HANDS PER DEVICE

AN ALTERNATIVE APPROACH TO OPTIMIZING WEB CONTENT DELIVERY AND INTERACTION FOR MULTIPLE PLATFORMS
On the 1st of February, 2011, Cisco published the Cisco® Visual Networking Index (VNI) Global Mobile Data Traffic Forecast Update, which is part of the comprehensive Cisco VNI Forecast, an ongoing initiative to track and forecast the impact of visual networking applications on global networks.
These are some of their results and projections:
GLOBAL MOBILE TRAFFIC

In 2010, the amount of global mobile data traffic was three times the size of the entire global internet in the year 2000.
GLOBAL MOBILE TRAFFIC

GLOBAL MOBILE DATA TRAFFIC IS EXPECTED TO INCREASE 26-FOLD BETWEEN 2010 AND 2015

2010

2015
MOBILE PENETRATION

By 2015, there will nearly one mobile device per capita

That means nearly every single human being on Earth will have a mobile device

2015
The proliferation of tablets, mobile phones, connected appliances and other smart machines is driving up the demand for connectivity.
CISCO’S RESEARCH MEANS THAT BOTH CONSUMERS AND CONTENT PROVIDERS ARE NO LONGER FACING A TWO OR THREE-DEVICE LANDSCAPE.
In the next few years, we will be facing an increasing amount of differentiated devices running on platforms with very few, if any, similarities – except for one:
These devices are all designed to be connected to the web.
THE CHALLENGE: OPTIMIZING CONTENT DELIVERY AND DIGESTION
Today, content providers are already grappling with the challenge of eliminating the accessibility barriers consumers are experiencing.

More often than not, content for the traditional web is incompatible with consumers’ expectations, and the user’s experience suffers because of it.
Modern devices such as smartphones and tablets, as well as traditional networked computers and laptops, are already demanding solutions for optimizing online content.
THE CURRENT SOLUTIONS
SOLUTION A: RESPONSIVE DESIGN
There are currently two forms of responsive design in use: **Progressive Enhancement**, and **Graceful Degradation**. Although the two forms aim to solve the same problem, their approach comes from opposite ends of the spectrum. To explain briefly:
PROGRESSIVE ENHANCEMENT is the practice of "scaling up"; that is: designing and developing for platforms with the least support in mind, and then using various techniques to enrich the user’s experience based on their device’s capabilities.
GRACEFUL DEGRADATION, on the other hand, is the practice of “scaling down”. This means building for the best possible user experience, and adjusting various elements depending on how little support the user’s device can provide.
As stated, both versions of responsive design intend to provide content providers with certain benefits:

- Only a single site is required, lowering development and maintenance costs
- A single update will be universally deployed
- Adequate future-proofing, due to various techniques based screen-size and browser support
Currently, responsive design is seeing a growing level of adoption, with the version of choice dependent on the goal(s) of the content provider.
However, there are a number of criticisms which have been voiced by those who do not favour this approach, such as:
One-size-fits-all approach to future-proofing opens up the possibility of ignoring their context of use, or how users operate their devices.

Universal deployment can also create a situation wherein content designed for the “base” version will be displayed on devices which are either too small or too large for it.
Crucially, research\textsuperscript{2} conducted by Usability Guru Jakob Nielsen; as well R.I. Singh and colleagues from the University of Alberta, have shown that comprehension suffers when content designed for traditional screens are viewed through mobile devices, further strengthening the argument that while responsive design has its merits, it is not a silver-bullet solution.
In the research conducted by the University of Alberta, users were made to read the “Privacy Policy” text from various websites, including Facebook, to test their comprehension based on the device:
COMPREHENSION DIFFERENCES

39.18% DESKTOP SCREEN
18.93% MOBILE SCREEN
Jakob Nielsen’s studies also pointed out that when regular websites were viewed through mobile devices, users experienced a new problem called “scanning”, which occurs when users lose their position while viewing a document, and attempt to relocate it.
“SCANNING” IN MOBILE DEVICES
Based on these studies, as well as our own observations, it would appear that the “scanning” problem may also exist when regular websites – notably those with generous content – are “fitted” into a mobile device through some form of responsive design.
SOLUTION B:
DEVICE-DEDICATED DELIVERY
THERE ALSO EXISTS ANOTHER ALTERNATIVE: DEVICE-DEDICATED DELIVERY. OFTEN USED BY LARGE FIRMS SUCH AS NIKE, CNN, AND FACEBOOK, AND RECOMMENDED BY JAKOB NIELSEN, THIS APPROACH REQUIRES CONTENT PROVIDERS TO BUILD A DEDICATED SITE FOR A PREDETERMINED SET OF TARGETED DEVICES.
This approach can provide a number of benefits, such as:
- Fully taking into account “context of use”, which means...

