



simplylook™
Streaming Images for the Wireless World

Optimized interactive images and graphics for the Wireless Web

White Paper

Simplylook, Inc.

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Overview

A growing number of wireless devices are gaining access to the Internet and other information sources. There is also an ever-increasing demand for rich online content both from the businesses as well as the users. A case in point is the widespread use of online image content in general and in particular by some businesses wherein the images or graphics would differentiate the in-store environment, allow detailed examination of artifacts or products, and enhance the visual experience of the user.

However, amid the rising sophistication of users and the increasingly competitive environment for the Web-based business models, the inherent limitations of the conventional online image methods have now become a constraining factor adding a new dimension to the problem of supporting and transmission of multimedia data on the Internet – both wired and wireless. The problem is further compounded in the wireless environment by the less resourceful client devices, which have limited communication processing, storage and display capabilities.

Simplylook Inc.'s *Image Engine* imaging application suite embodies a new approach. A powerful client/server based imaging engine is combined with a flexible, extensible, and standards-neutral hosting environment, providing a protocol, device and client platform agnostic environment for the content and service providers and ultimately the end users in the wireless domain. The system provides a powerful image/graphics-processing engine for maximizing the impact of the Web-based image content.

This paper describes the Image Engine technology and shows how the engine is going to provide enriched interactive experiences for the users of the plethora of mobile devices.



Dynamic adaptation of images from Web sites to heterogeneous clients

Extend the reach of content

Simplylook's Image Engine propels businesses to the second wave of the Internet – the Wireless Internet – and helps ensure that data and business critical visual content continue to reach customers in tomorrow's environment.

Riding the Wireless Internet Revolution

The number of Internet users over wireless links is expected to grow from 3 million today to over 50 million by the year 2004.¹ According to Yankee Group, in the U.S. there will be 21.3 million mobile data users by the end of 2001.² In Japan, DoCoMo is adding roughly 1 million wireless Internet subscribers for their iMode service each month, with the total number of subscribers today being roughly 11 million. IDC [International Data Corp.] predicts that by mid-2001, all digital cellular/PCS handsets shipped in the world will be WAP-capable so it's very realistic that the majority of Internet access will shift to a wireless from a wired means. Today, Internet sites have to be retrofitted for wireless users, but three years from now, it is conceivable they might have to be redesigned for wired users.³ Lehman Brothers has predicted that there will be a faster and deeper overall penetration of wireless data by 2007 earning a share of 21 percent of PCS revenue from wireless data.⁴

Experts believe that the growth and success of the wireless Internet will depend on the quality of the user's experience which is enhanced by multi-media. Initially, the content on the wireless Internet started with text, but is now moving towards multi-media with images and pictures being the first media-rich content, to be followed by audio and video. Simplylook has the technology to provide images on wireless devices with its core technology that is serving of interactive images over narrow bandwidth clients such as wireless cell phones and Personal Digital Assistants (PDAs). Simplylook's server-based technology stores images in a multi-resolution format with varying levels of granularity, such that the appropriate level of granularity is interactively sent from the server to the client based upon request from the client. Caching between the client and server and bandwidth sensitive streaming allow for a unique and interactive experience for the end user.

Simplylook has identified six major market segments as those that would benefit by imaging technology. They are Advertisement, On-line Auctions, Photo-based messaging, Real Estate, Services and Utilities, and m-Commerce. Companies in these market segments would also benefit significantly by integrating Wireless-Internet based solutions in their business models.

In addition, the companies in these segments would also be greatly benefited by delivering content for targeted marketing. In the Wireless Internet world it is possible to do this by introducing Location-based and Time sensitive services, especially for advertising, photo-based messaging, on-line auctions and m-Commerce.

Simplylook's technology can make this a reality.

Image Engine Framework

In order to improve the accessibility of rich web content by pervasive computing devices, Simplylook has developed a novel (patent pending) image processing and representation technology. A given image is processed and represented as child Image objects using an *ImageLOD* data model. This model manages different level of detailed image sections with different resolution and fidelities. The scalable image delivery is then enabled by either:

¹ Yankee Group, Nortel Networks Study on Wireless Internet Demand, Sept 1999.

² "Wireless Data: Hope After Hype", *Meg McGinity*, Inter@ctive Week, Dec. 1999

³ CyberAtlas: Internet Statistics and Market Research for Web Marketers, Apr. 2000

⁴ "Wireless Net access niche heats up", Stephanie Miles, CNET News.com, Sept 2000

