BUILDING STABLE AGILE CLOUD APPLICATIONS

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centare™

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Agile Alliance

ABOUT ME

- Senior Agile Consultant
- 13 Years Experience as Developer, IT Consultant, Architect, Trainer, Coach
- 2008 – 2013 MS Patterns & Practices Champion

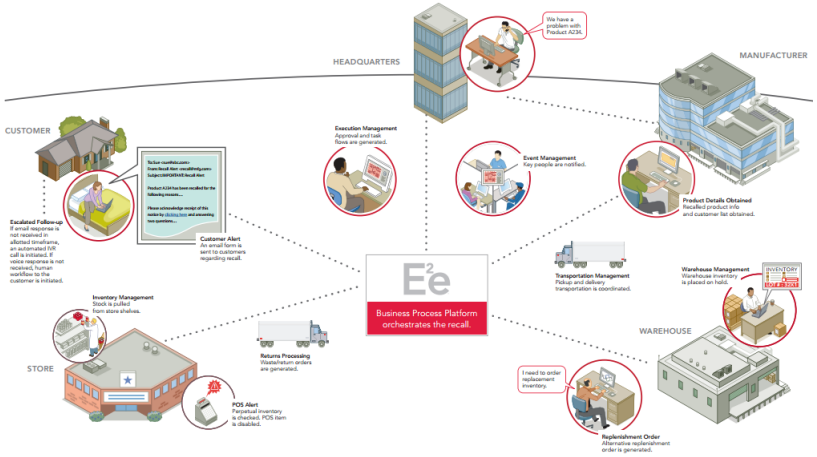
TALES FROM THE TRENCHES

"It was a good idea at the time. . ."

THE SUPPLY CHAIN COMPANY

- Large software vendor for supply chain solutions
- Software was designed for on premise installation
- Until one day . . .

They tried to go to the cloud!



THE INSURANCE COMPANY

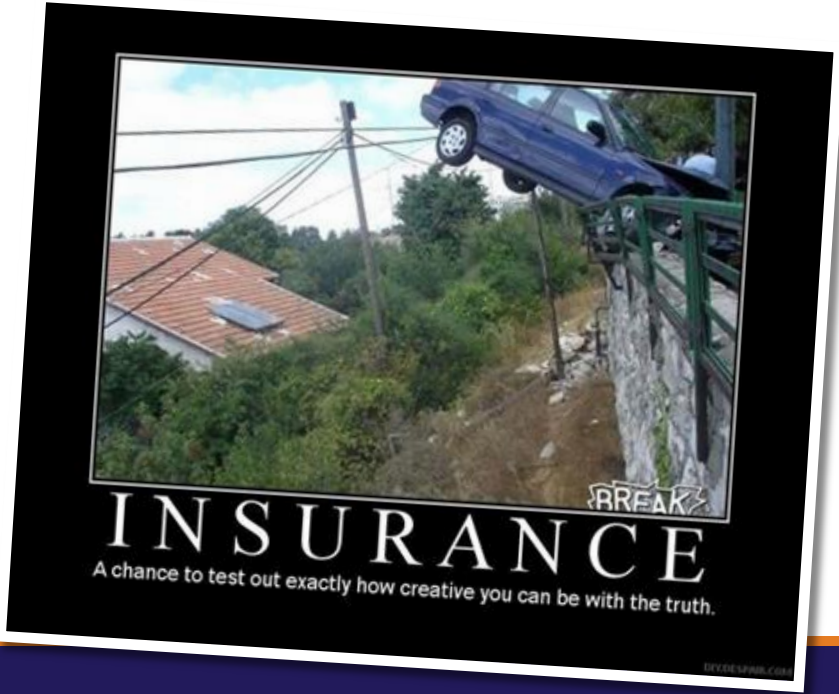
- SaaS software for insurance brokers
- Large stable private cloud
- Until one day . . .

Open Enrollment Started

ANOTHER INSURANCE COMPANY

- Green field consumer insurance software
- Rapid development schedule
- Heavily used 3rd party backend
- Until one day . . .

They fired the 3rd party vendor!



WHY DO WE CARE?

"It works fine most of the time"

IT'S ALL ABOUT PERCEPTION

- Response times affect perception
  - 0.1s - Users feeling that they are directly manipulating the UI
  - 1.0s - Users feeling that they are freely navigating the UI
  - 2.0s – User feel a noticeable delay in the UI
  - 10s - Users feeling that their experience is impaired
- This was from a paper in 1968!

