PLANAR

4 Things to Know About 4k

Navigating to true value beyond the industry hype

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Introduction

Video Taken to New Heights

In this ebook, we describe the benefits and challenges surrounding the latest trend in video: 4k or Ultra HD resolution. The included case studies can act as reference designs to others seeking to create powerful and immersive ultra HD experiences.

As the Vice President of Marketing for Planar, a leader in video walls, architectural displays and video products for a variety of specialty applications, Ms. Jennifer Davis has unique insights on emerging industry trends. Steve Seminario leads our product development roadmap for 4k large format displays and has years of experience video wall and image processing solutions. You will find more information about Jennifer and Steve on the Author page toward the end of this book.

"4k is a breakthrough technology that changes the viewing experience. Consumers and professional users alike will prefer the look and the performance of the displays once they experience it."

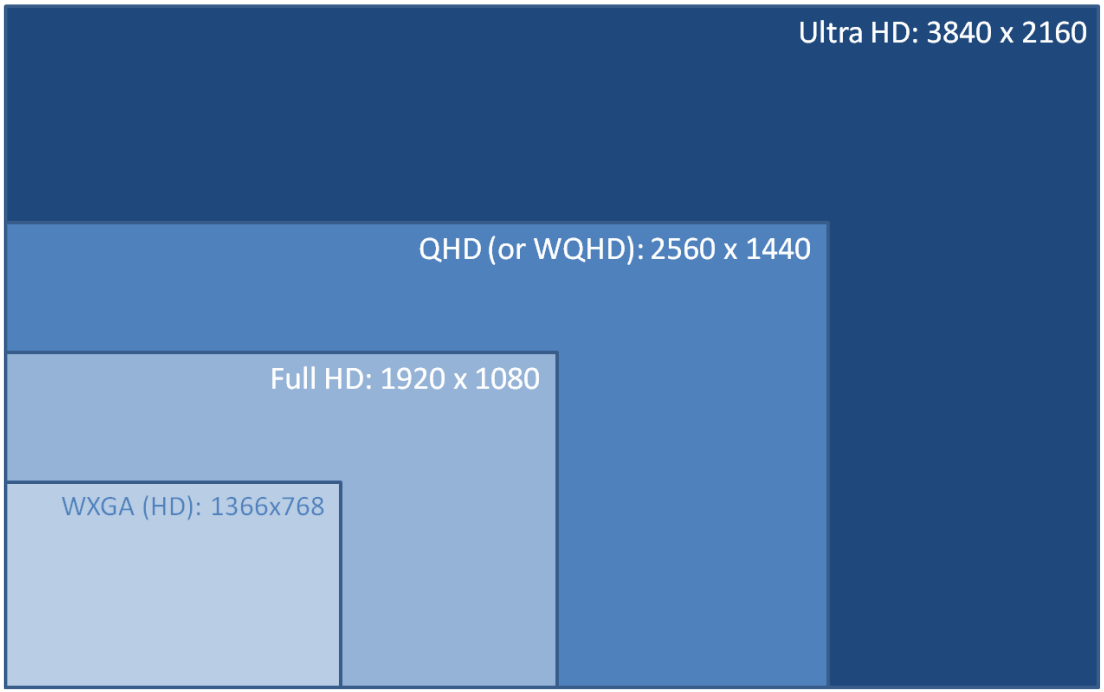
–Jennifer Davis, Vice President Marketing, Planar Systems

Four Times the Excitement

Starting with the Consumer Electronics Show in 2013 , the term “4k” has been the big trend in display technology, with product announcements and demonstrations from the world’s leading suppliers, including the launch of the Planar UltraRes Series for corporate and digital signage applications. In parallel, there has been a growing desire for higher resolution on the desktop as well, with well-publicized announcements of QHD monitors (which stands for “quad high definition”), including Planar’s own PXL2790MW. It’s easy to get lost in the alphabet soup. So, what do these resolutions actually mean?

