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Agenda

- TalkTalk
- Mesh Systems
- Illyriad Games

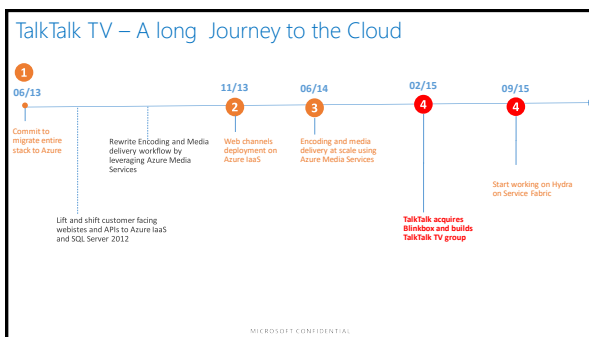
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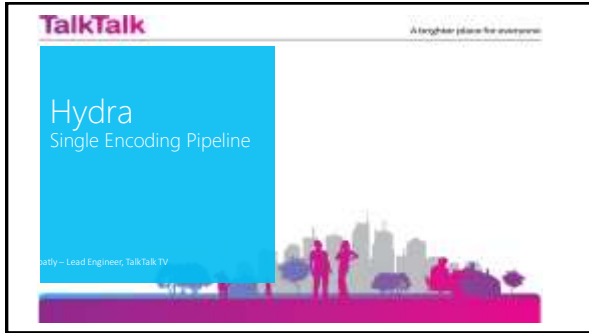


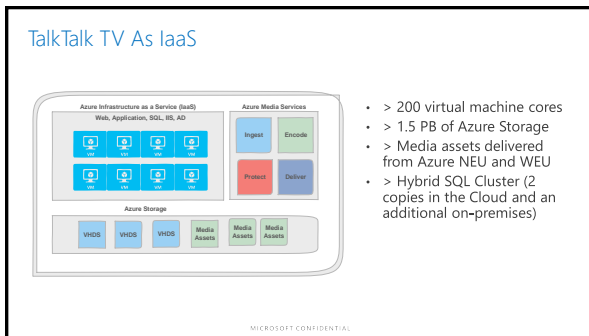


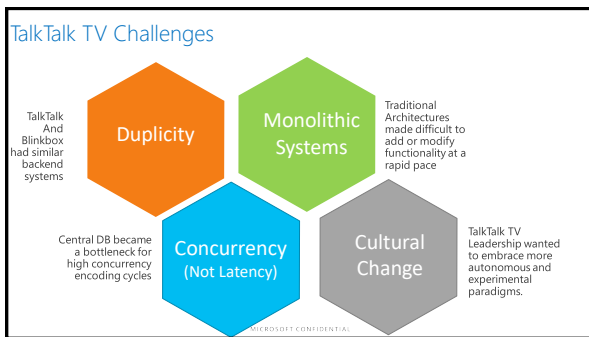
- UK's third largest cable TV Provider
- The Leading value for money phone, broadband and TV Provider for UK homes.
- With more than 1.4M customers, TalkTalk is the #3 pay TV platform in the UK
- TalkTalk TV delivers the latest TV and movie content to TalkTalk subscribers, Apple computers, PCs, game consoles, tablets, and smart TVs.

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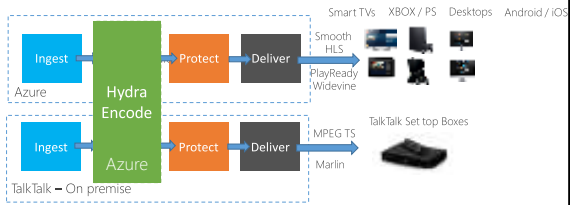






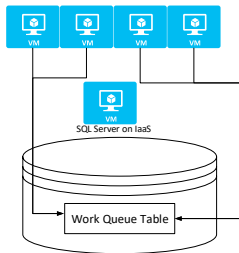


TalkTalk TV Challenges - Duplicity



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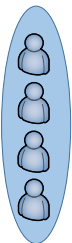
Monolithic Systems / Concurrency



- During large batches of encoding cycles the DB suffered high contention
- Despite having an elastic platform (Azure Media Encoders), the ability to submit large encoding jobs was constrained by traditional design paradigms
- Too tightly coupled APIs / systems

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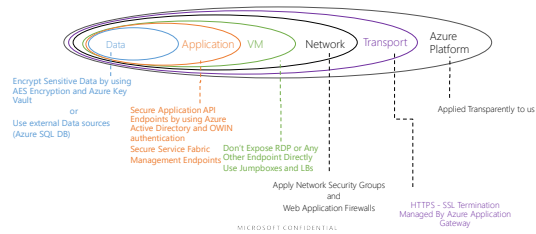
Cultural change to development



- Needed to adopt a more nimble and autonomous mentality
- Build small and cross functional teams
- Hydra : 3 engineers + Microsoft Support
- Developers + IT Ops – how to interact

