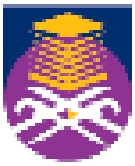

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33

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Title : A RESOURCE-AWARE CONTENT ADAPTATION APPROACH FOR E-LEARNING ENVIRONMENT

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The rapid growth of web and mobile technologies has allowed people to access E-Learning content from heterogeneous client devices. In order to deliver the best presentation of content requested, the E-Learning system must possess a mechanism that not only capable of accurately discovering the characteristics and capabilities of a client's device but also capable of finding out about network and server resource availability. Three recurring issues need to be addressed when constructing such solutions: 1) How to identify the device characteristic and the capabilities of a device, 2) How to find out about network resource availability, and 3) How to adapt application behavior. Addressing these questions the dissertation makes three main contributions. First, a content negotiation and adaptation architecture was proposed to facilitate the process of identifying and detecting client device. It differs from other existing content negotiation approaches by introducing the idea of combining dynamic and static device capabilities detection methods. It consists of a device database and two processing components: (1) device identification module and (2) device capabilities detection module. The content negotiation and adaptation architecture was implemented and validated through various laboratory experiments and field studies which the results highlight the importance of using token attributes matcher by eliminating the need of using the entire user agent strings for device identification and capabilities detection. Besides reducing the processing overhead it also achieves better results in terms of accuracy compared to the user agent approach. Second, network-aware applications architecture for E-Learning system was also proposed to dynamically adjust the users' demand based on network resources. For this to happen, applications need to have some mechanism that can estimate the network bandwidth by simply adjusting their behavior based on the collected network characteristics information. In the past, there have been several proposals that provide passive and active bandwidth estimation approaches. However, little effort has been spent to address the crucial issues of reliability and congestion control especially in wireless network environment, which stay as a sticking point for the success of network-aware application. Therefore, an active available bandwidth estimation technique was incorporated in the proposed solution. The experimental results validate the efficiency of the proposed solution in terms of accuracy, intrusiveness and timelines. Third, this thesis focuses around the objective of developing a resource-based content adaptation system. In order to achieve this objective, two architectures introduced in the first and second parts of the thesis were combined to provide the user with the best possible content based on the device capabilities, server and network condition. A prototype of the proposed architecture was built and validated which the focus is towards determining the decision algorithm precision and measuring the video assimilation. The results showed that the decision algorithm improves the measurement by 28% and the degraded transcoded video does not affect students' comprehension.