Developing a Micro Services Architecture Platform to Solve For Radiologist Capacity Challenge

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ABOUT ENVISION HEALTHCARE

- Fortune 500 healthcare provider ($8B annual revenue)
  - 900+ facilities in 45 states (+ 284 ASCs)
  - Envision Physician Services (EVPS) is the largest provider of hospital-based EM/HM, Anesthesiology, Women's & Children's, Acute Surgical and Radiology Services (24,000 employed clinicians)

- Recognized leader in Quality Clinical Outcomes, working on providing tools, resources & technologies needed to deliver high-quality patient care, profitably:
  - » Quality and performance reporting
  - » Operational support
  - » Dedicated lean process improvement teams
  - » Risk management resources

BUSINESS SEGMENT HIGHLIGHTS

12M
Radiology
Studies

Focus for this discussion

> 500
Anesthesia Sites

> 800
Emergency Medicine
and Hospitalist Sites

80
Neonatology
Programs

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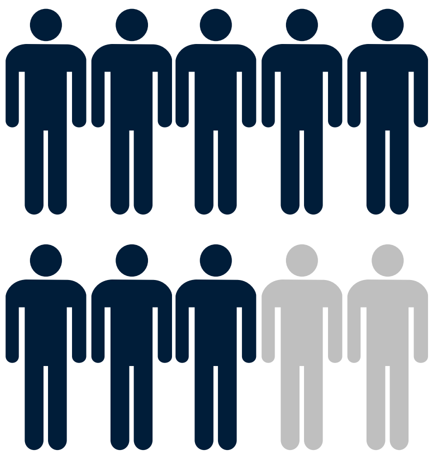
THE RADIOLOGY ECOSYSTEM & OPPORTUNITY

RADIOLOGY IS A CRITICAL FUNCTION IN HEALTHCARE

Takeaway

- **Critical for hospital systems and often the bottleneck for ED throughput**
- **Critical component of integrated care networks and at risk dollars; data acquisition opportunity between service lines**
- **Needed for Envision to win system wide multi physician service contracts ("lighthouse accounts")**

Clinically… & Operationally (for hospitals)…



80%

patients depend on radiology results before treatment

70%

of hospital admissions come through the ED where Radiology turnaround times drive throughput

SOURCES: Malnick, Stephen, et al. "Routine chest X-ray on hospital admission: does it contribute to diagnosis or treatment?." 12.6 (2010): 357*;* IBIS World; Transparency Market Research; Jefferies; Health, United States, 2009_U.S. Dept. of Health & Human Services 2014.

STAKEHOLDERS HAVE SIGNIFICANT PAIN POINTS TODAY

Patients

16 hours

Average report turnaround time

Physicians

40%

Time spent on non-clinical work

Hospitals

Varying Subsidy By Hospital

Represents potential for large player such as Envision

Quality

30%

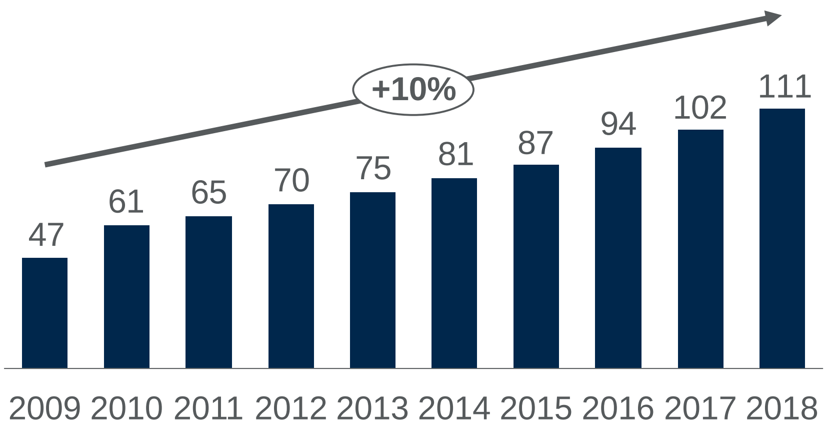
Unnecessary tests

Inconsistency in findings

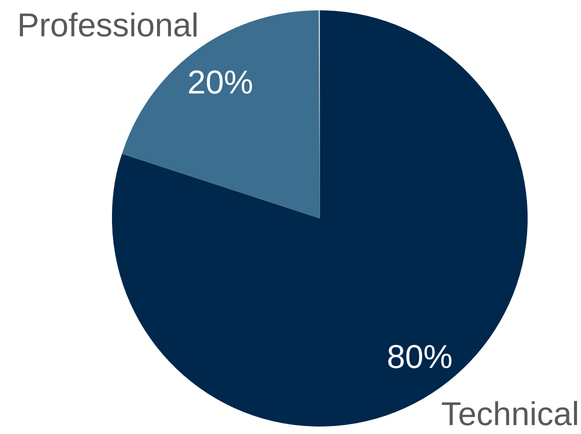
SOURCES: John-Paul, J. Yu, et al. "The radiologist's workflow environment: evaluation of disruptors and potential implications." Journal of the American College of Radiology 11.6 (2014): 589-593; Smith-Bindman, Rebecca, et al. "Rising use of diagnostic medical imaging in a large integrated health system." *Health Affairs* 27.6 (2008): 1491-1502; Medscape Radiologist Compensation Report 2015

MARKET OVERVIEW: DIAGNOSTIC IMAGING

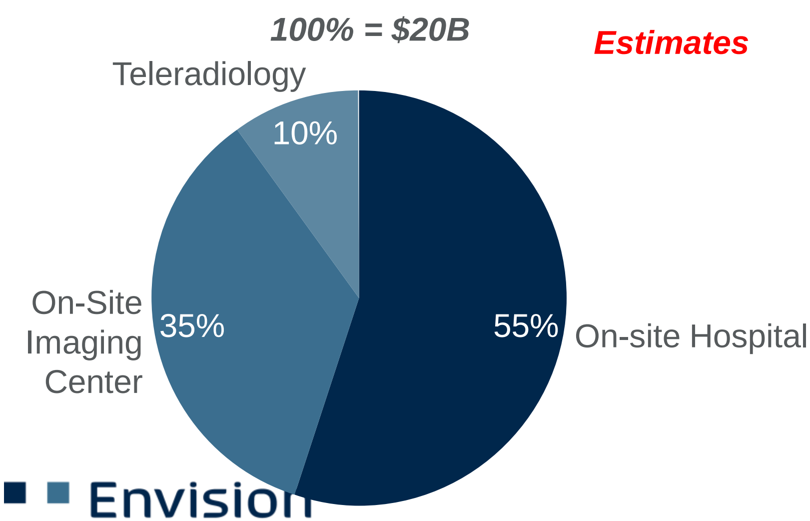
$100B, Growing Imaging Market ($B)



