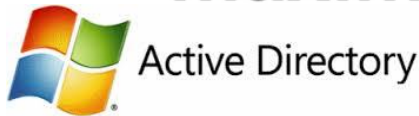


Leading2Lean Integration Overview and Architecture Diagrams

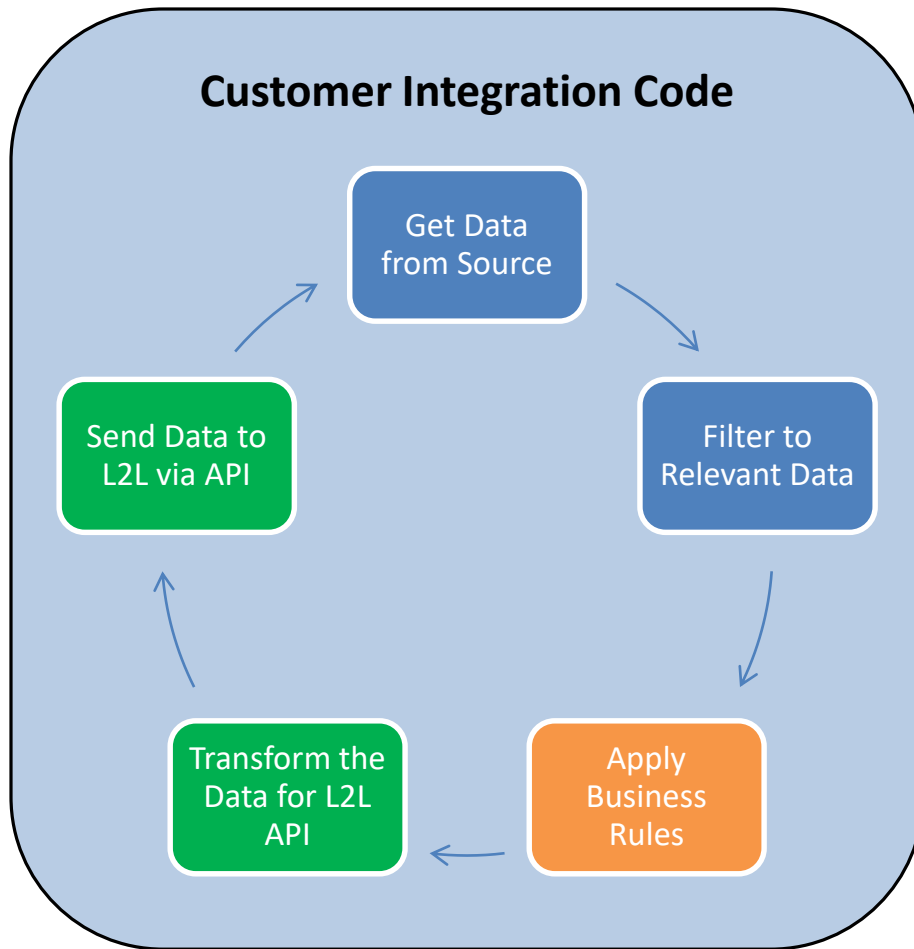
Tyler Whitaker

1/27/2020

Customer Integrations to Major Manufacturing Systems



Integration Application Architecture



- Integration Code is really a simple control loop for processing 3rd party data
- BLUE BOXES: Getting and Filtering the data is typically something local IT / Controls Engineers can help with
- ORANGE BOX: Customer and L2L collaborates on the business rules to achieve the business goals
- GREEN BOXES: L2L has documentation and code samples to guide you

How do we Integrate?

Easy Web Service API

- Fully documented REST based web service API
- Secure / Encrypted (SSL / HTTPS)
- Returns JSON/XML
- Can be integrated with any internet connected system
- Easy to use, integration take hours or days, not months
- Gives IT a toolkit to build solutions on top of the L2L Platform
- No Firewall ports to open - Access to pull or push from L2L from inside your firewall using outbound only connections