http://www.nngroup.com/articles/response-times-3-important-limits/

CURRENT HARDWARE IS STALE

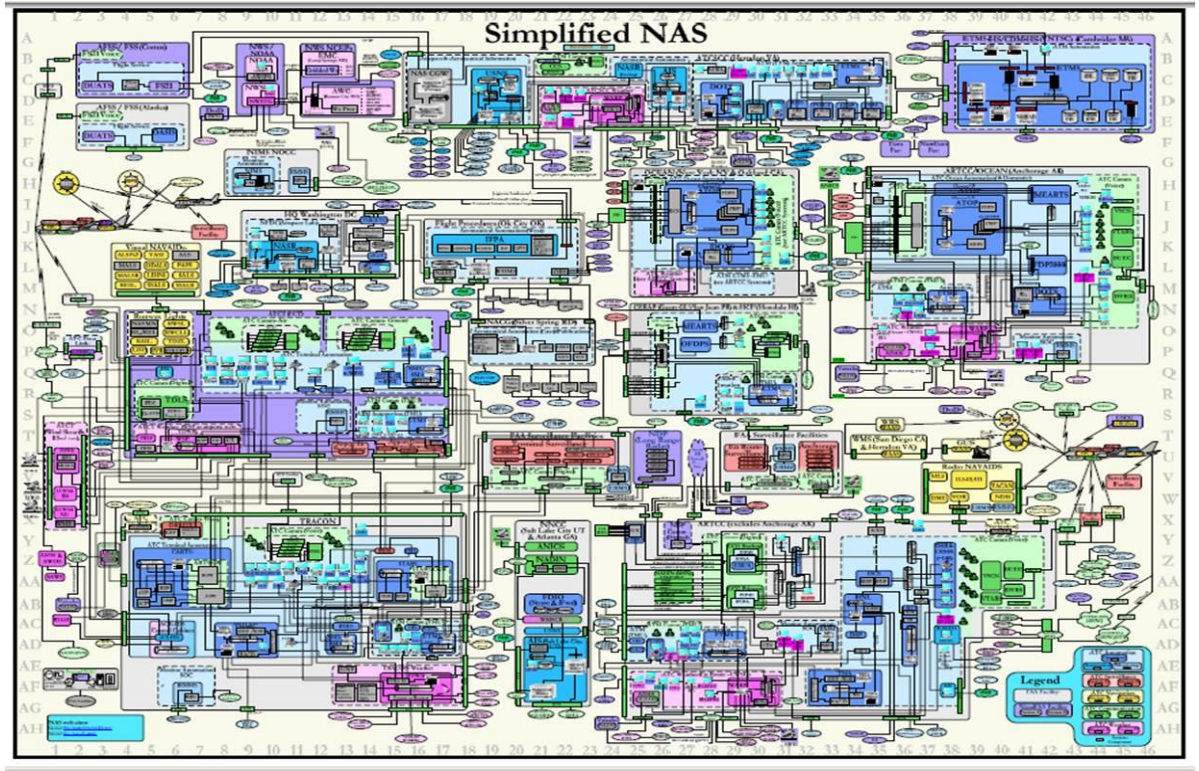
TO THE CLOUD!

CLOUD ADVANTAGES

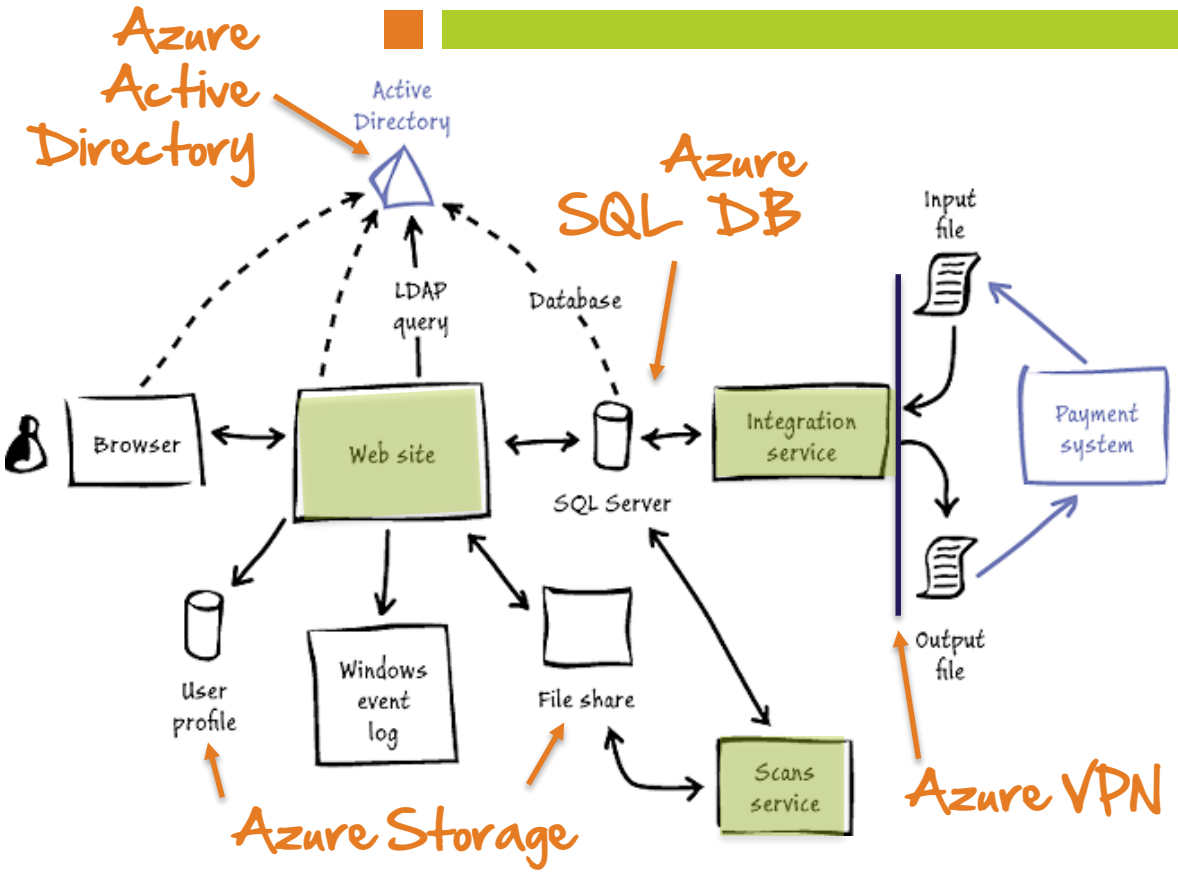
- Agility
- Secure*
- Scalable
- Cost Effective
- Full Automation Available

* Easy to screw up

BUT YOUR APP LOOKS LIKE THIS!



