Enterprise Cloud Adoption Framework (ECAF)

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Cloud Adoption Challenges

- **Government reaps significant benefits from technology**
  - Leverage IT innovations
  - IT people must understand the business/mission
  - Business workers must understand IT
- **Cloud is a big driver of technology change**
  - Multiple emerging technologies depend on cloud services
    - Artificial intelligence (AI), analytics, mobile and edge computing, internet of things (IOT), blockchain, etc.
  - Create a culture of continuous learning
- **Moving to multi-cloud environments**
  - Complex & challenging to navigate
  - Staff skills/knowledge/experience in cloud may be limited
  - Security, agility, performance, compliance, costs difficult to manage
- **Wanted**
  - Simpler way to move systems (applications & data) across cloud providers
  - Transformation-oriented managed services & hybrid implementations
  - Transform the business/mission while keeping the lights on

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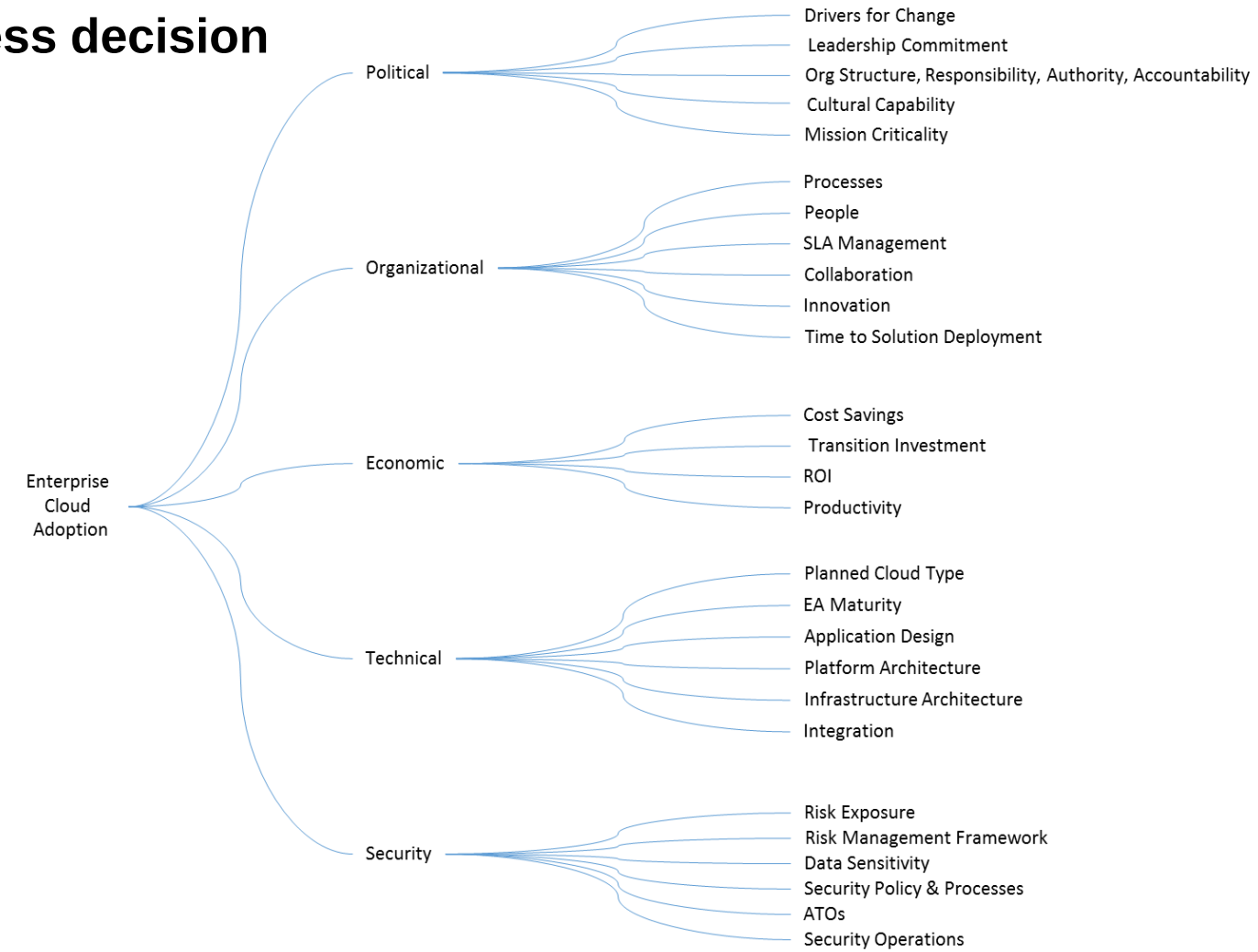
Enterprise Cloud Engineering (POET Model)