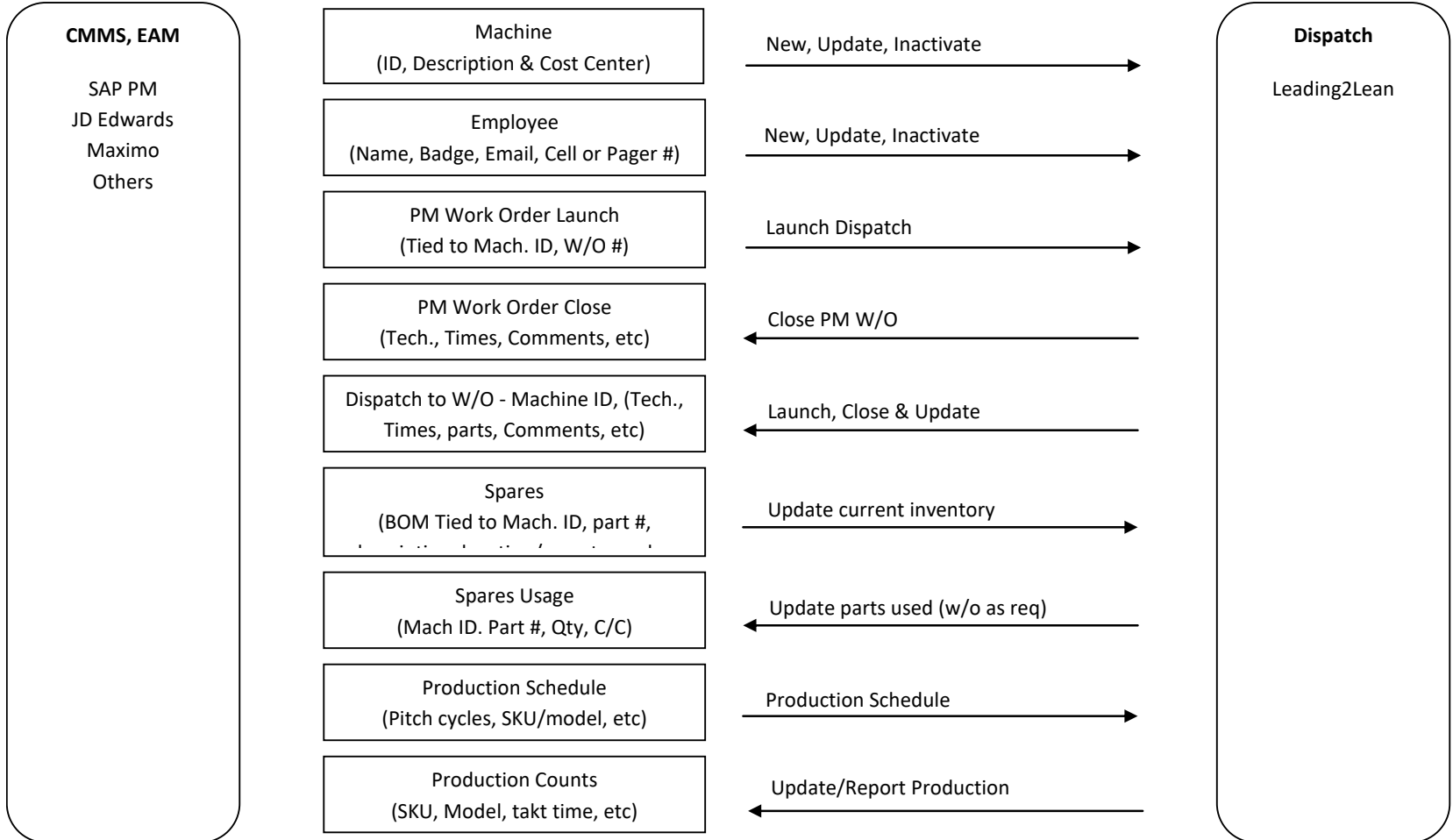
{ json:api }



Typical Skillsets / Toolsets Required

- Customer
 - IT Staff for network, server, and local programming support for ERP / CMMS systems
 - Controls / Automation Engineers to provide Machine connectivity and Machine specific knowledge
 - Machine connectivity via MES, SCADA, OPC Server, etc.
- Leading2Lean
 - Web Development experts with L2L Web Service API experience
 - Manufacturing Experts with Industry Best Practices Knowledge
 - API Documentation
 - API Authentication Keys

