ADLINK
Leading EDGE COMPUTING

Solution Blueprint

Increasing Medical Imaging Productivity with Panel Computers

The ADLINK Smart Panel solution helps increase the efficiency of medical imaging technicians and the throughput of diagnostic imaging equipment.



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Executive Summary

A panel computer, integrated into diagnostic imaging equipment, can improve the patient experience and greatly boost productivity at medical imaging facilitates. Much time is saved because imaging technicians can more quickly adjust the equipment and the patient's position when they view patient information from the scanner room and not in a separate monitor room, thus avoiding a lot of back and forth movement (Figure 1).

Patients appreciate spending less time on the examination table, especially since scans can last 15 to 90 minutes, depending on the size of the area being scanned and the number of images being taken.[1] Medical imaging facilities can conduct examinations in less time, allowing them to increase technician efficiency and get higher throughput from their scanners.

However, designing a panel computer from the ground up is a complex engineering task. Alternatively, it is much easier for equipment manufacturers of computed tomography (CT), magnetic resonance imaging (MRI), or X-ray scanners to integrate a commercially-available panel computer, like ADLINK's Smart Panel solution. This approach enables equipment manufacturers to spend more time developing diagnostic imaging solutions and less time mastering the intricacies of computer and display design.

The Smart Panel solution is modular, allowing it to be configured to meet a wide range of requirements and operating environments. The panel computer can control scanners and display images, as well as implement a variety of other features such as patient ID verification, remote updates, and asset management.

This paper discusses how diagnostic imaging equipment manufacturers can benefit from this solution.

Key Business Objectives

Equipment manufacturers can gain a competitive advantage by enabling medical imaging facilities to shorten examination times, thereby improving the patient experience and increasing productivity.

Business Challenges

A panel computer is a multifaceted design, consisting of a touch screen, LCD display, industrial PC mainboard, power supply, I/O, and a thin frame. When used in health care applications, it must comply with medical standards (e.g., electromagnetic interference). Moreover, one panel computer will not fit all scanners, thus the design should be flexible to accommodate different requirements. These are just a few of the factors that may steer a diagnostic imaging equipment manufacturer to consider integrating panel computers from an experienced vendor, like ADLINK.



Figure 1. A panel computer, integrated into diagnostic imaging equipment, can improve the patient experience and productivity at medical imaging facilities.

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Solution Overview

ADLINK's Smart Panel solution is based on an open system architecture that integrates a touch panel, display screen, PC mainboard, heat sink, and I/O interfaces. This all-in-one solution significantly reduces the time and effort needed for a diagnostic imaging equipment manufacturer to add a panel computer to a scanner. Equipment manufacturers can also customize Smart Panels to address different diagnostic imaging requirements through ADLINK's unique Function Module (FM) board, as shown in Figure 2.

Flexible Modular Architecture

The Smart Panel design is modular, allowing equipment manufacturers to select from a wide range of CPU performance (e.g., Intel® Core™ and Intel Atom® processors), panel types, screen sizes, and I/O interfaces. This modularity gives users the flexibility to choose a configuration that satisfies their diagnostic imaging application requirements and best shows the information to be displayed, such as:

- **Patient data** to identify patients.
- **Table position and patient orientation** to help imaging technicians position patients correctly. For example, the Smart Panel can display real-time video of the patient and graphically show technicians how to position the patient.
- **Automated guidance** to help technicians optimize imaging results when applying physiological sensors and physiological data to trigger image acquisition, based on a patient's ECG, respiratory, and pulse signals.

Equipment manufacturers can choose P-CAP or resistive touch panels with a 16:9 aspect ratio and screen sizes ranging from 7-inches to 21.5-inches. The Smart Panel also supports a second display, or even a third, which allows imaging technicians to control the scanner from either side. Additional displays connect via low-voltage differential signaling (LVDS) and embedded DisplayPort (eDP) interfaces, and an 5V/12V/optional isolated power supply. Regardless of the display panel choice, the same PC mainboard can be used, thereby keeping time-consuming board validation to a minimum.

