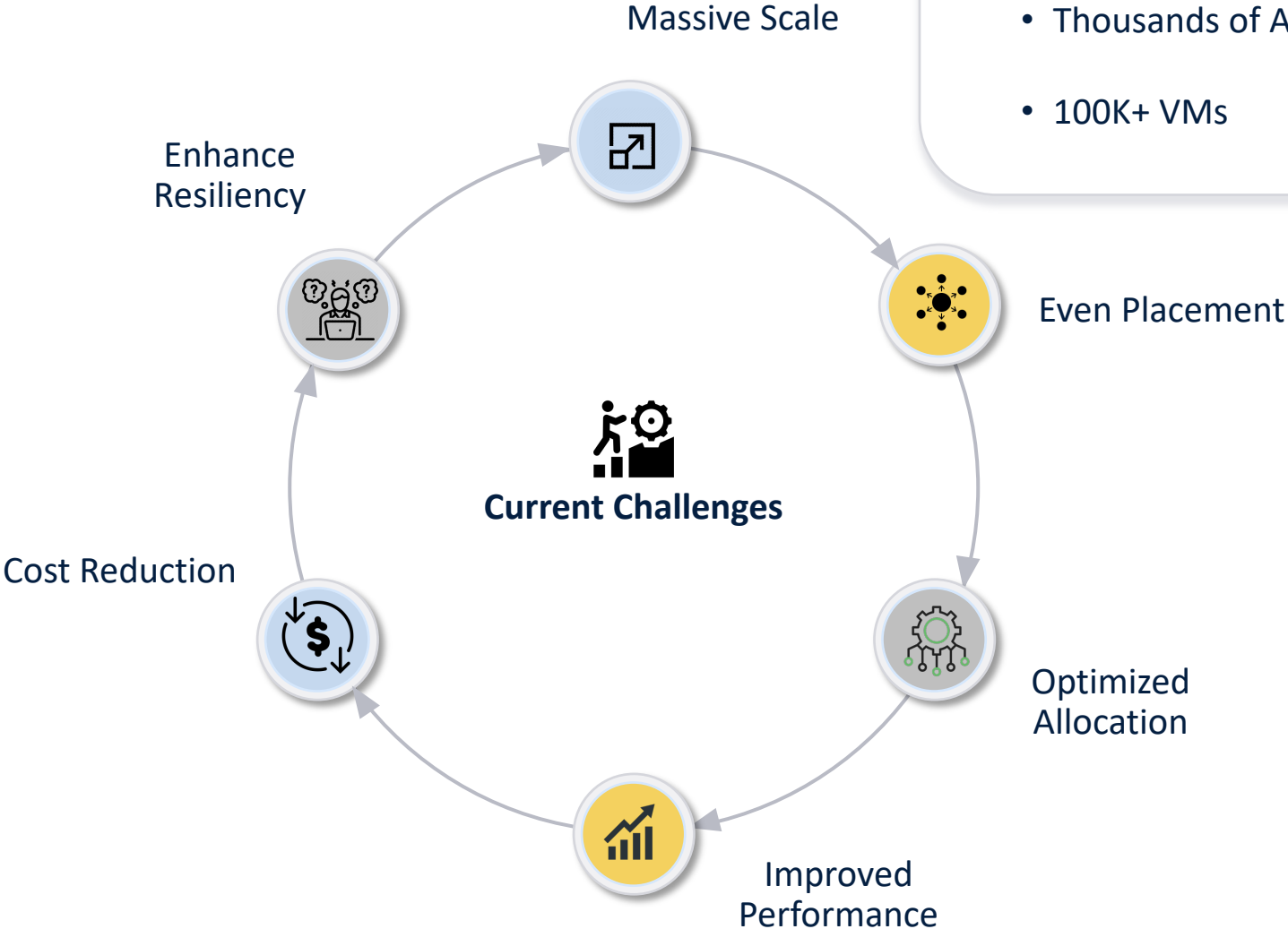# Walmart Private Cloud Rebalance
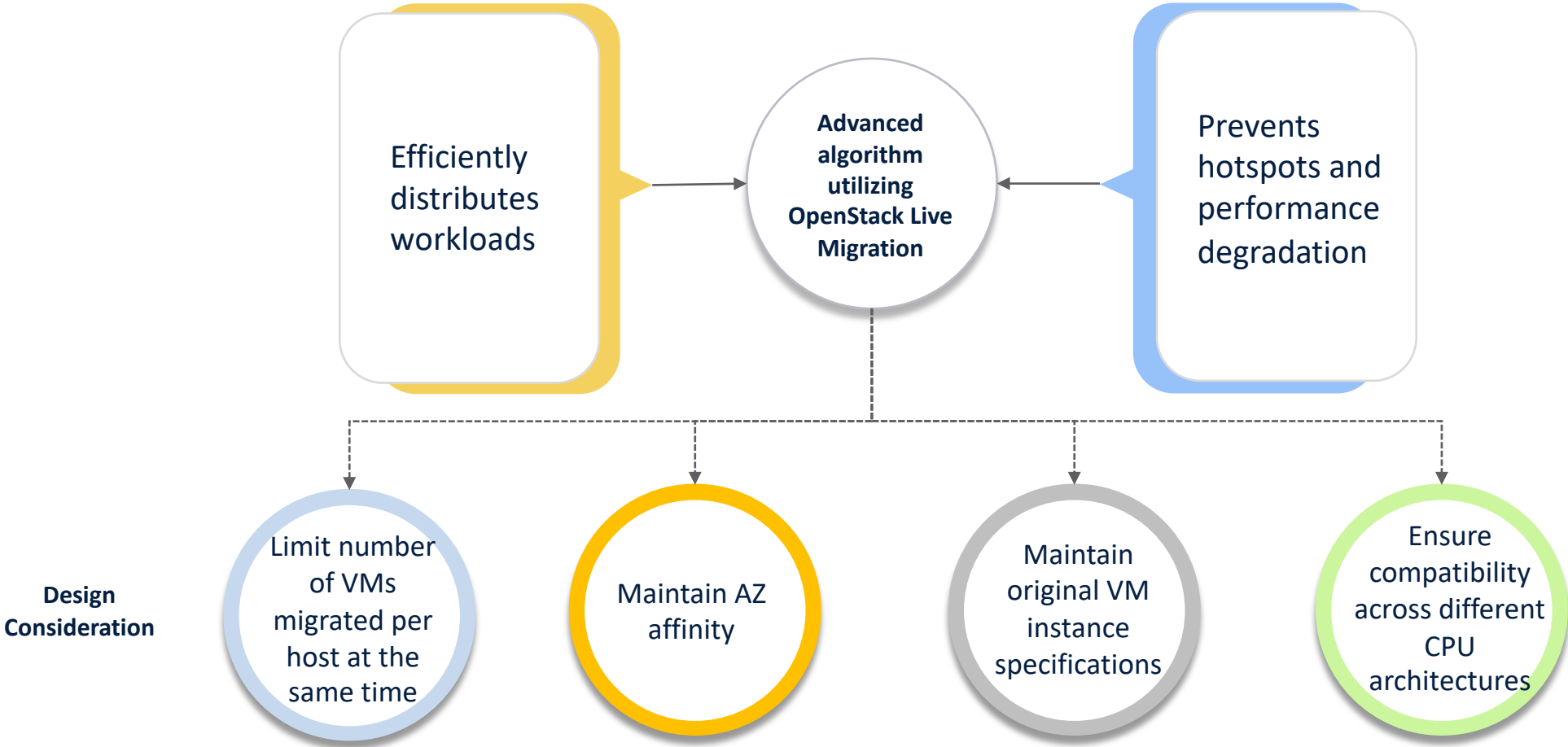
Why Do We Need Rebalance?
