

The Ah Ha Moment: How eXp Realty Reached The Decision to Build a Microservices Architecture.

Steve Ledwith / VP Engineering / eXp Realty, LLC

Agenda

1

Introductions & Context

2

Enterprise Growth

3

Challenges

4

Research

5

The Solution

6

Enterprise Platform

About eXp Realty, LLC

Cloud-based Real Estate Brokerage

- Largest real estate brokerage by geography in North America.
- Only brokerage to operate as a company-owned organization in all 50 U.S. States.

One of the Fastest Growing Firms

- More than 18,000 agents across
 - 50 U.S. States
 - District of Columbia
 - Three Canadian Provinces
 - Publicly traded on NASDAQ: EXPI



About Steve Ledwith

Vice President, Engineering

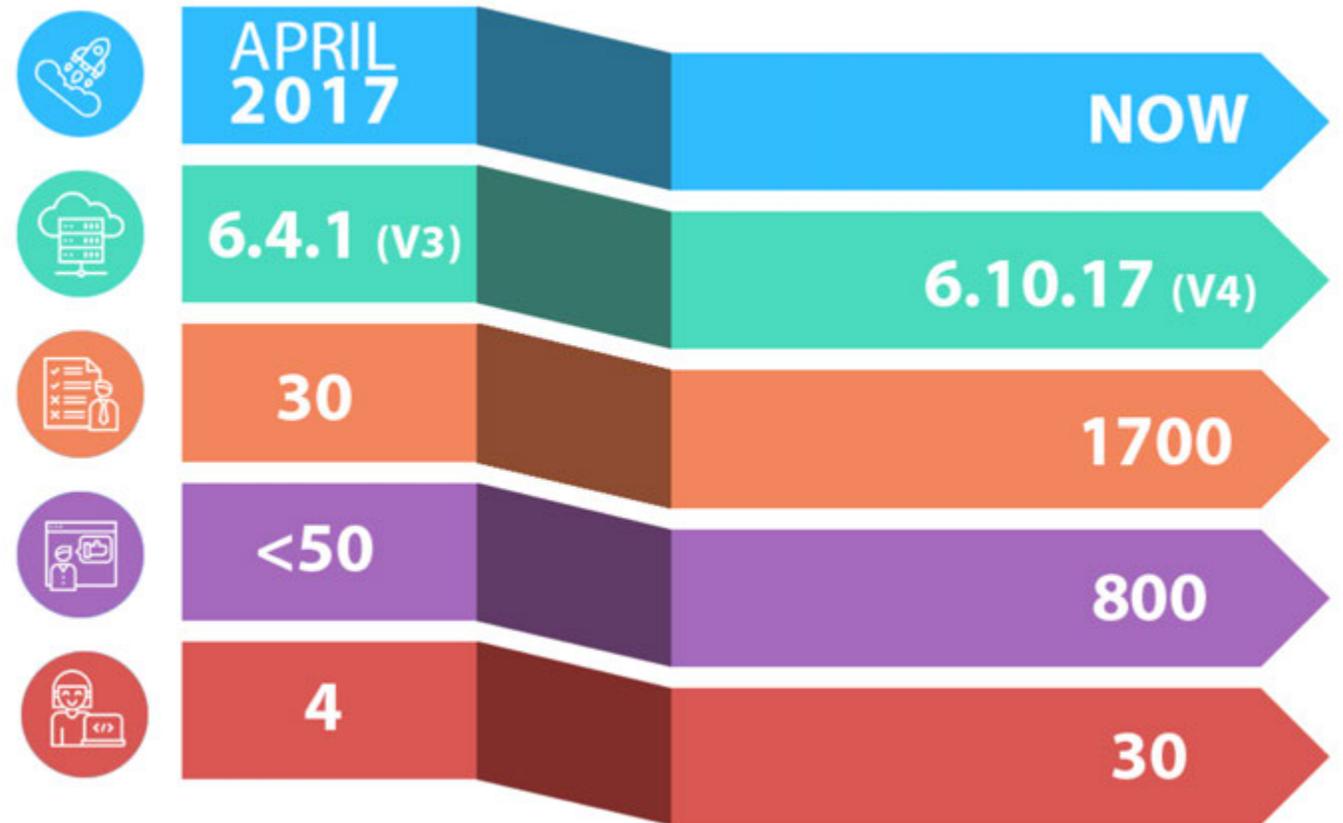
- More than 20 years experience in developing technology for the real estate industry
- Responsible for planning and management of the company's engineering strategy, and for developing and maintaining a technical roadmap that will continue to deliver the most innovative products and services for the eXp Realty agents, brokers and staff.
- Figure head of an amazing, talented, innovative team.



eXp Enterprise – Then and Now

Look how far we've come!