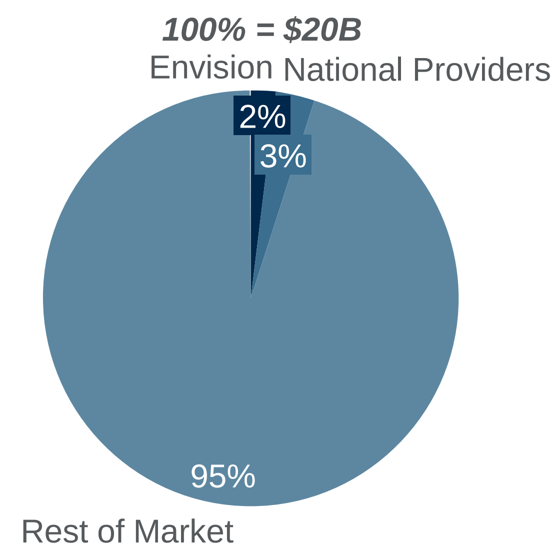
$20B Professional Radiology Market (%)



3 Major Professional Radiology Segments



Highly Fragmented Market (%)



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INDUSTRY "HEADWINDS"

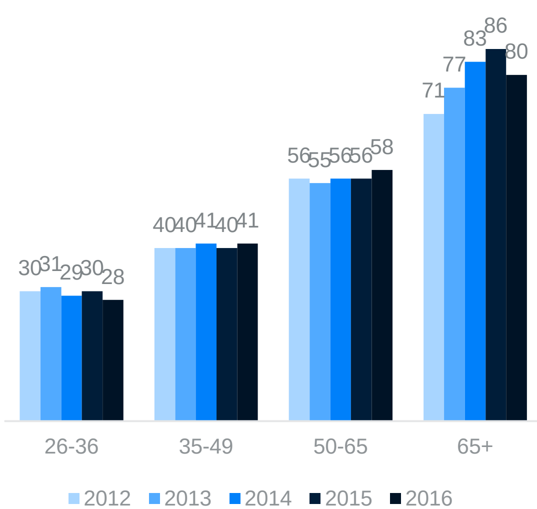
Takeaway

Growing shortage of radiologists, market consolidation, declining reimbursement and rising physician compensation presents significant barriers

Scale and a technology enabled model can turn ***these headwinds into a competitive advantage for Envision***

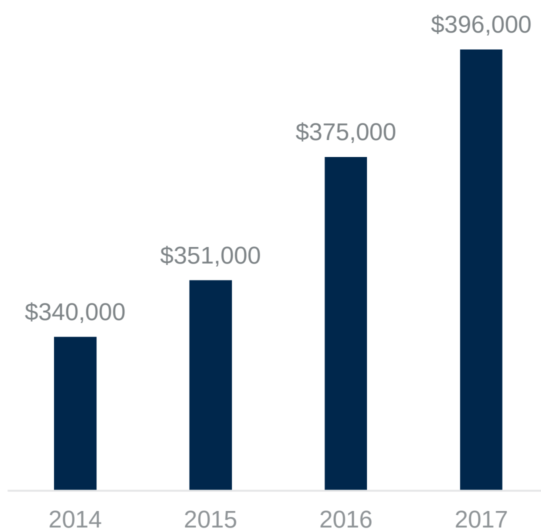
Accelerating Consolidation

Radiology FTE By Practice Size



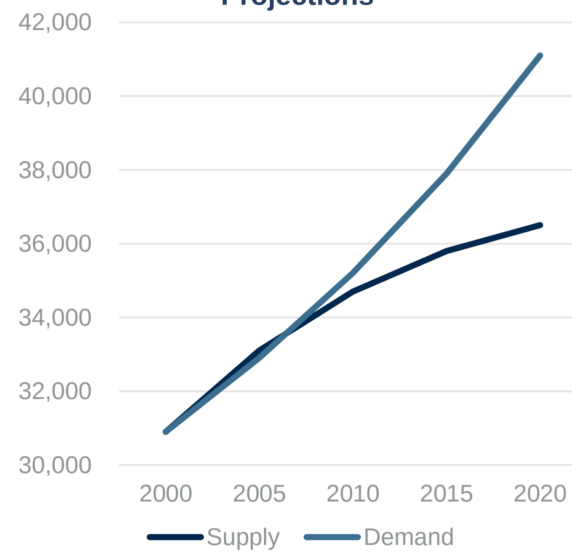
Rising Physician Compensation

MedScape Radiologist Survey Data



Potential Radiologist Shortage

HRSA Radiologist Supply vs. Demand Projections



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EVPS IS "SHAPING THE OPPORTUNITY ARENA" – CREATING THE INDUSTRY'S FIRST PHYSICIAN CENTRIC DISTRIBUTED RADIOLOGIST ECOSYSTEM

EVPS strategy: combine radiologist scale, domain expertise and clinical outcome data with technology to "flip the script"

Unique Local / National Partnership Model

Onsite + **Teleradiology**

Benefits

- ✓ Faster turnaround times improve ED throughput
- ✓ 24/7 access to sub specialists
- ✓ Lower unit cost
- ✓ Productivity based comp models

AI

RPA

Big Data

ENVISION HEALTHCARE – COMMITMENT TO DIGITALIZING OUR BUSINESS

INFO TECH'S ROLE IN ENABLING DIFFERENTIATION STRATEGY

OPERATIONAL CHALLENGES EVPS IS SOLVING FOR

MEETING THE NEEDS OF KEY CONSTITUENCIES

Key needs

Customers

- Access to consistent radiology outcomes (TAT, subspecialty reads, etc.); resulting in faster ED throughput, IP discharge
- Availability of true quality data, performance reporting analytics and performance measures
- Able to comply with CMS regulations