- **Adopting cloud is a business decision**
- **Complex set of factors**
  - Politics
  - Organizational change
  - Economic concerns
  - Technology evolution
- **Security & privacy**



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Enterprise Cloud Adoption Framework (ECAF)

	Create the Vision	Determine LRP, ROI & Objectives	Establish Governance & EA	Specify Solution Concept	Create Strategy	Develop Measures	Assess IT Investments	Identify Candidates	Implement	Operate	Optimize
Political	Assess Cloud Readiness & Drivers Develop Vision, Goals & Priorities	Address Law, Regulation & Policy (LRP) Develop Objectives	Establish Governance & Oversight	Identify Strategic Partnerships	Establish Technology Investment Strategy	Establish Performance Framework	Review IT Investment Business Cases	Approve & Fund Best Candidates	Manage Strategic Partnerships	Continuously Assess Success	Continuously Improve Governance & Investment
Organizational	Define Scope via Business Scenarios Identify Stakeholders	Identify Stakeholder Objectives	Plan Stakeholder Engagement & Leader Mobilization	Identify Process, Organization & Personnel (POP) Impacts	Define POP Strategy	Develop POP Measures	Evaluate Processes	Determine POP Changes Plan Training	Implement POP Changes	Perform Operations & Collect Data	Continuously Improve Organization Refine POP
Economic	Establish Risk Tolerance	Determine Return on Investment (ROI)	Build Cloud Business Case	Understand Cloud Cost Model	Update Acquisition Policy Develop Cost Recovery Strategy	Build Cost Measures	Reduce Redundancies Know the CSP Alternatives	Develop Candidate ROIs Develop Business Cases	Acquire Services Manage Acquisition Risks	Manage Contracts Manage Cost	Optimize Value
Technical	Understand State of Technology in Industry	Analyze State of Technology Applied to Objectives	Establish Baseline Technical Architecture	Develop Technical Solution Concept	Develop As-Is to To-Be Transition	Establish Technical Measures	Triage IT Systems Consolidate IT Analyze IT Risks	Determine Migration Type, Architecture	Develop & Execute Migration Plan Design System	Operate & Maintain System	Maximize Capability
Security	Establish Security Tolerance	Know Threat Environment Know RMF & FedRAMP	Perform Risk Analysis Categorize & Select Controls	Know Vendor Security & Privacy Capabilities	Update Security Policy Define Cloud Security Arch.	Develop Security & Privacy Measures	Assess Security & Privacy	Perform Risk Management Portfolio Analysis	Manage Migration Security Risks	Execute Continuous Monitoring & Security Operations	Continuously Improve Security & Privacy

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About the ECAF

- **Creating vision, goals & priorities is key to adoption success & should be done first**
- **ECAF can be used as an assessment tool to determine areas of strengths & weaknesses**
- **Identifies interactions & inter-dependence of activities to successfully adopt cloud**
- **Flexible & iterative, activities may be revisited as necessary**
  - Not a schedule, some activities may be quick, others may be projects
- **Not all areas of the framework may be necessary for every sponsor or situation**
  - Some activities may already be cloud ready
  - Not performing an activity potentially increases risks

Establish information-driven cloud adoption program to reduce risks and ensure a successful outcome

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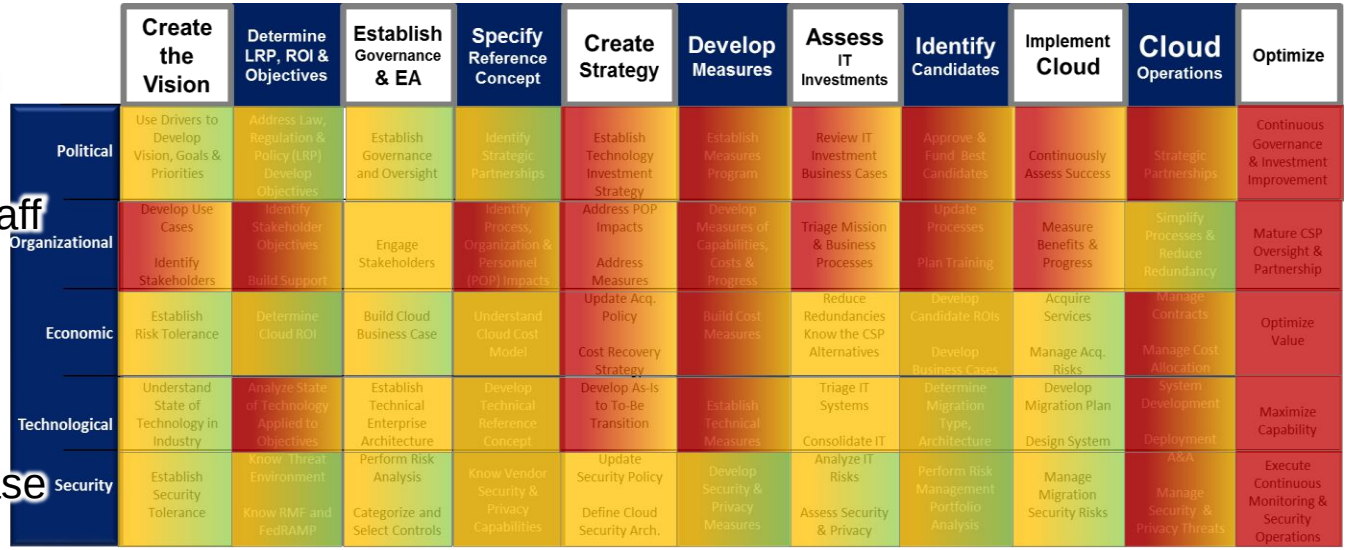
Cloud Adoption Process

