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ADLINK Leading EDGE COMPUTING

intel IoT Solutions Alliance

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ADLINK Edge IoT Solution

Digital eXperiments as-a-Service

Discover Success Implementing Edge IoT



www.adlinktech.com

Vol. S182

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introduction

The IoT Puzzle

The Internet of Things (IoT) offers businesses opportunities for incredible savings and growth. IoT has the power to help transform operations, decision-making, and revenue models—saving money and driving business growth. Many IT and OT leaders are struggling to thoughtfully manage all of the top-down and bottom-up requests for IoT solutions and technologies.

C-Level executives and tinkerers alike are ready to take full advantage of IoT to revolutionize products and operations, however, lofty expectations and operating in siloes will leave companies overwhelmed and frustrated. Consider these dilemmas in the IoT Puzzle:

I.T. organizations see themselves as best equipped to evaluate new technology

But operations has historically held I.T. at arms length as it pertains to the tools in deploys in plant and operations.

IoT security flaws have proven costly in the real world.

But no best-practice standard IoT Cyber-Security model has emerged.

There is **high risk of failure** in getting an IoT-based connected product or operation running in a business.

But the **lifespan of a business is getting shorter** and shorter and business model innovation is critical to survival.

Capturing data is **easier than ever** with IoT based technologies.

But there is more data being produced and captured which is causing **more data silos.**

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the opportunity

The Digital Experiment

Fully deployed IoT solutions require a significant up-front investment and the industry success rate for an IoT project is only 26% according to a 2016 IoT study conducted by Cisco. Therefore leaders need to understand and clearly communicate to teams and stakeholders that failure is an inevitability, as long as it happens fast and the organization learns fast.

Technologists have long used proofs of concept to test whether technologies work – but in IoT, testing bespoke technology is more often than not a poor indication of a project's real deployment viability. A new model has emerged at the convergence of I.T. best practices and operations' practical thinking: The Digital Experiment.

Economic growth occurs whenever people take resources and rearrange them in ways that make them more valuable
– Economist Paul Romer

The IoT Digital Experiment is a critical learning tool for a company building a new business model or business process leveraging the power of the Internet of Things. It tests both technology and business issues, enabling cross functional leadership to validate the effectiveness of a solution's design, strategy, organizational compatibility, and financial return. This is vital as IoT is fundamentally innovative not because of the technology, rather it makes a difference because of its ability to rearrange how value is created and captured.

A digital experiment therefore doesn't focus solely on singular technical approaches; the experiment encourages cross capability innovation. It validates not only internal capabilities but also supporting partner ecosystem resources before committing to a full rollout of across the business. Digital experiments combine existing things in new ways – and the more experiments you do, the more innovations you find.

Successful experiments strengthen the confidence of stakeholders to make the investments needed for large-scale rollout. They often result in minimally viable products with detailed business value assessments and create new forms of revenue. The best experiments result in a detailed blueprint for transforming an area of your process, product, or industry value network.

But make no mistake – often unsuccessful experiments provide significant value. From uncovering design issues which would have resulted in dramatic cost-overruns, to shedding light on where NOT to invest further, each experiment creates an opportunity for organizational learning in the age of IoT.

We believe strongly that digital experiments will form the basis of the next generation business models and processes which will shape industry landscapes. Both successful and unsuccessful Digital Experiments are key to building an effective innovation culture. Any industry experiencing heightened competitive pressures, decreasing margin on traditional business lines, or insurgency from new entrants will benefit from the ongoing exercise of testing and rolling out new ideas based on the results of their experiment investment.

The IoT's true value lies in its disruptive potential for reimagining business processes and, ultimately, rewiring business, government, and society society.
– Deloitte



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our approach

IoT Digital Experiment as-a-Service

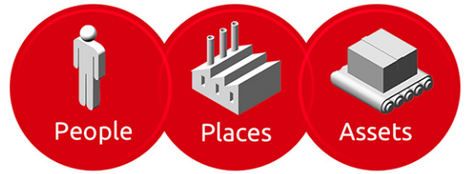
The ADLINK IoT Digital Experiments as-a-Service (DXS) enables our clients to run multiple IoT Digital Experiments in parallel. Built on a wealth of experience from multiple sectors, we have brought together a set of best practices designed to accelerate organizational learning, minimize risk, and maximize return.

The service includes relevant hardware, software and appropriate professional services in a highly optimized "sprint model" designed to help the client test many IoT ideas rapidly.