- eXp Enterprise is one application, running in the Mendix Cloud.



eXp Enterprise – Metrics

Mendix Cloud Resources				
App Container	Strato	Meso (+)	Iono (++)	Magneto (+++)
Mx RAM	2 GB	2 GB	8 GB	16 GB
DB CPU	0,5 core	2 core	2 core	4 cores
DB RAM	1 GB	8 GB	8 GB	16 GB
DB Storage	5 GB	20 GB	20 GB	80 GB
File storage	20 GB	20 GB	20 GB	320 GB
Backup	25 GB	40 GB	100 GB	400 GB
Network	Unlimited	Unlimited	Unlimited	Unlimited
Encryption at rest	No	Yes	Yes	Yes

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Thanos (WTF)
16 GB
16 Cores
64 GB
100 GB
320 GB
400 GB
Unlimited
Yes

Challenges – Hosting Resources

Mendix Cloud v3

- As shown earlier, we use a tremendous amount of resource in the Mendix Cloud.
- In June 2018, we realized the V3 Cloud would not be able to support us.
- We were already running on an XXL Container, and there was no more room.
- We migrated our 6.10 application to the V4 Cloud
- (Story for another time!)



Challenges – Technical Debt

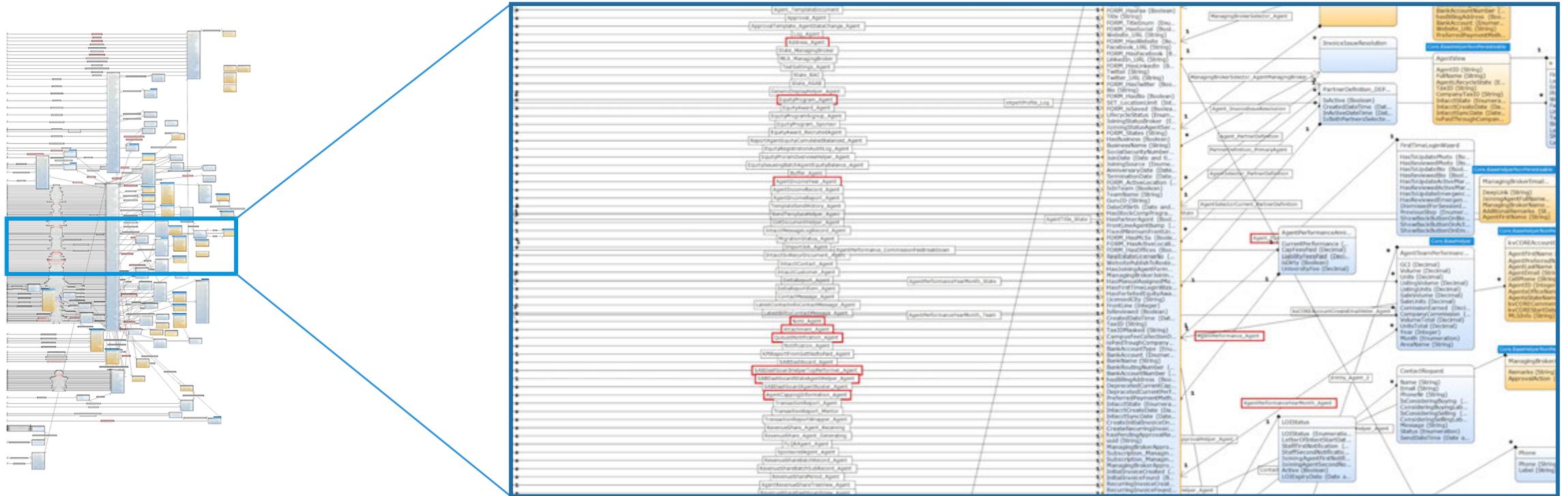
Best Practices are only a Suggestion! Right?

- Our team grew at an impressive rate, as did the feature requests
- We built a number of new tools on top of functionality not designed to support multiple workflows
- Input from users was limited, and we tightly coupled a lot of business logic across modules



Challenges – Entity Entanglement

Agent Database Domain Model*



*As Seen From Space

Challenges – Pushing the Limits

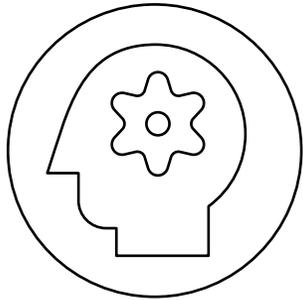
Mendix CloudFoundry Upgrade

- As we've grown, we've pushed the limits of the Mendix Cloud. Following the Cloud Foundry upgrade, we ran into performance issues, and frequent application crashes.
- The root cause was a new limit in Cloud Foundry which didn't work for our application.