- **Assessment**
  - Use ECAF to create heat chart of current cloud readiness for all swim-lanes
- **Strategy**
  - Use assessment results to drive strategic plans
- **Preparation**
  - Review IT policy, test with pilot projects, train staff
  - Leverage strengths, improve weaknesses
  - Plan for operations & continuous improvement
- **Implementation**
  - Leverage lessons learned from preparation phase
- **Operations & optimization**
  - Continuous improvement



Example Assessment

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Create the Vision

P **Understand drivers**
- Political, economic, technical, etc.

P **Assess the total readiness to adopt cloud**
- Technical, processes, people, security, etc.
- ECAF can be used as assessment tool

O **Set the goals & define scope**
- Productivity & collaboration
- Innovation & experimentation
- Geographic diversity & access
- Greater value to mission
- Compliance
- Cost savings

O **Develop business scenarios**
- Few, initial, high level concepts of cloud use

E/S **Establish risk tolerance**
- Organizations have differing tolerances for the amount of risk they can/will accept
  - Security/privacy/classification
  - Culture

O **Identify stakeholders**
- Users, IT, acquisition, security/privacy, Office Of General Counsel (OGC), leadership, etc.
- Consider stakeholder importance, influence, & relevant current & future roles

T **Understand state of technology in industry**
- Current
- Expected in future

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Determine LRP, ROI & Objectives

P **Law, Regulation & Policy (LRP)**
- Understand legal, regulatory & policy impacts
- Review/revise internal policy & regulations if necessary

O **Identify stakeholder needs, values, & objectives**
- Mission-centric
- Add value to your organization
- Measurable
- Aligned with goals

S **Know security threat environment**
- Technical, mission & programmatic risks

S **Know Risk Management Framework (RMF) & FedRAMP**

O/E **Assess Return On Investment (ROI)**
- Focus on objectives & mission value
- Consider total costs, including migration & operations
- Consider total mission benefit, including financial and non-monetary

T **Analyze state of technology applied to objectives**
- Current IT compared to cloud:
  - Security & privacy
  - Systems
  - Infrastructure
  - Data
  - Integration

Moving to a cloud may not reduce financial costs;
However, mission and business benefits may outweigh costs.

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Establish Governance & Enterprise Architecture

- P ■ **Implement the strategy**
  - Realize benefits of cloud adoption
- P ■ **Assures appropriate oversight**
  - Authorities, responsibilities, accountability
- P/O ■ **Provide consistent decision making**
  - At the right time, by the right people
  - Based on measures/metrics
- O/T ■ **Establish enterprise architecture**
  - Basis for decision making
- O/T/S ■ **Execute government RMF**
  - Establish & execute risk management
- O ■ **Plan initial stakeholder & leadership engagement**
  - Plan for change at all levels
  - Build leadership commitment
  - Build support for governance processes
  - Identify stakeholders & roles
- E ■ **Build cloud business case**
  - Understand tradeoffs to inform decisions
- T ■ **Provide technical migration oversight**
  - Systems & applications
  - Data
  - Infrastructure
  - Aggregate cloud adoption considerations

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Specify the Technical Solution Concept

- T **Service model**
  - IaaS, PaaS, SaaS
- T **Deployment model**
  - Public, community, private, hybrid
- T **Integration**
  - Performance
  - Interoperability
  - Potential redundancies
- T **Cloud performance**
  - Vendor visibility
  - Monitor the important stuff
- S **Vendor security & privacy**
  - Integration with current security & privacy
- O **Understand roles & responsibilities**
  - Consumer
  - Provider or integrator
  - Broker
  - Combination of the above
- P **Strategic partner relationships (long- & short-term)**
- P **Compliance to regulations & law**
- O/E **Identify Process, Organization & Personnel (POP) impacts**
  - Service Level Agreements (SLAs)
  - Policy, management, processes & roles
  - Operating & managing Cloud Service Providers (CSPs) & contractors