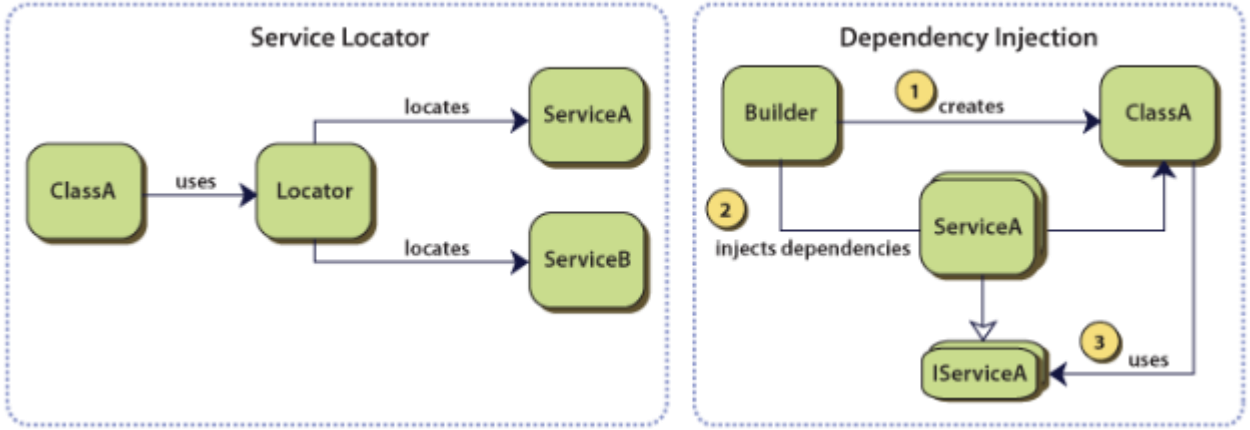
OR MAYBE MORE LIKE THIS



AVOIDING THE "BIG BANG"

- You don't need to migrate all at once
- Start with what comes "out of the box"
  - Cloud Databases (SQL Azure)
  - Caching Providers (SQL Cache, Redis Cache)
- Setup a VPN
  - Extremely easy, script is done for you
  - Azure has ExpressRoute (L2 connection)

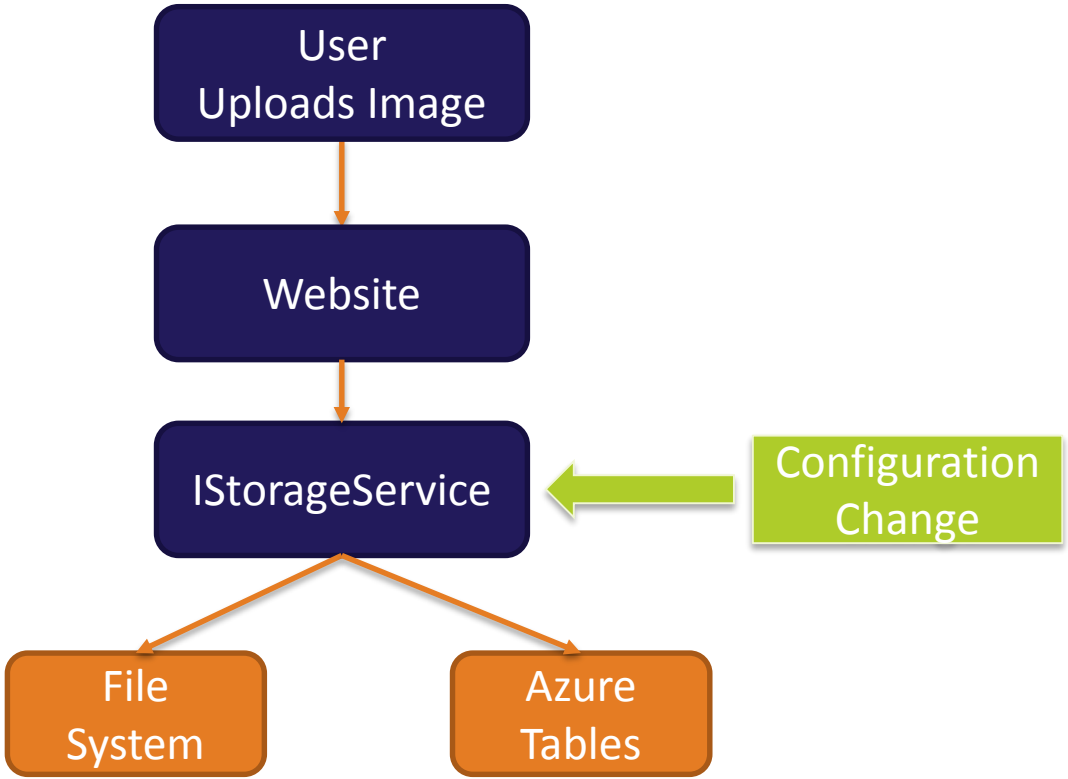
INVERSION OF CONTROL



See Fowler's "Inversion of Control Containers and the Dependency Injection pattern" at http://martinfowler.com/articles/injection.html for a great discussion on choices and tradeoffs here

