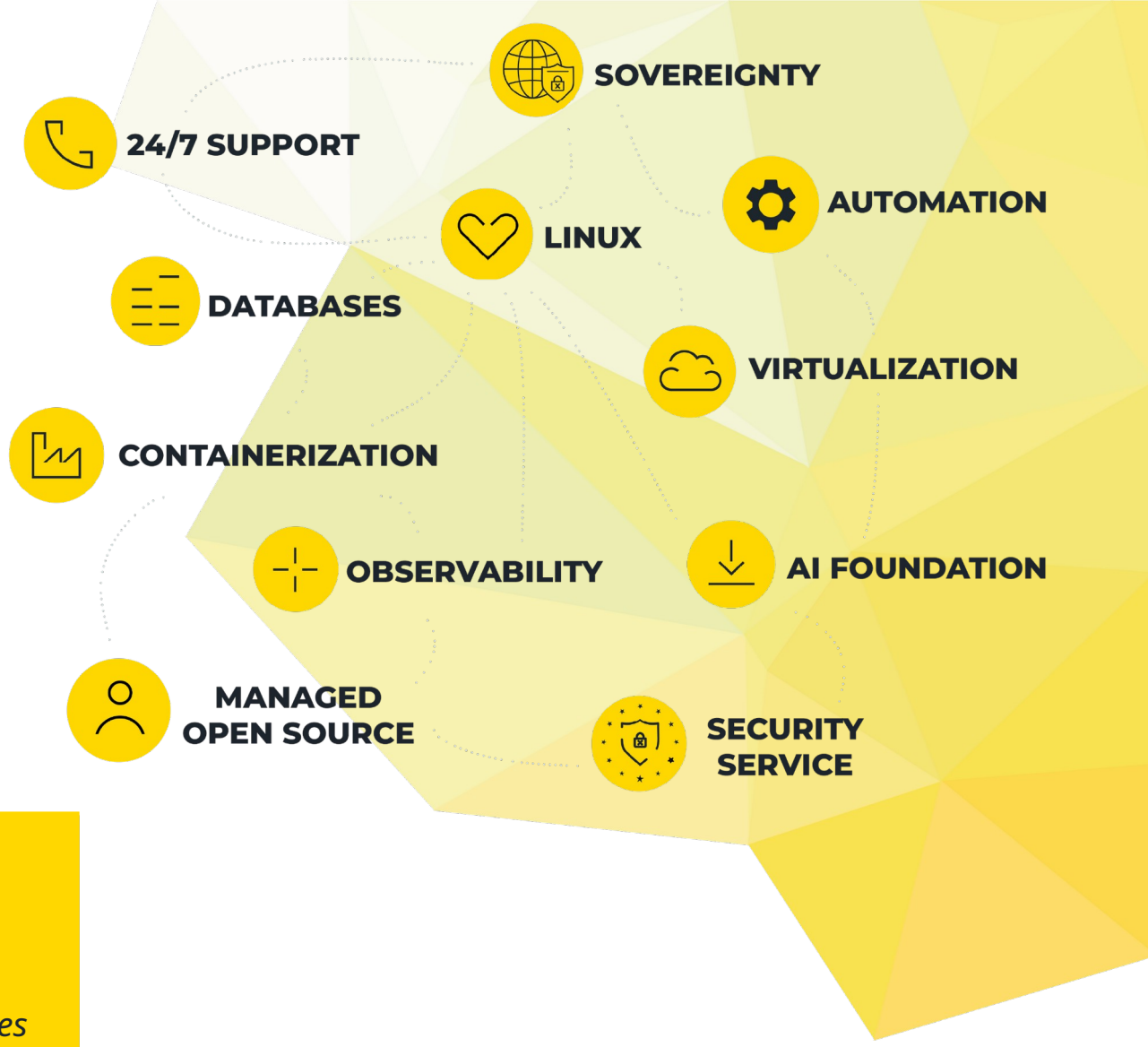
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Run PostgreSQL your way

Guy Gyles

Question is no longer “Can PostgreSQL do it?”

PostgreSQL already delivers

- Enterprise-grade reliability
- Rich SQL capabilities
- High availability
- Replication
- Partitioning
- Encryption

Models:

- Traditional VM deployment
- Containerized PostgreSQL
- Kubernetes-native PostgreSQL

Deployment Evolution



Each step reduces infrastructure management, while increasing automation.