Radiologists

- "Clean" work environment that promotes productivity; including access to leading tools (e.g. viewer, VR, etc.)
- Access to studies in area of expertise
- Transparency into performance

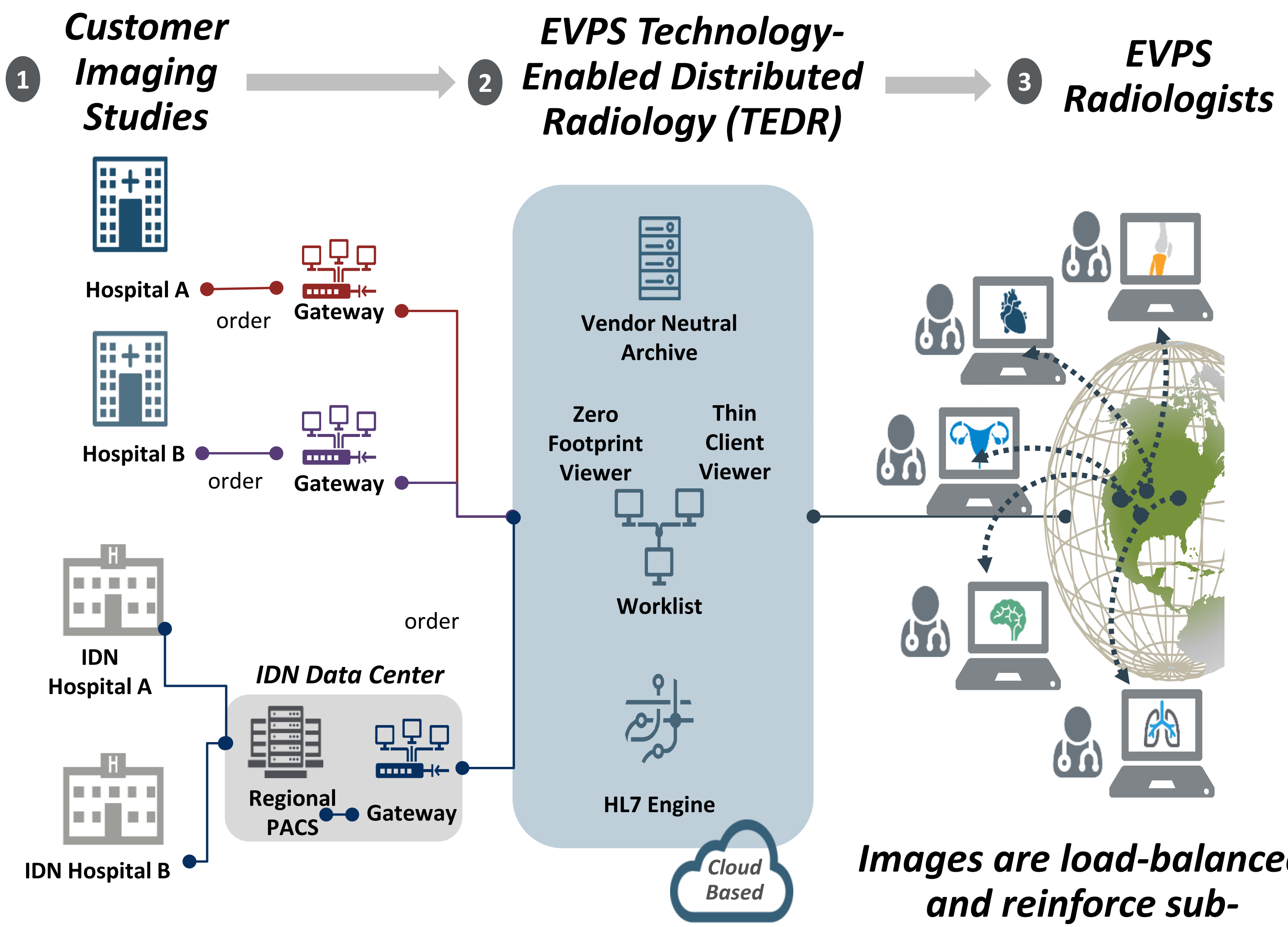
Operators

- Ability to "connect the 12 pods" (route cases to appropriate Rads) & unlock capacity/maximize utilization of resources
- Tools to project outcomes and optimize workforce

Ecosystem and Platform to deliver these competencies and help our stakeholders actively differentiate

- STRATEGIC DIFFERENTIATION – accelerating our hospital system clients transition from "fee for service" to Value Based Reimbursement & preparing for "consumerism"

"TEDR" MIGRATES RADIOLOGISTS READING EXCLUSIVELY ON HOSPITAL PACS TO READING ANY IMAGE IN OUR ECOSYSTEM



Images are load-balanced and reinforce sub-specialties

Platform Challenges

Volume
- Inherent bottlenecks in platform
- Could not scale

Workforce optimization
- Clinical Routing Rules Engine configuration is cumbersome
- IFTTT

Onboard
- Long lead to onboard new sites
- ~ 6 months from acceptance to release

Team Challenges

Tech Skills
- .NET shop (2/3 of onshore dev resources); 1/3 open source
- Captive offshore dev (70+ resources are .NET only)

Process
- Different implementations of Scrum
- Varied Product Mgmt. rigor

Knowledge Base
- Limited # of Platform SMEs
- Adequate Domain Experts

BUSINESS CHALLENGE

Need to "transform" Connect platform to TEDR, while collapsing 3 other ecosystems into it AND still delivering on sub 30 min TAT SLAs and onboarding 20% new growth

TECHNOLOGY ENABLED DISTRIBUTED RADIOLOGY

Strategic Goals

- Enable business to scale 4x in 4 years
- Support entry into new markets
- Differentiate via "applied innovation"