Image from http://msdn.microsoft.com/en-us/library/ff921087.aspx

EXAMPLE: STORAGE



WHERE THIS HELPS

- Hybrid Application Development
  - One provider in local datacenter, the other in the cloud
- Testability
- Seperation of Concerns

ADDING RESILIENCY

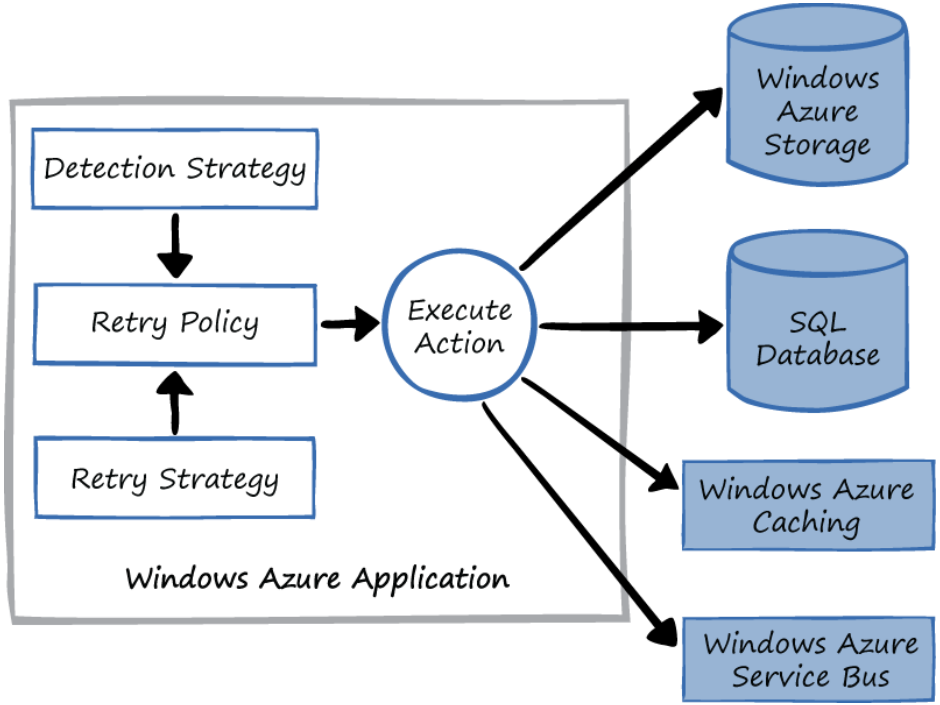
"I'm not quite dead yet...it's just a flesh wound!"

-Monty Python

TRANSIENT ERRORS

- No dependency is available 100% of the time
- Need to separate application failures from transient failures
- Retrying on transient errors produces less error logs
  - BUT it increases wait time! More to come on that…

HOW IT WORKS


Detection Strategy
Retry Policy
Retry Strategy
Execute Action
Windows Azure Application
Windows Azure Storage
SQL Database
Windows Azure Caching
Windows Azure Service Bus

TYPES OF RETRY POLICIES

Retry strategy	Example (intervals between retries in seconds)
Fixed interval	2,2,2,2,2,2
Incremental intervals	2,4,6,8,10,12
Random exponential back-off intervals	2, 3.755, 9.176, 14.306, 31.895

WHAT MAKES THIS WORK

- Asynchronous methods
- Isolated operations
- Known transient failures
- Recording when you "give up"
- Make retry strategies global (use IoC)

CODE EXAMPLE

```
public async Task<ActionResult> Index()
{
    // Step 1 - Setup retry
    var retryStrategy = new ExponentialBackoff(10, TimeSpan.FromSeconds(2), TimeSpan.FromSeconds(20), TimeSpan.FromMilliseconds

    // Step 2  - Create a retry policy
    var retryPolicy = new RetryPolicy<CustomTransientErrorDetectionStrategy>(retryStrategy);

    StockQuote quote;
    try
    {
        // Step 3 - Attempt the action
        quote = await retryPolicy.ExecuteAsync(() => this._stockService.GetQuote("MSFT"));
    }
    catch (Exception ex)
    {
        // Log error here
        Debug.WriteLine("The call failed!, Details: {0}", ex);
        throw;
    }

    return View(quote);
}
```

IT GETS SIMPLER

- Detecting errors can be difficult
  - Dig into errors, check status codes, details in messages, etc.
- Extensions exist to help
  - Caching
  - Database
  - Storage
  - Service Bus

