Considerations in Data Center Migration Life Cycle Cost Estimating

A Joint Information Environment (JIE) Perspective

Dennis J. McKeon

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Overview

- JIE background
- Migration to JIE / data center cost approach
- Major cost drivers
- Infrastructure cost model description
- Unique cost considerations
- Infrastructure cost ratios and outcomes
- Costing challenges and risks
- Potential JIE benefits
- Conclusion

JIE Background

- **The Secretary of Defense (SECDEF) decided to implement a JIE in October 2010**
- **The Joint Staff, DoD CIO, and U.S. Cyber Command continually update guidance**
- **JIE is NOT an official Program-of-Record**
- **JIE focus is on "five big rocks"**
- **Migrating to the JIE poses unique challenges**

JIE Goals

-Improve Mission Effectiveness

-Improve Security

-Gain IT Efficiencies

Migration to JIE / Data Center Cost Approach (1 of 3)

- **Identify cost estimating methodology**
  - Build-out / engineering judgment
  - Parametric tied to one or more variables
  - Identify type of migration / control / boundaries / Fee for Service
- **Develop alternatives for JIE / Data center (DC) migration**
  - Informed by ongoing JIE concept development
  - Could include sequential site migration, parallel site migration
  - Have to identify cutover periods and major milestones
- **Identify if private, public, or hybrid cloud options are feasible**
- **Construct tailored cost element structure / define elements**

Migration to JIE / Data Center Cost Approach (2 of 3)

- **Collect data on current data center metrics / inventory**
  - Bill-of-Materials (BOM) includes inventory of compute, storage, and database servers and network equipment
  - Infrastructure administration support numbers for compute, storage and other functions
  - Power consumption for equipment and cooling
  - Data Center power equipment maintenance, such as UPS
  - Facility costs (if in scope)
- **Identify anticipated future workload and requirements for compute, storage, availability, virtualization**

Migration to JIE / Data Center Cost Approach (3 of 3)

- **Market Research**
  - Identify latest versions of hardware (HW) and software (SW)
  - Identify industry trends for data center configuration options including virtualization, containers, etc.
  - Develop To-Be BOM
- **Develop and refine life cycle cost estimates per alternative**
- **Work with engineers to document assumptions**
- **Perform sensitivity and "What-if" analysis for key cost drivers**

Major Cost Drivers

- **Admin / Personnel Counts**
  - Compute, storage, and database admins
  - Enterprise integration & testing
  - Helpdesk and support

Personnel costs are the major cost drivers of a data center

- **Hardware / Software**
  - Compute

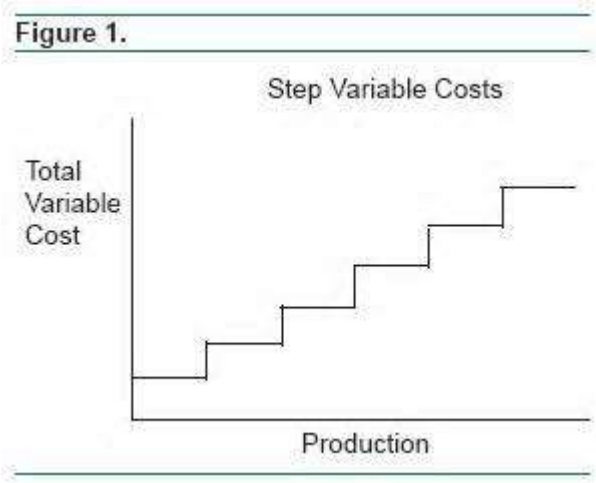
  - Storage

HW/SW sizing depends on workload and infrastructure requirements and projections

  - Application hosting / network

Data Center Economics

- **Fixed / upfront costs**
  - Facilities and shared equipment
  - Facility maintenance, security, and operations personnel
- **Variable costs**
  - Infrastructure administration, integration, and helpdesk
  - Application HW / SW
  - Power