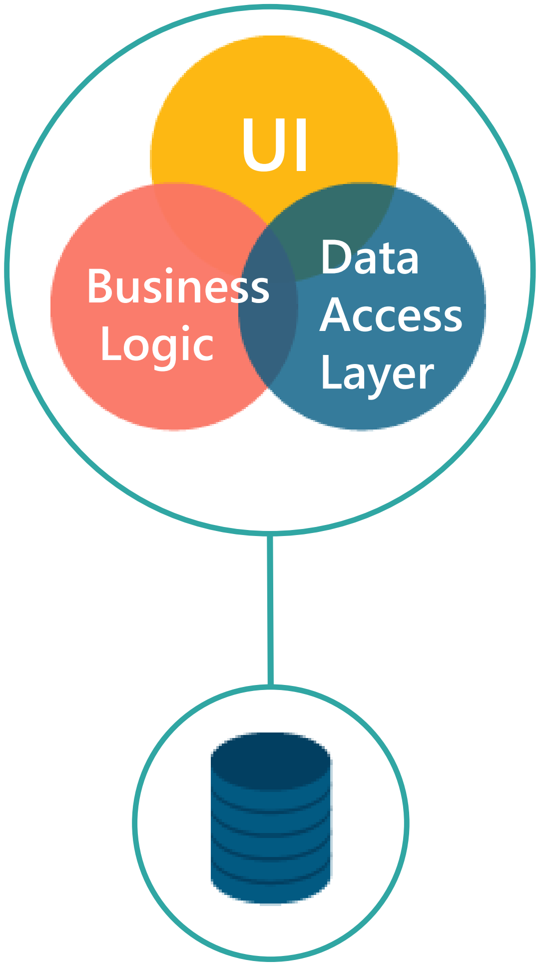
Architecture Principles

- Reduce inertia
- Eliminate accidental complexities
- Consistent interface and data flows
- No silver bullets

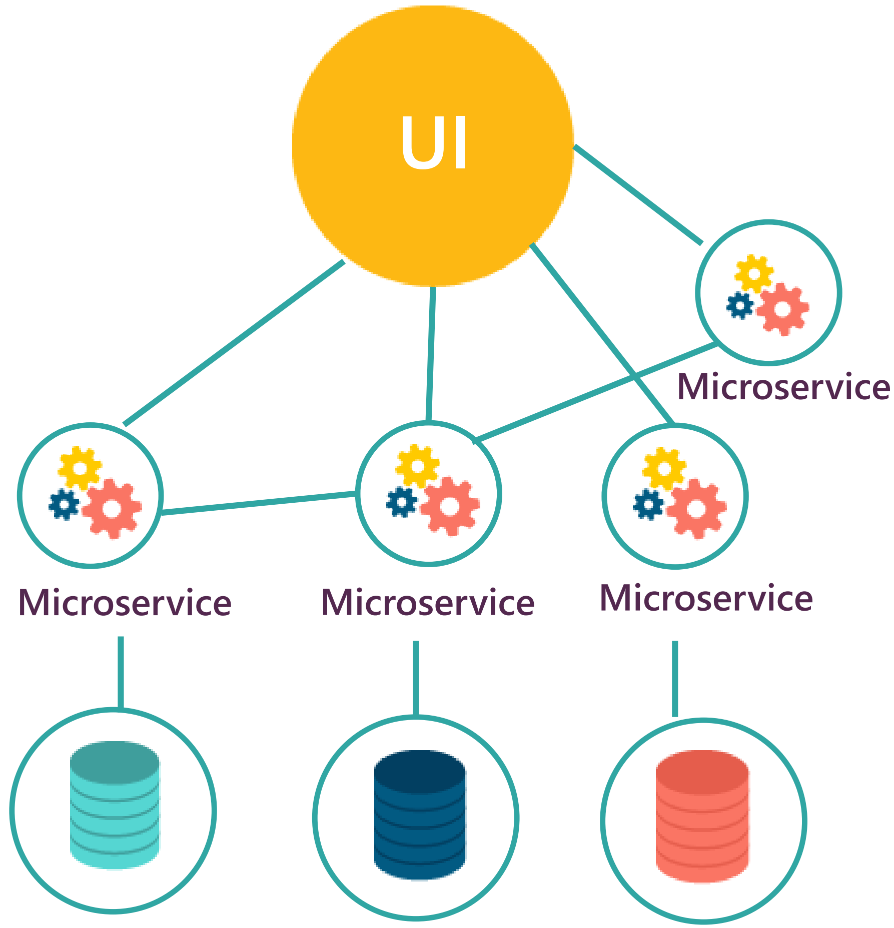
Design & Delivery Practices

- Standard HTTP/REST/AMPQ
- Encapsulate legacy
- Eliminate integration DBs
- Cleanse & master data
- Published integration model
- Small independent services
- Continuous Integration
- Minimal SaaS/COTS customization