“Note that > 1000 threads is indeed way beyond what is considered reasonable on the Mendix Platform, this is why It was not caught in testing. eXp needs to consider Refactoring their Application to bring this number down.”

-Mendix Cloud Support

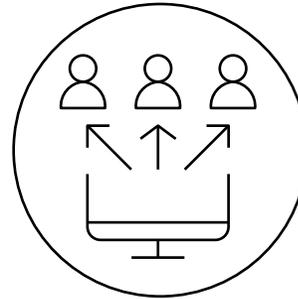
Realization & Research



Seminal Moment

In January 2018 we realized our current path forward wasn't going to work.

With three distinct teams working on Enterprise, we were constantly running into issues with scheduling, timing, and delivery.



Research Initiative

Spent a considerable amount of time reading about how leading technology and software companies were enabling their engineers and teams to accomplish amazing things.

Research – Throw Hardware at It!

- Most straight forward approach!
- Add resources to support our growth, and keep the application running
- Buy time to make better decisions

Challenges

- Only so much time you can buy
- Limits of the Mendix Cloud - containers only get so big
- Couldn't meet our growth, and does not scale



Research – Rewrite, Refactor, Optimize

- Would keep our business logic in place
- Correct some mistakes we've made
- Handle roles much better!

Challenges

- Would have two applications in process for a long time during the rewrite
- New features would have to be in both places
- Still have one giant app, with prospect of thousands of users

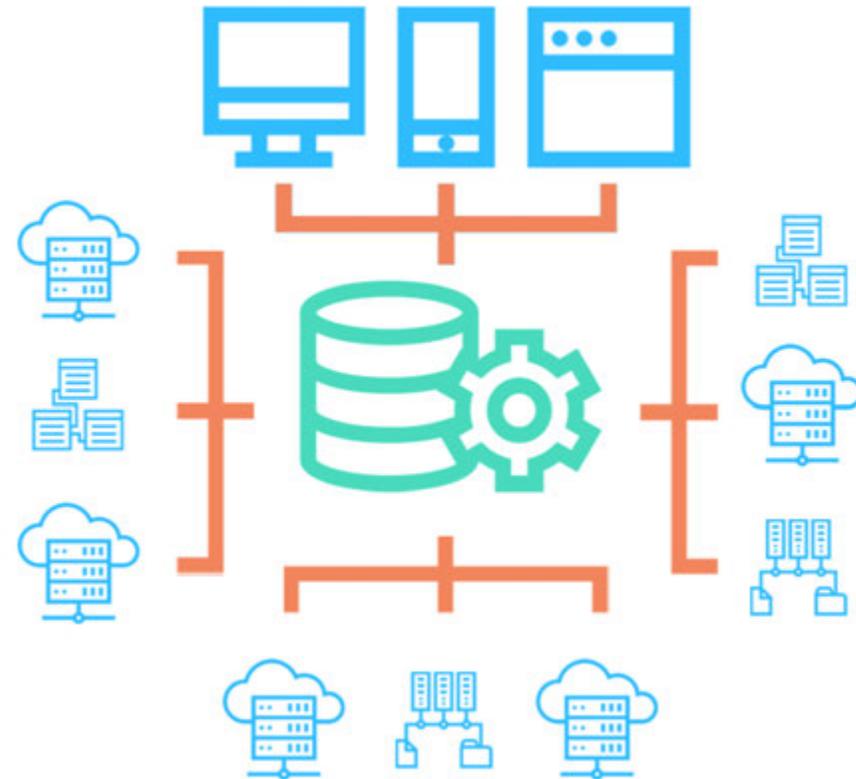


Research – Hub & Spoke

- Centralized integrations
- One main system to handle interaction with each satellite system
- Easy to understand

Challenges

- Similar to our current situation
- One main app which would require constant updates to allow for new integrations
- One single point of failure