Deployment Evolution

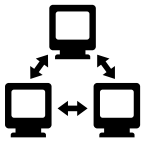


- Install OS & PostgreSQL
- Configure Replication
- Testing Backups & Recovery
- Manage failover
- Upgrade PostgreSQL
- Patching

Deployment Evolution


Bare Metal

→


Virtual Machines

→


Containers

→

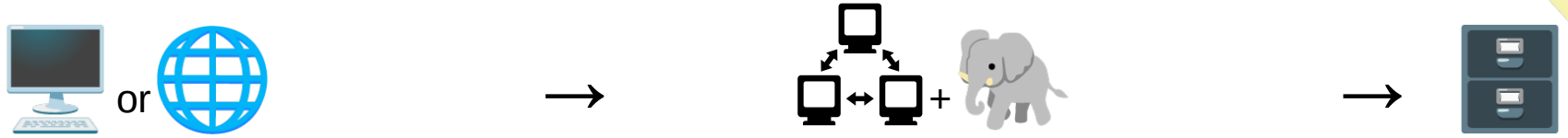

Kubernetes

→


Cloud

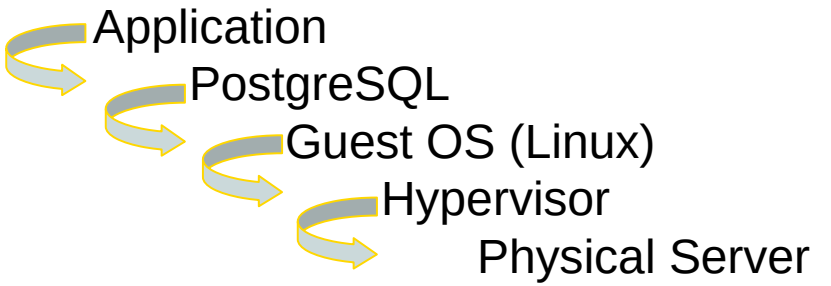
- Pod scheduling
- Service discovery
- Self-healing
- Resource management
- Scaling framework

Architecture of Virtual Machines

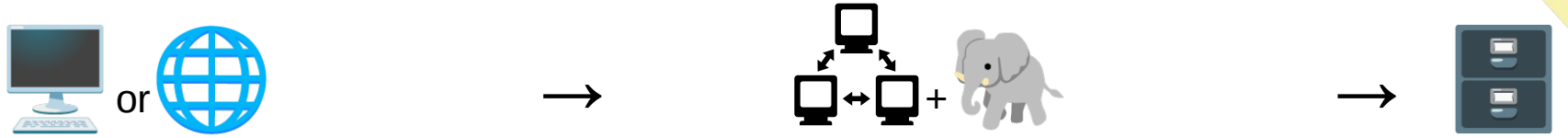


Each VM contains

- Its own operating system
- Its own kernel
- Dedicated CPU / RAM allocation
- Separate PostgreSQL instance(s)



PostgreSQL on Virtual Machines



Applications → PostgreSQL on a VM → Storage

Advantages

- Mature
- Predictable
- Simple troubleshooting
- Easy backup strategy
- Good for infrastructure and DBA-centric teams

Challenges

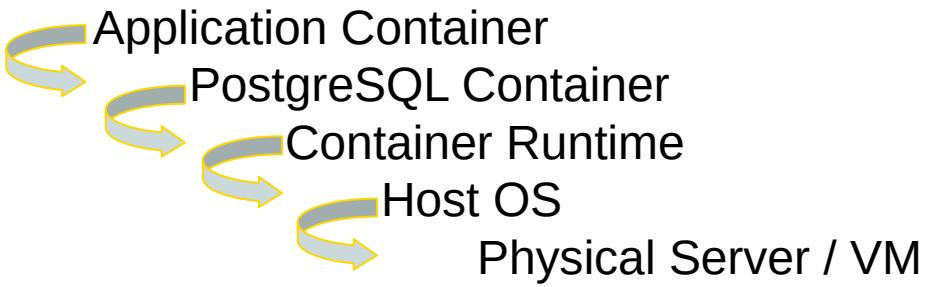
- Manual scaling
- Patching effort
- Failover automation often custom
- Longer provisioning times

Architecture of Containers



Containers

- Share the host OS kernel
- Package only application + dependencies
- Are much lighter than VMs
- Can be orchestrated



PostgreSQL in Containers



Benefits

- Consistent deployments
- Fast provisioning
- Immutable infrastructure
- Easier CI/CD integration

Challenges

- Storage management still matters
- Container ≠ Cloud-Native
- Failover often external

Containers solve packaging, not operations.

PostgreSQL Cloud-Native



Kubernetes → 

PostgreSQL Operator → 

PostgreSQL Cluster

Operator automates

- Provisioning
- Backups
- Replication
- Failover
- Upgrades

Operators

- CloudNativePG (Open Source)
- EDB Postgres AI for CloudNativePG Cluster
- Crunchy Data Operator
- Zalando Operator

PostgreSQL Operator

A PostgreSQL operator extends the Kubernetes API with custom resources that represent PostgreSQL clusters.