Detangle into Micro Services

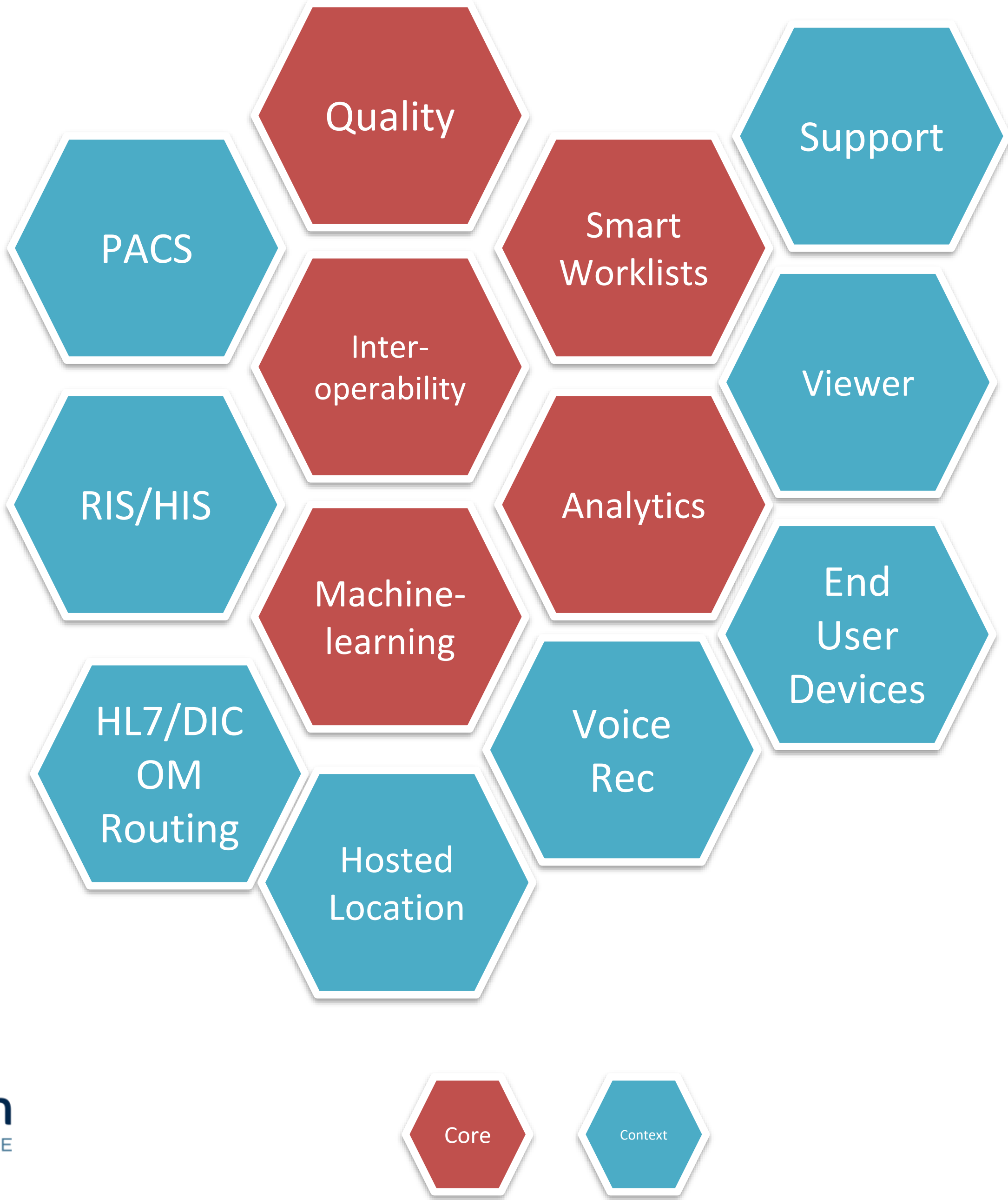


Monolithic Architecture



Micro Services Architecture

LOOSE COUPLING & HIGH COHESION



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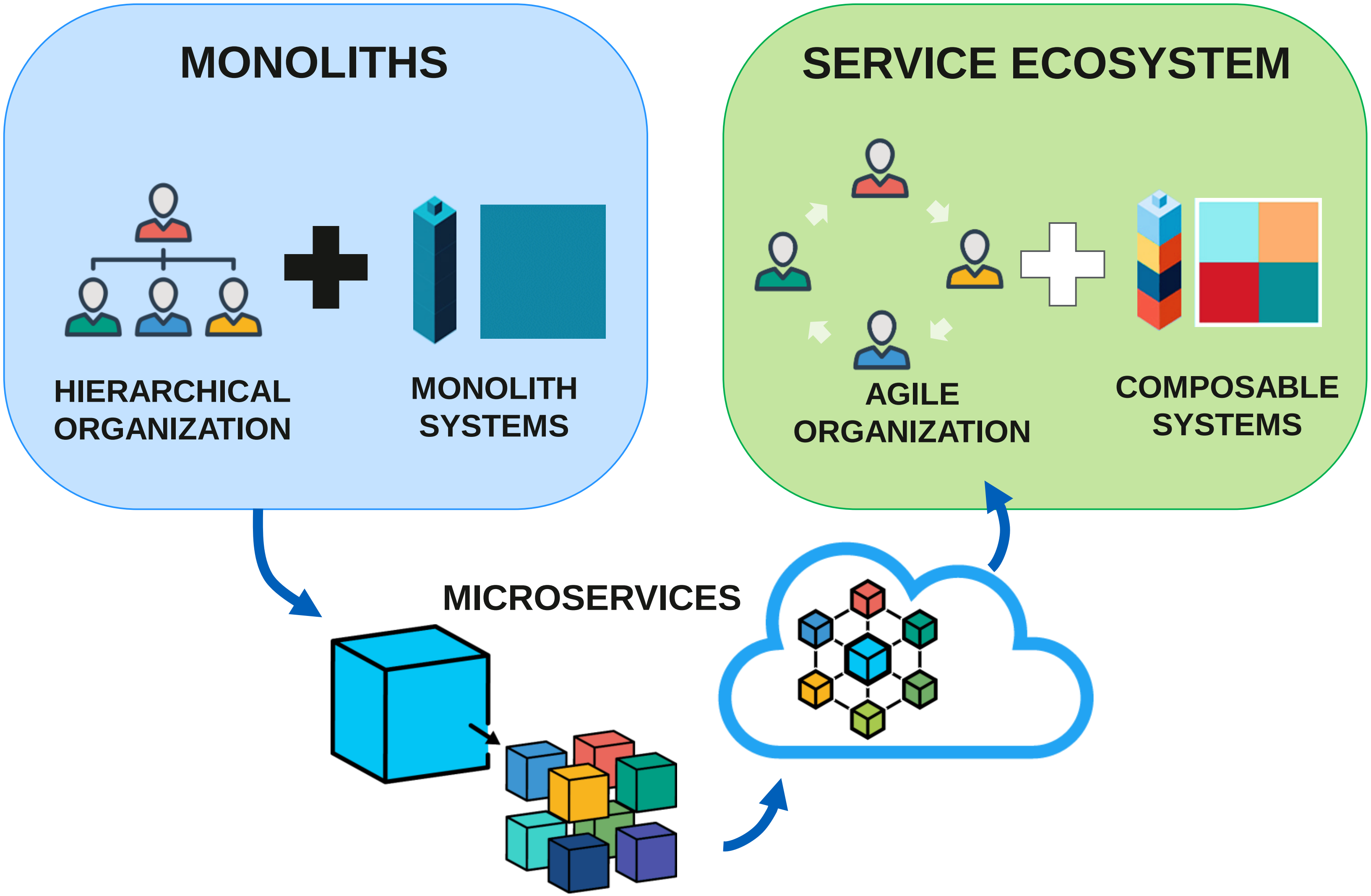
Detangle into Micro Services



