The Management of Data, Events, and Information Presentation for Network Management

by

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Abstract

The purpose of a network management (NM) system is to monitor and control a network. Monitoring and control functions entail dealing with large volumes of data, events, and the presentation of relevant information on a management station. In this thesis we focus on data and events management and information presentation issues of an NM system. Existing NM systems either use traditional database systems which are not well suited for an NM system or they lack intelligent event and information presentation management frameworks. None of the systems provides a unified framework for managing data, events and information presentation tasks on an NM station.

We believe that the complexities of network management can be reduced substantially by exploiting, enhancing and combining the features of new generation database systems such as *active temporal* and *database visualization systems*. In this thesis we show that an active database system where active behaviors are specified as *Event-Condition-Action (ECA) rules* is a suitable framework for NM data and events management. The **Hy**$^+$ *database visualization system* with its sophisticated abstraction and visualization capabilities is well-suited to meet the requirements of NM information presentation. We also show that by viewing the network as a *conceptual global database* the network management functions can be specified as *declarative database manipulation operations* and *Event-Condition-Action (ECA) rules*.

But the facilities provided by existing active database systems are not enough for an NM system. A number of existing active temporal database systems provide support for a *composite event specification language* (CESL) (used in the E part of an ECA rule) that allows one to relate events in the temporal dimension. But these languages lack features that otherwise are required by certain applications.

We propose a CESL called CEDAR that extends the power of existing languages. CEDAR allows a user to specify various event management functionalities in the NM domain, which are difficult or impossible to specify in existing languages. An implementation model of the language operators using Colored Petri Nets is proposed. We also propose a model of a *network management database system* that incorporates CEDAR into an active database system, and various features required by an NM system. The resulting system (the **Hy**$^+$-CEDAR system) is integrated with the **Hy**$^+$ database visualization system.

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