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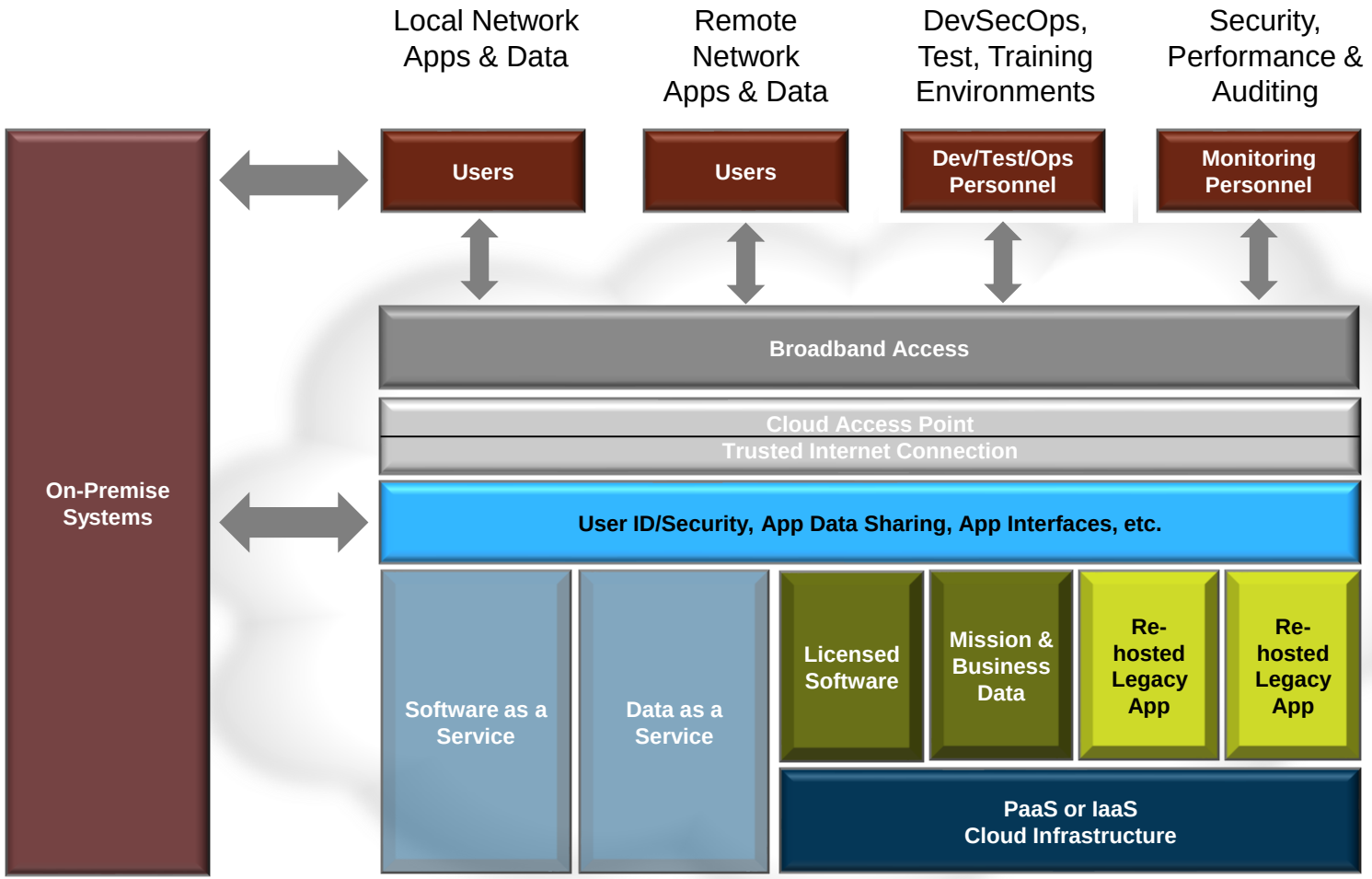
Hybrid Technical Solution Concept (Example)



Users access local systems

Or

Utilize broadband access

Via a Cloud Access Point (CAP) or Trusted Internet Connection (TIC)

Secured by IDAM/RBAC controls

Access multiple services, applications & data provided by CSPs, COTS & legacy apps