The ADLINK IoT Digital Experiment as a Service (DXS) will help you

- ***Run multiple IoT Digital Experiments in parallel via subscription service***
- ***Create a safe zone to experiment, fail, and learn***
- ***Validate effectiveness of IoT design, strategy, and partners***
- ***Lower risk before rolling out an IoT solution companywide***
- ***Strengthen confidence of IoT stakeholders and teams***
- ***Uncover design issues with large-scale consequences***
- ***Try different analytics and approaches to reduce costs***
- ***Create new revenue streams and create minimally viable products***
- ***Generate internal and external excitement***
- ***Quickly and easily deploy a digital experience with easy on-ramping***

Our approach is predicated on the belief that neither one technology nor one company can "crack the code" when creating IoT based solutions. Whether exploring operational efficiencies in a traditional business or looking to disrupt a sector and capture value in new ways, ADLINK's DXS methodology blends best practices and thinking from multiple sectors to help you create the best solution to your challenge. Its purpose is to help companies develop a comprehensive IoT solution strategy by executing on a variety of Digital Experiments and defining a roadmap for implementing successful IoT solutions which transform the way they create and capture value.



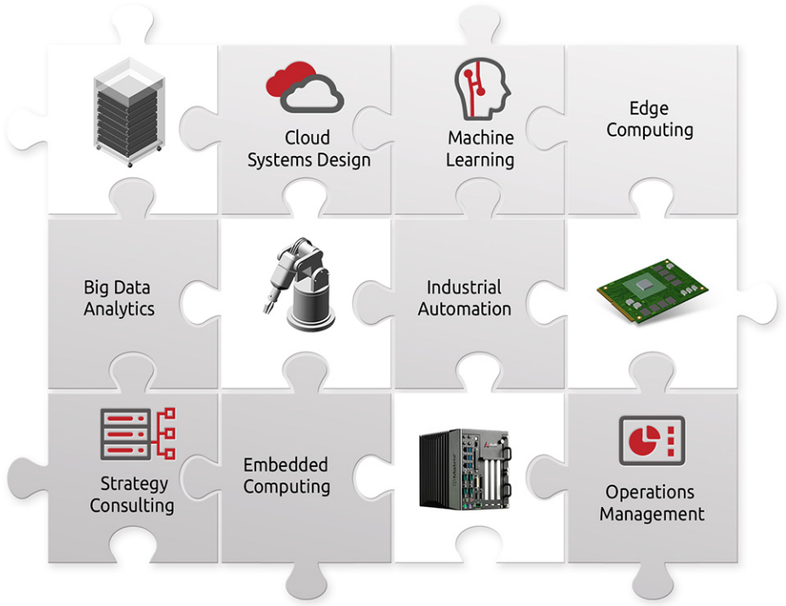
We help you by:

Designing solution experiences from the beginning with the user experience top of mind

Each DXS engagement focuses discretely on who will be impacted by the solution. From the operator on the plant floor or operating a tractor on a farm, all the way to the executive who has to allocate resources and balance priorities. At ADLINK we look at the intersection between the People, Places and Assets – the edges where value is created -- to design new value propositions and test idea. Fundamentally, DXS is built on the concept of design oriented thinking, which puts the imagined experience to the test.

Creating detailed blueprints – from Silicon to Software -- which de-risk your IoT implementation

Our engagements leverage technologies through all layers of the required hardware, software and network stacks to create viable, scalable, and secure IoT solutions. Solutions span not only capabilities from ADLINK, but from partners throughout our ecosystem.



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Testing the realities of IoT at each stage of physical deployment: from edge to cloud

IoT is flooded with do-it-yourself hobby kits to try out everything from robotics to sensor data capture. But moving beyond the whiteboard and hobbyist design is where many fall short. The ADLINK Digital eXperiments as-a-Service approach is built on years of experience designing hardened military grade solutions – optimized against real world limitations like security, latency, and compute power. Blueprints identify how solutions should be deployed to take maximum advantage of cloud, data center, and edge processing.