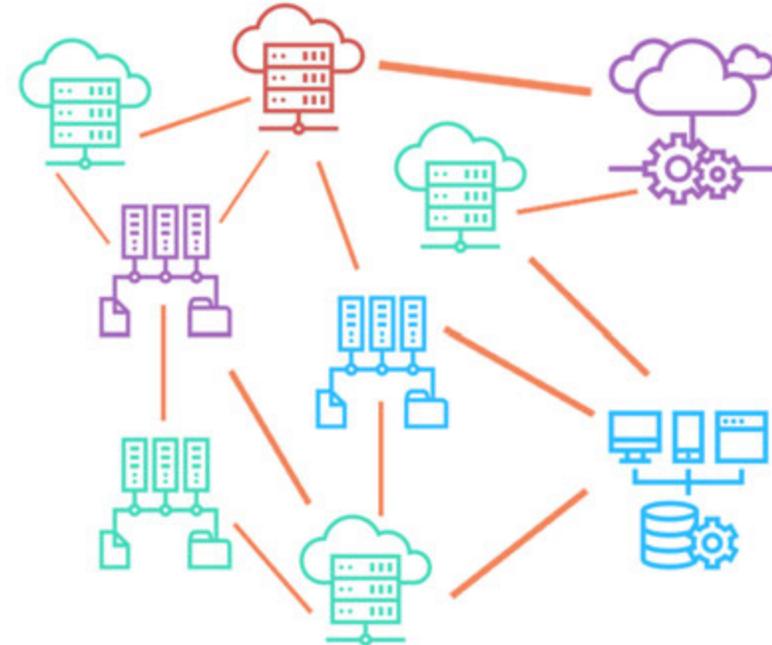


Research – Microservices

- Right sized, purpose built, process oriented applications
- Independent development and deployment schedules
- Autonomy and Flexibility

Challenges

- New process and style, requires a different way of thinking
- Not how we've always done it
- Limited understanding across the teams
- New versions of existing code - like rewriting



Microservices - It's got a Ring to It!

Microservices is a software development technique — a variant of the service-oriented architecture (SOA) architectural style that structures an application as a collection of loosely coupled services. In a microservices architecture, services are fine-grained and the protocols are lightweight.

Microservices - It's got a Ring to It!

“While there is no precise definition of this architectural style, there are certain common characteristics around organization around business capability, automated deployment, intelligence in the endpoints, and decentralized control of languages and data.”

- Martin Fowler

<https://martinfowler.com/articles/microservices.html>

The Enterprise Platform

Finding a Solution was only the Start

- Alignment
 - Business
 - Engineering
 - Product
- Socialization
 - Teaching
 - Training
- Experiments
 - Roll-out
 - Innovation Teams

“Delivering business Value requires input, Logic, and feedback, With a constant focus on what the business truly needs.”

Microservices - Architecture

1

Strategic Goals

- Enable Business at Scale
- Support Business Innovation
- Support Third Party Integration

2

Architectural Principles

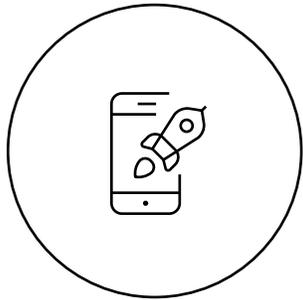
- Reduce Complexity
- Favor Rapid Development and Feedback
- Consistent interfaces and right tool for the job

3

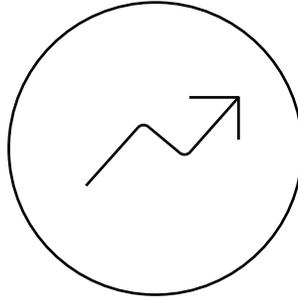
Design & Delivery

- HTTP / REST / OData
- Continuous Deployment and Integration
- Limit shared code between projects
- Small standalone services

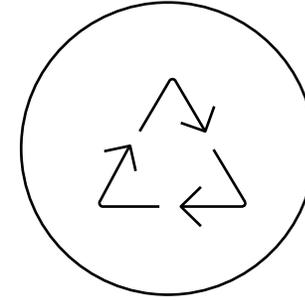
Innovation Teams – Deliver Value



Strategic Mindset – enable us to accomplish new things. Stand out in the marketplace.



Revenue Focus – add new revenue streams, reduce churn, and increase productivity.



Cost Reduction – Automate tasks, eliminate costs, reduce work.

The Enterprise Mindset

Low code doesn't mean "no code." Anyone can build an application in Python, C#, Mendix, or Java. Delivery of enterprise-class software with real business values requires planning, talent, input, logic, feedback, and careful execution with a constant focus on what the business truly needs.

Questions

Resources – Build Your Knowledge

Why DevOps Will Fail Without Microservices

- <https://www.mendix.com/blog/why-devops-will-fail-without-microservices/>

The Microservices You Need for DevOps

- <https://www.mendix.com/blog/the-microservices-you-need-for-devops/>

How Microservices and DevOps Help CIOs Realize Business-IT Alignment

- <https://www.mendix.com/blog/microservices-devops-help-cios-realize-business-alignment/>

Autonomous Units are Critical for Microservices

- <https://www.mendix.com/blog/autonomous-is-critical-for-microservices/>

Resources – Build Your Knowledge

Building Microservices by Sam Newman

- <https://www.amazon.com/Building-Microservices-Designing-Fine-Grained-Systems/dp/1491950358>

Production Ready Microservices by Susan Fowler

- <https://www.amazon.com/Production-Ready-Microservices-Standardized-Engineering-Organization/dp/1491965975>

Mendix Microservice Webinar

- <https://ww2.mendix.com/cw-changing-it-delivery-with-devops-and-microservices>