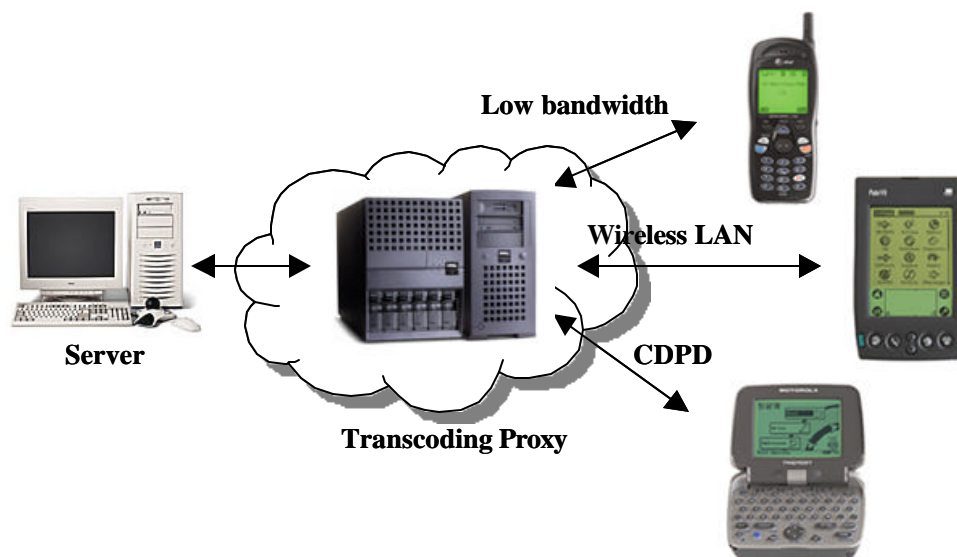
- storing, caching, managing, selecting and delivering different versions of the Image objects in the *ImageLOD* in order to adapt the image content to the client devices, or
- manipulating the image objects on-the-fly, such as by using methods in the *ImageLOD* for image transcoding and adaptation.

This allows the image content delivery to adapt to the wide diversity of client device capabilities for communication, processing, storage, and display.

The *ImageLOD* model provides a general framework for managing and manipulating image objects. It manages different versions of images with different fidelities – file formats, compression, scale, color depth, and size. The *ImageLOD* model also provides and manages the translation, compression and resizing methods that generate the different versions of the image objects.

In essence, the system is capable of delivering content to devices:

- with different form factors – screen sizes, color capability, memory foot print, etc.
- working on different protocols - HTML, HDML, WAP, Palm OS, Pocket PC, etc.
- working on different network technologies – CDMA, CDPD, GSM, etc.
- capable of handling different image/graphic file formats - JPEG, GIF, PNG, WBMP, BMP, etc.



System environment for image transcoding, consisting of a heterogeneous set of clients and a variety of network access links

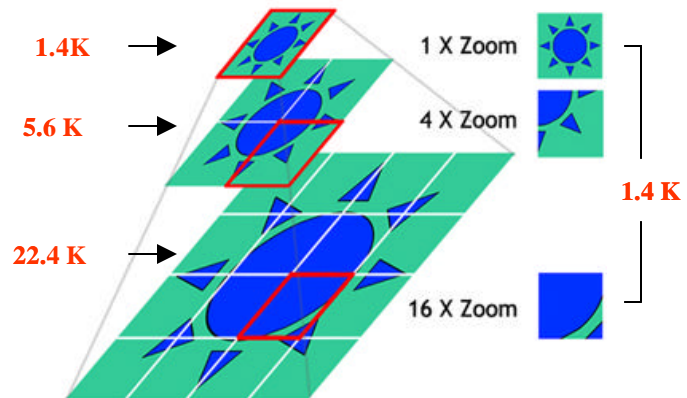
Streamline the delivery

Simplylook's Image Engine helps make accessing content across the Wireless Internet quicker, easier and cost-effective by delivering only what you need, when you need it.

ImageLOD Data Model

Every image is processed into different layers of hierarchy with a number of sections for each layer based on the resolution required to support the necessary level of zoom, pan and scroll for a requesting client device. The desired quality of the image can be specified by discrete values, or the system decides the fidelity based on the knowledge or rule base, which can be defined through the administrative console. Each section of the image is handled as an object with methods for rendering the section, as demanded; intelligently during zooming, panning or scrolling. Schematically the data model can be depicted as :

- Image represented in multiple levels of resolution
- Image is sectioned and cached
- Smooth Zoom, Pan and Scroll depend on cache sections



ImageLOD Data Model

Translation

In general, the manipulation operations for the image objects in the *ImageLOD* alter the fidelity. The *translation* methods convert the image objects to different formats, sizes, color depth, compression and scale. The *slicer* methods generate different hierarchical sections of the original image with varying resolutions and section sizes. This makes it possible to deliver just-in-time content to the client based on the client's request for zoomed or panned view of the image. Both the translation and slicing methods can be cascaded to change the fidelity of the images to best adapt them to a client request.

