INDUSTRIAL TRANSFORMATION
IX REFERENCE ARCHITECTURE

INDUSTRIAL TRANSFORMATION (IX) REFERENCE ARCHITECTURE

ECOSYSTEM

- Industry Solutions
- Implementation Services & Support
- Third-party and Partnered Applications and Products
- Marketplaces

APPLICATIONS & ANALYTICS

- NextGen Applications: Digital Twins, Smart Metering, Fleet Management, Connected Worker, Quality 4.0, EHS 4.0, and others
- Monitoring & Control
- Collaboration Social Search
- Analytics: Descriptive, Diagnostic, Predictive, Prescriptive, Prognostic
- Application & Integration APIs

DEVELOPMENT TOOLS & LIBRARIES

- Integrated Development Environment: Python, JAVA, HTML5, No/Low Code, Device Deployment, etc.
- Microservices, SDKs, and Restful APIs
- BOTS and RPA
- Workflow/Orchestration Execution Engine
- Models: Physical, Visual, Mathematical, Computational
- Analytics: Statistics, Artificial Intelligence, Machine Learning, Natural language Processing, Search & Optimization, Heuristics, etc.

ON-PREMISE, EDGE, & CLOUD

- Public, Private, Hybrid Cloud
- Edge Computing
- Scalable Storage SQL/No SQL
- Data Lake/Data Warehouse
- Scalable Storage
- Hadoop, Spark

DATA CONDITIONING & CONTEXTUALIZATION

- Anomaly Detection
- Data Cleansing
- Aggregation
- Compaction
- Mashing
- Complex Event Processing
- Data Model: Structured, Semi-Structured, Unstructured
- Integration/Persistence

NETWORK, SECURITY, & CONNECTIVITY

- Device Identification, Asset Inventory & Visibility
- Network Infrastructure: Servers, Gateways, Firewalls
- Cybersecurity: Security: Information & Event Management, End-Point Detection, User & Entity Behavior Analytics, Network Traffic Analysis, Network Intrusion Detection System, Host-based Intrusion Detection System, etc.
- ICS Active and Passive Detection and Control
- Communication Standards & Protocols: MQTT, OPC-UA, Wi-Fi, 4G/5G. AMQP, DDS, APIs, and others

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INDUSTRIAL TRANSFORMATION
IX PLATFORM

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IX APPS AND ANALYTICS

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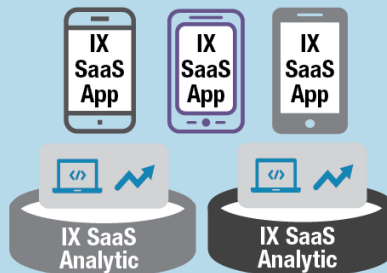**LNS Research**

INDUSTRIAL TRANSFORMATION
IX 3 ARCHITECTURAL APPROACHES

THREE ARCHITECTURAL APPROACHES TO INDUSTRIAL TRANSFORMATION (IX)

CUSTOM
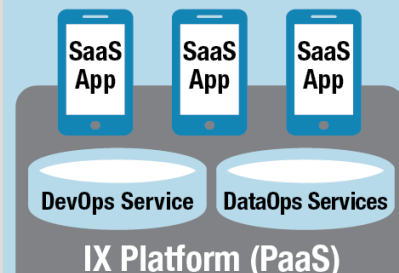
IX Infrastructure (IaaS)

BEST-OF-BREED

IX SaaS App · IX SaaS App · IX SaaS App

IX SaaS Analytic · IX SaaS Analytic

IX Infrastructure (IaaS)

VENDOR ECOSYSTEM

SaaS App · SaaS App · SaaS App

DevOps Service · DataOps Services

IX Platform (PaaS)

IX Infrastructure (IaaS)

LEVEL OF CUSTOM DEVELOPMENT AND INTEGRATION

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