- They can offer unique features completely separate from the traditional web version

- Content structure and volume can be modified or rearranged for the user’s benefit

- Overhead can be optimized with much better granularity than a responsive approach
And while this approach is also seeing wide levels of adoption, there are inherent issues to this approach as well:
Increased development and maintenance costs – building a completely separate site means that the content provider has to shoulder additional production overhead.
Limitlessness of technology – currently, companies utilizing this approach are maintaining two to three sites: one for mobiles, one for touch-tablets, and one for traditional network devices. However, with the impending increase of networked devices, the provider will have to invest additional resources in order to serve optimized content for each targeted device – making this an approach an even more expensive solution than it already is.
THE SHARED DRAWBACK
Although both solutions have their benefits, their approach relies on finding a common set of attributes, such as the device type, screen size, or browser support, in order to find a “trigger” that would determine how content is displayed.
But what happens if two or more devices which are technologically similar in output, are actually wildly different where input is concerned?
FALSE POSITIVES
TO ILLUSTRATE THIS, WE’VE LOOKED AT TWO VERSIONS OF A SINGLE DEVICE DESIGNED TO CONNECT TO THE WEB: INTERNET TV.
Both devices have screens that are in the 50” range, both are HDTV with 1080p display quality, and both provide access to YouTube, thus creating a situation wherein nearly all output variables are the same.
If the criteria from either the responsive web or the dedicated device approach were to be used, the same website would be delivered to both these devices.
HOWEVER, NEITHER APPROACH IS ABLE TO TAKE INTO ACCOUNT HOW THE USER ACTUALLY INTERACTS WITH EITHER DEVICE:

SAMSUNG SMART TV

LG INFINIA
To quote one review\textsuperscript{4} regarding the LG: “YouTube is a pain to navigate via remote, mostly because if you want to watch something that isn’t on the front-page portal, you have to type your search query with the number pad (as if you were texting on a cell phone).”
If we extend this issue to include other currently available devices such as large smartphones, small touch-tablets, e-book readers, and older mobiles with internet connectivity, the problem of classifying based on the device quickly becomes compounded.
Yet, in spite of a constant introduction of new devices with web connectivity, the majority of the discussion found on the web centers around only two devices: the smart phone and the network PC.
With this trend set to continue; and because more devices are being designed with web connectivity in mind (such as a number of upcoming automobiles with touchscreen displays), the question of: “how can content providers deliver the most optimized version to their consumers?” becomes even more prevalent.
THE ALTERNATIVE SOLUTION
HPD:
A PHYSICAL TRIGGER FOR DETERMINING DIGITAL OUTPUT
Throughout our observations, we noticed that if there was one similarity which remained fairly constant across all devices, it was that the user’s behaviour changed depending on the number of hands being used to interact with the device.
We found that the user’s level of immersion increased when the device was held with both hands, and the opposite occurred when the device only required a single hand – behaviours which remained constant regardless of the size of the device.
WE THEN BEGAN CLASSIFYING DEVICES BASED ON THE NUMBER OF HANDS-PER-DEVICE (HPD) REQUIRED TO COMFORTABLY USE THE DEVICE, AND FOUND A NUMBER OF SIMILARITIES AMONG THEM:

**SINGLE**

HAND USE

**DUAL**

HAND USE
• When a user interacts with an input-device designed for a single hand, the scope of their intentions are narrow, and expect fast responses – such as finding a location on a mobile map app; looking for a song on their MP3 player; or looking for something to watch on TV using a traditional remote.
The above behaviour mirrors the results of research\textsuperscript{2} conducted by Jakob Nielsen on mobile comprehension.

When using a two-handed device, response times became secondary to the quality of the content – again, this behaviour remained constant on across the two-handed devices: from touch tablets such as the iPad, to online shopping on a laptop, to playing a game on a dedicated gaming console.
On two-handed devices, it often felt as if the user was committed to whatever task was at hand, spending more time on the device than they normally would on a single-handed device.