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Adopting an overall approach to security



Hydra on Azure Service Fabric – Conceptual Design



Hydra on Service Fabric – Authentication and Security



Azure AD - Applications



Azure Key Vault

- Azure AD for user authentication to SF Apps
- Certificates/Secrets for cross-service authentication
- Store Azure keys (Media Services, Batch, DocumentDB...)
- Configuration settings
- Certificates

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Hydra on Azure Service Fabric – Media Jobs



- Azure encoders provide elastic encoding
- Azure Streaming Services to deliver the content to IP based devices
- Extends Azure Media Services capabilities
- Used for Marlin Encryption and long running jobs

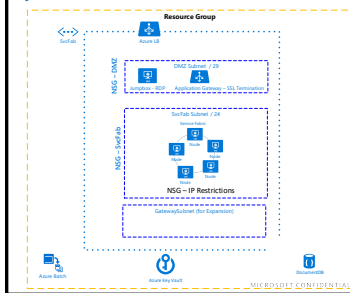
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Hydra on Azure Service Fabric – Detailed Services Design



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Hydra on Azure Service Fabric – Infrastructure Design



- Use Azure resource manager templates for deployment
- Application of security policies :
 - SSL termination
 - Endpoints authentication
 - IP restrictions

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Lessons Learned from TalkTalk

- Brown field development
 - You do not have to re-write the whole app to use microservices approach
- Pay attention to application and service composition
 - Loose coupling and high cohesion (contracts)
- Use the right programming model for each scenario
- Determine security and telemetry requirements up front
- Small team agility - The Perfect Combination
 - A Small Team (3 "+1") with a nimble engineering mentality
 - Right platform (Azure/ Service Fabric /Media Services/Batch)

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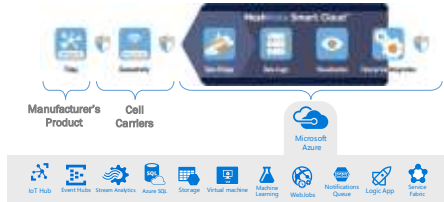
IoT On Azure Service Fabric

- Mesh Systems – NetLink
- Goals Of project
- Architecture
- Performance Metrics
- Lessons Learned

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Mesh Systems

- IoT Software and Services
- Connect Devices To Our Platform in Azure



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NETLINK

Smart Energy

Product Manufacturer: WLS

Business Case: Reduce maintenance and energy costs by only running lights when and where necessary.

Device: Multi-channel Wireless Light Controls and Base Station

Azure: Data logging, remote scheduling, event notifications, energy usage analysis

Key Comments:

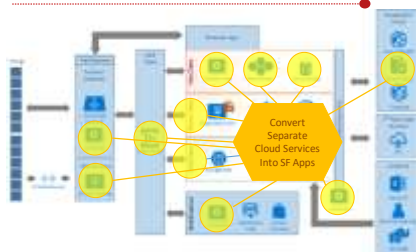
- Clients see 12-19 month ROI
- Improved safety and quality of service



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PaaS V1 Architecture

MESHVista



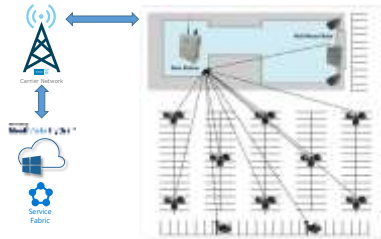
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Goals of project

- Bare-Metal Migration to Azure
 - Aging Infrastructure needs to be replaced
 - No easy way to scale with old model
- Why Choose PaaS V2 vs V1?
 - Reduce cost and improve resilience
 - 3 Worker/Web Roles for each task to meet SLA
 - Role only running < 10% capacity
 - Device State / Actor Pattern – light fixtures represent Actors, not available in V1

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NetLink WAN – Data flow



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MeshVista Hydra Architecture



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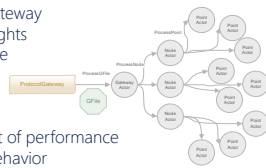
Mesh Systems microservices



Device Actor Fanout

Gateway: Field Gateway
Node: Pole with lights
Point: Sensor Value

Each incoming message evokes
a fan out of about ~200 actors



- Simplicity of actor vs cost of performance
- Business rules of Point behavior (alarms, timers, aggregation rules, etc.)

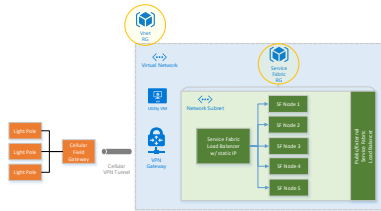
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Environment Applications

- Protocol Gateway service** – Parses the inbound device payloads
- Device Avatars Actors service** – Holds device state and runs device specific logic
- Cold Storage Application** – Persists device time series data to long term storage
- Last Values and Canonical Point Format Event hub service** – Persists last value data to query-able storage
- Raw Payload Processor service** Persists raw, unprocessed device payloads to archive storage
- Diagnostics Agent Service** – ETW listener forwards app and health diagnostics to ElasticSearch
- Elastic Search/Kibana Application** – Automated Elastic Search index management

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Two ARM Templates for deployment



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Performance Metrics

- Class of machine A2 – A3 RAM (5 machines)
 - 300k actors were CPU intensive
 - RAM pegged on A2
- Ways to improve the process
 - Placement Constraints would help
 - Autoscaling Would Help Spikes
 - Azure Customer Advisory Team provide test result...