Hosted on platform or infrastructure services

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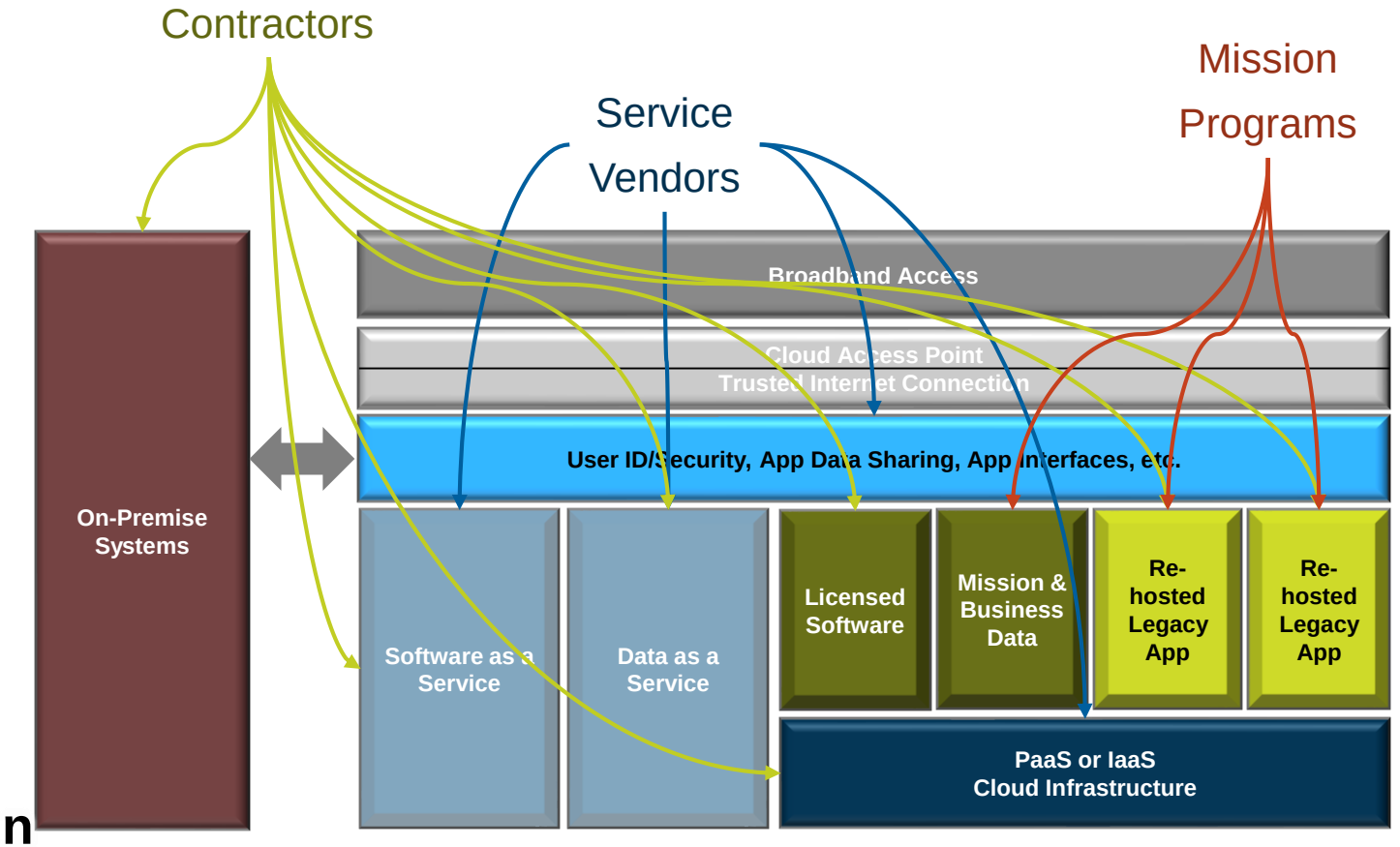
Technical Solution Concept Impacts

- T/S **Multiple CSPs**
  - Service models
  - Deployment models
- O/E **Multiple contractors**
- O/E **Multiple mission programs**
- O/E **Multi-vendor management**
  - Oversight
  - Slas & contracts
  - Operations & relationships
- T/S **Vendor & in-house integration**



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Create the Cloud Adoption Strategy