In many cases, ADLINK's design and development centers test multiple off-the-shelf approaches looking for attributes which best fit the application. Where appropriate, ADLINK's custom development centers can define from the ground up custom boards, and compute modules, smart cameras, and automation technology which fit your solution vision.





the details

what makes DXS work

The ADLINK IoT Digital Experiment as a Service (DXS) includes

- *Prevalidated edge hardware to connect your assets and get data moving*
- *Integrated Sensor packs to connect the unconnected*
- *Preconfigured adapters to key protocols like MODBUS BACNET etc*
- *Secure Data movement capabilities to bridge the IT/OT gap*
- *Data Streaming capabilities to the major cloud analytics providers including IBM, Amazon, Microsoft, and ThingWorx*
- *Enterprise Shared services to link your IoT data to key platforms like Hadoop, relational data stores, integration layers, CRM and ERP*
- *Endpoint Management capabilities built on a trusted platform*
- *Field and Professional Services packaged to meet your staff support needs*

Power by VORTEX EDGE

Connect the Unconnected
People, Assets & Places

Stream Anywhere
Data to the right time to the right place

Control the Edge
Monitor, Manage, Analyze

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Prevalidated Edge Hardware –
DXS service provides access to critical hardware needed to connect, and acquire crucial data from, unconnected legacy devices. The service leverages ADLINK performers like the Quad-Core Intel Atom® processor-based MXE Smart Gateway with equipment protocol support, the DEX-100 System with Intel® Cyclone® V FPGAs technology for Human Machine Interface data extraction, and other relevant hardware platforms for complete Edge integration. Device assets are easily mountable in any industrial setting and IP 67-rated.

The MXE Smart IoT Gateway with OT protocol capability and the DEX-100 for HMI integration.



Sensor Packs – While many digital experiments are focused on tapping into existing data sources in brownfield devices (or testing new greenfield configurations), many clients want to explore the feasibility of developing new data by retrofitting sensors into existing environments.

ADLINK pre-certifies and pre-integrates high-fidelity 3rd party sensors into the DXS platform, which enables our clients to quickly ascertain if new sensor options would make sense in broader deployment.

Certified sensors include those for current, strain, load, and temperature and many others



Preconfigured Adaptors – each industry's "things" talk a different language. Automotive talks J-1939. Many PLCs talk MODBUS. Building automation equipment often relate data over BACnet. Some systems have highly configured protocols optimized for low bandwidth locations – or limited local storage.

ADLINK has pre-integrated the most popular cmmunication adapters into its DXS platform. Rather than suffer through wiring point to point connections between different things and your target environment, the ADLINK platform normalizes data from multiple protocols seamlessly, and makes it ready to be shared with multiple destinations. To further extend your experimental reach, our platform is pre-configured with the popular kepware and OSI-PI systems so getting your program moving is faster than ever.

Standard industry protocols, popular historians, and industry adapter

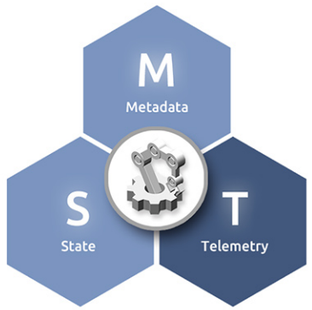
Modbus OSIsoft. OPC UA kepware ASHRAE BACnet™

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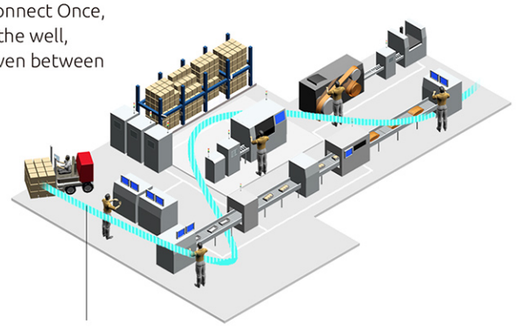
Secure Data Movement – The era of IoT makes data governance and security more important than ever. While traditional air-gap security mechanisms and lock-and-key access appropriate in the unconnected world, IoT connected devices – whether machines, building components, vehicles, or field equipment – only add value when data moves seamlessly and securely from operations to multiple places, including into I.T. secured systems for post-processing and analytics.



Data Streaming Capabilities – Vortex Edge streams IoT Data to where it is needed, be that a cloud, a micro-data center, or even to another device at the edge. Vortex Edge uses peer to peer data movement technology to securely transform and move data. Vortex Edge follows a "Connect Once, Stream Anywhere" approach – once a device is connected to the well, data can move freely between clouds, between assets, and even between business partners and suppliers.

Vortex Edge streams data from the edge to the major cloud analytics providers. In this example in agriculture, data gathered from distributed equipment moves to multiple clouds and between each other and partners.

VORTEX EDGE



Vortex Data River

Enterprise Shared Services – The ADLINK platform is pre-integrated with micro-services which seamlessly bridge IoT data sources to more traditional I.T. managed enterprise systems for data management and analytics. Leveraging open technologies pre-integrated with the ADLINK Thing Model, telemetry, state, and device metadata are easily bridged to enterprise Hadoop platforms (HBASE) and enterprise datamarts (MySQL). Enterprise I.T. can rapidly develop IoT centric applications as part of their digital experiments by tapping directly into streaming data using enterprise tools like Node Red and Elastic Search,

Endpoint Management – Distributed device management is a challenging task in any IoT deployment, and for digital experiments we've tried to simplify the effort by leveraging best-in-class container based edge content management (Docker) and processes for updating OS, managing device registration, monitoring uptime and reboot (VMWARE PULSE).