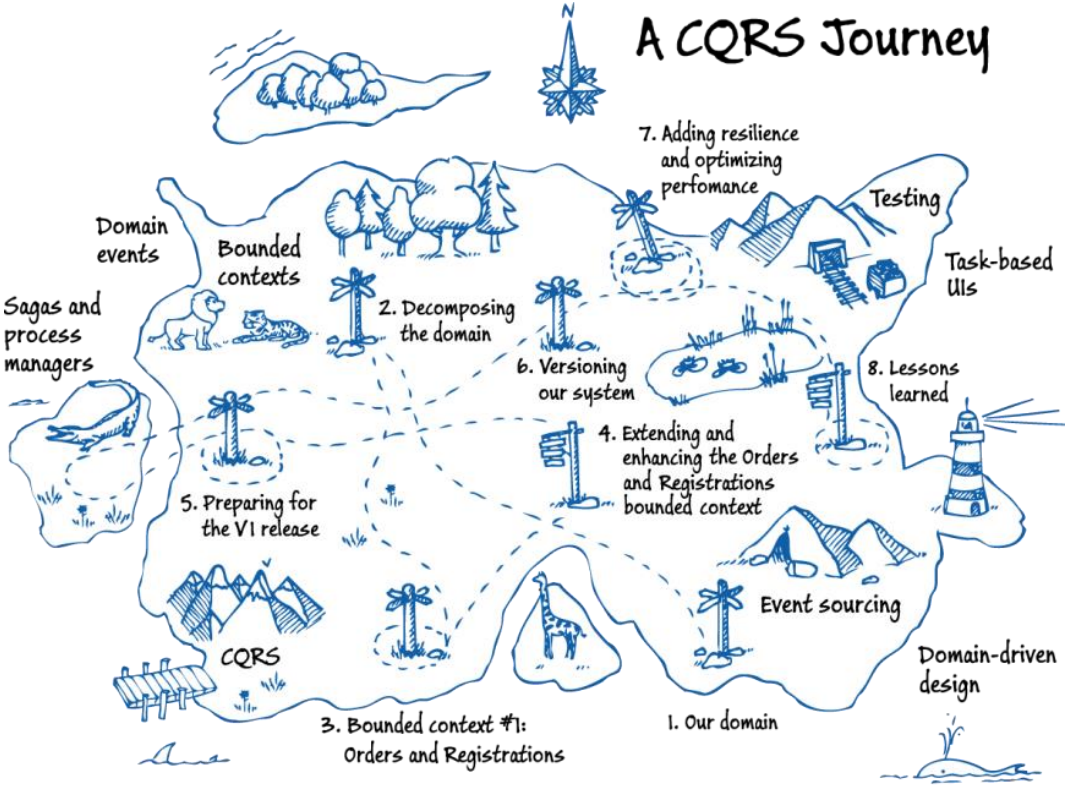
What about authorization?

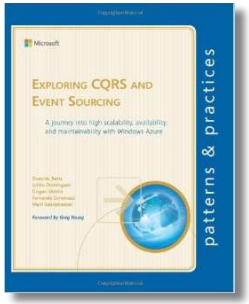
```
public class CustomTransientErrorDetectionStrategy : ITransientErrorDetectionStrategy
{
    public bool IsTransient(Exception ex)
    {
        return (ex is SocketException);
    }
}
```

WHAT ABOUT RESPONSE TIME?

- Retry is good for availability but can make the user wait
- “What happens if we don’t want it to fail?”
- “I don’t want the site to tip over if things get busy”
- “Auto-scale doesn’t work for my application”

