UDC 621.38.049.77

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INFORMATION INTEGRATION OF CAD TOOLS FOR THERMAL DESIGN OF MICROELECTRONIC DEVICES COMPONENTS AT CRITICAL MODES OF FUNCTIONING

This paper presents the concepts of the Network-based information integration of CAD tools for the thermal design. The system architecture is built on power information technologies and provides remote access to the thermal modeling engine of microelectronic devices and their components via Internet/Intranet..

Keywords – information integration, CAD, thermal simulator, microelectronic.

1. Introduction

In general process of designing electronic systems special attention should be paid to their thermal design, because it is one of the limitations: how electronics can be produced small and dense. Thermal design is the process by which engineers use simulation software tools to predict and uncover potential thermally associated risk areas and to obtain desirable and correct solution as fast as possible in the product design cycle. The ultimate goal of these efforts is to provide the optimal design, that meets design requirements and reliability qualifications. From our point of view, the clue to efficient thermal design is not the choice of the "best" tool, but rather the optimized integration of available tools. This can be achieved in the framework of integrated distributed environment, based on modern network software technologies. The Internet/Intranet is the most suitable for this purpose. The key features and main advantages of this approach are considered in the papers [1]-[3], in which the network CAD tools for thermal design of flip-chip structures are developed. The papers [4]-[6] present the mathematical backgrounds of thermal stresses and design optimization problems in power semiconductor devices and microelectronic devices components at critical modes of functioning. This paper is the further elaboration of our research and is devoted to the development of Network-based CAD tools for thermal design of microelectronic devices.

2. Concepts and Architecture

General architecture of the proposed Internet/Intranet-oriented CAD system is shown on fig.1. The system architecture is built on the Dynamic HTML, CSS, XML, PHP, MySQL, Macromedia Flash, ActionScript, OpenGL technologies.

Main directions to provide information integration are:
- Information integration on architecture level of Internet-oriented thermal analyses tools of microelectronic devises;
- Integration on information level of relational databases;
- Integration on data formats level;
- Integration on level of data processing and interpretation.