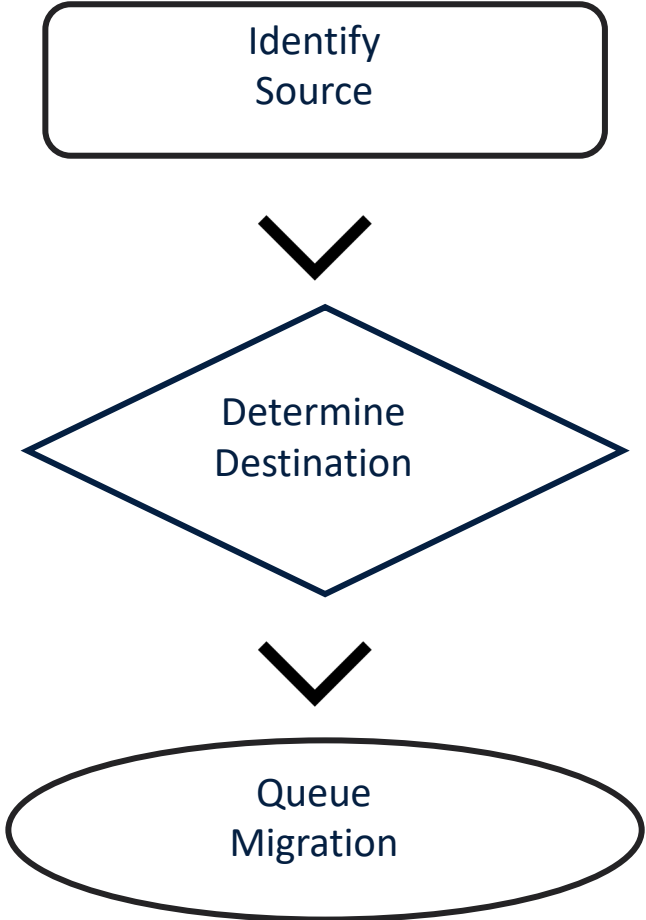
- Multiple Openstack Endpoints
- Couple Of Millions Physical Cores
- Thousands of Apps
- 100K+ VMs