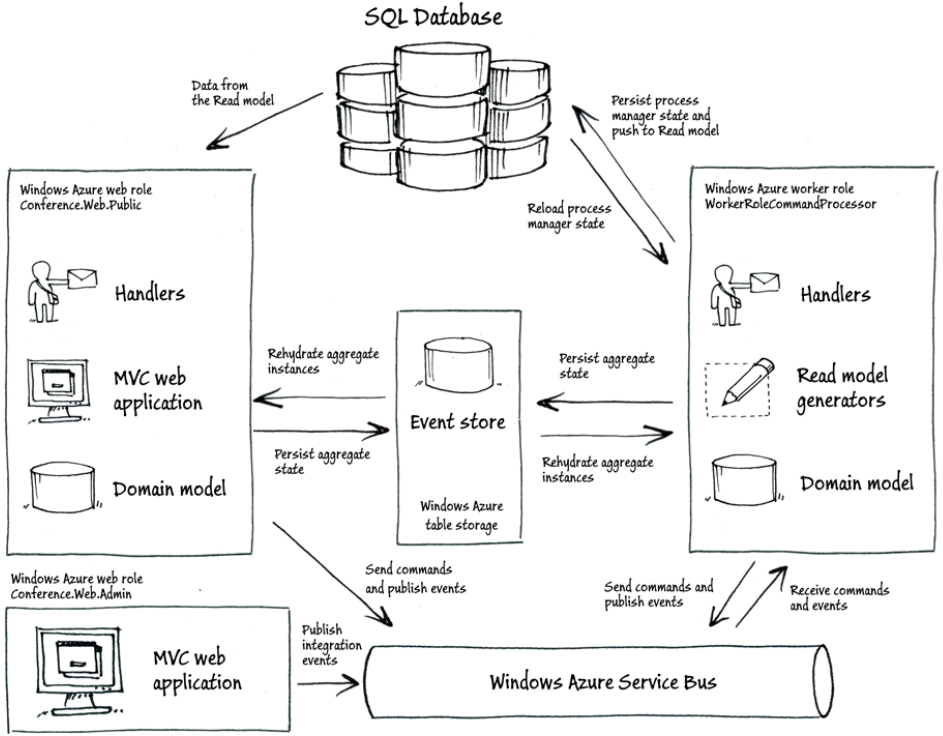
COMMAND & QUERY RESPONSIBILITY SEGREGATION





http://msdn.microsoft.com/en-us/library/jj554200.aspx

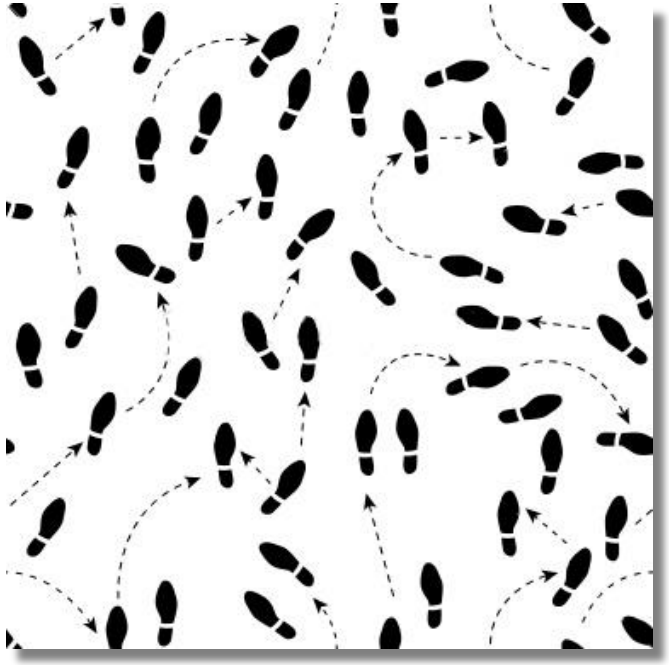
HOW IT WORKS



- Updates write to an event store
- Workers process events
- Aggregate state is persisted
- System reads aggregate state

WOW THAT'S COMPLEX!

- DON'T use this for every system
- Do research and read
- Build the pattern incrementally
  - Pro Tip: Try a small application
- Think about deployment



OTHER PERFORMANCE TIPS

- Caching
  - Static Content
  - Slow-Moving Results
- Compression and Optimization
- Call Separation

DEPLOYMENT AND THE CLOUD

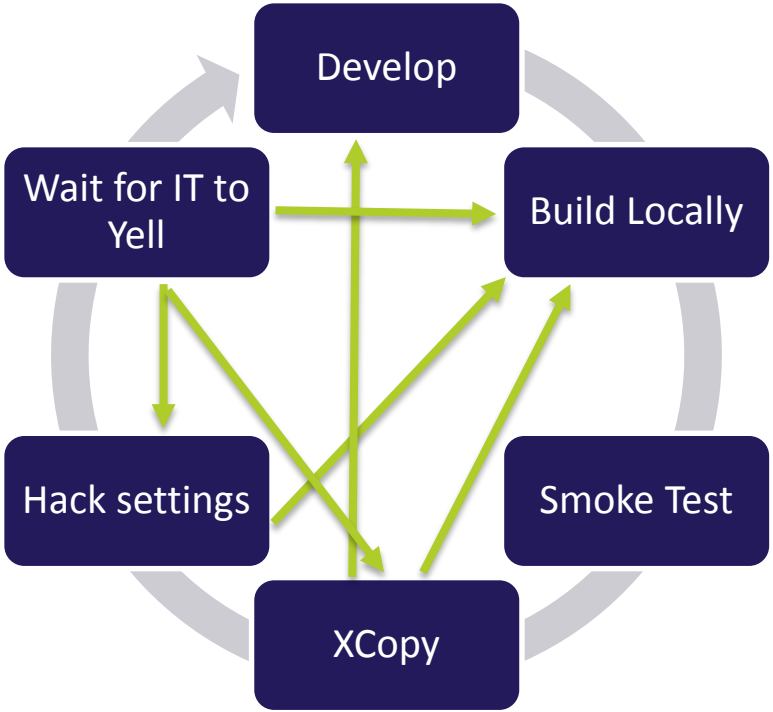
THE CONTINUOUS CONTINUUM

Continuous…	What it Does	Started By
Integration	Builds and Asserts Code Quality	No-One (Automated)
Deployment	Manages Application Releases to an Environment	Anyone (Dev, Qa, Business)
Delivery	Releases New Functionality	Business

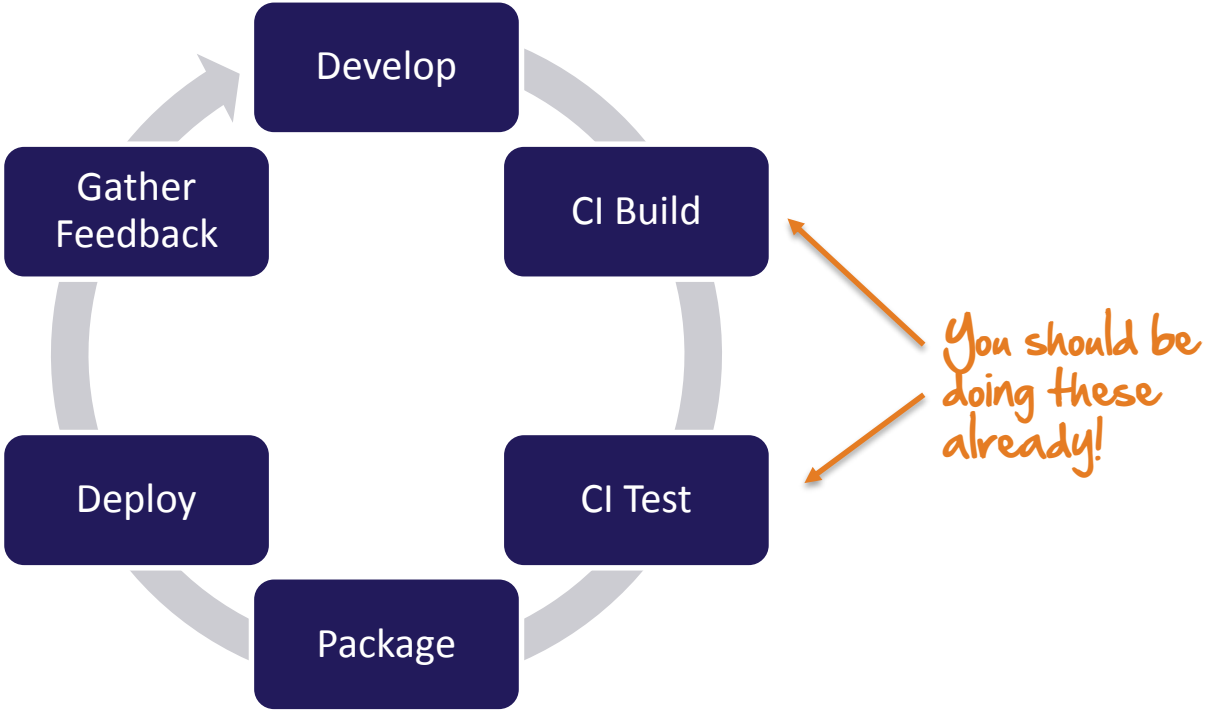
WHY DO DEPLOYMENTS FAIL?