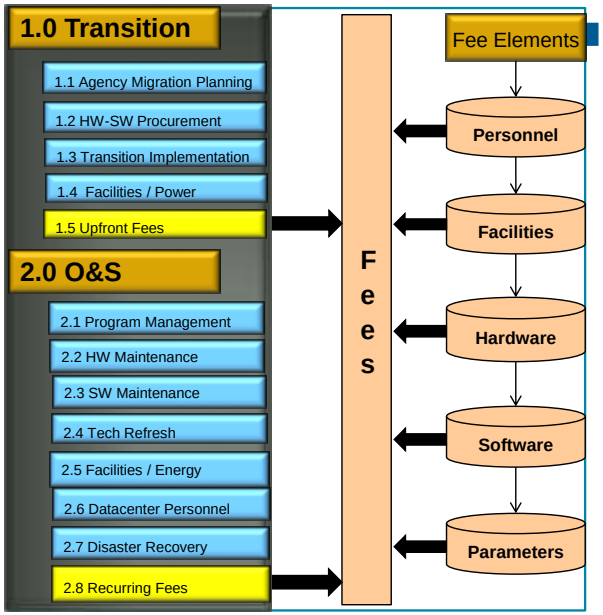
Admins and HW / SW do not increase at the same rate as workload but there are points where a whole unit has to be added

Develop Infrastructure Cost Model

The Model Capability

- Presents end-to-end life cycle costs
- Insight into major cost drivers
- Allows for "What-If-Analysis"
- Capability to perform a cost-risk assessment to major cost drivers
- One cost model being developed for each alternative
- Yellow boxes are unique to data center contract
- Cost drivers are dependent on migration approach
- Compare total cost of ownership (TCO) costs for "as-is" against Fees to be incurred for JIE

Modeling as-is costs helps anticipate and compare initial hosting estimate and long-term fees



Transition costs

- Plan migration approach to future data center
- HW / SW procurement*
- Transition implementation
- Facilities and power equipment
- *Upfront fees*

Operations and sustainment costs

- Program management
- HW / SW maintenance and tech refresh*
- Facilities maintenance and power
- Data center personnel (The major cost driver)
- *Recurring fees*

