WIP: Warfighter Information Packaging

Jon Dukes-Schlossberg, Yongwon Lee
Lockheed Martin Missiles & Space
Intelligent Systems Center
Palo Alto, California
jon.dukes-schlossberg@lmco.com

Marc Zev
ISX Corporation
Westlake Village, California

Yigal Arens
USC/ISI
Marina Del Rey, California

Costas Tsatsoulis, Huseyin Sevay
University of Kansas
Lawrence, Kansas

Hector Garcia-Molina, Michael Rys
Stanford University
Palo Alto, California

Under funding from the Battlefield Awareness and Data Dissemination (BADD) DARPA program[1], Lockheed Martin, ISX, USC/ISI, University of Kansas, and Stanford University are developing a suite of distributed components to deliver the right information at just the right time to just the right place. Operationally, this entails modeling the warfighter's information needs, accessing diverse, heterogeneous data sources, and displaying the results in a user-defined, predictable manner. The Warfighter Information Packaging (WIP) component is designed to smoothly integrate with and augment the objective BADD system. The WIP components are intended to be field tested with the objective BADD system in the Fall 1998 in San Diego.

The WIP system builds on the DARPA-sponsored Intelligent Integration of Information (I3) initiative, using a combination of AI and non-AI technologies to augment the BADD system with smart information push technology. Together, the WIP components create a distributed system which serves as a valuable tool for information analysis by 1) constructing "information needs profiles," which are parameterized by user interests, needs, and specific tasks and roles, automatically from pre-stored templates and models of the warfighter's missions and roles; 2) allowing users to customize their profiles with one-time or standing queries; 3) providing a web-based viewer that dynamically constructs product packages on demand and performs value-added information *linking* based on the information returned; 4) allowing users to make high-value complex information requests that can span multiple data sources, without any a priori knowledge of the schema of the sources; and 5) monitoring data sources and *anticipating* useful modifications to a user's information package. By augmenting the current BADD information dissemination system, "smart push" delivers just the right data, to just the right place, at just the right time.

Information needed by the warfighter is available from many different sources and in many different formats: unstructured and semistructured text (e.g., news wires, intelligence reports, etc.), structured data in database systems (e.g., logistics and inventory databases), and image and video data (e.g., weather maps from satellites, area maps and battlefield snapshots from UAVs, etc.). All this information needs to be integrated into a comprehensive scenario called the "Battlefield Infosphere" [McCarthy95]. This scenario strives to provide the warfighter with a complete visual presentation of the combat area containing "layers" of information with friendly forces, enemy forces, weather factors, the air situation, etc.

The BADD architecture attempts to deliver to the warfighter the vast amount of information necessary to support this vision.. An Information Dissemination Manager (IDM) determines what information to send over direct broadcast satellite to Warfighter's Associates (WFAs) in the field. We seek to augment the capabilities of the IDM with intelligence, that is, to anticipate future WFA information needs, to dynamically interact with information repositories, and to hyperlink information for ease of WFA interaction and drill-down. Figure 1 presents the WIP system architecture.

Theoretical work is also underway in warfighter profile merging strategies. The goal is to efficiently use the communications bandwidth by merging identical or similar queries. Various merging algorithms are under investigation. Also, the team is working on web extraction methods. This effort is to identify strategies for efficiently extracting web information: data formats, how many pages to extract, what pages are related, etc.