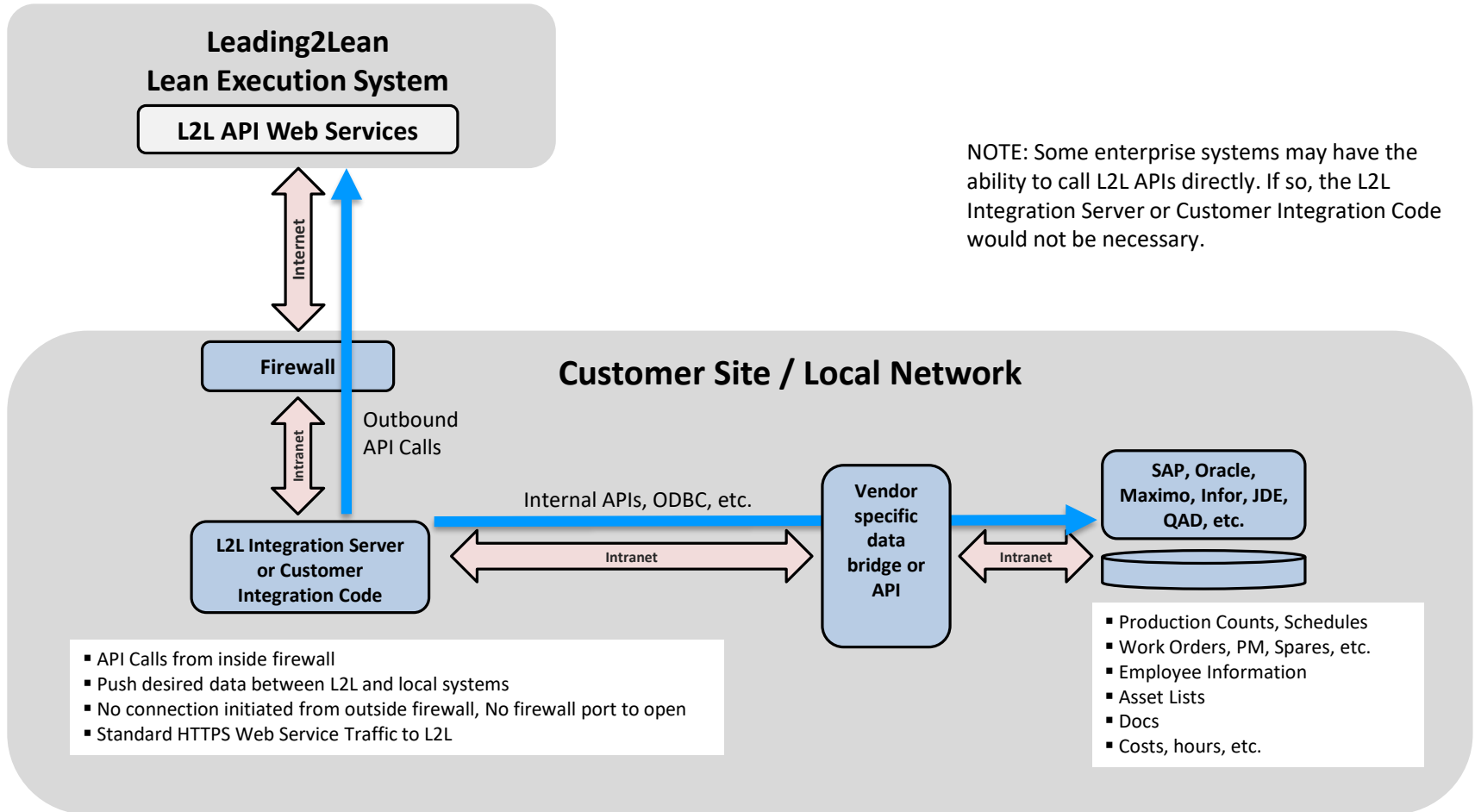
Typical ERP / CMMS / EAM Integration Points



- Evolve or expand to meet capabilities, business needs, systems, etc.