Users also seemed to “explore” more when interaction required two hands.
INTERACTIVE DESIGN WITH HANDS-PER-DEVICE (HPD) IN MIND
With the HPD approach, content providers can now apply the same content architecture across a much wider range of devices, with a much smaller room for future failure.
However, as **HPD** is more of a strategy, it is an incomplete solution on its own: content providers will need the scalability of Progressive Enhancement, as well as the granularity of a Device-Dedicated application, and presented through a “liquid” layout, in order to create a highly-adaptable hybrid solution.
To illustrate:
1) Using HPD means classifying the output into two groups – one for single-handed devices, and another for dual-handed ones.
2) THIS REQUIRES CONTENT PROVIDERS TO PREPARE TWO VERSIONS OF THE SITE ARCHITECTURE, BOTH OPTIMIZED FOR EACH GROUP.
3) BOTH VERSIONS OF THE SITE ARE BUILT WITH PROGRESSIVE ENHANCEMENT IN MIND. (SINGLE-HANDED DEVICES ARE SHOWN ABOVE)
4) AND FINALLY, A LIQUID LAYOUT IS APPLIED TO BOTH VERSIONS IN ORDER TO REDUCE OR ELIMINATE SCREEN SIZE-RELATED ISSUES. (SINGLE-HANDED DEVICES ARE SHOWN ABOVE)
FREQUENTLY ASKED QUESTIONS
What are the advantages of the HPD approach over a device-dedicated one?
As the number of devices increase, providers with device-dedicated websites will need to invest additional resources in order to create new websites, or overhaul existing ones. An HPD approach reduces the need to build another site outside of the two.
2

Why create two websites? Wouldn’t one built with Progressive Enhancement in mind be enough?
DIFFERENT LEVELS OF IMMERSION AND USER EXPECTATIONS COULD MEAN THAT THE CONTENT STRUCTURE OF A TRADITIONAL SITE IS OFTEN TOO HEAVY FOR GENERAL SINGLE-HANDED USE; WHILE THE MULTI-LAYERED “DRILL-DOWN” STRUCTURE OF MOST MOBILE SITES MAY BE TOO INEFFECTIVE FOR DUAL-HANDED USE, AS SHOWN BELOW:
HAVING TWO SITES ALSO MEANS THAT EVEN WITH PROGRESSIVE ENHANCEMENT IN PLACE, CONTENT PROVIDERS CAN STILL OPTIMIZE THE SITE’S OVERHEAD BETTER.
Could we see an example of progressive enhancement being combined with a liquid layout and applied to single-handed devices?
IF THE NEXT DEVICE ABOVE IT SUPPORTS BETTER TECHNOLOGY, A NUMBER OF ELEMENTS BEGIN TO APPEAR – ADDITIONAL IMAGES, FEATURE-RICH TECHNOLOGY (SUCH AS AJAX), AND MANY OTHERS.
PROGRESSIVE ENHANCEMENT BUILT WITH LIQUID LAYOUTS

(The experience enriches and expands with each device’s capabilities)
Who decides if a device is single or dual-handed?
ULTIMATELY, WE BELIEVE THAT THE CONTENT PROVIDER SHOULD DECIDE. THERE ARE A NUMBER OF REASONS FOR THIS, BUT AN EXAMPLE COULD BE WEB APPS OR ONLINE GAMES: EVEN IF THE CONTENT IS INITIALLY DESIGNED FOR DUAL-HANDED DEVICES, CERTAIN SINGLE-HANDED DEVICES, SUCH AS SMARTPHONES, MAY HAVE THE ABILITY TO PRESENT DUAL-HANDED CONTENT.
THE SUMMARY
• By using liquid layouts, our websites will respond to granular changes in viewing sizes.

• By creating separate sites for each HPD group, we improve usability and accessibility, and no longer have to rely on unpredictable variables such as screen widths.

• And finally, through progressive enhancement, the content is no longer “walled in” because of technological limitations.
DISCLAIMER AND GLOSSARY
Please note that all research and observations conducted were done so in an informal fashion, and not in a controlled environment.

This publication was not commissioned nor funded by a 3rd party. It is merely a written account that we wish to share.
The HPD, or Hands-per-Device approach, was originally presented at the Philippine Web Designers Organization’s “Form, Function, and Class” Philippine Web Designers Conference on September 11, 2011, by Hugo Manila (www.hugomanila.com) co-founder Andrei Gonzales.
Links to cited research:

1. http://bit.ly/qZm7pm
THANK YOU FOR READING