Four Times the Resolution

4k and Ultra HD or Quad HD are all used interchangably in the commercial and consumer display industry to refer to video products that are 3840 pixels wide by 2160 pixels in height. Technically, "4k" has a few more pixels in width, similar to how "2k" was always slightly wider than Full HD, but in common vernacular they are synonyms today. The resulting Ultra HD display is essentially 4-times the resolution of Full HD (at 1920 x 1080 pixels) and has over 8.2 million pixels (or is 8.2 megapixels). Similarly, QHD (or WQHD as some refer to it) is a higher resolution standard for desktop products delivering 2560 x 1440 (or four times 720p resolution). When equipped with native resolution content and players, the results on these high resolution displays are impressive. 4k is 55% more pixels than QHD and 400% more pixels than full HD!



1: Stunning Realism Beyond HD

More Detail Creates Lasting Visual Impact

There is no denying the visual impact of native 4k content on an ultra resolution display. It is simply stunning. Fashion photography takes on a whole new level of realism. Wayfinding applications are actually compelling, with even the finest text readable even at close viewing distances. Visualization applications in corporate, academic, or government environments are delivered in amazing detail, even when users "zoom in" on the content. Things never before possible with video display are now possible. This is why luxury retail brands, leading information display companies, and some of the leading visual simulation companies in the world are adopting 4k displays at a rapid pace. Things really do look better in 4k!

1: Stunning Realism Beyond HD

Pixel Density

One of the key selling features of these "beyond HD" resolution displays is their pixel density. Literally, the number of pixels packed into a single square inch of the display makes a difference, especially in use models where every detail counts. Calculating pixel density is straightforward, using the formula below.

(Width in Pixels x Height in Pixels) / (Width in Inches x Height in Inches) = Pixel (or dots) Per Inch (PPI)

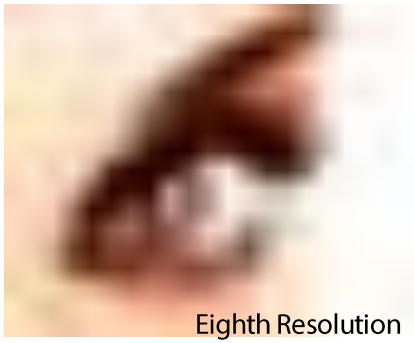
For instance, 4k 84" Planar UltraRes Series has a pixels-per-inch, or PPI, of 52. As the pixel density increases, so does the clarity of the image, as the photos below illustrate.

However, as audio visual professionals have long preached, viewing distance does play a role in whether or not individual pixels are perceivable. Even in the most sophisticated home theater systems, the videophile enthusiast can not tell the difference between 720p and 1080p when sitting in the middle of the theater. So, why is pixel density so important? Why does it matter more today than ever?


Maximum Resolution


Half Resolution


Quarter Resolution


Eighth Resolution

1: Stunning Realism Beyond HD

Getting Lost in the Pixels

The first benefit of higher pixel density is the ability to see detail clearly even when close up. As displays get larger (and the rooms they are installed in do not), people are reducing their viewing distances. Features like touch bring viewers closer still, as the picture here illustrates. At these viewing distances, users expect the pixel density that they see in other displays and increasingly that standard is smart phones and tablets.

You have heard consumer brands like Apple use the term "retina display"* to describe a screen on which your eye is unable to distinguish between pixels. The full definition of the term is dependent not only upon pixels per inch, but the viewing distance and the dot pitch of the display, which combine into a "pixels per degree" (PPD) calculation. By these calculations Planar's 84" 4k display when viewed from a reasonable viewing distance of 5 feet, has the same pixels per degree as displays Apple called "retina."

Getting lost in the content has never been easier now that pixels are virtually unperceivable.

* The term "retina display" is a trademark of Apple Corporation and only used here in reference to their approach.

