



Thoughts on Warehouse Execution

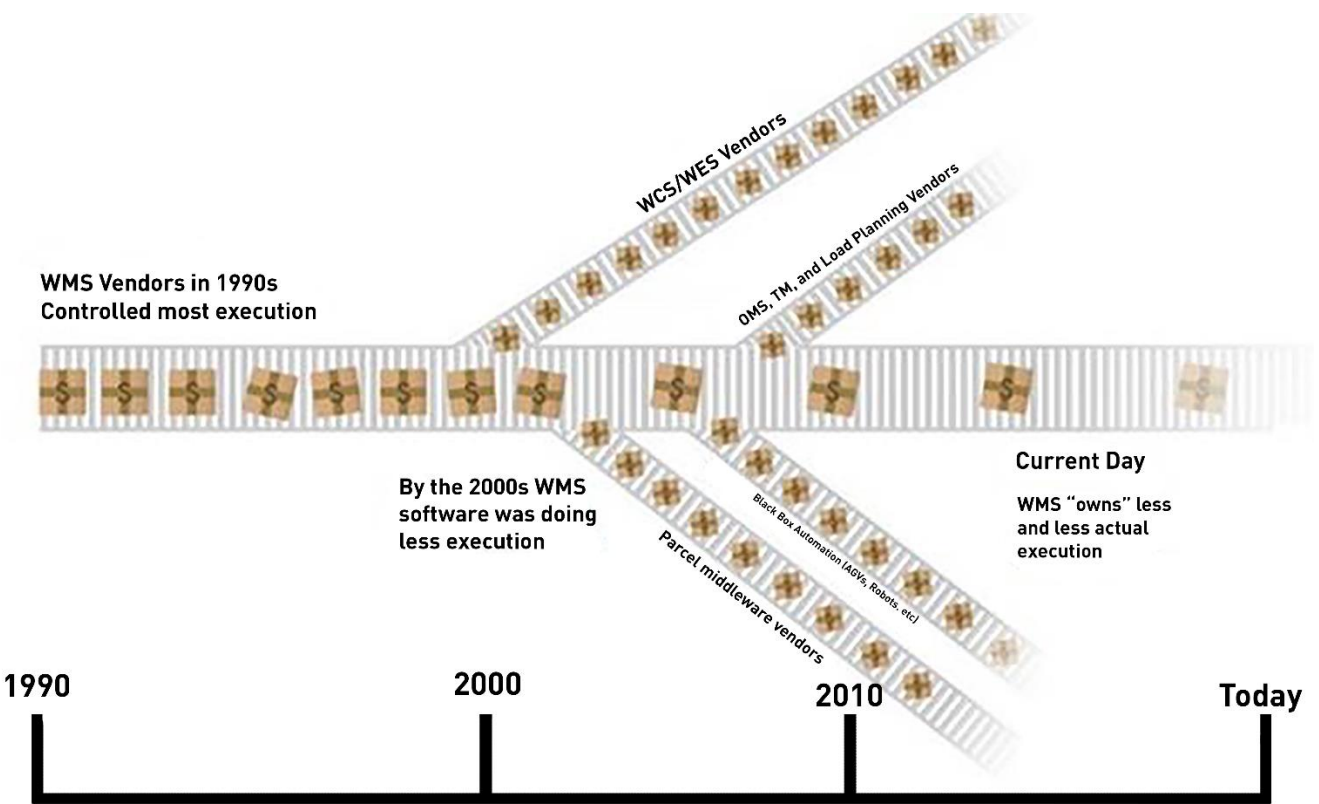
When You've Seen Some Things...

Endurance. If there is one thing you can say about me – I have endurance. I am one of a small group of people who began working in the WMS space in the 1980s and is still working today. When you've had the endurance to stick with one industry for this long – you've seen some things.

I remember the days when WMS vendors knew how to talk to PLCs. I know this because I was one of the 3-4 people at McHugh Freeman in the 1980s who did PLC integrations. But as WMS vendors moved 'up' the functional food chain, becoming more like shipment, inventory, and picking coordinators, they forgot how to, or didn't want to, do that low-level work.

History

By the 1990s, this shift created an entirely new market – WES vendors. An outgrowth of the Warehouse Control System (WCS) space, which to that point specialized in conveyor and other Material Handling Equipment (MHE) integration, the WES vendors sought to coordinate the different aspects of hardware automation under one, smarter, controller. The diagram below shows the slow and steady "execution attrition" out of WMS software. The WMS still maintains an important role as a coordinator, inventory, and shipment traffic cop, but less so as an executor. Meanwhile, many WES vendors now offer pretty full-featured WMS functionality.