Field & Professional Services – ADLINK has built a network of expert practitioners who bring the skills you need to the table to augment your team's own abilities. From experts in mechanical and electrical engineering, to roboticists, to data scientists and deep integration programmers. Each DXS holds a retainer on hours per month which can be applied to requisite skills needed for your project.
ADLINK project manages the endeavor and ensure delivery from In addition to commercial capabilities, ADLINK has partnered with leading technical universities like Newcastle University who regularly assign masters students to work on ADLINK projects as part of our partnership.



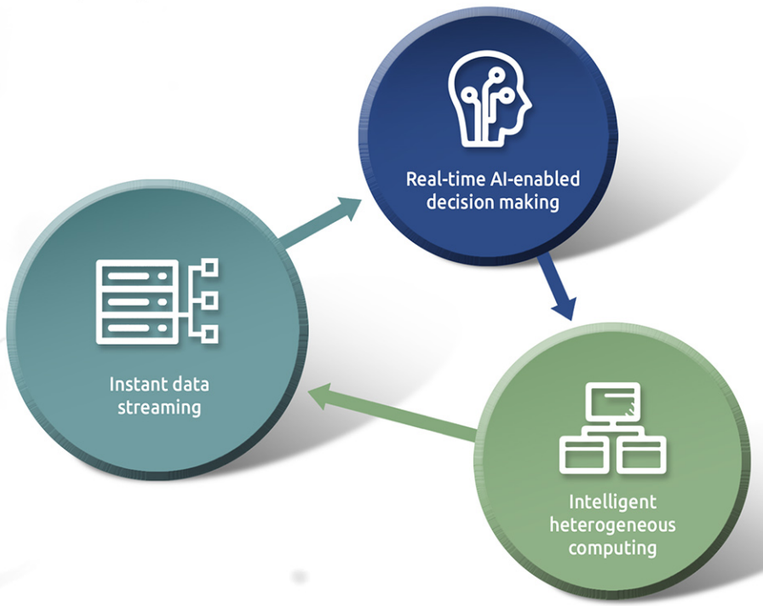
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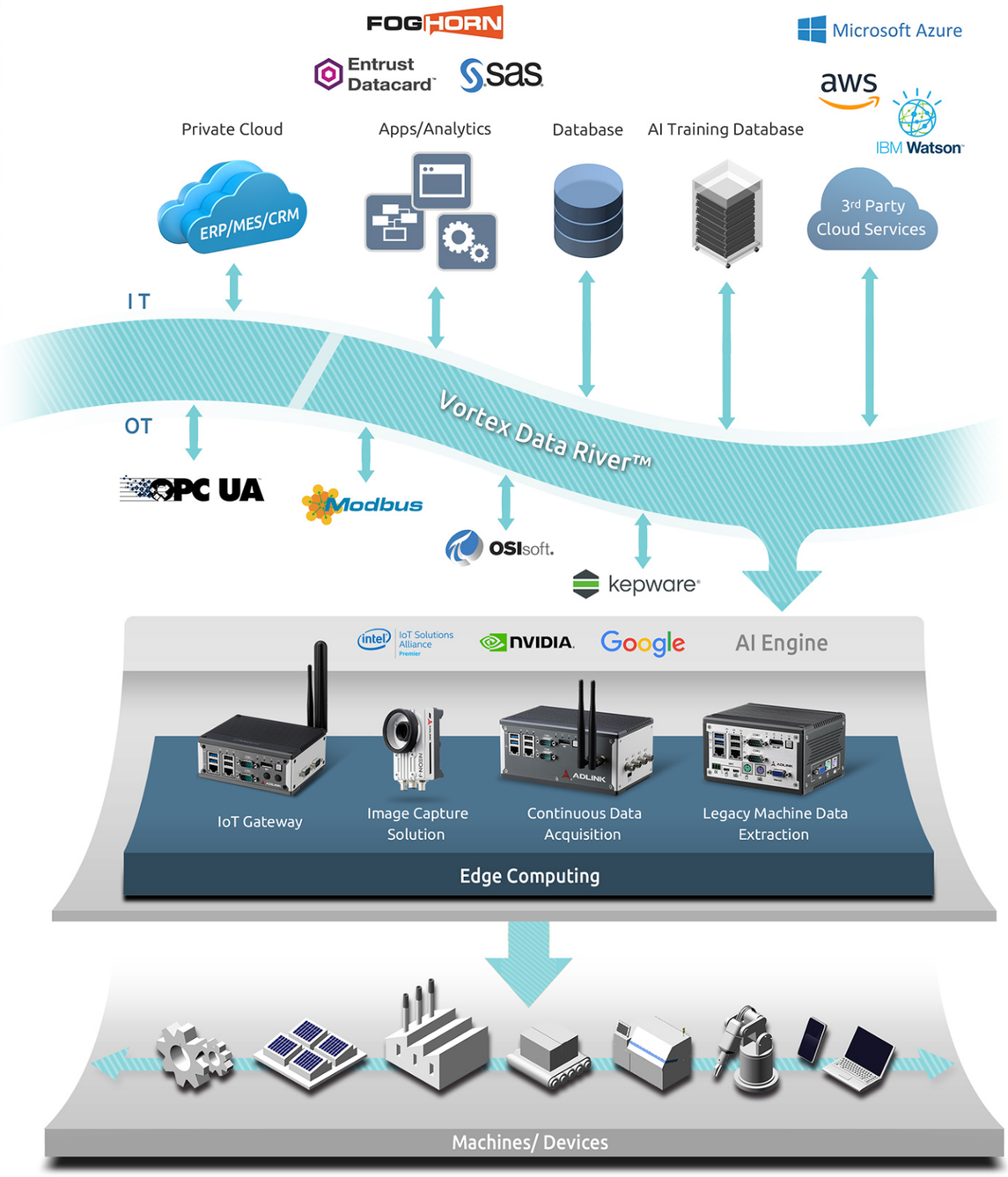