2: Content Ecosystem

4k Display Isn't Just About the Display

As much as manufacturers are pushing and promoting their new 4k displays, the successful deployment of this technology is about more than just the display itself. As with any system of this type, it is an entire ecosystem that works together to deliver the results. Especially if you want to maximize the visual experience with native resolution content, designed for this playback resolution.

And the content portion of the ecosystem, the agencies, media companies, software developers and broadcasters who provide visuals and video for displays, is maturing fast. Many have long been capable of producing 4k content, but with the lowered cost of digital still and video cameras, the falling costs of computing and storage for computer generated graphics, and an evolving toolset and workflow for 4k development, this will not be a barrier for long. In fact a growing number of camera companies are now marketing 6k or 8k cameras

Cameras capable of taking native resolution 4k graphics (or over 8 megapixel) are widespread. In fact, the primary camera on the iPhone 5 is 8 megapixel and the camera in the popular Samsung Galaxy S4 is 13 megapixel. You can literally create your own 4k content with your cell phone today.

Media player companies are announcing 4k playback. Streaming vendors have demonstrated their offerings, albeit crude. And the PC industry has long supported this resolution and consumers are now benefitting from falling prices. The time for 4k content is now!

Making Connections

The components for driving a 4k display continue to evolve quickly, as announcements are made each day by vendors in the personal computing (PC) market, as well as the audio visual space. In general, a lot of the consumer sales of 4k televisions have never seen 4k content, but rather rely on 1080p or 720p scaling to deliver an image to the screen. This will change with the coming announcements of media players and BluRay players capable of 4k.

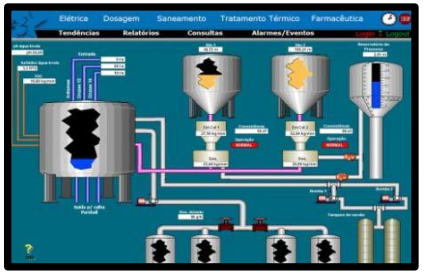
For commercial applications, the mainstream playback device is a PC, equipped with a graphics card by the likes of NVIDIA or AMD capable of native 4k playback. At the simplest level, customers want to display a computer desktop on a 4k display and do basic navigation and application manipulation. This can be done with a lot of laptops, even older ones, as long as videos are avoided. For full resolution playback of fast-paced video, a more performance oriented graphics card, and possibly computing platform, need to be assembled. See the case studies included here for additional insight into the system set ups that best enable 4k playback.

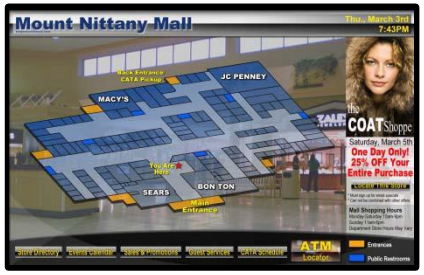
Integrators have found that is necessary for commercial displays to have multiple 4k capable inputs. For instance, the Planar UltraRes Series includes four (4) DisplayPort and four (4) HDMI, each capable of 1080p running to a quadrant of the display or for full-screen 4k playback. This allows a lot of flexibility and for multiple sources to be driven to the wall at once, without a separate processor.

Each Set Up Will Vary

System integrators should note that successful deployments of 4k might require some experimentation on their part. There are a number of variables that affect visual performance, including the processing intensity of the application, the frame rate and codex of the video stream, the number and type of sources to the display, and the settings on the cards and in the operating systems. This isn't to say that the system components are immature or unreliable, rather there is a variety of things that customers want to do with 4k and the system requirements for doing those things varies widely. The system that works for one application, might not work for the next. The case studies in this eBook can serve as useful reference designs, but different set ups may be required to achieve optimum performance.







4: Interactivity and 3D Extend Experience

Unleashing the Potential of 4k

The visual experience of ultra high definition can be expanded in many ways. The use of 3D on a 4k display, is unparalleled, because any resolution that is lost splitting the image for the two eyes (to create the stereo effect) are minimized by the extra resolution. The result is more detailed and life-like 3D.

