Problem 2: TCO Comparison (On-Prem vs Azure IaaS vs PaaS)

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| **Aspect** | **On-Premises** | **Azure IaaS (VMs)** | **Azure PaaS (Managed Services)** |
| **Initial Capex (Hardware)** | ~$17,100 | $0 | $0 |
| **Annual Opex (Operations)** | ~$11,750 | ~$5,000 | ~$5,000 |
| **3-Year Total Cost** | ~$52,350 | ~$15,000 | ~$15,000 |
| **Scalability** | Limited (hardware-bound) | Good (VM resizing) | Excellent (auto-scale) |
| **Availability (Uptime SLA)** | Medium (~95%-97%) | High (99.9%+ with zones) | Very High (99.95%+ native) |
| **Backup & Recovery** | Manual setup | Azure Backup (optional) | Built-in backups |
| **Security** | Manual (pfSense, hardening) | Azure Security Center + NSGs | Full Azure Security Suite + Private Link |
| **Maintenance (Hardware/OS)** | Manual (full-stack responsibility) | Partial (manage OS, Azure manages infra) | Minimal (Azure manages infra + OS) |
| **Performance Tuning** | Manual optimization | VM tuning needed | Auto-optimized platform |
| **Disaster Recovery Setup** | Complex, expensive | Azure Site Recovery available | Built-in redundancy |
| **Monitoring and Alerts** | Manual (Prometheus/Grafana) | Azure Monitor (VM-based) | Azure Monitor + Application Insights |
| **Global Load Balancing** | Complex, external CDNs needed | Azure Front Door/Traffic Manager (optional setup) | Native with Azure Front Door |
| **Compliance (ISO, HIPAA, etc.)** | Manual, expensive | Easier (shared compliance) | Inherited Azure compliance certifications |
| **Staffing Need** | Full IT Admin Team | Smaller DevOps Team | Minimal Operations (DevOps/Developers) |
| **Vendor Lock-in Risk** | None | Low (VM portability) | Higher (PaaS APIs tied to Azure services) |

# Conclusion

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| **Scenario** | **Best Option** |
| Minimum Cost (long term) | Azure Full PaaS |
| Minimum Maintenance | Azure Full PaaS |
| Maximum Control | Traditional On-Premises |
| Quick Migration | Azure IaaS |
| Highest Scalability | Azure Full PaaS |
| Best for Legacy Systems | Azure IaaS |
| Compliance-Heavy Needs | Traditional On-Premises |
| Small IT Team | Azure Full PaaS |