Main features of the Network users access tool architecture are:
- Multi-user access;
- Standard web-browser and special software tool for the client part;
- Cross-platform compatibility;
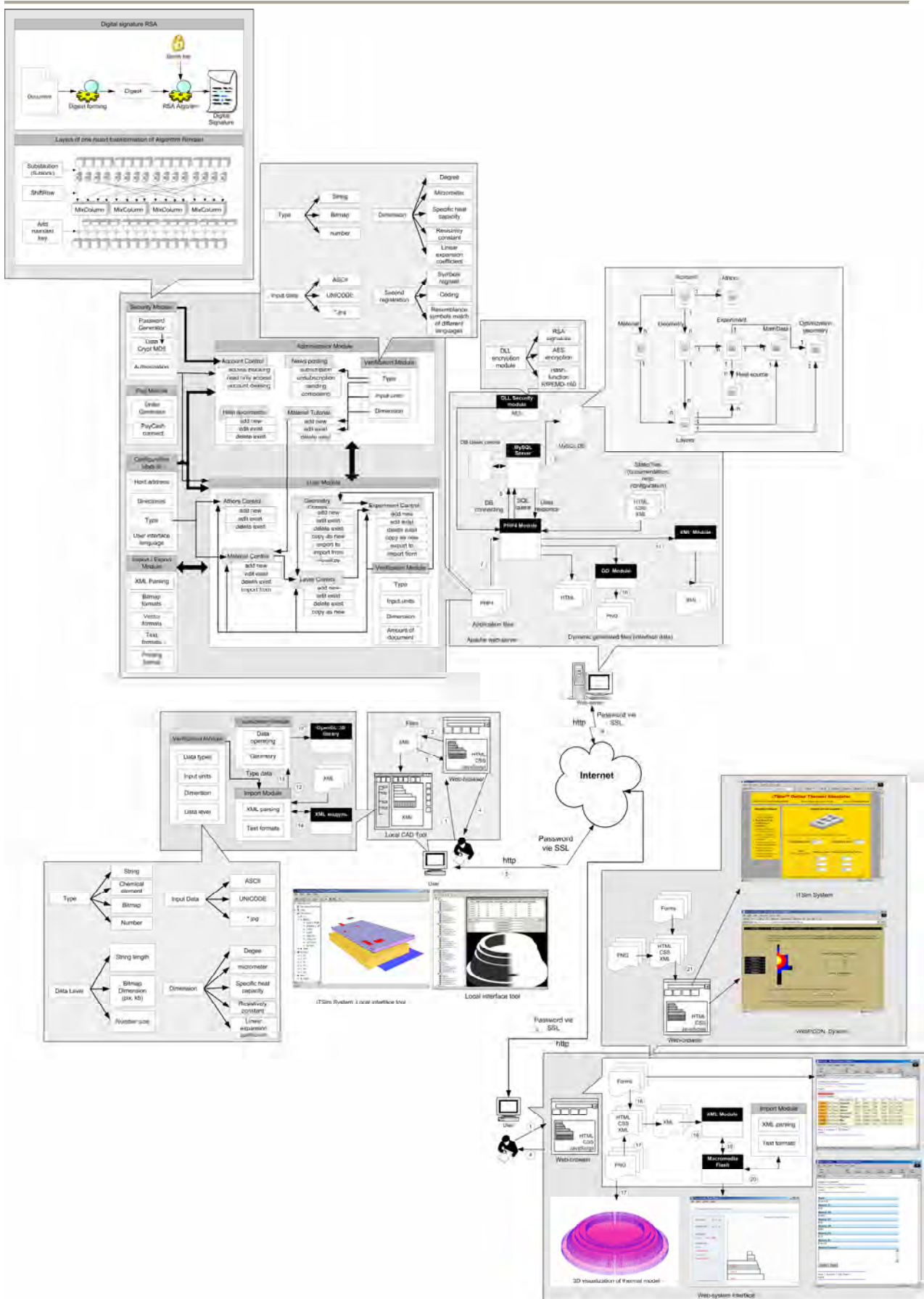- Application of modern computer technologies and tools.

Fig.1 The scheme of information integration of CAD Tools for Thermal Design of Microelectronic Devices Components

All architectural components physically are placed on one Internet server, which works as a Web-server and serves numerous clients of the system. A standard Web-browser is sufficient for the remote work with the thermal processor, such as Internet Explorer, Netscape Navigator, Mozilla, Opera or downloaded special software tools for better interaction. All information exchange between the user and the server is realized by standard HTTP protocol and SSL.

The main modules are:
- The module of Web-portal administration, which allows access control and management over portal accounts on the part of users and general portal resources;
- The module of the user's work organization of the Web-system for design, which allows to keep a record of the author's personal registration data, to keep a record of the list of projects, management of lists of modelling experiments;
- The protection module of Web-system, which carries out a mechanism of all system user's identification;
- The module of export and import of the design data in the system and from the system, which provides the functions of forming design information into text, formal XML, bitmap, vector and polygraphical layout;

Thermal models, modeling tasks and results are saving to the central relation database. Preprocessor, Processor, Postprocessor are connecting to database using language SQL (Structured Query Language). The thermal models, modeling tasks and results are saving in database as XML-formatted data. Such decision is fundamentally reducing database organization and allows to avoid a large number of cross table relations, because relations between data are realized by XML-structure layer, not by database table layer. Similar organization of relations between data is simplifying a modification of information model, because any modification of XML-formats not require a correction of database table structure, but require only the modification it's contents.

Scripts interact with graphical postprocessor and execute the last step of graphical images generation of modeling constructions and results (thermal level lines and та color temperature maps).

3. Conclusion

The concepts and system information integration of Network-bases CAD Tools for thermal design of microelectronic devices is developed in this paper. Further system development will test the ways of improving integration with an information network system, Internet remote data access system, and also integration with other information systems of design. The proposed system provides openness principles [7, 8] which are necessary for its successful further usage and development.

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