Eye of the Controller

Development of high-resolution monitors provides options to enhance the ATCO's working experience.

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The ATC industry is currently witnessing the birth, adaptation and increasing popularity of 4K2K resolution LCD monitors. As this popularity originated in commercial markets, such as the LCD TV market, it raises the question: "Can these 4K2K monitors be applied to mission-critical environments, such as a modern en-route or approach center?" To answer with any degree of realistic understanding, a wide range of influences, both technical and commercial, need to be taken into account.

Stability in Tradition

The mission-critical nature of the ATC market dictates the absolute and uncompromising need for reliable products to be used 24/7 for a number of years. ATM systems are typically deployed for 20 years or more before a major overhaul or renewal is considered. During the life of the ATM system there will be interim hardware refreshes from time to time but the monitor format itself generally cannot deviate from the original configuration. Careful consideration is vital to the long-term performance of the system.

There is little doubt that the 2K2K monitor format has been, and remains, the most dominant primary control monitor format in the professional ATM arena for displaying the key secondary surveillance radar (SSR) feed. The great majority of hardware refreshes for existing systems and new system deployment to ATC centers still strongly depend on the 2K2K format's performance, reliability and long-term availability.

From the early implementation of display technology

The 2K2K monitor format remains the dominant primary control monitor format in ATC.

into ATC centers using round cathode ray tubes (CRTs) to the success of the Sony DDM CRT, the SSR signal itself directly determined the monitors' fundamental dimensions and format over the years. Maintaining the screen size of 50cm (19in) from edge-to-edge, Sony released the DDM2800 – a 28-inch completely square monitor that succeeded the round CRTs.

With the gradual adoption of LCD technology in commercial markets, it was only a matter of time before it surpassed the CRT. Monitor manufacturers such as EIZO worked closely with panel manufacturers to perfect the technology for use in mission-critical environments including medical, financial trading, and ATC. This advancement is now used in virtually every hospital, financial trading floor, and approach and enroute center around the world. 2K2K resolution LCD monitors also achieved an even more advanced technical level whereby they could safely be used as an air traffic primary control monitor. They can be used in any control center 24/7 and remain fully operational for years. The monitors have been in production for several years, and spare parts will be available for much longer. This means that ANSPs can rest assured that a same form-and-fit monitor will be available to them for the full life of their ATM system – 20 years or more. Even if the monitors are superseded with newer versions equipped with more advanced functions and features, they are completely backward compatible, as technology specialists in this field understand the importance of reliability and stability in the market.
Though there are supporters and critics of the 2K2K resolution, it remains the cornerstone of any ATM visual experience. It has been a part of the ATM market for years and will continue in that role as long as the industry requires consistent performance and product availability to support current data formats. That being said, the ATM industry itself is in the midst of a major strategic change. While traditional processes and

technologies will continue to have a place in the market, the industry is now more open to new concepts that could improve performance and efficiency and offer alternatives to how ATCOs view and manage information.

Opening the Door to New Visual Concepts

Without doubt, the single most overwhelming reason that the industry has to consider radical changes to the way ATM is handled is the sheer number of flights that must be managed compared with available capacities. We are seeing a steadily increasing number of flights, pushing control capacity to the limit, and it is projected to only increase further. Programs such as SESAR in Europe and NextGen in the USA are driving needed change while ensuring standards in safety and efficiency are maintained or even enhanced. Current systems will simply not be able to handle the expected increase in flights, so innovative alternative solutions are imperative.

EIZO offers both 2K2K and 4K2K monitor solutions for mission-critical ATC. In an attempt to improve performance and efficiency, one such solution that is being mandated is ADS-B. This surveillance system will replace the traditional radar-based system and is currently being adopted in stages. ADS-B will enable greater coverage across a range of terrains and atmospheric conditions and enable more efficient routing and separation, and will do so with greater distance coverage than radar-based systems currently do. The mandated ADS-B concept is a clear movement away from traditional radar-based control systems, which have a strictly defined and fixed resolution feed. This means a move away from the radar feed that dictated the monitor's fundamental dimensions and format over the years. It provides a realistic opportunity to reconsider the entire ATC visual experience, opening the door to newer visual concepts and resolutions.

ANSPs worldwide have been investigating a vast array of ideas and concepts. Some have even issued tender commands defining technology and ideas that are currently not in existence, challenging innovators to push beyond limitations. Many organizations have risen to the challenge, giving ANSPs even more to consider. One such example is advances in the ATM core systems application interface itself. Systems integrators have developed APIs to display the traditional radar feeds on widescreen monitors with resolutions such as 4K2K. These systems enable information displayed on auxiliary monitors to be displayed directly on the primary control monitor with flexible positioning that the ATCO can adjust as needed.

