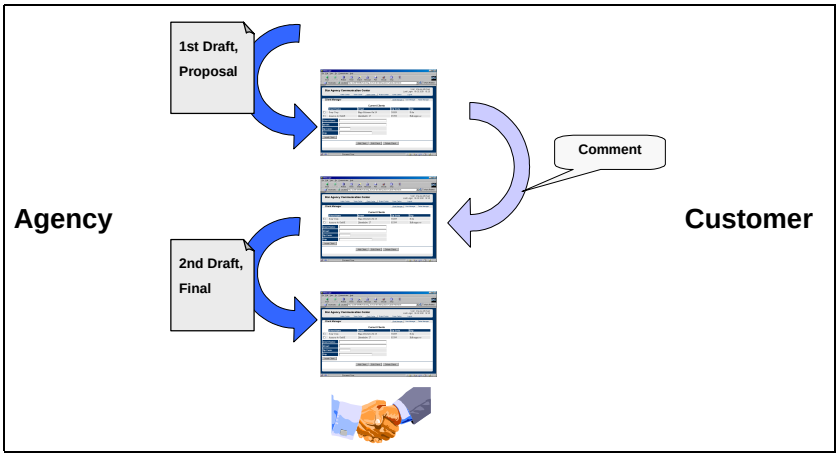

Figure 1: Customer Integration

This form of interaction between agency and customer enhances and simultaneously documents the creation process of the desired product. Incoming drafts and comments as well as the complete history and progress of the development process are being documented. Thus, we not only have collaborative CRM by using a communication center and communication

bridges between company and customer. We additionally have integrated the customer in the production process, which further enhances analytical CRM providing crucial customer data.

The model of collaboration among companies differs from the client integrated case in such a way that the participants are meant to agitate with equal rights. Therefore, all actors are equipped with equivalent access rights and contribute to the project by developing parts of the project, see Fig. 2. They do not necessarily interact in all segments of the project. As in the previously mentioned b2c case, project participants have the latest information and the history of the ongoing project at their fingertips, at any time and at any place, as long as there is an Internet connection available.

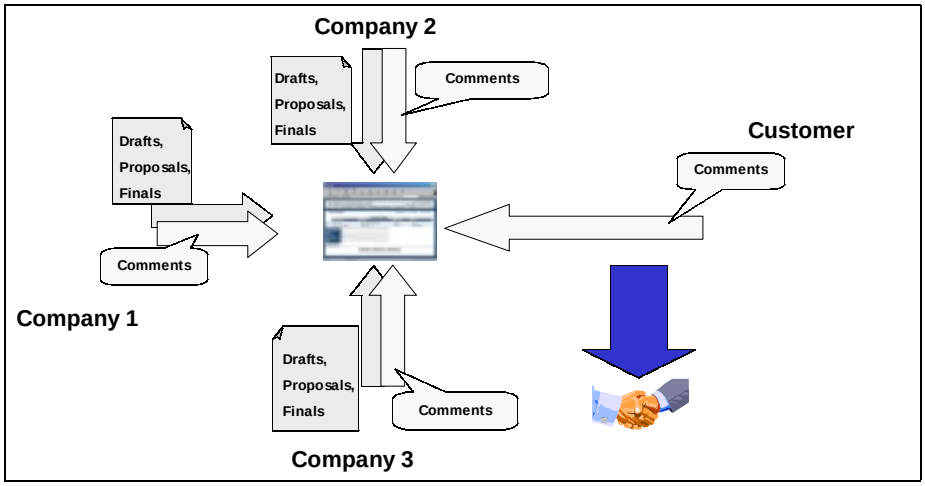

Figure 2: Collaboration among Companies

At first sight, a b2b collaboration setting does not require any customer-relationship management, because there are no customers involved. However, if both the virtual enterprise and its customers use the same Internet platform, individual companies can access CRM data both about the customers and about other participating companies.

Hierarchical b2b is characterized by precisely defined contracts with definite structures of responsibilities and dependencies. Tasks are passed on top-down. The flow of execution reports from the bottom up. This arrangement usually occurs in the context of proposal requests, e.g., for the planning of construction projects. In the example in Fig. 3, a prime contractor initiates an invitation to bid for several possible subcontracts. Potential subcontractors have the possibility to submit their proposal or pass a complete or part of the requested workload to further subcontractors. The prime contractor does not have insight into the complete process. After receiving all proposals from potential direct subcontractors, the prime contractor accepts favored proposals and the contracts may be signed. It is important to ensure that all contractors are just exposed to the part of the process and the project structure

that they are responsible for. This is achieved by security mechanisms and the distribution of different access rights. Due to reasons of acceptance it is appropriate to store project information at independent service providers or a superordinated association which may provide the needed infrastructure.