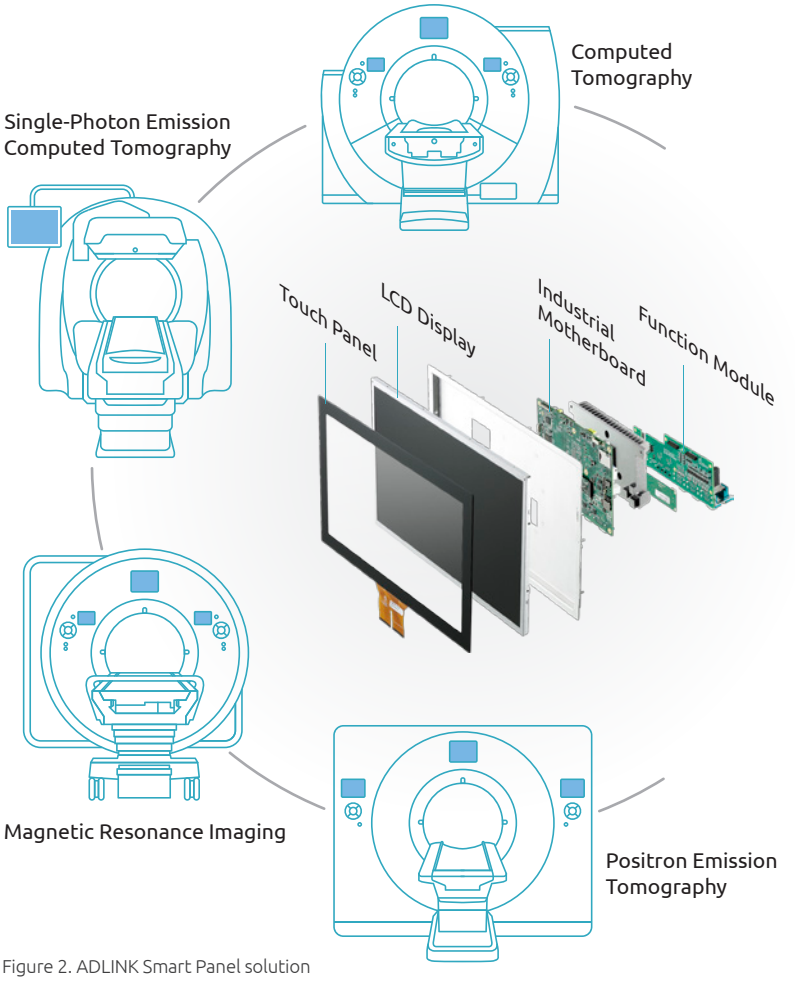


Figure 2. ADLINK Smart Panel solution

ADLINK PC mainboards provide various I/O interfaces, including USB 2.0/3.0, I^2C adapter, gigabit Ethernet (GbE), COM ports (RS232/422/485), 32 function keys, and power and audio control.

ADLINK's fully modular architecture gives equipment makers virtually limitless possibilities to configure the Smart Panel solution as needed.

Fast Customization

The Smart Panel can connect to other systems, such as motorized beds, X-ray scanners, detectors, and cameras, as shown in Figure 3. These connections are supported by I/O interfaces supplied by the PC mainboard or the FM board. Figure 3 shows examples of possible functions equipment manufacturers may wish to offer:

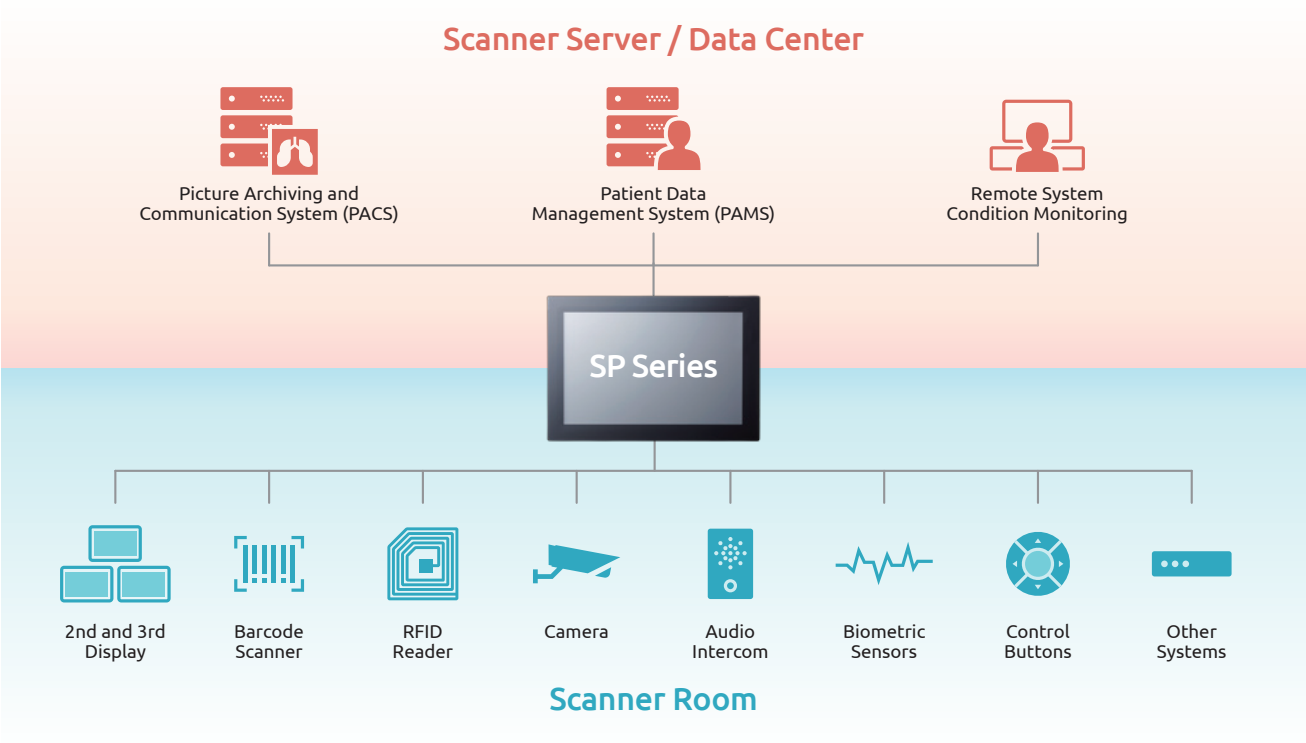


Figure 3. ADLINK's Smart Panel provides a high level of modularization to help satisfy different scanner room functionalities.

- **Control panel on left, center, and right:** Up to three displays
- **Identify patients:** Barcode scanner, RFDI reader
- **Monitor patients in real time:** Camera
- **Communicate with patients:** Audio intercom
- **Monitor patient vital signs (e.g., heart rate, respiration):** Biometric sensors
- **Control scan, bed, etc.:** Control buttons
- **Implement more capabilities:** Other systems

The flexibility of the Smart Panel allows equipment manufacturers to incorporate application-specific capabilities, such as:

- **Picture archiving and communications system:** Facilitates an economical image repository.
- **Patient data management system:** Streamlines clinical documentation.
- **Remote system condition monitoring:** Improves diagnostic imaging equipment availability via predictive maintenance.
- **Asset management:** Remotely maintains, updates, and manages all scanners.

Equipment manufacturers can either have ADLINK develop an FM board or develop a board themselves using an ADLINK design guide.

Short Time-to-Market

Using ADLINK's 80/20 development model (Figure 4), equipment manufacturers can build a prototype in about three months because the early-phase development has been completed by ADLINK.

- **ADLINK** provides 80% of the total solution, including circuit layout, drivers, customized touch panel, mainboard, and display function validation.
- **Equipment manufacturers** complete the remaining 20% of the development tasks: mechanical design evaluation and FM board customization.

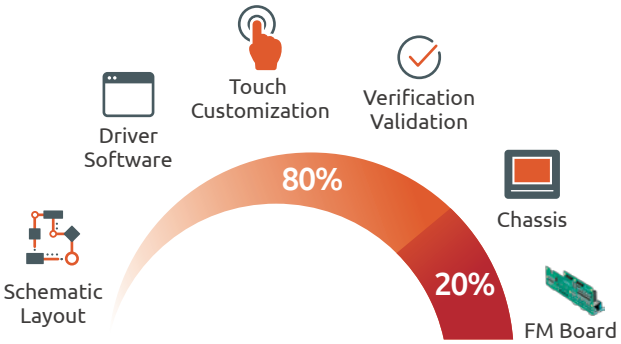


Figure 4. ADLINK's 80/20 development model delvers about 80% of the total Smart Panel design.

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Reliable and Rugged Design

ADLINK's Smart Panel solution ensures long-term reliability through a rugged design that can withstand very harsh operating environments. The solution complies with a large number of reliability standards, including EN 55032 (EMI), IEC/EN 61000-3-2 and 3-3 (EMI), EN 55024 (EMS), EN 61000/ EN 50155 /IEC 60601-1-2, and UNECE R10. Shock and vibration resistance is also built-in per compliance with EN61373 Class 1B, ISO 7637-2, and EN61373 Class 1B, making the Smart Panel more reliable than other panel computers tested for general electrostatic discharge (ESD) certifications.

Conclusion

With ADLINK's Smart Panel solution, diagnostic imaging equipment manufacturers can increase their value to medical imaging facilities by enabling a higher level of technician and scanner productivity. The solution also benefits equipment manufacturers by making it easier to add panel computers to scanners:

Reduced time-to-market: Equipment manufacturers can eliminate months of development effort by employing ADLINK's Smart Panel, which is factory-configured with display, touch panel, mainboard, heat sink, and I/O interfaces. ADLINK's 80/20 development model allows equipment manufacturers to skip the early-phase development, saving design and validation effort.

Reduced TCO: All critical ADLINK Smart Panel components are tested to industry standards before shipment to ensure high reliability, thus reducing the total cost of ownership for medical imaging facilities.