- See Leading2Lean Integration Options and Best Practices whitepaper for more data workflow examples

ERP / CMMS / EAM Integration Architecture

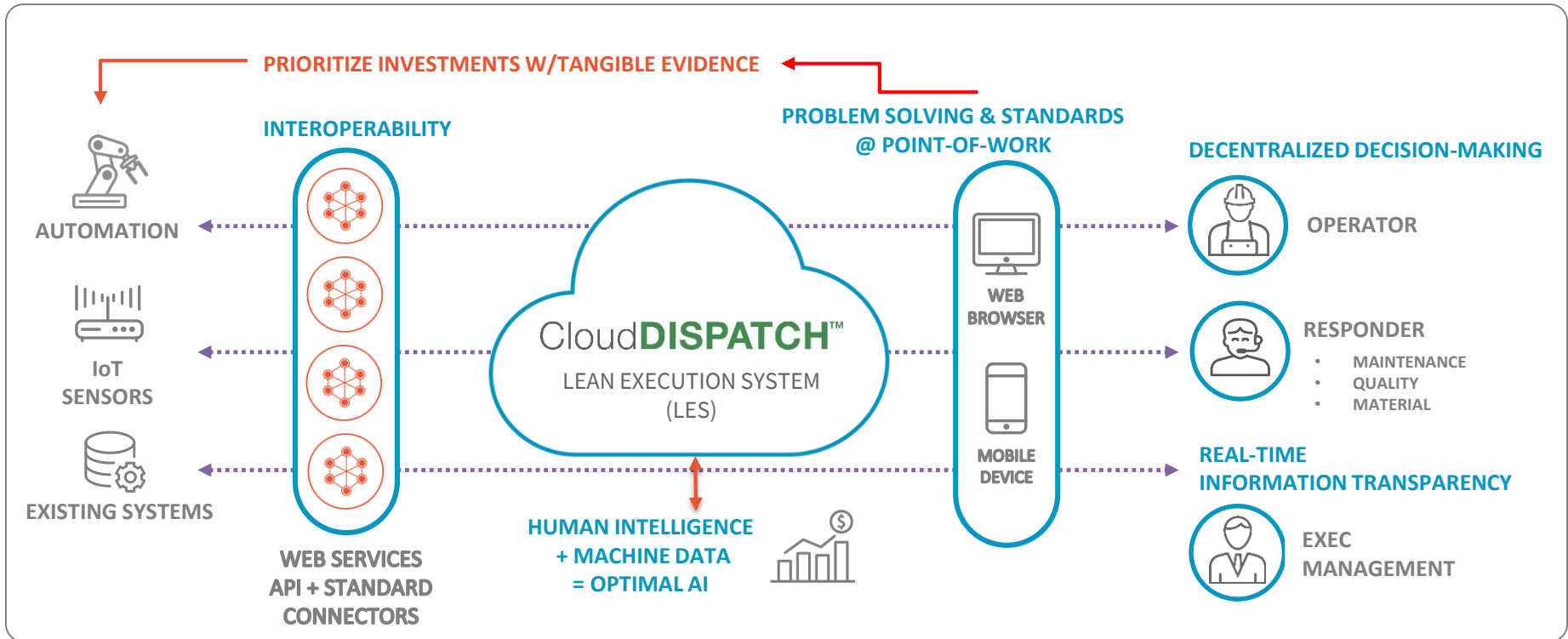


IoT / Machine Integration

- We are an Extension of your IoT Strategy
 - People are core to your IoT Strategy
 - We make IoT data Actionable & Accountable by adding People
 - Use L2L data to direct IoT Investment to solve actual problems
- Common IoT / Machine Integrations
 - Cycle Counts
 - Production Counts
 - New Dispatch Creation based on Sensor or PLC data
 - Trigger Human Interaction / Business Process Automation
 - Track occurrences / Duration of events / Resolution