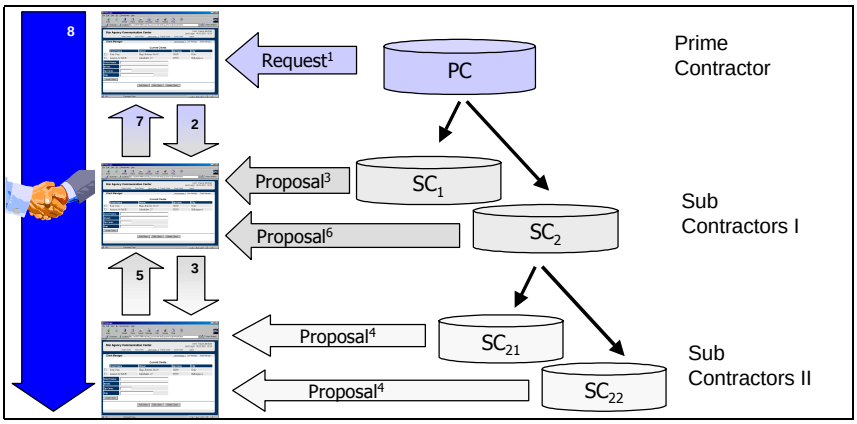

Figure 3: Collaboration with Subcontractors

In this scenario, we have a net of company-client relationships, where none of the participants may have full information about the entire setting. Communication to and information about the client is restricted to the prime contractor. Any subcontractors are only involved in communication with their subcontractors, of which they are the clients, and with their prime contractor, which is their client. CRM is complex in this scenario with nobody having full view to the complete project structure and to the complete CRM information that is available. In this case CRM principles can be applied on any stage, as any company, except the ones residing on the bottom, can act as a client for a subordinated company in the hierarchy.

7. Example

We will use a b2c application within a marketing agency as an example, see also Fig. 1. In this setting, a client is cooperating with the marketing agency in order to create a cover for an audio compact disk. The agency may prepare a first proposal for the cover. Additionally, drafts of flyers, commercials, advertisements etc. may be presented to the client. The client is being integrated in the production process by watching the current state of the process, by making comments on proposals and by submitting arbitrary ideas and demands. The project structure for this setting can easily be set up by the agency with a project configuration manager, see Fig. 4.

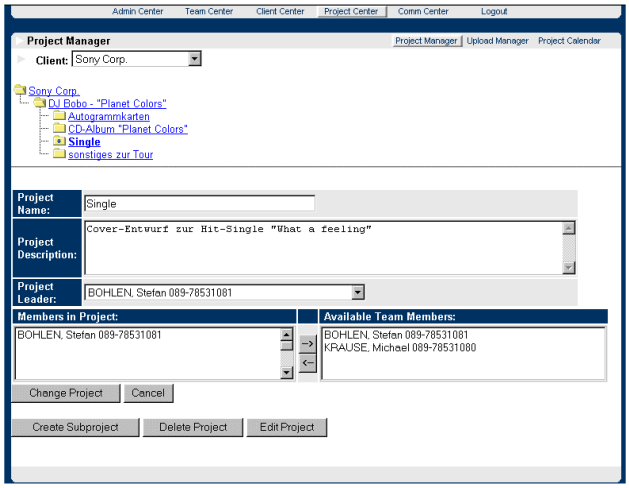

Figure 4: Project Manager (Agency's View)

As a next step, access rights for client users are specified. This results in a restricted access to the project structure for the client, see Fig. 5. Thus, the client has insight in the actual progress of the project. The type and the quantity of information that is given to the client can be managed, i.e., the access of the customer to certain project folders can be restricted.

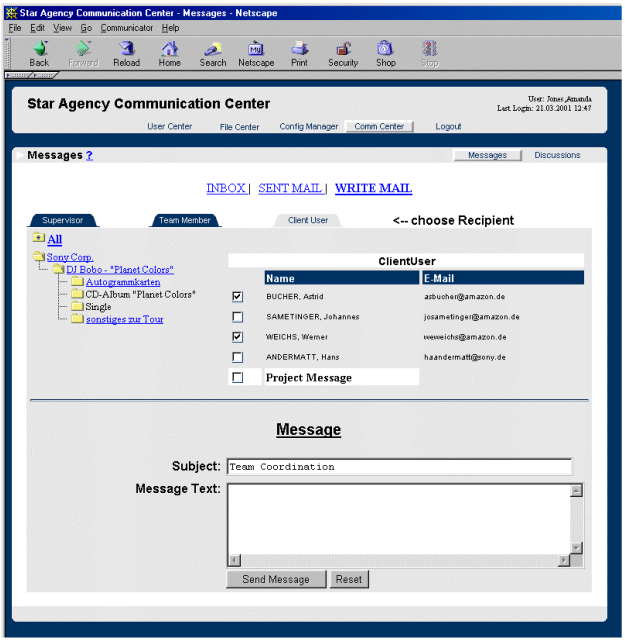

Figure 5: Restricted Client's View

There are two main advantages of this web-based collaboration. First, communication exchange can be done via pull and push technology, i.e., the client can always and from everywhere “tune in” and can also be automatically informed about project changes by email or short message services. Second, communication with the client, logins and other participation is being documented and can be used for further statistical analysis as well as for CRM purposes.