Massive Scale

Enhance Resiliency

Even Placement

Current Challenges

Cost Reduction

Optimized Allocation

Improved Performance

What is Cloud Rebalance?

Efficiently distributes workloads

Advanced algorithm utilizing OpenStack Live Migration

Prevents hotspots and performance degradation

Design Consideration

Limit number of VMs migrated per host at the same time

Maintain AZ affinity

Maintain original VM instance specifications

Ensure compatibility across different CPU architectures

How does it work? (Rebalance Architecture/Flow)

```
┌─────────────────────┐
│                     │        App-based distribution
│      Identify       │        Node CPU Load
│      Source         │        Instance CPU Steal
│                     │
└─────────────────────┘
           ⌄

          ◇
    ╱           ╲
   ╱  Determine   ╲            Minimize same app VMs per host
  ◇  Destination   ◇           Pre-calculate thresholds
   ╲             ╱             Minimize migration requests
    ╲           ╱
          ⌄

     ⬭ Queue ⬭
       Migration                Lock host to avoid conflicts
```
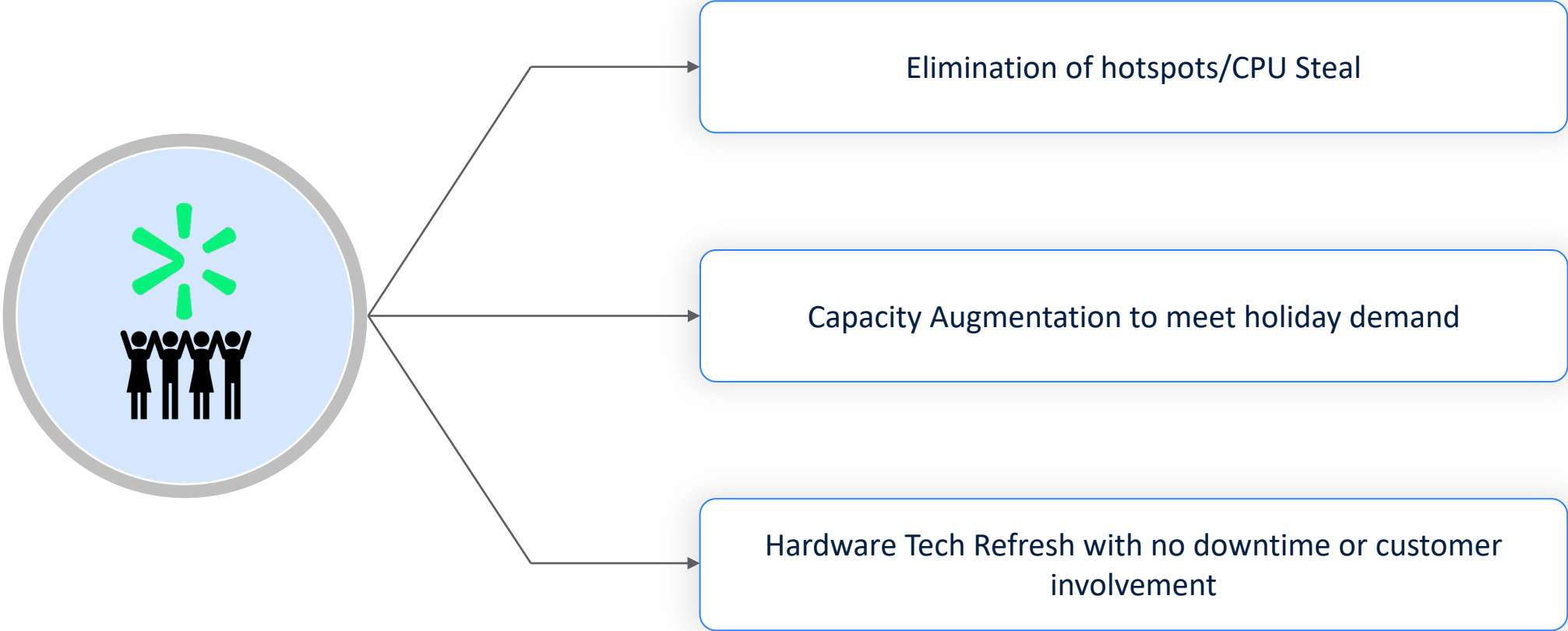
Rebalance Architecture/Flow Continued

API Layer

Queuing System

Key Value Pair DB

Openstack API

Fetch Job From Queue

Polling/UI

Worker

Pushing Updates

Live Job Status

NoSQL DB

Recent Successes

Elimination of hotspots/CPU Steal

Capacity Augmentation to meet holiday demand

Hardware Tech Refresh with no downtime or customer involvement

Additional Use Cases

CLOUD REBALANCE

Auto Pilot mode Rebalance

Rebalance Over Hypervisor Historical Metrics (CPU usage, Load, Network Rx/Tx)

Host Aggregate Conversion

Scheduled Maintenance

Even Distribution of application workloads

Optimized Openstack Scheduler

Expand Use Case: Auto Pilot Mode Rebalance
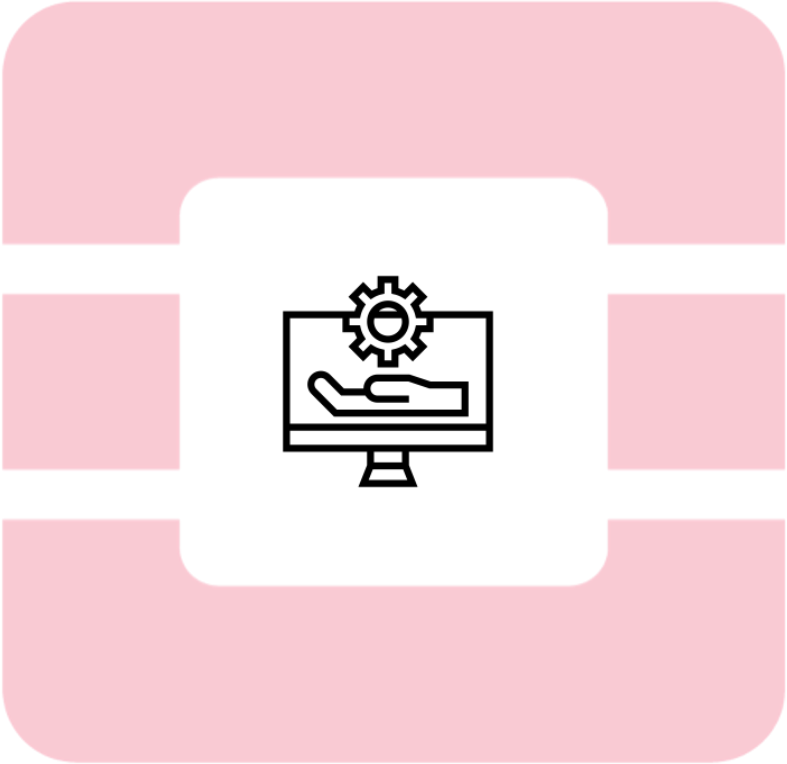
Fully Automated Migration based on Metrics Trend