Instead of manually managing PostgreSQL clusters, the operator handles the entire lifecycle:

- **Cluster provisioning**
  - Declarative YAML defines replica count, storage, resource limits
- **Automated failover**
  - Detects primary failure and promotes a replica automatically
- **Backup and restore**
  - Scheduled base backups via *pg_basebackup* or WAL archiving with continuous point-in-time recovery
- **Connection pooling**
  - Integrates *pgBouncer* or provides built-in pooler
- **Version upgrades**
  - Rolling major/minor version upgrades with minimal downtime
- **Monitoring**
  - Exports metrics for query performance, replication lag, and resource utilization

When a node fails?

Virtual Machine


Node Fails

→


Monitoring Alert

→


Intervention

Cloud Native


Node Fails

→


K8s Detects Failure

→


Automatic Rescheduling

→


Service Restored

Comparing Models

Operation	VM	Containers	Cloud Native
Provisioning	Manual	Fast	Automated
Backup orchestration	Manual	Manual	Automated
Replica setup / creation	Manual	Manual	Automated
Failover	Scripted / Manual	Scripted	Built-In
Major upgrades	Manual	Manual	Operator-assisted
Self-Healing	Limited	Limited	Strong
Operations	DBA-driven	DBA-driven	Operator-assisted

Cloud-Native doesn’t eliminate DBAs, it changes their focus.
Operators automate operational tasks, allowing DBAs to focus on architecture, performance, governance and recovery strategy.

Cost Considerations

Cloud-Native isn’t always cheaper

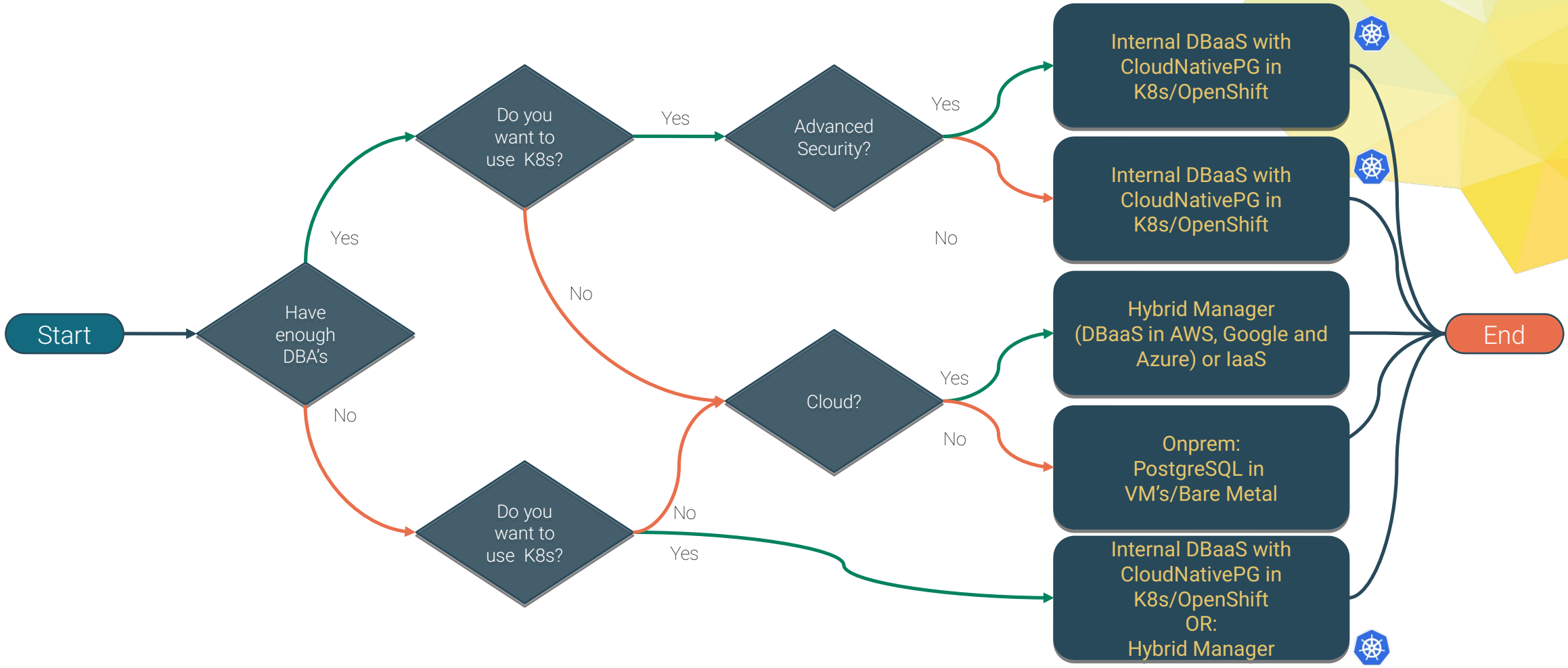
VMs can be cheaper when

- Workloads are stable
- Infrastructure already exists
- Team expertise is strong