Displays have the power to create visual experiences. Those experiences can also appeal to other senses to create something more immersive and more memorable. The more the user is interacting with the content, the more they own it: whether it be financial data in a corporate environment or product information on a digital sign.

We have seen a lot of interest in touch technology, especially multi-touch and even multi-user interactive technology on 4k displays and we expect this trend to continue. As was mentioned before, as interactive applications and touch sensors bring viewers closer to the display, the demand for high pixel density increases.

Summary

Are More Pixels Better?

Although the demos are impressive and anticipation in the market continues to grow, a number of AV integrators, professional broadcast engineers, and their clients are wondering if the time is right for them to switch to this new emerging standard. Many industries feel like they have just made the transition to full HD only to have 4k coming fast. They are asking "Is 4k for me?"

Although it is certainly a matter of application and preference, the industry is quickly adopting this technology the benefits outlined in this eBook, combined with the challenges that can be overcome, make the market ripe for rapid adoption.

To find out more about what is being done with 4k, see the case studies that follow.

Case Study: Conference Room Array of Planar UltraRes

This three-wide configuration of Planar UltraRes Series 4k displays was built first for the InfoComm 2013 trade show and has been gaining popularity for conference and collaboration rooms. Delivering a whopping 12-times- HD resolution, this 19-foot wide wall is slightly faceted for an even more immersive feeling.

The display array was driven by nine separate sources. The wall itself has inputs to accept up to 24 sources at either 1080p or 4k resolution. The content could be switched from a single 12k resolution slide show (shown), to a single 4k video on the center screen, to a mix of video and still images across the screen, and then to a 3-wide array of 3D imagery.

The sources driving the wall were as follows:

- 3D and 4k Video Sources were running off computers equipped with a 2nd generation Intel i7 processor, 8Gb Ram, SSD, with an NVIDIA K5000 graphics card
- 4k stills were driven from a PC running a 3rd generation Intel i7 processor, with 8Gb Ram, SSD, and an ATI W7000 graphics card
- There were four (4) inputs running in quadrants on a single display at 1080P/60Hz, each driven from a separate Planar ContentSmart™ media player and software.

Case Study: Board Room Installation of Clarity Matrix

This executive board room is outfitted with a 3x3 array of Clarity Matrix to create a tiled LCD video wall. The displays add to more than 4k resolution, but the input is set to 4k to allow for high resolution images and video to be played. The room is controlled with a AMX touchscreen system and the Clarity Matrix architecture leaves the wall quiet and easy to service, with no power outlets behind the wall.

This room does not have a dedicated PC, but rather allows any presenter to hook up their own laptop. The laptop then moves through an AMX control system in the room directly to the digital inputs in the Clarity Matrix QuadController.

Case Study: Architectural Display of Planar Mosaic

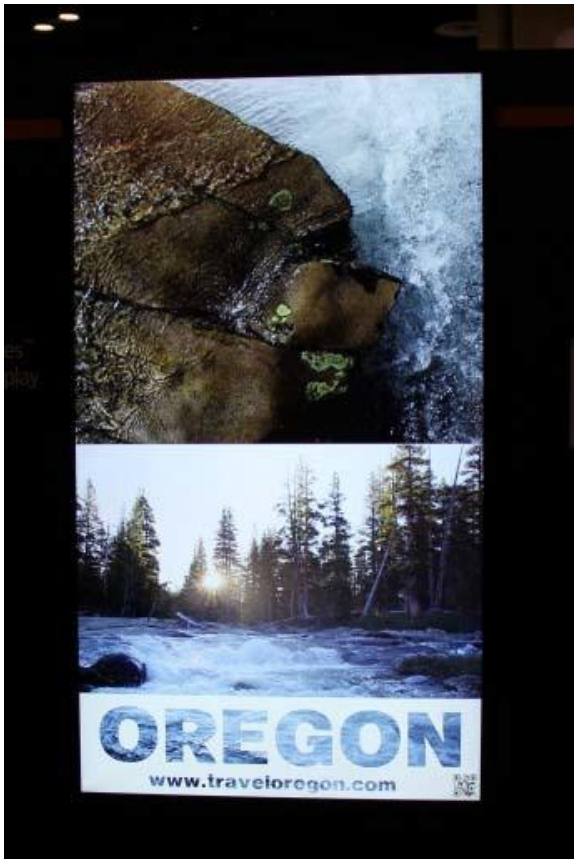
This interactive installation was designed for a trade show, but is applicable for a variety of museum, retail, and hospitality applications. The software, designed by IdentityMine, uses a small touchscreen (the top-rated Planar Helium 27") to control an artistic array of Planar Mosaic displays, in real-time. Users touch the small screen and the wall immediately responds.