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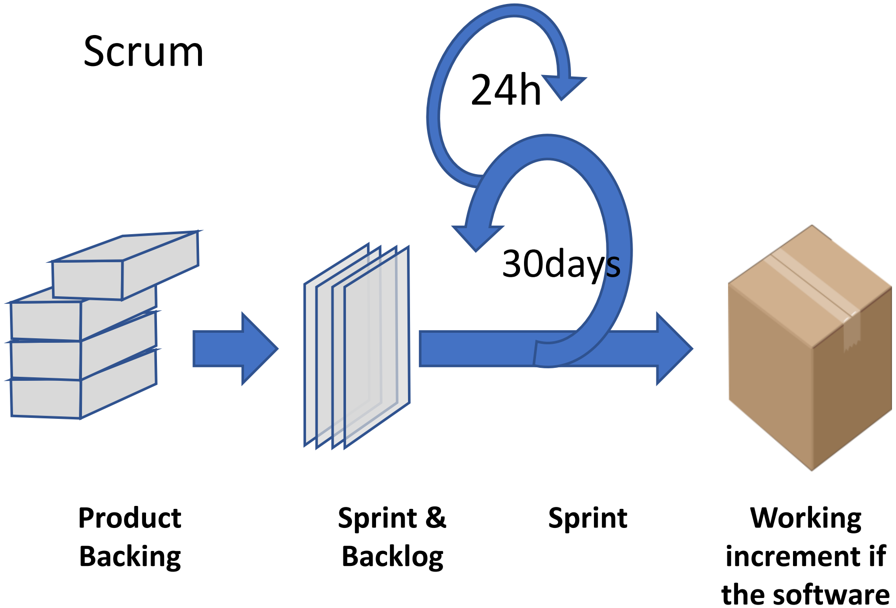
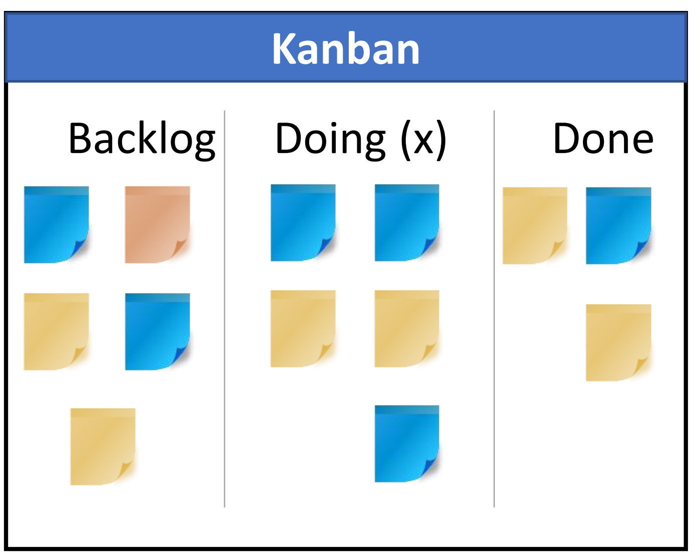