- CPU steal

- Resource constraints
  - CPU
  - Memory
  - Disk
  - Network
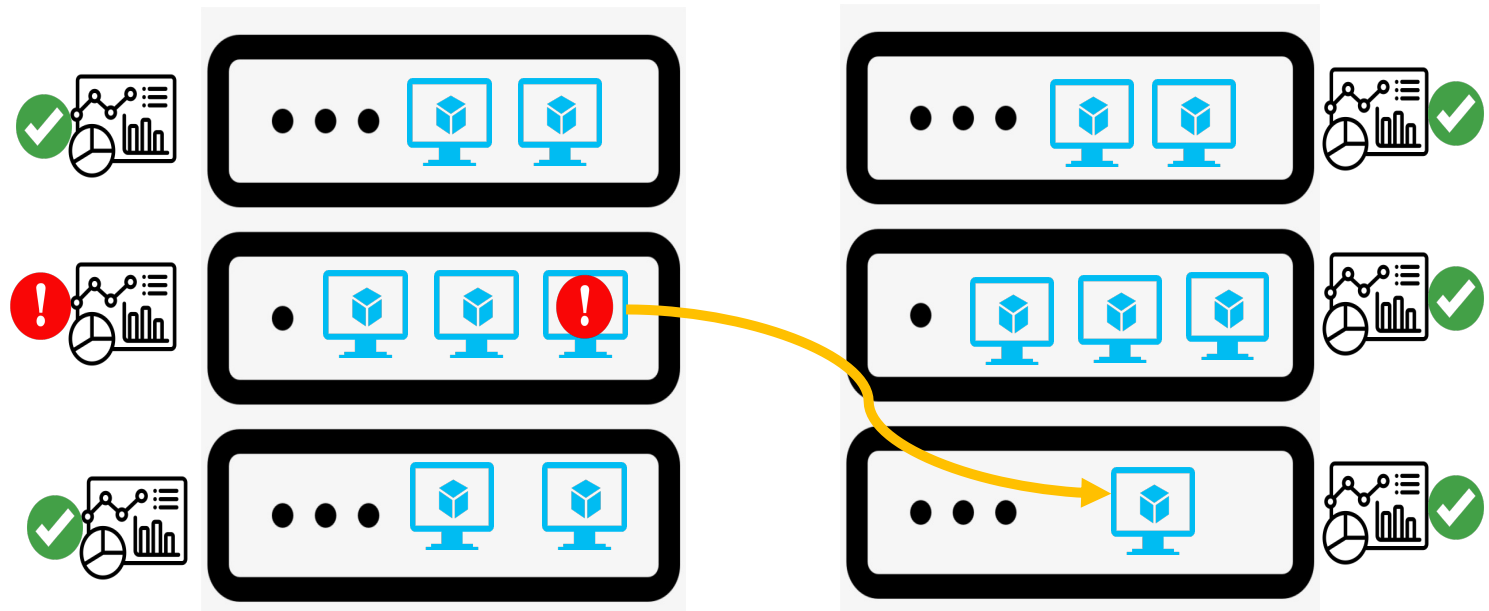
Expand Use Case: Scheduled Maintenances

Evacuating to free up hypervisors

Host Aggregate Conversion

Cloud Upgrades

Q & A

Thank You!();