- Large Work Batches
- Large Batches != Deployment Size
- How often do you deploy your software?

MOST DEPLOYMENTS TODAY



THE IDEAL DEPLOYMENT CYCLE

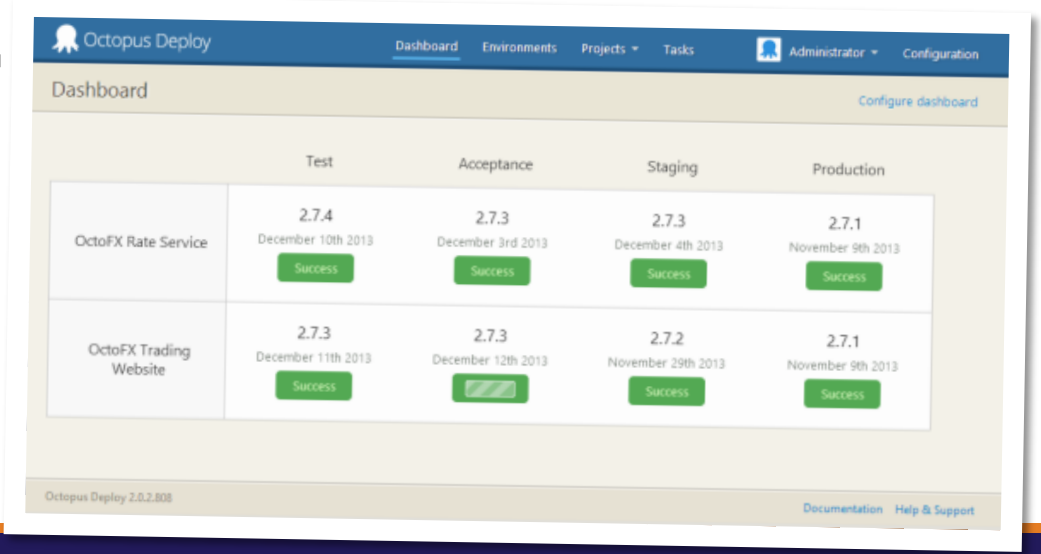


WHAT MAKES THIS WORK?

- Small Work Batches
- Automated Quality Gates
  - Unit Tests, Code Coverage, Quality Checkers (FxCop, etc.)
- Repeatable Process
  - Goal: No Manual Steps During Deployment

DEPLOYMENT: OCTOPUS DEPLOY

- Flexible Deployment Tool
- Deploys both On-Premise and to the Cloud
- Focused on Windows Apps
  - Web Applications
  - Windows Services
  - Click Once Apps
  - Databases
  - PowerShell



WHY CARE ABOUT DEPLOYMENT?

- Deployment to the cloud can be complicated
- Think about deploying everything each time
  - Application
  - Database
  - Service Bus Topics / Queues
  - Storage Container
- Treat your application settings like your code

IT'S NOT JUST ABOUT SOFTWARE

- Automate Your Infrastructure
  - New Development Environments
  - Automated Testing
  - Disaster Recovery / Scalability
- Tooling
  - Puppet
  - Chief
  - PowerShell Desired State

FLEXIBLE RELEASES

FEATURE TOGGLES

- A mechanism to switch between features at runtime
- Separates delivery from deployment
- Typically done at the UI / Service layer
- Scary?

You already have this in your application... User Login and Authorization!

MAKING TOGGLES EXPLICIT

Brittle!

```
HomePageModel homePageModel;

if (ConfigurationManager.AppSettings["ToggleMyFeature"] == "true")
{
    homePageModel = new HomePageModel
    {
        WelcomeMessage = "Well this is different...",
        SubMessage = "Something changed, not sure what",
        Title = "Base Page"
    };
}
else
{
    homePageModel = new HomePageModel
    {
        WelcomeMessage = "Welcome to my page!",
        SubMessage = "Now this is cool :)",
        Title = "Home Page"
    };
}
```

MAKING TOGGLES EXPLICIT

```
HomePageModel homePageModel;

if (ToggleManager.IsEnabled<ToggleMyFeature>())
{
    homePageModel = new HomePageModel
    {
        WelcomeMessage = "Well this is different...",
        SubMessage = "Something changed, not sure what",
        Title = "Base Page"
    };
}
else
{
    homePageModel = new HomePageModel
    {
        WelcomeMessage = "Welcome to my page!",
        SubMessage = "Now this is cool :)",
        Title = "Home Page"
    };
}
```

It's a Class!