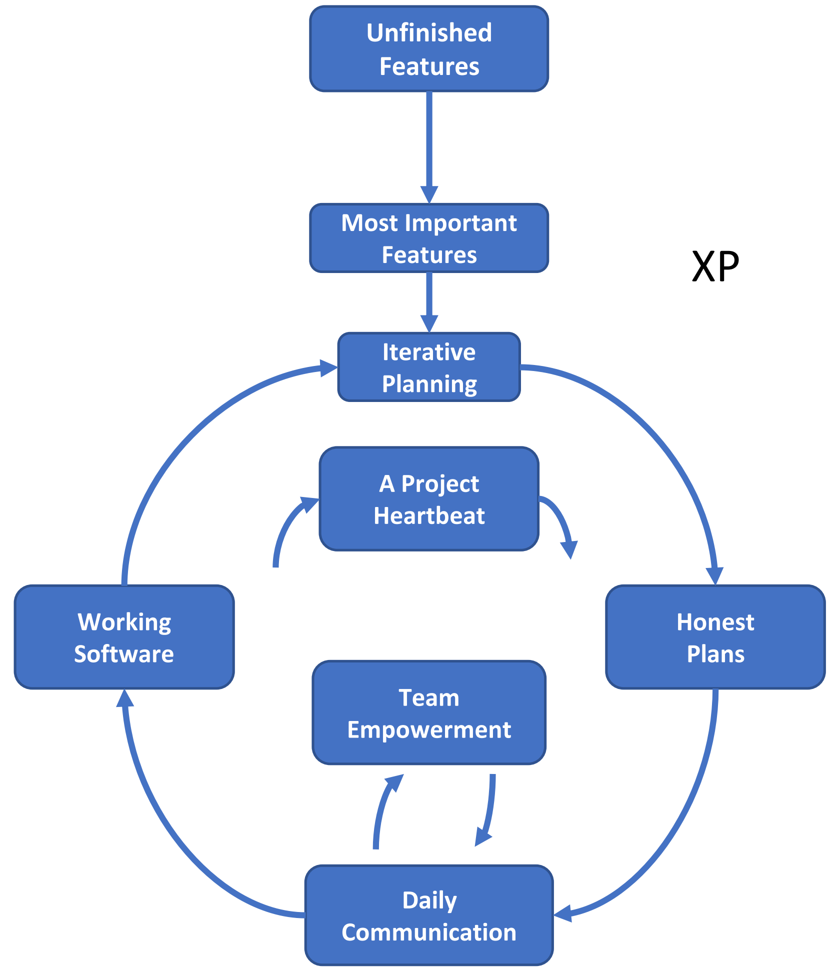
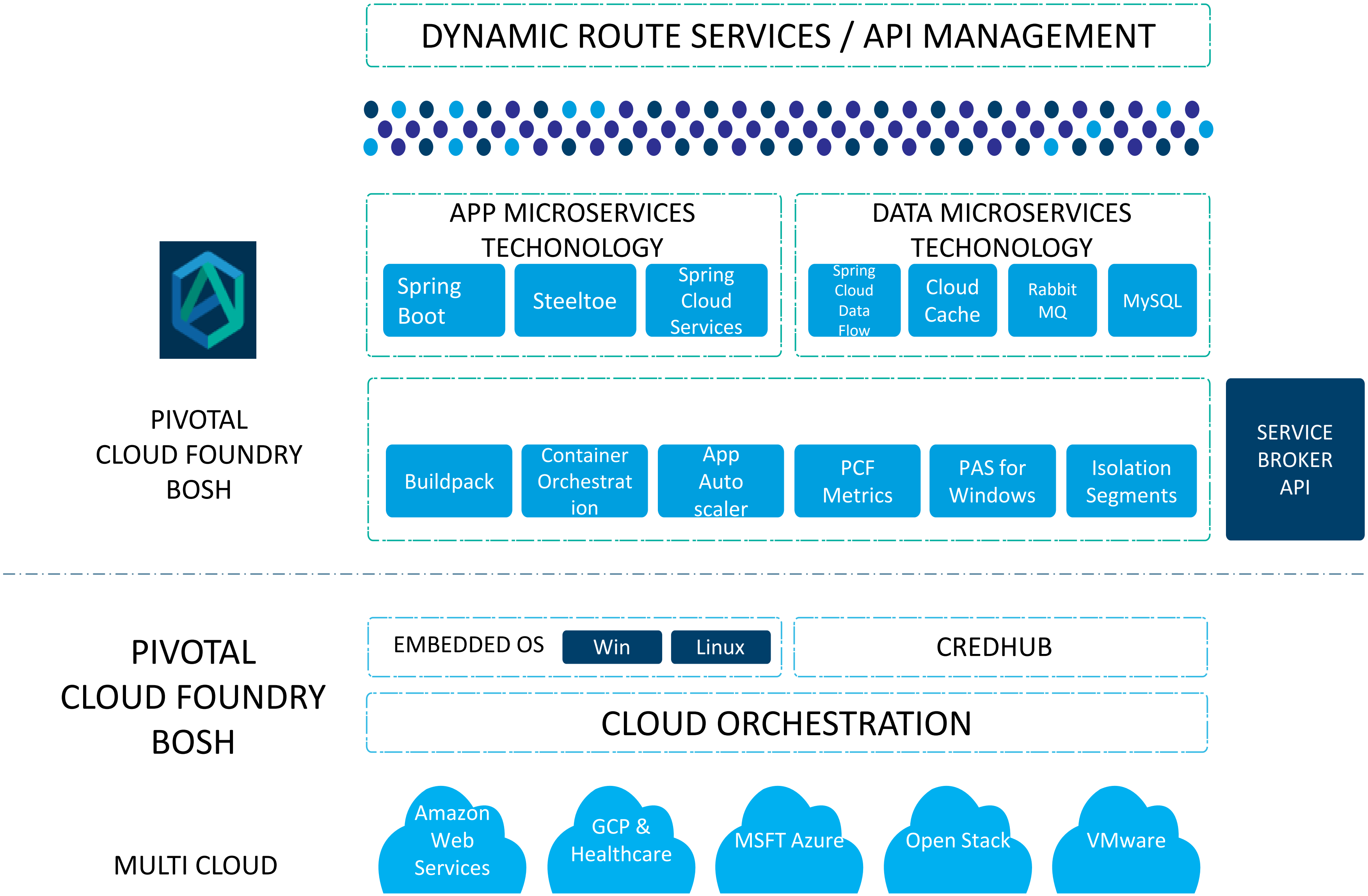
Embrace Diversity!!