References

[McCarthy95] J. McCarthy. (1995). "The Information Revolution and its Impact on the US Air Force." Luncheon Speech, AF Association Fifth Annual Air Force Acquisition Update, Broadmoor Hotel, Colorado Springs.
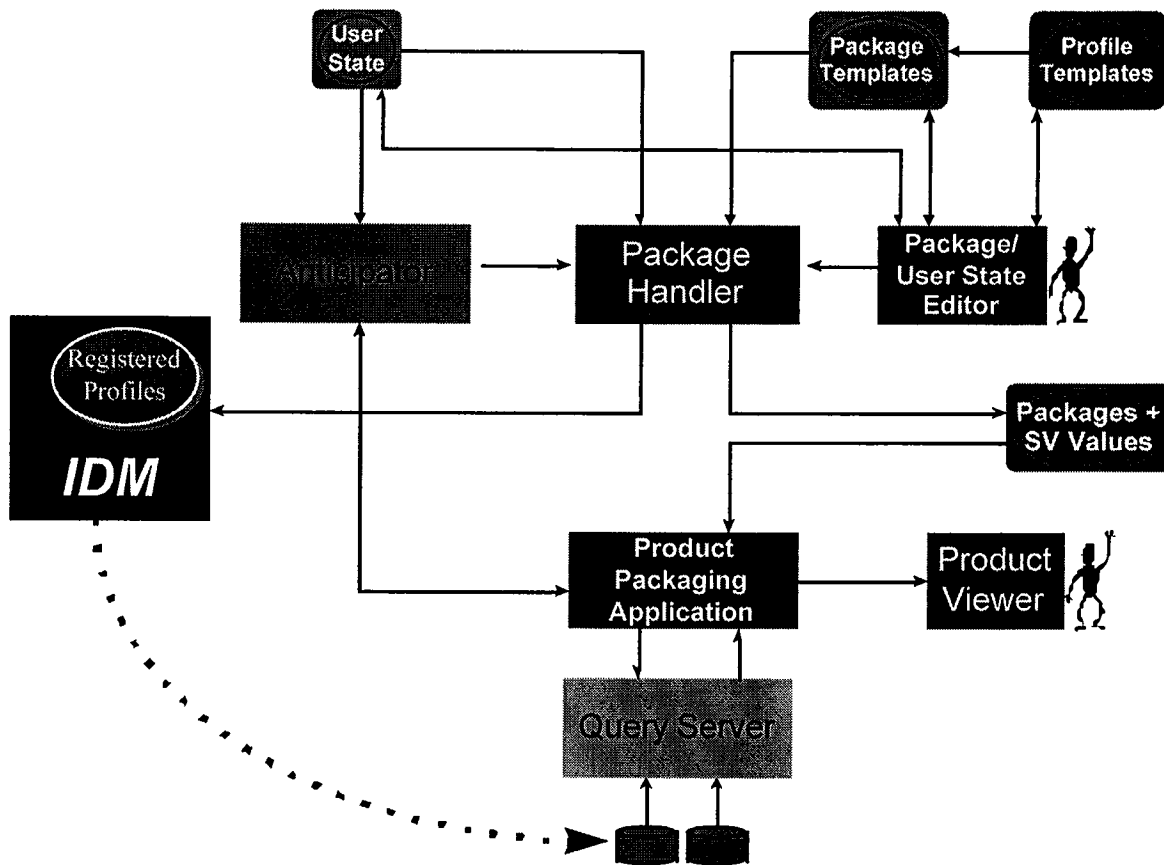
Figure 1. Warfighter Information Packaging Architecture. User modeling, information anticipation, data source access, and product packaging smoothly integrate to present the warfighter with just the right information at just the right time.

Selected Recent Team Publications

Yigal Arens, Yongwon Lee, Jon Dukes-Schlossberg, and Marc Zev. "Warfighter's Information Packager: Making Delivered Data Useful." Innovative Applications of Artificial Intelligence, IAAI-98, Madison, WI, August, 1998.

S. Chawathe , H. Garcia-Molina. Meaningful Change Detection in Structured Data. SIGMOD 1997, 1997.

J. Cho , H. Garcia-Molina , L. Page. Efficient Crawling Through URL Ordering . In Proceedings of 7th World Wide Web Conference, 1998.

Jon Dukes-Schlossberg, Yongwon Lee, and Nancy Lehrer. "IIDS: Intelligent Information Dissemination Server." In Proceedings of MILCOM '97, Monterey, CA, November, 1997.

J. Hammer, H. Garcia-Molina, J. Cho , R. Aranha, A. Crespo. Extracting Semistructured Information from the Web. In Proceedings of the Workshop on Management of Semistructured Data. Tucson, Arizona, May 1997.

Marc Zev, Yigal Arens, Yongwon Lee, and Jon Dukes-Schlossberg. "Warfighter Information Packaging as an Information Analysis Tool." in Proceedings of AIPA98, Washington, DC, March, 1998.