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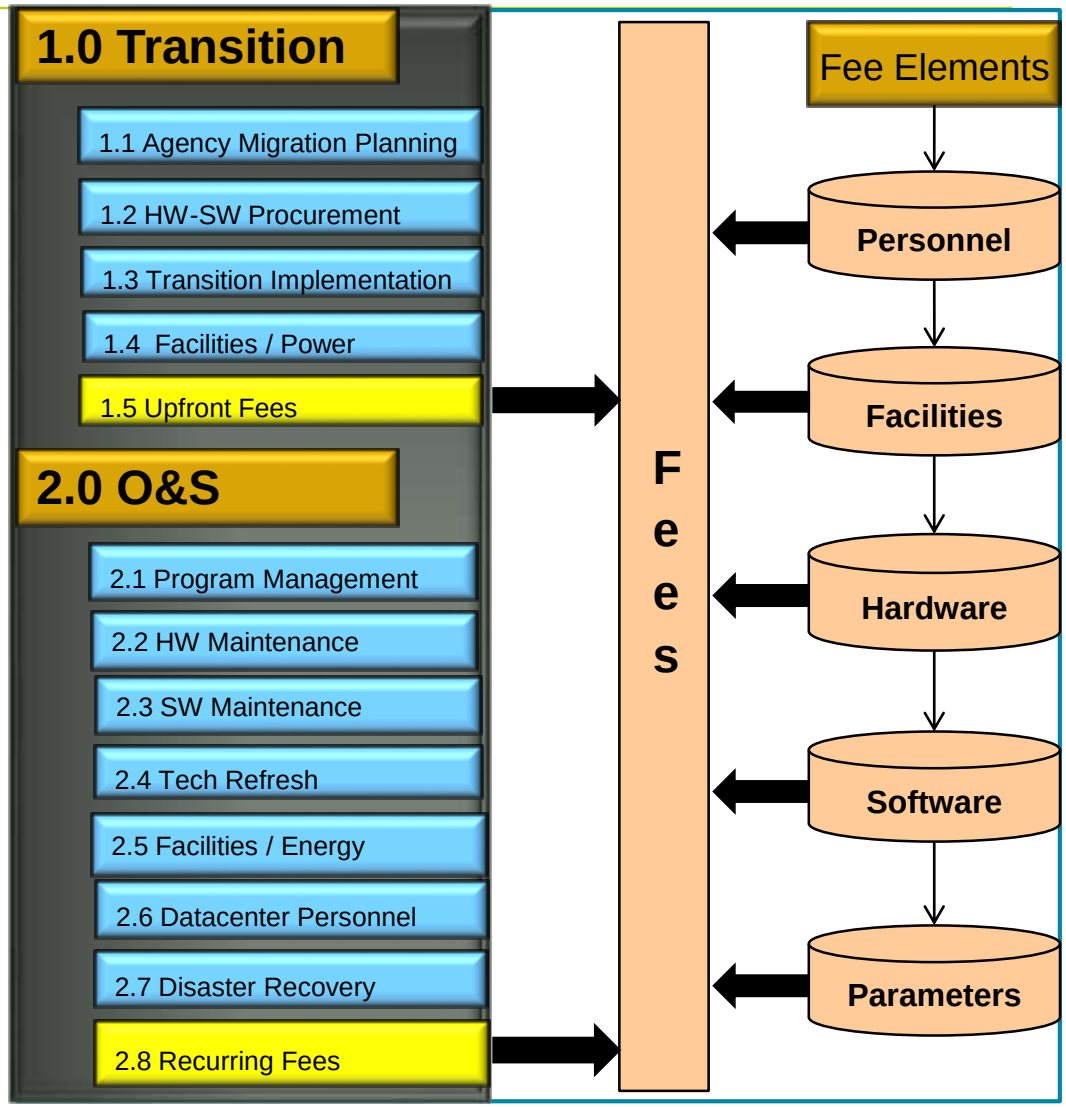

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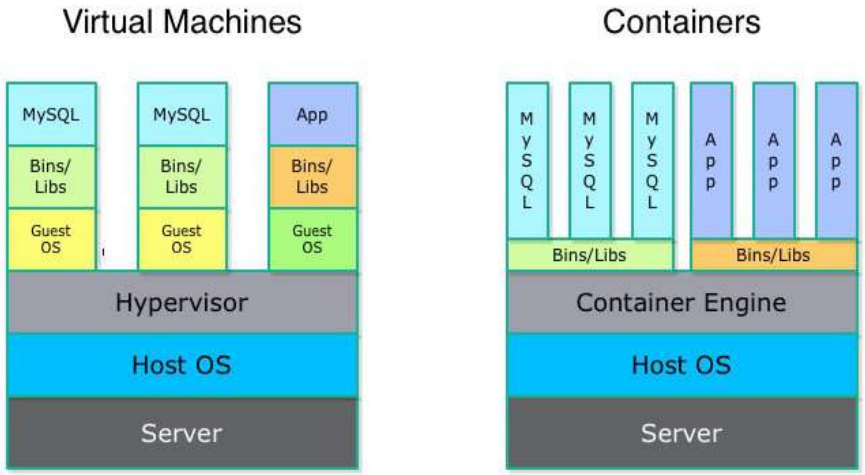
Unique Cost Considerations (1 of 3)