Enhanced design flexibility: ADLINK's FM integration allows fast and easy development of function and I/O configurations needed to support a family of scanners, with significantly reduced R&D time and cost.

1. U.K. National Health Service website, "How it's performed - MRI scan," https://www.nhs.uk/conditions/mri-scan/what-happens.

WORLDWIDE OFFICES

ADLINK Technology, Inc.

9F, No.166 Jian Yi Road, Zhonghe District
New Taipei City 235, Taiwan
新北市中和區建一路166號9樓
Tel: +886-2-8226-5877
Fax: +886-2-8226-5717
Email: service@adlinktech.com

Ampro ADLINK Technology, Inc.

5215 Hellyer Avenue, #110 San Jose, CA 95138, USA
Tel: +1-408-360-0200
Toll Free: +1-800-966-5200 (USA only)
Fax: +1-408-360-0222
Email: info@adlinktech.com

ADLINK Technology Singapore Pte, Ltd.

84 Genting Lane #07-02A, Axxel Innovation Centre,
Singapore 349584
Tel: +65-6844-2261
Fax: +65-6844-2263
Email: singapore@adlinktech.com

ADLINK Technology Singapore Pte. Ltd. (Indian Liaison Office)

#50-56, First Floor, Spearhead Towers
Margosa Main Road (between 16th/17th Cross)
Malleswaram, Bangalore - 560 055, India
Tel: +91-80-65605817, +91-80-42246107
Fax: +91-80-23464606
Email: india@adlinktech.com

ADLINK Technology Japan Corporation

〒101-0045 東京都千代田区神田鍛冶町3-7-4
ユニゾ神田鍛冶町三丁目ビル4F
Unizo Kanda Kaji-cho 3 Chome Bldg. 4F,
3-7-4 Kanda Kajicho, Chiyoda-ku, Tokyo 101-0045, Japan
Tel: +81-3-4455-3722
Fax: +81-3-5209-6013
Email: japan@adlinktech.com

ADLINK Technology, Inc. (Korean Liaison Office)

경기도 용인시 수지구 신수로 767
A동 1008호 (동천동, 분당수지유타워) (우) 16827
A-1008, U-TOWER, 767 Sinsu-ro, Suji-gu, Yongin-si,
Gyeonggi-do, Republic of Korea, 16827
Toll Free:+82-80-800-0585
Tel: +82-31-786-0585
Fax: +82-31-786-0583
Email: korea@adlinktech.com

ADLINK Technology (China) Co., Ltd.

上海市浦东新区张江高科技园区芳春路300号 (201203)
300 Fang Chun Rd., Zhangjiang Hi-Tech Park
Pudong New Area, Shanghai, 201203 China
Tel: +86-21-5132-8988
Fax: +86-21-5192-3588
Email: market@adlinktech.com

ADLINK Technology Beijing

北京市海淀区上地东路1号盈创动力大厦E座801室(100085)
Rm. 801, Power Creative E, No. 1 Shang Di East Rd.
Beijing, 100085 China
Tel: +86-10-5885-8666
Fax: +86-10-5885-8626
Email: market@adlinktech.com

ADLINK Technology Shenzhen

深圳市南山区科技园南区高新南七道数字技术园
A1栋2楼C区 (518057)
2F, C Block, Bldg. A1, Cyber-Tech Zone, Gao Xin Ave. Sec. 7
High-Tech Industrial Park S., Shenzhen, 518054 China
Tel: +86-755-2643-4858
Fax: +86-755-2664-6353
Email: market@adlinktech.com

ADLINK Technology GmbH

Hans-Thoma-Strasse 11, D-68163
Mannheim, Germany
Tel: +49 621 43214-0
Fax: +49 621 43214-30

(Deggendorf) Ulrichsbergerstrasse 17, 94469
Deggendorf, Germany
Tel: +49 (0) 991 290 94-10
Tel: +49 (0) 991 290 94-29
Email: emea@adlinktech.com

ADLINK Technology, Inc. (French Liaison Office)

6 allée de Londres, Immeuble Ceylan 91940
Les Ulis, France
Tel: +33 (0) 1 60 12 35 66
Fax: +33 (0) 1 60 12 35 66
Email: france@adlinktech.com

ADLINK Technology, Inc. (UK Liaison Office)

First Floor West Exeter House, Chichester Fields
Business Park Tangmere, West Sussex,
PO20 2FU, United Kingdom
Tel: +44-1243-859677
Email: UK@adlinktech.com

ADLINK Technology, Inc. (Israel Liaison Office)

SPACES OXYGEN, 62 Medinat, Ha-yehudim st
4673300, Herzliya, Israel, P.O.Box – 12960
Tel: +972-54-632-5251
Fax: +972-77-208-0230
Email: israel@adlinktech.com

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