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During that same time, you also started to see other niche software creeping onto the warehouse floor. Parcel Middleware Systems (PMS) vendors took over some of the shipping processes for eComm and other direct to consumer and bulk shipping via parcel applications. Additionally, transportation and load building applications started to guide picking and loading processes.

Today

Fast forward to today. The WMS vendors finally see the picture more clearly. In particular, the drive toward more and more automation, including big advances in the areas of autonomous vehicles, has permanently changed the landscape. The big push now for some of the WMS vendors seems to revolve around reacquiring some of the ground they lost on the floor execution side of things. Some are declaring they now have a WES, or some sort of robot doo-dad, or fancy smart carts, or whatever to show they can still do execution.

Yet, even as they scramble to get back to the floor (the execution side of the warehouse automation business), the landscape shifts beneath their feet. You see, trying to stake a claim on a WES in 2020 feels somewhat akin to saying your next big release is optimized for Windows 7.

Still, there is more.

A WES in 2020?

Even the WES vendors do not appear to see the signs turning against them. Some of the autonomous robot vendors already have robust WES capabilities (coordinating pack stations, etc.) or have acquired actual WMS software. So, what is the role of the WES vendor or the WMS vendor going forward when all these new vendors are trying to cordon off their own little worlds?

Well, as counter-intuitive as it might seem, having just chastised them for losing their minds in the 1990s only to try to buy back into the game now with 2009 ideas, but I still see the WMS vendors coming out on top and displaying significant ROI – largely based on their higher-level coordination abilities.

This does not mean, however, WMS vendors are in the clear. The whole notion they seem to have, of cobbling together single-site odds and ends for WES, robots, and other automation appears increasingly myopic with every passing automation tradeshow.

So, what are enterprising WMS architects to do?

Well, why not just embrace it all? Yep, all of it -- the changing landscape, new vendors, new technology, new challengers, everything.

This is thought process we drove us, over the last year or two, toward a completely new way of thinking about logistics execution. We call it Execution Activity Streams (EAS).

Introducing ElasticEAS

Execution Activity Streams (EAS – pronounced ‘ease’) provides the framework for a distributed, cloud/hybrid, multi-site, activity-based coordination and streaming processing. EAS allows you to define the activities, but not necessarily how they will be accomplished; to define the requirements of the operation without knowing who or what will execute it. Yes, we can use it to create a WES, which was



our original intent. But we realized its uses are so much greater than just building a newer version of stuff that's been around since the 1990s.

EAS has an extensible set of verbs that describes the coordination activities and observations. These verbs (actions), and their associated interactions, can be used to:

1. Construct an on-prem or cloud/hybrid WES for single-site or multi-site operations.
2. Construct an automated Task Managing system (*Distributed Work Manager*) that includes both humans and robots. It could further take guidance from Machine Learn/AI systems to alter priorities or change the actors involved from humans to robots to some other hardware automatically.
3. Direct picking to Pick-to-light, Good-to-Person, robotic co-picking bots, or plain-old humans and record all necessary observations along the way (travel start, travel end, verification complete, etc).
4. Conduct cases on a conveyor and record the movements (divert confirms).
5. Guide trailer movements in the yard and record placement. Or, in an RFID-enabled yard, pick up any trailer position observations during yard jockey movements.
6. Support gamified applications by allowing for activity injection and dynamic groupings with goals.
7. Constantly feed WorkForce Management (WFM) systems for labor data and the predictive shifting of resources.
8. Support stream-queries to feed Machine Learning and AI systems.

API-based interactions

Simple patterns and standard Web APIs (JSON and XML endpoint) make these capabilities simple to implement. Additionally, applications can register their own event subscribers to receive events as they occur. ElasticEAS is part of the ElasticWMS set of WMS extensions and can work with virtually any execution system (WMS, WES, WCS, etc). In the coming weeks, we'll be sharing examples of using ElasticEAS to coordinate:

- Case sortation automation and record divert confirms
- Send picks to Pick-to-Light systems and record confirmations
- Multiple robotic co-picking implementations with a no-code approach
- Packing and parcel shipping, parcel service coordination, and labor tracking

The generic EAS framework, called Leap Execution Activity Framework (LEAF) is available from our R&D group, AttunedLabs, under an open-source license.

More details to come 12.1.2020.