- P **Establish the technology investment initiatives & strategy**
  - Focused on meeting goals/objectives
  - Prioritized approach for reaching vision
- O **Establish baseline for all stakeholders**
  - Establish common cloud adoption understanding
  - Clear path for accomplishing goals
- P/O **Address measures**
  - Align high level measures to goals & objectives
- **Assess policy & update as needed**
  - E – Acquisition
  - S – Security & privacy
- T **Address infrastructure, apps & data**
  - Operations during migration
  - Operations post migration
- **Address strategies for change**
  - O – POP strategy
    - New IT implies new processes
  - O/E New organizations to support operations & CSP monitoring
    - Configuration & technical support
    - CSP performance management
    - Billing & invoicing allocations
  - Continuous optimization & improvement
  - Workforce development, training, coaching
- E/S – Risk management
- T – As-is to-be transition plan for EA
- E – Cost recovery strategy

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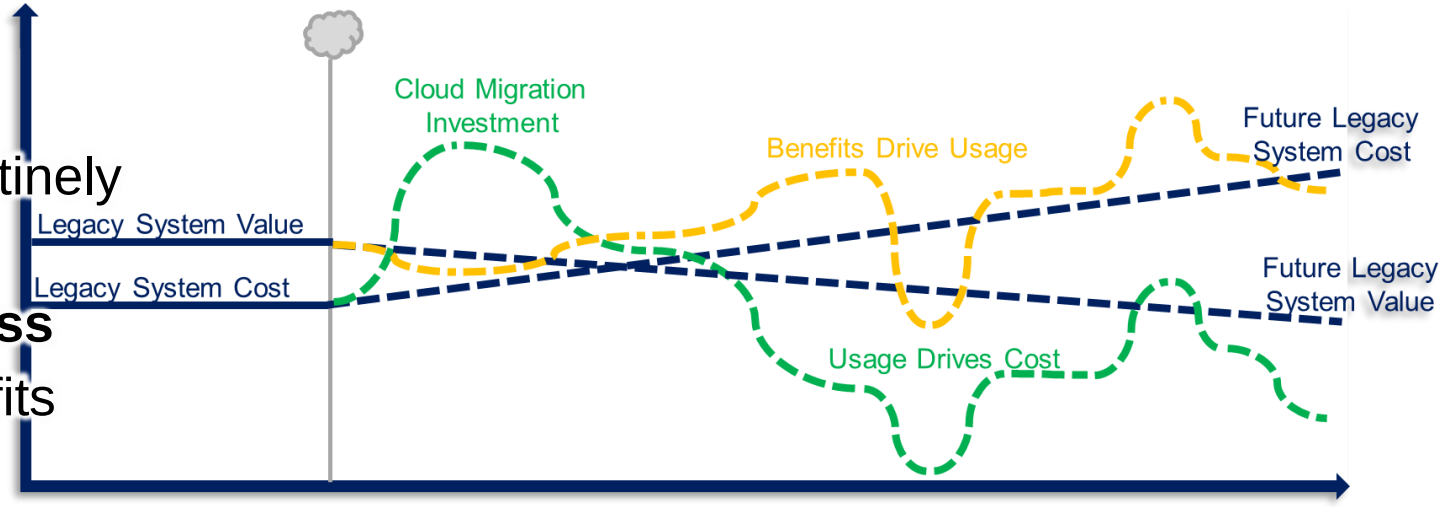
Develop Measures & Metrics

O/E/S ■ **Measure the right things by establishing a performance framework**
- Measure outcomes based on vision, goals & priorities
- Measure progress of activities, milestones & plans compared to strategy
- Measures for POP, cost, technology, security, & privacy

T ■ **Metrics must be obtainable**
- Objective-based metrics
- Measure consistently & routinely