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Details

- **Test Scenario**
 - 1,500 Gateways, 10 Nodes per Gateway, 20 Points per Node
 - Total: 300,000 actors
 - Gateway receives a GFile every three minutes
 - ~1,650 actors invoked per sec
 - Actor's State < 150 bytes
 - 10 minutes warm up (activations of all actors)
 - Measured latency of the full fan-out of a Gateway
- **ServiceFabric test clusters**
 - 2 test clusters: 3 D2 and 3 D3 machines
 - 3 services (GatewayActor, NodeActor, PointActor), each with 3 partitions and 3 replicas
 - KVS State provider, each invocation persists Actor's state

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Lessons Learned

- Cohesive logging is critical and hard
 - Need big picture for distributed services
 - Semantic filtering is better than timeline
- Take time to pick VM class
- CPU/Memory 300k sensor actors
 - Fan out
- DB "Broker" is huge help
 - Minimize trips to the database

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Lessons Learned (continued)

- Density/Cost - At small scale can have higher costs. At larger scale Service Fabric more cost effective
 - For MeshVista, 5 A3 machines cost more (approx.) 10-20% than existing cloud services solution.
- Be careful with actor programming model: Simplicity over performance
 - Careful of actor granularity. Don't go too granular or too coarse
 - Lots of message passing between actors will affect performance
 - Care of single threaded concurrency - calling "child" actor, blocks calls on "parent" actor. This can lead to longer fan-out times
 - Querying actors should be limited. Actors are great for isolated "avatars" but not good where data has to be aggregated or to build a view

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Service Fabric - Use Case Scenarios and Examples

Illyriad Games

Microsoft Services



Independent games developer specializing in multiplayer games

Micro-studio with 5 core members of staff

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Age of Ascent



- Born in the cloud – A new scale of gaming
- Space twitch combat, empire building, player driven economy
- Millions of players concurrently in single contiguous universe
- 50,000+ simultaneous players, real-time in the same battle
- 267 million network messages per second (23 Trillion per day)

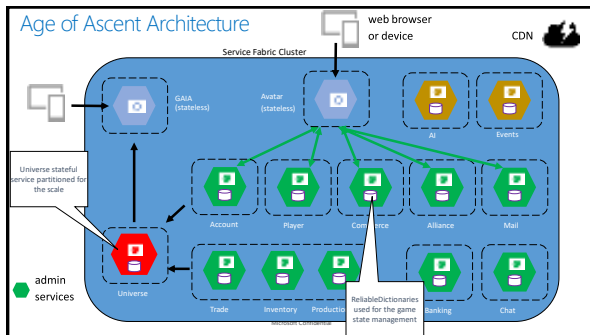
"Age of Ascent is poised to become something special, one of those games that players will point to years down the road and say, 'Yep, that was the one that changed everything!'" - MMORPG.com

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Age of Ascent Technology

- Use Microsoft Azure for hyperscale
- ASP.NET Core x64
 - Platform Agnostic – HTML5 + JS + WebGL Client, Azure Backend
 - Anywhere, Anytime – Cross device
- Service Fabric – game state management
- Listen to Hanselminutes podcast – Inside Age of Ascent with Ben Adams
 - <http://hanselminutes.com/509/inside-age-of-ascent-with-ben-adams>

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Service Fabric Benefits for Age of Ascent

- Deployment and upgrade agility
- Cost and efficient utilization due to high density
 - Illyriad estimated they would need ~700 cloud service machines to run Age of Ascent. On Service Fabric can achieve the same with < 100
- Elasticity scale in and out - manage costs
 - Dynamic Scaling - Spatial unfolding and refolding with scale sets
- Cluster management and orchestration
 - Dynamic Load Distribution - Service Fabric balancing of hot and cold nodes
- Always available stateful microservices

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Key Service Fabric Features

- Actors = In memory device avatars
- Lifecycle management
 - Rolling app independent updates
- Application specific horizontal scalability
 - Scale apps independent of compute (Density)
- Reliable collections - cache in place
 - Database load/connection throttling
- Lightweight applications by concern

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In Review: Takeaways

- Always have a clear and concise understanding of what you mean by scale and agility for your particular scenarios
- Service Fabric is a platform for building applications with a microservices approach
- See other case studies at <http://blogs.msdn.com/b/azure-service-fabric/>

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Lab: Using Service Fabric to build a customer order application





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