- **Estimating admin support based on workload**
  - Informs comparative analysis of “As-Is” against “To-Be” workload
- **Compute server administration**
  - Compute servers managed per admin ratios can be useful
  - Compute servers are vital for virtualization and require greater processing power and a higher level of admin skill
  - Estimating productivity per admin yields important information
    - More productive admins may cost more but be able to manage a larger cluster of servers
    - Virtualization requires a higher skill-set overall
- **Database / storage / network server administration**
  - Database, storage, and network-admin ratios are not as useful
  - Storage ratios can be derived but are very dependent on storage and data related technical and functional requirements

Unique Cost Considerations (2 of 3)

- **Infrastructure technology advances: Containerization**
  - Current approach assumes moving from physical, dedicated server management to virtualization



  - Application Containerization is an alternative solution needing further analysis potentially the next wave after virtualization to achieve infrastructure efficiencies
  - Research next generation infrastructure HW and SW, remain aware of trends and track industry progress
- **Cost methodology for containers and further advances will likely follow similar basic approach as for virtualization**

Unique Cost Considerations (3 of 3)

- **Infrastructure technology advances: Cloud**
  - Public, private, or hybrid cloud environment options seem better suited for well-defined, specific requirements
  - For complex environments with mission critical applications, it is more difficult for DoD Services, Agencies, and Components to relinquish responsibility
  - Potentially very cost effective but very dependent on rates
- **SW data center licensing schemes**
  - Essential to clearly understand use rights in license agreements such as processors, scope, technical support
  - Track and audit to ensure compliance to avoid cost increases in future contract renegotiation

Infrastructure Cost Ratios and Outcomes

- **Admin / personnel counts**
  - Compute server/admin ratio: 40:1*
  - Storage PB/admin ratio: 10TB:1*
- **Facility costs**
  - Dependent on buy-lease-build out, security classification
  - Rates can be obtained per square foot by location for each approach
- **Purpose of going through this rigor is to anticipate costs**
- **Using the model and approach described we found:**
  - The actual JIE migration estimate matched our estimate
  - Actual recurring fees were within 25 percent of our estimate for operations and sustainment
- **Result is that developing this model did help us gain a better understanding of likely costs for budgeting purposes**

Costing Challenges and Risks

- **Challenges and risks**
  - As-Is data for baseline costing may be hard to acquire and interpret against future infrastructure requirements
  - Anticipating future infrastructure capabilities and products due to improvements in server technologies is challenging
  - Service pricing and fees are dependent on forecasting workload metrics against combination of fixed and variable costs
  - Anticipating fees / costs should be presented as a range, not a point estimate
  - A robust cost recovery model needs to continuously adjust fixed and variable costs and offer competitive pricing
  - DoD security requirements will be a cost driver
  - Cloud requires increased network bandwidth requirements

Workload increases but technology improves so the key question is:

Does the growth in projected workload exceed the rate of improvement in server technologies and the ability of personnel to manage more with less?

Potential JIE Benefits

- **Reduction in admin support (DB, Storage, Compute)**

Reduction in shared service support administration and helpdesk contracts is the greatest single potential benefit of JIE

- **Improved technical / system performance metrics**
  - Better central processing unit (CPU) utilization when servers are not fully utilized
  - Better continuity of operations (COOP)
  - Less downtime for maintenance
  - Smaller machine room for footprint for same set of logical servers
  - Overall, performance should improve but it will require highly skilled personnel and a possible change in mindset

Conclusion / Way Ahead

- **JIE details are still being developed, moving target**
- **Collaborate and work together to envision future data center environment, workload, and develop assumptions**
- **A tailored, comprehensive cost estimate structure is critical to**
  - Identify key cost drivers for planning, transition, and migration to JIE
  - Identify long-term HW/SW and personnel sustainment costs
- **Developing a detailed life cycle cost estimate will**
  - Provide understanding of current and envisioned To-Be environment
  - Establish a baseline for comparison against upfront and recurring fees
- **Work with capital planning and financial SMEs to incorporate estimates into funding lines for out-year budget projections to ensure Infrastructure service costs are included**