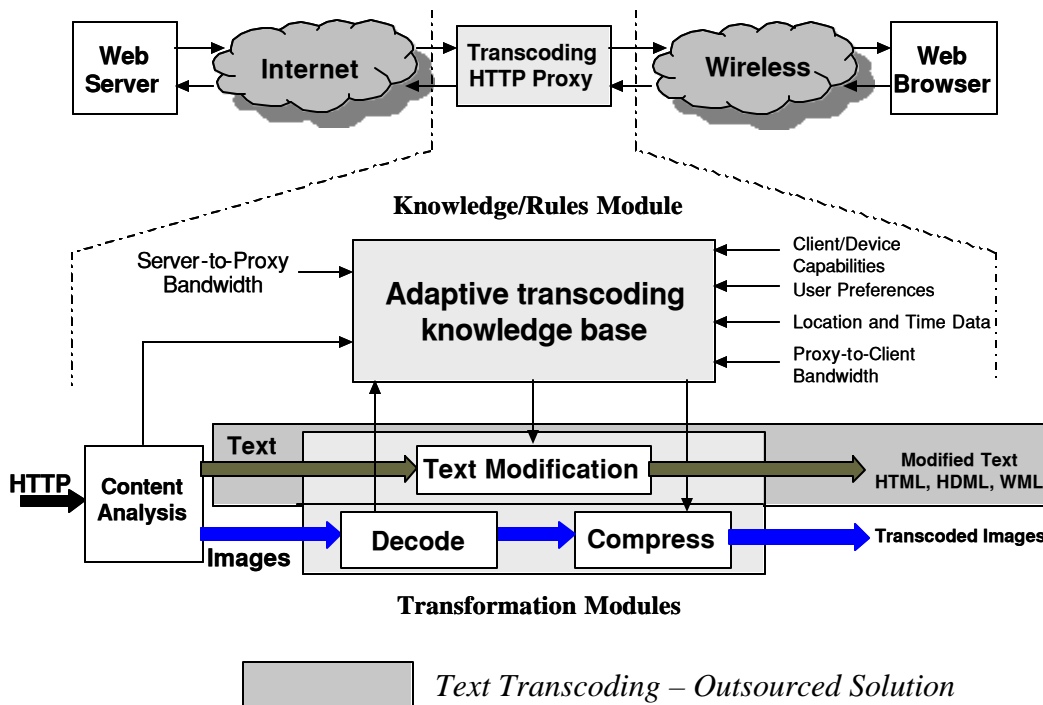
Architecture

The architecture of Simplylook's Image Server consists of these primary components :

- **Administration Console** : provides the ability to control device and user profiles, and decision criteria for intelligent content modification, in addition to exception logging, event logging, server monitoring and reporting requirements.
- **ImageLOD Representation** : There is an *ImageLOD* representation for each image. This representation can accommodate multiple levels of details within each image object with different fidelities.

- **Content Analysis** : Content analysis modules analyze the inter-relationship between different sections of the content. For example, these analysis modules determine the nature of images (whether they are graphics or images as shown below), the purpose of image (for navigational, button, etc.).
- **Transformation** : Examples of translation include the generation of progressive image representation with different color depth, scaling factor, compression factor and resolution.
- **Content Customization** : These modules customize the content based on the user interests, and client platform capabilities to determine the most appropriate format of the content that will be sent to the client.

The architecture is based on a *Proxy or Network Server* paradigm. This configuration can transform content coming from many different web servers. The proxy configuration includes HTTP support because the proxy intercepts the HTTP requests and responses as they flow between the user and the Web servers. The server is implemented as a medley of servlets and a set of JavaBeans, which provides the most flexible configuration, and it can run in essentially any Java environment on any platforms.



Internal Architecture of the image transcoding proxy

Customize presentation for end users

Simplylook's Image Engine helps make communication across the Wireless Internet more targeted, convenient and personalized.

Integrating Imaging with Core Business Objectives

As the development and delivery of Web content becomes more complex in the pervasive computing environment, businesses need to be able to rely on standards-based solutions that can cross-integrate with their core business systems. This is essential for the companies in the six segments that were mentioned earlier, where images and graphics would significantly enhance the experience of the visitor.

As a complete hosting and image delivery environment Simplylook's Image Engine is specifically designed to off-load the increasingly difficult task of managing large numbers of dynamically changing images in multiple locations, while also interfacing with existing standard platforms and infrastructure.

Standards-Neutral Design

As the system is based on a "standards-neutral" architecture, it avoids the problematic issues of specific file formats, viewer paradigms, database structures or operating system requirements. The Image Engine Framework is a 100% Java solution and hence can be hosted on either Windows NT, Windows 2000, Linux or UNIX-based platform and is designed to seamlessly interface with all major Web servers, browsers, mini-browsers, major database engines and security mechanisms.

Flexibility, Scalability and Extensibility

Building upon a robust server foundation, the Image Engine architecture is specifically designed with the inherent extensibility to embrace both unique application requirements and the need for smooth scalability. Since the solution is predominantly a server side application and is completely independent of any client-side constraints it can be easily extended to meet specialized needs, without requiring changes on the end-user side. Likewise, as the Web site's needs grow and change, the Image Engine can be readily adapted to support distributed content delivery systems.

The Image Engine server is also designed to mesh seamlessly with existing Web server architectures. It can be easily customized to interface with the text transcoding engines or application servers to provide a seamlessly integrated content delivery mechanism for enterprises, integrators and content aggregators.

In Summary

By bringing together powerful image handling capabilities into a robust and versatile standards-neutral architecture, the Image Engine imaging application platform is intended to help propel business possibilities to a whole new level of experiences in the pervasive computing environment.

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