ADLINK Edge IoT Smart Manufacturing Solution

Connecting Factories to Make the Future Happen

ADLINK, with years of experience in production line integration, delivers highly compatible solutions via edge IoT data extraction, supporting universal data acquisition and management to achieve operational superiority.





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About ADLINK IoT

ADLINK has a proven track record providing cutting edge products and solutions for the embedded and IoT solutions space. ADLINK's outstanding engineering and ADLINK-owned manufacturing facilities coupled with technology design labs around the world helps ADLINK act as a reliable, high quality partner through the entire lifecycle of clients' IoT and embedded initiatives.

- ***Wide Breadth of Product Offerings***
- ***Premier Partner in Intel IoT Alliance***
- ***Two production facilities (Taiwan and China), Low-Volume-High-Mix***
- ***High R&D investment, average of 14% annually***
- ***Design & Support in all geographic areas***
- ***Dedicated Design Services teams (US, Taiwan and EMEA)***
- ***ROHS compliance, ISO 900x and ISO 13485***
- ***Long product lifecycles and Lifecycle Extension***
- ***Worldwide Development Centers (San Jose USA, Manheim DE, Taipei TW, Shanghai CN)***



ADLINK has provided embedded computing technology to energy, transportation, medical, military, industrial automation and communications industries for over 30 years. We actively participate in and lead embedded computing standards committees such as CompactPCI, AdvancedTCA, and COM Express. Our technical leadership chairs several PCI Industrial Computer Manufacturers Group (PICMG) subcommittees as well as the PC/104 Consortium Technical Committee. We are active in the OPEN FOG, OMG, ECLIPSE and Robotic Operating System communities, and contribute time and resources to the ACCESSIBLE OLLI program, focused on autonomous vehicles for the disabled.

ADLINK is a Premier member of the Intel® Internet of Things Solutions Alliance. From modular components to market-ready systems, Intel and the 500+ global member companies of the Intel® Internet of Things Solutions Alliance provide scalable, interoperable solutions that accelerate deployment of intelligent devices and end-to-end analytics. Learn more at: intel.com/iotsolutionsalliance



ADLINK Partner Ecosystem

We believe that our client's success rides on the IoT ecosystem they surround themselves with, therefore ADLINK's partner ecosystem allows us to support any application across any industry. Our partner ecosystem includes:

- Field integrators – Customization and integration into brownfield industry
- Analytics Specialists – Data science and big data analytics technology
- Business consultants – Value assessments and business models
- Cloud/datacenter vendors – Xaas and PaaS
- Independent software vendors – Analytics, asset management, security, etc.
- Hardware/sensor vendors – Analog and digital sensors for every application
- Open source communities – Autonomous vehicles and vision systems



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