IoT / Industry 4.0 / **MANUFACTURING 4.0**

Artificial Intelligence + Human Intelligence = Real Intelligence

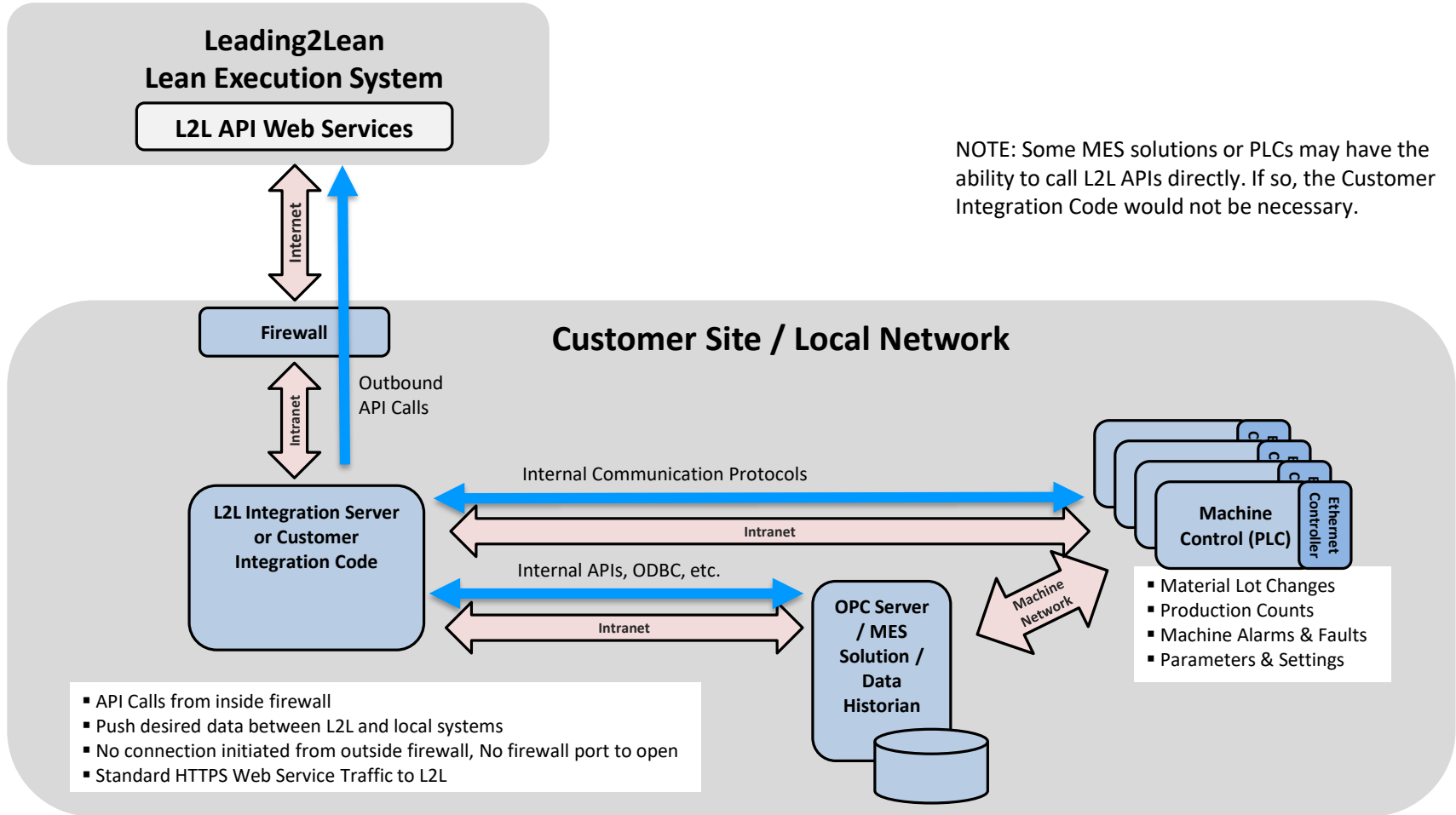


Artificial Intelligence ➡ Augmented Intelligence

Integration Options depend on Existing Solutions in Place

- Leverage your existing solutions
- Let your MES/SCADA collect the data
- Some PLCs have web service capabilities, integrate directly in your PLC code to cut out the middleman
- Use an OPC server to connect to the machine to off load the data to for integration
- Heterogeneous machine environments may require all the above

