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
Enterprise Cloud Engineering (POET Model)

- Adopting cloud is a business decision

- Complex set of factors
  - Politics
  - Organizational change
  - Economic concerns
  - Technology evolution

- Security & privacy
### Enterprise Cloud Adoption Framework (ECAF)

<table>
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<tr>
<th>Create the Vision</th>
<th>Determine LRP, ROI &amp; Objectives</th>
<th>Establish Governance &amp; EA</th>
<th>Specify Solution Concept</th>
<th>Create Strategy</th>
<th>Develop Measures</th>
<th>Assess IT Investments</th>
<th>Identify Candidates</th>
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<tr>
<td><strong>Political</strong></td>
<td>Assess Cloud Readiness &amp; Drivers Develop Vision, Goals &amp; Priorities</td>
<td>Address Law, Regulation &amp; Policy (LRP) Develop Objectives</td>
<td>Establish Governance &amp; Oversight</td>
<td>Identify Strategic Partnerships</td>
<td>Establish Technology Investment Strategy</td>
<td>Establish Performance Framework</td>
<td>Review IT Investment Business Cases</td>
<td>Approve &amp; Fund Best Candidates</td>
<td>Manage Strategic Partnerships</td>
<td>Continuously Improve Governance &amp; Investment</td>
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<tr>
<td><strong>Technical</strong></td>
<td>Understand State of Technology in Industry</td>
<td>Analyze State of Technology Applied to Objectives</td>
<td>Establish Baseline Technical Architecture</td>
<td>Develop Technical Solution Concept</td>
<td>Develop As-is to To-be Transition</td>
<td>Establish Technical Measures</td>
<td>Triage IT Systems Consolidate IT Analyze IT Risks</td>
<td>Determine Migration Type, Architecture</td>
<td>Develop &amp; Execute Migration Plan Design System</td>
<td>Operate &amp; Maintain System</td>
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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
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

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![Example Assessment Diagram](https://example.com/diagram.png)
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
Moving to a cloud may not reduce financial costs; however, mission and business benefits may outweigh costs.

**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
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

- **P/O/T/O** Establish enterprise architecture
  - Basis for decision making

- **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

P - Political
O - Organizational
E - Economic
T - Technical
S - Security
Specify the Technical Solution Concept

**Service model**
- IaaS, PaaS, SaaS

**Deployment model**
- Public, community, private, hybrid

**Integration**
- Performance
- Interoperability
- Potential redundancies

**Cloud performance**
- Vendor visibility
- Monitor the important stuff

**Vendor security & privacy**
- Integration with current security & privacy

**Understand roles & responsibilities**
- Consumer
- Provider or integrator
- Broker
- Combination of the above

**Strategic partner relationships (long- & short-term)**

**Compliance to regulations & law**

**Identify Process, Organization & Personnel (POP) impacts**
- Service Level Agreements (SLAs)
- Policy, management, processes & roles
- Operating & managing Cloud Service Providers (CSPs) & contractors
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
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

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**
- Acquisition
- Security & privacy

**T** Address infrastructure, apps & data
- Operations during migration
- Operations post migration

**Address strategies for change**
- 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
- As-is to to-be transition plan for EA
- Cost recovery strategy
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

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Assess IT Investments

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

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

- Triage IT systems
  - Initial assessment for candidate systems

- Analyze IT risks

- Assess security & privacy

Example Investment vs. Legacy Cost Graph

O/T

P - Political
O - Organizational
E - Economic
T - Technical
S - Security
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
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

**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
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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**Leadership & Strategic IT**

- Define Scope via Business Scenarios
- Identify Stakeholders

**Organizational Change**

- Define Return on Investment (ROI)
- Plan Stakeholder Engagement & Leader Mobilization

**Economics**

- Build Cloud Cost Model
- Reduce Redundancies

**Acquisition**

- Develop Cost Measures
- Know the CSP Alternatives

**Implementation**

- Acquire Services
- Manage Acquisition Risks

**Enterprise Architecture**

- Analyze State of Technology Applied to Objectives
- Develop Technical Architecture

**Technical**

- Develop Solution Concept
- Identify Cloud Cost Model

**Security**

- Identify Threat Environment
- Perform Risk Analysis

- Protect Systems Security
- Define Cloud Security Arch.

- Triage Risk
- Define IT Risks

- Manage Migration Security Risks
- Manage Migration Security Risks

- Execute Continuous Monitoring & Security Operations
- Continuously Improve Security & Privacy

## Glossary

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<td>AI</td>
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<td>CAP</td>
<td>Cloud Access Point</td>
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<td>COTS</td>
<td>Commercial Off The Shelf</td>
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<td>Federal Risk and Authorization Management Program</td>
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<td>IDAM</td>
<td>Identity and Access Management</td>
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<td>IOT</td>
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<td>IT</td>
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<td>OPGC</td>
<td>Office of General Counsel</td>
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<td>POET</td>
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<td>RBAC</td>
<td>Role Based Access Control</td>
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<td>SDLC</td>
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