Easier to Refactor

TOGGLES AND DEPLOYMENT

- Toggles do stuff! = Has a performance impact
- Must correlate changes to runtime feedback
- Flip toggles via deployments

3 STAGE UPDATES

Orders	
Id	**Number**
1	10001
2	10002
3	10003

3 STAGE UPDATES

STEP 1: DEPLOY NEW FUNCTIONALITY DISABLED

Orders		
Id	**Number**	**Urgent**
1	10001	F
2	10002	F
3	10003	F

Web Service

No Urgent Code
Uses Urgent Code

3 STAGE UPDATES

STEP 2: TOGGLE NEW SERVICE CODE

Orders		
Id	**Number**	**Urgent**
1	10001	F
2	10002	F
3	10003	F

3 STAGE UPDATES

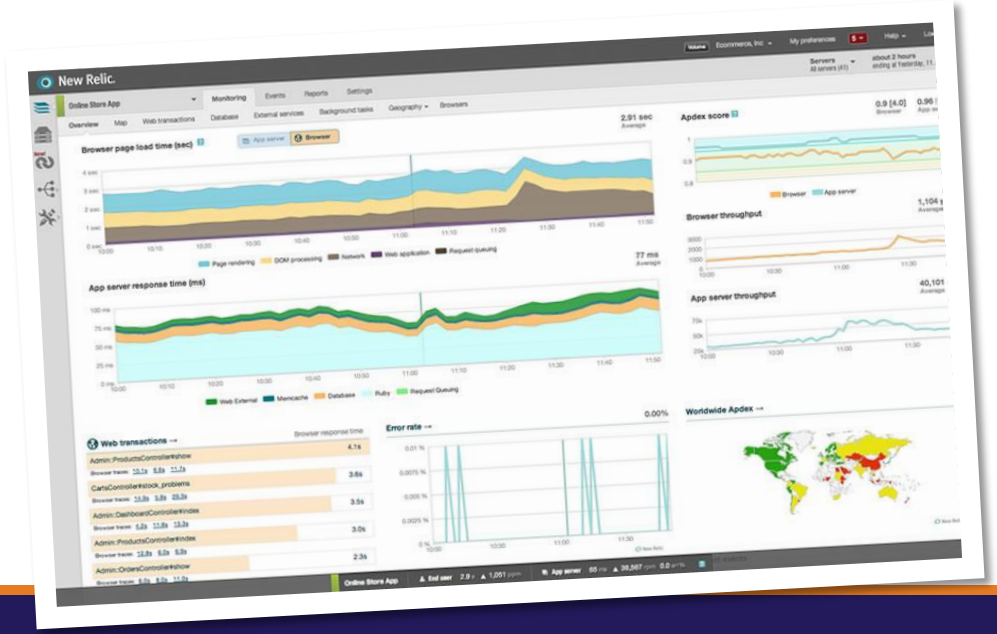
STEP 3: REMOVE OLD FUNCTIONALITY

Orders		
Id	**Number**	**Urgent**
1	10001	F
2	10002	F
3	10003	F

GETTING FEEDBACK

RUNTIME FEEDBACK

- Instrument your applications at runtime!
- Many tools available
  - New Relic
  - Application Insights
  - Splunk
  - Raygun.io
- Include User Analytics
  - Google
  - All above tools



DIG DEEPER FOR DATA

- Monitoring tools have APIs for tracing / logging
- Instrument key transactions in your system
- Track performance end-over-end for deployments
- Choose a logging framework and leverage it!
  - Log to a common location

ANALYZE EARLIER

- Find errors during development
- Make performance reviews part of your DoD
- Example: Glimpse
  - Trace your application
  - Many plugins available
  - http://www.getglimpse.com

HOST

Server Side

73 ms
Total Action Time

Server Time 11/30/2013 23:37:16 GMT +0000

126 ms
Render View

179 ms / 3
DB Queries

292 ms
Server Time

182 ms / 3
DB Connections

Store.Browse(...)
Controller/Action

	duration (ms)	from start (ms)
Request: /Store/Browse?Genre=Disco	92	+0.0
Controller: Store.Browse	4.28	+9.19
↳ 1 query 68.97 ms		
Render: Store.Browse	7.63	+91.28
Controller: ShoppingCart.CartSummary	4.06	+95.2
↳ 1 query 55.79 ms		
Controller: Store.GenreMenu	2.85	+157.51
↳ 1 query 55.16 ms		

Show Trivial

HTTP

Request	Wire	Server	Client
642 ms	2 ms	292 ms	348 ms

TAKE AWAY CONCEPTS

- Scaling enhancements can always be done incrementally
- Deploy in small batches!
- Provide fast feedback
- Treat deployment settings like code
- Separate deployments from releases

"Deployments are like exercise, the more you do them the less it hurts"

-Dan Piessens

RESOURCES

- Moving Applications to the Cloud 3rd Edition
  - http://msdn.microsoft.com/en-us/library/ff728592.aspx
- Building Hybrid Applications in the Cloud on Microsoft Azure
  - http://msdn.microsoft.com/en-us/library/hh871440.aspx
- CQRS Journey
  - http://msdn.microsoft.com/en-us/library/jj554200.aspx
- Transient Fault Handling Core
  - http://msdn.microsoft.com/en-us/library/hh675232.aspx
- Octopus Deploy
  - http://www.octopusdeploy.com

QUESTIONS?

Thank You!

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