P ■ **Continuously assess success**
- Compare progress to benefits

P/O ■ **Re-plan as necessary**



Example Investment vs. Benefits Metrics Graph

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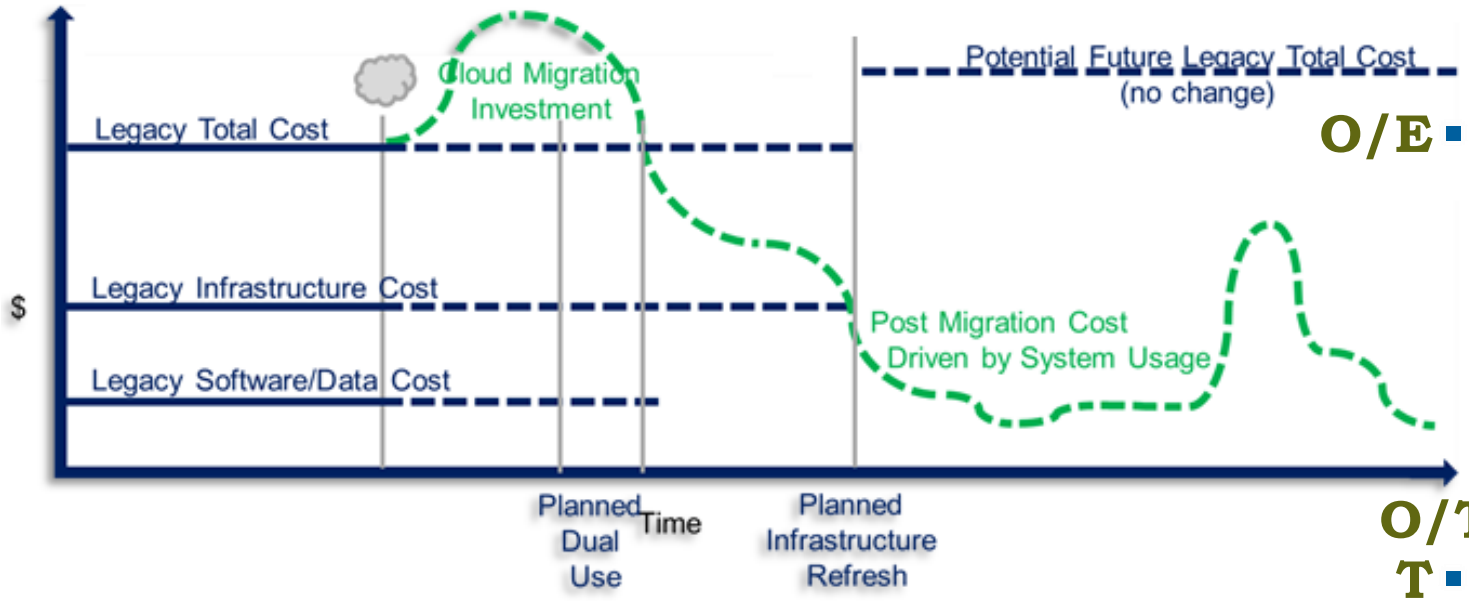
Assess IT Investments



Example Investment vs. Legacy Cost Graph

P ▪ **Review IT investment business cases**
- Mission & cost investments
- Aligned with goals & objectives
- Performed by governance body

O/E ▪ **Reduce redundancies**
- As part of governance decisions
- Evaluate “best of breed”
- Encourage re-use of systems & data
  - Reduce costs
  - Provide more uniformity of services

O/T – Evaluate IT processes

T ▪ **Triage IT systems**
- Initial assessment for candidate systems

S ▪ **Analyze IT risks**

S ▪ **Assess security & privacy**

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Identify Cloud Candidates

E ▪ **Develop business case(s)**
- Cost
- Security & privacy
- Mission
- Technology
- Etc.

O ▪ **Determine pop changes for cloud migration & management**
- Operations & account management

O ▪ **Identify management & user engagement, communications, & training**
- CSP tools & services for IT
- Account management

T/S ▪ **Use MITRE's Cloud Migration Framework & cloud assessment best practices to determine candidates**
- Determine migration type, architecture, & security needs
- Know the CSP alternatives
  - FedRAMP status of services
  - Compared to needs
  - Integration with processes & current IT
  - Vendor management & transparency

P ▪ **Fund & acquire best candidates**

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Implement Cloud & Perform the Migrations

- O/E **Continuously assess success**
  - Cost savings & mission improvements
  - Lessons learned & build success
- O/E **Measure the progress**
  - Number of systems in cloud
  - Migration process efficiency/effectiveness
- E/S **Manage risks**
  - Prioritize for less complexity
- E **Acquire services**
  - Consider replacing legacy systems
  - Agile contracting
- T **Plan & perform the migrations of candidate(s)**
  - Cloud engineering life cycle
  - Cloud migration planning
- T **New systems design & development**
  - Re-imagine systems
  - Re-architect for cloud
- O **Implement POP strategy**
  - Engagement & communications plan
  - Process, role, & org structure changes

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Operate

E ▪ **Manage contracts**

E ▪ **Manage cost allocation**
- Develop & implement payment model to allocate costs to organizational units
- Develop standard tags for resources
- Automate model
- Manage CSP accounts
- Determine charge-back model

T ▪ **Operate & maintain services**
- Elasticity & performance
- DR/COOP

O/E ▪ **Continuously assess to improve processes & reduce redundancy**
- Cost savings
- Mission performance

O/T ▪ **Provide training**
- CSP tools & services
- Development/test/operations processes

T ▪ **Seek & implement SDLC improvements**
- Development/test/operations continuous delivery

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Optimize

O/P ▪ **Continuously improve governance, POP, & investment decisions**
- Data-driven decisions focused on priorities
- Execute the strategy with governance oversight

O ▪ **Mature cloud management**
- Make the right thing easy & the wrong thing hard
- Reward the effort
- Reward the results
- Flexible approach to changes

E ▪ **Optimize costs**
- Usage monitoring & analysis
- Volume discounts
- Archival storage
- Off-hours processing