The wall itself is being driven by a PC using an NVIDIA K5000 graphics card and the output is a single 4k resolution video signal. The processing that comes with the Planar Mosaic aligns the content with the displays, ensuring that each of the displays gets the right pixels, even though they are rotated, spaced on the wall, and overlapping. Behind the control station is another standard PC driving a 1080p signal to the Planar Helium monitor. The two PCs shared a network link to keep the output synchronized for a smooth visitor experience.

Case Study: Digital Signage implementation of Planar UltraRes

In this application, an 84" Planar UltraRes Series monitor is mounted in portrait mode showing a video clip containing live action, animated graphics, and slow pans of imagery to tell visitors about the tourist sites in the state of Oregon. It integrates a QR code in the lower right hand corner (perfectly clear thanks to the high resolution of the display) that connects to the website for a more explicit tie-in of digital signage to social and mobile campaigns of the advertiser.

This display is being driven by a PC with 2nd generation i7 Intel processor with 8Gb Ram, SSD, and an ATI 6970 graphics card.



Case Study: Digital Signage Application of UltraRes Touch

This Planar UltraRes Touch installation featured an interactive automobile tour, created by IdentityMine, an experience agency headquartered in the Seattle, Washington area.

The application rendered 4k video in real-time responding to the users touch points. Visitors can spin the car around, open the doors, climb into the seats, and see first hand the features of the car.

This display is being driven by a PC with a 3nd Generation i7 Intel processor, 8Gb Ram, SSD, and an NVIDIA K5000 graphics card outputting 4k video to one of the digital inputs on the Planar UltraRes Touch display. The touch sensor utilizes a USB interface.

About the Authors

Jennifer Davis

Vice President, Marketing

Ms. Davis is an experienced executive with more than17 years of experience in display technologies, software, and internet services. She has held leadership positions at companies ranging from a small software start up to Intel, a Fortune 50 technology firm. She joined Planar Systems in 1998 and has held operational, marketing, and strategic roles. Jennifer graduated summa cum laude from Warner Pacific College with degrees in business and history and holds a Master's of Business Administration from Pepperdine University.

Steve Seminario

Senior Director, Product Marketing

Mr. Seminario is a product marketing executive with over 20 years experience in display technology and enterprise software. He has held product marketing and business development leadership positions in early stage and Fortune 100 companies. He joined Planar in 2006 and holds an undergraduate degree from the University of California, San Diego and a Master's of Business Administration from The Wharton School at the University of Pennsylvania.

Special thanks to Planar Systems' technical experts, including the Planar UltraRes Series design team.

Additional Information

Planar (NASDAQ: PLNR) is a global leader in digital display technology providing premier solutions for the world's most demanding environments. Retailers, educational institutions, government agencies, businesses, utilities and energy firms, and home theater enthusiasts all depend on Planar to provide superior performance when image experience is of the highest importance.

Planar solutions are used by the world's leading organizations in applications ranging from digital signage to simulation and from interactive kiosks to large-scale data visualization. Founded in 1983, Planar is headquartered in Oregon, US, with offices worldwide.

Please visit us at **www.planar.com** where you can learn more about Planar's innovative video solutions.