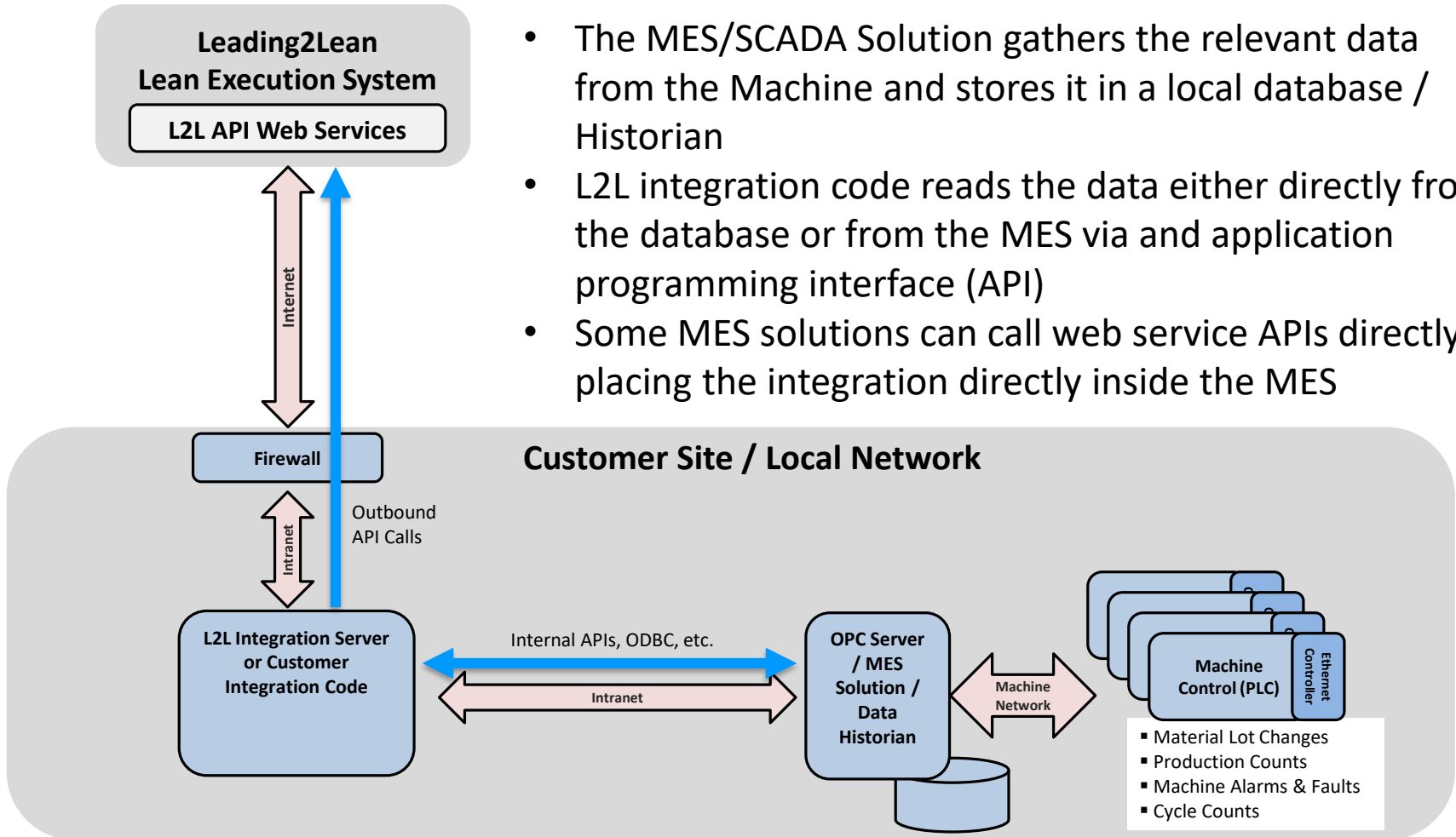
IoT / PLC / Machine Integration Architecture Overview



- API Calls from inside firewall
- Push desired data between L2L and local systems
- No connection initiated from outside firewall, No firewall port to open
- Standard HTTPS Web Service Traffic to L2L