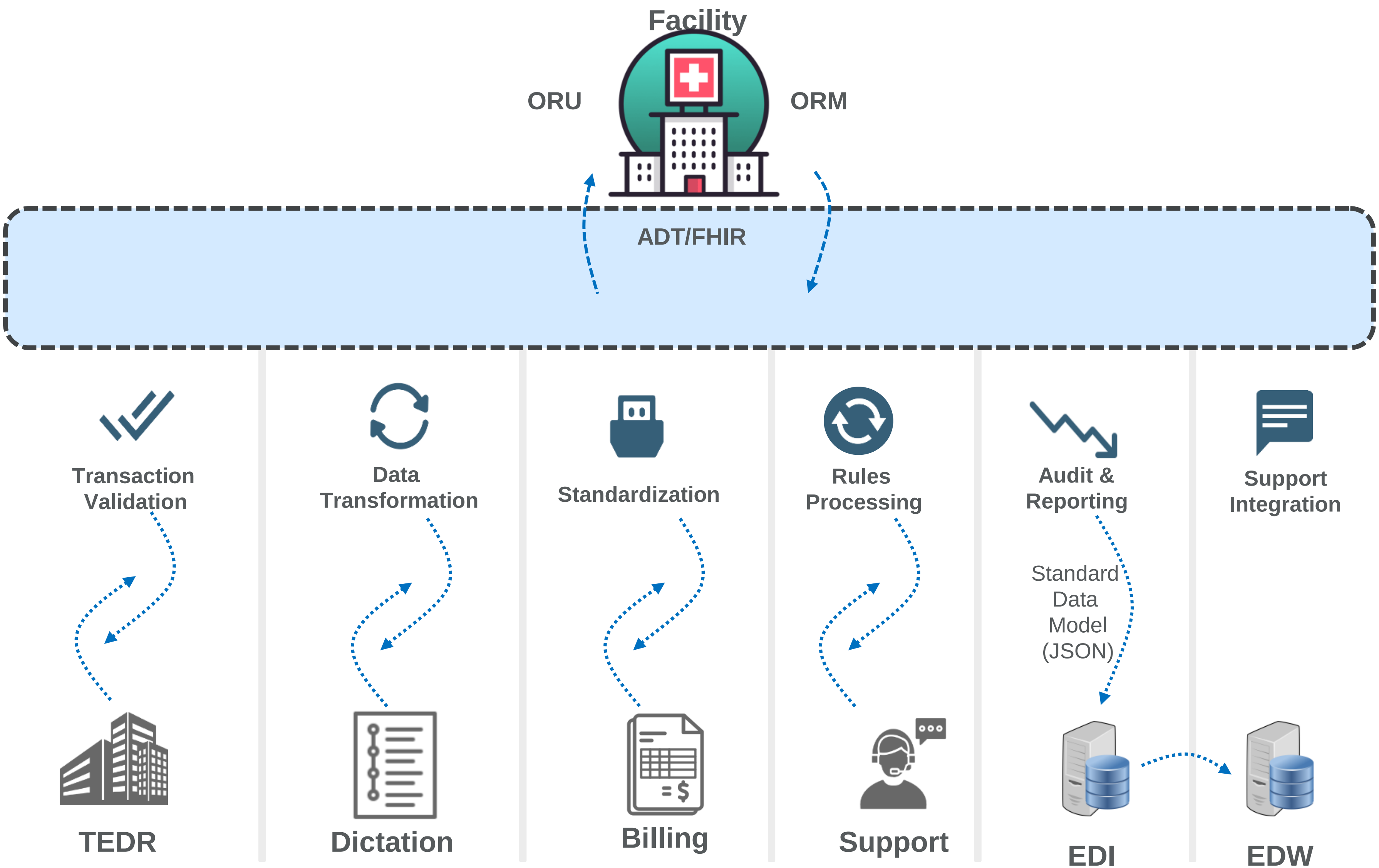




Cloud Agnostic Platform



ROSETTA HEALTH'S HEALTHBUS 2.0 PLATFORM



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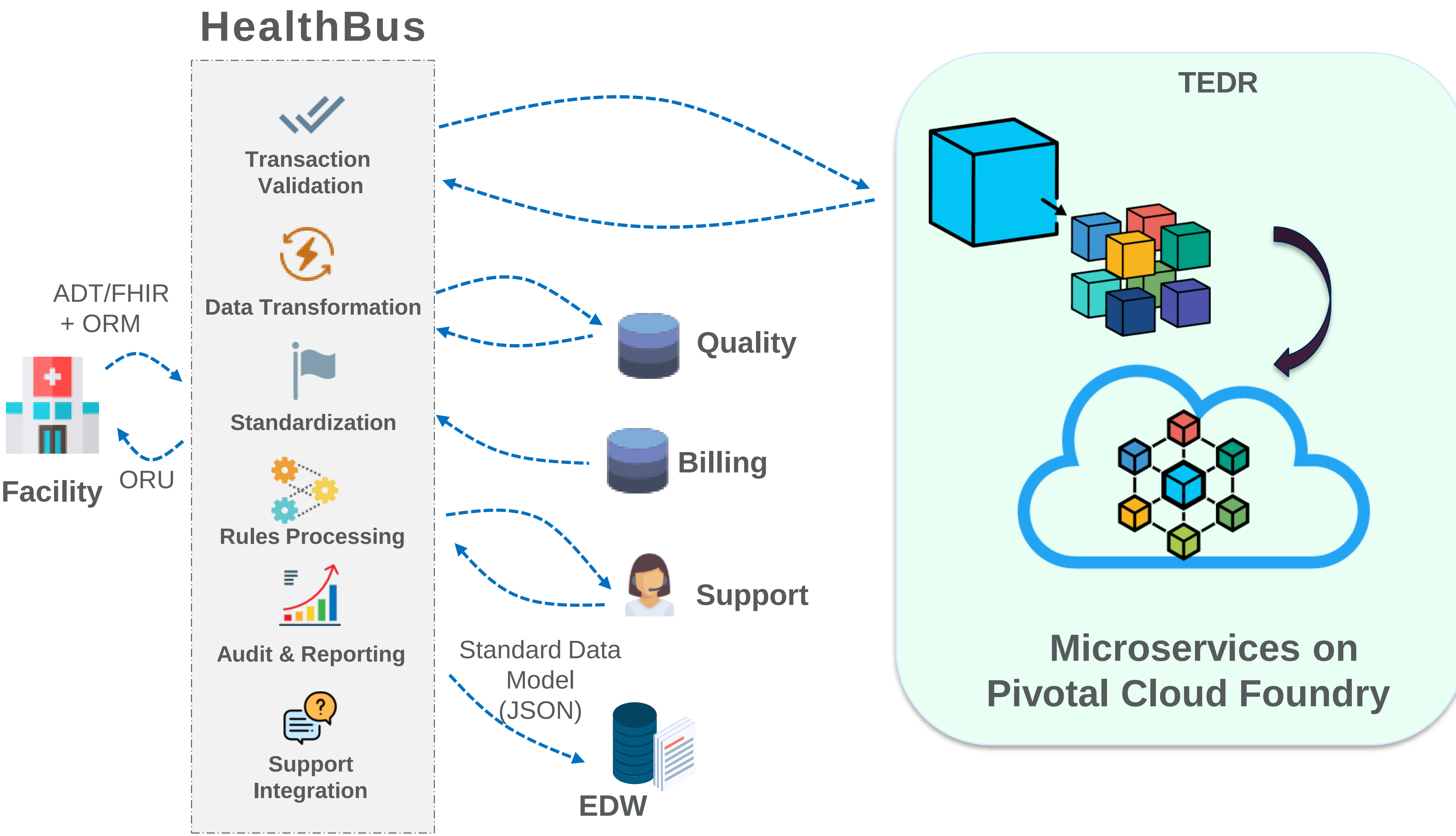
Micro Services on Cloud Foundry with HealthBus 2.0



OBJECTIVES & KPI

- 22% increase in releases Q3 vs Q2
- Release management: 30% reduction in lead and process time (fewer steps and hand-offs).
- Improved operational metrics: MTTR (< 30 mins), support tickets (< 0.5% of overall transactions)
- Improved security: Faster patching, zero downtime upgrades(> 99.9% Availability)
- Infrastructure usage: Higher density compute, auto-scale and license reductions (Cost/Study < Agreed Upon $ figure)
- Leveraging the big data & algos native to GCP PAAS (while utilizing RDS & Lambda functions in AWS)

WHERE ARE WE IN THE JOURNEY

Foundational
- Breakdown silos
- Consolidate platforms
- Align with Business Strategy

Competitive
- Keep up with Business scale
- Streamline operations
- Culture Change

Differentiating
- Deliver core strategic components
- Improve productivity & capability
- Deliver small 'innovation' wins

Breakaway
- Deliver Scale
- Drive Innovation
- Establish Industry thought leadership