Cloud-Native wins when

- Many environments
- Rapid delivery required
- Frequent deployments
- High automation needs

Decision Flow



Decision Matrix

Requirement	Recommendation
Strong DBA Team	VM
Existing Hypervisor-based infrastructure	VM
Simple packaging	Containers
CI/CD integration	Containers
Self-Healing Required	Cloud-Native
Automated failover	Cloud-Native
Many PostgreSQL clusters	Cloud-Native

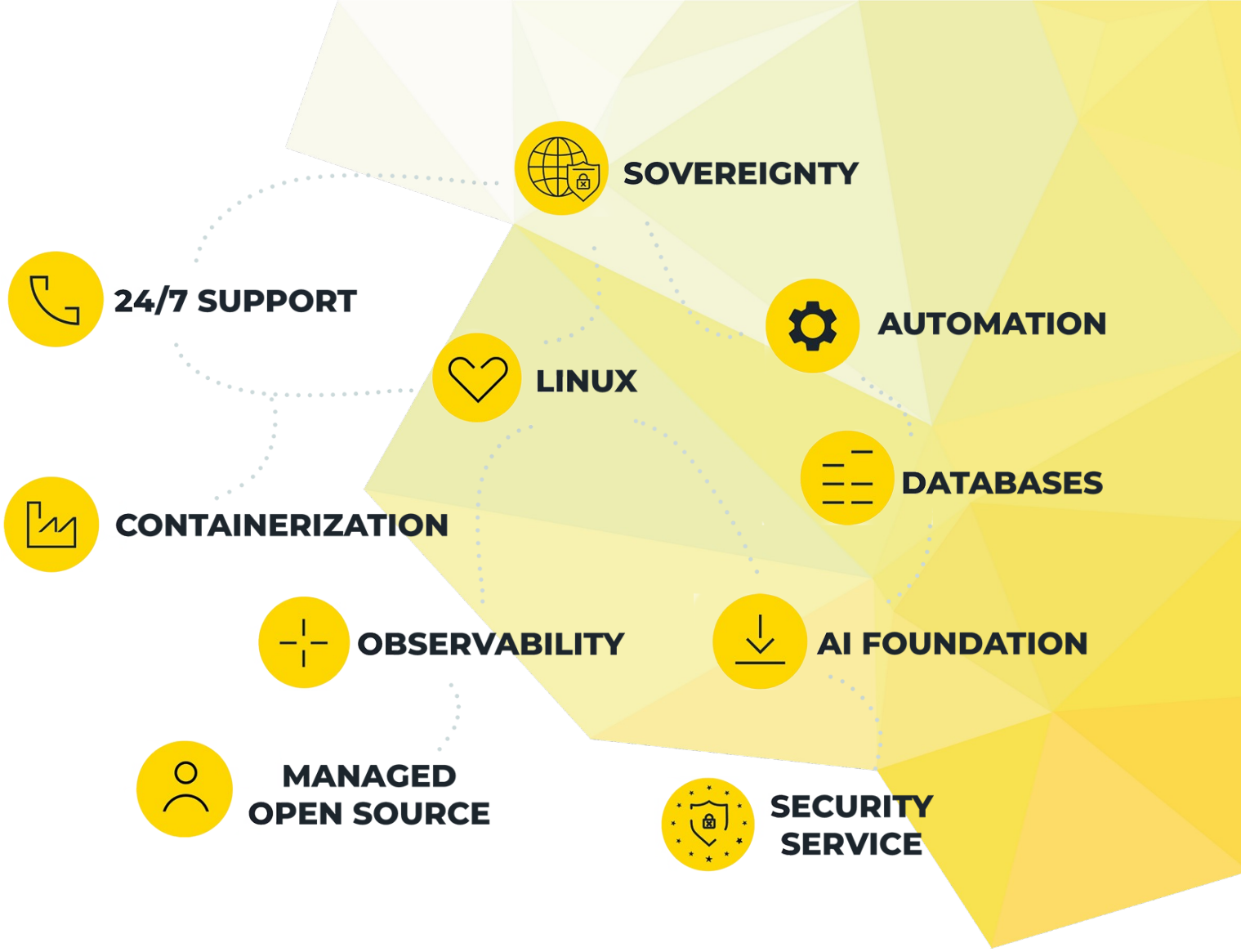
Containers are a packaging technology.
Cloud-Native is an operational model.

Modern PostgreSQL platforms should be

- Portable
- Automated
- Observed
- Recoverable

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Questions?



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