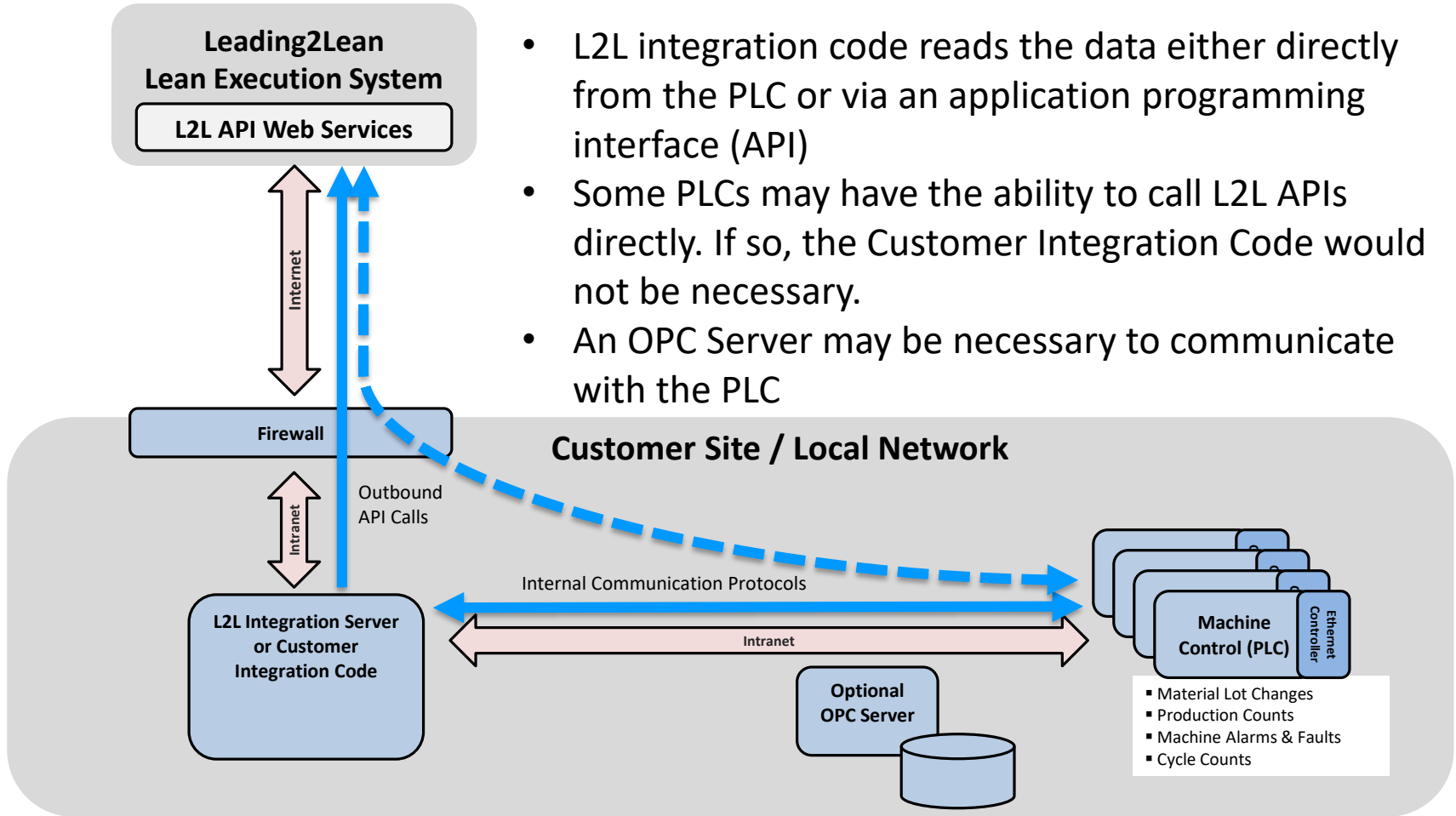
Integration Architecture with an Existing MES/SCADA Solution

- The MES/SCADA Solution gathers the relevant data from the Machine and stores it in a local database / Historian
- L2L integration code reads the data either directly from the database or from the MES via an application programming interface (API)
- Some MES solutions can call web service APIs directly placing the integration directly inside the MES



Integration Architecture directly with a PLC / Machine Control System

- L2L integration code reads the data either directly from the PLC or via an application programming interface (API)
- Some PLCs may have the ability to call L2L APIs directly. If so, the Customer Integration Code would not be necessary.
- An OPC Server may be necessary to communicate with the PLC



How to Get Started with the API

- Request an API Key from support
- API Documentation found under the support menu:
 - <https://<customer>.leading2lean/api/1.0/>
- Github Repository for Sample Code
 - <http://www.github.com/leading2lean/>
- Microsoft .NET
 - Dispatch Integration example code

