MCWDF:
Micro Chunk Based Web Delivery Framework

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ABSTRACT
Segregating the web page content into logical chunks is one of the popular techniques for modular organization of web page. While chunk-based approach works well for public web scenarios, in case of mobile-first personalization cases, chunking strategy would not be as effective for performance optimization due to dynamic nature of the Web content and due to the nature of content granularity. In this paper, the authors propose a novel framework Micro chunk based Web Delivery Framework which proposes and uses a novel concept of “micro chunk”. The micro chunk based Web Delivery framework aims to address the performance challenges posed by regular chunk in a personalized web scenario. The authors will look at the methods for creating micro chunk and they will discuss the advantages of micro chunk when compared to a regular chunk for a personalized mobile web scenario. They have created a prototype application implementing the Micro chunk based Web Delivery Framework and benchmarked it against a regular personalized web application to quantify the performance improvements achieved by micro chunk design.

KEYWORDS
Content Chunk, Micro Chunk, Personalization, Personalized Web Acceleration, Web Content, Web Performance, Web Performance Optimization

INTRODUCTION
As web is becoming a greater influence on the community, there are various initiatives to enhance the web experience. Web pages are now made highly responsive, interactive and personalized and it is available on all mobile devices. Modern web architecture needs to address multiple concerns and cater to various stakeholders. Internet-facing web sites should be responsive, interactive and should achieve optimal performance (Galletta et al., 2004). The success of online strategy depends on its usability and performance (Schmiedl et al., 2009). The web application should satisfy quality attributes such as performance, scalability, extensibility and flexibility (Shivakumar, 2014).

Web pages that display enterprise information would mainly get its web content from content management systems (CMS). We could broadly categorize such web pages as public web which renders web pages for public users and private web which renders the web content for personalized/logged-in scenarios. There are number of techniques such as layered architecture, caching, service-oriented-architecture, asynchronous resource loading, content compression that can be used to achieve better scalability and performance (Souders, 2009).

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Web content chunking (also known as HTML fragmenting) is one of the popular techniques wherein we logically segregate the page content into multiple chunks (or fragments) (Griffin et al., 2005). The chunks are modular logical entities which are independent and have reuse potential. A content chunk is a logic piece of cohesive HTML content on a web page which can exist independently and describes a semantic concept (Challenger et al., 2005).

For instance in a products web page, the product brief description information could constitute a chunk and product specifications information could form another chunk. A chunk consists of rich content and multi-media content. A chunk for the web content will be created from its origin system which is normally a content management system (CMS). The content chunk created will be tagged with metadata so that it can be appropriately retrieved on the correct web page. Chunk-based web page architecture addresses concerns such as scalability, performance and reusability (Shivakumar, 2014).

While content chunking works as an effective strategy for public web scenarios, personalized web poses its own set of challenges. In a personalized web scenario, a chunk contains the content applicable for a given context (such as user attributes, preferences, device, and language, location, and security roles and such). This means that it is not possible to statically author these content chunks in CMS and cache it globally. This further impacts the scalability and performance attributes. Web sites are adopting hyper personalization strategy wherein all content is heavily personalized for the user and the context. The trend is most noticed in e-commerce sites such as Amazon.com, Flipkart.com wherein the logged-in user would see personalized product recommendations, personalized offers, personalized notifications and such personalized content. In such scenarios there will be seldom static content chunks which can be applied to all users posing challenges to the page performance.

One of the ways to effectively achieve good performance in personalized scenario is to identify the static chunks for a personalized page and globally cache it. This partially addresses the problem as the dynamic and personalized chunks still cannot be cached and they have to be authored thereby impacting the overall page performance.

In this paper we introduce a novel concept called “micro chunk” and micro chunk based Web Delivery Framework (MCWDF) which addresses the challenges in authoring, management and performance for personalized web scenario. A micro chunk is highly granular dynamic content chunk which is created and managed at the run-time with minimal overhead on page performance. Micro chunk is created mainly based on context parameters such as user attributes, device name, security roles and other filters. As micro chunk caters to dynamic content scenarios, it can be effectively used in personalized web pages with minimal overhead in content authoring.

The objective of this paper is to elaborate the novel concepts related to micro chunk and MCWDF and how it solves the dynamic content challenge in personalization scenarios.

Based on our experiments we were able to notice 90% improvement in page response time by usage of micro chunk when compared to regular content chunk for personalized mobile web scenarios.

PAPER ORGANIZATION

In the remaining portions of the introduction section we will look at the necessity and novelty and motivation of micro chunk, core concepts of micro chunk along with related work and the significance of the work. We will discuss the complete details of the micro chunk, micro chunk based web delivery framework, caching design and the authoring and publishing aspects of micro chunk in the “Method” section. In “Results” section we will look at the benchmarked results of performance numbers at various user load and content metrics. Finally we will discuss the significance of results, explanation of the main findings, and impact on content authoring and future scope of improvements in “discussion” section.
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