P ▪ **Build & maintain strategic partnerships**
- CSP & government must work together to achieve best success
  - Performance, innovations & cost control
  - Security & incident handling

E/T ▪ **Optimize benefits & IT capabilities**
- Development/Security/Operations (DevSecOps) opportunities
- Disaster Recovery & Continuous Operations (DR/COOP)
- Re-use

S ▪ **Security & privacy continuous improvement**

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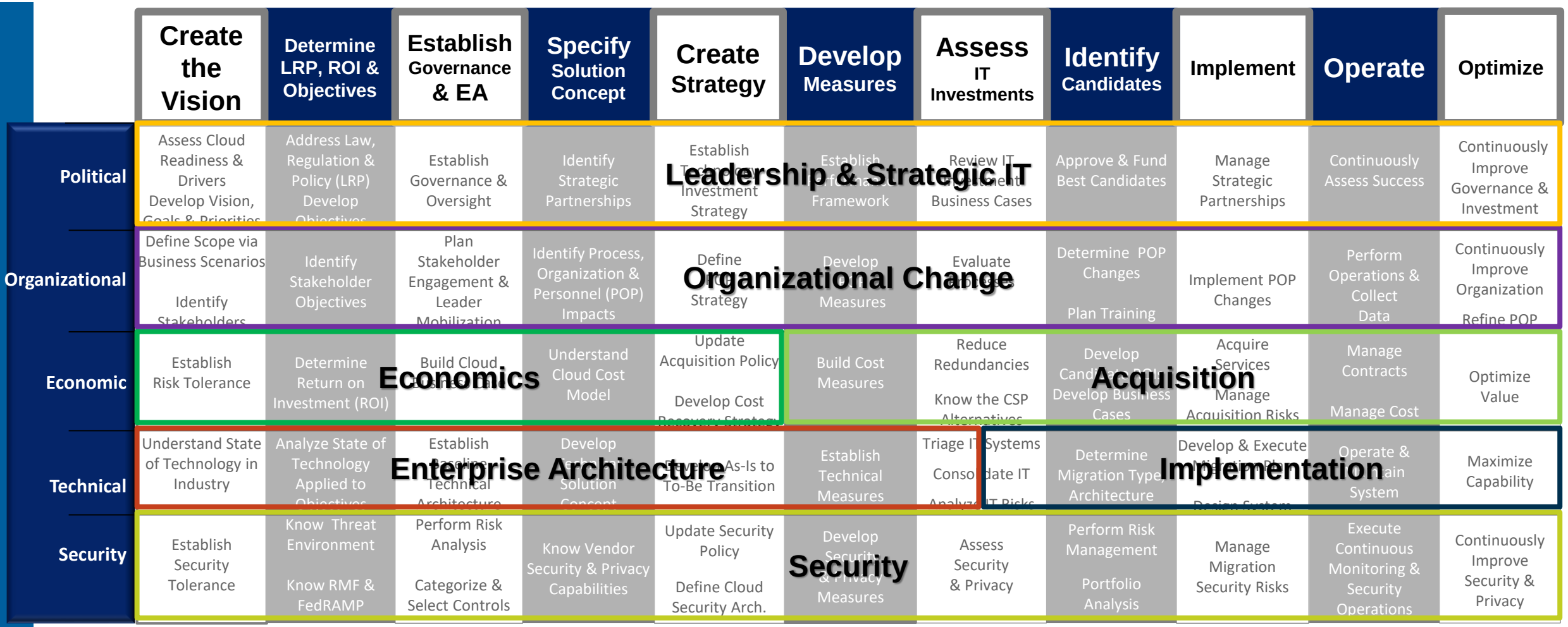

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Glossary

Acronym	Definition
AI	Artificial Intelligence
CAP	Cloud Access Point
CMF	Cloud Migration Framework
COTS	Commercial Off The Shelf
CSP	Cloud Service Provider
DevSecOps	Development, Security & Operations
DR/COOP	Disaster Recovery and Continuous Operations
EA	Enterprise Architecture
ECAF	Enterprise Cloud Adoption Framework
FedRAMP	Federal Risk and Authorization Management Program
IDAM	Identity and Access Management
IOT	Internet of Things
IT	Information Technology
LRP	Address Law, Regulation & Policy
OPGC	Office of General Counsel
POET	Political, Organizational, Economic & Technical model
POP	Process, Organization & Personnel
RBAC	Role Based Access Control
RMF	Risk Management Framework
ROI	Return on Investment
SDLC	Software Development Life Cycle
SELC	System Engineering Life Cycle
SLA	Service Level Agreements
TIC	Trusted Internet Connection

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