8. Implementation

We have implemented a Java-based modular web application using a standard SQL database interface, see Fig. 6. The underlying core business objects provide the basic prerequisites for security, scalability, robustness, performance and modularity. The modules in Fig. 6 are depicted and arranged according to the previously presented examples of various project environments, i.e., b2c, b2b and hierarchical b2b. The current modules, i.e., workflow management, message client, resource management, discussion forum, roll concept, document management, polls editor and cost accounting, combine the features that are necessary for intra-corporate project management. Adding the customer interface comfortably allows the setup for customer integrated project management with defined customer access to the system. The hierarchic company organization module is used to implement multi hierarchical project management like in the case of public offerings and construction projects.

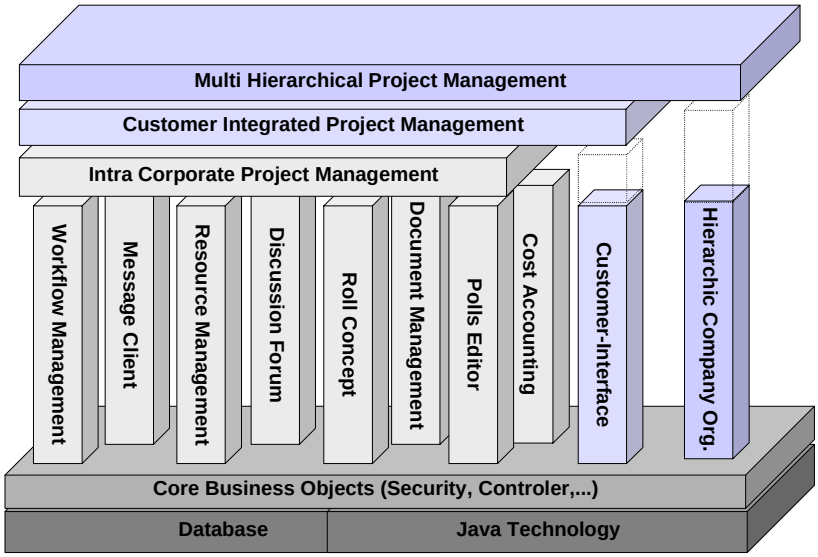

Figure 6: Software Architecture

The implementation has been written as a pure server-sided Java-based web application running both on Unix and Windows servers. It is compliant to Sun's Model 2 architecture by separating presentation and business logic using three servlets, about 50 JavaBeans and currently about 40 Java server pages. The system requirements for a PC client include Internet access and a browser that supports JavaScript.

9. Conclusion

In this paper we have given an overview of the basic concepts, including office communication, groupware and workflow management. We have then presented ideas for web-based project management, that can be used for a variety of activities over the Internet. This can be achieved by simply managing some meta data and other resources. Managing the

relations of companies to their clients is a major task of customer-relationship management. This task is different in traditional companies than in newer project settings like virtual enterprises. Support for new collaborative CRM approaches is needed, for which we have introduced a web-based Java implementation kit.

We provide hierarchic project structures with a generic combination and interaction functionality at each hierarchy level. A consequent workflow management philosophy supports reliable, cost- and time-effective groupware and project-orientated collaborative work. Other features include project expense overviews, instant updates of project notifications and constrained mile-stone-planning schemes. Future work will include enhanced support for mobile clients, integration of systems like MS Project, as well as integration of unified messaging systems.

Projects of a digital photography agency and a middle-class marketing agency have successfully been managed with the help of our tool. We plan to support and evaluate additional domains including lawyers and notary publics managing contracts, as well as university settings with courses.

The importance of project management increases as many companies restructure parts of their organization in a project-centric way. The distribution of digital products like certificates, contracts and audio/video products via the Internet is steadily growing. The evolution from economies of scale via economies of scope to economies of speed and information require more flexible and more individual planning and production processes as well as adapted forms of CRM. We have realized a project management platform with a modular and standardized design that enables extensibility and overcomes geographic boundaries in many project management settings like virtual enterprises.

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