The 4K2K resolution itself is still quite new to the professional monitor industry despite being commonplace in the commercial LCD TV market. Monitor manufacturers still search for industrial applications where the resolution could be beneficial and therefore warrant sustained product development. However, the professional 4K2K market is still developing and extreme care must be taken in selecting suitable products for mission-critical environments.
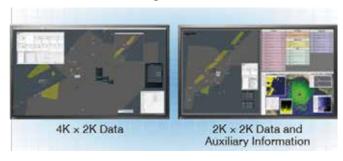
The generational move in attitudes toward IT in general, influenced by the media in our personal experiences outside the control room, exposes us to new commercial technologies every day. We have already witnessed trends such as widescreen format, 3D LCDs, 4K2K resolution and new technologies such as 8K4K resolution. Before such new technologies can be incorporated into an ATC setting, products must be equipped to handle the mission-critical nature of the environment. Commercial TV-grade monitors are not stable enough to be seriously considered for ATC. To be considered for deployment for use in a primary control workstation, a monitor must be capable of performing consistently 24/7. It must also be in production for several years to ensure long-term product and parts availability.

EIZO is spearheading the promotion of 4K2K technology to markets such as medical and ATC. For ATC, the company uses only high-end industrial-grade LCD panel modules designed for 24/7 use in mission-critical environments. EIZO worked closely with a panel manufacturer to develop a 36.4-inch monitor with an LCD module that meets the stringent requirements of ATC. The monitor is capable of receiving and displaying a full screen 4K2K image or dividing the screen in half to display two separate feeds simultaneously – 2K2K radar and auxiliary applications. This dedication to providing only the highest grade of product is imperative for any serious manufacturer supplying to

the ATC industry. The company also promotes an industrial grade 57.5-inch monitor for the primary controller workstation, offering two sizes of 4K2K monitors for ATC.

The biggest advantage of the 4K2K resolution in an ATC environment is that the ATCOs are able to see all relevant data on a single screen without the obtrusive bezels found in multi-monitor environments. In a multi-monitor setup, the user's eyes need to scan from one monitor to the next – a process that can be disrupted by the bezels and space between the monitors. They also need to adjust to the different pixel size between multiple monitors and this contributes to eyestrain over long periods of operation. A single 4K2K screen addresses these points by enabling the ATCO to display all pertinent information on one screen, making it more efficient and less straining to view.

4K × 2K Data   2K × 2K Data and Auxiliary Information

The 4K2K resolution itself is potentially very interesting for any ANSP to consider when investigating options for a future ATM system replacement. It opens the door to completely new visual possibilities to improve performance and efficiency. Unfortunately the 4K2K LCD panel module market is driven primarily by the commercial grade LCD TV market. These panels cannot be used 24/7 without affecting performance and reliability. While there are some steps that monitor manufacturers can take to enhance panel module reliability, without the development of an appropriate industrial-grade, or even a mid-level point-of-information grade panel capable of 24/7 operation, it will take

time for 4K2K to become a widespread alternative to 2K2K configurations. While production of such a panel is not out of the question, it would require a similar demand from another industry, as the worldwide ATC demand alone is not high enough to sustain the volumes needed to justify production.

Considering the Factors

The fundamental purpose and goals of the industry will remain unchanged and the challenges of increasing traffic volume mean that the industry will evolve. The mission-critical nature of ATC will continue to dictate the uncompromising need for reliable control solutions with long-term availability, regardless of the solution deployed. As an integral part of this evolution, there will be more focus on human-machine interface components, such as visual display technology. As long as the industry continues with SSR feeds and requires consistent performance, 24/7 reliability and long-term product availability and parts supply, the 2K2K primary control monitor will remain the cornerstone of many control centers for some time to come.

So can 4K2K monitors be applied to mission-critical environments, such as the modern enroute or approach center? Provided that the monitors and their components are designed to meet the stringent technical demands of the ATC environment, 4K2K resolution monitors could enhance the ATM visual experience and increase ATCOs' performance and efficiency. While some industrial-grade 4K2K monitors are currently being used in a limited number of enroute and approach centers, the range of sizes available is limited. As other industries also adopt the 4K2K resolution, the ATC market will also see more size variations. However, it may take time for such variations to be available at the level required for ATC.